

**Smart Valve Positioner 700 Series
with HART Communication Protocol
Model AVP701/702**

HART Communication Manual



Azbil Corporation

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1. INTRODUCTION

1.1 Scope

The Azbil Corporation smart valve positioner, model AVP701/702, revision 1 complies with HART Protocol Revision 7.3. This document specifies all the device-specific features and documents the HART Protocol implementation details (e.g., which Engineering Unit Codes are supported). 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 (e.g., *Smart Valve Positioner 700 Series with HART Communication Protocol User's Manual*) 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

A/D	Analog to digital
AO	Analog output
CPU	Central processing unit (of microprocessor)
I/F	Interface
ROM	Read-only memory
RAM	Random access memory
EPM	Electro-pneumatic conversion module
VTD	Valve travel detector
LUI	Local user interface
Ps	Supply pressure
Po	Output pressure (Pilot relay output pressure)
Pn	Nozzle flapper pressure (EPM output pressure)

1.5 References

HART Communication Protocol Specification: HCF_SPEC-13 (Available from FieldComm Group)

Smart Valve Positioner 700 Series with HART Communication Protocol User's Manual: CM2-AVP702-2001

2. DEVICE IDENTIFICATION

Manufacturer Name:	<u>Azbil Corporation</u>	Product Name:	<u>AVP700</u>
Manufacture ID Code:	<u>000036</u>	Device Type Code:	<u>360f</u>
HART Protocol Revision	<u>7.3</u>	Device Revision:	<u>1</u>
Number of Device Variables	<u>13</u>		
Physical Layers Supported	<u>FSK</u>		
Physical Device Category	<u>Actuator, Non-DC-isolated Bus Device</u>		

3. PRODUCT OVERVIEW

The 700 series model AVP70/702 is a current-pneumatic smart valve positioner. The device receives a current signal (4 to 20 mA DC) from control devices and controls pneumatic valves. In addition to this basic function, the device has communication capabilities, an automatic configuration program, and self-diagnostics functions that greatly increase the productivity and efficiency of plant operation.

All adjustments and settings can be made via HART communication. The Local User Interface (LUI), which consists of the LCD (liquid crystal display) and operation buttons, facilitates monitoring of the device variables (e.g. input signal, valve travel, and pressures) as well as basic adjustments.

In addition, the built-in pressure sensors to measure the supply air pressure and output air pressures enable not only device self-diagnostics but also the monitoring of the operation status and the characteristics of the control valve.

4. PRODUCT INTERFACES

4.1 Host interface

4.1.1 Analog Input

The two-wire 4-to-20 mA current loop is connected on two terminals marked "IIN+" and "IIN-". Refer to the User's Manual for connection details.

HART Communication is supported on this loop.

	Values (mA or V)
Minimum current	3.84 mA ^{Note}
Maximum current	21.6 mA
Multi-Drop current draw	8.0 mA
Minimum voltage	9.5 V (without overvoltage protection) 12.0 V (with overvoltage protection)

Note: In the range of 3.5 mA to 3.84 mA, HART communication is possible though the operation of the positioner is not guaranteed. (The output air pressure becomes the same state as the power-off. The pressure sensor value is not guaranteed.)

4.2 Local Interface

4.2.1 Local Display and Push Buttons

The device has a local user interface (LUI) consisting of an LCD and four buttons. Removing the front cover of the device enables the buttons to be operated.

Refer to the User's Manual for details on the functions that can be performed using the LUI, and the operating procedures.

5. DEVICE VARIABLES

5.1 Device-Specific Device Variables

There are 13 device-specific Device Variables. The definitions are shown as follows.

Device Variables			
Code	Name	Meaning	Units
0	Input Signal	Percent of range of input current	%
1	Position	Degree of valve opening Obtained by reverse-converting the travel characteristic (de-characterization)	%
2	Drive Signal	EPM drive signal	%
3	Po1	Pressure of output port 1	kPa, MPa, bar, kgf/cm2, psi
4	Input Current	Current being input to the device	mA
5	Set Point	Indicated travel value Obtained by converting the input signal characteristic	%
6	Travel	Actual valve travel The actual measured feedback valve travel before de-characterization.	%
7	Po2	Pressure of output port 2	kPa, MPa, bar, kgf/cm2, psi
8	Ps	Air pressure being supplied to device	kPa, MPa, bar, kgf/cm2, psi
9	Pn	Nozzle back pressure	kPa, MPa, bar, kgf/cm2, psi
10	Temp	Temperature of electric board	degrees C, degrees F
11	VTD Temp	Temperature of VTD	degrees C, degrees F
12	VTD Angle	Angle of VTD	degrees

Note: The pressure units that can be set are divided into two unit groups depending on the model number. Also, the temperature unit is determined automatically as appropriate for the pressure unit. It is degrees F only when the pressure unit is psi, and is degrees C when the pressure unit is anything else.

5.2 Device Variable Information

Further details on the Device Variables, including Percent Range, Loop Current, PV, SV, TV and QV, are shown as follows. (These details can be read with command #9 and command #54.)

Code	Name	Device Variable Transducer Serial Number	Device Variable Limits/ Minimum Span Units Code	Device Variable Upper Transducer Limit	Device Variable Lower Transducer Limit	Device Variable Damping Value	Device Variable Minimum Span	Device Variable Classification	Device Variable Family	Update Time Period.
0	Input Signal	Same as transducer serial number	Same as device variable units code	N/A	N/A	0	N/A	0: Not classified	250: Not used	50msec
1	Position	VTD serial number	Same as device variable units code	N/A	N/A	N/A	N/A	91: Valve actuator	250: Not used	25msec
2	Drive Signal	0: Not used	Same as device variable units code	N/A	N/A	N/A	N/A	0: Not classified	250: Not used	25msec
3	Po1	Pressure sensor board serial number	Same as device variable units code	N/A	N/A	N/A	N/A	65: Pressure	250: Not used	25msec
4	Input Current	0: Not used	Same as device variable units code	N/A	N/A	0	4	84: Current	250: Not used	50msec
5	Set Point	0: Not used	Same as device variable units code	N/A	N/A	N/A	N/A	0: Not classified	250: Not used	50msec
6	Travel	Same as Code 1	Same as device variable units code	N/A	N/A	N/A	N/A	91: Valve actuator	250: Not used	25msec
7	Po2	Same as Code 3	Same as device variable units code	N/A	N/A	N/A	N/A	65: Pressure	250: Not used	50msec
8	Ps	Same as Code 3	Same as device variable units code	N/A	N/A	N/A	N/A	65: Pressure	250: Not used	200msec
9	Pn	Same as Code 3	Same as device variable units code	N/A	N/A	N/A	N/A	65: Pressure	250: Not used	100msec
10	Temp	Temperature sensor serial number	Same as device variable units code	N/A	N/A	N/A	N/A	64: Temperature	250: Not used	5sec
11	VTD Temp	Same as Code 1	Same as device variable units code	N/A	N/A	N/A	N/A	64: Temperature	250: Not used	5sec
12	VTD Angle	Same as Code 1	Same as device variable units code	N/A	N/A	N/A	8	86: Angle	250: Not used	25msec
244	Percent Range	0: Not used	57: Percent	N/A	N/A	0	25	84: Current	250: Not used	50msec
245	Loop Current	Same as Code 4								
246	PV	Same as Code 0								
247	SV	Same as Code 1								
248	TV	Same as Code 2								
249	QV	Same as Code 3								

5.3 Device Variable Status

Shows the details of Device Variable Status returned by command #9. Bit 3 (“More Device Variable Status Available”) and Bit 2, 1, 0 (“Device Family Specific Status”) are not used (always set to 0).

The conditions for setting “Process Data Status” and “Limit Status” of each device variable are shown as follows.

“Status $n-m$ ” means that the condition is same as Additional Device Status where n indicates Byte number and m indicates Bit number. See also [Section 7.3](#).

Code	Name	Process Data Status (Bit7, 6)				Limit Status (Bit5, 4)			
		11:Good	01:Poor Accuracy	10:Mannual/Fixed	00:Bad	11:Constant	01:Low Limited	10:High Limited	00:Not Limited
0	Input Signal	Normal	N/A	Status 2-2	Status 1-2/ Status 14-0	N/A	N/A	N/A	Always
1	Position	Normal	Status 1-1/ Status 3-5	N/A	Status 1-0/ Status 1-2	N/A	N/A	N/A	Always
2	Drive Signal	Normal	N/A	Status 2-3/ Drive Signal fail-safe function is working.	N/A	Drive Signal fail-safe function is working.	N/A	Status 3-1	Normal
3	Po1	Normal	Status 1-2/ Status 3-3/ Status 14-1	N/A	Status 1-3/ Status 1-4	Status 3-1	N/A	N/A	Normal
4	Input Current	Normal	N/A	N/A	Status 1-2/ Status 14-0	N/A	N/A	N/A	Always
5	Set Point	Normal	N/A	Status 2-2	Status 1-2/ Status 14-0	N/A	Status 5-1	Status 5-0	Normal
6	Travel	Normal	Status 1-1/ Status 3-5	N/A	Status 1-0/ Status 1-2	N/A	N/A	N/A	Always
7	Po2	Normal	Status 1-2/ Status 3-3/ Status 14-1	N/A	Status 1-3/ Status 1-5	Status 3-1	N/A	N/A	Normal
8	Ps	Normal	Status 1-2/ Status 3-3/ Status 14-1	N/A	Status 1-3/ Status 1-6	Status 3-1	N/A	N/A	Normal
9	Pn	Normal	Status 1-2/ Status 3-3/ Status 14-1	N/A	Status 1-3/ Status 1-7	Status 3-1	N/A	N/A	Normal
10	Temp	Normal	Status 3-3	N/A	Status 1-2/ Status 14-1	N/A	N/A	N/A	Always
11	VTD Temp	Normal	Status 3-5	N/A	Status 1-0/ Status 1-2	N/A	N/A	N/A	Always
12	VTD Angle	Normal	Status 1-1/ Status 3-5	N/A	Status 1-0/ Status 1-2	N/A	N/A	N/A	Always
244	Percent Range	Same as Code 4							
245	Loop Current	Same as Code 4							
246	PV	Same as Code 0							
247	SV	Same as Code 1							
248	TV	Same as Code 2							
249	QV	Same as Code 3							

6. DYNAMIC VARIABLES

Four dynamic variables are implemented.

	Device Variable Code
PV	0
SV	1
TV	2
QV	3

7. STATUS INFORMATION

7.1 Field Device Status

Bit 7 ("Device Malfunction") is set whenever any status classified in "Failure" is detected. Command #48 gives further detail. (See [Section 7.3.](#))

Bit 4 ("More Status Available"): The status mapping is configurable. Command #48 gives further detail. (See [Section 7.3.](#))

7.2 Extended Device Status

Bit 1 ("Device Variable Alert") is set if any Device Variable Status is not zero. Command #9 gives further detail. (See [Section 5.3.](#))

Bit 0 ("Maintenance Required") is set if any status classified in "Maintenance Required" is set. Command #48 gives further detail. (See [Section 7.3.](#))

7.3 Additional Device Status (Command #48)

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

Byte	Bit	Meaning	Class	Device Status Bits Set (Default mapping)
0	0	ROM Failure	Failure	4,7
	1	RAM Failure	Failure	4,7
	2	Non-Volatile Memory Failure	Failure	4,7
	3	CPU Failure	Failure	4,7
	4	Not used		
	5	Not used		
	6	Not used		
	7	Not used		
1	0	Valve Travel Detector Failure	Failure	4,7
	1	Valve Travel Detector Out of Range	Failure	4,7
	2	A/D Conversion Module 1 Failure	Failure	4,7
	3	A/D Conversion Module 2 Failure	Failure	4,7
	4	Po1 Pressure Sensor Failure	Failure	4,7
	5	Po2 Pressure Sensor Failure	Failure	4,7
	6	Ps Pressure Sensor Failure	Failure	4,7
	7	Pn Pressure Sensor Failure	Failure	4,7
2	0	Dummy Travel Transmission simulation is running	Function Check	
	1	Local User I/F Active	Function Check	
	2	Dummy Input Signal simulation is running	Function Check	
	3	Dummy Drive Signal simulation is running	Function Check	
	4	Auto Setup is running	Function Check	
	5	Auto Travel Calibration is running	Function Check	
	6	Step Response Test is running	Function Check	
	7	Valve Signature is running	Function Check	
3	0	VTD Angle Span Out of Range	Out of Specification	4
	1	Input Signal Low	Out of Specification	4
	2	Insufficient Input Signal Range	Out of Specification	4
	3	Temperature Out of Range	Out of Specification	4

	4	Supply Pressure Out of Range	Out of Specification	4
	5	Not used		
	6	Incorrect Setting of Input Range High/Low	Out of Specification	4
	7	Not used		
4	0	Restriction is clogged	Maintenance Required	
	1	Deposits on the Nozzle-Flapper	Maintenance Required	
	2	Not used		
	3	Not used		
	4	Not used		
	5	Not used		
	6	Not used		
	7	Not used		
5	0	Travel Cutoff High	Information	
	1	Travel Cutoff Low	Information	
	2	Factory Settings Restored	Information	
	3	In Use by an Operator	Information	
	4	Local User I/F Abnormal	Information	
	5	Failure Output (AO)	Information	
	6	Not used		
	7	Local User I/F was used in past 10 min.	Information	
6	0	Maintenance Required	-	
	1	Device Variable Alert	-	
	2	Not used		
	3	Not used		
	4	Not used		
	5	Not used		
	6	Not used		
	7	Not used		
7	0	Not used		
	1	Not used		
	2	Not used		
	3	Not used		
	4	Not used		
	5	Not used		

	6	Not used		
	7	Not used		
8	0	Simulation Active	-	
	1	Non-Volatile Memory Defect	-	
	2	Volatile Memory Defect	-	
	3	Not used		
	4	Not used		
	5	Environmental Conditions Out of Range	-	
	6	Electronics Defect	-	
	7	Not used		
9 - 13	0	Not used		
	1	Not used		
	2	Not used		
	3	Not used		
	4	Not used		
	5	Not used		
	6	Not used		
	7	Not used		
14	0	Input Circuit Failure	Failure	4,7
	1	Temperature Sensor Failure	Failure	4,7
	2	Internal Program Execution Error	Failure	4,7
	3	Not used		
	4	Not used		
	5	Not used		
	6	Not used		
	7	Not used		
15	0	Not used		
	1	Not used		
	2	Not used		
	3	Not used		
	4	Not used		
	5	Not used		
	6	Not used		
	7	Not used		

16	0	Supply Pressure High Alarm	Out of Specification	4
	1	Supply Pressure Low Alarm	Out of Specification	4
	2	Temp High Alarm	Out of Specification	4
	3	Temp Low Alarm	Out of Specification	4
	4	Not used		
	5	Not used		
	6	Not used		
	7	Not used		
17	0	Total Stroke Alarm	Maintenance Required	
	1	Cycle Count Alarm	Maintenance Required	
	2	Shut Count Alarm	Maintenance Required	
	3	Max Travel Speed Plus Alarm	Maintenance Required	
	4	Max Travel Speed - Alarm	Maintenance Required	
	5	Output Pressure Validity Plus Alarm	Maintenance Required	
	6	Output Pressure Validity - Alarm	Maintenance Required	
	7	Max Friction Alarm	Maintenance Required	
18	0	Stick-Slip High Alarm	Maintenance Required	
	1	Stick-Slip Medium Alarm	Maintenance Required	
	2	Stick-Slip Low Alarm	Maintenance Required	
	3	Not used		
	4	Deviation Plus Alarm	Maintenance Required	
	5	Deviation Minus Alarm	Maintenance Required	
	6	Zero Travel Plus Alarm	Maintenance Required	
	7	Zero Travel Minus Alarm	Maintenance Required	
19 – 24	0	Not used		
	1	Not used		
	2	Not used		
	3	Not used		
	4	Not used		
	5	Not used		
	6	Not used		
	7	Not used		

These bits are set or cleared by continuous background self-diagnostics. See also [Section 13.3](#).

“Not used” bits are always set to 0.

8. UNIVERSAL COMMANDS

Command #9: The device has 13 device-specific Device Variables. (See [Section 5](#) for details.)

Command #14: Units for transducer limits and minimum span are fixed as mA (unit code 39 decimal).

Command #48 returns 25 bytes of data. (See [Section 7.3](#).)

9. COMMON-PRACTICE COMMANDS

9.1 Supported Commands

The following common-practice commands are implemented:

- 33 Read Device Variables
- 35 Write Primary Variable Range Values
- 42 Perform Device Reset
- 54 Read Device Variable Information
- 59 Write Number Of Response Preambles
- 95 Read Device Communications Statistics

Command #35: The Range Values allow the Loop Current to be converted to Input Signal. (See [Section 5.1](#).)

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 Variables.

10. NON-PUBLIC COMMANDS (COMMANDS #122–126)

Non-public commands are intended for factory-only use during the construction of the device.

All these commands are implemented as multi-transaction commands, which need a sub command number in the request data field, and moreover executed only under specific conditions. These design features prevent Non-public commands from being misused.

