

Profibus DP

Data Link Description

Converter in Remote Design
COPA-XM / MAG-XM for
Electromagnetic Flowmeter

D184B093U05 Rev. 03 / 06.2001



ABB



Data Link Description

50XM2000

Profibus DP

D184B093U05



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1 Condensed Description

The Profibus Data Link Module APG1000 provides the means to connect the converter to the Profibus DP in accordance with the DIN 19245 Standard as a passive instrument (slave). It is possible to request measurement values and to configure the instrument for flow metering. The instrument number can be set at the instrument keypad or over the Profibus.

2 Ident No.

The Ident No. has been assigned by the Profibus User Organization and is 6666_{hex} (26214_{dec})

3 Number of In- and Outputs

The number of in- and outputs, relative to the Master, is 16 Bytes

4 Configuration

Only a single configuration is available. The configuration byte is 3F_{hex} (63_{dec}). Any other configuration will not be accepted.

5 Parameter Entry

Parameters are entered as described in DIN 19245-3. User parameters are not available.

6 Diagnostics

The design of the diagnostic data corresponds to the descriptions in DIN 19245-3. User specific diagnostic data are not available.

7 Setting the Slave Address

There are two methods for setting the Slave Address:

1. Over the Bus as described in DIN 19245-3.
2. From the instrument keypad:

Menu Data Link

Submenu Slave_Adr

Set the address using the arrow keys (address range 000, 001 to 126) use always 3 digits (if submenu slave-adr is not available, input can be done by menu TAG number)

To 2. The TAG Number Menu originated in the HART-Protocol and is utilized for compatibility. It accepts the entry of letters. For Profibus only numbers may be used that are within the range listed above.

8 Baudrates

The Baudrates supported are:

9.6 kBaud
19.2 kBaud
45.45 kBaud
93.75 kBaud
187.5 kBaud
500 kBaud
1.5 MBaud

The baudrate is automatically recognized by the instrument.

9 GSD Files

The name of the GSD file is ABB_6666.GSD and is included with the shipment.

For the support of different languages additional files are available:

ABB_6666.GSE: english version (identical with the file GSD)

ABB_6666.GSG: german version

10 Variable Types

The variable types are categorized as:

1. Dynamic Variables

2. Static Variables

3. Constants

in blocks of 16 Bytes. Each block can contain a number of variables.

To 1: *Dynamic Variables*

include measurement values which are continuously changing, e.g. flowrate, temperature, totalizer values, etc.. The last four bytes in each block are always Error Register 1,2 and Status Register 1,2 in order to provide a means to check the validity of the measurement values. Dynamic variables are read only. The variable types within one block can be different.

To 2: Static Variables

are converter specific variables which do not change during operation but which can be reprogrammed, e.g. damping, Qmax, units totalizer, totalizer reset, temperature measurement ON/OFF, etc.. Static variables are blockwise readable and can be individually written to using an offset to Index 2 (see Writing Variables). The variable types within a block are always the same.

To 3: Constants

are converter specific values which cannot be changed, e.g. meter size, flowmeter primary type, etc.. Constants are read only. The variable types within a block are always the same.

11 Reading Variables

The variable are always read blockwise (16 Byte). The selection is made over an Index which is always located in Byte 1 and Byte 2. The response of the converter is the present value when Byte 1 and Byte 2 in the response are the same as the index sent by the Master (echoing). If the value FF_{HEX} (255_{dec}) appears in Byte 1 and Byte 2 then the converter is in the self test mode and operating values are not updated. The self test mode can only be initiated and reset locally from the converter keypad. If the Index sent is unknown by the converter, the response is always the dynamic variable block 1 (Index 1 = 1, Index 2 = 0).

Example: Read the dynamic variable block 1:

The Master sends (16 Byte):

Byte 1 1 (= Index 1 of dynamic variable block 1)
 Byte 2 0 (= Index 2 of dynamic variable block 1)
 Byte 3 to Byte 16 arbitrary values.

