Configuration and Use Manual
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Micro Motion™ 5700 Transmitters with PROFIBUS®-PA

Configuration and Use Manual

MICRO MOTION™

EMERSON™

Safety messages

Safety messages are provided throughout this manual to protect personnel and equipment. Read each safety message carefully before proceeding to the next step.

Safety and approval information

This Micro Motion product complies with all applicable European directives when properly installed in accordance with the instructions in this manual. Refer to the EU declaration of conformity for directives that apply to this product. The following are available: the EU declaration of conformity, with all applicable European directives, and the complete ATEX Installation Drawings and Instructions. In addition the IECEx Installation Instructions for installations outside of the European Union and the CSA Installation Instructions for installations in North America are available on the internet at www.emerson.com or through your local Micro Motion support center.

Information affixed to equipment that complies with the Pressure Equipment Directive, can be found on the internet at www.emerson.com. For hazardous installations in Europe, refer to standard EN 60079-14 if national standards do not apply.

Other information

Full product specifications can be found in the product data sheet. Troubleshooting information can be found in the configuration manual. Product data sheets and manuals are available from the Micro Motion web site at www.emerson.com.

Return policy

Follow Micro Motion procedures when returning equipment. These procedures ensure legal compliance with government transportation agencies and help provide a safe working environment for Micro Motion employees. Micro Motion will not accept your returned equipment if you fail to follow Micro Motion procedures.

Return procedures and forms are available on our web support site at www.emerson.com, or by phoning the Micro Motion Customer Service department.

Emerson Flow customer service

Email:

- Worldwide: flow.support@emerson.com
- Asia-Pacific: APflow.support@emerson.com

Telephone:

North and South America		Europe and Middle East		Asia Pacific	
United States	800-522-6277	U.K. and Ireland	0870 240 1978	Australia	800 158 727
Canada	+1 303-527-5200	The Netherlands	+31 (0) 70 413 6666	New Zealand	099 128 804
Mexico	+52 55 5809 5010	France	+33 (0) 800 917 901	India	800 440 1468
Argentina	+54 11 4809 2700	Germany	0800 182 5347	Pakistan	888 550 2682
Brazil	+55 15 3413 8000	Italy	+39 8008 77334	China	+86 21 2892 9000
Chile	+56 2 2928 4800	Central & Eastern	+41 (0) 41 7686 111	Japan	+81 3 5769 6803
Peru	+51 15190130	Russia/CIS	+7 495 995 9559	South Korea	+82 2 3438 4600
		Egypt	0800 000 0015	Singapore	+65 6 777 8211
		Oman	800 70101	Thailand	001 800 441 6426
		Qatar	431 0044	Malaysia	800 814 008
		Kuwait	663 299 01		
		South Africa	800 991 390		
		Saudi Arabia	800 844 9564		
		UAE	800 0444 0684		

Contents

1 Before you begin

1.1 About this manual

This manual helps you configure, commission, use, maintain, and troubleshoot Micro Motion 5700 transmitters with PROFIBUS-PA.

Important
This manual assumes that:

- The transmitter has been installed correctly and completely according to the instructions in the transmitter installation manual
- Users understand basic transmitter and sensor installation, configuration, and maintenance concepts and procedures

1.2 Hazard messages

This document uses the following criteria for hazard messages based on ANSI standards Z535.6-2011 (R2017).

DANGER
Serious injury or death will occur if a hazardous situation is not avoided.

WARNING
Serious injury or death could occur if a hazardous situation is not avoided.

CAUTION
Minor or moderate injury will or could occur if a hazardous situation is not avoided.

NOTICE
Data loss, property damage, hardware damage, or software damage can occur if a situation is not avoided. There is no credible risk of physical injury.

Physical access

NOTICE
Unauthorized personnel can potentially cause significant damage and/or misconfiguration of end users' equipment. Protect against all intentional or unintentional unauthorized use.

Physical security is an important part of any security program and fundamental to protecting your system. Restrict physical access to protect users' assets. This is true for all systems used within the facility.

1.3 Related documents

You can find all product documentation on the product documentation DVD shipped with the product or at www.emerson.com.

See any of the following documents for more information:

- *Micro Motion 5700 Product Data Sheet*
- *Micro Motion 5700 Transmitters for PROFIBUS-PA: Installation Manual*
- *Replacing the Junction Box for the 4200 Transmitter and the 5700 Transmitter*
- *Replacing the Sensor Cable for the 4200 Transmitter and the 5700 Transmitter*
- Sensor installation manual

1.4 Communication methods

You can use several different communications methods to interface with the transmitter. You may use different methods in different locations or for different tasks.

Interface	Tool
Display	Infrared-sensitive buttons
Universal Service Port	ProLink™ III
PROFIBUS PA channel	PROFIBUS-PA host On a PROFIBUS-PA host, the transmitter parameters are displayed in UIRD form (for example, the AMS intelligent Device Manager with DeltaV™ or Siemens® PDM)

For information about how to use the communication tools, see the appendices in this manual.

2 Quick start

2.1 Power up the transmitter

The transmitter must be powered up for all configuration and commissioning tasks, or for process measurement.

Procedure

1. Verify that all transmitter and sensor covers and seals are closed.

   ⚠ **WARNING**
   To prevent ignition of flammable or combustible atmospheres, ensure that all covers and seals are tightly closed. For hazardous area installations, applying power while housing covers are removed or loose can cause an explosion resulting in injury or death.

2. Turn on the electrical power at the power supply.

Postrequisites

Although the sensor is ready to receive process fluid shortly after power-up, the electronics can take up to 10 minutes to reach thermal equilibrium. Therefore, if this is the initial startup, or if power has been off long enough to allow components to reach ambient temperature, allow the electronics to warm up for approximately 10 minutes before relying on process measurements. During this warm-up period, you may observe minor measurement instability or inaccuracy.

2.2 Check meter status

Check the meter for any error conditions that require user action or that affect measurement accuracy.

Procedure

1. Wait approximately 10 seconds for the power-up sequence to complete.

   Immediately after power-up, the transmitter runs through diagnostic routines and checks for error conditions. During the power-up sequence, the `Transmitter Initializing` alert is active. This alert should clear automatically when the power-up sequence is complete.

2. Check the status LED on the transmitter.

   Table 2-1: Status LED and device status

Status LED condition	Device status
Solid green	No alerts are active.
Solid yellow	One or more alerts are active with **Alert Severity** = Out of Specification, Maintenance Required, or Function Check.
Solid red	One or more alerts are active with **Alert Severity** = Failure.
Flashing yellow (1 Hz)	The `Function Check in Progress` alert is active.

Table 2-2: Network status LED connection status

Network status LED condition	Network status
Solid green	Connection made with primary protocol host.
Solid red	Configuration error or other error during the PROFIBUS start up sequence.
Off	No connection with primary protocol host.

2.3 Determine PROFIBUS PA device address and Ident Selection using the display

You can configure the 5700 address using either of the following methods:

- Hardware addressing
- Software addressing

For more information, see Addressing.

Procedure

1. To determine the PROFIBUS-PA device address, choose **Menu** → **Configuration** → **Profibus-PA Setting** → **Profibus PA Address**.
   - The 5700 address is configurable if the BCD switches at the back of the printed circuit assembly (PCA) on the display are set > 125.
   - If you change the 5700 address from the display, power cycle the 5700 so that the new address gets used for PROFIBUS-PA communication.
2. To determine the PROFIBUS-PA Ident Selection, choose **Menu** → **Configuration** → **Profibus-PA Setting** → **Ident Selection**.

2.4 Commissioning wizards

The transmitter menu includes a *Guided Setup* to help you move quickly through the most common configuration parameters. ProLink III also provides a commissioning wizard.

By default, when the transmitter starts up, the Guided Setup menu is offered. You can choose to use it or not. You can also choose whether or not Guided Setup is displayed automatically.

- To enter Guided Setup upon transmitter startup, choose **Yes** at the prompt.
- To enter Guided Setup after transmitter startup, choose **Menu** → **Startup Tasks**.
- To control the automatic display of Guided Setup, choose **Menu** → **Configuration** → **Guided Setup**.

For information on the ProLink III commissioning wizard, see the *Micro Motion ProLink III with ProcessViz Software User Manual*.

As the commissioning wizards are self guided, they are not documented in detail.

2.5 Make a startup connection to the transmitter

For all configuration tools except the display, you must have an active connection to the transmitter to configure the transmitter.

Procedure

Identify the connection type to use, and follow the instructions for that connection type in the appropriate appendix.

2.6 Set the transmitter clock

Display	**Menu → Configuration → Time/Date/Tag**
ProLink III	**Device Tools → Configuration → Transmitter Clock**

The transmitter clock provides timestamp data for alerts, service logs, history logs, and all other timers and dates in the system. You can set the clock for your local time or for any standard time you want to use.

Tip
You may find it convenient to set all of your transmitter clocks to the same time, even if the transmitters are in different time zones.

Procedure

1. Select the time zone that you want to use.
2. If you need a custom time zone, select **Special Time Zone** and enter your time zone as a difference from UTC (Coordinated Universal Time).
3. Set the time appropriately for the selected time zone.

   Tip
   The transmitter does not adjust for Daylight Savings Time. If you observe Daylight Savings Time, you must reset the transmitter clock manually.

4. Set the month, day, and year.

   The transmitter tracks the year and automatically adds a day for leap years.

2.7 View the licensed features

Display	**Menu → About → Licenses → Licensed Features**
ProLink III	**Device Tools → Device Information → Licensed Features**
DeltaV AMS	**Overview → Device Information → Licenses**
Siemens PDM	**view → Overview → Device Information → Licenses**

You can view the licensed features to ensure that the transmitter was ordered with the required features.

Licensed features are purchased and available for permanent use. The options model code represents the licensed features.

A trial license allows you to explore features before purchasing. The trial license enables the specified features for a limited number of days. This number is displayed for reference. At the end of this period, the feature will no longer be available.

To purchase additional features or request a trial license, document the Unique ID Number and current license key from your transmitter and contact customer service. To enable the additional features or trial license, you will need to install the new license on the transmitter.

2.8 Set informational parameters

Display	**Menu → Configuration → Device Information**
ProLink III	**Device Tools → Configuration → Informational Parameters**
DeltaV AMS	**Configure → Manual Setup → Device**
Siemens PDM	**Device → Manual Setup → Device**

You can set several parameters that identify or describe the transmitter and sensor. These parameters are not used in processing and are not required.

Procedure

1. Set informational parameters for the transmitter.
    a) Set **Transmitter Serial Number** to the serial number of your transmitter.

       The transmitter serial number is provided on the metal tag that is attached to the transmitter housing.

    b) Set **Descriptor** to any desired description of this transmitter or measurement point.
    c) Set **Message** to any desired message.
    d) Verify that **Model Code (Base)** is set to the base model code of the transmitter.

       The base model code completely describes your transmitter, except for the features that can be licensed independently. The base model code is set at the factory.

    e) Set **Model Code (Options)** to the options model code of the transmitter.

       The options model code describes the independent features that have been licensed for this transmitter. The original options model code is set at the factory. If you license additional options for this transmitter, Micro Motion will supply an updated options model code.

2. Set informational parameters for the sensor.
    a) Set **Sensor Serial Number** to the serial number of the sensor connected to this transmitter.

       The sensor serial number is provided on the metal tag that is attached to the sensor case.

    b) Set **Sensor Material** to the material used for the sensor.
    c) Set **Sensor Liner** to the material used for the sensor liner, if any.
    d) Set **Flange Type** to the type of flange that was used to install the sensor.

Do not set **Sensor Type**. **Sensor Type** is set or derived during characterization.

2.9 Characterize the meter (if required)

Display	**Menu → Configuration → Sensor Parameters**
ProLink III	**Device Tools → Calibration Data**
DeltaV AMS	**Configure → Manual Setup → Characterization**
Siemens PDM	**Device → Manual Setup → Characterization**

Characterizing the meter adjusts your transmitter to match the unique traits of the sensor it is paired with. The characterization parameters (also called calibration parameters) describe the sensor's sensitivity to flow, density, and temperature. Depending on your sensor type, different parameters are required.

Values for your sensor are provided on the sensor tag or the calibration certificate.

- If your transmitter was ordered with a sensor, it was characterized at the factory. However, you should still verify the characterization parameters.
- Perform a characterization whenever you replace a core processor.

Procedure

1. Optional: Specify **Sensor Type**.
   - Straight Tube (T-Series sensors)
   - Curved Tube (all sensors except T-Series)

   Note
   Unlike earlier transmitters, the 5700 derives **Sensor Type** from the user-specified values for FCF and K1 in combination with an internal ID.

2. Set the flow calibration factor: **FCF** (also called **Flow Cal** or **Flow Calibration Factor**). Be sure to include all decimal points.
3. Set the density characterization parameters: **D1**, **D2**, **TC**, **K1**, **K2**, and **FD**. (**TC** is sometimes shown as **DT**.)
4. Apply the changes as required by the tool you are using.

   The transmitter identifies your sensor type, and characterization parameters are adjusted as required:

   - If **Sensor Type** changed from Curved Tube to Straight Tube, five characterization parameters are added to the list.
   - If **Sensor Type** changed from Straight Tube to Curved Tube, five characterization parameters are removed from the list.
   - If **Sensor Type** did not change, the list of characterization parameters does not change.

5. T-Series sensors only: Set the additional characterization parameters listed below.

Characterization parameter type	Parameters
Flow	**FTG**, **FFQ**

Characterization parameter type	Parameters
Density	**DTG, DFQ1, DFQ2**

2.9.1 Sample sensor tags

Figure 2-1: Tag on newer curved-tube sensors (all sensors except T-Series)

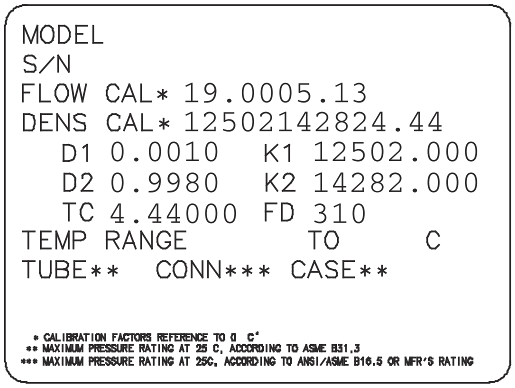


Figure 2-2: Tag on older straight-tube sensor (T-Series)

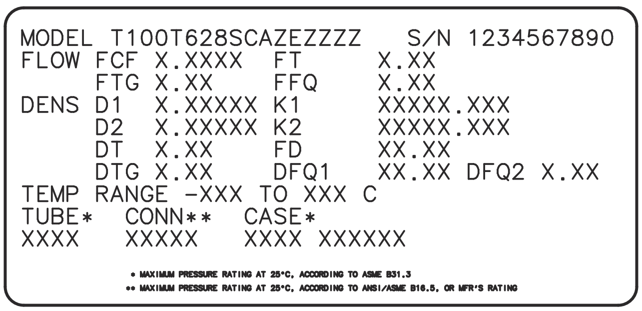
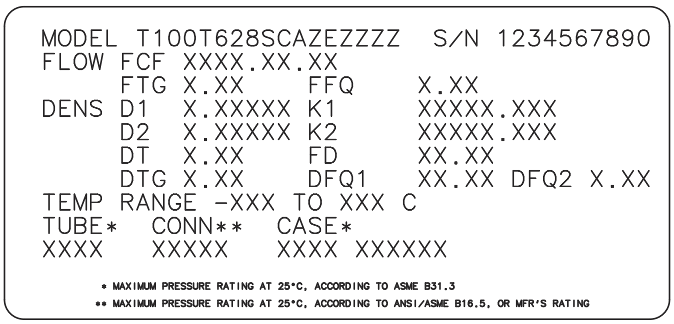


Figure 2-3: Tag on newer straight-tube sensor (T-Series)



2.9.2 Flow calibration parameters (FCF, FT)

Two separate values are used to describe flow calibration: a 6-character FCF value and a 4-character FT value. They are provided on the sensor tag.

Both values contain decimal points. During characterization, these are entered as a single 10-character string. The 10-character string is called either **Flowcal** or **FCF**.

If your sensor tag shows the **FCF** and the **FT** values separately and you need to enter a single value, concatenate the two values to form the single parameter value, retaining both decimal points.

Concatenating FCF and FT

```
FCF = x.xxxx FT = y.yy Flow calibration parameter: x.xxxxy.yy
```

2.9.3 Density calibration parameters (D1, D2, K1, K2, FD, DT, TC)

Density calibration parameters are typically on the sensor tag and the calibration certificate.

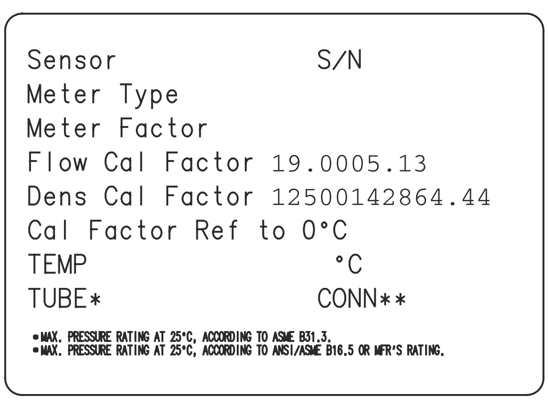
If your sensor tag does not show a D1 or D2 value:

- For **D1**, enter the Dens A or **D1** value from the calibration certificate. This value is the line-condition density of the low-density calibration fluid. Micro Motion uses air. If you cannot find a Dens A or **D1** value, enter `0.001` g/cm^3.
- For **D2**, enter the Dens B or **D2** value from the calibration certificate. This value is the line-condition density of the high-density calibration fluid. Micro Motion uses water. If you cannot find a Dens B or **D2** value, enter `0.998` g/cm^3 .

If your sensor tag does not show a K1 or K2 value:

- For **K1**, enter the first five digits of the density calibration factor. In this sample tag, this value is shown as 12500.
- For **K2**, enter the second five digits of the density calibration factor. In this sample tag, this value is shown as 14286.

Figure 2-4: K1, K2, and TC values in the density calibration factor



If your sensor does not show an **FD** value, contact customer service.

If your sensor tag does not show a **DT** or **TC** value, enter the last four characters of the density calibration factor. In the sample tag shown above, the value is shown as 4.44.

Do not confuse the **Meter Factor** line on the pictured sensor tag with any meter factor settings discussed in this manual.

2.10 Verify mass flow measurement

Check to see that the mass flow rate reported by the transmitter is accurate. You can use any available method.

Procedure

- Read the value for **Mass Flow Rate** on the transmitter display.
- Connect to the transmitter with ProLink III and read the value for **Mass Flow Rate** in the *Process Variables* panel.

Postrequisites

If the reported mass flow rate is not accurate:

- Check the characterization parameters.
- Review the troubleshooting suggestions for flow measurement issues.

2.11 Verify the zero

Display	**Menu → Service Tools → Verification & Calibration → Meter Zero → Zero Verification**
ProLink III	**Device Tools → Calibration → Smart Zero Verification and Calibration → Verify Zero**
DeltaV AMS	**Service Tools → Maintenance → Calibration → Zero Calibration → Perform Zero Verify**
Siemens PDM	**Diagnostics → Maintenance → Calibration → Zero Calibration → Perform Zero Verify**

Verifying the zero helps you determine if the stored zero value is appropriate to your installation, or if a field zero can improve measurement accuracy.

Important
In most cases, the factory zero is more accurate than the field zero. Do not zero the meter unless one of the following is true:

- The zero is required by site procedures.
- The stored zero value fails the zero verification procedure.

Do not verify the zero or zero the meter if a high-severity alert is active. Correct the problem, then verify the zero or zero the meter. You may verify the zero or zero the meter if a low-severity alert is active.

Procedure

1. Prepare the meter:
    a) Allow the meter to warm up for at least 20 minutes after applying power.
    b) Run the process fluid through the sensor until the sensor temperature reaches the normal process operating temperature.

   c) Stop flow through the sensor by shutting the downstream valve, and then the upstream valve if available.

   d) Verify that the sensor is blocked in, that flow has stopped, and that the sensor is completely full of process fluid.

2. Start the zero verification procedure, and wait until it completes.
3. If the zero verification procedure fails:
   a) Confirm that the sensor is completely blocked in, that flow has stopped, and that the sensor is completely full of process fluid.

   b) Verify that the process fluid is not flashing or condensing, and that it does not contain particles that can settle out.

   c) Repeat the zero verification procedure.

   d) If it fails again, zero the meter.

Postrequisites

Restore normal flow through the sensor by opening the valves.

Related information

Zero the meter

3 Introduction to configuration and commissioning

3.1 Security and write protection

The transmitter has several features that can help to protect it against intentional or unintentional access and configuration changes.

- When locked, the mechanical lock switch on the front of the display prevents any configuration changes to the transmitter from any local or remote configuration tool. A transmitter without a display does not have a lock switch.
- When enabled, the software setting **Write Protection** prevents any configuration changes. The setting can only be enabled if the transmitter does not have a display.
- If the Universal Service Port (USP) is disabled, the port cannot be used by any service tool to communicate with or make changes to the transmitter.
- When enabled, **Security** prevents any configuration changes being made from the display unless the appropriate password is entered.
- When enabled, the PROFIBUS PA write lock prevents any configuration changes being written from the PROFIBUS PA segment.

3.1.1 Universal Service Port security

This transmitter is equipped with a Universal Service Port that works with USB type A connections, including compatible flash drives. There are multiple levels of security built into the transmitter's service port that you can configure according to your needs and security standards.

The service port offers the following features that enhance interface security:

- The service port is inaccessible without physical access to the transmitter and requires removal of the terminal cover
- The service port can be disabled from the transmitter through software
- The transmitter has a non-traditional operating system that is not designed to execute programs or run scripts
- The display can be password protected to limit access to the USB file menu
- Overall transmitter security switches such as the lock switch or write-protection disallows configuration changes from all interfaces including the Universal Service Port

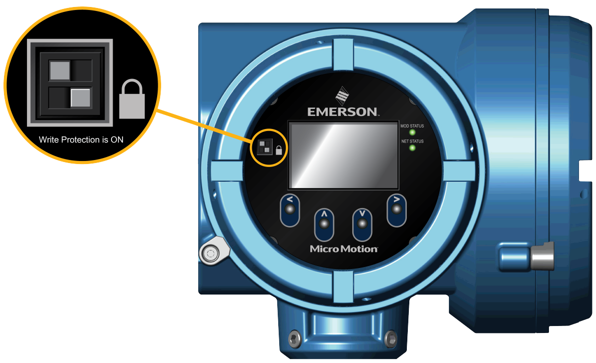
This transmitter:

- Was designed to be implemented in an industrial automation control system (Level 1 and Level 2 of the Purdue Reference Architecture Model), with defense in depth security controls
- Is not intended to be directly connected to an enterprise or to an internet-facing network without a compensating control in place

3.1.2 Lock or unlock the transmitter

If the transmitter has a display, a mechanical switch on the display can be used to lock or unlock the transmitter. When locked, no configuration changes can be made using any configuration tool.