11. DEVICE-SPECIFIC COMMANDS

The following device-specific commands are implemented:

- 128 Read Process Variables
- 130 Read Travel Angles
- 131-0 Write 0% Travel Angle
- 131-1 Write 100% Travel Angle
- 132 Read Stroke Time and Friction Index
- 134 Read Unit
- 135 Write Unit
- 136 Read Valve System Information
- 137-0 Write Actuator Type
- 137-1 Write Valve Closed Position
- 137-3 Write Feedback Lever Motion
- 138 Read Electro-pneumatic Action
- 140 Read Actuator Size
- 141 Write Actuator Size
- 142 Read Friction Level
- 143 Write Friction Level
- 144-0 Read PID Outside of GAP1
- 144-1 Read PID Inside of GAP1
- 144-2 Read PID Inside of GAP2

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- 144-3 Read Control Deadband
 - 145-0 Write PID Outside of GAP1
 - 145-1 Write PID Inside of GAP1
 - 145-2 Write PID Inside of GAP2
 - 145-3 Write Control Deadband
 - 146 Read Input Characterization
 - 147 Write Input Characterization
 - 148 Read Custom Curve Data IN
 - 149 Write Custom Curve Data IN
 - 150 Read Custom Curve Data OUT
 - 151 Write Custom Curve Data OUT
 - 152 Read Travel Cutoff
 - 153 Write Travel Cutoff
 - 154 Read Operating Time
 - 155 Write Operating Time
 - 156 Read Travel Transmission Fail Safe Direction
 - 158 Read Type Information
 - 159-0 Execute Auto Setup
 - 159-1 Stop Auto Setup
 - 160 Read Auto Setup Status and Result
 - 161-0 Execute Auto Travel Calibration
 - 161-1 Stop Auto Travel Calibration
 - 162 Read Auto Travel Calibration Status and Result

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- 163-0 Get Operation Authority
 - 163-1 Release Operation Authority
 - 164-0 Read Using Operator
 - 164-1 Read Operation Authority Status
 - 165 Write Password
 - 166 Read Password Use
 - 167-0 Disable Password Use
 - 167-1 Enable Password Use
 - 168-0 Set Dummy Input Signal (Input Simulation)
 - 168-1 Clear Dummy Input Signal (Input Simulation)
 - 169-0 Set Dummy Drive Signal (Drive Signal Simulation)
 - 169-1 Clear Dummy Drive Signal (Drive Signal Simulation)
 - 170 Adjust Pressure Sensors Zero
 - 171-0 Set Dummy Travel Transmission
 - 171-1 Set Dummy Fail Safe Travel Transmission
 - 171-2 Clear Dummy Travel Transmission
 - 173-0 Calibrate 4mA Travel Transmission
 - 173-1 Calibrate 20mA Travel Transmission
 - 174-0 Read Positioner Diagnostics Status Record
 - 174-1 Read Positioner Diagnostics Status Records (w/o parameter)
 - 176 Read Part of Additional Device Status
 - 177 Read Trend Data
 - 178 Read Travel Transmission

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- 180 Read Balance Pressure Ratio
 - 182-0 Read One of Operator Action Records
 - 182-1 Read All Operator Action Records
 - 184-0 Set Operator Action Record (EPM Adjustment)
 - 184-1 Set Operator Action Record (Pilot Adjustment)
 - 185-0 Perform 0% Travel Angle Correction
 - 185-1 Perform 100% Travel Angle Correction
 - 186 Read Various Characteristics Obtained by Auto Setup
 - 190 Read Real-Time Clock
 - 191 Set Real-Time Clock
 - 192 Read Auto Setup Parameters
 - 194 Read Valve Diagnostics Configuration Updated by Auto Setup
 - 220 Read Diagnostic Configuration
 - 221 Write Diagnostic Configuration
 - 222 Read Diagnostic Parameters
 - 223 Write Diagnostic Parameters
 - 232-0 Read Step Response Test Configuration1
 - 232-1 Read Step Response Test Configuration2
 - 232-2 Read Step Response Test Configuration3
 - 232-3 Read Step Response Test Configuration4
 - 232-4 Read Step Response Test Result and Status
 - 232-5 Read Step Response Test Sampling time
 - 233-0 Write Step Response Test Configuration1

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- 233-1 Write Step Response Test Configuration2
 - 233-2 Write Step Response Test Configuration3
 - 233-3 Write Step Response Test Configuration4
 - 233-5 Write Step Response Test Sampling time
 - 234-0 Perform Step Response Test
 - 234-1 Stop Step Response Test
 - 234-2 Clear Step Response Test Result
 - 236-0 Read Valve Signature Configuration
 - 236-1 Read Valve Signature Result and Status
 - 237 Write Valve Signature Configuration
 - 238-0 Perform Valve Signature
 - 238-1 Stop Valve Signature
 - 238-2 Clear Valve Signature Result
 - 240-0 Read Test Data
 - 240-1 Read Test Data Information
 - 240-2 Read Multiplier Factor for Pressure Unit
 - 242-0 Read Valve Diagnostics Status Record
 - 242-1 Read Valve Diagnostics Status Records (w/o parameters)
 - 244 Read Diagnostic Configuration (Combination)
 - 245 Write Diagnostic Configuration (Combination)
 - 246 Read Diagnostic Parameters (Combination)
 - 247 Write Diagnostic Parameters (Combination)
 - 248 Read Alarm Enable Flags

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- 249 Write Alarm Enable Flags
 - 250-0 Set Valve Closed Position
 - 250-1 Set Valve Open Position
 - 251-0 Calibrate 4mA Input Signal
 - 251-1 Calibrate 20mA Input Signal
 - 252-0 Read Production Number
 - 252-1 Read Model Number
 - 252-2 Read Valve Model Number
 - 252-3 Read Shipping Date
 - 253 Restore Factory Settings

Note 1: Command #137-2 has no functionality although it is implemented. Do not use the command.

Note 2: The following device-specific commands are not supported by Model AVP701/702 although they are implemented (Response code “Not Supported” is always returned.):

172-0, 172-1,

184-2,

188,

196,

224-0, 224-1, 224-2,

225,

226-0, 226-1, 226-2, 226-3,

228-0, 228-1,

229,

230-0, 230-1

11.1 Command #128: Read Process Variables

Reads the process variables.

These process variables are identical to the variables defined as Device Variables. Pressure variables can be read by specifying the unit. The specified unit is applied to all four pressures (Po1, Po2, Ps, and Pn). The unit cannot be specified individually.

The pressure units that can be specified are divided into two groups depending on the model number. Furthermore, the temperature unit is determined automatically as appropriate for the pressure unit. It is degrees F only when the pressure unit is psi, and is degrees C when the pressure unit is anything else.

Units Group	Specifiable Units
All	kPa, MPa, bar, kgf/cm ² , psi
SI Only	kPa, MPa, bar

Request Data Bytes

Byte	Format	Description
0	Enum	Pressure Unit Code (See Section 12.14)

Response Data Bytes

Byte	Format	Description
0-3	Float	Input Current
4-7	Float	Input Signal
8-11	Float	Set Point
12-15	Float	Travel
16-19	Float	Drive Signal
20-23	Float	Temp
24-27	Float	VTD Temp
28-31	Float	Po1
32-35	Float	Po2
36-39	Float	Ps

40-43	Float	Pn
44-47	Float	Position
48-51	Float	VTD Angle

Command-Specific Response Codes

Code	Class	Description
0	Success	No Command-Specific Errors
1		Undefined
2	Error	Invalid Selection
3-4		Undefined
5	Error	Too Few Data Bytes Received
6-127		Undefined

11.2 Command #130: Read Travel Angles

Reads the 0% travel angle and 100% travel angle.

Request Data Bytes

Byte	Format	Description
None		

Response Data Bytes

Byte	Format	Description
0-3	Float	0% Travel Angle
4-7	Float	100% Travel Angle

Command-Specific Response Codes

Code	Class	Description
0	Success	No Command-Specific Errors
1-127		Undefined

11.3 Command #131-0: Write 0% Travel Angle

Writes the 0% travel angle.

Request Data Bytes

Byte	Format	Description
0	Enum	Sub Command Number 0: Write 0% Travel Angle
1-4	Float	0% Travel Angle

Response Data Bytes

Byte	Format	Description
0	Enum	Sub Command Number
1-4	Float	0% Travel Angle

Command-Specific Response Codes

Code	Class	Description
0	Success	No Command-Specific Errors
1-2		Undefined
3	Error	Passed Parameter Too Large
4	Error	Passed Parameter Too Small
5	Error	Too Few Data Bytes Received
6-15		Undefined
16	Error	Access Restricted
17-127		Undefined

11.4 Command #131-1: Write 100% Travel Angle

Writes the 100% travel angle.

Request Data Bytes

Byte	Format	Description
0	Enum	Sub Command Number 1: Write 100% Travel Angle
1-4	Float	100% Travel Angle

Response Data Bytes

Byte	Format	Description
0	Enum	Sub Command Number
1-4	Float	100% Travel Angle

Command-Specific Response Codes

Code	Class	Description
0	Success	No Command-Specific Errors
1-2		Undefined
3	Error	Passed Parameter Too Large
4	Error	Passed Parameter Too Small
5	Error	Too Few Data Bytes Received
6-15		Undefined
16	Error	Access Restricted
17-127		Undefined

11.5 Command #132: Read Stroke Time and Friction Index

Reads the average stroke time, fully open stroke time, fully closed stroke time, and friction index that were measured during auto setup.

Request Data Bytes

Byte	Format	Description
None		

Response Data Bytes

Byte	Format	Description
0-3	Float	Stroke Time Average
4-7	Float	Stroke Time Open
8-11	Float	Stroke Time Close
12-15	Float	Friction Index

Command-Specific Response Codes

Code	Class	Description
0	Success	No Command-Specific Errors
1-127		Undefined

11.6 Command #134: Read Unit

Reads the pressure and temperature unit codes.

Request Data Bytes

Byte	Format	Description
None		

Response Data Bytes

Byte	Format	Description
0	Enum	Pressure Unit Code (See Section 12.14)
1	Enum	Temperature Unit Code (See Section 12.15)

Command-Specific Response Codes

Code	Class	Description
0	Success	No Command-Specific Errors
1–127		Undefined

11.7 Command #135: Write Unit

Writes the pressure unit code.

The pressure units that can be set are divided into two groups depending on the model number. (See Command #128.)

Request Data Bytes

Byte	Format	Description
0	Enum	Pressure Unit Code (See Section 12.14)

Response Data Bytes

Byte	Format	Description
0	Enum	Pressure Unit Code
1	Enum	Temperature Unit Code (See Section 12.15)

Command-Specific Response Codes

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

11.8 Command #136: Read Valve System Information

Reads the actuator type, valve closed position, booster relay, and feedback lever motion.

Request Data Bytes

Byte	Format	Description
None		

Response Data Bytes

Byte	Format	Description
0	Enum	Actuator Type 0: Linear 1: Rotary 90-degrees 2: Rotary other 3: Rotary-sub 90-degrees 4: Rotary-sub other
1	Enum	Valve Closed Position Feedback lever position when the valve is fully closed 0: Up 1: Down
2	Enum	Booster Relay 0: Without Booster Relay 1: With Booster Relay
3	Enum	Feedback Lever Motion Feedback lever motion direction as Po1 increases 0: Up 1: Down

Command-Specific Response Codes

Code	Class	Description
0	Success	No Command-Specific Errors
1-127		Undefined

11.9 Command #137-0: Write Actuator Type

Writes the actuator type.

Request Data Bytes

Byte	Format	Description
0	Enum	Sub Command Number 0: Write Actuator Type
1	Enum	Actuator Type (See Command #136)

Response Data Bytes

Byte	Format	Description
0	Enum	Sub Command Number
1	Enum	Actuator Type

Command-Specific Response Codes

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

11.10 Command #137-1: Write Valve Closed Position

Writes the valve closed position.

Request Data Bytes

Byte	Format	Description
0	Enum	Sub Command Number 1: Write Valve Closed Position
1	Enum	Valve Closed Position (See Command #136)

Response Data Bytes

Byte	Format	Description
0	Enum	Sub Command Number
1	Enum	Valve Closed Position

Command-Specific Response Codes

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

11.11 Command #137-3: Write Feedback Lever Motion

Writes the feedback lever motion.

Request Data Bytes

Byte	Format	Description
0	Enum	Sub Command Number 3: Write Feedback Lever Motion
1	Enum	Feedback Lever Motion (See Command #136)

Response Data Bytes

Byte	Format	Description
0	Enum	Sub Command Number
1	Enum	Feedback Lever Motion

Command-Specific Response Codes

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

11.12 Command #138: Read Electro-pneumatic Action

Reads the positioner action, fail to action and pilot relay type.

Request Data Bytes

Byte	Format	Description
None		

Response Data Bytes

Byte	Format	Description
0	Enum	Positioner Action 0: Direct 1: Reverse
1	Enum	Electrical Fail To 0: Close 1: Open
2	Enum	Air Fail To 0: Close 1: Open
3	Enum	Pilot Relay Type 0: Single 1: Double

Command-Specific Response Codes

Code	Class	Description
0	Success	No Command-Specific Errors
1-127		Undefined

11.13 Command #140: Read Actuator Size

Reads the actuator size.

Request Data Bytes

Byte	Format	Description
None		

Response Data Bytes

Byte	Format	Description
0	Enum	Actuator Size 0: Custom 1: Param 1 2: Param 2 3: Param 3 4: Param 4 5: Param 5 6: Param 6 7: Param A 8: Param B 9: Param C

Command-Specific Response Codes

Code	Class	Description
0	Success	No Command-Specific Errors
1-127		Undefined

11.14 Command #141: Write Actuator Size

Writes the actuator size.

Request Data Bytes

Byte	Format	Description
0	Enum	Actuator Size (See Command #140)

Response Data Bytes

Byte	Format	Description
0	Enum	Actuator Size

Command-Specific Response Codes

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

11.15 Command #142: Read Friction Level

Reads the friction level.

Request Data Bytes

Byte	Format	Description
None		

Response Data Bytes

Byte	Format	Description
0	Enum	Friction Level 0: Heavy 1: Medium 2: Light

Command-Specific Response Codes

Code	Class	Description
0	Success	No Command-Specific Errors
1-127		Undefined

11.16 Command #143: Write Friction Level

Writes the friction level.

Request Data Bytes

Byte	Format	Description
0	Enum	Friction Level (See Command #142)

Response Data Bytes

Byte	Format	Description
0	Enum	Friction Level

Command-Specific Response Codes

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

11.17 Command #144-0: Read PID Outside of GAP1

Reads the outermost PID and the outside gap for the control parameters that are used when the actuator size is 0 (custom).

Request Data Bytes

Byte	Format	Description
0	Enum	Sub Command Number 0: Read PID Outside of GAP1

Response Data Bytes

Byte	Format	Description
0	Enum	Sub Command Number
1-4	Float	Proportional Gain Outside of GAP1
5-8	Float	Integral Time Outside of GAP1
9-12	Float	Derivative Time Outside of GAP1
13-16	Float	GAP1

Command-Specific Response Codes

Code	Class	Description
0	Success	No Command-Specific Errors
1-4		Undefined
5	Error	Too Few Data Bytes Received
6-127		Undefined

11.18 Command #144-1: Read PID Inside of GAP1

Reads the middle PID and the inside gap for the control parameters that are used when the actuator size is 0 (custom).

Request Data Bytes

Byte	Format	Description
0	Enum	Sub Command Number 1: Read PID Inside of GAP1

Response Data Bytes

Byte	Format	Description
0	Enum	Sub Command Number
1-4	Float	Proportional Gain Inside of GAP1
5-8	Float	Integral Time Inside of GAP1
9-12	Float	Derivative Time Inside of GAP1
13-16	Float	GAP2

Command-Specific Response Codes

Code	Class	Description
0	Success	No Command-Specific Errors
1-4		Undefined
5	Error	Too Few Data Bytes Received
6-127		Undefined

11.19 Command #144-2: Read PID Inside of GAP2

Reads the innermost PID for the control parameters that are used when the actuator size is 0 (custom).

Request Data Bytes

Byte	Format	Description
0	Enum	Sub Command Number 2: Read PID Inside of GAP2

Response Data Bytes

Byte	Format	Description
0	Enum	Sub Command Number
1-4	Float	Proportional Gain Inside of GAP2
5-8	Float	Integral Time Inside of GAP2
9-12	Float	Derivative Time Inside of GAP2

Command-Specific Response Codes

Code	Class	Description
0	Success	No Command-Specific Errors
1-4		Undefined
5	Error	Too Few Data Bytes Received
6-127		Undefined

11.20 Command #144-3: Read Control Deadband

Reads the control (integral action) deadband.

Request Data Bytes

Byte	Format	Description
0	Enum	Sub Command Number 3: Read Control Deadband

Response Data Bytes

Byte	Format	Description
0	Enum	Sub Command Number
1-4	Float	Control Deadband

Command-Specific Response Codes

Code	Class	Description
0	Success	No Command-Specific Errors
1-4		Undefined
5	Error	Too Few Data Bytes Received
6-127		Undefined

11.21 Command #145-0: Write PID Outside of GAP1

Writes the outermost PID and the outside gap for the control parameters that are used when the actuator size is 0 (custom).

Request Data Bytes

Byte	Format	Description
0	Enum	Sub Command Number 0: Write PID Outside of GAP1
1-4	Float	Proportional Gain Outside of GAP1
5-8	Float	Integral Time Outside of GAP1
9-12	Float	Derivative Time Outside of GAP1
13-16	Float	GAP1

Response Data Bytes

Byte	Format	Description
0	Enum	Sub Command Number
1-4	Float	Proportional Gain Outside of GAP1
5-8	Float	Integral Time Outside of GAP1
9-12	Float	Derivative Time Outside of GAP1
13-16	Float	GAP1

Command-Specific Response Codes

Code	Class	Description
0	Success	No Command-Specific Errors
1-2		Undefined
3	Error	Passed Parameter Too Large
4	Error	Passed Parameter Too Small
5	Error	Too Few Data Bytes Received
6-15		Undefined
16	Error	Access Restricted
17-127		Undefined

11.22 Command #145-1: Write PID Inside of GAP1

Writes the middle PID and the inside gap for the control parameters that are used when the actuator size is 0 (custom).

Request Data Bytes

Byte	Format	Description
0	Enum	Sub Command Number 1: Write PID Inside of GAP1
1-4	Float	Proportional Gain Inside of GAP1
5-8	Float	Integral Time Inside of GAP1
9-12	Float	Derivative Time Inside of GAP1
13-16	Float	GAP2

Response Data Bytes

Byte	Format	Description
0	Enum	Sub Command Number
1-4	Float	Proportional Gain Inside of GAP1
5-8	Float	Integral Time Inside of GAP1
9-12	Float	Derivative Time Inside of GAP1
13-16	Float	GAP2

Command-Specific Response Codes

Code	Class	Description
0	Success	No Command-Specific Errors
1-2		Undefined
3	Error	Passed Parameter Too Large
4	Error	Passed Parameter Too Small
5	Error	Too Few Data Bytes Received
6-15		Undefined
16	Error	Access Restricted
17-127		Undefined

11.23 Command #145-2: Write PID Inside of GAP2

Writes the innermost PID for the control parameters that are used when the actuator size is 0 (custom).

Request Data Bytes

Byte	Format	Description
0	Enum	Sub Command Number 2: Write PID Inside of GAP2
1-4	Float	Proportional Gain Inside of GAP2
5-8	Float	Integral Time Inside of GAP2
9-12	Float	Derivative Time Inside of GAP2

Response Data Bytes

Byte	Format	Description
0	Enum	Sub Command Number
1-4	Float	Proportional Gain Inside of GAP2
5-8	Float	Integral Time Inside of GAP2
9-12	Float	Derivative Time Inside of GAP2

Command-Specific Response Codes

Code	Class	Description
0	Success	No Command-Specific Errors
1-2		Undefined
3	Error	Passed Parameter Too Large
4	Error	Passed Parameter Too Small
5	Error	Too Few Data Bytes Received
6-15		Undefined
16	Error	Access Restricted
17-127		Undefined

11.24 Command #145-3: Write Control Deadband

Writes the control (integral action) deadband.

The setting of this parameter is applied to control calculation regardless of the actuator size.

Request Data Bytes

Byte	Format	Description
0	Enum	Sub Command Number 3: Write Control Deadband
1-4	Float	Control Deadband

Response Data Bytes

Byte	Format	Description
0	Enum	Sub Command Number
1-4	Float	Control Deadband

Command-Specific Response Codes

Code	Class	Description
0	Success	No Command-Specific Errors
1-2		Undefined
3	Error	Passed Parameter Too Large
4	Error	Passed Parameter Too Small
5	Error	Too Few Data Bytes Received
6-15		Undefined
16	Error	Access Restricted
17-127		Undefined

11.25 Command #146: Read Input Characterization

Reads the input characterization.

Request Data Bytes

Byte	Format	Description
None		

Response Data Bytes

Byte	Format	Description
0	Enum	Input Characterization 0: Linear 1: Equal Percent 2: Quick Open 3: Custom Curve (21-point polyline)

Command-Specific Response Codes

Code	Class	Description
0	Success	No Command-Specific Errors
1-127		Undefined

11.26 Command #147: Write Input Characterization

Writes the input characterization.

Request Data Bytes

Byte	Format	Description
0	Enum	Input Characterization (See Command #146)

Response Data Bytes

Byte	Format	Description
0	Enum	Input Characterization

Command-Specific Response Codes

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

11.27 Command #148: Read Custom Curve Data IN

Reads the Custom Curve Data IN data.

This command is valid even if the Input Characterization setting is not Custom Curve.

Request Data Bytes

Byte	Format	Description
None		

Response Data Bytes

Byte	Format	Description
0-83	Float	Custom Curve Data IN 1-21 (Array of Float)

Command-Specific Response Codes

Code	Class	Description
0	Success	No Command-Specific Errors
1-127		Undefined

11.28 Command #149: Write Custom Curve Data IN

Writes the Custom Curve Data IN data.

This command is valid even if the Input Characterization setting is not Custom Curve.

Request Data Bytes

Byte	Format	Description
0-83	Float	Custom Curve Data IN 1-21 (Array of Float)

Response Data Bytes

Byte	Format	Description
0-83	Float	Custom Curve Data IN 1-21 (Array of Float)

Command-Specific Response Codes

Code	Class	Description
0	Success	No Command-Specific Errors
1-2		Undefined
3	Error	Passed Parameter Too Large
4	Error	Passed Parameter Too Small
5	Error	Too Few Data Bytes Received
6-15		Undefined
16	Error	Access Restricted
17-127		Undefined

11.29 Command #150: Read Custom Curve Data OUT

Reads the Custom Curve Data OUT data.