The converter responds with (16 Byte):

Byte 1 1 (= Index 1 of dynamic variable block 1)
 Byte 2 0 (= Index 2 of dynamic variable block 1)
 Byte 3 Word_high the percentage flowrate (Integer16)
 Byte 4 Word_low the percentage flowrate(Integer16)
 Byte 5 Octet 1 High the forward totalizer value (Unsigned32)
 Byte 6 Octet 2 the forward totalizer value (Unsigned32)
 Byte 7 Octet 3 the forward totalizer value (Unsigned32)
 Byte 8 Octet 4 Low the forward totalizer value (Unsigned32)
 Byte 9 Not used in this block
 Byte 10 Not used in this block
 Byte 11 Not used in this block
 Byte 12 Not used in this block
 Byte 13 Value of Error Register 1
 Byte 14 Value of Error Register 2
 Byte 15 Value of Status Register 1
 Byte 16 Value of Status Register 2

Example: Read the static variable block 1:

The Master sends (16 Byte):

Byte 1 16 (= Index 1 of static variable block 1)
 Byte 2 0 (= Index 2 of static variable block 1)
 Byte 3 to Byte 16 arbitrary values.

The converter responds with (16 Byte):

Byte 1 16 (= Index 1 of static variable block 1)
 Byte 2 0 (= Index 2 of static variable block 1)
 Byte 3 TAG Number
 Byte 4 Meter size
 Byte 5 Units totalizer
 Byte 6 Units Qmax
 Byte 7 Log Register 1
 Byte 8 Log Register 2
 Byte 9 (Write only)
 Byte 10 (Write only)
 Byte 11 Not used in this block
 Byte 12 Not used in this block
 Byte 13 Not used in this block
 Byte 14 Not used in this block
 Byte 15 Not used in this block
 Byte 16 Not used in this block

In order to increase the resolution for some values, they are multiplied by factors of x10,x100,x1000.

Example: Factors:

Factor x1000:
 Density = 1.123 kg/m³
 is represented by 1123.

Factor x100:
 Percentage flowrate = 51.12%
 is represented by 5112.

Factor x10:
 Temperature = 23.1 °C
 is represented by 231.

12 Writing Variables

When writing variables, in a manner similar to reading, first select the variable block, using Byte 1 and Byte 2 (=Index 1 and Index 2), in which the variable to be changed is located. In Index 2 add the position of the variable in this block (not the Byte-Position !). Byte 3 to Byte n, dependent on the variable type, contain the new value. For new values with multiplication factors it is important to consider the multiplication factors x10,x100,x1000 ! The converter responds with the Index 1 and Index 2 values that were sent and in Byte 3 to Byte n the present value stored in the converter. If this value is not the same as the value sent then it was not accepted, e.g. when the value is outside of the entry range, The converter will continue to sent the present variable value until the Master sets the Index again at the beginning of the block or in another block.

**Example: Write damping value in static variable block 2:**

The Master sends (16 Byte):

Byte 1 16 (16 = Index 1 of static variable block 2)
Byte 2 18 (16+2 = Index 2 of static variable block 2, 2nd variable is Damping)
Byte 3 Word_high Damping= 1
Byte 4 Word_low Damping=244 (Example: 5 sec x100 = 500 = 1*256+244)
Byte 5 to Byte 16 arbitrary value.

The converter responds with (16 Byte):

Byte 1 16 (16 = Index 1 of static variable block 2)
Byte 2 18 (16+2= Index 2 of static variable block 2, 2nd variable is Damping)
Byte 3 Word_high Damping= 1
Byte 4 Word_low Damping=244 (Example: 5 sec x100 = 500 = 1*256+244) Byte 5 to Byte 16 arbitrary value.

after the change is completed.

