System Technology

Remote Operation Instructions

HART® Communicator 275
Asset Management Solutions (AMS)

BM102
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1 General Information
The BM102 is a two-wire transmitter with 4..20mA current output and HART® capability.

General characteristics of the BM102 HART® interface:
- Multidrop Mode is supported.
- Burst Mode is not supported.
- The digital process value which is modulated on to the analog output signal as well as the analog value itself are low-pass filtered.

Electrical connection (point-to-point or multidrop): refer to sections HART® Communication and Electrical connection of the „Installation and Operating Instructions Manual. MicroFlex BM102“.

2 HART® Transmitter Revisions and Instrument Firmware

2.1 Device Revision
The BM102 HART® transmitter has only one revision: Device revision 1.

2.2 DD Revision
MicroFlex BM102 has the DD revision 1.
- It is capable to work both with AMS (1.4, 1.4.1, 5.0) and HC275.
3  HART® Communicator 275 (HC275)

3.1  Installation
The HC275 has to be programmed with the BM102 HART® Device Description (DD). Otherwise
the HC275 user can only use the generic commands of the HC275 without being able to access the
entire instrument control.

3.2  Operating
Refer to the BM102 Menu Tree HC275 (Attachment A).
The BM102 operating concept is based on the HART® DD for generic devices with the following
differences:
• There are additional specific parameters such as Probe length, Tank height, Dead zone,
  Thresholds…
• There are additional specific commands for the device calibration:
  Offset calibration, Automatic probe length calculation…
• Display format dependent on measuring range
• BM102 specific status messages can be displayed
• To “open” service functionality the user has to log in as specialist. To do this, one should invoke
  the “Service Code” command (item 3 ✶ 2 of the HC275 Menu Tree) and enter the correct
  service password. After the HC275 is switched off (or the same command is invoked with a
  wrong service password) specialist authorization is lost, and all service parameters/functions
  again become inaccessible.

Without the BM102 HART® DD, we can only modify the current output configuration. This is the
reason why it is difficult to install and configure the device without the specific DD.

3.3  Offline mode
Offline parameters:
  Unit Name, Unit Factor,
  Length Unit, Volume Unit,
  Tank height, Probe Length, Dead Zone, Detection Delay, Time Constant,
  PV, SV, TV, QV,
  Function I, Range I, Error Delay, Scale I min, Scale I max,
  Tag, Message, Descriptor, Date.

Restriction:
If PV and Function I are not equals, error messages could appear during configuration transfers.
Attention: Scale I min, Scale I max are linked to Function I and PV.
4 Asset Management Solutions (AMS)

4.1 Installation

- Refer to the “AMS Installation Guide” (Fisher Rosemount): “Installing Modems” (section 5) and “Wiring Diagrams” (appendix B).

- AMS Configuration:
  If the BM102 Device Description is not already installed on the AMS System an “BM102 Device Installation Kit” (on floppy disk / CD-ROM from KROHNE) is required.
  When installing the DD with the Installation Kit refer to:
  AMS 1.4: “AMS User’s Guide” (Fisher Rosemount), section 4 ➔ “Adding New Device Types to AMS” ➔ “Install Device Types Manually”.
  AMS 5.0: “AMS User’s Guide” (Fisher Rosemount) ➔ “Adding New Device Types to AMS” ➔ “Install Device Types Manually”.

4.2 Operating

Refer to the BM102 Menu Tree AMS (Attachment B).

Some additional comments:

- To “open” service functionality, the user has to log in as specialist. To do this, one should invoke the “Service Code” method from the Device Context Menu and enter the correct service password. Note, that after the Device Connection View is reopen (or the same method is invoked with a wrong service password) specialist authorization is lost, and all service parameters/functions (D/A trim, Reset user EEPROM, Reset factory EEPROM…) again become inaccessible.

- Compared with HC275 or PC-Star2 configuration tools, the BM102/AMS application has one additional function, which is the HART® Common-Practice Apply values method. The latter assigns to the PV Upper/Lower Range magnitude value of the applied process.

