AM54

HART-Protocol
Overview HART-commands
for standard software
D200F001U01_A11

Instruction Bulletin

CE

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Automation Products GmbH

HART-Protocol				
Compiled by Name: **Eggert Appel** Date: **25.09.00**	Instrument: Identification: Software:	**AM54_31/32_** **Standard Software A.11** **D200F001U01_A11**	Revision: Name: Date:	**1** **Eggert Appel** **14.05.01**

Contents

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HART-Protocol				
Compiled by Name: **Eggert Appel** Date: **25.09.00**	Instrument: Identification: Software:	**AM54_31/32_** **Standard Software A.11** **D200F001U01_A11**	Revision: **1** Name: **Eggert Appel** Date: **14.05.01**	

1 Overview Revision

Revision		Date	New pages	Pages modified	Name
No.	Soft				
0	A.10	09-25-2001	compiled	-	AP
1	A.11	05-14-2001	-	21 (Fault as to document: Maximum Range Water)	AP

HART-Protocol				
Compiled by Name: **Eggert Appel**	Instrument: Identification: Software:	**AM54_31/32_** **Standard Software A.11** **D200F001U01_A11**	Revision: Name:	**1** **Eggert Appel**
Date: **25.09.00**			Date:	**14.05.01**

2 Introduction

The onhand overview represents a list of all Hart commands available. It comprises both, the Universal and Common Practice as well as special commands, e.g. Slot etc.
Modifications as to previous command overviews will be visualized under "Revision" in the respective command.
Thanks to the numbering by paragraph solely the pages and paragraphs modified have to be replaced

The onhand documentation is valid for the following software versions:

     A.10
     A.11

HART-Protocol			
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3 Universal Commands

	Revision
3.1 HART-Command 0 : Read Transmitter Unique Identifier	
Request Data Bytes	none
Response Data Bytes	#0 Device Type Code for Expansion = 254 #1 Manufacturer Identification Code = 26 = ABB #2 Manufacturer Device Type = 27 = AM54_31/32_ #3 Number of Request Preambles = 8 #4 Revision Level of Universal Command = 5 #5 Revision Level of Transmitter Document = 0 #6 Software Revision Level = 0 #7 Hardware Revision Level = 0 #8 Flags, none defined at this time = 0 #9 Device Identification Number, 24 Bit, MSB = 0 #10 Device Identification Number, 24 Bit = MSB Instrument no. #11 Device Identification Number, 24 Bit, LSB = LSB Instrument no.
Response Codes	0 No Command Specific Error 5 Incorrect Byte Count

	Revision
3.2 HART-Command 1 : Read Primary Variable	
Request Data Bytes	none
Response Data Bytes	#0 Primary Variable Unit Code (Table 2) #1..#4 Primary Variable, IEEE 754
Response Codes	0 No Command Specific Error 5 Incorrect Byte Count
Annotation	Primary Variable =>Durchfluß Q (dependent on operational mode chosen)

	Revision
3.3 HART-Command 2 : Read Current and Percent of Range	
Request Data Bytes	none
Response Data Bytes	#0..#3 Analog Output Current mA, IEEE 754 #4..#7 Percent of Range, IEEE 754
Response Codes	0 No Command Specific Error 5 Incorrect Byte Count

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		Revision
3.4 HART-Command 3 : Read all dynamic Variables and Current		

Request Data Bytes	none	
Response Data Bytes	#0..#3	Analog Output Current mA, IEEE 754
	#4	Primary Variable Unit Code (Table 2)
	#5..#8	Primary Variable, IEEE 754
	#9	Secondary Variable Unit Code (Table 2)
	#10..#13	Secondary Variable, IEEE 754
	#14	Tertiary Variable Unit Code (Table 2)
	#15..#18	Tertiary Variable, IEEE 754
	#19	4th Variable Unit Code (Table 2)
	#20..#23	4th Variable, IEEE 754
Response Codes	0 5	No Command Specific Error Incorrect Byte Count
Bemerkung	Primary Variable =	Q Betriebsart, for unit see unsigned char-Slot 20
	Secondary Variable =	Zähler, for unit see unsigned char-Slot 62 (Zv) oder 63 (Zm)
	Tertiary Variable =	Item in percent, unit %
	Fourth Variable =	flow in percent, unit %

		Revision
3.5 HART-Command 6 : Write Polling Address		

Request Data Bytes	#0	Polling Address of Device
Response Data Bytes	#0	Polling Address of Device
Response Codes	0 2 5	No Command Specific Error Invalid Selection Incorrect Byte Count

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Date: **25.09.00**	Software:	**D200F001U01_A11**	Date:	**14.05.01**