Example: RESET the totalizer; static variable block 1:

The Master sends (16 Byte):

Byte 1 16 (16 = Index 1 of static variable block 1)
Byte 2 9 (0+9 = Index 2 of static variable block 1, 9th variable is RESET)
Byte 3 to Byte 16 arbitrary value, since it is only a single function without any change in value.

The converter responds with (16 Byte):

Byte 1 16 (16 = Index 1 of static variable block 1)
Byte 2 9 (0+9 = Index 2 of static variable block 1, 9th variable is RESET)
Byte 3 to Byte 16 arbitrary value, since it is only a single function without any change in value.

after the totalizer is RESET.

13 Functions in the Data Link Menu Functions in the Data Link Menu

The following parameters in the Data Link menu can be requested:

Adress	Slave Address
Adr.Chg	Change the Slave Address
Id.No.H	Ident Number High Byte
Id.No.L	Ident Number Low Byte
Conv Id	Identification number of the converter
Wdstate	Watchdog status: 0=Baud Search, 1= Baud Control, 2= DP Control
Initerr	Initialization error
Dpstate	DP Status: 0= Wait Prm, 1 = Wait Cfg, 2= Data Exchange
BDrate	Baudrate(kBaud): 3=1500;4=500;5=187.5;6=93.75;7=45.45;8=19.2;9=9.6
Accviol	Access error
GC com	Global Control command
Release	Revision level
OffPass	0=Offline,1=Passive Idle
MUcomu	Status data exchange converter
FreemeH	Free memory High Byte



FreememL	Free memory Low Byte
EventsH	Events High Byte
EventsL	Events Low Byte
INTconH	Interrupt High Byte
INTconL	Interrupt Low Byte
Prmstat	Station status (Parameter entry)
PrmWdf1	Watchdog Factor 1 (parameter entry)
PrmWdf2	Watchdog Factor 2 (parameter entry)
PrmTSDR	Min TSDR (parameter entry)
PrmID H	Ident No. High (parameter entry)
PrmID L	Ident No. Low (parameter entry)
PrmGrID	Group ID (parameter entry)
PrmSpUs	Special user byte (parameter entry)
Prm OK	Parameter entry OK= 0; parameter entry not OK = 255 (parameter entry)
Prm Len	Parameter length (parameter entry)
CfgData	Configure byte (configuration)
CfgRslt	Status of the configuration
Cfg OK	Configuration OK = 17; configuration not OK = 51; configuration changed = 32
Cfg Len	Configuration length
DiagFlg	Diagnostic flag
DiagLen	Diagnostic length
Out 1	
to	
Out 16	Byte 1 to Byte 16 last sent from Master
In 1	
to	
In 16	Byte 1 to Byte 16 last response from slave
VerB173A	Software

While the self test functions are active the data in In1 to In16, Out1 to Out16 are not updated. **This also applies to the measurement values which are sent to the Master !** An active self test function is indicated to the Master through the setting of Indices 1 and 2 (Byte 1 and Byte 2 in the data block) to 255_{dec}.

14 Terminal Designations

V1	B	RxD/TxD-P	Receive/Send Data-P
V2	A	RxD/TxD-N	Receive/Send Data -N
V4		VP	Supply voltage plus (P5V)
G2	C	DGND	Data common potential (M5V)



15 Variable Blocks 50XM2000

15.1 Dynamic Variables

15.1.1 Dynamic Variable Block 1

Contents	Variable Type	Position in 16 Byte Block
Index 1 = 1	Unsigned8	1
Index 2 = 0	Unsigned8	2
Percent Flowrate * 100	Integer16	3,4
Forward Direction Totalizer	Unsigned32	5,6,7,8
Forward Direction Overflow Counter	Unsigned8	9
Error Register 1	Unsigned8	13
Error Register 2	Unsigned8	14
Status Register 1	Unsigned8	15
Status Register 2	Unsigned8	16

15.1.1.1 Percent Flowrate

Indication of present flowrate in %. A negative value is indicated for the reverse flow direction.

