Interface Description
COM/FEX300/FEX500/HART-EN

Electromagnetic Flowmeter ProcessMaster, HygienicMaster FEX300, FEX500

HART Protokoll 5.0
Valid for software levels from 00.01.02

HART COMMUNICATION PROTOCOL

ABB

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ProcessMaster, HygienicMaster
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COM/FEX300/FEX500/HART-EN

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Translation of the original instruction

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1 Preamble

This overview lists all the available HART-Commands. It includes both the Universal and Common Practice Commands.

2 HART Commando Overview

2.1 Universal Commands

2.1.1 Command 0

Read Transmitter Unique Identifier

Command 0	**Mnemonic**	**Offset**	**Size**	**Datatype**
Request Data Bytes	None	-	-	-
Response Data Bytes	Device Type Code for Expansion = 254	#0	1	USIGN8
	Manufacturer Identification Code = 26	#1	1	USIGN8
	Manufacturer Device Type = 30	#2	1	USIGN8
	Number of Request Preambles = 5	#3	1	USIGN8
	Revision Level of Universal Command = 5	#4	1	USIGN8
	Revision Level of Transmitter Document = 0	#5	1	USIGN8
	Software Revision Level = 1	#6	1	USIGN8
	Hardware Revision Level = 0	#7	1	USIGN8
	Flags, none defined at this time = 0	#8	1	USIGN8
	Device Identification Number = 24 Bit, MSB	#9	1	USIGN8
	Device Identification Number = 24 Bit, LSB	#10	1	USIGN8
	Device Identification Number = 24 Bit enhanced	#11	1	USIGN8
Response Code	No Command Specific Error“ 5 „Incorrect Byte Count“			

2.1.2 Command 1

Read Primary Variable

Command 1	**Mnemonic**	**Offset**	**Size**	**Datatype**
Request Data Bytes	None	-	-	-
Response Data Bytes	Primary Variable Unit Code = Unit of Q	#0	1	USIGN8
	Primary Variable [Q in Unit]	#1 ... 4	4	FLOAT
Response Code	0 „No Command Specific Error“ 5 „Incorrect Byte Count“			

2.1.3 Command 2

Read Current and Percent of Range

Command 1	**Mnemonic**	**Offset**	**Size**	**Datatype**
Request Data Bytes	None	-	-	-
Response Data Bytes	Analog Output Current mA [Iout without Unit]	#0 ... 3	4	FLOAT
	Percent of Range [Q in Percent]	#4 ... 7	4	FLOAT
Response Code	0 „No Command Specific Error“ 5 „Incorrect Byte Count“			

2.1.4 Command 3

Read all dynamic Variables and Current

Command 0	**Mnemonic**	**Offset**	**Size**	**Datatype**
Request Data Bytes	None	-	-	-
Response Data Bytes	Analog Output Current [Iout]	#0 ... 3	4	FLOAT
	Primary Variable Unit Code Primary Variable [Q in Unit]	#4 #5 ... 8	5	FLOAT
	Secondary Variable Unit Code Secondary Variable [Counter Forward]	#9 #10 ... 13	5	FLOAT
	Tertiary Variable Unit Code (Table 2) Tertiary Variable [Counter Reverse]	#14 #15 ... 18	5	FLOAT
	4th Variable Unit Code 4th Variable [Counter Differenz]	#19 #20 ... 23	5	FLOAT
Response Code	0 „No Command Specific Error“ 5 „Incorrect Byte Count“			

2.1.5 Command 6

Write Polling Address

Command 6	**Mnemonic**	**Offset**	**Size**	**Datatype**
Request Data Bytes	Polling Adress of Device	#0	1	USIGN8
Response Data Bytes	Polling Adress of Device	#0	1	USIGN8
Response Code	0 „No Command Specific Error“ 2 „Invalid Selection” 5 „Incorrect Byte Count“			