This command is valid even if the Input Characterization setting is not Custom Curve.

Request Data Bytes

Byte	Format	Description
None		

Response Data Bytes

Byte	Format	Description
0-83	Float	Custom Curve Data OUT 1-21 (Array of Float)

Command-Specific Response Codes

Code	Class	Description
0	Success	No Command-Specific Errors
1-127		Undefined

11.30 Command #151: Write Custom Curve Data OUT

Writes the Custom Curve Data OUT data.

This command is valid even if the Input Characterization setting is not Custom Curve.

Request Data Bytes

Byte	Format	Description
0-83	Float	Custom Curve Data OUT 1-21 (Array of Float)

Response Data Bytes

Byte	Format	Description
0-83	Float	Custom Curve Data OUT 1-21 (Array of Float)

Command-Specific Response Codes

Code	Class	Description
0	Success	No Command-Specific Errors
1-2		Undefined
3	Error	Passed Parameter Too Large
4	Error	Passed Parameter Too Small
5	Error	Too Few Data Bytes Received
6-15		Undefined
16	Error	Access Restricted
17-127		Undefined

11.31 Command #152: Read Travel Cutoff

Reads the travel cutoff high and travel cutoff low values.

Request Data Bytes

Byte	Format	Description
None		

Response Data Bytes

Byte	Format	Description
0-3	Float	Travel Cutoff High
4-7	Float	Travel Cutoff Low

Command-Specific Response Codes

Code	Class	Description
0	Success	No Command-Specific Errors
1-127		Undefined

11.32 Command #153: Write Travel Cutoff

Writes the travel cutoff high and travel cutoff low values.

Request Data Bytes

Byte	Format	Description
0-3	Float	Travel Cutoff High
4-7	Float	Travel Cutoff Low

Response Data Bytes

Byte	Format	Description
0-3	Float	Travel Cutoff High
4-7	Float	Travel Cutoff Low

Command-Specific Response Codes

Code	Class	Description
0	Success	No Command-Specific Errors
1-2		Undefined
3	Error	Passed Parameter Too Large
4	Error	Passed Parameter Too Small
5	Error	Too Few Data Bytes Received
6-15		Undefined
16	Error	Access Restricted
17-127		Undefined

11.33 Command #154: Read Operating Time

Reads the operating time.

Request Data Bytes

Byte	Format	Description
None		

Response Data Bytes

Byte	Format	Description
0-3	Unsigned-32	Operating Time

Command-Specific Response Codes

Code	Class	Description
0	Success	No Command-Specific Errors
1-127		Undefined

11.34 Command #155: Write Operating Time

Writes the operating time.

Request Data Bytes

Byte	Format	Description
0-3	Unsigned-32	Operating Time

Response Data Bytes

Byte	Format	Description
0-3	Unsigned-32	Operating Time

Command-Specific Response Codes

Code	Class	Description
0	Success	No Command-Specific Errors
1-4		Undefined
5	Error	Too Few Data Bytes Received
6-15		Undefined
16	Error	Access Restricted
17-127		Undefined

11.35 Command #156: Read Travel Transmission Fail Safe Direction

Reads the fail safe direction determined by the electric switch setting for the travel transmission output (analog current).

Request Data Bytes

Byte	Format	Description
None		

Response Data Bytes

Byte	Format	Description
0	Enum	Travel Transmission Fail Safe Direction 0: Low 1: High

Command-Specific Response Codes

Code	Class	Description
0	Success	No Command-Specific Errors
1-75		Undefined
76	Error	Not Supported
77-127		Undefined

11.36 Command #158: Read Type Information

Reads information on the contact output availability, travel transmission (analog output) availability, integral or separate type, drive type, and unit system.

Request Data Bytes

Byte	Format	Description
None		

Response Data Bytes

Byte	Format	Description
0	Enum	Contact output availability 0: No 1: Yes
1	Enum	Travel transmission (analog output) availability 0: No 1: Yes
2	Enum	Integral or separate type (VTD) 0: Integral type 1: Separate type
3	Enum	Drive type 0: 4-20mA
4	Enum	Unit group 0: All 1: SI Only

Command-Specific Response Codes

Code	Class	Description
0	Success	No Command-Specific Errors
1-127		Undefined

11.37 Command #159-0: Execute Auto Setup

Executes auto setup.

Request Data Bytes

Byte	Format	Description
0	Enum	Sub Command Number 0: Execute Auto Setup

Response Data Bytes

Byte	Format	Description
0	Enum	Sub Command Number

Command-Specific Response Codes

Code	Class	Description
0	Success	No Command-Specific Errors
1-4		Undefined
5	Error	Too Few Data Bytes Received
6-15		Undefined
16	Error	Access Restricted
17-71		Undefined
72	Error	Conditions not met
73	Error	Current is insufficient
74-127		Undefined

11.38 Command #159-1: Stop Auto Setup

Stops auto setup.

Request Data Bytes

Byte	Format	Description
0	Enum	Sub Command Number 1: Stop Auto Setup

Response Data Bytes

Byte	Format	Description
0	Enum	Sub Command Number

Command-Specific Response Codes

Code	Class	Description
0	Success	No Command-Specific Errors
1-4		Undefined
5	Error	Too Few Data Bytes Received
6-15		Undefined
16	Error	Access Restricted
17-127		Undefined

11.39 Command #160: Read Auto Setup Status and Result

Reads the auto setup status and the previous execution result.

Returns “No Result” as the execution result if no auto setup has been executed since power up (or reset and start).

If auto setup is executed in “Idle” (command 159-0), the status changes to “Running”.

When auto setup ends, the result is updated at the same time that the status returns to “Idle”. (This allows confirmation of the ending and execution result with the same command response.)

Request Data Bytes

Byte	Format	Description
None		

Response Data Bytes

Byte	Format	Description
0	Enum	Auto Setup Status 0: Idle 1: Running
1	Enum	Auto Setup Result 0: No Result 1: Success 2: Failed

Command-Specific Response Codes

Code	Class	Description
0	Success	No Command-Specific Errors
1-127		Undefined

11.40 Command #161-0: Execute Auto Travel Calibration

Executes auto travel calibration.

Request Data Bytes

Byte	Format	Description
0	Enum	Sub Command Number 0: Execute Auto Travel Calibration

Response Data Bytes

Byte	Format	Description
0	Enum	Sub Command Number

Command-Specific Response Codes

Code	Class	Description
0	Success	No Command-Specific Errors
1-4		Undefined
5	Error	Too Few Data Bytes Received
6-15		Undefined
16	Error	Access Restricted
17-71		Undefined
72	Error	Conditions not met
73	Error	Current is insufficient
74-127		Undefined

11.41 Command #161-1: Stop Auto Travel Calibration

Stops auto travel calibration.

Request Data Bytes

Byte	Format	Description
0	Enum	Sub Command Number 1: Stop Auto Travel Calibration

Response Data Bytes

Byte	Format	Description
0	Enum	Sub Command Number

Command-Specific Response Codes

Code	Class	Description
0	Success	No Command-Specific Errors
1-4		Undefined
5	Error	Too Few Data Bytes Received
6-15		Undefined
16	Error	Access Restricted
17-127		Undefined

11.42 Command #162: Read Auto Travel Calibration Status and Result

Reads the auto travel calibration status.

Returns “No Result” as the execution result if no auto travel calibration is executed after power up (or reset start).

If auto travel calibration is executed in “Idle” (command 161-0), the status changes to “Running”.

When auto travel calibration ends, the result is updated at the same time that the status returns to “Idle”. (This allows confirmation of the ending and execution result with the same command response.)

Request Data Bytes

Byte	Format	Description
None		

Response Data Bytes

Byte	Format	Description
0	Enum	Auto Travel Calibration Status 0: Idle 1: Running
1	Enum	Auto Travel Calibration Result 0: No Result 1: Success 2: Failed

Command-Specific Response Codes

Code	Class	Description
0	Success	No Command-Specific Errors
1-127		Undefined

11.43 Command #163-0: Get Operation Authority

Obtains operation authority.

Getting operation authority enables exclusive device access. Only the LUI, primary master, and secondary master can be distinguished from one another, but multiple primary masters and secondary masters that may exist are not (cannot be) distinguished from one another.

If a master other than the master that issued this command has already obtained operation authority, operation authority is not available. Also, if the password function is enabled, operation authority can be obtained only if the correct password is specified.

Request Data Bytes

Byte	Format	Description
0	Enum	Sub Command Number 0: Get Operation Authority
1-4	Latin-1	Password String

Response Data Bytes

Byte	Format	Description
0	Enum	Sub Command Number
1	Enum	Using Operator (See Section 12.1)
2	Enum	Operation Authority Status Indicates whether the master that sent this command has operation authority after executing this command. 0: Does not have operation authority 1: Has operation authority

Command-Specific Response Codes

Code	Class	Description
0	Success	No Command-Specific Errors
1-4		Undefined
5	Error	Too Few Data Bytes Received
6-15		Undefined
16	Error	Access Restricted
17-76		Undefined

Code	Class	Description
77	Error	Wrong Password
78-127		Undefined

11.44 Command #163-1: Release Operation Authority

Releases operation authority.

If (and only if) this command is sent from the host that has operation authority, operation authority is released and using operator changes to “No Operator”.

Request Data Bytes

Byte	Format	Description
0	Enum	Sub Command Number 1: Release Operation Authority

Response Data Bytes

Byte	Format	Description
0	Enum	Sub Command Number
1	Enum	Using Operator (See Section 12.1)
2	Enum	Operation Authority Status (See Command #163-0)

Command-Specific Response Codes

Code	Class	Description
0	Success	No Command-Specific Errors
1-4		Undefined
5	Error	Too Few Data Bytes Received
6-15		Undefined
16	Error	Access Restricted
17-127		Undefined

11.45 Command #164-0: Read Using Operator

Reads the operator that currently has operation authority.

Request Data Bytes

Byte	Format	Description
0	Enum	Sub Command Number 0: Read Using Operator

Response Data Bytes

Byte	Format	Description
0	Enum	Sub Command Number
1	Enum	Using Operator (See Section 12.1)

Command-Specific Response Codes

Code	Class	Description
0	Success	No Command-Specific Errors
1-4		Undefined
5	Error	Too Few Data Bytes Received
6-127		Undefined

11.46 Command #164-1: Read Operation Authority Status

Reads the operation authority status.

With this command it is possible to check whether or not the master that sent this command has operation authority.

Request Data Bytes

Byte	Format	Description
0	Enum	Sub Command Number 1: Read Operation Authority Status

Response Data Bytes

Byte	Format	Description
0	Enum	Sub Command Number
1	Enum	Operation Authority Status (See Command #163-0)

Command-Specific Response Codes

Code	Class	Description
0	Success	No Command-Specific Errors
1-4		Undefined
5	Error	Too Few Data Bytes Received
6-127		Undefined

11.47 Command #165: Write Password

Writes the password that is used when the password function is enabled.

A password consists of 4 digits (4 characters). Numerals and/or uppercase letters can be used.

Request Data Bytes

Byte	Format	Description
0-3	Latin-1	Password String

Response Data Bytes

Byte	Format	Description
0-3	Latin-1	Password String

Command-Specific Response Codes

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

11.48 Command #166: Read Password Use

Reads the setting that determines whether the password function is used.

Password protection can be enabled for the request to get operation authority, and this command reads the status of the setting for password function use.

Request Data Bytes

Byte	Format	Description
None		

Response Data Bytes

Byte	Format	Description
0	Enum	Password Use 0: Disabled 1: Enabled

Command-Specific Response Codes

Code	Class	Description
0	Success	No Command-Specific Errors
1-127		Undefined

11.49 Command #167-0: Disable Password Use

Disables the use of the password function.

Request Data Bytes

Byte	Format	Description
0	Enum	Sub Command Number 0: Disable Password Use

Response Data Bytes

Byte	Format	Description
0	Enum	Sub Command Number

Command-Specific Response Codes

Code	Class	Description
0	Success	No Command-Specific Errors
1-4		Undefined
5	Error	Too Few Data Bytes Received
6-15		Undefined
16	Error	Access Restricted
17-127		Undefined

11.50 Command #167-1: Enable Password Use

Enables the use of the password function.

If you change the password use setting from “Disabled” to “Enabled”, it is highly recommended that you write new password to the device (using Command #165) before. Otherwise, the old password remains that you might have forgotten.

Request Data Bytes

Byte	Format	Description
0	Enum	Sub Command Number 1: Enable Password Use

Response Data Bytes

Byte	Format	Description
0	Enum	Sub Command Number

Command-Specific Response Codes

Code	Class	Description
0	Success	No Command-Specific Errors
1-4		Undefined
5	Error	Too Few Data Bytes Received
6-15		Undefined
16	Error	Access Restricted
17-127		Undefined

11.51 Command #168-0: Set Dummy Input Signal (Input Simulation)

Simulates the input signal.

When this command is received, the device does not handle input current but instead uses the value requested by this command as the input signal for controlling the valve. When 10 minutes have passed after last receiving command #168-0 or #169-0, the device automatically exits from this simulation state.

Request Data Bytes

Byte	Format	Description
0	Enum	Sub Command Number 0: Set Dummy Input Signal
1-4	Float	Dummy Input Signal Value

Response Data Bytes

Byte	Format	Description
0	Enum	Sub Command Number
1-4	Float	Dummy Input Signal Value

Command-Specific Response Codes

Code	Class	Description
0	Success	No Command-Specific Errors
1-2		Undefined
3	Error	Passed Parameter Too Large
4	Error	Passed Parameter Too Small
5	Error	Too Few Data Bytes Received
6-15		Undefined
16	Error	Access Restricted
17-71		Undefined
72	Error	Conditions not met
73	Error	Current is insufficient
74-127		Undefined

11.52 Command #168-1: Clear Dummy Input Signal (Input Simulation)

Ends simulation of the input signal.

Request Data Bytes

Byte	Format	Description
0	Enum	Sub Command Number 1: Clear Dummy Input Signal

Response Data Bytes

Byte	Format	Description
0	Enum	Sub Command Number

Command-Specific Response Codes

Code	Class	Description
0	Success	No Command-Specific Errors
1-4		Undefined
5	Error	Too Few Data Bytes Received
6-15		Undefined
16	Error	Access Restricted
17-127		Undefined

11.53 Command #169-0: Set Dummy Drive Signal

Simulates the drive signal.

When this command is received, the EPM drive signal is set at the value requested by this command and the valve is not controlled. When 10 minutes have passed after last receiving command #168-0 or #169-0, the device automatically exits from this simulation state.

Request Data Bytes

Byte	Format	Description
0	Enum	Sub Command Number 0: Set Dummy Drive Signal
1-4	Float	Dummy Drive Signal Value

Response Data Bytes

Byte	Format	Description
0	Enum	Sub Command Number
1-4	Float	Dummy Drive Signal Value

Command-Specific Response Codes

Code	Class	Description
0	Success	No Command-Specific Errors
1-2		Undefined
3	Error	Passed Parameter Too Large
4	Error	Passed Parameter Too Small
5	Error	Too Few Data Bytes Received
6-15		Undefined
16	Error	Access Restricted
17-71		Undefined
72	Error	Conditions not met
73	Error	Current is insufficient
74-127		Undefined

11.54 Command #169-1: Clear Dummy Drive Signal

Ends simulation of the drive signal.

Request Data Bytes

Byte	Format	Description
0	Enum	Sub Command Number 1: Clear Dummy Drive Signal

Response Data Bytes

Byte	Format	Description
0	Enum	Sub Command Number

Command-Specific Response Codes

Code	Class	Description
0	Success	No Command-Specific Errors
1-4		Undefined
5	Error	Too Few Data Bytes Received
6-15		Undefined
16	Error	Access Restricted
17-127		Undefined

11.55 Command #170: Adjust Pressure Sensors Zero

Adjusts the zero points of all four pressure sensors.

The current pressure becomes “0.”

This adjustment should be done when the supply pressure is 0. This command is rejected if the pressure sensors are not working (powered off) due to low input current.

Request Data Bytes

Byte	Format	Description
0	Enum	Dummy Request byte for security 0: Dummy Request

Response Data Bytes

Byte	Format	Description
0	Enum	Dummy Request byte for security

Command-Specific Response Codes

Code	Class	Description
0	Success	No Command-Specific Errors
1		Undefined
2	Error	Invalid Selection
3-4		Undefined
5	Error	Too Few Data Bytes Received
6-15		Undefined
16	Error	Access Restricted
17-72		Undefined
73	Error	Current is insufficient
74-127		Undefined

11.56 Command #171-0: Set Dummy Travel Transmission

Simulates the travel transmission (analog output).

When this command is received, the device does not output the actual travel signal but outputs the travel signal for the value requested by this command. The available range is from -1.25% to 103.125% (3.8 mA to 20.5 mA). When 10 minutes have passed after last receiving this command, the device automatically exits from this simulation state.

Request Data Bytes

Byte	Format	Description
0	Enum	Sub Command Number 0: Set Dummy Travel Transmission
1-4	Float	Dummy Travel Transmission Value (%)

Response Data Bytes

Byte	Format	Description
0	Enum	Sub Command Number
1-4	Float	Dummy Travel Transmission Value (%)

Command-Specific Response Codes

Code	Class	Description
0	Success	No Command-Specific Errors
1-2		Undefined
3	Error	Passed Parameter Too Large
4	Error	Passed Parameter Too Small
5	Error	Too Few Data Bytes Received
6-15		Undefined
16	Error	Access Restricted
17-75		Undefined
76	Error	Not Supported
77-127		Undefined

11.57 Command #171-1: Set Dummy Fail Safe Travel Transmission

Simulates the output of an analog signal in accordance with the fail-safe direction (determined by the hardware). When 10 minutes have passed after last receiving this command, the device automatically exits from this simulation state.

Request Data Bytes

Byte	Format	Description
0	Enum	Sub Command Number 1: Set Dummy Fail Safe Travel Transmission

Response Data Bytes

Byte	Format	Description
0	Enum	Sub Command Number

Command-Specific Response Codes

Code	Class	Description
0	Success	No Command-Specific Errors
1-4		Undefined
5	Error	Too Few Data Bytes Received
6-15		Undefined
16	Error	Access Restricted
17-75		Undefined
76	Error	Not Supported
77-127		Undefined

11.58 Command #171-2: Clear Dummy Travel Transmission

Ends the travel transmission simulation (Command #171-0 Dummy Travel Transmission or Command #171-1 Dummy Fail Safe Travel Transmission).

Request Data Bytes

Byte	Format	Description
0	Enum	Sub Command Number 2: Clear Dummy Travel Transmission

Response Data Bytes

Byte	Format	Description
0	Enum	Sub Command Number

Command-Specific Response Codes

Code	Class	Description
0	Success	No Command-Specific Errors
1-4		Undefined
5	Error	Too Few Data Bytes Received
6-15		Undefined
16	Error	Access Restricted
17-75		Undefined
76	Error	Not Supported
77-127		Undefined

11.59 Command #173-0: Calibrate 4mA Travel Transmission

Calibrates the 4 mA travel transmission output.

A suitable reference, like a digital multi-meter is used to calibrate the transmission output. Before calibration is performed, the travel transmission is forced to 4mA using Command #171-0, Set Dummy Travel Transmission. The reference instrument's measured value for the current should be sent as request data. The device corrects the difference.

Request Data Bytes

Byte	Format	Description
0	Enum	Sub Command Number 0: Calibrate 4mA Travel Transmission
1-4	Float	Externally Measured Output Current Level, units of milliamperes

Response Data Bytes

Byte	Format	Description
0	Enum	Sub Command Number
1-4	Float	Externally Measured Output Current Level, units of milliamperes

Command-Specific Response Codes

Code	Class	Description
0	Success	No Command-Specific Errors
1-2		Undefined
3	Error	Passed Parameter Too Large
4	Error	Passed Parameter Too Small
5	Error	Too Few Data Bytes Received
6-15		Undefined
16	Error	Access Restricted
17-71		Undefined
72	Error	Conditions not met
73-75		Undefined
76	Error	Not Supported

Code	Class	Description
77-127		Undefined

11.60 Command #173-1: Calibrate 20mA Travel Transmission

Calibrates the 20 mA travel transmission output.