15.1.1.2 Forward Totalizer

Totalizer value for the forward direction. For units see "Units totalizer"

15.1.1.3 Forward Overflow Counter

Number of totalizer overflows

15.1.1.4 Error Register 1

The Error-Register 1 is sent bitwise (from Bit 7 to Bit 0):

Bit	Definition
0	Error 0 Empty pipe
1	Error 1 A/D Converter saturated
2	Error 2 Uref too small
3	Error 3 Flowrate > 130 %
4	Error 4 External zero return
5	Error 5 Defective EEPROM
6	Error 6 Totalizer corrupted
7	Error 7 Urefp too large

15.1.1.5 Error Register 2

Indications same as Error Register 1. The individual bits have the following definition:

Bit	Definition
0	Error 8 (Urefn too large)
1	Error 9 (Excitation error)
2	Max-Alarm
3	Min-Alarm
4	Error C (Primary data)
5	Function test active
6	Error 6v (Forward totalizer defective)
7	Error 6r (Reverse totalizer defective)

15.1.1.6 Status Register 1

8-Bit Register. Indication of the corresponding decimal value. The individual bits have the following definition:

Bit	Definition
0	Forward totalizer overflow
1	Reverse totalizer overflow
2	The present flow range set in the operating modes "2FR.,ext" and "2FR.,auto". 0 = Qmax 1 1 = Qmax 2
3	New parameter entered from keypad
4	An adjustment routine is active
5	Flowrate is below the low flow cutoff range
6	End contact (in the Operating Mode "Preset Totalizer")
7	Instrument alarm. Alarm activated see "Error Register 1" and "Error Register 2"

15.1.1.7 Status Register 2

8-Bit Register. Indication of the corresponding decimal value. The individual bits have the following definition:

Bit	Definition
0	For internal use
1	For internal use
2	Present flow direction. 0 = Reverse 1 = Forward
3	Not used



- 4 Test Mode active (Function Test with Simulator)
- 5 **Power supply breakdown identification**
- 6 Not used
- 7 Not used

15.1.2 Dynamic Variable Block 2

Contents	Variable Type	Position in 16 Byte Block
Index 1 = 1	Unsigned8	1
Index 2 = 16	Unsigned8	2
Volume flowrate in engineering units * 1000	Integer32	3,4,5,6
Reverse totalizer	Unsigned32	7,8,9,10
Reverse overflow counter	Unsigned8	11
Error Register 1	Unsigned8	13
Error Register 2	Unsigned8	14
Status Register 1	Unsigned8	15
Status Register 2	Unsigned8	16

15.1.2.1 Volume Flowrate in Engineering Units

Flowrate in direct reading engineering units.
Units see "Units Qmax"

15.1.2.2 Reverse Totalizer

Reverse direction totalizer value. Units see "Units totalizer"

15.1.2.3 Reverse Overflow Counter

Number of totalizer overflows

Error Register 1 and Error Register2, Status Register1 and Status Register 2 same as Dynamic Variable Block 1 !



15.2 Static Variables

15.2.1 Static Variable Block 1

Contents	Variable Type	Position in 16 Byte Block
Index 1 = 16	Unsigned8	1
Index 2 = 0	Unsigned8	2
TAG Number = DP Slave Address	Unsigned8	3
Meter size	Unsigned8	4
Units totalizer	Unsigned8	5
Units Qmax	Unsigned8	6
Log Register 1	Unsigned8	7
Log Register 2	Unsigned8	8
Unused	Unsigned8	9
RESET Log Register 1 (write only)	Unsigned8	10
RESET Forward totalizer (write only)	Unsigned8	11
RESET Reverse totalizer (write only)	Unsigned8	12

15.2.1.1 TAG Number = DP Slave Address

The TAG Number is also the DP Slave Address. **Changes to the Slave Address should only be made from the keypad or by using the Set Slave Address Service in the Profibus DP !**

15.2.1.2 Meter Size

Indication of the meter size by a code number.