3.6 HART-Command 11 : Read Unique Identifier Associated With Tag

Revision

Request Data Bytes	#0..#5 Tag, Packed ASCII	
Response Data Bytes	#0 Device Type Code for Expansion #1 Manufacturer Identification Code #2 Manufacturer Device Type #3 Number of Request Preambles #4 Revision Level of Universal Command #5 Revision Level of Transmitter Document #6 Software Revision Level #7 Hardware Revision Level #8 Flags, none defined at this time #9 Device Identification Number, 24 Bit, MSB #10 Device Identification Number, 24 Bit #11 Device Identification Number, 24 Bit, LSB	= 254 = 26 = ABB = 27 = AM54_31/32_ = 8 = 5 = 0 = 0 = 0 = 0 = 0 = MSB Instrument no. = LSB Instrument no.
Response Codes	0 No Command Specific Error 5 Incorrect Byte Count	

3.7 HART-Command 12 : Read Message

Revision

Request Data Bytes	none
Response Data Bytes	#0..#23 Message, Packed ASCII
Response Codes	0 No Command Specific Error 5 Incorrect Byte Count

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3.8 HART-Command 13 : Read Tag, Descriptor, Date

Revision

Request Data Bytes	none
Response Data Bytes	#0..#5 Tag, Packed-ASCII #6..#17 Descriptor, Packed-ASCII #18..#20 Date: Day, Month, Year
Response Codes	0 No Command Specific Error 5 Incorrect Byte Count

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		Revision
3.9 HART-Command 14 : Read Primary Variable Sensor Information		

Request Data Bytes	none	
Response Data Bytes	#0..#2	Sensor Serial Number MSB, 24-bit unsigned integer
	#3	Sensor Limits/Min Span Units, Table II Unit Codes
	#4..#7	Upper Sensor Limit, IEEE754
	#8..#11	Lower Sensor Limit, IEEE754
	#12..#15	Minimum Span, IEEE754
Response Codes	0	No Command Specific Error
	5	Incorrect Byte Count
Bemerkung	Sensor Serial Number	= 0
	Upper Sensor Limit	= Qmax Medium
	Lower Sensor Limit	= 0
	Minimum Span	= 0.9 * QmaxDN,

		Revision
3.10 HART-Command 15 : Read Primary Variable Output Information		

Request Data Bytes	none	
Response Data Bytes	#0	Alarm Select Code, Table VI
	#1	Primary Variable Transfer Function Code, Table III
	#2	Primary Variable Range Values Units Code, Table II
	#3..#6	Primary Variable Upper Range Value, IEEE754
	#7..#10	Primary Variable Lower Range Value, IEEE754, always Zero
	#11..#14	Primary Variable Damping Value, IEEE754, Units of Seconds
	#15	Write Protect Code, Table VII
	#16	Private Label Distributor Code, Table VIII
Response Codes	0	No Command Specific Error
	5	Incorrect Byte Count
Bemerkung	Alarm Selection Code	= 0 = High, 1 = Low
	PV Transfer Function Code	= 0 = Linear
	PV Upper Range Value	= Qmax
	PV Lower Range Value	= 0
	PV Damping Value	= Damping
	Write Protect Code	= 251 = Not Implemented
	Private Label Distributor	= 26 = ABB

		Revision
3.11 HART-Command 16 : Read Final Assembly Number		

Request Data Bytes	none	
Response Data Bytes	#0..#2	Final Assembly Number
Response Codes	0	No Command Specific Error
	5	Incorrect Byte Count

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Compiled by Name: **Eggert Appel**		Instrument: Identification: Software:	**AM54_31/32_ Standard Software A.11 D200F001U01_A11**	Revision: Name:	**1 Eggert Appel**
Date: **25.09.00**				Date:	**14.05.01**

3.12 HART-Command 17 : Write Message		Revision
Request Data Bytes	#0..#23 Message, Packed-ASCII	
Response Data Bytes	#0..#23 Message, Packed-ASCII	
Response Codes	0 No Command Specific Error 5 Incorrect Byte Count	

3.13 HART-Command 18 : Write Tag, Descriptor, Date		Revision
Request Data Bytes	#0..#5 Tag, Packed-ASCII #6..#17 Descriptor, Packed-ASCII #18..#20 Date: Day, Month, Year	
Response Data Bytes	#0..#5 Tag, Packed-ASCII #6..#17 Descriptor, Packed-ASCII #18..#20 Date: Day, Month, Year	
Response Codes	0 No Command Specific Error 5 Incorrect Byte Count	

3.14 HART-Command 19 : Write Final Assembly Number		Revision
Request Data Bytes	#0..#2 Final Assembly Number	
Response Data Bytes	#0..#2 Final Assembly Number	
Response Codes	0 No Command Specific Error 5 Incorrect Byte Count	