A suitable reference, like a digital multi-meter is used to calibrate the transmission output. Before calibration is performed, the travel transmission is forced to 20mA using Command #171-0, Set Dummy Travel Transmission. The reference instrument's measured value for the current should be sent as request data. The device corrects the difference.

Request Data Bytes

Byte	Format	Description
0	Enum	Sub Command Number 1: Calibrate 20mA Travel Transmission
1-4	Float	Externally Measured Output Current Level, units of milliamperes

Response Data Bytes

Byte	Format	Description
0	Enum	Sub Command Number
1-4	Float	Externally Measured Output Current Level, units of milliamperes

Command-Specific Response Codes

Code	Class	Description
0	Success	No Command-Specific Errors
1-2		Undefined
3	Error	Passed Parameter Too Large
4	Error	Passed Parameter Too Small
5	Error	Too Few Data Bytes Received
6-15		Undefined
16	Error	Access Restricted
17-71		Undefined
72	Error	Conditions not met
73-75		Undefined
76	Error	Not Supported

Code	Class	Description
77-127		Undefined

11.61 Command #174-0: Read Positioner Diagnostics Status Record

Reads one self-diagnostic record of the device with a related parameter.

The device stores up to 10 records. If the number of records exceeds 10, the oldest record is deleted (overwritten) and the most recent 10 records are stored.

Since buffer indexes 0 to 9 are assigned to the data, data is read by specifying the index.

Request Data Bytes

Byte	Format	Description
0	Enum	Sub Command Number 0: Read Positioner Diagnostics Status Record
1	Unsigned-8	Read Buffer Index (0-9)

Response Data Bytes

Byte	Format	Description
0	Enum	Sub Command Number
1	Unsigned-8	Read Buffer Index
2	Unsigned-8	Returned Data Record Serial Number (0-99)
3	Enum	Status Code (See Section 12.1)
4-7	Unsigned-32	Time Stamp (Operating Time)
8	Enum	Status Signal Code (See Section 12.4)
9-12	Float	Related Parameter (See Section 12.2)
13	Unsigned-8	The most recent value for the positioner diagnostics status record serial number (0-99) Returns 255 if there is no record.

Command-Specific Response Codes

Code	Class	Description
0	Success	No Command-Specific Errors
1		Undefined
2	Error	Invalid Selection
3-4		Undefined
5	Error	Too Few Data Bytes Received

Code	Class	Description
6-127		Undefined

11.62 Command #174-1: Read Positioner Diagnostics Status Records (w/o parameter)

Reads a batch of 10 self-diagnostic records of the device without related parameter.

Also see Command #174-0.

Request Data Bytes

Byte	Format	Description
0	Enum	Sub Command Number 1: Read Positioner Diagnostics Status Records (w/o parameter)

Response Data Bytes

Byte	Format	Description
0	Enum	Sub Command Number
1	Unsigned-8	Number of Record Data Sets: m Indicates the number of valid record data sets in the subsequent record data set array. “m=0” indicates that there is no valid record data set, and m=1 to 10 indicates that the record data sets from the top (first) to the mth position in the record data set array are valid.

2-101	Array of Structure	<p>Array of record data set (structure, size 10 bytes)</p> <p>The array size is 10.</p> <p>Record data is arranged in order from newest to oldest.</p> <p>If an array element is not a valid record data set, that element (structure) is filled with dummy data (all zeros).</p> <p>Structure Definition</p> <table border="1"> <thead> <tr> <th>Format</th> <th>Description</th> </tr> </thead> <tbody> <tr> <td>Enum</td> <td>Status Type 7 low-order bits of status code (status code & 0x7F)</td> </tr> <tr> <td>Enum</td> <td>Indicates whether the status occurred or disappeared One high-order bit of status code (status code & 0x80)</td> </tr> <tr> <td>Date</td> <td>Time Stamp</td> </tr> <tr> <td>Time</td> <td>Time Stamp</td> </tr> <tr> <td>Enum</td> <td>Status Signal (See Command #174-0)</td> </tr> </tbody> </table>	Format	Description	Enum	Status Type 7 low-order bits of status code (status code & 0x7F)	Enum	Indicates whether the status occurred or disappeared One high-order bit of status code (status code & 0x80)	Date	Time Stamp	Time	Time Stamp	Enum	Status Signal (See Command #174-0)
Format	Description													
Enum	Status Type 7 low-order bits of status code (status code & 0x7F)													
Enum	Indicates whether the status occurred or disappeared One high-order bit of status code (status code & 0x80)													
Date	Time Stamp													
Time	Time Stamp													
Enum	Status Signal (See Command #174-0)													

Command-Specific Response Codes

Code	Class	Description
0	Success	No Command-Specific Errors
1-4		Undefined
5	Error	Too Few Data Bytes Received
6-127		Undefined

11.63 Command #176: Read Part of Additional Device Status

Reads part of the additional device status.

This command is simplified version of command #48 without request data. Specify the part (3 bytes of Additional Device Status) in the request index.

“More Status Available” is not reset by issuing this command.

Request Data Bytes

Byte	Format	Description
0	Unsigned-8	Index

Response Data Bytes

Byte	Format	Description												
0	Unsigned-8	Index												
1-3	Bits	Part of Additional Device Status specified in the request index. <table border="1" data-bbox="667 1041 1401 1397"><thead><tr><th>Index</th><th>Bytes (3bytes)</th></tr></thead><tbody><tr><td>0</td><td>Byte 0 to 2</td></tr><tr><td>1</td><td>Byte 3 to 5</td></tr><tr><td>2</td><td>Byte 14 to 16</td></tr><tr><td>3</td><td>Byte 17 to 19</td></tr><tr><td>4</td><td>Byte 20 to 22</td></tr></tbody></table>	Index	Bytes (3bytes)	0	Byte 0 to 2	1	Byte 3 to 5	2	Byte 14 to 16	3	Byte 17 to 19	4	Byte 20 to 22
Index	Bytes (3bytes)													
0	Byte 0 to 2													
1	Byte 3 to 5													
2	Byte 14 to 16													
3	Byte 17 to 19													
4	Byte 20 to 22													

Command-Specific Response Codes

Code	Class	Description
0	Success	No Command-Specific Errors
1		Undefined
2	Error	Invalid Selection
3-4		Undefined
5	Error	Too Few Data Bytes Received
6-127		Undefined

11.64 Command #177: Read Trend Data

Reads the trend data.

This command is assumed to be used by a Host System, etc. to collect device trend data at a short interval (for example, one second).

Request Data Bytes

Byte	Format	Description
None		

Response Data Bytes

Byte	Format	Description
0-1	Signed-16	Input Signal
2-3	Signed-16	Position
4-5	Signed-16	Set Point
6-7	Signed-16	Travel
8-9	Signed-16	Drive Signal
10-11	Signed-16	Temp
12-13	Signed-16	Po1
14-15	Signed-16	Po2
16-17	Signed-16	Ps
18-19	Signed-16	Pn
20-34	Bits	Part of Additional Device Status (15 bytes) Byte 0 to 5, and 14 to 22
35-38	Unsigned-32	Operating Time
39	Unsigned-8	The most recent value for the positioner diagnostics status record serial number
40	Unsigned-8	The most recent value for the valve diagnostics status record serial number
41	Unsigned-8	The most recent value for the operator action record serial number

Command-Specific Response Codes

Code	Class	Description
0	Success	No Command-Specific Errors
1-127		Undefined

11.65 Command #178: Read Travel Transmission

Reads the travel transmission.

Same as Position (%) in normal state, and 103.25% when the fail-safe direction is set to High and -25% when it is set to Low in the event of a failure (when a failure is detected in self-diagnostics).

Request Data Bytes

Byte	Format	Description
None		

Response Data Bytes

Byte	Format	Description
0-3	Float	Travel Transmission (%)

Command-Specific Response Codes

Code	Class	Description
0	Success	No Command-Specific Errors
1-75		Undefined
76	Error	Not Supported
77-127		Undefined

11.66 Command #180: Read Balance Pressure Ratio

Reads the balance pressure ratio of Po2 and Ps.

The device calculates the balance pressure ratio of Po2 and Ps and returns the result as a percentage (%) for the pilot calibration method.

Request Data Bytes

Byte	Format	Description
None		

Response Data Bytes

Byte	Format	Description
0-3	Float	Balance Pressure Ratio (%)

Command-Specific Response Codes

Code	Class	Description
0	Success	No Command-Specific Errors
1-127		Undefined

11.67 Command #182-0: Read One of Operator Action Records

Reads one operator action record.

The device stores up to 10 records. If the number of records exceeds 10, the oldest record is deleted (overwritten) and the most recent 10 records are stored.

Since buffer indexes 0 to 9 are assigned to the data, data is read by specifying the index.

Request Data Bytes

Byte	Format	Description
0	Enum	Sub Command Number 0: Read Operator Action Record
1	Unsigned-8	Read Buffer Index (0-9)

Response Data Bytes

Byte	Format	Description
0	Enum	Sub Command Number
1	Unsigned-8	Read Buffer Index
2	Unsigned-8	Returned Data Record Serial Number (0-99)
3	Enum	Operator Action Index (See Section 12.5)
4-7	Unsigned-32	Time Stamp (Operating Time)
8	Enum	Operator (See Section 12.1)
9	Unsigned-8	The most recent value for the operator action record serial number (0-99) Returns 255 if there is no record.

Command-Specific Response Codes

Code	Class	Description
0	Success	No Command-Specific Errors
1		Undefined
2	Error	Invalid Selection
3-4		Undefined
5	Error	Too Few Data Bytes Received
6-127		Undefined

11.68 Command #182-1: Read All Operator Action Records

Reads a batch of 10 operator action records.

Request Data Bytes

Byte	Format	Description
0	Enum	Sub Command Number 1: Read Operator Action Records

Response Data Bytes

Byte	Format	Description
0	Enum	Sub Command Number
1	Unsigned-8	Number of Record Data Sets: m Indicates the number of valid record data sets in the subsequent record data set array. “m=0” indicates that there is no valid record data set, and m=1 to 10 indicates that the record data sets from the top (first) to the mth position in the record data set array are valid.

2-101	Array of Structure	<p>Array of record data sets (structures, size 10 bytes) (size 10). Record data is arranged in order from newest to oldest. If an array element is not a valid record data set, that element (structure) is filled with dummy data (all zeros).</p> <p>Structure Definition</p> <table border="1"> <thead> <tr> <th>Format</th> <th>Description</th> </tr> </thead> <tbody> <tr> <td>Enum</td> <td>Operator Action Code</td> </tr> <tr> <td>Enum</td> <td>Indicates the operation category One high-order bit of operator action code (Operator Action Code & 0x80) 0x00: Method operation 0x80: Change parameter</td> </tr> <tr> <td>Date</td> <td>Time Stamp</td> </tr> <tr> <td>Time</td> <td>Time Stamp</td> </tr> <tr> <td>Enum</td> <td>Operator (See Section 12.1)</td> </tr> </tbody> </table>	Format	Description	Enum	Operator Action Code	Enum	Indicates the operation category One high-order bit of operator action code (Operator Action Code & 0x80) 0x00: Method operation 0x80: Change parameter	Date	Time Stamp	Time	Time Stamp	Enum	Operator (See Section 12.1)
Format	Description													
Enum	Operator Action Code													
Enum	Indicates the operation category One high-order bit of operator action code (Operator Action Code & 0x80) 0x00: Method operation 0x80: Change parameter													
Date	Time Stamp													
Time	Time Stamp													
Enum	Operator (See Section 12.1)													

Command-Specific Response Codes

Code	Class	Description
0	Success	No Command-Specific Errors
1-4		Undefined
5	Error	Too Few Data Bytes Received
6-127		Undefined

11.69 Command #184-0: Set Operator Action Record (EPM Adjustment)

Records the EPM adjustment action in the operator action records.

EMP Adjustment refers to the operation for the operator to manually turn the adjustment screw in the main body and is not a function that is executed by software.

Accordingly, the EMP adjustment action cannot be recorded automatically by software.

The operator can issue this command to record The EPM Adjustment when it is performed.

Request Data Bytes

Byte	Format	Description
0	Enum	Sub Command Number 0: Set Operator Action Record (EPM Adjustment)

Response Data Bytes

Byte	Format	Description
0	Enum	Sub Command Number

Command-Specific Response Codes

Code	Class	Description
0	Success	No Command-Specific Errors
1-4		Undefined
5	Error	Too Few Data Bytes Received
6-15		Undefined
16	Error	Access Restricted
17-127		Undefined

11.70 Command #184-1: Set Operator Action Record (Pilot Adjustment)

Records the pilot adjustment action in the operator action records.

Pilot Adjustment refers to the operation for the operator to manually turn the adjustment screw in the main body and is not a function that is executed by software.

Accordingly, the pilot adjustment action cannot be recorded automatically by software.

The operator can issue this command to record the pilot adjustment when it is performed.

Request Data Bytes

Byte	Format	Description
0	Enum	Sub Command Number 1: Set Operator Action Record (Pilot Adjustment)

Response Data Bytes

Byte	Format	Description
0	Enum	Sub Command Number

Command-Specific Response Codes

Code	Class	Description
0	Success	No Command-Specific Errors
1-4		Undefined
5	Error	Too Few Data Bytes Received
6-15		Undefined
16	Error	Access Restricted
17-127		Undefined

11.71 Command #185-0: Perform 0% Travel Angle Correction

Writes the 0% travel angle.

Request Data Bytes

Byte	Format	Description
0	Enum	Sub Command Number 0: Perform 0% Travel Angle Correction
1-4	Float	0% Travel Angle

Response Data Bytes

Byte	Format	Description
0	Enum	Sub Command Number
1-4	Float	0% Travel Angle

Command-Specific Response Codes

Code	Class	Description
0	Success	No Command-Specific Errors
1-2		Undefined
3	Error	Passed Parameter Too Large
4	Error	Passed Parameter Too Small
5	Error	Too Few Data Bytes Received
6-15		Undefined
16	Error	Access Restricted
17-127		Undefined

11.72 Command #185-1: Perform 100% Travel Angle Correction

Writes the 100% travel angle.

Request Data Bytes

Byte	Format	Description
0	Enum	Sub Command Number 1: Perform 100% Travel Angle Correction
1-4	Float	100% Travel Angle

Response Data Bytes

Byte	Format	Description
0	Enum	Sub Command Number
1-4	Float	100% Travel Angle

Command-Specific Response Codes

Code	Class	Description
0	Success	No Command-Specific Errors
1-2		Undefined
3	Error	Passed Parameter Too Large
4	Error	Passed Parameter Too Small
5	Error	Too Few Data Bytes Received
6-15		Undefined
16	Error	Access Restricted
17-127		Undefined

11.73 Command #186: Read Various Characteristics Obtained by Auto Setup

Reads various characteristic values that are automatically obtained by auto setup.

Those values are used for positioner diagnostics and valve diagnostics.

Request Data Bytes

Byte	Format	Description
0	Enum	Pressure Unit Code (See Section 12.14)

Response Data Bytes

Byte	Format	Description
0	Enum	Pressure Unit Code
1-4	Float	Initial Supply Pressure
5-8	Float	Spring Range High
9-12	Float	Spring Range Low
13-16	Float	Drive Signal Range High
17-20	Float	Drive Signal Range Low
21-24	Float	Drive Signal-Pn Gain EPM Characteristic
25-28	Float	Drive Signal-Pn Intercept EPM Characteristic

Command-Specific Response Codes

Code	Class	Description
0	Success	No Command-Specific Errors
1		Undefined
2	Error	Invalid Selection
3-4		Undefined
5	Error	Too Few Data Bytes Received
6-127		Undefined

11.74 Command #190: Read Real-Time Clock

Reads the real-time clock value.

Request Data Bytes

Byte	Format	Description
None		

Response Data Bytes

Byte	Format	Description
0-2	Date	Current Date
3-6	Time	Current Time of Day
7-9	Date	Date clock last set
10-13	Time	Time clock last set
14	Bits	RTC Flags

Command-Specific Response Codes

Code	Class	Description
0	Success	No Command-Specific Errors
1-127		Undefined

11.75 Command #191: Set Real-Time Clock

Sets the real-time clock value.

Request Data Bytes

Byte	Format	Description
0-2	Date	Date Code to set device's Real-Time Clock
3-6	Time	Time of Day to set device's Real-Time Clock

Response Data Bytes

Byte	Format	Description
0-2	Date	Date Code to set device's Real-Time Clock
3-6	Time	Time of Day to set device's Real-Time Clock

Command-Specific Response Codes

Code	Class	Description
0	Success	No Command-Specific Errors
1-2		Undefined
3	Error	Passed Parameter Too Large
4	Error	Passed Parameter Too Small
5	Error	Too Few Data bytes received
6-15		Undefined
16	Error	Access Restricted
17-80		Undefined
81	Error	Invalid Date or Time
82-127		Undefined

11.76 Command #192: Read Auto Setup Parameters

Reads parameters that may be changed automatically by auto setup; in particular, those related to basic configuration and valve control.

Request Data Bytes

Byte	Format	Description
None		

Response Data Bytes

Byte	Format	Description
0-3	Float	0% Travel Angle
4-7	Float	100% Travel Angle
8-11	Float	Stroke Time Average
12-15	Float	Stroke Time Open
16-19	Float	Stroke Time Close
20-23	Float	Friction Index
24	Enum	Actuator Size
25	Enum	Friction Level
26	Enum	Feedback Lever Motion
27	Enum	Positioner Action
28	Enum	Electrical Fail To
29	Enum	Air Fail To
30	Enum	Pilot Relay Type
31-34	Float	PV Upper Range Value
35-38	Float	PV Lower Range Value

Command-Specific Response Codes

Code	Class	Description
0	Success	No Command-Specific Errors
1-127		Undefined

11.77 Command #194: Read Valve Diagnostics Configuration Updated by Auto Setup

Reads the valve diagnostics configuration data that are automatically changed by auto setup.

Request Data Bytes

Byte	Format	Description
0	Enum	Pressure Unit Code (See Section 12.14)

Response Data Bytes

Byte	Format	Description
0	Enum	Pressure Unit Code
1-4	Float	Output Pressure Validity Threshold Plus
5-8	Float	Output Pressure Validity Threshold Minus
9-12	Float	Output Pressure-Travel Standard Gain
13-16	Float	Output Pressure-Travel Standard Intercept
17-20	Float	Max Friction Threshold
21-24	Float	Supply Pressure Threshold High
25-28	Float	Supply Pressure Threshold Low

Command-Specific Response Codes

Code	Class	Description
0	Success	No Command-Specific Errors
1		Undefined
2	Error	Invalid Selection
3-4		Undefined
5	Error	Too Few Data Bytes Received
6-127		Undefined

11.78 Command #220-n: Read Diagnostic Configuration

Reads the valve diagnostics configuration.

Specify the diagnostic type in the sub command number. Sub Command Table shows the details. See [Section 12.6](#).

Specify the pressure unit or temperature unit in Unit Code. This is valid only when the parameter you want to read is related to the pressure or temperature. Unit group limitations by the model number are imposed on the units that can be specified. (See Command #128.)

Sub Command #4, #5, and #8 need valid pressure unit code.

Sub Command #7 needs valid temperature or pressure unit code. Received pressure unit code, the temperature unit is determined automatically as appropriate for the pressure unit. It is degrees F only when the pressure unit is psi, and is degrees C when the pressure unit is anything else.