Code Meter size
Number

000	3	1/10"
001	4	5/32"
002	5	3/16"
003	6	1/4"
004	8	5/16"
005	10	3/8"
006	15	1/2"
007	20	3/4"
008	25	1"
009	32	1-1/4"
010	40	1-1/2"
011	50	2"
012	65	2-1/2"
013	80	3"
014	100	4"
015	125	5"
016	150	6"



017	200	8"
018	250	10"
019	300	12"
020	350	14"
021	400	16"
022	450	18"
023	500	20"
024	600	24"
025	700	28"
026	750	30"
027	800	32"
028	900	36"
029	1000	40"
030	1100	42"
031	1200	48"
032	1300	50"
033	1400	54"
034	1500	60"
035	1600	64"
036	1700	66"
037	1800	72"
038	2000	78"
039	2100	84"
040	2200	88"
041	2300	92"
042	2400	96"
043	1	1/25"
044	1.5	1/16"
045	2	3/32"
046	1350	52"

15.2.1.3 Units Totalizer

Indication of the totalizer units by a code number with the following definition:

Code Number	Unit
----------------	------

000	l
001	hl
002	m3
003	igal
004	gal
005	mgal
006	bbl
007	bls
008	kg



009	t
010	g
011	ml
012	mlt
013	lbs
014	uton
015	user programmable unit

15.2.1.4 Units Qmax

Indication of the Qmax units by a code number with the following definition:

Code Number	Unit
000	l/s
001	l/min
002	l/h
016	hl/s
017	hl/min
018	hl/h
032	m ³ /s
033	m ³ /min
034	m ³ /h
048	igal/s
049	igal/min
050	igal/h
064	mgd
065	gpm
066	gph
080	bbbl/s
081	bbbl/min
082	bbbl/h
096	bls/day
097	bls/min
098	bls/h
112	kg/s
113	kg/min
114	kg/h
128	t/s
129	t/min
130	t/h
144	g/s
145	g/min
146	g/h
160	ml/s
161	ml/min

162	ml/h
176	mlt/min
177	mlt/h
178	mlt/d
192	lbs/s
193	lbs/min
194	lbs/h
208	uton/min
209	uton/h
210	uton/d
224	Prog.units/s
225	Prog.units/min
226	Prog.units/h

15.2.1.5 Log Register 1

See "Error Register 1"

Differences from the Error Register:

The contents of the Error Log Register are not automatically reset. Errors once detected remain stored and must be manually reset.

A further difference:

Bit 5 is set in the Error-Log-Register when the data in the RAM area no longer coincides with the data in the EEPROM causing a Restart to be released.

15.2.1.6 Log Register 2

See Error Register 2

15.2.1.7 RESET Log Register 1 and 2

Resets the both Error Log Registers

15.2.1.8 RESET Forward Totalizer

Clears the forward totalizer and the overflow counter

15.2.1.9 RESET Reverse Totalizer

Clears the reverse totalizer and the overflow counter

15.2.2 Static Variable Block 2

Contents	Variable Type	Position in 16 Byte
----------	---------------	---------------------



		Block
Index 1 = 16	Unsigned8	1
Index 2 = 16	Unsigned8	2
Low flow cutoff value [%] * 100	Unsigned16	3,4
Damping* 100	Unsigned16	5,6
System zero * 10	Integer16	7,8
Density *1000	Unsigned16	9,10

15.2.2.1 Low Flow Cutoff Value [%]

Programming the low flow cutoff value %.

Data range: 0 * 100 to 10 * 100

15.2.2.2 Low Flow Cutoff Value [%]

Programming the low flow cutoff value %.

Data range: 0 * 100 to 10 * 100

15.2.2.3 Damping

Damping in seconds.

Data range:

0.5 * 100 to 100 * 100 (6 1/4 Hz)

0.25 * 100 to 100 * 100 (12 1/2 Hz)

0.125 * 100 to 100 * 100 (25 Hz)

15.2.2.4 System Zero

Programming the system zero value in Hz. A negative entry indicates reverse flow.