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Compiled by Name: **Eggert Appel** Date: **25.09.00**	Instrument: **AM54_31/32_** Identification: **Standard Software A.11** Software: **D200F001U01_A11**	Revision: **1** Name: **Eggert Appel** Date: **14.05.01**

4 Commom Practice Commands

		Revision
4.1 HART-Command 34 : Write Primary Variable Damping Value		
Request Data Bytes	#0..#3 Damping Value, IEEE 754	
Response Data Bytes	#0..#3 Actual Damping Value, IEEE 754	
Response Codes	0 No Command Specific Error 3 Passed Parameter to Large 4 Passed Parameter to Small 5 Incorrect Byte Count	

		Revision
4.2 HART-Command 35 : Write Primary Variable Range Values		
Request Data Bytes	#0 PV Upper and Lower Range Values Units Code, Table II #1..#4 Primary Variable Upper Range Value, IEEE 754 #5..#8 Primary Variable Lower Range Value, IEEE 754	
Response Data Bytes	#0 PV Upper and Lower Range Values Units Code, Table II #1..#4 Primary Variable Upper Range Value, IEEE 754 #5..#8 Primary Variable Lower Range Value, IEEE 754	
Response Codes	0 No Command Specific Error 2 Invalid Selection 5 Incorrect Byte Count 11 Upper Range Value too High 12 Upper Range Value too Low 13 Upper and Lower Range Values Out of Limits	
Bemerkung	PV Upper Range Value = Qmax PV lower Range Value = 0	

		Revision
4.3 HART-Command 38 : Reset Configuration Changed Flag		
Request Data Bytes	none	
Response Data Bytes	none	
Response Codes	0 No Command Specific Error 5 Incorrect Byte Count	

HART-Protocol				
Compiled by Name: **Eggert Appel**	Instrument: Identification: Software:	**AM54_31/32_** **Standard Software A.11** **D200F001U01_A11**	Revision: Name: Date:	**1** **Eggert Appel** **14.05.01**
Date: **25.09.00**				

4.4 HART-Command 40 : Enter/Exit Primary Variable Current Mode

Revision

Request Data Bytes	#0..#3 Fixed Primary Variable Current Level, IEEE 754, mA
Response Data Bytes	#0..#3 Actual Fixed Primary Variable Current Level, IEEE 754, mA
Response Codes	0 No Command Specific Error 3 Passed Parameter to Large (> 20.8 mA) 4 Passed Parameter to Small (< 4.0 mA) 5 Incorrect Byte Count 11 In Multidrop Mode

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4.5 HART-Command 45 : Trim Primary Variable Current DAC Zero

Revision

Request Data Bytes	#0..#3 Externally Measured Primary Variable Current Level, IEEE 754, Units of mA
Response Data Bytes	#0..#3 Actual Measured Primary Variable Current Level, IEEE 754, mA
Response Codes	0 No Command Specific Error 3 Passed Parameter to Large (> 5mA) 4 Passed Parameter to Small (< 3mA) 5 Incorrect Byte Count 9 Not in Proper Current Mode 11 In Multidrop Mode

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4.6 HART-Command 46 : Trim Primary Variable Current DAC Gain

Revision

Request Data Bytes	#0..#3 Externally Measured Primary Variable Current Level, IEEE 754, Units of mA
Response Data Bytes	#0..#3: Actual Measured Primary Variable Current Level, IEEE 754, mA
Response Codes	0 No Command Specific Error 3 Passed Parameter to Large (> 22mA) 4 Passed Parameter to Small (< 18mA) 5 Incorrect Byte Count 9 Not in Proper Current Mode 11 In Multidrop Mode

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Date: **25.09.00**			Date: **14.05.01**

	Revision
4.7 HART-Command 48 : Read Additional Transmitter Status	

Request Data Bytes	none
Response Data Bytes	#0..#2 Additional Status Information

Fehlerregister:

#0, Bit 0	Fehler 0:	Unbenutzt / Don't care
#0, Bit 1	Fehler 1:	Front End (Drehkondensator) / Front End
#0, Bit 2	Fehler 2:	Unbenutzt / Don't care
#0, Bit 3	Fehler 3:	Durchfluss > 105% / flow > 105%
#0, Bit 4	Fehler 4:	Unbenutzt / Don't care
#0, Bit 5	Fehler 5a:	Int. Datenbasis / Int. Database
#0, Bit 6	Fehler 5b:	Ext. Datenbasis / Ext. Database
#0, Bit 7	Fehler 6:	Zähler / Totalizer
#1, Bit 0	Fehler 8:	Unbenutzt / Don't care
#1, Bit 1	Fehler 9:	Unbenutzt / Don't care
#1, Bit 2	Fehler 10:	Unbenutzt / Don't care
#1, Bit 3	Fehler 11:	Unbenutzt / Don't care
#1, Bit 4	Fehler 12:	Viskosität / Viscosity
#1, Bit 5	Fehler 13:	Unbenutzt / Don't care
#1, Bit 6	Fehler 14:	Unbenutzt / Don't care
#1, Bit 7	Fehler 15:	Unbenutzt / Don't care