- In contrary to the HC275, handling of the Strap Table within AMS can be carried out in two ways:
  - 1. The old scheme (Strap table input, Strap table suppress methods).
  - 2. Controlled directly from the configuration displays. Due to transmitter implementation, some steps should be sequentially undertaken to create or change the table from configuration displays. The matter is that all the changes in table of elements are initially accumulated in the instrument memory. The trigger event, that permits the settling of the strapping table in the EEPROM, is the Command #143 (Conversion Table Number). It is a single parameter command with the ‘Number of points’ as variable (configuration display “Strap Table”). It is the only command that initiates the strap table and in case it was plausible, it activates the settling of the EEPROM. As every point of the strap table relies on the variable “number of points” (in term of acceptance), and considering that this number of points has been set before, the user could see on the display: “error table non monotonous”. Subsequently, the strapping table (every item) is written in RAM. For EEPROM records (non volatile memory) you need to transmit to the device the number of table points. That means by reentering the number (say, 10 to 10, or 4 to 4) and press “Apply” again.

All comments above can be summarised as following:

1. If the number of points is changed (with or without changes of the table contents), the user should ignore the first possible error response after pressing ‘Apply’ (‘Table not monotonous’ happened writing ‘Number of points’), “change” the number of points again to the desired amount (i.e. reenter exactly the same value) and again press ‘Apply’.

2. If the number of points is preserved but some table items are changed, the user should press ‘Apply’ (thus transferring changed items to device), then reenter the number of points (as above)
and press ‘Apply’ again - otherwise the updated point(s) will be active only until the first power reset.

- **Attention:** While executing function “Re-Start BM102”, error messages could appear (“error reading xxx: field device did not respond”). This is due to the fact that AMS tries to refresh its values while the BM102 is not able to answer (initial self test : about 30 seconds).
  - After having executed this function, just close all AMS screens concerning the field device (Process variable screens, Configuration properties screens,…) and reopen the desired AMS screens.
  - While changing the threshold value, a pre-edit action is executed in order to refresh the distance value.
  - Calibration Management functions are not supported.

### 4.3 Shortcomings

- With AMS 5.0, when we create or erase a volume table, the window “Process Variable“ could not be refreshed (bargraphs of volume measurements are not displayed or removed). We must close the window and open a new one to solve the problem.
- When we import a configuration from the HART™ communicator (data type = Standard) to AMS (import offline configuration), the values of 2 parameters are asked: *Function I* and the *Number of point* of the volume table.
  - *Function I* items could not be available. First enter the number of point (0), after that click on the window (anywhere). The *Function I* items should now be available.
- If we use the “Full (for PC)” data type, there is no problem when saving the configuration on the HART Communicator and transferring it to AMS (and vice versa). In case do not login as specialist, specialist parameters will not be saved. Moreover when sending data to the device, 3 errors messages could appear when we want to write the “Gain”, the “Release number” and the “Electronic offset”. These messages appear because there is no write-command for these parameters. We can not modify them directly (their values are calculated automatically by the device). This is the reason why we can not transfer the value of these parameters from one device to an other. Don’t worry about these messages.
- With AMS, in Offline Configuration, when we get a configuration from the history and when we transfer it to the device, we could have the following 2 errors:
  - Error writing Lev,
  - Table not monotonous.
  The second message can appear even if there is no volume table (number of point = 0). Don’t worry about these messages.
5 Status Meaning

- Meaning of General Status Messages:

<table>
<thead>
<tr>
<th>Status Message</th>
<th>Meaning</th>
</tr>
</thead>
<tbody>
<tr>
<td>Configuration Changed</td>
<td>Appears whenever a configuration parameter is changed.</td>
</tr>
<tr>
<td>More Status Available</td>
<td>Set when there is more information to read.</td>
</tr>
<tr>
<td></td>
<td>HC275: Execute function “Watch Status”</td>
</tr>
<tr>
<td></td>
<td>AMS: Go to the “Status” window</td>
</tr>
<tr>
<td>Primary Variable Analog Output Fixed</td>
<td>Set when:</td>
</tr>
<tr>
<td></td>
<td>• Device is set to Multidrop Mode</td>
</tr>
<tr>
<td></td>
<td>(Polling Address ≠ 0)</td>
</tr>
<tr>
<td></td>
<td>• Fixed Current Mode is entered</td>
</tr>
<tr>
<td></td>
<td>(during Loop Test and DAC Trim)</td>
</tr>
<tr>
<td>Analog Output Saturated</td>
<td>During normal operation the maximum value for analog output is 20mA. In case the Process Value (PV) reaches the upper sensor limit the analog output and its digital value is saturated at 20mA and the flag is set.</td>
</tr>
</tbody>
</table>