2.1.6 Command 11

Read Unique Identifier Associated With Tag

Command 11	**Mnemonic**	**Offset**	**Size**	**Datatype**
Request Data Bytes	Tag	#0	6	PACKED ASCII
Response Data Bytes	Device Type Code for Expansion = 254	#0	1	USIGN8
	Manufacturer Identification Code = 26	#1	1	USIGN8
	Manufacturer Device Type = 30	#2	1	USIGN8
	Number of Request Preambles = 8	#3	1	USIGN8
	Revision Level of Universal Command = 5	#4	1	USIGN8
	Revision Level of Transmitter Document = 0	#5	1	USIGN8
	Software Revision Level = 1	#6	1	USIGN8
	Hardware Revision Level = 0	#7	1	USIGN8
	Flags, none defined at this time = 0	#8	1	USIGN8
	Device Identification Number = 24 Bit, MSB	#9	1	USIGN8
	Device Identification Number = 24 Bit, LSB	#10	1	USIGN8
	Device Identification Number= 24 Bit enhanced	#11	1	USIGN8
Response Code	0 „No Command Specific Error“ 5 „Incorrect Byte Count“			

2.1.7 Command 12

Read Message

Command 12	**Mnemonic**	**Offset**	**Size**	**Datatype**
Request Data Bytes	None	-	-	-
Response Data Bytes	HART Message	#0 ... 23	24	PACKED ASCII
Response Code	0 „No Command Specific Error“ 5 „Incorrect Byte Count“			

2.1.8 Command 13

Read Tag, Descriptor, Date

Command 13	**Mnemonic**	**Offset**	**Size**	**Datatype**
Request Data Bytes	None			
Response Data Bytes	HART Tag	#0 ... 5	6	PACKED ASCII
	HART Descriptor	#6 ... 17	12	PACKED ASCII
	HART Day	#18	1	USIGN8
	HART Month	#19	1	USIGN8
	HART Year	#20	1	USIGN8
Response Code	0 „No Command Specific Error“ 5 „Incorrect Byte Count“			

2.1.9 Command 14

Read Primary Variable Sensor Information

Command 14	**Mnemonic**	**Offset**	**Size**	**Datatype**
Request Data Bytes	None			
Response Data Bytes	Sensor Serial Number = 0	#0 … 2	3	USIGN16
	Sensor Limits / Min Span Units = Unit of Q	#1	1	USIGN8
	Upper Sensor Limit = 2 x Q_{max} DN	#3 ... 7	5	FLOAT
	Lower Sensor Limit = 0	#8 ... 11	4	FLOAT
	Minimum Span = 0.02 x Q_{max} DN	#12 ... 15	4	FLOAT
Response Code	0 „No Command Specific Error“ 5 „Incorrect Byte Count“			

2.1.10 Command 15

Read Primary Variable Output Information

Command 15	**Mnemonic**	**Offset**	**Size**	**Datatype**
Request Data Bytes	None			
Response Data Bytes	Alarm Select Code ≥ Low = 0, High = 1	#0	1	USIGN8
	Primary Variable Transfer Function = HART Pv Transfer Function = 0	#1	1	USIGN8
	Primary Variable Range Values Units	#2	1	USIGN8
	Primary Variable Upper Range Value = Q_{max}	#3 ... 6	4	FLOAT
	Primary Variable Lower Range Value HART Pv Lower Range Value = 0	#7 ... 10	4	FLOAT
	Primary Variable Damping Value = Damping	#11 ... 14	4	FLOAT
	Write Protect Code = HART Write Protect = 251	#15	1	USIGN8
	Private Label Distributor Code = HART Private Label Distributor = 26	#16	1	USIGN8
Response Code	0 „No Command Specific Error“ 5 „Incorrect Byte Count“			

2.1.11 Command 16

Read Final Assembly Number

Command 16	**Mnemonic**	**Offset**	**Size**	**Datatype**
Request Data Bytes	None			
Response Data Bytes	HART Final Assembly Number	#0 ... 2	3	STRINGV
Response Code	0 „No Command Specific Error“ 5 „Incorrect Byte Count“			

2.1.12 Command 17

Write Message

Command 17	**Mnemonic**	**Offset**	**Size**	**Datatype**
Request Data Bytes	HART Message	#0 ... 23	24	PC ASCII
Response Data Bytes	HART Message	#0 ... 23	24	PC ASCII
Response Code	0 „No Command Specific Error“ 5 „Incorrect Byte Count“			