Statusregister:

#0, Bit 0	Impulswertigkeit begrenzt / Puls factor limited
#0, Bit 1	Impulsbreite begrenzt / Puls width limited
#0, Bit 2	Alarm
#0, Bit 3	Max Alarm
#0, Bit 4	Min Alarm
#0, Bit 5	Zählereinheit wechseln / Change totalizer unit
#0, Bit 6	Funktion- oder Selbsttest läuft / Function or self test
#0, Bit 7	Unbenutzt / Don't care

Response Codes	0 No Command Specific Error 5 Incorrect Byte Count

HART-Protocol				
Compiled by Name: **Eggert Appel**	Instrument: Identification: Software:	**AM54_31/32_** **Standard Software A.11** **D200F001U01_A11**	Revision: Name:	**1** **Eggert Appel**
Date: **25.09.00**			Date:	**14.05.01**

5 Slot - Commands

The converter parameters can be divided into three different groups:

unsigned char-Variablen

       parameters of menues containing selective lists will be saved as "unsigned char", e.g. language:

              German = 0

              English = 1

unsigned int-Variablen

       Some figures, which may solely appear whole numbered, will be saved as "unsigned int", e.g. instrument numbers:

float-Variablen

       The remaining figures will be saved as float (IEEE 754), e.g. damping.

Please find below the read and write commands for the respective groups as well as a table containing the corresponding parameters.

5.1 Unsigned-char-Variables

5.1.1 HART-Command 128 : Read unsigned-char-Variable		Revision
Request Data Bytes	#0 Slot-Index	
Response Data Bytes	#0 Slot-Index #1 Content of slot	
Response Codes	0 No Command Specific Error 5 Incorrect Byte Count 6 Transmitter Specific Command Error -> void slot no.	

5.1.2 HART-Command 129 : Write unsigned-char-Variable		Revision
Request Data Bytes	#0 Slot-Index #1 Content of slot	
Response Data Bytes	#0 Slot-Index #1 Content of slot	
Response Codes	0 No Command Specific Error 2 Invalid Selection 3 Parameter too large 5 Incorrect Byte Count 6 Transmitter Specific Command Error -> void slot no.	

	HART-Protocol				
Compiled by Name: **Eggert Appel**	Instrument: **AM54_31/32_**			Revision: **1**	
	Identification: **Standard Software A.11**			Name: **Eggert Appel**	
Date: **25.09.00**	Software: **D200F001U01_A11**			Date: **14.05.01**	

5.1.3 Table of „unsigned char" -Variables

Slot-Nummer	Parameter	Key No.	Meaning	Revision
20	Betriebsmodus | Flow mode	0 1 2 3 4 5	Flüssigkeit Qv | Liquid Qv Flüssigkeit Qm | Liquid Qm Gas Qv Gas Norm Qn Gas Standard Qs Gas Qm	
50	Sprache | Language	0 1	Deutsch | German Englisch | English	
51 52 53	Anzeige 1. Zeile | Display 1. Line Anzeige 2. Zeile | Display 2. Line Anzeige 2.Zeile Multiplex | Display 2. Line Multiplex	0 1 2 3	Q Betriebsart | Q operation Prozent | Percent Zähler | Totalizer Position	
54	2. Zeile Multiplex | 2. Line multiplex	0 1	Aus | Off An | On	
60	Einheit Qvol | Unit Qvol	Siehe HART-Tabelle: 24 17 138 28 131 19 29 26 15 130 27 22 16 136 23 137 18 30 31 132 133 134 135	 l/s l/m l/h m3/s m3/m m3/h m3/d ft3/s ft3/m ft3/h ft3/d ugl/s ugl/m ugl/h mgl/d igl/s igl/m igl/h igl/d bbl/s bbl/m bbl/h bbl/d	

Erstellt von Name:	**Eggert Appel**	Gerät:	**AM54_31/32_**	Revision:	**1**
		Kennung:	**Standard Software A.11**	Name:	**Eggert Appel**
Datum:	**25.09.00**	Software:	**D200F001U01_A11**	Datum:	**14.05.01**