- Meaning of Transmitter Specific Status Messages:

<table>
<thead>
<tr>
<th>Status Message</th>
<th>Meaning</th>
</tr>
</thead>
<tbody>
<tr>
<td>Invalid selection</td>
<td>You have chosen a non valid item</td>
</tr>
<tr>
<td>Passed parameter too large</td>
<td>Value too large for the parameter</td>
</tr>
<tr>
<td>Passed parameter too small</td>
<td>Value too small for the parameter</td>
</tr>
<tr>
<td>Too few data bytes</td>
<td>There are not enough bytes transmitted</td>
</tr>
<tr>
<td>In write protect mode</td>
<td>Protection against writing</td>
</tr>
<tr>
<td>Update failure</td>
<td>The BM102 is not able to measure.</td>
</tr>
<tr>
<td>Lower range value too high</td>
<td>The value of the range is incorrect</td>
</tr>
<tr>
<td>Applied process too high</td>
<td>Message appears when the PV range values are incorrect (method Apply values)</td>
</tr>
<tr>
<td>Not in proper current mode</td>
<td>Appear if the current output is not fixed while we execute the method DAC Trim</td>
</tr>
<tr>
<td>Can not change active password</td>
<td>Appears if the passed password is incorrect</td>
</tr>
<tr>
<td>Table non monotonous</td>
<td>Appears if the volume table is not monotonous</td>
</tr>
<tr>
<td>Lower range value too low</td>
<td>The value of the range is incorrect</td>
</tr>
<tr>
<td>Applied process too low</td>
<td>Message appears when the PV range values are incorrect (method Apply values)</td>
</tr>
<tr>
<td>Upper range value too high</td>
<td>The value of the range is incorrect</td>
</tr>
<tr>
<td>Multidrop mode</td>
<td>Appears if we are in multidrop mode and we want to fixe a value on the current output</td>
</tr>
<tr>
<td>Illegal password symbol</td>
<td>The characters of the passed password are incorrect. They must be ‘E’, ‘R’ or ‘U’</td>
</tr>
<tr>
<td>Upper range value too low</td>
<td>The value of the range is incorrect</td>
</tr>
<tr>
<td>Invalid units code</td>
<td>The unit is not supported by the BM102</td>
</tr>
<tr>
<td>Invalid function</td>
<td>The result of the function is incorrect.</td>
</tr>
<tr>
<td>Invalid password</td>
<td>Can not enter Specialist menu because the password is incorrect.</td>
</tr>
<tr>
<td>Access restricted</td>
<td>When the customer password is set, this message appears if we want to modify a parameter.</td>
</tr>
<tr>
<td>Invalid range units code</td>
<td>Appears if the unit of the range is incorrect</td>
</tr>
</tbody>
</table>
| Device busy                                | Appears when the device is busy. Normally it appears when the
<table>
<thead>
<tr>
<th>Message</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Not implemented</td>
<td>Appears if the command sent to the device is not implemented in the device.</td>
</tr>
</tbody>
</table>
| First Parameter too high (first member of the couple too high) | Some parameters are handled in couples. When a member of a couple is written, the other member is also written. When one of this message occurs, one of the member of the couple is incorrect. These couples are:  
  - Tank height / Probe length  
  - Dead zone / Detection delay  
  - Threshold value / Threshold distance  
  - Optional unit name / Optional unit factor  
  - Offset of measure / Period of measure  
  - Electronics Calspeed / mechanical calspeed  
  - Epsilon R / “Set value” of Electronic offset |
| First Parameter too low (first member of the couple too low) |                                                                                  |
| Second Parameter too high (second member of the couple too high) |                                                                                  |
| Second Parameter too low (second member of the couple too low) |                                                                                  |
6 Attachment A