Data range: $\pm 500 * 10$ Hz

15.2.2.5 Density

Density in g/cm^3 .

Data range: 0.01 * 1000 to 5 * 1000



15.2.3 Static Variable Block 3

Contents	Variable Type	Position in 16 Byte Block
Index 1 = 16	Unsigned8	1
Index 2 = 32	Unsigned8	2
Qmax 1 * 1000	Unsigned32	3,4,5,6

15.2.3.1 Qmax 1

Programming the Qmax value.

Units see "Units Qmax"

In the operating modes "2 FR.,ext." and "2 FR.,auto." the value of "Qmax 1" is set, in the operating mode "2 FR.,F/R" the value of "Qmax →F".

Data range: 0.05 * 1000 to 1.5 * 1000 QmaxDN

15.2.4 Static Variable Block 4

Contents	Variable Type	Position in 16 Byte Block
Index 1 = 16	Unsigned8	1
Index 2 = 48	Unsigned8	2
Operating mode	Unsigned8	3
Filter ON/OFF	Unsigned8	4
Excitation frequency	Unsigned8	5
Totalizer function	Unsigned8	6

15.2.4.1 Operating Mode

Setting the operating mode using a code number. The operating mode setting can be requested in "Mode Register 2".

Code Number Operating Mode

0	Standard
1	2 FR., ext.
2	2 FR., auto.
3	Fast
4	Preset totalizer
5	2 FR., F/R (Forward/Revers)

15.2.4.2 Filter ON/OFF

Filter on / off.
0 =off, 1 = on.

The present setting can be requested in "Mode Register 2".

15.2.4.3 Excitation Frequency

Programming the excitation frequency using a code number.

Code Excitation
Number

0	6 1/4 Hz AC/DC
1	7 1/2 Hz AC/DC
2	12 1/2 Hz AC/DC
3	15 Hz AC/DC
4	25 Hz AC/DC
5	30 Hz AC/DC
6	6 1/4 Hz DC
7	7 1/2 Hz DC
8	12 1/2 Hz DC
9	15 Hz DC
10	25 Hz DC
11	30 Hz DC
12	3 1/8 Hz DC
13	3 3/4 Hz DC
14	Negative continuous excitation
15	Positive continuous excitation

15.2.4.4 Totalizer Function

The desired totalizer function can be set using a code. The present function can be requested in "Mode Register 2".

Code Number Totalizer Function

0	Standard (2 separate totalizers for forward and reverse flow)
1	Difference totalizer

15.2.5 Static Variable Block 5

Contents	Variable Type	Position in 16 Byte Block
Index 1 = 16	Unsigned8	1
Index 2 = 64	Unsigned8	2
Pulse factor * 10	Unsigned16	3,4
Pulse width * 10	Unsigned16	5,6

15.2.5.1 Pulse Factor

Pulse factor for the scaled pulse output.
Data range: $0.001 * 10$ to $1000 * 10$.

15.2.5.2 Pulse Width

Pulse width for the scaled pulse output in ms.
Data range: $0.064 * 10$ to $2000 * 10$.

15.2.6 Static Variable Block 8

Contents	Variable Type	Position in 16 Byte Block
Index 1 = 16	Unsigned8	1
Index 2 = 112	Unsigned8	2
Empty pipe detector	Unsigned16	3,4

15.2.6.1 Empty Pipe Detector

Threshold of the EPD:

Data range: 0 to 3000



15.2.7 Static Variable Block 9

Contents	Variable Type	Position in 16 Byte Block
Index 1 = 16	Unsigned8	1
Index 2 = 128	Unsigned8	2
Qmax 2 * 1000	Unsigned32	3,4,5,6
Preset totalizer * 1000	Unsigned32	7,8,9,10

15.2.7.1 Qmax 2

In the operating modes "2 FR.,ext." and "2 FR.,auto." the value of "Qmax 2" is set, in the operating mode "2 FR.,F/R" the value of "Qmax ←R". Units see "Units Qmax"

Data range: $0.05 * 1000$ to $1.5 * 1000$ QmaxDN

⚠ ATTENTION ⚠

In the operating mode "Preset Totalizer" this parameter should not be programmed !