HART-Protocol

Slot-Nummer	Parameter	Key-No.	Meaning	Revision
61	Einheit Qm	Unit Qml	See HART-Table: 70	g/s	
		71	g/m	
		72	g/h	
		73	kg/s	
		74	kg/m	
		75	kg/h	
		76	kg/d	
		77	t/m	
		78	t/h	
		79	t/d	
		80	lb/s	
		81	lb/m	
		82	lb/h	
		83	lb/d	
62	Zv: Einheit Zähler	Unit Totalizer (betriebsartabhängig.| depends on flow mode)	41	l	
		43	m3	
		112	ft3	
		40	usgal	
		42	igal	
63	Zm: Einheit Zähler	Unit Totalizer (betriebsartabhängig.| depends on flow mode)	60	g	
		61	kg	
		62	t	
		63	lb	
66	Einheit Dichte	Unit Density	95	g/ml	
		91	g/cm3	
		97	g/l	
		96	kg/l	
		92	kg/m3	
		94	lb/ft3	
		93	lb/ugl	

HART-Protocol			
Compiled by Name: **Eggert Appel**	Instrument: **AM54_31/32_** Identification: **Standard Software A.11**	Revision: **1** Name: **Eggert Appel**	
Date: **25.09.00**	Software: **D200F001U01_A11**	Date: **14.05.01**	

5.2 Unsigned-int-Variables

		Revision
5.2.1 HART-Command 130 : Read-unsigned int-Variable		
Request Data Bytes	#0 Slot-Index	
Response Data Bytes	#0 Slot-Index #1 Unit codes #2..#3 Content of Slot	
Response Codes	0 No Command Specific Error 5 Incorrect Byte Count 6 Transmitter Specific Command Error -> void Slot No.	

		Revision
5.2.2 HART-Command 131 : Schreibe unsigned-int-Variable		
Request Data Bytes	#0 Slot-Index #1 Unit codes Content of Slot #2 MSB #3 LSB	
Response Data Bytes	#0 Slot-Index #1 Unit codes Content of Slot #2 MSB #3 LSB	
Response Codes	0 No Command Specific Error 2 Invalid Selection -> Ungültiger Einheitenkode 3 Parameter To Large -> Parameter zu groß 4 Parameter To Small -> Parameter zu klein 5 Incorrect Byte Count -> Anzahl Datenbytes ungleich 4 6 Transmitter Specific Command Error -> void slot no.	

HART-Protocol				
compiled by Name: **Eggert Appel**	Instrument: Identification: Software:	**AM54_31/32_** **Standard Software A.11** **D200F001U01_A11**	Revision: Name:	**1** **Eggert Appel**
Date: **25.09.00**			Date:	**14.05.01**

5.2.3 Tables of „unsigned int"-Variables

Slot-nummer	Parameter	Meaning	Revision
0	Gerätenummer | Instrument number	Einheit: None = 250 Minimum = 0 Maximum = 65535	
80	Überlauf | Overflow	Unit: None = 250 Nur Lesen | Read only	
141	Service-Kode | Code number	Unit: None = 250 Minimum = 0 Maximum = 9999	
142	Angle Primary | Angle primary	Unit: None = 250 Nur Lesen | Read only	
160	Abgleich Winkel 0% | Adjust angle 0%	Unit: None = 250 Minimum = 31400 Maximum = 31800	
161	Abgleich Winkel 100% | Adjust angle 100%	Unit: None = 250 Minimum = 32200 Maximum = 32600	

HART-Protocol			
Compiled by Name: **Eggert Appel**	Instrument: **AM54_31/32_** Identification: **Standard Software A.11** Software: **D200F001U01_A11**		Revision: **1** Name: **Eggert Appel**
Date: **25.09.00**			Date: **14.05.01**

5.3 Float-Variablen

		Revision
5.3.1 HART-Command 132 : Read float-Variable		
Request Data Bytes	#0 Slot-Index	
Response Data Bytes	#0 Slot-Index #1 Einheitenkode #2..#5 Inhalt des Slots	
Response Codes	0 No Command Specific Error 5 Incorrect Byte Count 6 Transmitter Specific Command Error -> void slot no.	

		Revision
5.3.2 HART-Command 133 : Write float-Variable		
Request Data Bytes	#0 Slot-Index #1 Unit codes #2..#5 Content of Slot	
Response Data Bytes	#0 Slot-Index #1 Unit codes #2..#5 Content of Slots	
Response Codes	0 No Command Specific Error 2 Invalid Selection -> Ungültiger Einheitenkode 3 Parameter To Large -> Parameter zu groß 4 Parameter To Small -> Parameter zu klein 5 Incorrect Byte Count -> Anzahl Datenbytes ungleich 4 6 Transmitter Specific Command Error -> void slot no.	