Figure 3-1: Lock switch on transmitter display



You can determine whether you need to lock or unlock the transmitter by looking at the switch.

- If the switch is in the right position, the transmitter is locked.
- If the switch is in the left position, the transmitter is unlocked.

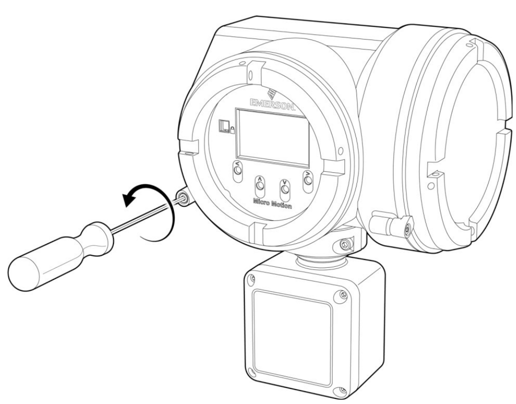
Note
The top switch is reserved for future use.

Procedure

1. **WARNING**
   If the transmitter is in a hazardous area, do not remove the housing cover while the transmitter is powered up. Failure to follow these instructions can cause an explosion resulting in injury or death.

   If you are in a hazardous area, power down the transmitter.
2. Remove the transmitter housing cover.

Figure 3-2: Removing the transmitter housing cover



3. Using a fine-pointed tool, move the switch to the desired position.
4. Replace the transmitter housing cover.
5. If necessary, power up the transmitter.

3.1.3 Enable or disable the service port

Display	**Menu → Configuration → Security → Service Port**
ProLink III	Not available
DeltaV AMS	**Configure → Manual Setup → Security and Simulation → Enable/Disable Service Port**
Siemens PDM	**Device → Manual Setup → Security and Simulation → Enable/Disable Service Port**

The service port is enabled by default, so you can use it for transferring files or connect to it with ProLink III. If you want to completely prevent it from being used, you can disable it.

Note
Enabling or disabling the service port will not take effect until power has been cycled to the transmitter.

WARNING
Do not use the service port if the transmitter is in a hazardous area because using the service port means that you must open the transmitter wiring compartment. Opening the wiring compartment in a hazardous area while the transmitter is powered up can cause an explosion resulting in injury or death.

3.1.4 Enable or disable software write-protection

Display	Use the mechanical switch on the display.
ProLink III	**Device Tools → Configuration → Write-Protection**
DeltaV AMS	**Configure → Manual Setup → Security and Simulation → Profibus PA → Write Lock**
Siemens PDM	**Device → Manual Setup → Security and Simulation → Profibus PA → Write Lock**

When enabled, **Write-Protection** prevents changes to the transmitter configuration. You can perform all other functions, and you can view the transmitter configuration parameters.

Note
The write protection setting via software methods (such as ProLink III) is available only on transmitters without a display.
For transmitters with a display, write protection is available only using the lock switch on the display. See Lock or unlock the transmitter.

Write-protecting the transmitter primarily prevents accidental changes to configuration, not intentional changes. Any user who can make changes to the configuration can disable write protection.

3.1.5 Configure security for the display

Display	**Menu → Configuration → Security → Display Security**
ProLink III	**Device Tools → Configuration → Transmitter Display → Display Security**

DeltaV AMS	**Configure → Manual Setup → Display → Display Menus**
Siemens PDM	**Device → Manual Setup → Display → Display Menus**

When using the display, you can require users to enter a password to do any of the following tasks:

- Enter the main menu
- Change a parameter
- Access alert data through the display
- Start, stop, or reset totalizers or inventories via the context menu

The display password can be the same or different from the totalizer/inventory context menu control password. If different, the display password is used to reset, start, and stop totalizers or inventories using **Menu → Operations → Totalizers**.

Procedure

1. Configure **Password Required** as desired.

Option	Description
At Write	When an user chooses an action that leads to a configuration change, they are prompted to enter the display password.
Enter Menu	When the menu is selected from the process variable screen, the display password will be immediately required if **Password Required** is set.
Never (default)	When a user chooses an action that leads to a configuration change, they are prompted to activate ⇦⇧⇩⇨. This is designed to protect against accidental changes to configuration. It is not a security measure.

2. If the At Write or Enter Menu option was selected, enable or disable alert security as desired.

Option	Description
Enabled	If an alert is active, the alert symbol ⓘ is shown in the upper right corner of the display but the alert banner is not displayed. If the operator attempts to enter the alert menu, they are prompted to enter the display password.
Disabled	If an alert is active, the alert symbol ⓘ is shown in the upper right corner of the display and the alert banner is displayed automatically. No password or confirmation is required to enter the alert menu.

Restriction

You cannot set Password Required to Never and enable alert security.

- If you did not enable **Password Required**, alert security is disabled and cannot be enabled.
- Alert security is disabled automatically if you set **Password Required** to Never after:
  - **Password Required** is initially set to either At Write or Enter Menu
  - Alert security is enabled

3. If **Password Required** has been set to At Write or Enter Menu, you will be prompted to enter the desired password.
   - Default: AAAA
   - Range: Any four alphanumeric characters
   - **Password Required** must be set to At Write or Enter Menu to enable the totalizer/inventory control context menu password option.

   Important
   If you enable **Password Required** but you do not change the display password, the transmitter will post a configuration alert.

4. Configure **Main Menu Available** as desired.

Option	Description
Enabled	The local display **Menu** option from the process variable screen will be accessible.
Disabled	The local display **Menu** option from the process variable screen will not be accessible.

Important
Once **Main Menu Available** has been disabled, you cannot enable it from the local display. Use another configuration tool, such as ProLink III, to re-enable main menu access from the local display.

3.1.6 Enable or disable PROFIBUS write lock

When locked, the PROFIBUS write lock prevents any configuration changes being written from the PROFIBUS segment.

Procedure

Set the **Write Lock** parameter (OD index 34) of the physical block to **Locked** (0) or **Unlocked** (2457).

3.2 Work with configuration files

You can save the current transmitter configuration in two forms: a backup file and a replication file. You can save the configuration to the SD card on your transmitter or to a USB drive.

Tip
You can use a saved configuration file to change the nature of the transmitter quickly. This might be convenient if the transmitter is used for different applications or different process fluids.

You can load a configuration file to the transmitter's working memory or to the transmitter's SD card. You can load either a backup file or a replication file.

Backup files Contain all parameters. They are used to restore the current device if required. The `.spare` extension is used to identify backup files.

Replication files Contain all parameters except the device-specific parameters, e.g., calibration factors or meter factors. They are used to replicate the transmitter configuration to other devices. The `.xfer` extension is used to identify replication files.

3.2.1 Save a configuration file using the display

Prerequisites

If you are planning to use the USB drive, the service port must be enabled. It is enabled by default. However, if you need to enable it, choose **Menu** → **Configuration** → **Security** and set **Service Port** to On.

Procedure

- To save the current configuration to the transmitter's SD card as a backup file:
  a) Choose **Menu** → **Configuration** → **Save/Restore Config** → **Save Config to Memory**.
  b) Enter the name for this configuration file.

  The configuration file is saved to the transmitter's SD card as `yourname.spare`.

- To save the current configuration to a USB drive, as either a backup file or a replication file:
  a) ⚠ **WARNING**
     If the transmitter is in a hazardous area, do not remove the housing cover while the transmitter is powered up. Failure to follow these instructions can cause an explosion resulting in injury or death.

     Open the wiring compartment on the transmitter and insert a USB drive into the service port.
  b) Choose **Menu** → **USB Options** → **Transmitter –> USB Drive** → **Save Active Config to USB Drive**.
  c) Choose Backup or Replicate.
  d) Enter the name for this configuration file.

  The configuration file is saved to the USB drive as `yourname.spare` or `yourname.xfer`.

- To copy a configuration file from the transmitter's SD card to the USB drive:
  a) ⚠ **WARNING**
     If the transmitter is in a hazardous area, do not remove the housing cover while the transmitter is powered up. Failure to follow these instructions can cause an explosion resulting in injury or death.

     Open the wiring compartment on the transmitter and insert a USB drive into the service port.
  b) Choose **Menu** → **USB Options** → **Transmitter –> USB Drive** → **Transfer Config File to USB Drive**.
  c) Choose Backup or Replicate.
  d) Select the file that you want to transfer.

  The configuration file is copied to the USB drive, using its existing name.

3.2.2 Save a configuration file using ProLink III

Note
When you use ProLink III format for configuration files, you can specify configuration parameters individually or by groups. Therefore, you can use this format for both backup and replication.

Procedure

- To save the current configuration to the transmitter's SD card:
    a) Choose **Device Tools** → **Configuration Transfer** → **Save Configuration**.
    b) Select On my 5700 Device Internal Memory and select **Next**.
    c) Select **Save**.
    d) Enter the name for this configuration file.
    e) Set the file type.
        — To save a backup file, set the file type to Backup.
        — To save a replication file, set the file type to Transfer.
    f) Select **Save**.

    The configuration file is saved to the transmitter's SD card as `yourname.spare` or `yourname.xfer`.

- To save the current configuration to your PC, in 5700 format:
    a) Choose **Device Tools** → **Configuration Transfer** → **Save Configuration**.
    b) Select On my computer in 5700 device file format and select **Next**.
    c) Select **Save**.
    d) Browse to the desired location, then enter the name for this configuration file.
    e) Set the file type.
        — To save a backup file, set the file type to Backup.
        — To save a replication file, set the file type to Transfer.
    f) Select **Save**.

    The configuration file is saved to the specified location as `yourname.spare` or `yourname.xfer`.

- To save the current configuration to your PC, in ProLink III format:
    a) Choose **Device Tools** → **Configuration Transfer** → **Save Configuration**.
    b) Select On my computer in ProLink III file format and click **Next**.
    c) Select **Save**.
    d) Select the configuration parameters to be included in this file.
        — To save a backup file, select all parameters.
        — To save a replication file, select all parameters except device-specific parameters.
    e) Select Save.
    f) Browse to the desired location, then enter the name for this configuration file.
    g) Set the file type to ProLink configuration file.
    h) Select Start Save.

    The configuration file is saved to the specified location as `yourname.pcfg`.

3.2.3 Load a configuration file using the display

Prerequisites

You must have a backup file or a replication file available for use.

If you are planning to use the USB drive, the service port must be enabled. It is enabled by default. However, if you need to enable it, choose **Menu** → **Configuration** → **Security** and set **Service Port** to On.

Procedure

- To load either a backup file or a replication file from the transmitter's SD card:
    a) Choose **Menu** → **Configuration** → **Save/Restore Config** → **Restore Config from Memory**.
    b) Select **Backup** or **Replicate**.
    c) Select the file that you want to load.

  The file is loaded to working memory and becomes active immediately.
- To load a either a backup file or a replication file from a USB drive:
    a) ⚠ **WARNING**
       If the transmitter is in a hazardous area, do not remove the housing cover while the transmitter is powered up. Failure to follow these instructions can cause an explosion resulting in injury or death.

       Open the wiring compartment on the transmitter and insert the USB drive containing the backup file or replication file into the service port.
    b) Choose **Menu** → **USB Options** → **USB Drive –> Transmitter** → **Upload Configuration File**.
    c) Select **Backup** or **Replicate**.
    d) Select the file that you want to load.
    e) Choose Yes or No when prompted to apply the settings.
       — Yes: The file is loaded to working memory and becomes active immediately.
       — No: The file is loaded to the transmitter's SD card but not to working memory. You can load it from the SD card to working memory at a later time.

3.2.4 Load a configuration file using ProLink III

You can load a configuration file to the transmitter's working memory. You can load a backup file or a replication file. Two PC file formats are supported: the 5700 format and the ProLink III format.

Note
When you use ProLink III format for configuration files, you can specify configuration parameters individually or by groups. Therefore, you can use this format for both backup and replication.

Procedure

- To load a backup file or replication file from the transmitter's SD card:
    a) Choose **Device Tools** → **Configuration Transfer** → **Load Configuration**.

b) Select On my 5700 Device Internal Memory and select **Next**.

c) Select Restore.

d) Set the file type.

— To load a backup file, set the file type to Backup.

— To load a replication file, set the file type to Transfer.

e) Select the file that you want to load and select **Load**.

The parameters are written to working memory, and the new settings become effectively immediately.

- To load a backup file or replication file in 5700 format from the PC:

a) Choose **Device Tools** → **Configuration Transfer** → **Load Configuration**.

b) Select On my computer in 5700 device file format and select **Next**.

c) Select Restore.

d) Set the file type.

— To load a backup file, set the file type to Backup.

— To load a replication file, set the file type to Transfer.

e) Navigate to the file you want to load, and select it.

The parameters are written to working memory, and the new settings become effectively immediately.

- To load a file in ProLink III format from the PC:

a) Choose **Device Tools** → **Configuration Transfer** → **Load Configuration**.

b) Select On my computer in ProLink III file format and select **Next**.

c) Select the parameters that you want to load.

d) Select Load.

e) Set the file type to Configuration file.

f) Navigate to the file you want to load, and select it.

g) Select Start Load.

The parameters are written to working memory, and the new settings become effectively immediately.

3.2.5 Restore the factory configuration

Display	**Menu → Configuration → Save/Restore Configuration → Restore Config from Memory**
ProLink III	**Device Tools → Configuration Transfer → Restore Factory Configuration**
DeltaV AMS	**Service Tools → Maintenance → Reset/Restore → Restore Factory Configuration**
Siemens PDM	**Diagnostics → Maintenance → Reset/Restore → Restore Factory Configuration**

A file containing the factory configuration is always saved in the transmitter's internal memory, and is available for use.

This action is typically used for error recovery or for repurposing a transmitter.

If you restore the factory configuration, the real-time clock, the audit trail, the historian, and other logs are not reset.

Note
Using a web browser, you can download the factory (.cfg) configuration file and view it with a text editor, but you must use ProLink III or the display to restore the factory configuration.

3.2.6 Replicate a transmitter configuration

Replicating a transmitter configuration is a fast method to set up similar or identical measurement points.

Procedure

1. Configure a transmitter and verify its operation and performance.
2. Use any available method to save a replication file from that transmitter.
3. Use any available method to load the replication file to another transmitter.
4. At the replicated transmitter, set device-specific parameters and perform device-specific procedures:
    a) Set the clock.
    b) Set the tag and related parameters.
    c) Characterize the transmitter.
    d) Perform zero validation and take any recommended actions.
    e) Perform loop tests and take any recommended actions, including mA Output trim.
    f) Use sensor simulation to verify transmitter response.
    g) Set **Node Address** for PROFIBUS PA communication.
5. At the replicated transmitter, set device-specific parameters and perform device-specific procedures:
    a) Set the clock.
    b) Set the tag, long tag, Modbus address, and related parameters.
    c) Characterize the transmitter.
    d) Perform zero validation and take any recommended actions.
    e) Perform loop tests and take any recommended actions, including mA Output trim.
    f) Use sensor simulation to verify transmitter response.
    g) Set **Node Address** for PROFIBUS PA communication.
6. At the replicated transmitter, make any other configuration changes.
7. Follow your standard procedures to ensure that the replicated transmitter is performing as desired.

4 Configure process measurement

4.1 Configure Sensor Flow Direction Arrow

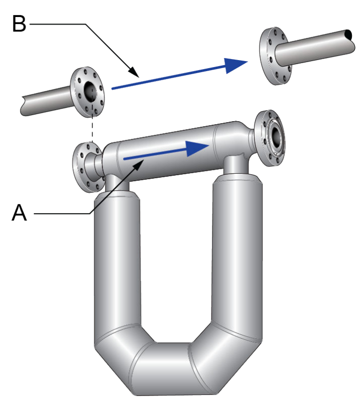
Display	**Menu → Configuration → Process Measurement → Flow Variables → Flow Direction**
ProLink III	**Device Tools → Configuration → Process Measurement → Flow → Sensor Direction**
DeltaV AMS	**Configure → Manual Setup → Measurements → Flow → Sensor Direction**
Siemens PDM	**Device → Manual Setup → Measurements → Flow → Sensor Direction**

Sensor Flow Direction Arrow is used to accommodate installations in which the Flow arrow on the sensor does not match the majority of the process flow. This typically happens when the sensor is accidentally installed backwards.

Sensor Flow Direction Arrow interacts with **mA Output Direction**, **Frequency Output Direction**, and **Totalizer Direction** to control how flow is reported by the outputs and accumulated by the totalizers and inventories.

The **Sensor Flow Direction Arrow** also affects how flow is reported on the transmitter display and via digital communications. This includes ProLink III, the PROFIBUS PA host, and all other user interfaces.

Figure 4-1: Flow arrow on sensor



A. Flow arrow
B. Actual flow direction

Procedure

Set **Sensor Flow Direction Arrow** as appropriate.

Option	Description
With Arrow	The majority of flow through the sensor matches the Flow arrow on the sensor. Actual forward flow is processed as forward flow.
Against Arrow	The majority of flow through the sensor is opposite to the Flow arrow on the sensor. Actual forward flow is processed as reverse flow.

Tip
Micro Motion sensors are bidirectional. Measurement accuracy is not affected by actual flow direction or the setting of **Sensor Flow Direction Arrow**. **Sensor Flow Direction Arrow** controls only whether actual flow is processed as forward flow or reverse flow.

Related information

Configure mA Output Direction
Configure Frequency Output Direction
Configure Discrete Output Source
Configure totalizers and inventories
Effect of Sensor Flow Direction Arrow on digital communications

4.2 Configure mass flow measurement

The mass flow measurement parameters control how mass flow is measured and reported. The mass total and mass inventory are derived from the mass flow data.

4.2.1 Configure Mass Flow Measurement Unit

Display	**Menu → Configuration → Process Measurement → Flow Variables → Mass Flow Settings → Units**
ProLink III	**Device Tools → Configuration → Process Measurement → Flow → Mass Flow Rate Unit**
DeltaV AMS	**Configure → Manual Setup → Measurements → Mass Flow → Unit**
Siemens PDM	**Device → Manual Setup → Measurements → Mass Flow → Unit**

Mass Flow Measurement Unit specifies the unit of measure that will be used for the mass flow rate. The default unit used for mass total and mass inventory is derived from this unit.

Procedure

Set **Mass Flow Measurement Unit** to the unit you want to use.

Default: g/sec (grams per second)

Tip
If the measurement unit you want to use is not available, you can define a special measurement unit.

Options for Mass Flow Measurement Unit

The transmitter provides a standard set of measurement units for **Mass Flow Measurement Unit**, plus one user-defined special measurement unit. Different communications tools may use different labels for the units.

Unit description	Label			
	Display	**ProLink III**	**PROFIBUS PA host**	**Host code**
Grams per second	gram/s	g/sec	g/s	1318
Grams per minute	gram/min	g/min	g/min	1319
Grams per hour	gram/h	g/hr	g/h	1320

Unit description	Label			
	Display	**ProLink III**	**PROFIBUS PA host**	**Host code**
Kilograms per second	kg/s	kg/sec	kg/s	1322
Kilograms per minute	kg/min	kg/min	kg/min	1323
Kilograms per hour	kg/h	kg/hr	kg/h	1324
Kilograms per day	kg/d	kg/day	kg/d	1325
Metric tons per minute	MetTon/min	mTon/min	t/min	1327
Metric tons per hour	MetTon/h	mTon/hr	t/h	1328
Metric tons per day	MetTon/d	mTon/day	t/d	1329
Pounds per second	lb/s	lbs/sec	lb/s	1330
Pounds per minute	lb/min	lbs/min	lb/min	1331
Pounds per hour	lb/h	lbs/hr	lb/h	1332
Pounds per day	lb/d	lbs/day	lb/d	1333
Short tons (2000 pounds) per minute	STon/min	sTon/min	STon/min	1335
Short tons (2000 pounds) per hour	STon/h	sTon/hr	STon/h	1336
Short tons (2000 pounds) per day	STon/d	sTon/day	STon/d	1337
Long tons (2240 pounds) per hour	LTon/h	lTon/hr	LTon/h	1340
Long tons (2240 pounds) per day	LTon/d	lTon/day	LTon/d	1341
Special unit	SPECIAL	Special	Special	1999

Define a special measurement unit for mass flow

Display	**Menu → Configuration → Process Measurement → Flow Variables → Mass Flow Settings → Units → SPECIAL**
ProLink III	**Device Tools → Configuration → Process Measurement → Flow → Mass Flow Rate Unit → Special**
DeltaV AMS	**Configure → Manual Setup → Measurements → Optional Setup → Special Units → Mass Special Units**
Siemens PDM	**Device → Manual Setup → Measurements → Optional Setup → Special Units → Mass Special Units**

Procedure

1. Specify **Base Mass Unit**.

   Base Mass Unit is the existing mass unit that the special unit will be based on.

2. Specify **Base Time Unit**.

   Base Time Unit is the existing time unit that the special unit will be based on.

3. Calculate **Mass Flow Conversion Factor** as follows:
    a) x base units = y special units
    b) **Mass Flow Conversion Factor** = x ÷ y
4. Enter **Mass Flow Conversion Factor**.

    The original mass flow rate value is divided by this value.
5. Set **Mass Flow Label** to the name you want to use for the mass flow unit.
6. Set **Mass Total Label** to the name you want to use for the mass total and mass inventory unit.

The special measurement unit is stored in the transmitter. You can configure the transmitter to use the special measurement unit at any time.

Example: Defining a special measurement unit for mass flow

If you want to measure mass flow in ounces per second (oz/sec):

1. Set **Base Mass Unit** to Pounds (lb).
2. Set **Base Time Unit** to Seconds (sec).
3. Calculate **Mass Flow Conversion Factor**:
    a. 1 lb/sec = 16 oz/sec
    b. **Mass Flow Conversion Factor** = 1 ÷ 16 = 0.0625
4. Set **Mass Flow Conversion Factor** to `0.0625`.
5. Set **Mass Flow Label** to `oz/sec`.
6. Set **Mass Total Label** to `oz`.