2.1.13 Command 18

Write Tag, Descriptor, Date

Command 18	**Mnemonic**	**Offset**	**Size**	**Datatype**
Request Data Bytes	Tag = HART Tag	#0 ... 5	6	PC ASCII
	Descriptor = HART Descriptor	#6 ... 17	12	PC ASCII
	Day = HART Date Day	#18	1	USIGN8
	Month = HART Date Month	#19	1	USIGN8
	Year = HART Date Year	#20	1	USIGN8
Response Data Bytes	Tag = HART Tag	#0 ... 5	6	PC ASCII
	Descriptor = HART Descriptor	#6 ... 17	12	PC ASCII
	Day = HART Date Day	#18	1	USIGN8
	Month = HART Date Month	#19	1	USIGN8
	Year = HART Date Year	#20	1	USIGN8
Response Code	0 „No Command Specific Error“ 5 „Incorrect Byte Count“			

2.1.14 Command 19

Write Final Assembly Number

Command 19	**Mnemonic**	**Offset**	**Size**	**Datatype**
Request Data Bytes	Final Assembly Number	#0 ... 2	3	STRINGV
Response Data Bytes	Final Assembly Number	#0 ... 2	3	STRINGV

2.2 Common Practice

2.2.1 Command 33

Read Transmitter Variables

With this command, it is possible to initiate a request using one, two, three or four of the four available slot numbers. The request can be initiated using the same slot number four times or using different slot numbers.

If a requested device variable is not supported in the field device, then the corresponding value must be set to “0x7F, 0xA0, 0x00, 0x00” and the unit code must be set to “250” (= not set).

Command 33	**Slot**	**Mnemonic**	**Offset**	**Size**	**Datatype**
Request Data Bytes	0	Transmitter Variable	-	1	-
	0, 1	Transmitter Variable	-	2	
	0, 1, 2	Transmitter Variable	-	3	
	0, 1, 2, 3	Transmitter Variable	-	4	
Response Data Bytes	0	Slot Number = 0		1	USIGN8
		Unit Code von Q in Unit		1	USIGN8
		Slot #0 Variable = Q in Unit		4	FLOAT
	1	Slot Number = 1		1	USIGN8
		Unit Code of Totalizer Forward		1	USIGN8
		Slot #0 Variable = Totalizer Forward		4	FLOAT
	2	Slot Number = 2		1	USIGN8
		Unit Code of Totalizer Reverse		1	USIGN8
		Slot #0 Variable = Totalizer Reverse		4	FLOAT
	3	Slot Number = 3		1	USIGN8
		Unit Code of Totalizer Net		4	FLOAT
		Slot #0 Variable = Totalizer Net		1	USIGN8
Response Code		0 „No Command Specific Error“ 5 „Incorrect Byte Count“			

2.2.2 Command 34

Write Primary Variable Damping Value

Command 34	**Mnemonic**	**Offset**	**Size**	**Datatype**
Request Data Bytes	Damping Value = Damping	#0 ... 3	4	FLOAT
Response Data Bytes	Actual Damping Value = Damping	#0 ... 3	4	FLOAT
Response Code	0 „No Command Specific Error“ 3 „Passed Parameter to Large” 4 „Passed Parameter to Small” 5 „Incorrect Byte Count“			

2.2.3 Command 35

Write Primary Variable Range Values

Command 35	**Mnemonic**	**Offset**	**Size**	**Datatype**
Request Data Bytes	PV Upper and Lower Range Values Units Code Primary Variable Upper Range Value = Q_{max} Primary Variable Lower Range Value = 0	#0 #1 ... 4 #5 ... 8	1 4 4	USIGN8 FLOAT FLOAT
Response Data Bytes	PV Upper and Lower Range Values Units Code Primary Variable Upper Range Value = Q_{max} Primary Variable Lower Range Value = 0	#0 #1 ... 4 #5 ... 8	1 4 4	USIGN8 FLOAT FLOAT
Response Code	0 „No Command Specific Error” 5 „Incorrect Byte Count” 11 „Upper Range Value too High” 12 „Upper Range Value too Low” 13 „Upper and Lower Range Value out of Limits”			

2.2.4 Command 38

Reset Configuration Changed Flag

Command 38	**Mnemonic**	**Offset**	**Size**	**Datatype**
Request Data Bytes	None			VOID
Response Data Bytes	None			VOID
Response Code	0 „No Command Specific Error“ 5 „Incorrect Byte Count“			

2.2.5 Command 40

Enter/Exit Primary Variable Current Mode

If Primary Variable = 0, Simulation of Current Level stopped.