BM102 Menu Tree HC275

1 Process Var.
  1 Measurements
    1 Function I
      2 I
      3 %
  2 Input/Outputs

2 Config./Test
  1 Operation
    1 Test Output (M)
  2 Test
  3 Service

3 Access Rights

4 Watch Status (M)

5 HART Variables
  1 Measurements
    1 Level
    2 Distance
    3 Volume/Mass/Flow ★
    4 Ullage Volume/ Mass/Flow ★
  2 Input/Outputs
    1 Function I
    2 I
    3 %

Designations:

- refer to the next page
- method is invoked to retrieve/change data
- method is invoked to retrieve/change data
- method is invoked to retrieve/change data
- subsists and is displayed only when the Strap Table exists

1 Basis Parameters
  1 Length
    1 Volume Unit
    2 Display Format (L)
    3 Define New Unit
  2 Display
  3 Analog Output
  4 User Data
    1 Function I
    2 Range I
    3 Error Delay
    4 Scale I min
    5 Scale I max

5 Application
  1 Threshold
  2 Distance Input(M)
  3 Detection Delay
  4 Search Probe End (M)
  5 Reset BM102 (M)

6 Serial I/O
  1 Poll Address

7 Strap Table
  1 Volume unit
  2 Input table (M)
  3 Delete table (M)

1 Tank Height
2 Probe Length
3 Time Constant
4 Dead Zone
5 Sensor Info

1 Snr Upper Lim
2 Snr Lower Lim
3 Snr Min Span

Designations:

- refer to the next page
- method is invoked to retrieve/change data
- method is invoked to retrieve/change data
- method is invoked to retrieve/change data
- subsists and is displayed only when the Strap Table exists
BM102 Menu Tree HC275

1 Process Var.

2 Config./Test

3 Access Rights

4 Watch Status (M)

5 HART Variables

1 Operation

2 Tests

3 Service

1 Basis Parameters

1 Offset of Measure

2 Probe Type

3 Application Type

4 Epsilon R  

1 Voltage Values. (M)

2 Watch Pulses (M)


4 Problem History (M)

2 Application

3 Calibration

4 EEPROM Reset

1 Current Output (M)

2 Elec. Cal. Speed

3 Mech. Cal. Speed

4 Electronic Offset (M)

5 Auto Offset Measure (M)

6 Set Ref. Frequency

1 User Reset (M)

2 Factory Reset (M)

3 Identification (M)

Designations:

- refer to the previous page

(M) - method is invoked to retrieve/change data

- subsists and is displayed only when “Application Type”= “2 Products – 1 Level”

- - subsists and is displayed only when “Application Type”= “2 Products – 1 Level”
7 Attachment B

BM102 Menu Tree AMS

Process Variables Status
Diagnostics and Test
Calibrate
Re-start BM102
Master reset
Reset user EEPROM
Reset factory EEPROM
Change Maintenance Access
Get Specialist Authorization
Audit Trail
Drawing Notes ...
Help ...
Clear Offline Configuration
Compare Configurations
Configuration Properties

Measurements
• Level
• Distance
• Volume/Mass/Flow
• Ullage Volume/Mass/Flow

Analog Output
• Analog Output Value
• PV Percent of Range

Calibration Management
D/A trim
Apply values

Overview
• Primary variable out of limits
• Non-primary variable out of limits
• Primary variable analog output saturated
• Primary variable analog output fixed
• Cold start
• Configuration changed
• Field device malfunction

Fatal Errors
Hardware :
• Error: EEPROM problem
• Error: RAM problem
• Error: Incorrect checksum ROM
• Error: Analog to Digital converter does not work correctly
• Error: Gains do not work correctly
• Error: Electronic offset out of limits

Voltage :
• Error: Incorrect value for +3.3 volts
• Error: Incorrect value for -3.3 volts
• Error: Incorrect value for VCO1 voltage
• Error: Incorrect value for VCO2 voltage