4.2.2 Configure Flow Damping

Display	**Menu → Configuration → Process Measurement → Flow Variables → Flow Damping**
ProLink III	**Device Tools → Configuration → Process Measurement → Flow → Flow Rate Damping**
DeltaV AMS	**Configure → Manual Setup → Measurements → Flow → Damping**
Siemens PDM	**Device → Manual Setup → Measurements → Flow → Damping**

Flow Damping controls the amount of damping that will be applied to the measured mass flow rate. It affects flow rate process variables that are based on the measured mass flow rate. This includes volume flow rate and gas standard volume flow rate.

Flow Damping also affects specialized flow rate variables such as temperature-corrected volume flow rate (API Referral) and net mass flow rate (concentration measurement).

Damping is used to smooth out small, rapid fluctuations in process measurement. The damping value specifies the time period, in seconds, over which the transmitter will spread changes in the process variable. At the end of the interval, the internal value of the process variable (the damped value) will reflect 63% of the change in the actual measured value.

Procedure

Set **Flow Damping** to the value you want to use.

- Default: 0.64 seconds
- Range: 0 seconds to 60 seconds

Note
If a number greater than 60 is entered, it is automatically changed to 60.

Tip
- A high damping value makes the process variable appear smoother because the reported value changes slowly.
- A low damping value makes the process variable appear more erratic because the reported value changes more quickly.
- The combination of a high damping value and rapid, large changes in flow rate can result in increased measurement error.
- Whenever the damping value is non-zero, the reported measurement will lag the actual measurement because the reported value is being averaged over time.
- In general, lower damping values are preferable because there is less chance of data loss, and less lag time between the actual measurement and the reported value.
- The transmitter automatically rounds off any entered damping value to the nearest valid value. Therefore, the recommended damping value for gas applications should be 3.2 seconds. If you enter 2.56, the transmitter will round it off to 3.2.
- For filling applications, Micro Motion recommends using the default value of 0.04 seconds.

Effect of flow damping on volume measurement

Flow damping affects volume measurement for liquid volume data. Flow damping also affects volume measurement for gas standard volume data. The transmitter calculates volume data from the damped mass flow data.

Interaction between Flow Damping and mA Output Damping

In some circumstances, both **Flow Damping** and **mA Output Damping** are applied to the reported mass flow value.

Flow Damping controls the rate of change in flow process variables. **mA Output Damping** controls the rate of change reported via the mA Output. If **mA Output Process Variable** is set to Mass Flow Rate, and both **Flow Damping** and **mA Output Damping** are set to non-zero values, flow damping is applied first, and the added damping calculation is applied to the result of the first calculation.

4.2.3 Configure Mass Flow Cutoff

Display	**Menu → Configuration → Process Measurement → Flow Variables → Mass Flow Settings → Low Flow Cutoff**
ProLink III	**Device Tools → Configuration → Process Measurement → Flow → Mass Flow Cutoff**

DeltaV AMS	**Configure → Manual Setup → Measurements → Flow → Cutoff**
Siemens PDM	**Device → Manual Setup → Measurements → Flow → Cutoff**

Mass Flow Cutoff specifies the lowest mass flow rate that will be reported as measured. All mass flow rates below this cutoff will be reported as 0.

Procedure

Set **Mass Flow Cutoff** to the value you want to use.

- Default: A sensor-specific value set at the factory. If your transmitter was ordered without a sensor, the default may be 0.0.
- Recommendation: 0.5% of maximum flow rate of the attached sensor. See the sensor specifications.

Important
Do not use your meter for measurement with **Mass Flow Cutoff** set to 0.0 g/sec. Ensure that **Mass Flow Cutoff** is set to the value that is appropriate for your sensor.

Effect of Mass Flow Cutoff on volume measurement

Mass Flow Cutoff does not affect volume measurement. Volume data is calculated from the actual mass data rather than the reported value.

Volume flow has a separate Volume Flow Cutoff that is not affected by the Mass Flow Cutoff value.

Interaction between Mass Flow Cutoff and mA Output Cutoff

Mass Flow Cutoff defines the lowest mass flow value that the transmitter will report as measured. **mA Output Cutoff** defines the lowest flow rate that will be reported via the mA Output. If **mA Output Process Variable** is set to Mass Flow Rate, the mass flow rate reported via the mA Output is controlled by the higher of the two cutoff values.

Mass Flow Cutoff affects all reported values and values used in other transmitter behavior (e.g., events defined on mass flow).

mA Output Cutoff affects only mass flow values reported via the mA Output.

Example: Cutoff interaction with mA Output Cutoff lower than Mass Flow Cutoff

Configuration:

- **mA Output Process Variable**: Mass Flow Rate
- **Frequency Output Process Variable**: Mass Flow Rate
- **mA Output Cutoff**: `10` g/sec
- **Mass Flow Cutoff**: `15` g/sec

Result: If the mass flow rate drops below 15 g/sec, mass flow will be reported as 0, and 0 will be used in all internal processing.

Example: Cutoff interaction with mA Output Cutoff higher than Mass Flow Cutoff

Configuration:

- **mA Output Process Variable**: Mass Flow Rate
- **Frequency Output Process Variable**: Mass Flow Rate
- **mA Output Cutoff**: `15` g/sec
- **Mass Flow Cutoff**: `10` g/sec

Result:

- If the mass flow rate drops below 15 g/sec but not below 10 g/sec:
  - The mA Output will report zero flow.
  - The Frequency Output will report the actual flow rate, and the actual flow rate will be used in all internal processing.
- If the mass flow rate drops below 10 g/sec, both outputs will report zero flow, and 0 will be used in all internal processing.

4.3 Configure volume flow measurement for liquid applications

The volume flow measurement parameters control how liquid volume flow is measured and reported. The volume total and volume inventory are derived from volume flow data.

Restriction
You cannot implement both liquid volume flow and gas standard volume flow at the same time. Choose one or the other.

4.3.1 Configure Volume Flow Type for liquid applications

Display	**Menu → Configuration → Process Measurement → Flow Variables → Volume Flow Settings → Flow Type → Liquid**
ProLink III	**Device Tools → Configuration → Process Measurement → Flow → Volume Flow Type → Liquid Volume**
DeltaV AMS	**Overview → Device Information → Licenses → Enable/Disable Applications → Volume Flow Type**
Siemens PDM	**View → Overview → Device Information → Licenses → Enable/Disable Applications → Volume Flow Type**

Volume Flow Type controls whether liquid or gas standard volume flow measurement will be used.

Restriction
Gas standard volume measurement is incompatible with the following applications:

- API Referral
- Concentration measurement

For these applications, set **Volume Flow Type** to Liquid.

Procedure

Set **Volume Flow Type** to Liquid.

4.3.2 Configure Volume Flow Measurement Unit for liquid applications

Display	**Menu → Configuration → Process Measurement → Flow Variables → Volume Flow Settings → Units**
ProLink III	**Device Tools → Configuration → Process Measurement → Flow → Volume Flow Rate Unit**
DeltaV AMS	**Configure → Manual Setup → Measurements → Volume Flow → Unit**
Siemens PDM	**Device → Manual Setup → Measurements → Volume Flow → Unit**

Volume Flow Measurement Unit specifies the unit of measurement that will be displayed for the volume flow rate. The unit used for the volume total and volume inventory is based on this unit.

Prerequisites

Before you configure **Volume Flow Measurement Unit**, be sure that **Volume Flow Type** is set to Liquid.

Procedure

Set **Volume Flow Measurement Unit** to the unit you want to use.

Default: l/sec (liters per second)

Tip
If the measurement unit you want to use is not available, you can define a special measurement unit.

Options for Volume Flow Measurement Unit for liquid applications

Unit description	Label			
	Display	**ProLink III**	**PROFIBUS PA host**	**Host code**
Cubic feet per second	ft3/s	ft3/sec	ft^3/min	1356
Cubic feet per minute	ft3/min	ft3/min	ft^3/min	1357
Cubic feet per hour	ft3/h	ft3/hr	ft^3/h	1358
Cubic feet per day	ft3/d	ft3/day	ft^3/d	1359
Cubic meters per second	m3/s	m3/sec	m^3/s	1347
Cubic meters per minute	m3/min	m3/min	m^3/min	1348
Cubic meters per hour	m3/h	m3/hr	m^3/h	1349
Cubic meters per day	m3/d	m3/day	m^3/d	1350
U.S. gallons per second	gal/s	US gal/sec	gal/s	1362
U.S. gallons per minute	gal/m	US gal/min	gal/min	1363
U.S. gallons per hour	gal/h	US gal/hr	gal/h	1364
U.S. gallons per day	gal/d	US gal/day	gal/d	1365
Million U.S. gallons per day	MMgal/d	mil US gal/day	Mgal/d	1366

Unit description	Label			
	Display	ProLink III	PROFIBUS PA host	Host code
Liters per second	L/s	l/sec	L/s	1351
Liters per minute	L/min	l/min	L/min	1352
Liters per hour	L/h	l/hr	L/h	1353
Million liters per day	MML/d	mil l/day	ML/d	1355
Imperial gallons per second	Impgal/s	Imp gal/sec	ImpGal/s	1367
Imperial gallons per minute	Impgal/m	Imp gal/min	ImpGal/min	1368
Imperial gallons per hour	Impgal/h	Imp gal/hr	ImpGal/h	1369
Imperial gallons per day	Impgal/d	Imp gal/day	ImpGal/d	1370
Special unit	SPECIAL	Special	Special	1999

Define a special measurement unit for volume flow

Display	**Menu → Configuration → Process Measurement → Flow Variables → Volume Flow Settings → Units → SPECIAL**
ProLink III	**Device Tools → Configuration → Process Measurement → Flow → Volume Flow Rate Unit → Special**
DeltaV AMS	**Configure → Manual Setup → Measurements → Optional Setup → Special Units → Volume Special Units**
Siemens PDM	**Device → Manual Setup → Measurements → Optional Setup → Special Units → Volume Special Units**

Procedure

1. Specify **Base Volume Unit**.

   Base Volume Unit is the existing volume unit that the special unit will be based on.

2. Specify **Base Time Unit**.

   Base Time Unit is the existing time unit that the special unit will be based on.

3. Calculate **Volume Flow Conversion Factor** as follows:
   a) x base units = y special units
   b) **Volume Flow Conversion Factor** = x ÷ y

4. Enter **Volume Flow Conversion Factor**.

   The original volume flow rate value is divided by this conversion factor.

5. Set **Volume Flow Label** to the name you want to use for the volume flow unit.
6. Set **Volume Total Label** to the name you want to use for the volume total and volume inventory unit.

The special measurement unit is stored in the transmitter. You can configure the transmitter to use the special measurement unit at any time.

Example: Defining a special measurement unit for volume flow

You want to measure volume flow in pints per second (pints/sec).

1. Set **Base Volume Unit** to Gallons (gal).

2. Set **Base Time Unit** to Seconds (sec).
3. Calculate the conversion factor:
   a. 1 gal/sec = 8 pints/sec
   b. **Volume Flow Conversion Factor** = 1 ÷ 8 = 0.1250
4. Set **Volume Flow Conversion Factor** to `0.1250`.
5. Set **Volume Flow Label** to `pints/sec`.
6. Set **Volume Total Label** to `pints`.

4.3.3 Configure Volume Flow Cutoff

Display	**Menu → Configuration → Process Measurement → Flow Variables → Volume Flow Settings → Low Flow Cutoff**
ProLink III	**Device Tools → Configuration → Process Measurement → Flow → Volume Flow Cutoff**
DeltaV AMS	**Configure → Manual Setup → Measurements → Volume Flow → Cutoff**
Siemens PDM	**Device → Manual Setup → Measurements → Volume Flow → Cutoff**

Volume Flow Cutoff specifies the lowest volume flow rate that will be reported as measured. All volume flow rates below this cutoff are reported as 0.

Procedure

Set **Volume Flow Cutoff** to the value you want to use.

- Default: 0.0 l/sec (liters per second)
- Range: 0 l/sec to *x* l/sec, where *x* is the sensor's flow calibration factor, multiplied by 0.0002.

Interaction between Volume Flow Cutoff and mAO Cutoff

Volume Flow Cutoff defines the lowest liquid volume flow value that the transmitter will report as measured. **mAO Cutoff** defines the lowest flow rate that will be reported via the mA Output. If **mA Output Process Variable** is set to Volume Flow Rate, the volume flow rate reported via the mA Output is controlled by the higher of the two cutoff values.

Volume Flow Cutoff affects both the volume flow values reported via the outputs and the volume flow values used in other transmitter behavior (e.g., events defined on the volume flow).

mAO Cutoff affects only flow values reported via the mA Output.

Example: Cutoff interaction with mAO Cutoff lower than Volume Flow Cutoff

Configuration:

- **mA Output Process Variable**: Volume Flow Rate
- **Frequency Output Process Variable**: Volume Flow Rate
- **AO Cutoff**: `10` l/sec
- **Volume Flow Cutoff**: `15` l/sec

Result: If the volume flow rate drops below 15 l/sec, volume flow will be reported as 0, and 0 will be used in all internal processing.

Example: Cutoff interaction with mAO Cutoff higher than Volume Flow Cutoff

Configuration:

- **mA Output Process Variable**: Volume Flow Rate
- **Frequency Output Process Variable**: Volume Flow Rate
- **AO Cutoff**: `15` l/sec
- **Volume Flow Cutoff**: `10` l/sec

Result:

- If the volume flow rate drops below 15 l/sec but not below 10 l/sec:
  - The mA Output will report zero flow.
  - The Frequency Output will report the actual flow rate, and the actual flow rate will be used in all internal processing.
- If the volume flow rate drops below 10 l/sec, both outputs will report zero flow, and 0 will be used in all internal processing.

4.4 Configure Gas Standard Volume (GSV) flow measurement

The gas standard volume (GSV) flow measurement parameters control how gas standard volume flow is measured and reported.

Restriction
You cannot implement both liquid volume flow and gas standard volume flow at the same time. Choose one or the other.

4.4.1 Configure Volume Flow Type for gas applications

Display	**Menu → Configuration → Process Measurement → Flow Variables → Volume Flow Settings → Flow Type → Gas**
ProLink III	**Device Tools → Configuration → Process Measurement → Flow → Volume Flow Type → Gas Standard Volume**
DeltaV AMS	**Overview → Device Information → Licenses → Enable/Disable Applications → Volume Flow Type**
Siemens PDM	**view → Overview → Device Information → Licenses → Enable/Disable Applications → Volume Flow Type**

Volume Flow Type controls whether liquid or gas standard volume flow measurement will be used.

Restriction
Gas standard volume measurement is incompatible with the following applications:

- API Referral
- Concentration measurement

For these applications, set **Volume Flow Type** to Liquid.

Procedure

Set **Volume Flow Type** to Gas.

4.4.2 Configure Standard Gas Density

Display	**Menu → Configuration → Process Measurement → Flow Variables → Volume Flow Settings → Standard Gas Density**
ProLink III	**Device Tools → Configuration → Process Measurement → Flow → Standard Density of Gas**
DeltaV AMS	**Configure → Manual Setup → Measurements → Optional Setup → Gas Standard Volume → Density → Gas Reference Density**
Siemens PDM	**Device → Manual Setup → Measurements → Optional Setup → Gas Standard Volume → Density → Gas Reference Density**

Standard Gas Density is the density of your gas at reference temperature and reference pressure. This is often called *standard density* or *base density*. It is used to calculate the GSV flow rate from the mass flow rate.

Procedure

Set **Standard Gas Density** to the density of your gas at reference temperature and reference pressure.

You can use any reference temperature and reference pressure that you choose. It is not necessary to configure these values in the transmitter.

Tip
ProLink III provides a guided method that you can use to calculate the standard density of your gas if you do not know it.

4.4.3 Configure Gas Standard Volume Flow Measurement Unit

Display	**Menu → Configuration → Process Measurement → Flow Variables → Volume Flow Settings → Units**
ProLink III	**Device Tools → Configuration → Process Measurement → Flow → Gas Standard Volume Flow Unit**
DeltaV AMS	**Configure → Manual Setup → Measurement → Gas Standard Volume Flow → Unit**
Siemens PDM	**Device → Manual Setup → Measurement → Gas Standard Volume Flow → Unit**

Gas Standard Volume Flow Measurement Unit specifies the unit of measure that will be used for the gas standard volume (GSV) flow rate. The unit used for gas standard volume total and gas standard volume inventory is derived from this unit.

Prerequisites

Before you configure **Gas Standard Volume Flow Measurement Unit**, be sure that **Volume Flow Type** is set to Gas Standard Volume.

Procedure

Set **Gas Standard Volume Flow Measurement Unit** to the unit you want to use.

Default: SCFM (Standard Cubic Feet per Minute)

Tip
If the measurement unit you want to use is not available, you can define a special measurement unit.

Options for Gas Standard Volume Flow Measurement Unit

The transmitter provides a standard set of measurement units for **Gas Standard Volume Flow Measurement Unit**, plus one user-defined special measurement unit. Different communications tools may use different labels for the units.

Unit description	Label			
	Display	**ProLink III**	**PROFIBUS PA host**	**Host code**
Normal cubic meters per second	NCMS	Nm3/sec	m³/s normal	1588
Normal cubic meters per minute	NCMM	Nm3/min	m³/min normal	1589
Normal cubic meters per hour	NCMH	Nm3/hr	m³/h normal	1590
Normal cubic meters per day	NCMD	Nm3/day	m³/d normal	1591
Normal liter per second	NLPS	NLPS	L/s normal	1592
Normal liter per minute	NLPM	NLPM	L/min normal	1593
Normal liter per hour	NLPH	NLPH	L/h normal	1594
Normal liter per day	NLPD	NLPD	NL/d normal	1595
Standard cubic feet per second	SCFS	SCFS	ft3/min std.	1360
Standard cubic feet per minute	SCFM	SCFM	ft3/s std.	1604
Standard cubic feet per hour	SCFH	SCFH	ft3/h std.	1361
Standard cubic feet per day	SCFD	SCFD	ft3/d std.	1605
Standard cubic meters per second	SCMS	Sm3/sec	m³/s std.	1596
Standard cubic meters per minute	SCMM	Sm3/min	m³/min std.	1597
Standard cubic meters per hour	SCMH	Sm3/hr	m³/h std.	1598
Standard cubic meters per day	SCMD	Sm3/day	Sm³/d std.	1599
Standard liter per second	SLPS	SLPS	L/s std.	1600
Standard liter per minute	SLPM	SLPM	L/min std.	1601
Standard liter per hour	SLPH	SLPH	L/h std.	1602
Standard liter per day	SLPD	SLPD	L/d std.	1603
Special measurement unit	SPECIAL	Special	Special	1999

Define a special measurement unit for gas standard volume flow

Display	**Menu → Configuration → Process Measurement → Flow Variables → Volume Flow Settings → Units → SPECIAL**
ProLink III	**Device Tools → Configuration → Process Measurement → Flow → Gas Standard Volume Flow Unit → Special**
DeltaV AMS	**Configure → Manual Setup → Measurements → Optional Setup → Special Units → Special Gas Standard Volume Units**
Siemens PDM	**Device → Manual Setup → Measurements → Optional Setup → Special Units → Special Gas Standard Volume Units**

A special measurement unit is a user-defined unit of measure that allows you to report process data, totalizer data, and inventory data in a unit that is not available in the transmitter. A special measurement unit is calculated from an existing measurement unit using a conversion factor.

Procedure

1. Specify **Base Gas Standard Volume Unit**.

   Base Gas Standard Volume Unit is the existing gas standard volume unit that the special unit will be based on.
2. Specify **Base Time Unit**.

   Base Time Unit is the existing time unit that the special unit will be based on.
3. Calculate **Gas Standard Volume Flow Conversion Factor** as follows:
   a) x base units = y special units
   b) **Gas Standard Volume Flow Conversion Factor** = x ÷ y
4. Enter the **Gas Standard Volume Flow Conversion Factor**.

   The original gas standard volume flow value is divided by this conversion factor.
5. Set **Gas Standard Volume Flow Label** to the name you want to use for the gas standard volume flow unit.
6. Set **Gas Standard Volume Total Label** to the name you want to use for the gas standard volume total and gas standard volume inventory unit.

The special measurement unit is stored in the transmitter. You can configure the transmitter to use the special measurement unit at any time.

Example: Defining a special measurement unit for gas standard volume flow

You want to measure gas standard volume flow in thousands of standard cubic feet per minute.

1. Set **Base Gas Standard Volume Unit** to SCFM.
2. Set **Base Time Unit** to minutes (min).
3. Calculate the conversion factor:
   a. One thousands of standard cubic feet per minute = 1000 cubic feet per minute
   b. **Gas Standard Volume Flow Conversion Factor** = 1 ÷ 1000 = 0.001
4. Set **Gas Standard Volume Flow Conversion Factor** to `0.001`.

5. Set **Gas Standard Volume Flow Label** to `KSCFM`.
6. Set **Gas Standard Volume Total Label** to `KSCF`.

4.4.4 Configure Gas Standard Volume Flow Cutoff

Display	**Menu → Configuration → Process Measurement → Flow Variables → Volume Flow Settings → Low Flow Cutoff**
ProLink III	**Device Tools → Configuration → Process Measurement → Flow → Gas Standard Volume Flow Cutoff**
DeltaV AMS	**Configure → Manual Setup → Measurements → Gas Standard Volume Flow → Cutoff**
Siemens PDM	**Device → Manual Setup → Measurements → Gas Standard Volume Flow → Cutoff**

Gas Standard Volume Flow Cutoff specifies the lowest gas standard volume flow rate that will reported as measured. All gas standard volume flow rates below this cutoff will be reported as 0.

Procedure

Set **Gas Standard Volume Flow Cutoff** to the value you want to use.

- Default: 0.0
- Range: 0.0 to any positive value

Interaction between Gas Standard Volume Flow Cutoff and mA Output Cutoff

Gas Standard Volume Flow Cutoff defines the lowest Gas Standard Volume flow value that the transmitter will report as measured. **mA Output Cutoff** defines the lowest flow rate that will be reported via the mA Output. If **mA Output Process Variable** is set to Gas Standard Volume Flow Rate, the volume flow rate reported via the mA Output is controlled by the higher of the two cutoff values.

Gas Standard Volume Flow Cutoff affects both the gas standard volume flow values reported through outputs and the gas standard volume flow values used in other transmitter behavior (for example, events defined on gas standard volume flow).

mA Output Cutoff affects only flow values reported via the mA Output.