Command 40	**Mnemonic**	**Offset**	**Size**	**Datatype**
Request Data Bytes	Fixed Primary Variable Current Level	#0 ... 3	4	FLOAT
Response Data Bytes	Actual Fixed Primary Variable Current Level	#0 ... 3	4	FLOAT
Response Code	0 „No Command Specific Error” 3 „Passed Parameter to Large” 4 „Passed Parameter to Small” 5 „Incorrect Byte Count”			

2.2.6 Command 44

Write Primary Variable Units

Command 44	**Mnemonic**	**Offset**	**Size**	**Datatype**
Request Data Bytes	Primary Variable Unit Code	#0	1	USIGN8
Response Data Bytes	Primary Variable Unit Code	#0	1	USIGN8
Response Code	0 „No Command Specific Error” 2 „Invalid Selection” 5 „Incorrect Byte Count”			

2.2.7 Command 45

Trim Primary Variable Current DAC Zero

Command 45	**Mnemonic**	**Offset**	**Size**	**Datatype**
Request Data Bytes	Externally Measured Primary Variable Current Level (4 mA Trim)	#0 ... 3	4	FLOAT
Response Data Bytes	Actual Measured Primary Variable Current Level (4 mA Trim)	#0 ... 3	4	FLOAT
Response Code	0 „No Command Specific Error” 3 „Passed Parameter to Large (> 5 mA)” 4 „Passed Parameter to Small (< 3 mA)” 5 „Incorrect Byte Count” 9 „Not in Proper Current Mode”			

2.2.8 Command 46

Trim Primary Variable Current DAC Gain

Command 46	**Mnemonic**	**Offset**	**Size**	**Datatype**
Request Data Bytes	Externally Measured Primary Variable Current Level (20 mA Trim)	#0 ... 3	4	FLOAT
Response Data Bytes	Actual Measured Primary Variable Current Level (20 mA Trim)	#0 ... 3	4	FLOAT
Response Code	0 „No Command Specific Error” 3 „Passed Parameter to Large (> 22 mA)” 4 „Passed Parameter to Small (< 18 mA)” 5 „Incorrect Byte Count” 9 „Not in Proper Current Mode”			

2.2.9 Command 48

Read Additional Transmitter Status

Command 48	**Mnemonic**		**Offset**	**Size**	**Datatype**
Request Data Bytes	None				
Byte 0	0x01	Simulated / Fixed Current Output? Simulation Mode? HART address > 0 ?	#0	1	USIGN8
	0x02	Logic Simulation selected on DO1. Switch off Simulation Mode.			
	0x04	Pulse Simulation selected on DO1. Switch off Simulation Mode.			
	0x08	Logic Simulation selected on DO2. Switch off Simulation Mode			
	0x10	Pulse Simulation selected on DO2. Switch off Simulation Mode.			
	0x20	Min. Alarm flow rate. The current flowrate in the pipeline is smaller than the min. alarm configured.			
	0x40	Max. Alarm flow rate. The current flowrate in the pipeline is greater than the max. alarm configured.			
	0x80	Flowrate > 103 %. Check flowrate. Check range setting.			
Byte 1	0x01	Flowrate simulation active. Switch off simulation mode.	#1	1	USIGN8
	0x02	The transmitter is operated on simulator / Test mode is on. Switch off test mode.			
	0x04	Exl. cut-off active. The flowrate is set to zero. Check digital input terminals 81 / 82.			
	0x08	Totalizer Stop. Check digital input terminals 81 / 82.			
	0x10	Display value is < 1600 h at Q_{max}. Change engineering unit for totalizer.			
	0x20	Totalizer Reset. Check digital input terminals 81 / 82.			
	0x40	Errors Sensor communication. (Sensor Memory) Bad EMC environment. Check wiring.			
	0x80	HART address ≠ 0 Multidrop Mode. Set HART address = 0 in the communication menu.			