Request. Data Bytes

Byte	Format	Description
0	Enum	Sub Command Number (0-13)
1	Enum	Unit Code For Pressure: kPa, MPa, bar, psi, kgf/cm ² (See Section 12.14) For Temperature: degrees C, degrees F (See Section 12.15)

Response Data Bytes

Byte	Format	Description
0	Enum	Sub Command Number (0-13)
1	Enum	Unit Code Returns the same value received in the request data even if the unit code is unnecessary for the diagnostics specified in the sub command number.
2-n	-	Configuration data of the diagnostics specified in the sub command number

Command-Specific Response Codes

Code	Class	Description
0	Success	No Command-Specific Errors
1		Undefined

Code	Class	Description
2	Error	Invalid Selection
3-4		Undefined
5	Error	Too Few Data Bytes Received
6-127		Undefined

Note: This table shows only the definition of codes. See [Section 12.6](#) for Response Code specification for each transaction (sub command).

11.79 Command #221-n: Write Diagnostic Configuration

Writes the valve diagnostic configuration.

Specify the diagnostic type in the sub command number. Sub Command Table shows the details. See [Section 12.7](#).

Specify the parameter unit you want to write in Unit Code. (See Command #220. The only difference is “read” or “write.”)

Request Data Bytes

Byte	Format	Description
0	Enum	Sub Command Number (0-12)
1	Enum	Unit Code For Pressure: kPa, MPa, bar, psi, kgf/cm2 (See Section 12.14) For Temperature: degrees C, degrees F (See Section 12.15)
2-n	-	Configuration data of the diagnostics specified in the sub command number

Response Data Bytes

Byte	Format	Description
0	Enum	Sub Command Number (0-12)
1	Enum	Unit Code Returns the same value received in the request data even if the unit code is unnecessary for the diagnostics specified in the sub command number.
2-n	-	Configuration data of the diagnostics specified in the sub command number

Command-Specific Response Codes

Code	Class	Description
0	Success	No Command-Specific Errors
1		Undefined
2	Error	Invalid Selection
3	Error	Passed Parameter Too Large
4	Error	Passed Parameter Too Small

Code	Class	Description
5	Error	Too Few Data Bytes Received
6-15		Undefined
16	Error	Access Restricted
17-127		Undefined

Note: This table shows only the definition of codes. See [Section 12.7](#) for Response Code specification for each transaction (sub command).

11.80 Command #222-n: Read Diagnostic Parameters

Reads the diagnostic output parameters.

Specify the diagnostic parameters in the sub command number. Sub Command Table shows the details. See [Section 12.8](#).

Specify the parameter unit you want to read in Unit Code. (See also Command #220.)

Sub Command 9, #10, #12, #14, #16, #18 and #23 need valid pressure unit code.

Sub Command #20 needs valid temperature or pressure unit code. Received pressure unit code, the temperature unit is determined automatically as appropriate for the pressure unit. It is degrees F only when the pressure unit is psi, and is degrees C when the pressure unit is anything else.

Request Data Bytes

Byte	Format	Description
0	Enum	Sub Command Number
1	Enum	Unit Code For Pressure: kPa, MPa, bar, psi, kgf/cm2 (See Section 12.14) For Temperature: degrees C, degrees F (See Section 12.15)

Response Data Bytes

Byte	Format	Description
0	Enum	Sub Command Number
1	Enum	Unit Code Returns the same value received in the request data even if the unit code is unnecessary for the parameters specified in the sub command number.
2-n	-	Diagnostic output parameters data specified in the sub command number

Command-Specific Response Codes

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

Code	Class	Description
3-4		Undefined
5	Error	Too Few Data Bytes Received
6-127		Undefined

Note: This table shows only the definition of codes. See [Section 12.8](#) for Response Code specification for each transaction (sub command).

11.81 Command #223-n: Write Diagnostic Parameters

Writes the diagnostic output parameters.

Used to reset diagnostic parameters periodically and inherit diagnostic parameters when a device is replaced.

Specify the diagnostic parameters in the sub command number. Sub Command Table shows the details. See [Section 12.9](#).

Request Data Bytes

Byte	Format	Description
0	Enum	Sub Command Number
1	-	Reserved
2-n	-	Diagnostic output parameters data specified in the sub command number

Response Data Bytes

Byte	Format	Description
0	Enum	Sub Command Number
1	-	Reserved
2-n	-	Diagnostic output parameters data specified in the sub command number

Command-Specific Response Codes

Code	Class	Description
0	Success	No Command-Specific Errors
1-3		Undefined
4	Error	Passed Parameter Too Small
5	Error	Too Few Data Bytes Received
6-15		Undefined
16	Error	Access Restricted
17-127		Undefined

Note: This table shows only the definition of codes. See [Section 12.9](#) for Response Code specification for each transaction (sub command).

11.82 Command #232-0: Read Step Response Test Configuration1

Reads the step response test configuration data.

Time-Series data during the test can be saved in the device and acquired after the test.

The combination of the device variables to be saved is specified in the collection data pattern.

Request Data Bytes

Byte	Format	Description
0	Enum	Sub Command Number 0: Read Step Response Test Configuration1

Response Data Bytes

Byte	Format	Description						
0	Enum	Sub Command Number						
1	Unsigned-8	Number of Steps (1-60)						
2	Enum	Collection Data Pattern Number (See Section 12.10)						
3-62	Array of Structure	Step Configuration Data Array [0]-[14] (Array of structure) Structure Definition <table border="1" style="margin-left: 40px;"> <thead> <tr> <th>Format</th> <th>Description</th> </tr> </thead> <tbody> <tr> <td>Signed-16</td> <td>Target Set point of Step 1 count: 0.01%</td> </tr> <tr> <td>Unsigned-16</td> <td>Time of Step 1 count: 1sec</td> </tr> </tbody> </table>	Format	Description	Signed-16	Target Set point of Step 1 count: 0.01%	Unsigned-16	Time of Step 1 count: 1sec
Format	Description							
Signed-16	Target Set point of Step 1 count: 0.01%							
Unsigned-16	Time of Step 1 count: 1sec							

Command-Specific Response Codes

Code	Class	Description
0	Success	No Command-Specific Errors
1-4		Undefined
5	Error	Too Few Data Bytes Received
6-127		Undefined

11.83 Command #232-1: Read Step Response Test Configuration2

Reads the step response test configuration data (step configuration data array [15]-[29]).

Request Data Bytes

Byte	Format	Description
0	Enum	Sub Command Number 1: Read Step Response Test Configuration2

Response Data Bytes

Byte	Format	Description
0	Enum	Sub Command Number
1-60	Array of Structure	Step Configuration Data Array [15]-[29]

Command-Specific Response Codes

Code	Class	Description
0	Success	No Command-Specific Errors
1-4		Undefined
5	Error	Too Few Data Bytes Received
6-127		Undefined

11.84 Command #232-2: Read Step Response Test Configuration3

Reads the step response test configuration data (step configuration data array [30]-[44]).

Request Data Bytes

Byte	Format	Description
0	Enum	Sub Command Number 2: Read Step Response Test Configuration3

Response Data Bytes

Byte	Format	Description
0	Enum	Sub Command Number
1-60	Array of Structure	Step Configuration Data Array [30]-[44]

Command-Specific Response Codes

Code	Class	Description
0	Success	No Command-Specific Errors
1-4		Undefined
5	Error	Too Few Data Bytes Received
6-127		Undefined

11.85 Command #232-3: Read Step Response Test Configuration4

Reads the step response test configuration data (step configuration data array [45]-[59]).

Request Data Bytes

Byte	Format	Description
0	Enum	Sub Command Number 3: Read Step Response Test Configuration4

Response Data Bytes

Byte	Format	Description
0	Enum	Sub Command Number
1-60	Array of Structure	Step Configuration Data Array [45]-[59]

Command-Specific Response Codes

Code	Class	Description
0	Success	No Command-Specific Errors
1-4		Undefined
5	Error	Too Few Data Bytes Received
6-127		Undefined

11.86 Command #232-4: Read Step Response Test Result and Status

Reads the step response test result and status.

Request Data Bytes

Byte	Format	Description
0	Enum	Sub Command Number 4: Read Step Response Test Result and Status

Response Data Bytes

Byte	Format	Description
0	Enum	Sub Command Number
1	Enum	Step Response Test Result 0: No Result 1: Complete 2: Pressure Error 3: Buffer Overflow 4: Aborted
2	Enum	Step Response Test Status 0: Idle 1: Running

Command-Specific Response Codes

Code	Class	Description
0	Success	No Command-Specific Errors
1-4		Undefined
5	Error	Too Few Data Bytes Received
6-127		Undefined

11.87 Command #232-5: Read Step Response Test Sampling time

Reads the step response test sampling time.

Request Data Bytes

Byte	Format	Description
0	Enum	Sub Command Number 5: Read Step Response Test Sampling time

Response Data Bytes

Byte	Format	Description
0	Enum	Sub Command Number
1-4	Float	Sampling Time (sec)

Command-Specific Response Codes

Code	Class	Description
0	Success	No Command-Specific Errors
1-4		Undefined
5	Error	Too Few Data Bytes Received
6-127		Undefined

11.88 Command #233-0: Write Step Response Test Configuration1

Writes the step response test configuration data.

See Command #232-0 for details on the data.

Request Data Bytes

Byte	Format	Description
0	Enum	Sub Command Number 0: Write STEP RESPONSE TEST Configuration1
1	Unsigned-8	Number of Steps (1-60)
2	Enum	Collection Data Pattern Number (See Section 12.10)
3-62	Array of Structure	Step Configuration Data Array [0]-[14]

Response Data Bytes

Byte	Format	Description
0	Enum	Sub Command Number
1	Unsigned-8	Number of Steps
2	Enum	Collection Data Pattern Number
3-62	Array of Structure	Step Configuration Data Array [0]-[14]

Command-Specific Response Codes

Code	Class	Description
0	Success	No Command-Specific Errors
1		Undefined
2	Error	Invalid Selection
3	Error	Passed Parameter Too Large
4	Error	Passed Parameter Too Small
5	Error	Too Few Data Bytes Received
6-15		Undefined
16	Error	Access Restricted
17-127		Undefined

11.89 Command #233-1: Write Step Response Test Configuration2

Writes the step response test configuration data (step configuration data array [15]-[29]).

Request Data Bytes

Byte	Format	Description
0	Enum	Sub Command Number 1: Write Step Response Test Configuration2
1-60	Array of Structure	Step Configuration Data Array [15]-[29]

Response Data Bytes

Byte	Format	Description
0	Enum	Sub Command Number
1-60	Array of Structure	Step Configuration Data Array [15]-[29]

Command-Specific Response Codes

Code	Class	Description
0	Success	No Command-Specific Errors
1-2		Undefined
3	Error	Passed Parameter Too Large
4		Undefined
5	Error	Too Few Data Bytes Received
6-15		Undefined
16	Error	Access Restricted
17-127		Undefined

11.90 Command #233-2: Write Step Response Test Configuration3

Writes the step response test configuration data (step configuration data array [30]-[44]).

Request Data Bytes

Byte	Format	Description
0	Enum	Sub Command Number 2: Write Step Response Test Configuration3
1-60	Array of Structure	Step Configuration Data Array [30]-[44]

Response Data Bytes

Byte	Format	Description
0	Enum	Sub Command Number
1-60	Array of Structure	Step Configuration Data Array [30]-[44]

Command-Specific Response Codes

Code	Class	Description
0	Success	No Command-Specific Errors
1-2		Undefined
3	Error	Passed Parameter Too Large
4		Undefined
5	Error	Too Few Data Bytes Received
6-15		Undefined
16	Error	Access Restricted
17-127		Undefined

11.91 Command #233-3: Write Step Response Test Configuration4

Writes the step response test configuration data (step configuration data array [45]-[59]).

Request Data Bytes

Byte	Format	Description
0	Enum	Sub Command Number 3: Write Step Response Test Configuration4
1-60	Array of Structure	Step Configuration Data Array [45]-[59]

Response Data Bytes

Byte	Format	Description
0	Enum	Sub Command Number
1-60	Array of Structure	Step Configuration Data Array [45]-[59]

Command-Specific Response Codes

Code	Class	Description
0	Success	No Command-Specific Errors
1-2		Undefined
3	Error	Passed Parameter Too Large
4		Undefined
5	Error	Too Few Data Bytes Received
6-15		Undefined
16	Error	Access Restricted
17-127		Undefined

11.92 Command #233-5: Write Step Response Test Sampling time

Writes the step response test sampling time setting.

The sampling time can be set only to a predefined value: 0.05, 0.1, or $0.2 \cdot N$ where N is an integer more than one. If the device receives the other values, the nearest possible value is set and returned in the response data.

Request Data Bytes

Byte	Format	Description
0	Enum	Sub Command Number 5: Write Step Response Test Sampling time
1-4	Float	Sampling Time (sec)

Response Data Bytes

Byte	Format	Description
0	Enum	Sub Command Number
1-4	Float	Sampling Time (sec)

Command-Specific Response Codes

Code	Class	Description
0	Success	No Command-Specific Errors
1-3		Undefined
4	Error	Passed Parameter Too Small
5	Error	Too Few Data Bytes Received
6-15		Undefined
16	Error	Access Restricted
17-127		Undefined

11.93 Command #234-0: Perform Step Response Test

Performs the step response test.

Since it takes time until the test ends, a response is made without waiting for the end of the test. (Only a start trigger is activated.)

Request Data Bytes

Byte	Format	Description
0	Enum	Sub Command Number 0: Perform Step Response Test

Response Data Bytes

Byte	Format	Description
0	Enum	Sub Command Number

Command-Specific Response Codes

Code	Class	Description
0	Success	No Command-Specific Errors
1-4		Undefined
5	Error	Too Few Data Bytes Received
6-15		Undefined
16	Error	Access Restricted
17-71		Undefined
72	Error	Conditions not met
73	Error	Current is insufficient
74-127		Undefined

11.94 Command #234-1: Stop Step Response Test

Stops the step response test.

Request Data Bytes

Byte	Format	Description
0	Enum	Sub Command Number 1: Stop Step Response Test

Response Data Bytes

Byte	Format	Description
0	Enum	Sub Command Number

Command-Specific Response Codes

Code	Class	Description
0	Success	No Command-Specific Errors
1-4		Undefined
5	Error	Too Few Data Bytes Received
6-15		Undefined
16	Error	Access Restricted
17-127		Undefined

11.95 Command #234-2: Clear Step Response Test Result

Clear the step response test result.

Request Data Bytes

Byte	Format	Description
0	Enum	Sub Command Number 2: Clear Step Response Test Result

Response Data Bytes

Byte	Format	Description
0	Enum	Sub Command Number

Command-Specific Response Codes

Code	Class	Description
0	Success	No Command-Specific Errors
1-4		Undefined
5	Error	Too Few Data Bytes Received
6-15		Undefined
16	Error	Access Restricted
17-127		Undefined

11.96 Command #236-0: Read Valve Signature Configuration

Reads the valve signature configuration data.

Request Data Bytes

Byte	Format	Description
0	Enum	Sub Command Number 0: Read Valve Signature Configuration

Response Data Bytes

Byte	Format	Description
0	Enum	Sub Command Number
1-4	Float	Set point corresponding to minimum travel
5-8	Float	Set point corresponding to maximum travel
9-12	Float	Set point that the device stops once before the valve signature starts
13-16	Float	Valve Signature Ramp Time (sec)
17-20	Float	Valve Signature Pause Time (sec)
21-24	Float	Valve Signature Sampling Time (sec)

Command-Specific Response Codes

s	Class	Description
0	Success	No Command-Specific Errors
1-4		Undefined
5	Error	Too Few Data Bytes Received
6-127		Undefined

11.97 Command #236-1: Read Valve Signature Result and Status

Reads the valve signature result.

Request Data Bytes

Byte	Format	Description
0	Enum	Sub Command Number 1: Read Valve Signature Result

Response Data Bytes

Byte	Format	Description
0	Enum	Sub Command Number
1	Enum	Valve Signature Result 0: No Result 1: Complete 2: Pressure Error 3: Travel Error 4: Aborted
2	Enum	Valve Signature Status 0: Idle 1: Running
3-6	Floart-32	Stick-Slip Y during execution of the valve signature
7-10	Floart-32	Stick-Slip X during execution of the valve signature

Command-Specific Response Codes

Code	Class	Description
0	Success	No Command-Specific Errors
1-4		Undefined
5	Error	Too Few Data Bytes Received
6-127		Undefined

11.98 Command #237: Write Valve Signature Configuration

Writes the valve signature configuration data.

Request Data Bytes

Byte	Format	Description
0-3	Float	Set point corresponding to minimum travel
4-7	Float	Set point corresponding to maximum travel
8-11	Float	Set point that the device stops once before the valve signature starts
12-15	Float	Valve Signature Ramp Time (sec)
16-19	Float	Valve Signature Pause Time (sec)
20-23	Float	Valve Signature Sampling Time (sec)

Response Data Bytes

Byte	Format	Description
0-3	Float	Set point corresponding to minimum travel
4-7	Float	Set point corresponding to maximum travel
8-11	Float	Set point that the device stops once before the valve signature starts
12-15	Float	Valve Signature Ramp Time (sec)
16-19	Float	Valve Signature Pause Time (sec)
20-23	Float	Valve Signature Sampling Time (sec)

Command-Specific Response Codes

Code	Class	Description
0	Success	No Command-Specific Errors
1-2		Undefined
3	Error	Passed Parameter Too Large
4	Error	Passed Parameter Too Small
5	Error	Too Few Data Bytes Received
6-15		Undefined
16	Error	Access Restricted

Code	Class	Description
17-127		Undefined

11.99 Command #238-0: Perform Valve Signature

Performs the valve signature.

Since it takes time until the test ends, a response is made without waiting for the end of the test. (Only a start trigger is activated.)

Request Data Bytes

Byte	Format	Description
0	Enum	Sub Command Number 0: Perform Valve Signature

Response Data Bytes

Byte	Format	Description
0	Enum	Sub Command Number

Command-Specific Response Codes

Code	Class	Description
0	Success	No Command-Specific Errors
1-4		Undefined
5	Error	Too Few Data Bytes Received
6-15		Undefined
16	Error	Access Restricted
17-71		Undefined
72	Error	Conditions not met
73	Error	Current is insufficient
74-127		Undefined

11.100 Command #238-1: Stop Valve Signature

Stops the valve signature.

Request Data Bytes

Byte	Format	Description
0	Enum	Sub Command Number 1: Stop Valve Signature

Response Data Bytes

Byte	Format	Description
0	Enum	Sub Command Number

Command-Specific Response Codes

Code	Class	Description
0	Success	No Command-Specific Errors
1-4		Undefined
5	Error	Too Few Data Bytes Received
6-15		Undefined
16	Error	Access Restricted
17-127		Undefined

11.101 Command #238-2: Clear Valve Signature Result

Clears the valve signature result.

Request Data Bytes

Byte	Format	Description
0	Enum	Sub Command Number 2: Clear Valve Signature Result

Response Data Bytes

Byte	Format	Description
0	Enum	Sub Command Number

Command-Specific Response Codes

Code	Class	Description
0	Success	No Command-Specific Errors
1-4		Undefined
5	Error	Too Few Data Bytes Received
6-15		Undefined
16	Error	Access Restricted
17-127		Undefined

11.102 Command #240-0: Read Test Data

Reads the time-series data saved in the device during the test.

Used for the full stroke test, partial stroke test, valve signature, and step response test.

Specify the position to start reading data in the index of the request data. (The index at the beginning of the whole data is zero.)

Response data consists of the specified index, number of read data records (number of data records that are actually sent), (preliminary) total number of test data records, number of saved (collected) data records, and time-series data.

Time-series data is an array of structures; one structure consists of a combination of device variables determined by the collection data pattern number. (See [Section 12.10.](#)) The length of a returned array varies, and the data that can be returned (stored in the device) at the point when this command is received is returned as much as possible within the limit that the whole response data does not exceed 110 bytes.