15.2.7.2 Preset Totalizer

Preset totalizer (can only be used in operating mode "Preset Totalizer"). Units see "Units Totalizer".

⚠ ATTENTION ⚠

Only in the operating mode "Preset Totalizer" this parameter is allowed to be programmed !

15.2.8 Static Variable Block 22

Contents	Variable Type	Position in 16 Byte Block
Index 1 = 32	Unsigned8	1
Index 2 = 80	Unsigned8	2
Empty pipe detector ON/OFF	Unsigned8	3

15.2.8.1 Detector Empty Pipe ON/OFF

0 off
1 on

15.3 Constants

15.3.1 Constant Block 1

Contents	Variable Type	Position in 16 Byte Block
Index 1 = 0	Unsigned8	1
Index 2 = 16	Unsigned8	2
Converter recognition	Unsigned8	3

15.3.1.1 Converter Recognition

The code numbers are:

XH1000	02
XM1000	03
A5400	07
SM1000	08
ES7000	09
XP1000	10
XM2000	12
XE4000	13
XH2000	14
VM1000	15
MM2000	16
D10A5486	17
XF4000	18
UD2000	19

15.3.2 Constant Block 2

Contents	Variable Type	Position in 16 Byte Block
Index 1 = 0	Unsigned8	1
Index 2 = 32	Unsigned8	2
QmaxDN * 1000	Unsigned32	3,4,5,6
Instrument number	Unsigned32	7,8,9,10

15.3.2.1 QmaxDN

Indication of QmaxDN. Units see "Units Qmax"

15.3.2.2 Instrument Number

Indication of the converter instrument number

15.3.3 Constant Block 4

Contents	Variable Type	Position in 16 Byte Block
Index 1 = 0	Unsigned8	1
Index 2 = 64	Unsigned8	2
Mode Register 1	Unsigned8	3
Mode Register 2	Unsigned8	4

15.3.3.1 Mode Register 1

8-Bit Register. Indication of the corresponding decimal value. The individual bits have the following definition:

Bit	Contents	Definition
0		Empty pipe detector
	0	Off
	1	On
1		Direction indication
	0	Normal
	1	Inverse
2		QmaxDN
	0	Fixed
	1	Programmable
3	-	
4		Flow direction
	0	Forward-/reverse
	1	Forward
5		QmaxDN velocity.
	0	10 m/s
	1	33.33 ft/s



6		Filter
	0	Off
	1	On
7		-

15.3.3.2 Mode Register 2

8-Bit Register. Indication of the corresponding decimal value. The individual bits have the following definition:

Bit	Contents	Definition
0		Totalizer mode
	0	Standard
	1	Difference totalizer
1		Supply voltage
	0	AC
	1	DC
2		Entry limits Qmax
	0	Qmax ≥ 0.05 QmaxDN
	1	Qmax ≥ 0.02 QmaxDN
3		Alarm empty pipe detector
	0	Off
	1	On
4		Operating mode
5		Operating mode
6		Operating mode
7		Operating mode

Bit 7, 6, 5, 4	Mode
0 0 0 0	Standard
0 0 0 1	2 FR., F/R
0 0 1 0	2 FR., ext.
0 0 1 1	2 FR., auto
0 1 x x	fast
1 1 x x	preset totalizer



ABB Automation Products GmbH

Dransfelder Str. 2, D-37079 Goettingen

Tel.: +49 (0) 5 51 9 05 - 0

Fax: +49 (0) 5 51 9 05 - 777

<http://www.abb.com/automation>