HART-Protocol					
Compiled by Name: **Eggert Appel**	Instrument: Identification: Software:	**AM54_31/32_** **Standard Software A.11** **D200F001U01_A11**		Revision: Name:	**1** **Eggert Appel**
Date: **25.09.00**				Date:	**14.05.01**

Table of „Float"-Variables

Slot-Nummer	Parameter	Meaning		Revision
0	Qmax Medium | Range medium	Einheit: Siehe Einheiten-tabelle der einge-stellten Betriebsart | See unit table flow mode		
		Anmerkung: Qmax Medium kann nur gelesen werden! | Read only!		
1	Qmax | Range	Einheit: Siehe Einheiten-tabelle der einge-stellten Betriebsart Betriebsart | See unit table flow mode Minimum = Maximum =	0,9 * Qmax-Medium 1,02 * Omax-Medium	
2	Schleichmenge | Low flow cutoff	Einheit: % = Minimum = Maximum =	57 1 % 10 %	
20	Viskosität | Viscosity	Einheit: mPas= Minimum = Maximum =	253 0.1 mPas 100 mPas	
26	Normdichte | Normal density	Einheit: Siehe Dichte-Einheit | See unit table density Minimum = Maximum =	0,00001 [g/cm3] 0,1 [g/cm3]	

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Date: **25.09.00**				Date:	**14.05.01**

Slot-Nummer	Parameter	Meaning				Revision
27	Betriebsdichte | Operation density	Einheit: Siehe Dichte-Einheit | See unit table density Minimum = Maximum =	0,00001 [g/cm3] Schwebe-körper-dichte | Float density [g/cm3]			
90	Impuls Faktor | Puls factor	Einheit: Kehrwert der Zählereinheit; be-triebsartabhängig | 1/totalizer unit; depends on flow mode 41 43 112 40 42 46	1/l 1/m3 1/ft3 1/ugl 1/igl 1/bbl	60 61 62 63	1/g 1/kg 1/t 1/lb	
91	Impulsbreite | Puls width	Einheit: ms = Minimum = Maximum =	253 5 ms 256 ms			
100	Dämpfung | Damping	Einheit: s = Minimum = Maximum =	51 0,5 s 100 s			
101	Iout bei Alarm | Iout at alarm	Einhei: mA = Minimum = Maximum =	39 21 mA 23 mA			
110	Max Alarm	Einheit: %= Minimum = Maximum =	57 0 % 105 %			

5.3-3

HART-Protocol				
Compiled by Name: **Eggert Appel** Date: **25.09.00**	Instrument: Identification: Software:	**AM54_31/32_** **Standard Software A.11** **D200F001U01_A11**	Revision: **1** Name: **Eggert Appel** Date: **14.05.01**	

Slot-Nummer	Parameter	Meaning		Revision
111	Min Alarm	Einheit: % = Minimum = Maximum =	57 0 % 105 %	
160	Abgleich Iout 4mA | Adjust Iout 4 mA	Einheit: mA = Minimum = Maximum =	39 2 mA 6 mA	
161	Abgleich Iout 20mA | Adjust Iout 20mA	Einheit: mA = Minimum = Maximum =	39 10 mA 30 mA	
164	Qmax Wasser | Range water	Einheit: l/h = Minimum = Maximum =	138 20 l/h 270999 l/h	
165	Schwebekörperdichte | Float density	Einheit: g/cm3 = Minimum = Maximum =	91 1,000001 g/cm3 10 g/cm3	
166	Viskositätszahl | Viscosity number	Einheit mPas = Minimum = Maximum =	253 0.1 mPas 100 mPas	
170 171 172 173 174 175 176 177 178 179	Masterpoint: M1 M2 M3 M4 M5 M6 M7 M8 M9 M10	Einheit: % = Minimum = Maximum =	57 M(n-1) ; M(0)= 0% M(n+1)	

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Compiled by Name: **Eggert Appel**	Instrument: Identification: Software:	**AM54_31/32_** **Standard Software A.11** **D200F001U01_A11**	Revision: Name:	**1** **Eggert Appel**
Date: **25.09.00**			Date:	**14.05.01**

Slot-Nummer	Parameter	Meaning		Revision
	Calibration:	Unit:		
180	P1	% =	57	
181	P2			
182	P3	Minimum =	P(n-1) ; P(0)= 0%	
183	P4	Maximum =	P(n+1)	
184	P5			
185	P6			
186	P7			
187	P8			
188	P9			
189	P10			

HART-Protocol				
Compiled by Name: **Eggert Appel**	Instrument: Identification: Software:	AM54_31/32_ **Standard Software A.11** **D200F001U01_A11**	Revision: Name:	**1** **Eggert Appel**
Date: **25.09.00**			Date:	**14.05.01**

5.4 String-Variables

	Revision
5.4.1 HART-Command 134 : Read string-Variable	

Request Data Bytes	#0	Slot-Index
Response Data Bytes	#0 #1..#max	Slot-Index content of slots (max. lentgh depends on slot string only)
Response Codes	0 5 6	No Command Specific Error Incorrect Byte Count Transmitter Specific Command Error -> void slot no.