Example: Cutoff interaction with mA Output Cutoff lower than Gas Standard Volume Flow Cutoff

Configuration:

- **mA Output Process Variable** for the primary mA Output: Gas Standard Volume Flow Rate
- **Frequency Output Process Variable**: Gas Standard Volume Flow Rate
- **mA Output Cutoff** for the primary mA Output: `10` SLPM (standard liters per minute)
- **Gas Standard Volume Flow Cutoff**: `15` SLPM

Result: If the gas standard volume flow rate drops below 15 SLPM, the volume flow will be reported as 0, and 0 will be used in all internal processing.

Example: Cutoff interaction with mA Output Cutoff higher than Gas Standard Volume Flow Cutoff

Configuration:

- **mA Output Process Variable** for the primary mA Output: Gas Standard Volume Flow Rate
- **Frequency Output Process Variable**: Gas Standard Volume Flow Rate
- **mA Output Cutoff** for the primary mA Output: `15` SLPM (standard liters per minute)
- **Gas Standard Volume Flow Cutoff**: `10` SLPM

Result:

- If the gas standard volume flow rate drops below 15 SLPM but not below 10 SLPM:
  - The primary mA Output will report zero flow.
  - The Frequency Output will report the actual flow rate, and the actual flow rate will be used in all internal processing.
- If the gas standard volume flow rate drops below 10 SLPM, both outputs will report zero flow, and 0 will be used in all internal processing.

4.5 Configure density measurement

The density measurement parameters control how density is measured and reported. Density measurement is used with mass flow rate measurement to determine liquid volume flow rate.

4.5.1 Configure Density Measurement Unit

Display	**Menu → Configuration → Process Measurement → Density → Units**
ProLink III	**Device Tools → Configuration → Process Measurement → Density → Density Unit**
DeltaV AMS	**Configure → Manual Setup → Measurements → Density → Density Unit**
Siemens PDM	**Device → Manual Setup → Measurements → Density → Density Unit**

Density Measurement Unit controls the measurement units that will be used in density calculations and reporting.

Restriction

If the API Referral application is enabled, you cannot change the density measurement unit here. The density measurement unit is controlled by the API table selection.

Procedure

Set **Density Measurement Unit** to the option you want to use.

Default: g/cm^3 (grams per cubic centimeter)

Options for Density Measurement Unit

The transmitter provides a standard set of measurement units for **Density Measurement Unit**. Different communications tools may use different labels.

Unit description	Label			
	Display	**ProLink III**	**PROFIBUS PA host**	**Host code**
Specific gravity(1)	SGU	SGU	SGU	1114
Grams per cubic centimeter	g/cm3	g/cm3	g/cm^3	1100
Grams per liter	g/L	g/l	g/L	1105
Grams per milliliter	g/mL	g/ml	g/ml	1104
Kilograms per liter	kg/L	kg/l	kg/L	1103
Kilograms per cubic meter	kg/m3	kg/m3	kg/m^3	1097
Pounds per U.S. gallon	lb/gal	lbs/USgal	lb/gal	1108
Pounds per cubic foot	lb/ft3	lbs/ft3	lb/ft^3	1107
Pounds per cubic inch	lb/in3	lbs/in3	lb/in^3	1106
Degrees API	API	API	°API	1113
Short ton per cubic yard	STon/yd3	sT/yd3	$STon/yd^3$	1109

(1) *Non-standard calculation. This value represents line density divided by the density of water at 60 °F (15.6 °C).*

4.5.2 Configure Density Damping

Display	**Menu → Configuration → Process Measurement → Density → Damping**
ProLink III	**Device Tools → Configuration → Process Measurement → Density → Density Damping**
DeltaV AMS	**Configure → Manual Setup → Measurements → Density → Damping**
Siemens PDM	**Device → Manual Setup → Measurements → Density → Damping**

Density Damping controls the amount of damping that will be applied to density data.

Damping is used to smooth out small, rapid fluctuations in process measurement. The damping value specifies the time period, in seconds, over which the transmitter will spread changes in the process variable. At the end of the interval, the internal value of the process variable (the damped value) will reflect 63% of the change in the actual measured value.

Procedure

Set **Density Damping** to the desired value.

- Default: 1.28 seconds
- Range: 0.0 to 60 seconds

Tip

- A high damping value makes the process variable appear smoother because the reported value changes slowly.

- A low damping value makes the process variable appear more erratic because the reported value changes more quickly.
- The combination of a high damping value and rapid, large changes in density can result in increased measurement error.
- Whenever the damping value is non-zero, the damped value will lag the actual measurement because the damped value is being averaged over time.
- In general, lower damping values are preferable because there is less chance of data loss, and less lag time between the actual measurement and the damped value.
- If a number greater than 60 is entered, it is automatically changed to 60.

Effect of Density Damping on volume measurement

Density Damping affects liquid volume measurement. Liquid volume values are calculated from the damped density value rather than the measured density value. **Density Damping** does not affect gas standard volume measurement.

Interaction between Density Damping and mA Output Damping

When the mA Output is configured to report density, both **Density Damping** and **mA Output Damping** are applied to the reported density value.

Density Damping controls the rate of change in the value of the process variable in transmitter memory. **mA Output Damping** controls the rate of change reported via the mA Output.

If **mA Output Source** is set to Density, and both **Density Damping** and **mA Output Damping** are set to non-zero values, density damping is applied first, and the mA Output damping calculation is applied to the result of the first calculation. This value is reported over the mA Output.

4.5.3 Configure Density Cutoff

Display	**Menu → Configuration → Process Measurement → Density → Cutoff**
ProLink III	**Device Tools → Configuration → Process Measurement → Density → Density Cutoff**
DeltaV AMS	**Configure → Manual Setup → Measurements → Density → Cutoff**
Siemens PDM	**Device → Manual Setup → Measurements → Density → Cutoff**

Density Cutoff specifies the lowest density value that will be reported as measured. All density values below this cutoff will be reported as 0.

Procedure

Set **Density Cutoff** to the value you want to use.

- Default: 0.2 g/cm^3
- Range: 0.0 g/cm^3 to 0.5 g/cm^3

Effect of Density Cutoff on volume measurement

Density Cutoff affects liquid volume measurement. If the density value goes below **Density Cutoff**, the volume flow rate is reported as 0.

4.6 Configure temperature measurement

The temperature measurement parameters control how temperature data is processed. Temperature data is used in several different ways, including temperature compensation, API Referral, and concentration measurement.

4.6.1 Configure Temperature Measurement Unit

Display	**Menu → Configuration → Process Measurement → Temperature → Units**
ProLink III	**Device Tools → Configuration → Process Measurement → Temperature → Temperature Unit**
DeltaV AMS	**Configure → Manual Setup → Measurements → Temperature → Unit**
Siemens PDM	**Device → Manual Setup → Measurements → Temperature → Unit**

Temperature Measurement Unit specifies the unit that will be used for temperature measurement.

Procedure

Set **Temperature Measurement Unit** to the option you want to use.

Default: °C (Celsius)

Options for Temperature Measurement Unit

The transmitter provides a standard set of units for **Temperature Measurement Unit**. Different communications tools may use different labels for the units.

Unit description	Label			
	Display	ProLink III	PROFIBUS-PA	Host code
Degrees Celsius	°C	°C	°C	1001
Degrees Fahrenheit	°F	°F	°F	1002
Degrees Rankine	°R	°R	°R	1003
Kelvin	°K	°K	K	1000

4.6.2 Configure Temperature Damping

Display	**Menu → Configuration → Process Measurement → Temperature → Damping**
ProLink III	**Device Tools → Configuration → Process Measurement → Temperature → Temperature Damping**
DeltaV AMS	**Configure → Manual Setup → Measurements → Temperature → Damping**
Siemens PDM	**Device → Manual Setup → Measurements → Temperature → Damping**

Temperature Damping controls the amount of damping that will be applied to temperature data from the sensor. **Temperature Damping** is not applied to external temperature data.

Damping is used to smooth out small, rapid fluctuations in process measurement. The damping value specifies the time period, in seconds, over which the transmitter will spread changes in the process variable. At the end of the interval, the internal value of the process variable (the damped value) will reflect 63% of the change in the actual measured value.

Procedure

Set **Temperature Damping** to the desired value.

- Default: 4.8 seconds
- Range: 0.0 to 80 seconds

Note
If a number greater than 80 is entered, it is automatically changed to 80.

Tip
- A high damping value makes the process variable appear smoother because the reported value changes slowly.
- A low damping value makes the process variable appear more erratic because the reported value changes more quickly.
- The combination of a high damping value and rapid, large changes in temperature can result in increased measurement error.
- Whenever the damping value is non-zero, the damped value will lag the actual measurement because the damped value is being averaged over time.
- In general, lower damping values are preferable because there is less chance of data loss, and less lag time between the actual measurement and the damped value.

Effect of Temperature Damping on process measurement

Temperature Damping affects all processes and algorithms that use temperature data from the internal sensor RTD.

Temperature compensation

Temperature compensation adjusts process measurement to compensate for the effect of temperature on the sensor tubes.

API Referral

Temperature Damping affects API Referral process variables only if the transmitter is configured to use temperature data from the sensor. If an external temperature value is used for API Referral, **Temperature Damping** does not affect API Referral process variables.

Concentration measurement

Temperature Damping affects concentration measurement process variables only if the transmitter is configured to use temperature data from the sensor. If an external temperature value is used for concentration measurement, **Temperature Damping** does not affect concentration measurement process variables.

4.7 Configure Pressure Measurement Unit

Display	**Menu → Configuration → Process Measurement → Pressure → Units**
ProLink III	**Device Tools → Configuration → Process Measurement → Pressure Compensation → Pressure Unit**
DeltaV AMS	**Configure → Manual Setup → Measurements → Optional Setup → External Variables → Pressure → Unit**
Siemens PDM	**Device → Manual Setup → Measurements → Optional Setup → External Variables → Pressure → Unit**

Pressure Measurement Unit controls the measurement unit used for pressure. This unit must match the unit used by the external pressure device.

Pressure data is used for pressure compensation and for API Referral. The device does not measure pressure directly. You must set up a pressure input.

Procedure

Set **Pressure Measurement Unit** to the desired unit.

Default: psi

4.7.1 Options for Pressure Measurement Unit

The transmitter provides a standard set of measurement units for **Pressure Measurement Unit**. Different communications tools may use different labels for the units. In most applications, set **Pressure Measurement Unit** to match the pressure measurement unit used by the remote device.

Unit description	Label			
	Display	**ProLink III**	**PROFIBUS PA host**	**Host code**
Feet water @ 68 °F	ftH2O @68°F	Ft Water @ 68°F	ftH_2O (68°F)	1154
Inches water @ 4 °C	inH2O @4°C	In Water @ 4°C	inH_2O (4°C)	1147
Inches water @ 60 °F	inH2O @60°F	In Water @ 60°F	inH_2O (60°F)	33003
Inches water @ 68 °F	inH2O @68°F	In Water @ 68°F	inH_2O (68°F)	1148
Millimeters water @ 4 °C	mmH2O @4°C	mm Water @ 4°C	mmH_2O (4°C)	1150
Millimeters water @ 68 °F	mmH2O @68°F	mm Water @ 68°F	mmH_2O (68°F)	1151
Millimeters mercury @ 0 °C	mmHg @0°C	mm Mercury @ 0°C	mmHg (0°C)	1158
Inches mercury @ 0 °C	inHg @0°C	In Mercury @ 0°C	inHg (0°C)	1156
Pounds per square inch	psi	PSI	psi	1141
Bar	bar	bar	bar	1137
Millibar	mbar	millibar	mbar	1138
Grams per square centimeter	g/cm2	g/cm2	gf/cm^2	1144
Kilograms per square centimeter	kg/cm2	kg/cm2	Kgf/cm^2	1145
Pascals	Pa	pascals	Pa	1130
Kilopascals	kPA	Kilopascals	kPa	1133

Unit description	Label			
	Display	**ProLink III**	**PROFIBUS PA host**	**Host code**
Megapascals	mPA	Megapascals	MPa	1132
Torr @ 0 °C	torr	Torr @ 0°C	torr	1139
Atmospheres	atm	atms	atm	1140

4.8 Configure Velocity Measurement Unit

Display	**Menu → Configuration → Process Measurement → Velocity → Units**
ProLink III	**Device Tools → Configuration → Process Measurement → Velocity → Unit**
DeltaV AMS	**Configure → Manual Setup → Measurements 2 → Approximate Velocity → Velocity Unit**
Siemens PDM	**Device → Manual Setup → Measurements 2 → Approximate Velocity → Velocity Unit**

Velocity Measurement Unit controls the measurement unit used to report velocity.

Procedure

Set **Velocity Measurement Unit** to the desired unit.

Default: m/sec

4.8.1 Options for Velocity Measurement Unit

The transmitter provides a standard set of measurement units for **Velocity Measurement Unit**. Different communications tools may use different labels.

Unit description	Label			
	Display	**ProLink III**	**PROFIBUS PA host**	**Host code**
Feet per minute	ft/min	ft/min	ft/min	1070
Feet per second	ft/s	ft/sec	ft/s	1067
Inches per minute	in/min	in/min	in/min	1069
Inches per second	in/s	in/sec	in/s	1066
Meters per hour	m/h	m/hr	m/h	1063
Meters per second	m/s	m/sec	m/s	1061

4.9 Energy flow

Energy flow is the energy content of the process gas flowing through the pipe per units of time. The 5700 can compute the energy flow by taking the Analog Output function block input using the PROFIBUS-PA connection. The calculated energy flow is available on the Energy Flow process variable.

4.9.1 Set up energy flow

Prerequisites

If you plan to poll an external device, assign either of the Analog Output function block channels as Calorific Value.

Procedure

1. From the display, go to **Menu** → **Configuration** → **Process Measurement** → **Energy Flow**.
2. Select **Units** for **Calorific Value and Energy Flow**.
3. To poll an external device, set up either Analog Output function block for Calorific Value.
4. Set up energy flow on an mA Output or Frequency Output.

Option	Description
mAO	a. Configure an mA Output b. Select **Energy Flow** as a source.
FO	a. Configure a Frequency Output b. Select **Energy Flow** as a source.

4.9.2 Options for Energy Flow Unit

Unit description	Label	
	PROFIBUS PA host	Unit code for PROFIBUS PA
Megajoule per minute	MJ/min	1443
Megajoule per hour	MJ/h	1196
British thermal unit per minute	Btu/min	1446
British thermal unit per hour	Btu/h	1197
British thermal unit per day	Btu/day	1447

4.9.3 Options for Calorific Value Unit

Unit description	Label	
	PROFIBUS PA host	Unit code for PROFIBUS PA
Megajoule per kilogram	MJ/kg	1207
Megajoule per meter cube	MJ/m^3	33006
British thermal unit per pound	Btu/lb	1516
British thermal unit per standard cubic feet	Btu/scf	33005

4.10 Piecewise linearization (PWL) for calibrating gas meters

Piecewise linearization (PWL) can linearize the measurements of flow meters for greater accuracy in order to measure gas over a wide range of flow rates. PWL does not apply when measuring liquid flow. When better accuracy is required over the published gas measurement specifications, an Emerson-approved independent gas laboratory can calibrate gas up to 10 PWL adjustment points.

For more information, see the white paper, *The Practical Application of Multi-Point Piecewise Linear Interpolation (PWL) and Other Developing Trends with Coriolis Meters for Natural Gas Custody Transfer Applications*, available at www.emerson.com.

The PWL feature is available in ProLink III, so you can view the points that are stored and capture them in the uploaded and downloaded configuration files.

4.10.1 Configure PWL

Display	Not available
ProLink III	**Device Tools → Configuration → Process Measurement → Piecewise Linearization for Gas (PWL)**
DeltaV AMS	**Configure → Manual Setup → Measurements → Optional Setup → Gas Linearization**
Siemens PDM	**Device → Manual Setup → Measurements → Optional Setup → Gas Linearization**

The PROFIBUS PA host shows only the 10 point linearization table values.

5 Configure process measurement applications

5.1 Set up the API Referral application

The API Referral application corrects line density to reference temperature and reference pressure according to American Petroleum Institute (API) standards. The resulting process variable is *referred density*.

Restriction
The API Referral application is not compatible with the following applications:

- Gas Standard Volume Measurement (GSV)
- Piecewise linearization (PWL)
- Advanced Phase Measurement
- Concentration measurement

5.1.1 Set up the API Referral application using the display

Enable the API Referral application using the display

The API Referral application must be enabled before you can perform any setup. If the API Referral application was enabled at the factory, you do not need to enable it now.

Prerequisites

The API Referral application must be licensed on your transmitter.

Procedure

1. Choose **Menu** → **Configuration** → **Process Measurement**.
2. Choose **Flow Variables** → **Volume Flow Settings** and ensure that **Flow Type** is set to Liquid.
3. Return to the *Process Measurement* menu.
4. If the concentration measurement application is displayed in the list, choose **Concentration Measurement** and ensure that **Enabled/Disabled** is set to Disabled.

   The concentration measurement application and the API Referral application cannot be enabled simultaneously.
5. If the gas linearization application displays in the list, choose **Gas Linearization** and verify that **Enable/ Disable** is set to Disabled.

   The gas linearization application and the API Referral application cannot be enabled simultaneously.
6. If the Adv Phase Measurement application displays in the list, choose **Adv Phase Measurement** and verify that **Application Setup** is set to Disabled.

   The Advance Phase Measurement application and the API Referral application cannot be enabled simultaneously.

Configure API Referral using the display

The API Referral parameters specify the API table, measurement units, and reference values to be used in referred density calculations.

Prerequisites

You will need API documentation for the API table that you select.

Depending on your API table, you may need to know the thermal expansion coefficient (TEC) for your process fluid.

You must know the reference temperature and reference pressure that you want to use.

Procedure

1. Choose **Menu** → **Configure** → **Process Measurement** → **API Referral**.
2. Set **API Table** to the API table that you want to use to calculate referred density.

   Each API table is associated with a specific set of equations. Choose your API table based on your process fluid and the measurement unit that you want to use for referred density.

   Your choice also determines the API table that will be used to calculate the correction factor for volume (CTPL or CTL).

3. Refer to the API documentation and confirm your table selection.
   a) Verify that your process fluid falls within range for line density, line temperature, and line pressure.
   b) Verify that the referred density range of the selected table is adequate for your application.

4. If you chose a C table, enter **Thermal Expansion Coefficient (TEC)** for your process fluid.

   Acceptable limits:

   - 230.0×10^{-6} to 930.0×10^{-6} per °F
   - 414.0×10^{-6} to 1674.0×10^{-6} per °C

5. If required, set **Reference Temperature** to the temperature to which density will be corrected in referred density calculations.

   The default reference temperature is determined by the selected API table.

6. If required, set **Reference Pressure** to the pressure to which density will be corrected in referred density calculations.

   The default reference pressure is determined by the selected API table.

Set up temperature and pressure data for API Referral using the display

The API Referral application uses temperature and, optionally, pressure data in its calculations. You must decide how to provide this data, then perform the required configuration and setup.

Note
Fixed values for temperature or pressure are not recommended. Using a fixed temperature or pressure value may produce inaccurate process data.

Prerequisites

The pressure measurement must be gauge pressure, not atmospheric pressure.

The pressure device must use the pressure unit that is configured in the transmitter.

If you are using an external temperature device, it must use the temperature unit that is configured in the transmitter.

Procedure

1. Choose the method to be used to supply temperature data, and perform the required setup.

Method	Description	Setup
Internal temperature	Temperature data from the on-board temperature sensor (RTD) will be used for all measurements and calculations. No external temperature data will be available.	a. Choose **Menu** → **Configuration** → **Process Measurement** → **Temperature**. b. Set **External Temperature** to Off.
Digital communications	A host writes temperature data to the meter at appropriate intervals. This data will be available in addition to the internal temperature data.	a. Choose **Menu** → **Configuration** → **Process Measurement** → **Temperature**. b. Set **External Temperature** to On. c. Perform the necessary host programming and communications setup to write temperature data to the transmitter at appropriate intervals.

2. Choose the method to be used to supply pressure data, and perform the required setup.

Method	Description	Setup
Digital communications	A host writes pressure data to the meter at appropriate intervals.	a. Choose **Menu** → **Configuration** → **Process Measurement** → **Pressure** → **External Pressure**. b. Set **External Pressure** to On. c. Perform the necessary host programming and communications setup to write pressure data to the transmitter at appropriate intervals.

Postrequisites

Choose **Menu** → **Service Tools** → **Service Data** → **View Process Variables** and verify the values for External Temperature and External Pressure.

Need help?
If the value is not correct:

- Ensure that the external device and the meter are using the same measurement unit.
- For digital communications:
  - Verify that the host has access to the required data.

— Verify that the output variable is being correctly received and processed by the transmitter.

5.1.2 Set up the API Referral application using ProLink III

Enable the API referral application using ProLink III

The API referral application must be enabled before you can perform any setup. If the API referral application was enabled at the factory, you do not need to enable it now.

Prerequisites

The API referral application must be licensed on your transmitter.

Procedure

1. Choose **Device Tools** → **Configuration** → **Process Measurement** → **Flow** and ensure that **Volume Flow Type** is set to Liquid Volume.
2. Choose **Device Tools** → **Configuration** → **Process Measurement** → **Advance Phase Measurement** → **APM Status** and ensure that **Application Status** is set to Disable.

   The Advance Phase Measurement application and the API referral application cannot be enabled simultaneously.
3. Choose **Device Tools** → **Configuration** → **Transmitter Options**.
4. If the concentration measurement application is enabled, disable it and select Apply.

   The concentration measurement application and the API referral application cannot be enabled simultaneously.
5. If the gas linearization application is enabled, disable it and select Apply.

   The gas linearization application and the API referral application cannot be enabled simultaneously.

Configure API Referral using ProLink III

The API Referral parameters specify the API table, measurement units, and reference values to be used in referred density calculations.

Prerequisites

You will need API documentation for the API table that you select.

Depending on your API table, you may need to know the thermal expansion coefficient (TEC) for your process fluid.

You must know the reference temperature and reference pressure that you want to use.

Procedure

1. Choose **Device Tools** → **Configuration** → **Process Measurement** → **API Referral**.
2. Specify the API table to use to calculate referred density.

   Each API table is associated with a specific set of equations.

   a) Set **Process Fluid** to the API table group that your process fluid belongs to.

API table group	Process fluids
A tables	Generalized crude and JP4
B tables	Generalized products: Gasoline, jet fuel, aviation fuel, kerosene, heating oils, fuel oils, diesel, gas oil
C tables	Liquids with a constant base density or known thermal expansion coefficient (TEC). You will be required to enter the TEC for your process fluid.
D tables	Lubricating oils
E tables	NGL (Natural Gas Liquids) and LPG (Liquid Petroleum Gas)

b) Set **Referred Density Measurement Unit** to the measurement units that you want to use for referred density.

c) Select **Apply**.