Command 48	Mnemonic		Offset	Size	Datatype
Request Data Bytes	None				
Byte 2	0x01	Transmitter Memory (FRAM) error detected. Contact ABB Service.	#2	1	Usign8
	0x02	No SensorMemory. Check wiring Check switch SW3 on backplane of Transmitter.			
	0x04	Simulation Digital Input. Switch off simulation mode.			
	0x08	AD converter saturated. Check empty pipe or galvanic. voltage.			
	0x10	Error in Coil circuit. Check wiring for short circuit.			
	0x20	Coil resistance out of range. Check wiring. Contact ABB Service.			
	0x40	Driver Error. Reference voltage U_{ref} = 0. Check wiring for open circuit. Check the coil circuit fuse.			
	0x80	Noise signal too high. Switch on noise reduction.			
Byte 3	0x01	DC to high. Lot of NV-resets. Refer to operating instructions	#3		
	0x02	Empty Pipe. Fill pipeline.			
	0x04	Electrode Voltage out of Range. Check range settings or galv. voltage.			
	0x08	No signal from the measuring electrodes. Check wiring E1 / E2 and 1S / 2S.			
	0x10	Electrode balance out of range. Coating? Flow profil?			
	0x20	Electrode impedance too high. Coating? Condutivity to low? Empty pipe?			
	0x40	Hold last good known value. Switch OFF Noise Reduction. Contact ABB Service			
	0x80	Internal supply voltage error in transmitter. Contact ABB Service.			
Byte 4	0x01	Error digital potentiometer. Hardware error in Trnasmitter. Contact ABB Service.	#4	1	USIGN8
	0x02	Sensor is partially filled (TFE). Fill pipe. Adjust empty pipe detector.			
	0x04	Current output error. Communication to MSP. Check wiring! 20 mA passive ? Check BR901!			
	0x08	Sensor setup Cal-Status Set Cal-Status to "calibrated" Contact ABB Service.			
	0x10	Calibration Mode Incompatible. Set Cal.Mode. Contact ABB Service.			
	0x20	ROM Error in Transmitter. Contact ABB Service.			
	0x40	RAM Error in Transmitter. Contact ABB Service.			
	0x80	Simulation of HART frequency. Switch off Simulation Mode.			

Command 48	**Mnemonic**		**Offset**	**Size**	**Datatype**
Request Data Bytes	None				
Byte 5	0x01	Unused	#5	1	USIGN8
	0x02	Unused			
	0x04	Unused			
	0x08	Unused			
	0x10	Pulse output is cutted off. Check pulse output configuration.			
	0x20	An alarm is simulated. Switch off alarm simulation.			
	0x40	Unused			
	0x80	Unused			
Byte 6	reserved 0		#6	1	USIGN8
Byte 7	reserved 1		#7	1	USIGN8
Byte 8	reserved 2		#8	1	USIGN8
Byte 9	reserved 3		#9	1	USIGN8
Byte 10	reserved 4		#10	1	USIGN8
Byte 11	reserved 5		#11	1	USIGN8
Byte 12	reserved 6		#12	1	USIGN8
Byte 13	reserved 7		#13	1	USIGN8
Byte 14	ErrorID = The number of the error with the highes priority.		#14	1	USIGN8
Byte 15	Classification = The classification of that error with the highes priority.		#15	1	USIGN8
Byte 16	Group = The namur group of that error with the highes priority.		#16	1	USIGN8
Byte 17	History Byte 0 (for description see Byte 0)		#17	1	USIGN8
Byte 18	History Byte 1 (for description see Byte 1)		#18	1	USIGN8
Byte 19	History Byte 2 (for description see Byte 2)		#19	1	USIGN8
Byte 20	History Byte 3 (for description see Byte 3)		#20	1	USIGN8
Byte 21	History Byte 4 (for description see Byte 4)		#21	1	USIGN8
Byte 22	History Byte 5 (for description see Byte 5)		#22	1	USIGN8
Byte 23	reserved		#23	1	USIGN8
Response Code	0 „No Command Specific Error” 5 „Incorrect Byte Count” 5 „Incorrect Byte Count”				

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