Param :
• Error: Incorrect checksum for bank0 user
• Error: Incorrect checksum for bank0 factory
• Error: Incorrect checksum for bank1 user
• Error: Incorrect checksum for bank1 factory

Pulses :
• Delay out of limits
• Reference not found
• Flange not found
• Error : FPGA
• Error : FPGA Parity

Warnings
• Full tank
• Empty tank
• Level lost

Designations:
☆ - subsists and is displayed only when the Strap Table exists
→ - refer to the next page

KROHNE BM102 45ec01
BM102 Menu Tree AMS

**Designations:**
- (L) - Local AMS variable, that is not read/written to instrument
- * - Read-only variable

<table>
<thead>
<tr>
<th>Process Variables</th>
<th>Status</th>
</tr>
</thead>
<tbody>
<tr>
<td>------------------</td>
<td>--------</td>
</tr>
<tr>
<td>------------------</td>
<td>--------</td>
</tr>
<tr>
<td>Diagnostics and Test</td>
<td>Calibrate</td>
</tr>
<tr>
<td>------------------</td>
<td>--------</td>
</tr>
<tr>
<td>Master reset</td>
<td></td>
</tr>
<tr>
<td>Reset user EEPROM</td>
<td></td>
</tr>
<tr>
<td>Reset factory EEPROM</td>
<td></td>
</tr>
<tr>
<td>Entry Code</td>
<td></td>
</tr>
<tr>
<td>Service Code</td>
<td></td>
</tr>
<tr>
<td>------------------</td>
<td>--------</td>
</tr>
<tr>
<td>Audit Trail</td>
<td></td>
</tr>
<tr>
<td>Drawing Notes</td>
<td></td>
</tr>
<tr>
<td>Help</td>
<td></td>
</tr>
<tr>
<td>Clear Offline Configuration</td>
<td>Compare Configurations</td>
</tr>
<tr>
<td>Configuration Properties</td>
<td></td>
</tr>
</tbody>
</table>

### Basic Setup
- **Tag**
- **Tank Height**
- **Probe Length**
- **Dead Zone**
- **Time Constant**
- **Scale I Max**
- **Scale I Min**
- **Sensor**
  - **Snsr Upper Lim** *
  - **Snsr Lower Lim** *
  - **Snsr Min Span** *

### Sensor
- **Tank**
- **Dead Zone**
- **Limits**
- **Snsr Upper Lim** *
- **Snsr Lower Lim** *
- **Snsr Min Span** *
- **Correction**
  - **Detection Delay**

### Analog Output
- **Tank**
- **Dead Zone**
- **Limits**
- **Snsr Upper Lim** *
- **Snsr Lower Lim** *
- **Snsr Min Span** *
- **Correction**
  - **AO Alarm type** *

### Application
- **Threshold**
  - **Level Signal Amplitude** *
  - **Level Signal Gain** *
  - **Distance value** *
  - **Threshold**

### Device
- **Model** *
- **Manufacturer** *
- **Fid dev rev** *
- **Software rev** *
- **Write protect** *
- **User Data**
  - **Serial Number** *
  - **French Comm. Nmb.** *
  - **German Comm. Nmb.** *
  - **Release Number** *
  - **ROM checksum** *
  - **Probe Type** *

### HART
- **Device Identification**
  - **Tag**
  - **Device ID** *
  - **Date**
  - **Descriptor**
  - **Message**
  - **Final Assembly Number**
  - **Sensor Serial Number**
  - **Protocol Data**
    - **Universal revision** *
    - **Num request preams** *
    - **Num response preams**
    - **Polling address**

### Service
- **Basis Parameters**
  - **Offset of Measure**
  - **Probe Type**
  - **Application Type**
  - **Epsilon R**
  - **Calibration**
  - **Elec. Cal. Speed**
  - **Mech. Cal. Speed**
  - **Converter Value**
  - **Identification**
  - **French Comm. Nmb.**
  - **German Comm. Nmb.**

### Strap Table
- **Number of points**
- 20 pairs
- **Level** ⇔ **Volume/Mass/Flow**