These parameters uniquely identify the API table to be used to calculate referred density. The selected API table is displayed, and the meter automatically changes the density unit, temperature unit, pressure unit, and reference pressure to match the API table.

Your choice also determines the API table that will be used to calculate the correction factor for volume (CTPL or CTL).

Restriction
Not all combinations are supported by the API Referral application. See the list of API tables in this manual.

3. Refer to the API documentation and confirm your table selection.
   a) Verify that your process fluid falls within range for line density, line temperature, and line pressure.
   b) Verify that the referred density range of the selected table is adequate for your application.
4. If you chose a C table, enter **Thermal Expansion Coefficient (TEC)** for your process fluid.

   Acceptable limits:

   - 230.0×10^{-6} to 930.0×10^{-6} per °F
   - 414.0×10^{-6} to 1674.0×10^{-6} per °C
5. Set **Reference Temperature** to the temperature to which density will be corrected in referred density calculations. If you choose Other, select the temperature measurement unit and enter the reference temperature.
6. Set **Reference Pressure** to the pressure to which density will be corrected in referred density calculations.

Set up temperature and pressure data for API Referral using ProLink III

The API Referral application uses temperature and, optionally, pressure data in its calculations. You must decide how to provide this data, then perform the required configuration and setup.

Note
Fixed values for temperature or pressure are not recommended. Using a fixed temperature or pressure value may produce inaccurate process data.

Prerequisites

The pressure measurement must be gauge pressure, not atmospheric pressure.

The pressure device must use the pressure unit that is configured in the transmitter.

If you are using an external temperature device, it must use the temperature unit that is configured in the transmitter.

Procedure

1. Choose **Device Tools** → **Configuration** → **Process Measurement** → **API Referral**.
2. Choose the method to be used to supply temperature data, and perform the required setup.

Option	Description	Setup
Digital communications	A host writes temperature data to the meter at appropriate intervals. This data will be available in addition to the internal RTD temperature data.	a. Set **Line Temperature Source** to Fixed Value or Digital Communications. b. Select **Apply**. c. Perform the necessary host programming and communications setup to write temperature data to the meter at appropriate intervals.

3. Choose the method you will use to supply pressure data, and perform the required setup.

Option	Description	Setup
Digital communications	A host writes pressure data to the meter at appropriate intervals.	a. Set **Pressure Source** to Fixed Value or Digital Communications. b. Perform the necessary host programming and communications setup to write pressure data to the meter at appropriate intervals.

Postrequisites

If you are using external temperature data, verify the external temperature value displayed in the *Inputs* group on the ProLink III main window.

The current pressure value is displayed in the **External Pressure** field. Verify that the value is correct.

Need help?
If the value is not correct:

- Ensure that the external device and the meter are using the same measurement unit.

- For digital communications:
  - Verify that the host has access to the required data.
  - Verify that the output variable is being correctly received and processed by the transmitter.

5.1.3 Set up the API referral application using a PROFIBUS-PA host

This section guides you through the tasks required to set up and implement the API referral application using a PROFIBUS-PA host.

Enable the API referral application using a PROFIBUS-PA host

DeltaV AMS	**Overview → Device Information → Licenses → Enable/Disable Application → Volume Flow**
Siemens PDM	**Overview → Device Information → Licenses → Enable/Disable Application → Volume Flow Type**

The API referral application must be enabled before you can perform any setup. If the API referral application was enabled at the factory, you do not need to enable it now.

Prerequisites

The API referral application must be licensed on your transmitter.

Volume Flow Type must be set to Liquid.

Procedure

1. Ensure that the volume flow is set to Liquid.
2. If the concentration measurement application is enabled, disable it.

   The concentration measurement application and the API referral application cannot be enabled simultaneously.
3. If the gas linearization application is enabled, disable it.

   The gas linearization application and the API referral application cannot be enabled simultaneously.
4. If **Advance Phase Measurement** → **Output Type** is other than Disabled, disable it.

   The Advance Phase Measurement application and the API referral application cannot be enabled simultaneously.

Configure the API referral application using a PROFIBUS PA host

DeltaV AMS	**Configure → Manual Setup → Measurements → Optional Setup → API Referral**
Siemens PDM	**Device → Manual Setup → Measurements → Optional Setup → API Referral**

The API Referral parameters specify the API table, measurement units, and reference values to be used in referred density calculations.

Prerequisites

Prerequisites

You will need API documentation for the API table that you select.

Depending on your API table, you may need to know the thermal expansion coefficient (TEC) for your process fluid.

You must know the reference temperature and reference pressure that you want to use.

Procedure

1. Choose **API Referral Setup**.
2. Specify the API table that you want to use to calculate referred density.

   Each API table is associated with a specific set of equations.

   a) Set **API Table Number** to the number that matches the API table units that you want to use for referred density.

      Your choice also determines the measurement unit to be used for temperature and pressure, and the default values for reference temperature and reference pressure.

API table number	Measurement unit for referred density	Temperature measurement unit	Pressure measurement unit	Default reference temperature	Default reference pressure
5	°API	°F	psi (g)	60 °F	0 psi (g)
6(1)	°API	°F	psi (g)	60 °F	0 psi (g)
23	SGU	°F	psi (g)	60 °F	0 psi (g)
24(1)	SGU	°F	psi (g)	60 °F	0 psi (g)
53	kg/m³	°C	kPa (g)	15 °C	0 kPa (g)
54(1)	kg/m³	°C	kPa (g)	15 °C	0 kPa (g)
59	kg/m³	°C	kPa (g)	20 °C	0 kPa (g)
60	kg/m³	°C	kPa (g)	20 °C	0 kPa (g)

(1) *Used only with **API Table Letter** = C.*

   b) Set **API Table Letter** to the letter of the API table group that is appropriate for your process fluid.

API table letter	Process fluids
A(1)	Generalized crude and JP4
B(1)	Generalized products: Gasoline, jet fuel, aviation fuel, kerosene, heating oils, fuel oils, diesel, gas oil
C(2)	Liquids with a constant base density or known thermal expansion coefficient (TEC). You will be required to enter the TEC for your process fluid.
D(1)	Lubricating oils
E(3)	NGL (Natural Gas Liquids) and LPG (Liquid Petroleum Gas)

(1) *Used only with **API Table Number**= 5, 23, **53**, **59**, or **60**.*
(2) *Used only with **API Table Number**= 6, 24, or **54**.*
(3) *Used only with **API Table Number** = 23, 24, 53, 54, 59, or 60.*

API Table Number and **API Table Letter** uniquely identify the API table. The selected API table is displayed, and the meter automatically changes the density unit, temperature unit, pressure unit, reference temperature, and reference pressure to match the API table.

Your choice also determines the API table that will be used to calculate the correction factor for volume (CTPL or CTL).

Restriction
Not all combinations are supported by the API Referral application. See the list of API tables in this manual.

3. If you chose a C table, enter **Thermal Expansion Coefficient (TEC)** for your process fluid.

   Acceptable limits:

   - 230.0×10^{-6} to 930.0×10^{-6} per °F
   - 414.0×10^{-6} to 1674.0×10^{-6} per °C

4. Refer to the API documentation and confirm your table selection.
   a) Verify that your process fluid falls within range for line density, line temperature, and line pressure.
   b) Verify that the referred density range of the selected table is adequate for your application.

5. If required, set **Reference Temperature** to the temperature to which density will be corrected in referred density calculations.

   The default reference temperature is determined by the selected API table.

6. If required, set **Reference Pressure** to the pressure to which density will be corrected in referred density calculations.

   The default reference pressure is determined by the selected API table. API referral requires gauge pressure.

Set up temperature and pressure data for API referral using a PROFIBUS PA host

DeltaV AMS	**Configure → Manual Setup → Measurements → Optional Setup → External Variables → External Temperature**
Siemens PDM	**Device → Manual Setup → Measurements → Optional Setup → External Variables → External Temperature**

The API Referral application uses temperature and, optionally, pressure data in its calculations. You must decide how to provide this data, then perform the required configuration and setup.

Note
Fixed values for temperature or pressure are not recommended. Using a fixed temperature or pressure value may produce inaccurate process data.

Procedure

1. Choose the method to be used to supply temperature data, and perform the required setup.

Method	Description	Setup
Internal RTD temperature data	Temperature data from the on-board temperature sensor (RTD) is used.	Set **Temperature Compensation** to Disable.
Digital communications	A host writes temperature data to the meter at appropriate intervals. This data will be available in addition to the internal RTD temperature data.	a. Set **Temperature Compensation** to Enable. b. Choose one of the following options: • For DeltaV AMS, **Configure** → **Manual Setup** → **Classic View** → **Function Block** → **Analog Output Block** • For Siemens PDM, **Device** → **Manual Setup** → **Classic View** → **Function Block** → **Analog Output Block** c. Select either AO Block 1 or AO Block 2. d. Set **IN Channel** as Temperature. e. Set **PV Scale** → **Unit Index** to the matching host **Temperature Unit**. f. Set **Out Scale** → **Unit Index** to the matching device **Temperature Unit**. g. Ensure that the corresponding AO block is assigned to the slot.

2. Perform the required setup for digital communications so that the host writes pressure data to the meter at appropriate intervals.
    a) Choose one of the following options:
        - For DeltaV AMS, **Configure** → **Manual Setup** → **Measurements** → **Optional Setup** → **External Variables** → **External Pressure**
        - For Siemens PDM, **Device** → **Manual Setup** → **Measurements** → **Optional Setup** → **External Variables** → **External Pressure**
    b) Set **Pressure Compensation** to Enable.
    c) Choose **Configure** → **Manual Setup** → **Classic View** → **AI/AO Block Channel Mapping** → **Analog Output Block**.
    d) Select either AO Block 1 or AO Block 2.
    e) Set **IN Channel** as Pressure.
    f) Set **PV Scale** → **Unit Index** to the matching host **Pressure Unit**.
    g) Set **Out Scale** → **Unit Index** to the matching device **Pressure Unit**.
    h) Ensure that the corresponding AO block is assigned to the slot.

Postrequisites

Need help?

If the value is not correct:

- Ensure that the external device and the meter are using the same measurement unit.
- For digital communications:
  - Verify that the host has access to the required data.
  - Verify that the output variable is being correctly received and processed by the transmitter.

5.1.4 API tables supported by the API Referral application

The API tables listed here are supported by the API Referral application.

Table 5-1: API tables, process fluids, measurement units, and default reference values

Process fluid	API tables (calculations)(1)		Referred density (API): unit and range	Default reference temp	Default reference pressure	API standard
	Referred density(2)	CTL or CTPL(3) (4)				
Generalized crude and JP4	5A	6A	Unit: °API Range: 0 to 100 °API	60 °F	0 psi (g)	API MPMS 11.1
	23A	24A	Unit: SGU Range: 0.6110 to 1.0760 SGU	60 °F	0 psi (g)	
	53A	54A	Unit: kg/m³ Range: 610 to 1075 kg/m³	15 °C	0 kPa (g)	
Generalized products (gasoline, jet fuel, aviation fuel, kerosene, heating oils, fuel oils, diesel, gas oil)	5B	6B	Unit: °API Range: 0 to 85 °API	60 °F	0 psi (g)	API MPMS 11.1
	23B	24B	Unit: SGU Range: 0.6535 to 1.0760 SGU	60 °F	0 psi (g)	
	53B	54B	Unit: kg/m³ Range: 653 to 1075 kg/m³	15 °C	0 kPa (g)	
Liquids with a constant density base or known thermal expansion coefficient(5)	N/A	6C	Unit: °API	60 °F	0 psi (g)	API MPMS 11.1
	N/A	24C	Unit: SGU	60 °F	0 psi (g)	
	N/A	54C	Unit: kg/m³	15 °C	0 kPa (g)	
Lubricating oils	5D	6D	Unit: °API Range: −10 to +40 °API	60 °F	0 psi (g)	API MPMS 11.1
	23D	24D	Unit: SGU Range: 0.8520 to 1.1640 SGU	60 °F	0 psi (g)	
	53D	54D	Unit: kg/m³ Range: 825 to 1164 kg/m³	15 °C	0 kPa (g)	

Table 5-1: API tables, process fluids, measurement units, and default reference values *(continued)*

Process fluid	API tables (calculations)(1)		Referred density (API): unit and range	Default reference temp	Default reference pressure	API standard
	Referred density(2)	CTL or CTPL(3) (4)				
NGL (natural gas liquids) and LPG (liquid petroleum gas)	23E	24E	Unit: SGU	60 °F	0 psi (g)	API MPMS 11.2.4
	53E	54E	Unit: kg/m³	15 °C	0 psi (g)	
	59A	60A	Unit: kg/m³	20 °C	0 psi (g)	
	59B	60B	Unit: kg/m³	20 °C	0 psi (g)	
	59D	60D	Unit: kg/m³	20 °C	0 psi (g)	
	59E	60E	Unit: kg/m³	20 °C	0 psi (g)	

(1) *Each API table represents a specialized equation defined by the American Petroleum Institute for a specific combination of process fluid, line conditions, and output.*
(2) *Referred density is calculated from line density. You must specify this table, either directly or by selecting the process fluid and base density measurement unit.*
(3) *You do not need to specify this table. It is invoked automatically as a result of the previous table selection.*
(4) *CTL is a correction factor based on online temperature. CTPL is a correction factor based on both line pressure and line temperature. Calculation of CTL and CTPL for A, B, C, and D table products is in accordance with API MPMS Chapter 11.1. Calculation of CTL and CTPL for E table products is in accordance with API MPMS Chapters 11.2.2, 11.2.4, and 11.2.5.*
(5) *The Thermal Expansion Coefficient (TEC) replaces the referred density calculation. Use the CTL/CTPL table instead.*

5.1.5 Process variables from the API Referral application

The API Referral application calculates several different process variables according to API standards.

CTPL
Correction factor based on line temperature and line pressure.

CTL
Correction factor based on line temperature at saturation conditions.

Referred density
The measured density after CTL or CTPL has been applied.

API volume flow
The measured volume flow rate after CTL or CTPL has been applied. Also called *corrected volume flow*.

Batch-weighted average density
One density value is recorded for each unit of flow (e.g., barrel, liter). The average is calculated from these values. The average is reset when the API totalizer is reset. Not available unless a totalizer has been configured with **Source** set to Corrected Volume Flow.

Batch-weighted average temperature
One temperature value is recorded for each unit of flow (e.g., barrel, liter). The average is calculated from these values. The average is reset when the API totalizer is reset. Not available unless a totalizer has been configured with **Source** set to Temperature-Corrected Volume Flow.

API volume total
The total API volume measured by the transmitter since the last API totalizer reset. Also called *corrected volume total*. Not available unless a totalizer has been configured with **Source** set to Corrected Volume Flow.

API volume inventory	The total API volume measured by the transmitter since the last API inventory reset. Also called *corrected volume inventory*. Not available unless an inventory has been configured with **Source** set to Corrected Volume Flow.

5.2 Set up concentration measurement

The concentration measurement application calculates concentration from line density and line temperature.

5.2.1 Preparing to set up concentration measurement

The procedure for setting up concentration measurement application depends on how your device was ordered and how you want to use the application. Review this information before you begin.

Requirements for concentration measurement

To use the concentration measurement application, the following conditions must be met:

- The concentration measurement application must be enabled.
- The API Referral application must be disabled.
- The gas piecewise linearization (PWL) application must be disabled.
- The Advanced Phase Measurement application must be disabled .
- A concentration matrix must be loaded into one of the six slots on the transmitter.

  Tip
  In most cases, the concentration matrix that you ordered was loaded at the factory. If it was not, you have several options for loading a matrix. You can also build a matrix.

- **Temperature Source** must be configured and set up.
- One matrix must be selected as the active matrix (the matrix used for measurement).

Requirements for matrices

A matrix is the set of coefficients used to convert process data to concentration, plus related parameters. The matrix can be saved as a file.

The transmitter requires all matrices to be in .matrix format. You can use ProLink III to load matrices in other formats:

- .edf (used by ProLink II)
- .xml (used by ProLink III)

The transmitter can store matrices in two locations:

- One of the six slots in memory
- The transmitter's SD card

Any matrix in a slot is available for use. In other words, it can be selected as the active matrix and used for measurement. Matrices on the SD card are not available for use. Matrices must be loaded into a slot before they can be used for measurement.

All matrices in slots must use the same derived variable. Matrices on the SD card have no requirement for their derived variables to match.

Requirements for derived variables

A *derived variable* is the process variable that a concentration matrix measures. All other process variables are calculated from the derived variable. There are eight possible derived variables. Each matrix is designed for one specific derived variable.

The transmitter can store up to six matrices in six slots. There are additional matrices on the transmitter's SD card. All matrices in the six slots must use the same derived variable. If you change the setting of **Derived Variable**, all matrices are deleted from the six slots. Any matrices on the transmitter's SD card are not affected.

Tip
Always ensure that **Derived Variable** is set correctly before loading matrices into slots.

Derived variables and net flow rate

If you want the transmitter to calculate Net Mass Flow Rate, the derived variable must be set to Mass Concentration (Density). If your matrix is not designed for Mass Concentration (Density), contact customer support for assistance.

If you want the transmitter to calculate Net Volume Flow Rate, the derived variable must be set to Volume Concentration (Density). If your matrix is not designed for Volume Concentration (Density), contact customer support for assistance.

Derived variables based on specific gravity

The following derived variables are based on specific gravity:

- Specific Gravity
- Concentration (Specific Gravity)
- Mass Concentration (Specific Gravity)
- Volume Concentration (Specific Gravity)

If you are using one of these derived variables, two additional parameters can be configured:

- **Reference Temperature of Water** (default setting: 4 °C)
- **Water Density at Reference Temperature** (default setting: 999.99988 kg/m^3)

These two parameters are used to calculate specific gravity.

You cannot set these parameters from the display. If the default values are not appropriate, you must use another method to set them.

Optional tasks in setting up concentration measurement

The following tasks are optional:

- Modifying names and labels
- Configuring extrapolation alerts

5.2.2 Set up concentration measurement using the display

This section guides you through most of the tasks related to setting up and implementing the concentration measurement application.

Restriction
This section does not cover building a concentration matrix. For detailed information on building a matrix, see the *Micro Motion Enhanced Density Application Manual*.

Enable concentration measurement using the display

The concentration measurement application must be enabled before you can perform any setup. If the concentration measurement application was enabled at the factory, you do not need to enable it now.

Prerequisites

The concentration measurement application must be licensed on your transmitter.

Disable the following applications before enabling concentration measurement as concentration measurement cannot be enabled at the same time:

- API Referral
- Piecewise linearization (PWL)
- Gas Standard Volume

Procedure

1. Choose **Menu** → **Configuration** → **Process Measurement**.
2. Choose **Flow Variables** → **Volume Flow Settings** and ensure that **Flow Type** is set to Liquid.
3. Return to the *Process Measurement* menu.
4. If the API Referral application is displayed in the menu, choose **API Referral** and ensure that **Enabled/ Disabled** is set to Disabled.

   The concentration measurement application and the API Referral application cannot be enabled simultaneously.

5. If the Advanced Phase Measurement application is displayed in the menu, choose **Advanced Phase Measurement** → **Application Setup** and ensure that **Enabled/Disabled** is set to Disabled.
6. Enable concentration measurement.
   a) Choose **Menu** → **Configuration** → **Process Measurement** → **Concentration Measurement**.
   b) Set **Enabled/Disabled** to Enabled.

Load a concentration matrix from a USB drive using the display

At least one concentration matrix must be loaded into one of the six slots on your transmitter. You can load up to six matrices into slots. You can also copy matrices to the transmitter's SD card, and load them into slots at a later time.

Tip
In many cases, concentration matrices were ordered with the device and loaded at the factory. You may not need to load any matrices.

WARNING

If the transmitter is in a hazardous area, do not remove the housing cover while the transmitter is powered up. Failure to follow these instructions can cause an explosion resulting in injury or death.

Prerequisites

The concentration measurement application must be enabled on your device.

For each concentration matrix that you want to load, you need a file containing the matrix data. The transmitter's SD card and the ProLink III installation include a set of standard concentration matrices. Other matrices are available from Micro Motion.

Each concentration matrix file must be in .matrix format.

Tip

- If you have a custom matrix on another device, you can save it to a file, then load it to the current device.
- If you have a matrix file in a different format, you can load it using ProLink III.

The .matrix files must be copied to the root directory of a USB drive.

You must know the derived variable that the matrix is designed to calculate.

Important

- All concentration matrices on your transmitter must use the same derived variable.
- If you change the setting of **Derived Variable**, all existing concentration matrices will be deleted from the six slots on the transmitter, but not from the SD card. Set **Derived Variable** before loading concentration matrices.

Procedure

1. Choose **Menu** → **Configuration** → **Process Measurement** → **Concentration Measurement** → **Configure Application** and ensure that the setting of **Derived Variable** matches the derived variable used by your matrix. If it does not, change it as required and click **Apply**.

   Important

   If you change the setting of **Derived Variable**, all existing concentration matrices will be deleted from the six slots, but not from the transmitter's SD card. Verify the setting of **Derived Variable** before continuing.

   ---

2. Load the matrix.
   a) Remove the cover from the transmitter's wiring compartment, open the snap flap to access the service port, and insert the USB drive into the service port.
   b) Choose **Menu** → **USB Options** → **USB Drive –> Transmitter** → **Upload Configuration File**.
   c) Set **Config File Type** to Concentration Measurement Matrix.
   d) Select the .matrix file that you want to load, and wait for the transfer to complete.
3. Choose Yes or No when you are asked if you want to apply the settings.

The transmitter has six slots that are used to store concentration matrices. Any one of these can be used for measurement. The transmitter also has the capability to store multiple concentration matrices on its SD card. These cannot be used for measurement until they are moved to a slot.

Option	Description
Yes	The matrix is saved to the SD card, and the loading process continues with loading the matrix into one of the slots.
No	The matrix is saved to the SD card, and the loading process ends. You must load a matrix into a slot before you can use it for measurement.

4. If you chose Yes, select the slot to load this matrix into, and wait until the load is complete.

   You can load the matrix into any empty slot, or you can overwrite an existing matrix.

Postrequisites

If you loaded the matrix into a slot, choose **Menu** → **Configuration** → **Process Measurement** → **Concentration Measurement** → **Configure Application** → **Active Matrix** and ensure that the matrix is listed.