	Revision
5.4.2 HART-Command 135 : Write string-Variable	

Request Data Bytes	#0 #1..#max	Slot-Index content of slots
Response Data Bytes	#0 #1..#max	Slot-Index content of slots (max. length depends on slot string only)
Response Codes	0 5 6	No Command Specific Error Incorrect Byte Count Transmitter Specific Command Error -> void slot no.

HART-Protocol				
Compiled by Name: **Eggert Appel**	Instrument: Identification: Software:	**AM54_31/32_** **Standard Software A.11** **D200F001U01_A11**	Revision: Name:	**1** **Eggert Appel**
Date: **25.09.00**			Date:	**14.05.01**

Tabelle der „String"-Variables

Slot- Number	Parameter	Meaning	Revision
160	Auftragsnummer | Order number	Max. Length: 16 characters	

5.5 Overview slot commands

Menu Title	Variable Type	Commands		Slot	Revision
		Read	Write		
Operating Mode	unsigned char	128	129	20	
Language	unsigned char	128	129	50	
Display 1. Line	unsigned char	128	129	51	
Display 2. Line	unsigned char	128	129	52	
Display 2. Line multiplex	unsigned char	128	129	53	
2. Line Multiplex	unsigned char	128	129	54	
Unit Qvol	unsigned char	128	129	60	
Unit Totalizer Zv	unsigned char	128	129	62	
Unit Totalizer Zm	unsigned char	128	129	63	
Unit Density	unsigned char	128	129	66	
Instrument No. (2.)	unsigned int	130	131	0	
Overflow	unsigned int	130	131	80	
Service Code	unsigned int	130	131	141	
Angle Primary (**2.**)	unsigned int	130	---	142	
Adjust angle 0% (2.)	unsigned int	130	131	160	
Adjust angle 100% (2.)	unsigned int	130	131	161	
Qmax Medium	float	132	---	0	
Qmax	float	132	13	1	
Low Flow cutoff	float	132	133	2	
Viscosity	float	132	133	20	
Norm density	float	132	133	26	
Operating density	float	132	133	27	
Pulse factor (1.)	float	132	133	90	
Pulse factor (1.)	float	132	133	91	
Damping	float	132	133	100	
Iout with alarm	float	132	133	101	
MAX Alarm	float	132	133	110	
MIN Alarm	float	132	133	111	
Adjust Iout 4mA (2.)	float	132	133	160	
Adjust Iout 20mA (2.)	float	132	133	161	
Qmax Water (**2.**)	float	132	133	164	
Density of float (2.)	float	132	133	165	
Viscosity figure (2.)	float	132	133	166	
M1 (**2.**)	float	132	133	170	
M2 (**2.**)	float	132	133	171	
M3 (**2.**)	float	132	133	172	
M4 (**2.**)	float	132	133	173	
M5 (**2.**)	float	132	133	174	
M6 (**2.**)	float	132	133	175	
M7 (**2.**)	float	132	133	176	
M8 (**2.**)	float	132	133	177	
M9 (**2.**)	float	132	133	178	
M10 (**2.**)	float	132	133	179	
P1 (**2.**)	float	132	133	180	

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Menu Title	Variable Type	Command		Slot	Revision
		Read	Write		
P2 (**2.**)	float	132	133	181	
P3 (**2.**)	float	132	133	182	
P4 (**2.**)	float	132	133	183	
P5 (**2.**)	float	132	133	184	
P6 (**2.**)	float	132	133	185	
P7 (**2.**)	float	132	133	186	
P8 (**2.**)	float	132	133	187	
P9 (**2.**)	float	132	133	188	
P10 (**2.**)	float	132	133	189	
Order Number (**2.**)	String	134	135	160	

Annotation:

1. In addition to normal interdependences (Operating Mode -> Qmax etc.) both parameters have to be read again with changes of pulse width or pulse value (pulse) to to obtain those values stored within the converter.

2. **The parameters can only be changed subsequent to entry of service code number.**
   They are not accessible to the customer!

	HART-Protocol			
Compiled by Name: **Eggert Appel**	Instrument:	**AM54_31/32_**	Revision:	**1**
	Identification:	**Standard Software A.11**	Name:	**Eggert Appel**
Date: **25.09.00**	Software:	**D200F001U01_A11**	Date:	**14.05.01**

6 Other Commands

The following paragraph contains all other commands available which are neither Universal, Common Practice nor Slot-Commands.