Collection data pattern numbers 1-18 can all be selected in the step response test, but in other tests the patterns are fixed and cannot be selected. The collection data pattern number of saved time-series data can be read by using command #240-1.

Request Data Bytes

Byte	Format	Description
0	Enum	Sub Command Number 0: Read Test Data
1-2	Unsigned-16	Read Start Index

Response Data Bytes

Byte	Format	Description
0	Enum	Sub Command Number
1-2	Unsigned-16	Sent Data Top Index (Same as Read Start Index)
3	Unsigned-8	Number of Sent Data Records
4-5	Unsigned-16	Total Number of Test Data Number of Test Data
6-7	Unsigned-16	Number of Collected Data Records

8-n	Singed-16	Time-series Data
-----	-----------	------------------

Command-Specific Response Codes

Code	Class	Description
0	Success	No Command-Specific Errors
1		Undefined
2	Error	Invalid Selection
3-4		Undefined
5	Error	Too Few Data Bytes Received
6-127		Undefined

11.103 Command #240-1: Read Test Data Information

Reads the following information related to test data: Sampling Time, Total Number of Test Data Records (Preliminary), Test Type, Collection Data Pattern Number, and Data Collection Start Time.

The information is updated at the time when the data collection actually starts.

Request Data Bytes

Byte	Format	Description
0	Enum	Sub Command Number 1: Read Test Data Information

Response Data Bytes

Byte	Format	Description
0	Enum	Sub Command Number
1-4	Float	Sampling Time (sec)
5-6	Unsigned-16	Total Number of Test Data Records (Preliminary)
7	Enum	Test Type 0: None 2: Full Stroke Test 3: Step Response Test 4: Valve Signature
8	Enum	Collection Data Pattern Number (See Section 12.10)
9-12	Unsigned-32	Data Collection Start Time Operating time when the data collection starts

Command-Specific Response Codes

Code	Class	Description
0	Success	No Command-Specific Errors
1-4		Undefined
5	Error	Too Few Data Bytes Received
6-127		Undefined

11.104 Command #240-2: Read Multiplier Factor for Pressure Unit

Reads the multiplier factor for converting the integer pressure value, read by using command #240- 0, to the desired unit.

Request Data Bytes

Byte	Format	Description
0	Enum	Sub Command Number 2: Read Multiplier Factor for Pressure Unit
1	Enum	Pressure Unit Code (See Section 12.14)

Response Data Bytes

Byte	Format	Description
0	Enum	Sub Command Number
1	Enum	Pressure Unit Code
2-5	Float	Multiplier Factor

Command-Specific Response Codes

Code	Class	Description
0	Success	No Command-Specific Errors
1		Undefined
2	Error	Invalid Selection
3-4		Undefined
5	Error	Too Few Data Bytes Received
6-127		Undefined

11.105 Command #242-0: Read Valve Diagnostics Status Record

Reads one valve diagnostics status record with related parameters.

The device stores up to 10 records. If the number of records exceeds 10, the oldest record is deleted (overwritten) and the most recent 10 records are stored.

Request Data Bytes

Byte	Format	Description
0	Enum	Sub Command Number 0: Read Valve Diagnostics Status Record
1	Unsigned-8	Read Buffer Index (0-9)

Response Data Bytes

Byte	Format	Description
0	Enum	Sub Command Number
1	Unsigned-8	Read Buffer Index
2	Unsigned-8	Returned Data Record Number (0-99)
3	Enum	Status Code (See Section 12.3)
4-7	Unsigned-32	Time Stamp (Operating Time)
8	Enum	Status Signal Code (See Section 12.4)
9-12	Float or Unsigned-32	Related Parameter 1 (See Section 12.3)
13-16	Float	Related Parameter 2 (See Section 12.3)
17	Unsigned-8	The most recent value for the valve diagnostics status record serial number (0-99) Returns 255 if there is no record.

Command-Specific Response Codes

Code	Class	Description
0	Success	No Command-Specific Errors
1		Undefined
2	Error	Invalid Selection
3-4		Undefined

Code	Class	Description
5	Error	Too Few Data Bytes Received
6-127		Undefined

11.106 Command #242-1: Read Valve Diagnostics Status Records (w/o parameters)

Reads a batch of 10 valve diagnostics status records without related parameters.

See also Command #242-0.

Request Data Bytes

Byte	Format	Description
0	Enum	Sub Command Number 1: Read Valve Diagnostics Status Record (w/o parameters)

Response Data Bytes

Byte	Format	Description
0	Enum	Sub Command Number
1	Unsigned-8	Number of Record Data Sets (m) Indicates the number of valid record data sets in the next record data set array. “m=0” indicates that there is no valid record data set, and m=1 to 10 indicates that the record data sets from the top (first) to the m th position in the record data set array are valid.

2-101	Array of Structure	<p>Array of record data set (structure, size 10 bytes). The array size is 10. Record data is arranged in order from newest to oldest. If an array element is not a valid record data set, that element (structure) is filled with dummy data (all zeros).</p> <p>Structure Definition</p> <table border="1" data-bbox="608 636 1337 1218"> <thead> <tr> <th data-bbox="612 642 788 696">Format</th> <th data-bbox="788 642 1332 696">Description</th> </tr> </thead> <tbody> <tr> <td data-bbox="612 696 788 846">Enum</td> <td data-bbox="788 696 1332 846"> Status Type 7 low-order bits of the status code (status code & 0x7F) </td> </tr> <tr> <td data-bbox="612 846 788 1048">Enum</td> <td data-bbox="788 846 1332 1048"> Indicates whether the status occurred or disappeared One high-order bit of the status code (Status Code & 0x80) </td> </tr> <tr> <td data-bbox="612 1048 788 1102">Date</td> <td data-bbox="788 1048 1332 1102">Time Stamp</td> </tr> <tr> <td data-bbox="612 1102 788 1155">Time</td> <td data-bbox="788 1102 1332 1155">Time Stamp</td> </tr> <tr> <td data-bbox="612 1155 788 1209">Enum</td> <td data-bbox="788 1155 1332 1209">Status Signal (See Command #242-0)</td> </tr> </tbody> </table>	Format	Description	Enum	Status Type 7 low-order bits of the status code (status code & 0x7F)	Enum	Indicates whether the status occurred or disappeared One high-order bit of the status code (Status Code & 0x80)	Date	Time Stamp	Time	Time Stamp	Enum	Status Signal (See Command #242-0)
Format	Description													
Enum	Status Type 7 low-order bits of the status code (status code & 0x7F)													
Enum	Indicates whether the status occurred or disappeared One high-order bit of the status code (Status Code & 0x80)													
Date	Time Stamp													
Time	Time Stamp													
Enum	Status Signal (See Command #242-0)													

Command-Specific Response Codes

Code	Class	Description
0	Success	No Command-Specific Errors
1-4		Undefined
5	Error	Too Few Data Bytes Received
6-127		Undefined

11.107 Command #244: Read Diagnostic Configuration (Combination)

Reads the valve diagnostic configuration.

This command allows a Master to read any combination of the valve diagnostics configuration data within the limit that the whole response data does not exceed 110 bytes. Specify the combination in the request flags (bit strings).

See [Section 12.11](#) for details on the request flags.

Request Data Bytes

Byte	Format	Description
0-5	Bits	Flags (Byte 0 to Byte 5)

Response Data Bytes

Byte	Format	Description
0-5	Bits	Flags
6-n		Configuration data specified in the flags

Command-Specific Response Codes

Code	Class	Description
0	Success	No Command-Specific Errors
1		Undefined
2	Error	Invalid Selection
3-4		Undefined
5	Error	Too Few Data Bytes Received
6-77		Undefined
78	Error	Too much data bytes to be sent
79-127		Undefined

11.108 Command #245: Write Diagnostic Configuration (Combination)

Writes the valve diagnostic configuration.

This command allows a Master to write any combination of the valve diagnostic configuration data within the limit that the whole response data does not exceed 110 bytes. Specify the combination in the request flags (bit strings).

See [Section 12.11](#) for details on the request flags.

Request Data Bytes

Byte	Format	Description
0-5	Bits	Flags (Byte 0 to Byte 5)
6-n		Configuration data specified in the flags

Response Data Bytes

Byte	Format	Description
0-5	Bits	Flags
6-n		Configuration data specified in the flags

Command-Specific Response Codes

Code	Class	Description
0	Success	No Command-Specific Errors
1		Undefined
2	Error	Invalid Selection
3	Error	Passed Parameter Too Large
4	Error	Passed Parameter Too Small
5	Error	Too Few Data Bytes Received
6-15		Undefined
16	Error	Access Restricted
17-77		Undefined
78	Error	Too much data bytes to be sent
79-127		Undefined

11.109 Command #246: Read Diagnostic Parameters (Combination)

Reads the valve diagnostic parameters.

This command allows a Master to read any combination of the valve diagnostics parameters within the limit that the whole response data does not exceed 110 bytes. Specify the combination in the request flags (bit strings).

See [Section 12.12](#) for details on the request flags.

Request Data Bytes

Byte	Format	Description
0-5	Bits	Flags (Byte 0 to Byte 5)

Response Data Bytes

Byte	Format	Description
0-5	Bits	Flags
6-n		Parameters specified in the flags

Command-Specific Response Codes

Code	Class	Description
0	Success	No Command-Specific Errors
1		Undefined
2	Error	Invalid Selection
3-4		Undefined
5	Error	Too Few Data Bytes Received
6-77		Undefined
78	Error	Too much data bytes to be sent
79-127		Undefined

11.110 Command #247: Write Diagnostic Parameters (Combination)

Writes the valve diagnostic parameters.

This command allows a Master to write any combination of the valve diagnostics parameters within the limit that the whole response data does not exceed 110 bytes. Specify the combination in the request flags (bit strings).

See [Section 12.12](#) for details on the request flags.

Request Data Bytes

Byte	Format	Description
0-5	Bits	Flags (Byte 0 to Byte 5)
6-n		Parameters specified in the flags

Response Data Bytes

Byte	Format	Description
0-5	Bits	Flags
6-n		Parameters specified in the flags

Command-Specific Response Codes

Code	Class	Description
0	Success	No Command-Specific Errors
1		Undefined
2	Error	Invalid Selection
3-4		Undefined
5	Error	Too Few Data Bytes Received
6-15		Undefined
16	Error	Access Restricted
17-77		Undefined
78	Error	Too much data bytes to be sent
79-127		Undefined

11.111 Command #248: Read Alarm Enable Flags

Reads the diagnostic alarm enable flags.

See [Section 12.13](#) for details on the bit assignment.

Request Data Bytes

Byte	Format	Description
None		

Response Data Bytes

Byte	Format	Description
0-2	Bits	Diagnostic Alarm Enable Flags 0: Disabled 1: Enabled

Command-Specific Response Codes

Code	Class	Description
0	Success	No Command-Specific Errors
1-127		Undefined

11.112 Command #249: Write Alarm Enable Flags

Writes the diagnostic alarm enable flags.

See [Section 12.13](#) for details on the bit assignment.

Request Data Bytes

Byte	Format	Description
0-2	Bits	Diagnostic Alarm Enable Flags 0: Disable 1: Enable

Response Data Bytes

Byte	Format	Description
0-2	Bits	Diagnostic Alarm Enable Flags

Command-Specific Response Codes

Code	Class	Description
0	Success	No Command-Specific Errors
1-4		Undefined
5	Error	Too Few Data Bytes Received
6-15		Undefined
16	Error	Access Restricted
17-127		Undefined

11.113 Command #250-0: Set Valve Closed Position

Sets the current valve position to 0% travel.

This command is used for Manual Setting of 0% travel angle.

Request Data Bytes

Byte	Format	Description
0	Enum	Sub Command Number 0: Set Valve Closed Position

Response Data Bytes

Byte	Format	Description
0	Enum	Sub Command Number

Command-Specific Response Codes

Code	Class	Description
0	Success	No Command-Specific Errors
1-4		Undefined
5	Error	Too Few Data Bytes Received
6-15		Undefined
16	Error	Access Restricted
17-71		Undefined
72	Error	Conditions not met
73		Undefined
74	Error	Angle Out Of Range
75-127		Undefined

11.114 Command #250-1: Set Valve Open Position

Sets the current valve position to 100% travel.

This command is used for Manual Setting of 100% travel angle.

Request Data Bytes

Byte	Format	Description
0	Enum	Sub Command Number 1: Set Valve Open Position

Response Data Bytes

Byte	Format	Description
0	Enum	Sub Command Number

Command-Specific Response Codes

Code	Class	Description
0	Success	No Command-Specific Errors
1-4		Undefined
5	Error	Too Few Data Bytes Received
6-15		Undefined
16	Error	Access Restricted
17-71		Undefined
72	Error	Conditions not met
73		Undefined
74	Error	Angle Out Of Range
75-127		Undefined

11.115 Command #251-0: Calibrate 4mA Input Signal

Calibrates the 4 mA input signal.

This command should be issued while 4 mA is being input by using the appropriate loop current source. Received this command, the device performs calibration so that measured current value matches to 4 mA.

Request Data Bytes

Byte	Format	Description
0	Enum	Sub Command Number 0: Calibrate 4mA Input Signal

Response Data Bytes

Byte	Format	Description
0	Enum	Sub Command Number

Command-Specific Response Codes

Code	Class	Description
0	Success	No Command-Specific Errors
1-4		Undefined
5	Error	Too Few Data Bytes Received
6-8		Undefined
9	Error	Input Current Too High
10	Error	Input Current Too Low
11-15		Undefined
16	Error	Access Restricted
17-127		Undefined

11.116 Command #251-1: Calibrate 20mA Input Signal

Calibrates the 20 mA input signal.

This command should be issued while 20 mA is being input by using the appropriate loop current source. Received this command, the device performs calibration so that measured current value matches to 20 mA.

Request Data Bytes

Byte	Format	Description
0	Enum	Sub Command Number 1: Calibrate 20mA Input Signal

Response Data Bytes

Byte	Format	Description
0	Enum	Sub Command Number

Command-Specific Response Codes

Code	Class	Description
0	Success	No Command-Specific Errors
1-4		Undefined
5	Error	Too Few Data Bytes Received
6-8		Undefined
9	Error	Input Current Too High
10	Error	Input Current Too Low
11-15		Undefined
16	Error	Access Restricted
17-127		Undefined

11.117 Command #252-0: Read Production Number

Reads the production number.

Request Data Bytes

Byte	Format	Description
0	Enum	Sub Command Number 0: Read Production Number

Response Data Bytes

Byte	Format	Description
0	Enum	Sub Command Number
1-14	Latin-1	Production Number

Command-Specific Response Codes

Code	Class	Description
0	Success	No Command-Specific Errors
1-4		Undefined
5	Error	Too Few Data Bytes Received
6-127		Undefined

11.118 Command #252-1: Read Model Number

Reads the model number.

Request Data Bytes

Byte	Format	Description
0	Enum	Sub Command Number 1: Read Model Number

Response Data Bytes

Byte	Format	Description
0	Enum	Sub Command Number
1-32	Latin-1	Model Number

Command-Specific Response Codes

Code	Class	Description
0	Success	No Command-Specific Errors
1-4		Undefined
5	Error	Too Few Data Bytes Received
6-127		Undefined

11.119 Command #252-2: Read Valve Model Number

Reads the valve model number.

If ordered as part of a control valve assembly, the factory writes the valve model number to the device.

If you purchased the device separately, the data is all “?”.

Request Data Bytes

Byte	Format	Description
0	Enum	Sub Command Number 2: Read Valve Model Number

Response Data Bytes

Byte	Format	Description
0	Enum	Sub Command Number
1-32	Latin-1	Valve Model Number

Command-Specific Response Codes

Code	Class	Description
0	Success	No Command-Specific Errors
1-4		Undefined
5	Error	Too Few Data Bytes Received
6-127		Undefined

11.120 Command #252-3: Read Shipping Date

Reads the shipping date (day/month/year).

Request Data Bytes

Byte	Format	Description
0	Enum	Sub Command Number 3: Read Shipping Date

Response Data Bytes

Byte	Format	Description
0	Enum	Sub Command Number
1-3	Date	Shipping Date

Command-Specific Response Codes

Code	Class	Description
0	Success	No Command-Specific Errors
1-4		Undefined
5	Error	Too Few Data Bytes Received
6-127		Undefined

11.121 Command #253: Restore Factory Settings

Restores the device settings to the factory defaults.

The actual restoring action is performed after a response is returned. At first the device is reset and started by the software. Then, the system initialization procedure including the restoring action is performed.

Request Data Bytes

Byte	Format	Description
0	Enum	Dummy Data for security 0: Dummy Data

Response Data Bytes

Byte	Format	Description
0	Enum	Dummy Data Same value as that in the requested data actually received.

Command-Specific Response Codes

Code	Class	Description
0	Success	No Command-Specific Errors
1		Undefined
2	Error	Invalid Selection
3-4		Undefined
5	Error	Too Few Data Bytes Received
6-15		Undefined
16	Error	Access Restricted
17-71		Undefined
72	Error	Conditions not met
73-127		Undefined

12. TABLES

12.1 Operator Codes

0	No Operator
1	LUI
2	Primary Master
3	Secondary Master

12.2 Status Codes for Positioner Diagnostics Status Record

Status Occurrence

Status Code	Status Signal (See Section 12.4)	Status Name	Related Parameter	
			Description	Format
0x01	F	Valve Travel Detector Failure		
0x02	F	Valve Travel Detector Out of Range	VTD Angle	Float
0x03	F	CPU Failure		
0x04	F	RAM Failure		
0x05	F	ROM Failure		
0x06	F	A/D Conversion Module 1 Failure		
0x07	F	A/D Conversion Module 2 Failure		
0x08	F	Non-Volatile Memory Failure		
0x09	F	Po 1 Pressure Sensor Failure		
0x0A	F	Po 2 Pressure Sensor Failure		
0x0B	F	Ps Pressure Sensor Failure		
0x0C	F	Pn Pressure Sensor Failure		
0x0D	F	Input Circuit Failure		
0x0E	F	Temperature Sensor Failure		
0x0F	F	Internal Program Execution Error		
0x10		Undefined		
0x11		Undefined		
0x12	S	VTD Angle Span Out of Range		
0x13	S	Input Signal Low	Input Current (mA)	Float
0x14	S	Insufficient Input Signal Range		
0x15	S	Temperature Out of Range	Temperature	Float
0x16	S	Supply Pressure Out of Range	Ps	Float
0x17		Undefined		
0x18	S	Incorrect Setting of Input Range High/Low		

0x19	M	Restriction is clogged	Drive Signal Max Shift Plus	Float
0x1A	M	Deposits on the Nozzle-Flapper	Drive Signal Max Shift Minus	Float

Status Termination

Status Code	Status Signal (See Section 12.4)	Status Name	Related Parameter	
			Description	Format
0x81	F	Valve Travel Detector Failure		
0x82	F	Valve Travel Detector Out of Range	VTD Angle	Float
0x83	F	CPU Failure		
0x84	F	RAM Failure		
0x85	F	ROM Failure		
0x86	F	A/D Conversion Module 1 Failure		
0x87	F	A/D Conversion Module 2 Failure		
0x88	F	Non-Volatile Memory Failure		
0x89	F	Po 1 Pressure Sensor Failure		
0x8A	F	Po 2 Pressure Sensor Failure		
0x8B	F	Ps Pressure Sensor Failure		
0x8C	F	Pn Pressure Sensor Failure		
0x8D	F	Input Circuit Failure		
0x8E	F	Temperature Sensor Failure		
0x8F	F	Internal Program Execution Error		
0x90		Undefined		
0x91		Undefined		
0x92	S	VTD Angle Span Out of Range		
0x93	S	Input Signal Low	Input Current (mA)	Float
0x94	S	Insufficient Input Signal Range		
0x95	S	Temperature Out of Range	Temperature	Float
0x96	S	Supply Pressure Out of Range	Ps	Float
0x97		Undefined		
0x98	S	Incorrect Setting of Input Range High/Low		
0x99	M	Restriction is clogged	Drive Signal Max Shift Plus	Float
0x9A	M	Deposits on the Nozzle-Flapper	Drive Signal Max Shift Minus	Float