If you loaded the matrix onto the SD card only, choose **Menu** → **Configuration** → **Process Measurement** → **Concentration Measurement** → **Load Matrix** and ensure that the matrix is listed.

Load a concentration matrix from the SD card using the display

If you have a concentration matrix on the transmitter's SD card, you can load it into one of the six slots on your transmitter. You cannot use the matrix for measurement until it has been loaded into a slot. You can load up to six matrices into slots.

Prerequisites

You must have one or more concentration matrices stored on the transmitter's SD card. The standard matrices are loaded to the SD card at the factory.

You must know the derived variable that the matrix is designed to calculate.

Procedure

1. Choose **Menu** → **Configuration** → **Process Measurement** → **Concentration Measurement** and ensure that the setting of **Derived Variable** matches the derived variable used by your matrix. If it does not, change it as required and click **Apply**.

   Important
   If you change the setting of **Derived Variable**, all existing concentration matrices will be deleted from the six slots, but not from the transmitter's SD card. Verify the setting of **Derived Variable** before continuing.

2. Choose **Menu** → **Configuration** → **Process Measurement** → **Concentration Measurement** → **Load Matrix**.
   The transmitter displays a list of all matrices that are on the SD card.
3. Select the matrix that you want to load.

4. Select the slot that you want to load it into.

   You can load the matrix into any empty slot, or you can overwrite an existing matrix.

Postrequisites

Choose **Menu** → **Configuration** → **Process Measurement** → **Concentration Measurement** → **Configure Application** → **Active Matrix** and ensure that the matrix is listed.

Set up temperature data using the display

The concentration measurement application uses line temperature data in its calculations. You must decide how to provide this data, then perform the required configuration and setup. Temperature data from the on-board temperature sensor (RTD) is always available. Optionally, you can set up an external temperature device and use external temperature data.

The temperature setup that you establish here will be used for all concentration measurement matrices on this meter.

Important
Line temperature data is used in several different measurements and calculations. It is possible to use the internal RTD temperature in some areas and an external temperature in others. The transmitter stores the internal RTD temperature and the external temperature separately. However, the transmitter stores only one alternate temperature value, which may be either the external temperature or the configured fixed value. Accordingly, if you choose a fixed temperature for some uses, and an external temperature for others, the external temperature will overwrite the fixed value.

Procedure

Choose the method to be used to supply temperature data, and perform the required setup.

Method	Description	Setup
Internal temperature	Temperature data from the on-board temperature sensor (RTD) will be used for all measurements and calculations. No external temperature data will be available.	a. Choose **Menu** → **Configuration** → **Process Measurement** → **Temperature**. b. Set **External Temperature** to Off.
Digital communications	A host writes temperature data to the meter at appropriate intervals. This data will be available in addition to the internal temperature data.	a. Choose **Menu** → **Configuration** → **Process Measurement** → **Temperature**. b. Set **External Temperature** to On. c. Perform the necessary host programming and communications setup to write temperature data to the transmitter at appropriate intervals.

Postrequisites

Choose **Menu** → **Service Tools** → **Service Data** → **View Process Variables** and verify the value for External Temperature.

Need help?
If the value is not correct:

- Ensure that the external device and the meter are using the same measurement unit.
- For digital communications:
  - Verify that the host has access to the required data.
  - Verify that the output variable is being correctly received and processed by the transmitter.

Modify matrix names and labels using the display

For convenience, you can change the name of a concentration matrix and the label used for its measurement unit. This does not affect measurement.

Procedure

1. Choose **Menu** → **Configuration** → **Process Measurement** → **Concentration Measurement** → **Configure Matrix**.
2. Select the matrix that you want to modify.
3. Set **Matrix Name** to the name that will be used for this matrix.
4. Set **Concentration Unit** to the label that will be used for the concentration unit.

   If you want to use a custom label, you can use the display to select Special. However, you cannot use the display to configure the custom label. You must use another tool to change the label from Special to a user-defined string.

Modify extrapolation alerts using the display

You can enable and disable extrapolation alerts, and set extrapolation alert limits. These parameters control the behavior of the concentration measurement application but do not affect measurement directly.

Each concentration matrix is built for a specific density range and a specific temperature range. If line density or line temperature goes outside the range, the transmitter will extrapolate concentration values. However, extrapolation may affect accuracy. Extrapolation alerts are used to notify the operator that extrapolation is occurring.

Each concentration matrix has its own extrapolation alert limits.

Procedure

1. Choose **Menu** → **Configuration** → **Process Measurement** → **Concentration Measurement** → **Configure Matrix**.
2. Select the matrix that you want to modify.
3. Set **Extrapolation Limit** to the point, in percent, at which an extrapolation alert will be posted.
4. Choose **Menu** → **Configuration** → **Process Measurement** → **Concentration Measurement** → **Configure Application** → **Extrapolation Alerts**.
5. Enable or disable the high and low limit alerts for temperature and density as desired.

Example: Extrapolation alerts in action

If **Extrapolation Limit** is set to 5%, **High Limit (Temp)** is enabled, and the active matrix is built for a temperature range of 40 °F (4.4 °C) to 80 °F (26.7 °C), a high-temperature extrapolation alert will be posted if line temperature goes above 82 °F (27.8 °C).

Select the active concentration matrix using the display

You must select the concentration matrix to be used for measurement. Although the transmitter can store up to six concentration matrices, only one matrix can be used for measurement at any one time.

Procedure

1. Choose **Menu** → **Configuration** → **Process Measurement** → **Concentration Measurement** → **Configure Application**.
2. Set **Active Matrix** to the matrix you want to use.

5.2.3 Set up concentration measurement using ProLink III

This section guides you through the tasks required to set up, configure, and implement concentration measurement.

Enable concentration measurement using ProLink III

The concentration measurement application must be enabled before you can perform any setup. If the concentration measurement application was enabled at the factory, you do not need to enable it now.

Prerequisites

The concentration measurement application must be licensed on your transmitter.

Disable the following applications before enabling concentration measurement as concentration measurement cannot be enabled at the same time:

- API Referral
- Piecewise linearization (PWL)
- Gas Standard Volume

Procedure

1. Choose **Device Tools** → **Configuration** → **Process Measurement** → **Flow** and ensure that **Volume Flow Type** is set to Liquid Volume.
2. Choose **Device Tools** → **Configuration** → **Process Measurement** → **Advance Phase Measurement** → **APM Status** and ensure that **Application Status** is set to Disable.
3. Choose **Device Tools** → **Configuration** → **Transmitter Options**.
4. Disable API Referral and set the Advance Phase Measurement application to Disabled or Single Liquid.
5. Disable gas Piecewise Linearization (PWL), and set the Advance Phase Measurement application to Disabled or Single Liquid.
6. Set **Concentration Measurement** to Enabled and select **Apply**.

Load a concentration matrix using ProLink III

At least one concentration matrix must be loaded onto your transmitter. You can load up to six.

Prerequisites

The concentration measurement application must be enabled on your device.

For each concentration matrix that you want to load, you need a file containing the matrix data. The ProLink III installation includes a set of standard concentration matrices. Other matrices are available from Micro Motion. The file can be on your computer or in the transmitter's internal memory.

The file must be in one of the formats that ProLink III supports. This includes:

- .xml (ProLink III)
- .matrix (5700)

If you are loading an .xml file, you must know the following information for your matrix:

- The derived variable that the matrix is designed to calculate
- The density unit that the matrix was built with
- The temperature unit that the matrix was built with

If you are loading a .matrix file, you must know the derived variable that the matrix is designed to calculate.

Important

- All concentration matrices on your transmitter must use the same derived variable.
- If you change the setting of **Derived Variable**, all existing concentration matrices will be deleted from the six slots on the transmitter, but not from the transmitter's SD card. Set **Derived Variable** before loading concentration matrices.
- ProLink III loads matrices directly to one of the transmitter's six slots.

Tip

In many cases, concentration matrices were ordered with the device and loaded at the factory. You may not need to load any matrices.

Restriction

You cannot use ProLink III to load a matrix to the transmitter's SD card.

Procedure

1. If you are loading an .xml file, choose **Device Tools** → **Configuration** → **Process Measurement** → **Line Density** and set **Density Unit** to the density unit used by your matrix.

   Important

   When you load a matrix in one of these formats, if the density unit is not correct, concentration data will be incorrect. The density units must match at the time of loading. You can change the density unit after the matrix is loaded.

2. If you are loading an .xml file, choose **Device Tools** → **Configuration** → **Process Measurement** → **Line Temperature**and set **Temperature Unit** to the temperature unit used by your matrix.

   Important
   When you load a matrix in one of these formats, if the temperature unit is not correct, concentration data will be incorrect. The temperature units must match at the time of loading. You can change the temperature unit after the matrix is loaded.

3. Choose **Device Tools** → **Configuration** → **Process Measurement** → **Concentration Measurement**.
   The *Concentration Measurement* window is displayed. It is organized into steps that allow you to perform several different setup and configuration tasks. For this task, you will not use all the steps.
4. In Step 1, ensure that the setting of **Derived Variable** matches the derived variable used by your matrix. If it does not, change it as required and select **Apply**.

   Important
   If you change the setting of **Derived Variable**, all existing concentration matrices will be deleted from the six slots. Verify the setting of **Derived Variable** before continuing.

5. Load one or more matrices.
   a) In Step 2, set **Matrix Being Configured** to the location (slot) to which the matrix will be loaded.
   b) To load a .xml file from your computer, select **Load Matrix from File**, navigate to the file, and load it.
   c) To load a .matrix file from your computer, select **Load Matrix from My Computer**, navigate to the file, and load it.
   d) To load a .matrix file from the transmitter's internal memory, select Load Matrix from 5700 Device Memory, navigate to the file on the transmitter, and load it.
   e) Repeat until all required matrices are loaded.

Set reference temperature values for specific gravity using ProLink III

When **Derived Variable** is set to any option based on specific gravity, you must set the reference temperature for water, then verify the density of water at the configured reference temperature. These values affect specific gravity measurement.

This requirement applies to the following derived variables:

- Specific Gravity
- Concentration (Specific Gravity)
- Mass Concentration (Specific Gravity)
- Volume Concentration (Specific Gravity)

Procedure

1. Choose **Device Tools** → **Configuration** → **Process Measurement** → **Concentration Measurement**.
   The *Concentration Measurement* window is displayed. It is organized into steps that allow you to perform several different setup and configuration tasks. For this task, you will not use all the steps.
2. Scroll to Step 2, set **Matrix Being Configured** to the matrix you want to modify, and select **Change Matrix**.

3. Scroll to Step 3, then perform the following actions:
    a) Set **Reference Temperature for Referred Density** to the temperature to which line density will be corrected for use in the specific gravity calculation.
    b) Set **Reference Temperature for Water** to the water temperature that will be used in the specific gravity calculation.
    c) Set **Water Density at Reference Temperature** to the density of water at the specified reference temperature.

        The transmitter automatically calculates the density of water at the specified temperature. The new value will be displayed the next time that transmitter memory is read. You can enter a different value if you prefer.

4. Select **Apply** at the bottom of Step 3.

Set up temperature data using ProLink III

The concentration measurement application uses line temperature data in its calculations. You must decide how to provide this data, then perform the required configuration and setup. Temperature data from the on-board temperature sensor (RTD) is always available. Optionally, you can set up an external temperature device and use external temperature data.

The temperature setup that you establish here will be used for all concentration measurement matrices on this meter.

Important
Line temperature data is used in several different measurements and calculations. It is possible to use the internal RTD temperature in some areas and an external temperature in others. The transmitter stores the internal RTD temperature and the external temperature separately. However, the transmitter stores only one alternate temperature value, which may be either the external temperature or the configured fixed value. Accordingly, if you choose a fixed temperature for some uses, and an external temperature for others, the external temperature will overwrite the fixed value.

Procedure

1. Choose **Device Tools** → **Configuration** → **Process Measurement** → **Concentration Measurement**.

    The *Concentration Measurement* window is displayed. It is organized into steps that allow you to perform several different setup and configuration tasks. For this task, you will not use all the steps.

2. Scroll to Step 4.
3. Choose the method to be used to supply temperature data, and perform the required setup.

Option	Description	Setup
Internal temperature	Temperature data from the on-board temperature sensor (RTD) will be used for all measurements and calculations. No external temperature data will be available.	a. Set **Line Temperature Source** to Internal. b. Click **Apply**.

Option	Description	Setup
Digital communications	A host writes temperature data to the meter at appropriate intervals. This data will be available in addition to the internal RTD temperature data.	a. Set **Line Temperature Source** to Fixed Value or Digital Communications. b. Click **Apply**. c. Perform the necessary host programming and communications setup to write temperature data to the meter at appropriate intervals.

Postrequisites

If you are using external temperature data, verify the external temperature value displayed in the *Inputs* group on the ProLink III main window.

Need help?
If the value is not correct:

- Ensure that the external device and the meter are using the same measurement unit.
- For digital communications:
  - Verify that the host has access to the required data.
  - Verify that the output variable is being correctly received and processed by the transmitter.

Modify matrix names and labels using ProLink III

For convenience, you can change the name of a concentration matrix and the label used for its measurement unit. This does not affect measurement.

Procedure

1. Choose **Device Tools** → **Configuration** → **Process Measurement** → **Concentration Measurement**.
   The *Concentration Measurement* window is displayed. It is organized into steps that allow you to perform several different setup and configuration tasks. For this task, you will not use all the steps.
2. Scroll to Step 2, set **Matrix Being Configured** to the matrix you want to modify, and click **Change Matrix**.
3. Scroll to Step 3, then perform the following actions:
   a) Set **Concentration Units Label** to the label that will be used for the concentration unit.
   b) If you set **Concentration Units Label** to Special, enter the custom label in **User-Defined Label**.
   c) In **Matrix Name**, enter the name to be used for the matrix.
4. Select **Apply** at the bottom of Step 3.

Modify extrapolation alerts using ProLink III

You can enable and disable extrapolation alerts, and set extrapolation alert limits. These parameters control the behavior of the concentration measurement application but do not affect measurement directly.

Each concentration matrix is built for a specific density range and a specific temperature range. If line density or line temperature goes outside the range, the transmitter will extrapolate concentration values. However, extrapolation may affect accuracy. Extrapolation alerts are used to notify the operator that extrapolation is occurring.

Each concentration matrix has its own extrapolation alert limits.

Procedure

1. Choose **Device Tools** → **Configuration** → **Process Measurement** → **Concentration Measurement**.
   The *Concentration Measurement* window is displayed. It is organized into steps that allow you to perform several different setup and configuration tasks. For this task, you will not use all the steps.
2. Scroll to Step 2, set **Matrix Being Configured** to the matrix you want to modify, and click **Change Matrix**.
3. Scroll to Step 4.
4. Set **Extrapolation Alert Limit** to the point, in percent, at which an extrapolation alert will be posted.
5. Enable or disable the high and low limit alerts for temperature and density, as desired, and click **Apply**.

Example: Extrapolation alerts in action

If **Extrapolation Limit** is set to 5%, **High Limit (Temp)** is enabled, and the active matrix is built for a temperature range of 40 °F (4.4 °C) to 80 °F (26.7 °C), a high-temperature extrapolation alert will be posted if line temperature goes above 82 °F (27.8 °C).

Select the active concentration matrix using ProLink III

You must select the concentration matrix to be used for measurement. Although the transmitter can store up to six concentration matrices, only one matrix can be used for measurement at any one time.

Procedure

1. Choose **Device Tools** → **Configuration** → **Process Measurement** → **Concentration Measurement**.
2. Scroll to Step 2, set **Active Matrix** to the matrix you want to use and select **Change Matrix**.

5.2.4 Set up concentration measurement using a PROFIBUS PA host

This section guides you through most of the tasks related to setting up and implementing the concentration measurement application.

Enable concentration measurement using a PROFIBUS PA host

DeltaV AMS	**Overview** → **Device Information** → **Licenses** → **Enable/Disable Applications**
Siemens PDM	**view** → **Overview** → **Device Information** → **Licenses** → **Enable/Disable Applications**

The concentration measurement application must be enabled before you can perform any setup. If the concentration measurement application was enabled at the factory, you do not need to enable it now.

Prerequisites

The concentration measurement application must be licensed on your transmitter.

Disable the following applications before enabling concentration measurement as concentration measurement cannot be enabled at the same time:

- API Referral

- Piecewise linearization (PWL)
- Gas Standard Volume

Procedure

1. Ensure that **Flow Type** is set to Liquid Volume Flow.
2. Ensure that the API Referral and piecewise linearization (PWL) are disabled.
3. Ensure that the **Advance Phase Measurement Output Type** is either disabled or set to liquid with gas continuous flow or liquid with gas variable flow.
4. Execute the concentration measurement method. This method sets the device application for concentration measurement.

Set reference temperature values for specific gravity using a PROFIBUS PA host

DeltaV AMS	**Configure → Manual Setup → Measurements → Optional Setup → Concentration Measurement**
Siemens PDM	**Device → Manual Setup → Measurements → Optional Setup → Concentration Measurement**

When **Derived Variable** is set to any option based on specific gravity, you must set the reference temperature for water, then verify the density of water at the configured reference temperature. These values affect specific gravity measurement.

The PROFIBUS PA host shows only the 10 point linearization table values.

Check the setting of **Configure Concentration Measurement → Derived Variable**.

Important
Do not change the setting of **Derived Variable**. If you change the setting of **Derived Variable**, all existing concentration matrices will be deleted from transmitter memory.

Procedure

1. Set **Configure Matrix → Matrix Being Configured** to the matrix you want to modify.
2. Choose **Reference Conditions**, then perform the following actions:
    a) Set **Reference Temperature** to the temperature to which line density will be corrected for use in the specific gravity calculation.
    b) Set **Water Reference Temperature** to the water temperature that will be used in the specific gravity calculation.
    c) Set **Water Reference Density** to the density of water at the specified reference temperature.

    The transmitter automatically calculates the density of water at the specified temperature. The new value will be displayed the next time that transmitter memory is read. Optionally, you can enter a different value.

Provide temperature data using a PROFIBUS PA host

DeltaV AMS	**Configure → Manual Setup → Measurements → Optional Setup → External Variables**
Siemens PDM	**Device → Manual Setup → Measurements → Optional Setup → External Variables**

The concentration measurement application uses line temperature data in its calculations. You must decide how to provide this data, then perform the required configuration and setup. Temperature data from the on-board temperature sensor (RTD) is always available. You can set up an external temperature device and use external temperature data if you want to.

The temperature setup that you establish here will be used for all concentration measurement matrices on this meter.

Procedure

Choose the method to be used to supply temperature data, and perform the required setup.

Method	Description	Setup
Internal RTD temperature data	Temperature data from the on-board temperature sensor (RTD) is used.	Set **Temperature Compensation** to Disable.
Digital communications	A host writes temperature data to the meter at appropriate intervals. This data will be available in addition to the internal RTD temperature data.	a. Set **Temperature Compensation** to Enable. b. Perform the necessary host programming and communications setup to write temperature data to the meter at appropriate intervals.

Postrequisites

Choose **Service Tools** → **Variables** → **External Variables** and verify the value for **External Temperature**.

Need help?

If the value is not correct:

- Ensure that the external device and the meter are using the same measurement unit.
- For digital communications:
  - Verify that the host has access to the required data.
  - Verify that the output variable is being correctly received and processed by the transmitter.

Modify matrix names and labels using a PROFIBUS PA host

DeltaV AMS	**Configure** → **Manual Setup** → **Measurements** → **Optional Setup** → **Concentration Measurement** → **Configure Matrix** → **Matrix Selection**
Siemens PDM	**Device** → **Manual Setup** → **Measurements** → **Optional Setup** → **Concentration Measurement** → **Configure Matrix** → **Matrix Selection**

For convenience, you can change the name of a concentration matrix and the label used for its measurement unit. This does not affect measurement.

Procedure

1. Set **Matrix Being Configured** to the matrix you want to modify.
2. Set **Matrix Name** to the name to be used for the matrix.
3. Set **Concentration Unit** to the label that will be used for the concentration unit.
4. If you set **Concentration Unit** to Special, choose **Label** and enter the custom label.

Modify extrapolation alerts for concentration measurement using a PROFIBUS PA host

DeltaV AMS	**Configure → Manual Setup → Measurements → Optional Setup → Concentration Measurement → Configure Matrix**
Siemens PDM	**Device → Manual Setup → Measurements → Optional Setup → Concentration Measurement → Configure Matrix**

You can enable and disable extrapolation alerts, and set extrapolation alert limits. These parameters control the behavior of the concentration measurement application but do not affect measurement directly.

Each concentration matrix is built for a specific density range and a specific temperature range. If line density or line temperature goes outside the range, the transmitter will extrapolate concentration values. However, extrapolation may affect accuracy. Extrapolation alerts are used to notify the operator that extrapolation is occurring.

Each concentration matrix has its own extrapolation alert limits.

Procedure

1. Set **Matrix Selection** → **Matrix Being Configured** to the matrix you want to modify.
2. Set **Extrapolation Alert** → **Limit** to the point, in percent, at which an extrapolation alert will be posted.
3. Choose one of the following options based on the tool you are using:
   - For DeltaV AMS, **Configure** → **Alert Setup** → **Concentration Measurement Alerts**
   - For Siemens PDM, **Device** → **Alert Setup** → **Concentration Measurement Alerts**
4. Enable or disable the high and low alerts for temperature and density, as desired.

Example: Extrapolation alerts in action

If **Extrapolation Limit** is set to 5%, **High Limit (Temp)** is enabled, and the active matrix is built for a temperature range of 40 °F (4.4 °C) to 80 °F (26.7 °C), a high-temperature extrapolation alert will be posted if line temperature goes above 82 °F (27.8 °C).

Select the active concentration matrix using a PROFIBUS PA host

DeltaV AMS	**Configure → Manual Setup → Measurements → Optional Setup → Concentration Measurement**
Siemens PDM	**Device → Manual Setup → Measurements → Optional Setup → Concentration Measurement**

You must select the concentration matrix to be used for measurement. Although the transmitter can store up to six concentration matrices, only one matrix can be used for measurement at any one time.

Procedure

Set **Active Matrix** to the matrix you want to use.

6 Configure advanced options for process measurement

6.1 Configure Response Time

Display	**Menu → Configuration → Process Measurement → Response Time**
ProLink III	**Device Tools → Configuration → Process Measurement → Response Time**
DeltaV AMS	**Configure → Manual Setup → Measurements 2 → Response Time**
Siemens PDM	**Device → Manual Setup → Measurements 2 → Response Time**

Response Time controls the speed of various internal processes that are involved in retrieving electronic data from the sensor and converting it to process data.