6.1 HART-Command 140 : Clear Totalizer and Overflow

<div align="right">Revision</div>

Request Data Bytes	none
Response Data Bytes	none
Response Codes	0 No Command Specific Error 5 Incorrect Byte Count

6.2 HART-Command 150 : Initialization of int. and ext. database

<div align="right">Revision</div>

Request Data Bytes	none
Response Data Bytes	none
Response Codes	0 No Command Specific Error 5 Incorrect Byte Count
Anmerkung	The command can be applied subsequent to entry of service code number only! **It** is thus not accessible to the customer! **Caution:** All customer and instrument specific parameters will be lost during execution of these commands!

6.3 HART-Command 151 : Download of int. into ext. database

<div align="right">Revision</div>

Request Data Bytes	none
Response Data Bytes	none
Response Codes	0 No Command Specific Error 5 Incorrect Byte Count
Anmerkung	The command can be applied subsequent to entry of service code number only! It is thus not accessible to the customer! **Caution:** All parameters contained in external databases will be lost during execution of these commands!

HART-Protocol			
Compiled by Name: **Eggert Appel**	Instrument: **AM54_31/32_** Identification: **Standard Software A.11** Software: **D200F001U01_A11**	Revision: **1** Name: **Eggert Appel**	
Date: **25.09.00**		Date: **14.05.01**	

		Revision
6.4 HART-Command 165 : read „Prog. Output" Settings		
Request Data Bytes	none	
Response Data Bytes	#0 0 = Keine Funktion | No function 1 = Impulsausgang | Pulse output 2 = Min/Max-Alarm _ | Min/Max-alarm _ 3 = Min/Max-Alarm / | Min/Max-alarm / 4 = Sammel-Alarm _ | General-alarm _ 5 = Sammel-Alarm / | General-alarm /	
Response Codes	0 No Command Specific Error 5 Incorrect Byte Count	

|		Revision
6.5 HART-Command 166 : Write „Prog. Output" Settings		
Request Data Bytes	#0 0 = Keine Funktion | No function 1 = Impulsausgang | Puls output 2 = Min/Max-Alarm _ | Min/Max-alarm _ 3 = Min/Max-Alarm / | Min/Max-alarm / 4 = Sammel-Alarm _ | General-alarm _ 5 = Sammel-Alarm / | General-alarm /	
Response Data Bytes	#0 0 = Keine Funktion | No function 1 = Impulsausgang | Puls output 2 = Min/Max-Alarm _ | Min/Max-alarm _ 3 = Min/Max-Alarm / | Min/Max-alarm / 4 = Sammel-Alarm _ | General-alarm _ 5 = Sammel-Alarm / | General-alarm /	
Response Codes	0 No Command Specific Error 5 Incorrect Byte Count	

HART-Protocol		
compiled by Name: **Eggert Appel** Date: **25.09.00**	Instrument: **AM54_31/32_** Identification: **Standard Software A.11** Software: **D200F001U01_A11**	Revision: **1** Name: **Eggert Appel** Date: **14.05.01**

7 Troubleshooting Hart

If the HART communication is not working, please verify following aspects:

1.   The converter has to be equipped with a Hart compatible current output module.
2.   The current output burden has to be between 250 and 500 ohms.
3.   The instrument's interface menu

Should the Hart communication not be working although all aspects turn out appropriate you should check on
 reception. The submenu "Acceptance Test" includes the function "HART-Command":
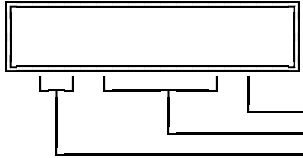

A non-working display is synonymous with a nonexistent reception. In this case, please use a oscilloscope or AC-DVM to examine whether or not the converter receives a HART signal at all. In general the signal level should amount to 1 mA_{pp}, so tha you received, e.g. a 1 mA_{pp} * 500 Ohm = 500 mV_{pp} signal with a burden of 500 ohms.
Should a signal arrive without the converter realizing it the signal is of a quality to poor to be detected.
In this case, please repeat the test under improved conditions.

Should the converter receive the HART Commands and the opposition (e.g. the hand-held communicator) nevertheless indicate a faulty condition, the converter has to be examined by means of an AC-DVM or an oscilloscope.
Use function test "HART commands" to carry out this examination:
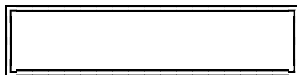
Subsequent to opening, the converter logically sends 0 (=2200Hz) and 1 (=1200Hz) subsequent to keystroke.

Using an oscilloscope, please ensure that the converter responds to the command.

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