12.3 Status Codes for Valve Diagnostics Status Record

Status Occurrence

Status Code	Status Signal (See Section 12.4)	Status Name	Related Parameter 1		Related Parameter 2	
			Description	Format	Description	Format
0x01	S	Supply Pressure High Alarm	Ps	Float		
0x02	S	Supply Pressure Low Alarm	Ps	Float		
0x03	S	Temperature High Alarm	Temperature	Float		
0x04	S	Temperature Low Alarm	Temperature	Float		
0x05	M	Deviation Plus Alarm	Set Point	Float	Travel	Float
0x06	M	Deviation Minus Alarm	Set Point	Float	Travel	Float
0x07	M	Zero Travel Plus Alarm	Travel	Float		
0x08	M	Zero Travel Minus Alarm	Travel	Float		
0x09	M	Total Stroke Alarm	Total Stroke	Float		
0x0A	M	Cycle Count Alarm	Cycle Count	Unsigned-32		
0x0B	M	Shut Count Alarm	Shut Count	Unsigned-32		
0x0C	M	Max Travel Speed Plus Alarm	Max Travel Speed Plus	Float		
0x0D	M	Max Travel Speed Minus Alarm	Max Travel Speed Minus	Float		
0x0E	M	Output Pressure Validity Plus Alarm	Output Pressure Validity Plus	Float		
0x0F	M	Output Pressure Validity Minus Alarm	Output Pressure Validity Minus	Float		
0x10	M	Max Friction Alarm	Max Friction	Float		
0x11	M	Stick-Slip High Alarm	Stick-Slip X	Float	Stick-Slip Y	Float
0x12	M	Stick-Slip Medium Alarm	Stick-Slip X	Float	Stick Slip Y	Float
0x13	M	Stick-Slip Low Alarm	Stick-Slip X	Float	Stick-Slip Y	Float

Status Termination

Status Code	Status Signal (See Section 12.4)	Status Name	Related Parameter 1		Related Parameter 2	
			Description	Format	Description	Format
0x81	S	Supply Pressure High Alarm	Ps	Float		
0x82	S	Supply Pressure Low Alarm	Ps	Float		
0x83	S	Temperature High Alarm	Temperature	Float		
0x84	S	Temperature Low Alarm	Temperature	Float		

0x85	M	Deviation Plus Alarm	Set Point	Float	Travel	Float
0x86	M	Deviation Minus Alarm	Set Point	Float	Travel	Float
0x87	M	Zero Travel Plus Alarm	Travel	Float		
0x88	M	Zero Travel Minus Alarm	Travel	Float		
0x89	M	Total Stroke Alarm	Total Stroke	Float		
0x8A	M	Cycle Count Alarm	Cycle Count	Unsigned-32		
0x8B	M	Shut Count Alarm	Shut Count	Unsigned-32		
0x8C	M	Max Travel Speed Plus Alarm	Max Travel Speed Plus	Float		
0x8D	M	Max Travel Speed Minus Alarm	Max Travel Speed Minus	Float		
0x8E	M	Output Pressure Validity Plus Alarm	Output Pressure Validity Plus	Float		
0x8F	M	Output Pressure Validity Minus Alarm	Output Pressure Validity Minus	Float		
0x90	M	Max Friction Alarm	Max Friction	Float		
0x91	M	Stick-Slip High Alarm	Stick-Slip X	Float	Stick-Slip Y	Float
0x92	M	Stick-Slip Medium Alarm	Stick-Slip X	Float	Stick Slip Y	Float
0x93	M	Stick-Slip Low Alarm	Stick-Slip X	Float	Stick-Slip Y	Float

12.4 Status Signal Codes

Indicates the diagnostic status category

1	F: Failure
2	C: Function Check
3	S: Out of Specification
4	M: Maintenance Required
5	I: Information

12.5 Operator Action Record Index

Operator Action Type: Method

Index	Description
0x01	Execute Auto Setup
0x02	Abort Auto Setup
0x03	Execute Auto Travel Calibration
0x04	Abort Auto Travel Calibration
0x05	Angle Correction (Travel Angle 0%)
0x06	Angle Correction (Travel Angle 100%)

0x07	Manual Setting (Travel Angle 0%)
0x08	Manual Setting (Travel Angle 100%)
0x09	Undefined
0x0A	Undefined
0x0B	Undefined
0x0C	Undefined
0x0D	Undefined
0x0E	Change Travel Angle (Travel Angle 0%)
0x0F	Change Travel Angle (Travel Angle 100%)
0x10	Calibrate 4mA Input Signal
0x11	Calibrate 20mA Input Signal
0x12	Pressure Sensors Zero Adjustment
0x13	Calibrate 4mA Travel Transmission
0x14	Calibrate 20mA Travel Transmission
0x15	Change password use setting
0x16	Change Password
0x17	Set Real Time Clock
0x18	EPM Adjustment
0x19	Restore factory settings
0x1A	Pilot Adjustment

Operator Action Type: Parameter Change (Write)

Index	Description
0x81	Write Primary Variable Range Values (Input Range High/Low)
0x82	Write Actuator Type
0x83	Write Valve Closed Position
0x84	Write Booster Relay
0x85	Write Actuator Size
0x86	Write Friction Level
0x87	Write PID Outside of GAP1
0x88	Write PID Inside of GAP1
0x89	Write PID Inside of GAP2
0x8A	Write Input Characterization
0x8B	Write Custom Curve Data IN
0x8C	Write Custom Curve Data OUT

0x8D	Write Travel Cutoff
0x8E	Write Tag, Descriptor, Date
0x8F	Write Long Tag
0x90	Write Polling Address
0x91	Write Number of Response Preambles
0x92	Write Feedback Lever Motion
0x93	Undefined
0x94	Write Control Deadband

12.6 Sub Command Table for Command #220

Shows the diagnostic configuration parameters and the response codes for each transaction (sub command).

Byte indicates the relative byte position in the configuration data (when the beginning is “0”). Note that this is not the position of the response data in the command.

Sub Command Number	Configuration Parameters			Response Codes
	Byte	Format	Description	
0	0-3	Float	Total Stroke Threshold	0, 5
	4-7	Float	Total Stroke Dead Band	
	8	Enum	Total Stroke Alarm Enabled	
1	0-3	Float	Cycle Count Dead Band High	0, 5
	4-7	Float	Cycle Count Dead Band Low	
	8-11	Unsigned-32	Cycle Count Threshold	
	12	Enum	Cycle Count Alarm Enabled	
2	0-3	Unsigned-32	Shut Count Threshold	0, 5
	4	Enum	Shut Count Alarm Enabled	
3	0-3	Float	Max Travel Speed Threshold Plus	0, 5
	4-7	Float	Max Travel Speed Threshold Minus	
	8	Enum	Max Travel Speed Alarm Enabled	
4	0-3	Float	Output Pressure Validity Threshold Plus	0, 2, 5
	4-7	Float	Output Pressure Validity Threshold Minus	
	8-11	Float	Output Pressure-Travel Standard Gain	
	12-15	Float	Output Pressure-Travel Standard Intercept	
	16	Enum	Output Pressure Validity Alarm Enabled	

5	0-3	Float	Max Friction Threshold	0, 2, 5
	4	Enum	Max Friction Alarm Enabled	
6	0-3	Float	Po Stable Threshold	0, 5
	4-7	Float	Travel Stable Threshold	
	8-11	Float	Travel Upper Limit	
	12-15	Float	Travel Lower Limit	
7	0-3	Float	Temperature Threshold High	0, 2, 5
	4-7	Float	Temperature Threshold Low	
	8	Enum	Temperature Alarm Enabled	
8	0-3	Float	Supply Pressure Threshold High	0, 2, 5
	4-7	Float	Supply Pressure Threshold Low	
	8-11	Float	Supply Pressure Travel Stable Threshold	
	12-15	Float	Supply Pressure Travel Stable Time	
	16	Enum	Supply Pressure Alarm Enabled	
9	0-3	Float	Drive Signal Shift Threshold Plus	0, 5
	4-7	Float	Drive Signal Shift Threshold Minus	
	8-11	Float	Drive Signal Stable Threshold	
	12-15	Float	Pn Stable Threshold	
	16	Enum	Positioner Air Circuit Alarm Enabled	
10	0-3	Float	Stick-Slip Cycle Time	0, 5
	4-7	Float	Stick-Slip Threshold Low	
	8-11	Float	Stick-Slip Threshold Medium	
	12-15	Float	Stick-Slip Threshold High	
	16	Enum	Stick-Slip Alarm Enabled	
11	0-3	Float	Deviation Threshold Plus	0, 5
	4-7	Float	Deviation Threshold Minus	
	8-11	Float	Deviation Time Threshold	
	12	Enum	Deviation Alarm Enabled	
12	0-3	Float	Zero Travel Threshold Plus	0, 5
	4-7	Float	Zero Travel Threshold Minus	
	8-11	Float	Zero Travel Static Time Threshold	
	12-15	Float	Zero Travel Wait Time Threshold	
	16-19	Float	Zero Travel Time Threshold	
	20-23	Float	Zero Travel Stable Threshold	
	24	Enum	Zero Travel Alarm Enabled	

13	0-99	Float	Travel Segment Divider 1-25	0, 5
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12.7 Sub Command Table for Command #221

Shows the diagnostic configuration parameters and the response codes for each transaction (sub command).

Byte indicates the relative byte position in the configuration data (when the beginning is “0”). Note that this is not the position of the request/response data in the command.

Sub Command Number	Configuration Parameters			Response Codes
	Byte	Format	Description	
0	0-3	Float	Total Stroke Threshold	0, 2, 3, 4, 5, 16
	4-7	Float	Total Stroke Dead Band	
	8	Enum	Total Stroke Alarm Enabled	
1	0-3	Float	Cycle Count Dead Band High	0, 2, 3, 4, 5, 16
	4-7	Float	Cycle Count Dead Band Low	
	8-11	Unsigned-32	Cycle Count Threshold	
	12	Enum	Cycle Count Alarm Enabled	
2	0-3	Unsigned-32	Shut Count Threshold	0, 2, 3, 5, 16
	4	Enum	Shut Count Alarm Enabled	
3	0-3	Float	Max Travel Speed Threshold Plus	0, 2, 3, 4, 5, 16
	4-7	Float	Max Travel Speed Threshold Minus	
	8	Enum	Max Travel Speed Alarm Enabled	
4	0-3	Float	Output Pressure Validity Threshold Plus	0, 2, 3, 4, 5, 16
	4-7	Float	Output Pressure Validity Threshold Minus	
	8-11	Float	Output Pressure-Travel Standard Gain	
	12-15	Float	Output Pressure-Travel Standard Intercept	
	16	Enum	Output Pressure Validity Alarm Enabled	
5	0-3	Float	Max Friction Threshold	0, 2, 3, 4, 5, 16
	4	Enum	Max Friction Alarm Enabled	
6	0-3	Float	Po Stable Threshold	0, 2, 3, 4, 5, 16
	4-7	Float	Travel Stable Threshold	
	8-11	Float	Travel Upper Limit	
	12-15	Float	Travel Lower Limit	
7	0-3	Float	Temperature Threshold High	0, 2, 3, 4, 5,

	4-7	Float	Temperature Threshold Low	16
	8	Enum	Temperature Alarm Enabled	
8	0-3	Float	Supply Pressure Threshold High	0, 2, 3, 4, 5, 16
	4-7	Float	Supply Pressure Threshold Low	
	8-11	Float	Supply Pressure Travel Stable Threshold	
	12-15	Float	Supply Pressure Travel Stable Time	
	16	Enum	Supply Pressure Alarm Enabled	
9	0-3	Float	Drive Signal Shift Threshold Plus	0, 2, 3, 4, 5, 16
	4-7	Float	Drive Signal Shift Threshold Minus	
	8-11	Float	Drive Signal Stable Threshold	
	12-15	Float	Pn Stable Threshold	
	16	Enum	Positioner Air Circuit Alarm Enabled	
10	0-3	Float	Stick-Slip Cycle Time	0, 2, 3, 4, 5, 16
	4-7	Float	Stick-Slip Threshold Low	
	8-11	Float	Stick-Slip Threshold Medium	
	12-15	Float	Stick-Slip Threshold High	
	16	Enum	Stick-Slip Alarm Enabled	
11	0-3	Float	Deviation Threshold Plus	0, 2, 3, 4, 5, 16
	4-7	Float	Deviation Threshold Minus	
	8-11	Float	Deviation Time Threshold	
	12	Enum	Deviation Alarm Enabled	
12	0-3	Float	Zero Travel Threshold Plus	0, 2, 3, 4, 5, 16
	4-7	Float	Zero Travel Threshold Minus	
	8-11	Float	Zero Travel Static Time Threshold	
	12-15	Float	Zero Travel Wait Time Threshold	
	16-19	Float	Zero Travel Time Threshold	
	20-23	Float	Zero Travel Stable Threshold	
	24	Enum	Zero Travel Alarm Enabled	

12.8 Sub Command Table for Command #222

Shows the diagnostic output parameters and the response codes for each transaction (sub command).

Byte indicates the relative byte position in the output parameter data (when the beginning is “0”). Note that this is not the position of the response data in the command.

Sub Command Number	Output Parameters			Response Codes
	Byte	Format	Description	
0			Not implemented	
1	0-103	Array of Unsigned-32	Travel Histogram Count 1-26	0, 5
2	0-103	Array of Float	Travel Histogram Percent 1-26	0, 5
3			Not implemented	0, 5
4	0-3	Float	Total Stroke	0, 5
5	0-3	Unsigned-32	Cycle Count	0, 5
6	0-3	Unsigned-32	Shut Count	0, 5
7	0-3	Float	Max Travel Speed Plus	0, 5
	4-7	Float	Max Travel Speed Minus	
8			Not implemented	
9	0-103	Array of Float	Max Output Pressure of Segment 1-26	0, 2, 5
10	0-103	Array of Float	Min Output Pressure of Segment 1-26	0, 2, 5
11			Not implemented	
12	0-103	Array of Float	Unbalance Force of Segment 1-26	0, 2, 5
13			Not implemented	
14	0-3	Float	Output Pressure Validity Plus	0, 2, 5
	4-7	Float	Output Pressure Validity Minus	
15			Not implemented	
16	0-103	Array of Float	Friction of Segment 1-26	0, 2, 5
17			Not implemented	
18	0-3	Float	Max Friction	0, 2, 5
19			Not implemented	

20	0-3	Float	Temperature Max	0, 2, 5												
	4-7	Float	Temperature Min													
21	Not implemented															
22	0-1	Unsigned-16	Temperature High Alarm Count	0, 5												
	2-3	Unsigned-16	Temperature Low Alarm Count													
23	0-3	Float	Supply Pressure Max	0, 2, 5												
	4-7	Float	Supply Pressure Min													
24	Not implemented															
25	0-1	Unsigned-16	Supply Pressure High Alarm Count	0, 5												
	2-3	Unsigned-16	Supply Pressure Low Alarm Count													
26	0-3	Float	Drive Signal Max Shift Plus	0, 5												
	4-7	Float	Drive Signal Max Shift Minus													
27	Not implemented															
28	0-1	Unsigned-16	Drive Signal Plus Alarm Count	0, 5												
	2-3	Unsigned-16	Drive Signal Minus Alarm Count													
29	0-3	Float	Stick-Slip X	0, 5												
	4-7	Float	Stick-Slip Y													
	8	Unsigned-8	Stick-Slip Validity													
	9-12	Unsigned-32	Stick-Slip Updated Operating Time													
	13-15	Date	Stick-Slip Updated Date													
	16-19	Time	Stick-Slip Updated Time													
30	0-79	Array of Structure	<p>Time-series Stick-Slip Data [0]-[4] (5 structures) The device stores up to 25 Stick-Slip data. The data is an array of structures. It is arranged in order from newest to oldest. (Data [0] is newest)</p> <p>Structure Definition</p> <table border="1"> <thead> <tr> <th>Format</th> <th>Description</th> </tr> </thead> <tbody> <tr> <td>Float</td> <td>Stick-Slip X</td> </tr> <tr> <td>Float</td> <td>Stick-Slip Y</td> </tr> <tr> <td>Unsigned-8</td> <td>Stick-Slip Validity</td> </tr> <tr> <td>Date</td> <td>Stick-Slip Updated Date</td> </tr> <tr> <td>Time</td> <td>Stick-Slip Updated Time</td> </tr> </tbody> </table> <p>One structure data size: 16 bytes</p>	Format	Description	Float	Stick-Slip X	Float	Stick-Slip Y	Unsigned-8	Stick-Slip Validity	Date	Stick-Slip Updated Date	Time	Stick-Slip Updated Time	0, 5
Format	Description															
Float	Stick-Slip X															
Float	Stick-Slip Y															
Unsigned-8	Stick-Slip Validity															
Date	Stick-Slip Updated Date															
Time	Stick-Slip Updated Time															
31	0-79	Array of Structure	Time-series Stick-Slip Data [5]-[9] (5 structures)	0, 5												

32	0-79	Array of Structure	Time-series Stick-Slip Data [10]-[14] (5 structures)	0, 5
33	0-79	Array of Structure	Time-series Stick-Slip Data [15]-[19] (5 structures)	0, 5
34	0-79	Array of Structure	Time-series Stick-Slip Data [20]-[24] (5 structures)	0, 5
35	Not implemented			
36	0-1	Unsigned-16	Stick-Slip Low Alarm Count	0, 5
	2-3	Unsigned-16	Stick-Slip Medium Alarm Count	
	4-5	Unsigned-16	Stick-Slip High Alarm Count	
37	0-3	Float	Deviation Time Max Plus	0, 5
	4-7	Float	Deviation Time Max Minus	
38	Not implemented			
39	0-1	Unsigned-16	Deviation Plus Alarm Count	0, 5
	2-3	Unsigned-16	Deviation Minus Alarm Count	
40	0-3	Float	Zero Travel Max	0, 5
	4-7	Float	Zero Travel Min	
41	Not implemented			
42	0-1	Unsigned-16	Zero Travel Plus Alarm Count	0, 5
	2-3	Unsigned-16	Zero Travel Minus Alarm Count	

12.9 Sub Command Table for Command #223

Shows the diagnostic output parameters and the response codes for each transaction (sub command).

Byte indicates the relative byte position in the output parameter data (when the beginning is "0"). Note that this is not the position of the request/response data in the command.