Response Time affects all process and diagnostic variables.

Restriction
Response Time is configurable only if you are using the enhanced core processor. If you are using the standard core processor, **Response Time** is set to Low Filtering and cannot be changed.

Procedure

Set **Response Time** as desired.

Option	Description
Normal	Appropriate for typical applications.
High Filtering	Slower response. Appropriate for applications with significant amount of entrained gas or process noise.
Low Filtering	Fastest response. Appropriate for proving or filling applications.

6.2 Detect and report two-phase flow

Two-phase flow (gas in a liquid process or liquid in a gas process) can cause a variety of process control issues. The transmitter provides two methods to detect and report or respond to two-phase flow.

6.2.1 Detect two-phase flow using density

Display	**Menu → Configuration → Process Measurement → Density**
ProLink III	**Device Tools → Configuration → Process Measurement → Density**
DeltaV AMS	**Configure → Manual Setup → Measurements → Two-Phase Flow → Low Limit** **Configure → Manual Setup → Measurements → Two-Phase Flow → High Limit** **Configure → Manual Setup → Measurements → Two-Phase Flow → Duration**

Siemens PDM	**Device → Manual Setup → Measurements → Two-Phase Flow → Low Limit** **Device → Manual Setup → Measurements → Two-Phase Flow → High Limit** **Device → Manual Setup → Measurements → Two-Phase Flow → Duration**

The transmitter can use line density data to detect two-phase flow (gas in a liquid process or liquid in a gas process). The density limits are user-specified. When two-phase flow is detected, an alert is posted.

Procedure

1. Set **Two-Phase Flow Low Limit** to the lowest density value that is considered normal in your process.

   Values below this will cause the transmitter to post a Process Aberration alert.

   Tip
   Gas entrainment can cause your process density to drop temporarily. To reduce the occurrence of two-phase flow alerts that are not significant to your process, set **Two-Phase Flow Low Limit** slightly below your expected lowest process density.

   You must enter **Two-Phase Flow Low Limit** in g/cm^3, even if you configured another unit for density measurement.

   - Default: 0 g/cm^3
   - Range: 0 g/cm^3 to the sensor limit

2. Set **Two-Phase Flow High Limit** to the highest density value that is considered normal in your process.

   Values above this will cause the transmitter to post a Process Aberration alert.

   Tip
   To reduce the occurrence of two-phase flow alerts that are not significant to your process, set **Two-Phase Flow High Limit** slightly above your expected highest process density.

   You must enter **Two-Phase Flow High Limit** in g/cm^3, even if you configured another unit for density measurement.

   - Default: 5 g/cm^3
   - Range: 5 g/cm^3 to the sensor limit

3. Set **Two-Phase Flow Timeout** to the number of seconds that the transmitter will wait for a two-phase flow condition to clear before posting the alert.

   - Default: 0 seconds, meaning that the alert will be posted immediately
   - Range: 0 to 60 seconds

6.2.2 Detect two-phase flow using sensor diagnostics

Display	**Menu → Configuration → Inputs/Outputs → Channel B → I/O Settings → Source**
ProLink III	**Device Tools → Configuration → I/O → Outputs → mA Output**
DeltaV AMS	**Configure → Manual Setup → Mapping/Source → Output Source → Milliamp Output Source**
Siemens PDM	**Device → Manual Setup → Mapping/Source → Output Source → Milliamp Output Source**

The transmitter always monitors sensor diagnostics and applies a two-phase flow algorithm. You can assign an mA Output to report the results of this calculation: single-phase flow, moderate two-phase flow, or severe two-phase flow. Severe two-phase flow can cause the meter to stop functioning.

Prerequisites

Channel B must be configured as mA Output.

Procedure

Set **mA Output Source** to Two-Phase Flow Detection.

The signal from the mA Output indicates the current state of the process:

- 12 mA: Single-phase flow
- 16 mA: Moderate two-phase flow
- 20 mA: Severe two-phase flow

6.3 Configure Flow Rate Switch

Display	**Menu → Configuration → Alert Setup → Enhanced Events → Flow Rate Switch**
ProLink III	**Device Tools → Configuration → I/O → Outputs → Discrete Output → Source → Flow Switch Indication**
DeltaV AMS	**Configure → Manual Setup → Mapping/Source → Output Source → Discrete Output Source**
Siemens PDM	**Device → Manual Setup → Mapping/Source → Output Source → Discrete Output Source**

Flow Rate Switch is used to indicate that the flow rate has moved past a user-specified setpoint, in either direction. The flow rate switch is implemented with a user-configurable hysteresis.

Typically, a Discrete Output is assigned as the flow rate switch indicator. The Discrete Output can be wired to an external device such as a light or a horn.

Prerequisites

Channel C must be configured as a Discrete Output.

Procedure

1. Set **Discrete Output Source** to Flow Switch, if you have not already done so.
2. Set **Flow Switch Variable** to the flow variable that you want to use to control the flow rate switch.
3. Set **Flow Switch Setpoint** to the value at which the flow switch will be triggered (after **Hysteresis** is applied).

   Depending on the polarity of the Discrete Output:

   - If the flow rate is below this value, the Discrete Output is ON.
   - If the flow rate is above this value, the Discrete Output is OFF.

4. Set **Hysteresis** to the percentage of variation above and below the setpoint that will operate as a deadband.

Hysteresis defines a range around the setpoint within which the flow rate switch will not change.

- Default: 5%
- Range: 0.1% to 10%

Example

If **Flow Switch Setpoint** = `100` g/sec and **Hysteresis** = `5%`, and the first measured flow rate is above 100 g/sec, the discrete output is OFF. It will remain OFF unless the flow rate drops below 95 g/sec. If this happens, the discrete output will turn ON, and remain ON until the flow rate rises above 105 g/sec. At this point it turns OFF and will remain OFF until the flow rate drops below 95 g/sec.

Related information

Configure a Discrete Output

6.4 Configure events

An event occurs when the real-time value of a user-specified process variable moves past a user-defined setpoint. Events are used to provide notification of process changes or to perform specific transmitter actions if a process change occurs.

Related information

Configure an enhanced event

6.4.1 Configure an enhanced event

Display	**Menu → Configuration → Alert Setup → Enhanced Events**
ProLink III	**Device Tools → Configuration → Events → Enhanced Events**
DeltaV AMS	**Configure → Manual Setup → Events → Configure Events**
Siemens PDM	**Device → Manual Setup → Events → Configure Events**

An enhanced event is used to provide notification of process changes and, optionally, to perform specific transmitter actions if the event occurs. An enhanced event occurs (is ON) if the real-time value of a user-specified process variable moves above (HI) or below (LO) a user-defined setpoint, or in range (IN) or out of range (OUT) with respect to two user-defined setpoints.

You can define up to five enhanced events. For each enhanced event, you can assign one or more actions that the transmitter will perform if the enhanced event occurs.

Procedure

1. Select the event that you want to configure.
2. Assign a process variable to the event.
3. Specify **Event Type**.

Option	Description
HI	$x > A$

Option	Description
	The event occurs when the value of the assigned process variable (*x*) is greater than the setpoint (**Setpoint A**), endpoint not included.
LO	$x < A$ The event occurs when the value of the assigned process variable (*x*) is less than the setpoint (**Setpoint A**), endpoint not included.
IN	$A \leq x \leq B$ The event occurs when the value of the assigned process variable (*x*) is *in range*, that is, between **Setpoint A** and **Setpoint B**, endpoints included.
OUT	$x \leq A$ or $x \geq B$ The event occurs when the value of the assigned process variable (*x*) is *out of range*, that is, less than **Setpoint A** or greater than **Setpoint B**, endpoints included.

4. Set values for the required setpoints.
   - For HI and LO events, set **Setpoint A**.
   - For IN and OUT events, set **Setpoint A** and **Setpoint B**.
5. Optional: Configure a Discrete Output to switch states in response to the event status.
6. Optional: Specify the action or actions that the transmitter will perform when the event occurs.

Option	Description
Display	**Menu** → **Configuration** → **Alert Setup** → **Enhanced Events**, select any enhanced event, and choose **Assign Actions**
ProLink III	**Device Tools** → **Configuration** → **I/O** → **Inputs** → **Action Assignment**

Related information

Configure Discrete Output Source

Options for Enhanced Event Action

Action	Label		
	Display	**ProLink III**	**PROFIBUS-PA**
Standard			
Start sensor zero	Start Zero Calibration	Start Sensor Zero	Start Sensor Zero
Totalizers			
Start/stop all totalizers and inventories	Start/stop all totalizers	Start or Stop All Totalizers	Start/Stop All Totals
Reset totalizer *X*	Reset Total X	Totalizer X	Reset Total X

Action	Label		
	Display	**ProLink III**	**PROFIBUS-PA**
Reset all totalizers and inventories	Reset All Totals	Reset All Totals	Reset All Totals
Start\stop inventory *X*	Start\stop Inventory X	Start or stop Inventory X	Start\Stop Inventory X
Concentration measurement			
Increment CM matrix	Increment Matrix	Increment ED Curve	Increment Curve
Meter verification			
Start meter verification test	Start SMV	Start Meter Verification	Start Smart Meter Verification

6.5 Configure totalizers and inventories

Display	**Menu → Configuration → Process Measurement → Totalizers & Inventories**
ProLink III	**Device Tools → Totalizer Control → Totalizers**
DeltaV AMS	**Configure → Manual Setup → Measurements → Optional Setup → Configure Totalizers/Inventories**
Siemens PDM	**Device → Manual Setup → Measurements → Optional Setup → Configure Totalizers/Inventories**

The transmitter provides seven configurable totalizers and seven configurable inventories. Each totalizer and each inventory can be configured independently.

Totalizers track the process since the last totalizer reset. Inventories track the process since the last inventory reset. Inventories are typically used to track the process across totalizer resets.

Tip
The default configurations cover the most typical uses of totalizers and inventories. You may not need to change any configurations.

Prerequisites

Before configuring the totalizers and inventories, ensure that the process variables you plan to track are available on the transmitter.

Procedure

1. Select the totalizer or inventory that you want to configure.
2. Set **Totalizer Source** or **Inventory Source** to the process variable that the totalizer or inventory will track.

Option	Description
Mass flow	The totalizer or inventory will track Mass Flow Rate and calculate total mass since the last reset.
Volume flow	The totalizer or inventory will track Volume Flow Rate and calculate total volume since the last reset.

Option	Description
Gas standard volume flow	The totalizer or inventory will track Gas Standard Volume Flow Rate and calculate total volume since the last reset.
Temperature-corrected volume flow	The totalizer or inventory will track Temperature-Corrected Volume Flow Rate and calculate total volume since the last reset.
Standard volume flow	The totalizer or inventory will track Standard Volume Flow Rate and calculate total volume since the last reset.
Net mass flow	The totalizer or inventory will track Net Mass Flow Rate and calculate total mass since the last reset.
Net volume flow	The totalizer or inventory will track Net Volume Flow Rate and calculate total volume since the last reset.

For totalizer source codes, see Totalizer source Advanced Phase Measurement codes.

Note
The totalizer/inventory value will not automatically be reset when the source is changed. The user must manually reset the totalizer/inventory.

Tip
If you are using the API Referral application and you want to measure batch-weighted average density or batch-weighted average temperature, you must have a totalizer configured to measure temperature-corrected volume flow.

3. Set **Totalizer Direction** to specify how the totalizer or inventory will respond to forward or reverse flow.

Option	Flow direction	Totalizer and inventory behavior
Forward Only	Forward	Totals increment
	Reverse	Totals do not change
Reverse Only	Forward	Totals do not change
	Reverse	Totals increment
Bidirectional	Forward	Totals increment
	Reverse	Totals decrement
Absolute Value	Forward	Totals increment
	Reverse	Totals increment

Important
Actual flow direction interacts with **Sensor Flow Direction Arrow** to determine the flow direction that the transmitter uses in processing. See the following table.

Table 6-1: Interaction between actual flow direction and Sensor Flow Direction Arrow

Actual flow direction	Setting of Sensor Flow Direction Arrow	Flow direction sent to outputs and totalizers
Forward (same direction as Flow arrow on sensor)	With Arrow	Forward
	Against Arrow	Reverse
Reverse (opposite from Flow arrow on sensor)	With Arrow	Reverse
	Against Arrow	Forward

4. Optional: Set **User Name** to the name you want to use for the inventory or totalizer.

   User Name can have a maximum of 16 characters.

   The transmitter automatically generates a name for each totalizer and inventory, based on its source, direction, and type.

   ### Example

   - **Totalizer Source**=Mass Flow
   - **Totalizer Direction**=Forward Only
   - Totalizer name=`Mass Fwd Total`

   ### Example

   - **Inventory Source**=Gas Standard Volume Flow
   - **Inventory Direction**=Bidirectional
   - Inventory name = `GSV Bidir Inv`

   The specified name is used on the transmitter display and on all interfaces that support it. If **User Name** contains only spaces, the transmitter-generated name is used. Not all interfaces support totalizer and inventory names.

Example: Checking for backflow

You suspect that there is a significant amount of backflow through the sensor. To collect data, configure two totalizers as follows:

- **Source**=Mass Flow, **Direction**=Forward Only
- **Source**=Mass Flow, **Direction**=Reverse Only

Reset both totalizers, allow them to run for an appropriate period, then look at the amount of reverse flow as a percentage of forward flow.

Example: Tracking three different process fluids

Three tanks are connected to a loading dock through a single meter. Each tank contains a different process fluid. You want to track each process fluid separately.

1. Set up three totalizers, one for each tank.
2. Name the totalizers `Tank 1`, `Tank 2`, and `Tank 3`.

3. Configure each totalizer as required for the corresponding process fluid.
4. Stop and reset all three totalizers to ensure that the beginning values are 0.
5. When loading from a tank, start the corresponding totalizer, and stop it when the load is finished.

6.5.1 Totalizer source Advanced Phase Measurement codes

Code	Description
73	APM: Net Flow Oil at Line
75	APM: Net Flow Water at Line
78	APM: Net Flow Oil At Reference
81	APM: Net Flow Water At Reference
188	APM: SF Net Oil Flow at Line
189	APM: SF Net Oil Flow at Reference
190	APM: SF Volume Flow at Reference
210	APM: Unremediated Mass Flow
212	APM: Unremediated Vol Flow
230	APM: TMR Liquid Flow

6.5.2 Default settings for totalizers and inventories

Totalizer or inventory	Source (process variable assignment	Direction	Name of totalizer Name of inventory
1	Mass flow	Forward Only	Mass Fwd Total Mass Fwd Inv
2	Volume flow	Forward Only	Volume Fwd Total Volume Fwd Inv
3	Temperature-corrected volume flow	Forward Only	API Volume Fwd Total API Volume Fwd Inv
4	Gas standard volume flow	Forward Only	GSV Fwd Total GSV Fwd Inv
5	Standard volume flow	Forward Only	Standard Vol Fwd Total Standard Vol Fwd Inv
6	Net mass flow	Forward Only	Net Mass Fwd Total Net Mass Fwd Inv
7	Net volume flow	Forward Only	Net Vol Fwd Total Net Vol Fwd Inv

6.6 Configure logging for totalizers and inventories

Display	**Menu → Configuration → Totalizer Log**
ProLink III	**Device Tools → Configuration → Totalizer Log**
DeltaV AMS	Not available
Siemens PDM	Not available

The transmitter can write the current value of four totalizers or inventories to a log, at user-specified intervals. You can generate a log file from this data for viewing and analysis.

Procedure

1. Specify the date on which totalizer logging will begin.

   You must specify a future date. If you try to specify the current date, the transmitter will reject the setting.

2. Specify the time at which totalizer logging will begin.
3. Specify the number of hours between records.
4. Select up to four totalizers or inventories to be logged.

6.7 Configure Process Variable Fault Action

Display	**Menu → Configuration → Alert Setup → Output Fault Actions**
ProLink III	**Device Tools → Configuration → Fault Processing**
DeltaV AMS	**Configure → Alert Setup → Output Fault Actions → Fault Setting**
Siemens PDM	**Device → Alert Setup → Output Fault Actions → Fault Setting**

Process Variable Fault Action specifies the values that will be reported via the display and digital communications if the device encounters a fault condition. The values are also sent to the outputs for processing against their configured fault actions.

Procedure

Set **Process Variable Fault Action** as desired.

Default: None

Restriction
If you set **Process Variable Fault Action** to NAN, you cannot set **mA Output Fault Action** or **Frequency Output Fault Action** to None. If you try to do this, the transmitter will not accept the configuration.

Important

- If you want the mA Output to continue reporting process data during fault conditions, you must set both **Process Variable Fault Action** and **mA Output Fault Action** to **None**. If **mA Output Fault Action** is set to **None** and **Process Variable Fault Action** is set to any other option, the mA Output will produce the signal associated with the selection.
- If you want the Frequency Output to continue reporting process data during fault conditions, you must set both **Process Variable Fault Action** and **Frequency Output Fault Action** to **None**. If **Frequency Output**

Fault Action is set to **None** and **Process Variable Fault Action** is set to any other option, the Frequency Output will produce the signal associated with the selection.

6.7.1 Options for Process Variable Fault Action

Label			Description
Display	**ProLink III**	**PROFIBUS-PA**	
Upscale	Upscale	Upscale	• Process variable values indicate that the value is greater than the upper sensor limit. • Totalizers stop incrementing.
Downscale	Downscale	Downscale	• Process variable values indicate that the value is lower than the lower sensor limit. • Totalizers stop incrementing.
Zero	Zero	Zero	• Flow rate variables go to the value that represents a flow rate of 0 (zero). • Density is reported as `0`. • Temperature is reported as `0 °C`, or the equivalent if other units are used (e.g., `32 °F`. • Drive gain is reported as measured. • Totalizers stop incrementing.
Not-a-Number (NAN)	Not a Number	NAN	• Process variables are reported as `IEEE NAN`. • Drive gain is reported as measured. • Modbus scaled integers are reported as `Max Int`. • Totalizers stop incrementing.
Flow to Zero	Flow to Zero	Flow goes to zero	• Flow rates are reported as `0`. • Other process variables are reported as measured. • Totalizers stop incrementing.
None (default)	None	None	• All process variables are reported as measured. • Totalizers increment if they are running.

6.7.2 Interaction between Process Variable Fault Action and other fault actions

The setting of **Process Variable Fault Action** affects the operation of the mA Outputs, Frequency Outputs, and Discrete Outputs if the corresponding output fault actions are set to None.

Interaction between Process Variable Fault Action and mA Output Fault Action

If **mA Output Fault Action** is set to None, the mA Output signal depends on the setting of **Process Variable Fault Action**.

If the device detects a fault condition:

1. **Process Variable Fault Action** is evaluated and applied.
2. **mA Output Fault Action** is evaluated.
   - If it is set to None, the output reports the value associated with the setting of **Process Variable Fault Action**.
   - If it is set to any other option, the output performs the specified fault action.

If you want the mA Output to continue to report process data during fault conditions, you must set both **mA Output Fault Action** and **Process Variable Fault Action** to None.

Interaction between Process Variable Fault Action and Frequency Output Fault Action

If **Frequency Output Fault Action** is set to None, the Frequency Output signal depends on the setting of **Process Variable Fault Action**.

If the device detects a fault condition:

1. **Process Variable Fault Action** is evaluated and applied.
2. **Frequency Output Fault Action** is evaluated.
   - If it is set to None, the output reports the value associated with the setting of **Process Variable Fault Action**.
   - If it is set to any other option, the output performs the specified fault action.

If you want the Frequency Output to continue to report process data during fault conditions, you must set both **Frequency Output Fault Action** and **Process Variable Fault Action** to None.

Interaction between Process Variable Fault Action and Discrete Output Fault Action

If **Discrete Output Fault Action** is set to None and **Discrete Output Source** is set to Flow Rate Switch, the Discrete Output state during a fault depends on the setting of **Process Variable Fault Action**.

If the device detects a fault condition:

1. **Process Variable Fault Action** is evaluated and applied.
2. **Discrete Output Fault Action** is evaluated.
   - If it is set to None, and **Discrete Output Source** is set to Flow Rate Switch, the Discrete Output will use the value determined by the current setting of **Process Variable Fault Action** to determine if a flow rate switch has occurred.

- If **Discrete Output Source** is set to any other option, the setting of **Process Variable Fault Action** is irrelevant to the behavior of the Discrete Output during fault conditions. The Discrete Output is set to the specified fault action.

If you want the Discrete Output to report a flow rate switch appropriately during fault conditions, you must set both **Discrete Output Fault Action** and **Process Variable Fault Action** to None.

Related information

Configure mA Output Fault Action
Configure Frequency Output Fault Action
Configure Discrete Output Fault Action

7 Configure device options and preferences

7.1 Configure the transmitter display

You can control the language used on the display, the process variables shown on the display, and a variety of display behaviors.

7.1.1 Configure the language used on the display

Display	**Menu → Configuration → Display Settings → Language**
ProLink III	**Device Tools → Configuration → Local Display Settings → Transmitter Display → General → Language**
DeltaV AMS	**Configure → Manual Setup → Display → Display Language → Language**
Siemens PDM	**Device → Manual Setup → Display → Display Language → Language**

Language controls the language that the display uses for process data, menus, and information.

The languages available depend on your transmitter model and version.

Procedure

Set **Language** to the desired language.

7.1.2 Configure the process variables shown on the display

Display	**Menu → Configuration → Display Settings → Display Variables**
ProLink III	**Device Tools → Configuration → Transmitter Display → Display Variables**
DeltaV AMS	**Configure → Manual Setup → Display → Display Variables**
Siemens PDM	**Device → Manual Setup → Display → Display Variables**

You can control the process variables shown on the display and the order in which they appear. The display can scroll through up to 15 process variables in any order you choose. This configuration applies to both auto-scroll and manual scrolling.

By default, one process variable is shown at a time. You can configure a custom display screen that shows two process variables at a time.

Restriction
You cannot remove all display variables. At least one display variable must be configured.

Notes

- If you have a display variable configured to show a volume process variable, and you change **Volume Flow Type** to Gas Standard Volume, the display variable is automatically changed to the equivalent GSV variable, and vice versa.
- For all other display variables, if the process variable becomes unavailable due to changes in configuration, the transmitter will not display that variable.

Procedure

For each display variable, select the process variable to be shown in that position in the rotation.

You can skip positions and you can repeat process variables.