Sub Command Number	Output Parameters			Response Codes
	Byte	Format	Description	
0			Not implemented	
1	0-103	Array of Unsigned-32	Travel Histogram Count 1-26	0, 5, 16
2			Not implemented	
3	None		Reset Travel Histogram Count 1-26 (Don't need request data.)	0, 5, 16
4	0-3	Float	Total Stroke	0, 4, 5, 16
5	0-3	Unsigned-32	Cycle Count	0, 5, 16
6	0-3	Unsigned-32	Shut Count	0, 5, 16
7			Not implemented	
8	None		Write Zeros to Max Travel Speed Pus and Minus (Don't need request data.)	0, 5, 16
9			Not implemented	
10			Not implemented	
11	None		Reset Max and Min Output Pressure of Segment 1-26 (Don't need request data.) Reset Unbalance Force of Segment 1-26 (Don't need request data.) Reset Output Pressure Validity Plus and Minus (Don't need request data.) Reset Friction of Segment 1-26 (Don't need request data.) Write Zero to Max Friction (Don't need request data.)	0, 5, 16
12			Not implemented	
13			Not implemented	
14			Not implemented	

15			Not implemented	
16			Not implemented	
17			Not implemented	
18			Not implemented	
19			Not implemented	
20			Not implemented	
21	None		Reset Max and Min Temperature (Don't need request data.)	0, 5, 16
22	0-1	Unsigned-16	Temperature High Alarm Count	0, 5, 16
	2-3	Unsigned-16	Temperature Low Alarm Count	
23			Not implemented	
24	None		Reset Supply Pressure Max and Min (Don't need request data.)	0, 5, 16
25	0-1	Unsigned-16	Supply Pressure High Alarm Count	0, 5, 16
	2-3	Unsigned-16	Supply Pressure Low Alarm Count	
26			Not implemented	
27	None		Reset Drive Signal Max Shift Plus and Minus (Don't need request data.)	0, 5, 16
28	0-1	Unsigned-16	Drive Signal Plus Alarm Count	0, 5, 16
	2-3	Unsigned-16	Drive Signal Minus Alarm Count	
29			Not implemented	
30			Not implemented	
31			Not implemented	
32			Not implemented	
33			Not implemented	
34			Not implemented	
35			Not implemented	
36	0-1	Unsigned-16	Stick-Slip Low Alarm Count	0, 5, 16
	2-3	Unsigned-16	Stick-Slip Medium Alarm Count	
	4-5	Unsigned-16	Stick-Slip High Alarm Count	
37			Not implemented	
38	None		Reset Deviation Time Max Plus and Minus (Don't need request data.)	0, 5, 16
39	0-1	Unsigned-16	Deviation Plus Alarm Count	0, 5, 16

	2-3	Unsigned-16	Deviation Minus Alarm Count	
40			Not implemented	
41	None		Reset Zero Travel Max and Min (Don't need request data.)	0, 5, 16
42	0-1	Unsigned-16	Zero Travel Plus Alarm Count	0, 5, 16
	2-3	Unsigned-16	Zero Travel Minus Alarm Count	

12.10 Collection Data Pattern Numbers for Test

Shows a combination of device variables (structure) to be saved during the test.

1	{Travel}
2	{Travel, Po1}
3	{Travel, Po1, Pn}
4	{Travel, Po1, Ps}
5	{Travel, Po1, Pn, Ps}
6	{Travel, Po1, Po2}
7	{Travel, Po1, Po2, Pn}
8	{Travel, Po1, Po2, Ps}
9	{Travel, Po1, Po2, Pn, Ps}
10	{Travel, Drive Signal}
11	{Travel, Po1, Drive Signal}
12	{Travel, Po1, Pn, Drive Signal}
13	{Travel, Po1, Drive Signal, Ps}
14	{Travel, Po1, Pn, Drive Signal, Ps}
15	{Travel, Po1, Po2, Drive Signal}
16	{Travel, Po1, Po2, Pn, Drive Signal}
17	{Travel, Po1, Po2, Drive Signal, Ps}
18	{Travel, Po1, Po2, Pn, Drive Signal, Ps}

12.11 Diagnostic Configuration Combination Flags

Byte 5

Code	Description	Format	Byte Size
0x01	Total Stroke Threshold	Float	4
0x02	Total Stroke Dead Band	Float	4
0x04	Cycle Count Threshold	Unsigned-32	4
0x08	Cycle Count Dead Band High	Float	4
0x10	Cycle Count Dead Band Low	Float	4
0x20	Shut Count Threshold	Unsigned-32	4
0x40	Max Travel Speed Threshold Plus	Float	4
0x80	Max Travel Speed Threshold Minus	Float	4

Byte 4

Code	Description	Format	Byte Size
0x01	Output Pressure Validity Threshold Plus	Float	4
0x02	Output Pressure Validity Threshold Minus	Float	4
0x04	Output Pressure Stable Threshold	Float	4
0x08	Travel Stable Threshold	Float	4
0x10	Travel Upper Limit	Float	4
0x20	Travel Lower Limit	Float	4
0x40	Output Pressure-Travel Standard Gain	Float	4
0x80	Output Pressure-Travel Standard Intercept	Float	4

Byte 3

Code	Description	Format	Byte Size
0x01	Max Friction Threshold	Float	4
0x02	Output Pressure Stable Threshold	Float	4
0x04	Travel Stable Threshold	Float	4
0x08	Travel Upper Limit	Float	4
0x10	Travel Lower Limit	Float	4
0x20	Temperature Threshold High	Float	4
0x40	Temperature Threshold Low	Float	4
0x80	Supply Pressure Threshold High	Float	4

Byte 2

Code	Description	Format	Byte Size
0x01	Supply Pressure Threshold Low	Float	4
0x02	Supply Pressure Travel Stable Threshold	Float	4
0x04	Supply Pressure Travel Stable Time	Float	4
0x08	Drive Signal Shift Threshold Plus	Float	4
0x10	Drive Signal Shift Threshold Minus	Float	4
0x20	Drive Signal-Pn Gain	Float	4
0x40	Drive Signal-Pn Intercept	Float	4
0x80	Pn Stable Threshold	Float	4

Byte 1

Code	Description	Format	Byte Size
0x01	Drive Signal Stable Threshold	Float	4
0x02	Stick-Slip Threshold Low	Float	4
0x04	Stick-Slip Threshold Medium	Float	4
0x08	Stick-Slip Threshold High	Float	4
0x10	Stick-Slip Cycle Time	Float	4
0x20	Deviation Threshold Plus	Float	4
0x40	Deviation Threshold Minus	Float	4
0x80	Deviation Time Threshold	Float	4

Byte 0

Code	Description	Format	Byte Size
0x01	Zero Travel Threshold Plus	Float	4
0x02	Zero Travel Threshold Minus	Float	4
0x04	Zero Travel Time Threshold	Float	4
0x08	Zero Travel Stable Threshold	Float	4
0x10	Zero Travel Static Time Threshold	Float	4
0x20	Zero Travel Wait Time Threshold	Float	4
0x40	Undefined		
0x80	Undefined		

12.12 Diagnostic Parameter Combination Flags

Byte 5

Code	Description	Format	Byte Size
0x01	Travel Histogram Count 1-26	Array of Unsigned-32	104
0x02	Total Stroke	Float	4
0x04	Cycle Count	Unsigned-32	4
0x08	Shut Count	Unsigned-32	4
0x10	Max Travel Speed Plus	Float	4
0x20	Max Travel Speed Minus	Float	4
0x40	Output Pressure Validity Plus	Float	4
0x80	Output Pressure Validity Minus	Float	4

Byte 4

Code	Description	Format	Byte Size
0x01	Max Output Pressure of Segment 1-26	Array of Float	104
0x02	Min Output Pressure of Segment 1-26	Array of Float	104
0x04	Unbalance Force of Segment 1-26	Array of Float	104
0x08	Max Friction	Float	4
0x10	Max Output Pressure of Segment 1-26	Array of Float	104
0x20	Min Output Pressure of Segment 1-26	Array of Float	104
0x40	Friction of Segment 1-26	Array of Float	104
0x80	Temperature Max	Float	4

Byte 3

Code	Description	Format	Byte Size
0x01	Temperature Min	Float	4
0x02	Temperature High Alarm Count	Unsigned-16	2
0x04	Temperature Low Alarm Count	Unsigned-16	2
0x08	Supply Pressure Max	Float	4
0x10	Supply Pressure Min	Float	4
0x20	Supply Pressure High Alarm Count	Unsigned-16	2
0x40	Supply Pressure Low Alarm Count	Unsigned-16	2
0x80	Drive Signal Max Shift Plus	Float	4

Byte 2

Code	Description	Format	Byte Size
0x01	Drive Signal Max Shift Minus	Float	4
0x02	Drive Signal Plus Alarm Count	Unsigned-16	2
0x04	Drive Signal Minus Alarm Count	Unsigned-16	2
0x08	Undefined		
0x10	Most recent Stick-Slip X Read Only	Float	4
0x20	Most recent Stick-Slip Y Read Only	Float	4
0x40	Most recent Stick-Slip Validity Read Only	Unsigned-8	1
0x80	Most recent Stick-Slip Updated Operating Time Read Only	Unsigned-32	4

Byte 1

Code	Description	Format	Byte Size
0x01	Stick-Slip Low Alarm Count	Unsigned-16	2
0x02	Stick-Slip Medium Alarm Count	Unsigned-16	2
0x04	Stick-Slip High Alarm Count	Unsigned-16	2
0x08	Deviation Time Max Plus	Float	4
0x10	Deviation Time Max Minus	Float	4
0x20	Deviation Plus Alarm Count	Unsigned-16	2
0x40	Deviation Minus Alarm Count	Unsigned-16	2
0x80	Zero Travel Max	Float	4

Byte 0

Code	Description	Format	Byte Size
0x01	Zero Travel Min	Float	4
0x02	Zero Travel Plus Alarm Count	Unsigned-16	2
0x04	Zero Travel Minus Alarm Count	Unsigned-16	2
0x08	Undefined		
0x10	Undefined		
0x20	Undefined		
0x40	Undefined		
0x80	Undefined		

12.13 Alarm Enable Flags

Byte 2

Code	Description
0x01	Total Stroke Alarm Enabled
0x02	Cycle Count Alarm Enabled
0x04	Shut Count Alarm Enabled
0x08	Max Travel Speed Alarm Enabled
0x10	Output Pressure Validity Alarm Enabled
0x20	Max Friction Alarm Enabled
0x40	Temperature Alarm Enabled
0x80	Supply Pressure Alarm Enabled

Byte 1

Code	Description
0x01	Positioner Air Circuit Alarm Enabled
0x02	Stick-Slip Alarm Enabled
0x04	Deviation Alarm Enabled
0x08	Zero Travel Alarm Enabled
0x10	Undefined
0x20	Undefined
0x40	Undefined
0x80	Undefined

Byte 0

Code	Description
0x01	Undefined
0x02	Undefined
0x04	Undefined
0x08	Undefined
0x10	Undefined
0x20	Undefined
0x40	Undefined
0x80	Undefined

12.14 Pressure Unit Codes

(A subset of HART Common Table 2, Unit Codes)

6	psi
7	bar
10	kgf/cm2
12	kPa
237	MPa

12.15 Temperature Unit Codes

(A subset of HART Common Table 2, Unit Codes)

32	degrees C
33	degrees F

13. PERFORMANCE

13.1 Power-Up

On power up, the device goes through a system initialization procedure, which takes approximately 2 seconds. During this period, the device will not respond to HART commands, and the drive signal is set at 0%.

All simulation modes are cancelled by power loss.

13.2 Reset

Command #42 (“Device Reset”) causes the device to reset its microprocessor. The resulting restart is identical to the normal power up sequence. (See [Section 13.1.](#))

Command #253 (“Restore Factory Settings”) causes the device to reset its microprocessor. See Command #253 for details.

13.3 Self-Diagnostics

Continuous self-diagnostics is part of the normal device operation. Self-diagnostics is performed while the measurement control function is running. A function (command) to perform only self-diagnostics while the measurement control function is off is not implemented.

13.4 Command Response Times

Minimum	10ms
Typical	150ms
Maximum	200ms

13.5 Busy and Delayed-Response

The device does not respond with “busy” status.

Delayed-response is not used.

13.6 Long Messages

The largest data field used is in the response to Command 240-0: 110 bytes including the two status bytes.

13.7 Non-Volatile Memory

EEPROM is used to hold the device's configuration and calibration parameters. New data is written to this memory within 120 seconds after executing the write command.

13.8 Modes

The following 4 simulation modes are available. These modes are all ended by a power loss, reset, or timeout.

Dummy Input Signal

Dummy Drive Signal

Dummy Travel Transmission

Furthermore, the device includes the following application functions using a dummy input signal and dummy drive signal.

Auto Setup

Auto Travel Calibration

Step Response Test

Valve Signature

Partial Stroke Test

Full Stroke Test

13.9 Write Protection

Write-protection is not provided.

13.10 Operation Authority

An operation authority system is implemented to prevent multiple operators (primary master, secondary master, or LUI) from changing parameters or operating devices at the same time.

When one operator has operation authority, requests to change parameters and operate devices from other operators are rejected. (“Read” commands are allowed.)

If the password function is enabled, the operator is able to obtain operation authority only by sending the correct password using command #163-0. If the password function is disabled, operation authority can be automatically obtained by sending commands to change parameters or operate devices without using command #163-0. In either case, the precondition is that there is no user for the operation authority.

When operation authority is obtained and 10 minutes pass after the request for operation authority was last issued, operation authority is automatically released and there is no user with operation authority.

Terms and Conditions

We would like to express our appreciation for your purchase and use of Azbil Corporation's products. You are required to acknowledge and agree upon the following terms and conditions for your purchase of Azbil Corporation's products (system products, field instruments, control valves, and control products), unless otherwise stated in any separate document, including, without limitation, estimation sheets, written agreements, catalogs, specifications and instruction manuals.

1. Warranty period and warranty scope

1.1 Warranty period

Azbil Corporation's products shall be warranted for one (1) year from the date of your purchase of the said products or the delivery of the said products to a place designated by you.

1.2 Warranty scope

In the event that Azbil Corporation's product has any failure attributable to azbil during the aforementioned warranty period, Azbil Corporation shall, without charge, deliver a replacement for the said product to the place where you purchased, or repair the said product and deliver it to the aforementioned place. Notwithstanding the foregoing, any failure falling under one of the following shall not be covered under this warranty:

- (1) Failure caused by your improper use of azbil product (noncompliance with conditions, environment of use, precautions, etc. set forth in catalogs, specifications, instruction manuals, etc.);
- (2) Failure caused for other reasons than Azbil Corporation's product;
- (3) Failure caused by any modification or repair made by any person other than Azbil Corporation or Azbil Corporation's subcontractors;
- (4) Failure caused by your use of Azbil Corporation's product in a manner not conforming to the intended usage of that product;
- (5) Failure that the state-of-the-art at the time of Azbil Corporation's shipment did not allow Azbil Corporation to predict; or
- (6) Failure that arose from any reason not attributable to Azbil Corporation, including, without limitation, acts of God, disasters, and actions taken by a third party.

Please note that the term "warranty" as used herein refers to equipment-only-warranty, and Azbil Corporation shall not be liable for any damages, including direct, indirect, special, incidental or consequential damages in connection with or arising out of Azbil Corporation's products.

2. Ascertainment of suitability

You are required to ascertain the suitability of Azbil Corporation's product in case of your use of the same with your machinery, equipment, etc. (hereinafter referred to as "Equipment") on your own responsibility, taking the following matters into consideration:

- (1) Regulations and standards or laws that your Equipment is to comply with.
- (2) Examples of application described in any documents provided by Azbil Corporation are for your reference purpose only, and you are required to check the functions and safety of your Equipment prior to your use.
- (3) Measures to be taken to secure the required level of the reliability and safety of your Equipment in your use
Although azbil is constantly making efforts to improve the quality and reliability of Azbil Corporation's products, there exists a possibility that parts and machinery may break down. You are required to provide your Equipment with safety design such as fool-proof design, *1 and fail-safe design*2 (anti-flame propagation design, etc.), whereby preventing any occurrence of physical injuries, fires, significant damage, and so forth. Furthermore, fault avoidance, *3 fault tolerance,*4 or the like should be incorporated so that the said Equipment can satisfy the level of reliability and safety required for your use.

*1. A design that is safe even if the user makes an error.

*2. A design that is safe even if the device fails.

*3. Avoidance of device failure by using highly reliable components, etc.

*4. The use of redundancy.

3. Precautions and restrictions on application

Azbil Corporation's products other than those explicitly specified as applicable (e.g. azbil Limit Switch For Nuclear Energy) shall not be used in a nuclear energy controlled area (radiation controlled area).

Any Azbil Corporation's products shall not be used for/with medical equipment.

The products are for industrial use. Do not allow general consumers to install or use any Azbil Corporation's product. However, azbil products can be incorporated into products used by general consumers. If you intend to use a product for that purpose, please contact one of our sales representatives.

In addition,

you are required to conduct a consultation with our sales representative and understand detail specifications, cautions for operation, and so forth by reference to catalogs, specifications, instruction manual, etc. in case that you intend to use azbil product for any purposes specified in (1) through (6) below.

Moreover, you are required to provide your Equipment with fool-proof design, fail-safe design, anti-flame propagation design, fault avoidance, fault tolerance, and other kinds of protection/safety circuit design on your own responsibility to ensure reliability and safety, whereby preventing problems caused by failure or nonconformity.

- (1) For use under such conditions or in such environments as not stated in technical documents, including catalogs, specification, and instruction manuals
- (2) For use of specific purposes, such as:

- * Nuclear energy/radiation related facilities
[For use outside nuclear energy controlled areas] [For use of Azbil Corporation's Limit Switch For Nuclear Energy]
 - * Machinery or equipment for space/sea bottom
 - * Transportation equipment
[Railway, aircraft, vessels, vehicle equipment, etc.]
 - * Antidisaster/crime-prevention equipment
 - * Burning appliances
 - * Electrothermal equipment
 - * Amusement facilities
 - * Facilities/applications associated directly with billing
- (3) Supply systems such as electricity/gas/water supply systems, large-scale communication systems, and traffic/air traffic control systems requiring high reliability
 - (4) Facilities that are to comply with regulations of governmental/public agencies or specific industries
 - (5) Machinery or equipment that may affect human lives, human bodies or properties
 - (6) Other machinery or equipment equivalent to those set forth in items (1) to (5) above which require high reliability and safety

4. Precautions against long-term use

Use of Azbil Corporation's products, including switches, which contain electronic components, over a prolonged period may degrade insulation or increase contact-resistance and may result in heat generation or any other similar problem causing such product or switch to develop safety hazards such as smoking, ignition, and electrification. Although acceleration of the above situation varies depending on the conditions or environment of use of the products, you are required not to use any Azbil Corporation's products for a period exceeding ten (10) years unless otherwise stated in specifications or instruction manuals.

5. Recommendation for renewal

Mechanical components, such as relays and switches, used for Azbil Corporation's products will reach the end of their life due to wear by repetitious open/close operations.

In addition, electronic components such as electrolytic capacitors will reach the end of their life due to aged deterioration based on the conditions or environment in which such electronic components are used. Although acceleration of the above situation varies depending on the conditions or environment of use, the number of open/close operations of relays, etc. as prescribed in specifications or instruction manuals, or depending on the design margin of your machine or equipment, you are required to renew any Azbil Corporation's products every 5 to 10 years unless otherwise specified in specifications or instruction manuals.

System products, field instruments (sensors such as pressure/flow/level sensors, regulating valves, etc.) will reach the end of their life due to aged deterioration of parts. For those parts that will reach the end of their life due to aged deterioration, recommended replacement cycles are prescribed. You are required to replace parts based on such recommended replacement cycles.

6. Other precautions

Prior to your use of Azbil Corporation's products, you are required to understand and comply with specifications (e.g., conditions and environment of use), precautions, warnings/cautions/notices as set forth in the technical documents prepared for individual Azbil Corporation's products, such as catalogs, specifications, and instruction manuals to ensure the quality, reliability, and safety of those products.

7. Changes to specifications

Please note that the descriptions contained in any documents provided by azbil are subject to change without notice for improvement or for any other reason. For inquires or information on specifications as you may need to check, please contact our branch offices or sales offices, or your local sales agents.

8. Discontinuance of the supply of products/parts

Please note that the production of any Azbil Corporation's product may be discontinued without notice.

For repairable products, we will, in principle, undertake repairs for five (5) years after the discontinuance of those products. In some cases, however, we cannot undertake such repairs for reasons, such as the absence of repair parts.

For system products, field instruments, we may not be able to undertake parts replacement for similar reasons.

9. Scope of services

Prices of Azbil Corporation's products do not include any charges for services such as engineer dispatch service. Accordingly, a separate fee will be charged in any of the following cases:

- (1) Installation, adjustment, guidance, and attendance at a test run
- (2) Maintenance, inspection, adjustment, and repair
- (3) Technical guidance and technical education
- (4) Special test or special inspection of a product under the conditions specified by you

Please note that we cannot provide any services as set forth above in a nuclear energy controlled area (radiation controlled area) or at a place where the level of exposure to radiation is equivalent to that in a nuclear energy controlled area.

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