Table 7-1: Default configuration for display variables

Display variable	Process variable assignment
Display Variable 1	Mass flow rate
Display Variable 2	Mass total
Display Variable 3	Volume flow rate
Display Variable 4	Volume total
Display Variable 5	Density
Display Variable 6	Temperature
Display Variable 7	Drive gain
Display Variable 8	None
Display Variable 9	None
Display Variable 10	None
Display Variable 11	None
Display Variable 12	None
Display Variable 13	None
Display Variable 14	None
Display Variable 15	None

7.1.3 Configure a two-line display screen

Display	**Menu → Configuration → Display Settings → Display Variables → 2-Value View**
ProLink III	**Device Tools → Configuration → Transmitter Display → Display Variables → 2 PV Screen Slot #*X***
DeltaV AMS	**Configure → Manual Setup → Display → Display Variables → Two Variable Screen**
Siemens PDM	**Device → Manual Setup → Display → Display Variables → Two Variable Screen**

You can configure one display screen to show two process variables at a time. For each of these process variables, the current value and the measurement is shown.

The two-line display screen operates like one of the basic 15 screens. You can use ⌄ and ⌃ to scroll to it. If Auto Scroll is enabled, the two-line screen will be the last screen in the cycle.

7.1.4 Configure the number of decimal places (precision) shown on the display

Display	**Menu → Configuration → Display Settings → Decimals on Display**
ProLink III	**Device Tools → Configuration → Transmitter Display → Display Variables → Decimal Places for x**
DeltaV AMS	**Configure → Manual Setup → Display → Decimal Places**
Siemens PDM	**Display → Manual Setup → Display → Decimal Places**

You can specify the precision (the number of decimal places) that the display uses for each display variable. You can set the precision independently for each display variable.

The display precision does not affect the actual value of the variable, the value used in calculations, or the value reported via outputs or digital communications.

Procedure

1. Select a process variable or a diagnostic variable.

   You can configure the precision for all variables, whether or not they are assigned as display variables. The configured precision will be stored and used when applicable.

2. Set **Number of Decimal Places** to the number of decimal places to be used when this variable is shown on the display.
   - Default:
     — Temperature variables: 2
     — All other variables: 4
   - Range: 0 to 5

   Tip
   The lower the precision, the greater the change must be for it to be reflected on the display. Do not set **Number of Decimal Places** too low to be useful.

7.1.5 Turn on and turn off automatic scrolling through the display variables

Display	**Menu → Configuration → Display Settings → Auto Scroll**
ProLink III	**Device Tools → Configuration → Transmitter Display → General → Auto Scroll**
DeltaV AMS	**Configure → Manual Setup → Display → General Setting → Auto Scroll**
Siemens PDM	**Device → Manual Setup → Display → General Setting → Auto Scroll**

You can configure the display to automatically scroll through the list of display variables or to show a single display variable until the operator activates **Scroll**. If **Auto Scroll** is turned on, you can configure the number of seconds that each display variable will be shown.

Procedure

1. Turn on or turn off **Auto Scroll** as desired.

Option	Description
On	The display automatically shows each display variable for the number of seconds specified by **Scroll Rate**, then shows the next display variable. The operator can move to the next display variable at any time by activating **Scroll**.
Off	The display shows Display Variable 1 and does not scroll automatically. The operator can move to the next display variable at any time by activating **Scroll**.

Default: Off

2. If you turned on **Auto Scroll**, set **Scroll Rate** as desired.
   - Default: 10
   - Range: 1 to 30 seconds

Tip
Scroll Rate may not be available until you apply **Auto Scroll**.

7.1.6 Configure the display backlight

Display	**Menu → Configuration → Display Settings**
ProLink III	**Device Tools → Configuration → Transmitter Display → General → Backlight**
DeltaV AMS	**Configuration → Manual Setup → Display → Backlight → Control**
Siemens PDM	**Device → Manual Setup → Display → Backlight → Control**

You can control the intensity and contrast of the backlight on the display's LCD panel.

Procedure

1. Set **Intensity** as desired.
   - Default: 50
   - Range: 0 to 100
2. Set **Contrast** as desired.
   - Default: 50
   - Range: 0 to 100

7.1.7 Configure security for the display

Display	**Menu → Configuration → Security → Display Security**
ProLink III	**Device Tools → Configuration → Transmitter Display → Display Security**
DeltaV AMS	**Configure → Manual Setup → Display → Display Menus**
Siemens PDM	**Device → Manual Setup → Display → Display Menus**

When using the display, you can require users to enter a password to do any of the following tasks:

- Enter the main menu
- Change a parameter
- Access alert data through the display
- Start, stop, or reset totalizers or inventories via the context menu

The display password can be the same or different from the totalizer/inventory context menu control password. If different, the display password is used to reset, start, and stop totalizers or inventories using **Menu** → **Operations** → **Totalizers**.

Procedure

1. Configure **Password Required** as desired.

Option	Description
At Write	When an user chooses an action that leads to a configuration change, they are prompted to enter the display password.
Enter Menu	When the menu is selected from the process variable screen, the display password will be immediately required if **Password Required** is set.
Never (default)	When a user chooses an action that leads to a configuration change, they are prompted to activate ⇦⇧⇩⇨. This is designed to protect against accidental changes to configuration. It is not a security measure.

2. If the At Write or Enter Menu option was selected, enable or disable alert security as desired.

Option	Description
Enabled	If an alert is active, the alert symbol ⓘ is shown in the upper right corner of the display but the alert banner is not displayed. If the operator attempts to enter the alert menu, they are prompted to enter the display password.
Disabled	If an alert is active, the alert symbol ⓘ is shown in the upper right corner of the display and the alert banner is displayed automatically. No password or confirmation is required to enter the alert menu.

Restriction

You cannot set Password Required to Never and enable alert security.

- If you did not enable **Password Required**, alert security is disabled and cannot be enabled.
- Alert security is disabled automatically if you set **Password Required** to Never after:
  - **Password Required** is initially set to either At Write or Enter Menu
  - Alert security is enabled

3. If **Password Required** has been set to At Write or Enter Menu, you will be prompted to enter the desired password.
   - Default: AAAA
   - Range: Any four alphanumeric characters
   - **Password Required** must be set to At Write or Enter Menu to enable the totalizer/inventory control context menu password option.

   Important
   If you enable **Password Required** but you do not change the display password, the transmitter will post a configuration alert.

4. Configure **Main Menu Available** as desired.

Option	Description
Enabled	The local display **Menu** option from the process variable screen will be accessible.
Disabled	The local display **Menu** option from the process variable screen will not be accessible.

Important
Once **Main Menu Available** has been disabled, you cannot enable it from the local display. Use another configuration tool, such as ProLink III, to re-enable main menu access from the local display.

7.1.8 Configure totalizer and inventory control

Display	**Menu → Configuration → Security → Display Security → Totalizers & Inventories**
ProLink III	**Device Tools → Configuration → Totalizer Control Methods**
DeltaV AMS	**Configure → Manual Setup → Display → Totalizer Options** **Configure → Manual Setup → Display → Inventory Options**
Siemens PDM	**Device → Manual Setup → Display → Totalizer Options** **Device → Manual Setup → Display → Inventory Options**

You can enable or disable the operator's ability to start, stop, or reset totalizers or inventories. The totalizer/inventory control context menus password can also be configured. The context menu is accessed by selecting the options menu from the process variable screen when a total or inventory is displayed.

These parameters do not affect the operator's ability to start, stop, or reset totalizers or inventories using another tool.

Procedure

1. Enable or disable **Reset Totalizers**, as desired.
   Default = Enable
2. Enable or disable **Start/Stop Totalizers**, as desired.
   Default = Enable
3. Enable or disable **Reset Inventory**, as desired.

Default = Disable

4. Enable or disable **Start/Stop Inventory**, as desired.

   Default = Disable

5. If required, configure the totalizer/inventory control context menu password.

Option	Description
No password (default)	Start, stop or reset totalizer/inventory actions via the context menu do not require a password.
Password Required	When a user selects **Start/Stop** or **Reset** from the context menu and the password is enabled for totalizer/inventory control, the user is required to enter a password before the action occurs.

If the context menu password option has been set to **Password Required**, you will be prompted to enter the password.

- Default: AAAA
- Range: Any four alphanumeric characters
- The display **Password Required** must be set to At Write or Enter Menu to enable the totalizer/ inventory control context menu password option.

Important
If you enable **Password Required** for totalizers and inventories, but you do not change the password from the default, the transmitter will post a configuration alert.

7.2 Configure the transmitter's response to alerts

7.2.1 Configure the transmitter's response to alerts using the display

For some alerts, you can change the transmitter's response to an alert by setting the alert severity. You can also configure the transmitter to ignore some alerts and conditions.

The transmitter implements the NAMUR NE 107 specification for alerts. NAMUR NE 107 categorizes alerts by the suggested operator action, not by cause or symptom. Each alert has one or more associated conditions.

Important
The transmitter reports all the process and device conditions that were reported by previous transmitters. However, the transmitter does not report them as individual alerts. Instead, the transmitter reports them as conditions associated with alerts.

Procedure

- To change the severity of an alert:
  a) Choose **Menu** → **Configuration** → **Alert Setup** → **Response to Alerts**.
  b) Select the alert.

c) Set **Alert Severity** as desired.

Option	Description
Failure	The event is serious enough to require fault actions by the transmitter. The event may be either device-related or process-related. Operator action is strongly recommended.
Function Check	Configuration change or device testing. No fault actions are performed. The operator may need to complete a procedure.
Out of Specification	The process is outside user-specified limits or device limits. No fault actions are performed. The operator should check the process.
Maintenance Required	Device maintenance is recommended, either near-term or mid-term.

- To ignore an alert:
  a) Choose **Menu** → **Configuration** → **Alert Setup** → **Response to Alerts**
  b) Select the alert.
  c) Set **Alert Detection** to Ignore.

  If an alert is ignored, any occurrence of this alert is not posted to the alert list and the status LED on the transmitter does not change color. The occurrence is posted to alert history.
- To ignore a condition:
  a) Choose **Menu** → **Configuration** → **Alert Setup** → **Response to Alerts**
  b) Select the alert associated with the condition.
  c) Select Condition Detection.
  d) Select the condition and set it to Ignore.

  If a condition is ignored, any occurrence of this condition is not posted to the alert list and the status LED on the transmitter does not change color. The occurrence is posted to alert history.

7.2.2 Configure the transmitter's response to alerts using ProLink III

For some alerts, you can change the transmitter's response to an alert by setting the alert severity. You can also configure the transmitter to ignore some alerts and conditions.

The transmitter implements the NAMUR NE 107 specification for alerts. NAMUR NE 107 categorizes alerts by the suggested operator action, not by cause or symptom. Each alert has one or more associated conditions.

Important
The transmitter reports all the process and device conditions that were reported by previous transmitters. However, the transmitter does not report them as individual alerts. Instead, the transmitter reports them as conditions associated with alerts.

Procedure

- To change the severity of an alert:
  a) Choose **Device Tools** → **Configuration** → **Alert Severity**.
  b) Select the alert.

c) Set the severity as desired.

Option	Description
Failure	The event is serious enough to require fault actions by the transmitter. The event may be either device-related or process-related. Operator action is strongly recommended.
Function Check	Configuration change or device testing. No fault actions are performed. The operator may need to complete a procedure.
Out of Specification	The process is outside user-specified limits or device limits. No fault actions are performed. The operator should check the process.
Maintenance Required	Device maintenance is recommended, either near-term or mid-term.

- To ignore an alert:
  a) Choose **Device Tools** → **Configuration** → **Alert Severity**.
  b) Select the alert.
  c) Set the severity to Ignore.

  If an alert is ignored, any occurrence of this alert is not posted to the alert list and the status LED on the transmitter does not change color. The occurrence is posted to alert history.

- To ignore a condition:
  a) Choose **Menu** → **Configuration** → **Alert Setup** → **Response to Alerts**.
  b) Select the alert associated with the condition and expand it.
  c) Select the condition and set it to Ignore.

  If a condition is ignored, any occurrence of this condition is not posted to the alert list and the status LED on the transmitter does not change color. The occurrence is posted to alert history.

7.2.3 Configure Fault Timeout

Display	**Menu** → **Configuration** → **Alert Setup** → **Output Fault Actions** → **Fault Timeout (sec)**
ProLink III	**Device Tools** → **Configuration** → **Fault Processing** → **Fault Timeout**
DeltaV AMS	**Configure** → **Alert Setup** → **Output Fault Actions** → **Fault Timeout**
Siemens PDM	**Device** → **Alert Setup** → **Output Fault Actions** → **Fault Timeout**

Fault Timeout controls the delay before fault actions are performed.

The fault timeout period begins when the transmitter detects an alert condition.

- During the fault timeout period, the transmitter continues to report its last valid measurements.
- If the fault timeout period expires while the alert is still active, the fault actions are performed.
- If the alert condition clears before the fault timeout expires, no fault actions are performed.

Restriction

- **Fault Timeout** is not applied to all alerts. For some alerts, fault actions are performed as soon as the alert condition is detected. See the list of alerts and conditions for details.

- **Fault Timeout** is applicable only when **Alert Severity** = Failure. For all other settings of **Alert Severity**, **Fault Timeout** is irrelevant.

Procedure

Set **Fault Timeout** as desired.

- Default: 0 seconds
- Range: 0 to 60 seconds

If you set **Fault Timeout** to 0, fault actions are performed as soon as the alert condition is detected.

7.2.4 Alerts, conditions, and configuration options

For more information on these alerts, see Status alerts, causes, and recommendations.

Configuration Error

Default severity: Failure
Severity configurable: No
Fault Timeout applicable: No

Table 7-2: Configuration Error conditions

Name	Ignorable
[021] Incorrect Sensor Type	Yes
[030] Incorrect Board Type	No
[120] Curve Fit Failure	No
Core Has Incompatible ETO	No
Core Software Update Failed	Yes
Time Not Set	Yes

Core Low Power

Default severity: Failure
Severity configurable: No
Fault Timeout applicable: No

Table 7-3: Core Low Power conditions

Name	Ignorable
[031] Low Power - Core	No

Data Loss Possible

Default severity: Maintenance Required
Severity configurable: Yes
Fault Timeout applicable: No

Table 7-4: Data Loss Possible conditions

Name	Ignorable
[103] Data Loss Possible	Yes
Clock is Constant	Yes
Firmware Update Failed	No
Internal Memory Full	No
No Permanent License	No
SD Card Not Present	No

Drive Over Range

Default severity: Maintenance
Severity configurable: Yes
Fault Timeout applicable: Yes

Table 7-5: Drive Over-Range conditions

Name	Ignorable
[102] Drive Overrange	Yes

Electronics Failed

Default severity: Failure
Severity configurable: No
Fault Timeout applicable: No

Table 7-6: Electronics Failed conditions

Name	Ignorable
[002] RAM Error (Core Processor)	No
[018] EEPROM Error (Transmitter)	No
[019] RAM Error (Transmitter)	No
[022] Configuration Database Corrupt (Core Processor)	No
[024] Program Corrupt (Core Processor)	No
Watchdog Error	No
Fieldbus Bridge Memory Failure	No

Event Active

Default severity: Out of Speculation
Severity configurable: Yes
Fault Timeout applicable: Yes

Table 7-7: Event Active conditions

Name	Ignorable
Discrete Event [1 - 5] Active	Yes

Extreme PPV

Default severity: Failure
Severity configurable: Yes
Fault Timeout applicable: Yes

Table 7-8: Extreme PPV conditions

Name	Ignorable
[005] Mass Flow Rate Overrange	Yes
[008] Density Overrange	Yes

Flowmeter Init

Default severity: Failure
Severity configurable: No
Fault Timeout applicable: No

Table 7-9: Flowmeter Init conditions

Name	Ignorable
[009] Transmitter Initializing	No

Function Check

Table 7-10: Function Check conditions

Name	Ignorable
Out of Service	No

Function Check Failed or Smart Meter Verification Aborted

Default severity: Maintenance Required
Severity configurable: Yes
Fault Timeout applicable: No

Table 7-11: Function Check Failed or Smart Meter Verification Aborted conditions

Name	Ignorable
[010] Calibration Failed	No
[034] Smart Meter Verification Failed	Yes
[035] Smart Meter Verification Aborted	Yes

Function Check in Progress

Default severity: Function Check
Severity configurable: No
Fault Timeout applicable: No

Table 7-12: Function Check in Progress conditions

Name	Ignorable
[104] Calibration in Progress	No
[131] Smart Meter Verification in Progress	Yes

Output Fixed

Default severity: Function Check
Severity configurable: Yes
Fault Timeout applicable: No

Table 7-13: Output Fixed conditions

Name	Ignorable
[111] Frequency Output Fixed	No
[119] Discrete Output Fixed	No
mA Output Fixed	No

Output Saturated

Default severity: Out of Speculation
Severity configurable: Yes
Fault Timeout applicable: No

Table 7-14: Output Saturated conditions

Name	Ignorable
[110] Frequency Output 1 Saturated	Yes
mA Output 3 Saturated	Yes

Table 7-14: Output Saturated conditions *(continued)*

Name	Ignorable
Watercut Limited at 0%	Yes
Watercut Limited at 100%	Yes

Process Aberration

Default severity: Out of Speculation
Severity configurable: Yes
Fault Timeout applicable: Yes

Table 7-15: Process Aberration conditions

Name	Ignorable
[105] Two-Phase Flow	Yes
[115] No Input	Yes
[116] Temperature Out of Range	Yes
[117] Density Out of Range	Yes
[121] Extrapolation Alert	Yes
Phase Genius Detected Moderate Severity	Yes

Sensor Being Simulated

Default severity: Function Check
Severity configurable: No
Fault Timeout applicable: No

Table 7-16: Sensor Being Simulated conditions

Name	Ignorable
[132] Sensor Simulation Active	No

Sensor Failed

Default severity: Failure
Severity configurable: No
Fault Timeout applicable: Yes

Table 7-17: Sensor Failed conditions

Name	Ignorable
[003] Sensor Failed	No
[016] Sensor Temperature (RTD) Failure	No
[017] Sensor Case Temperature (RTD) Failure	No

Sensor-Transmitter Communication Error

Default severity: Failure
Severity configurable: No
Fault Timeout applicable: Yes

Table 7-18: Sensor-Transmitter Communication Error conditions

Name	Ignorable
[026] Sensor/Transmitter Communications Failure	No
[028] Core Process Write Failure	No

Tube Not Full

Default severity: Failure
Severity configurable: Yes
Fault Timeout applicable: Yes

Table 7-19: Tube Not Full conditions

Name	Ignorable
[033] Tube Not Full	No

7.3 Control button sensitivity on the display

Display	**Menu → Configuration → Yes → Display Settings → Button Sensitivity**

You can configure the button sensitivity for each button (right, left, up, down) from the 200 default level to a range of 187 to 225, where the lower number signifies lower sensitivity.

8 Integrate the meter with the control system

8.1 Configure PROFIBUS-PA Channel A

Display	**Menu → Configuration → Profibus PA Settings**
ProLink III	**Device Tools → Configuration → Communications → Communications (Profibus PA)**
DeltaV AMS and Siemens PDM	For information about setting up function blocks, see PROFIBUS PA function blocks.

Channel A is used exclusively for PROFIBUS-PA communication.

8.2 Configure mA Output Channel B

Display	**Menu → Configuration → Inputs/Outputs → Channel B → I/O Type**
ProLink III	**Device Tools → Configuration → I/O → Channels**
DeltaV AMS	**Configure → Manual Setup → Inputs/Outputs → Channel B**
Siemens PDM	**Device → Manual Setup → Inputs/Outputs → Channel B**

Channel B is exclusively used for a mA Output. It can be disabled using a PROFIBUS PA host or ProLink III.

8.2.1 Configure an mA Output

Use an mA Output to report current values of process variables. The mA signal varies between 4 mA and 20 mA in proportion to the current value of the assigned process variable.

The 5700 PROFIBUS-PA transmitter has one mA Output at Channel B.

Configure mA Output Source

Display	**Menu → Configuration → Inputs/Outputs → Channel B → I/O Settings → Source**
ProLink III	**Device Tools → Configuration → I/O → Outputs → mA Output**
DeltaV AMS	**Configure → Manual Setup → Inputs/Outputs → Channel B**
Siemens PDM	**Device → Manual Setup → Inputs/Outputs → Channel B**

mA Output Source specifies the process variable that is reported by the mA Output.

Prerequisites

- If you plan to configure the output to report volume flow, ensure that you have set **Volume Flow Type** as desired: Liquid or Gas Standard Volume.
- If you plan to configure an output to report a concentration measurement process variable, API Referral, or Advance Phase Measurement process variable, ensure that the concentration measurement

application, API Referral, or Advance Phase Measurement application respectively, is configured so that the desired variable is available.

Procedure

Set **mA Output Process Variable** as desired.

Default: mA Output: Mass Flow Rate

Postrequisites

If you change the configuration of **mA Output Source**, verify the settings of **Lower Range Value** and **Upper Range Value**. The transmitter automatically loads a set of values, and these values may not be appropriate for your application.

Related information

Configure Lower Range Value (LRV) and Upper Range Value (URV) for the mA Output

Options for mA Output Source

The transmitter provides a basic set of options for **mA Output Source**, plus several application-specific options. Different communications tools may use different labels for the options.

Process variable	Label			
	Display	**ProLink III**	**PROFIBUS-PA host**	**Host code**
Standard				
Mass flow rate	Mass Flow Rate	Mass Flow Rate	Mass Flow Rate	0
Volume flow rate	Volume Flow Rate	Volume Flow Rate	Volume Flow Rate	5
Gas standard volume flow rate	GSV Flow Rate	Gas Standard Volume Flow Rate	Gas Standard Volume Flow Rate	62
Temperature	Temperature	Temperature	Temperature	1
Density	Density	Density	Density	3
External pressure	External Pressure	External Pressure	External Input Pressure	53
External temperature	External Temperature	External Temperature	External Input Temperature	55
Calorific value	Calorific Value	Calorific Value	Calorific Value	157
Energy flow	Energy Flow	Energy Flow	Energy Flow	215
Diagnostics				
Velocity	Velocity	Velocity	Mass Flow Velocity	208
Two-phase flow detection	Phase	Phase Flow Severity	Phase Genius Flow Severity	228
Drive gain	Drive Gain	Drive Gain	Drive Gain	47
API Referral				
Temperature-corrected density	Referred Density	Density at Reference Temperature	API: Corr Density	15

Process variable	Label			
	Display	**ProLink III**	**PROFIBUS-PA host**	**Host code**
Temperature-corrected (standard) volume flow rate	Referred Volume Flow	Volume Flow Rate at Reference Temperature	API: Corr Volume Flow	16
Average temperature-corrected density	Average Line Density	Average Density	API: Average Density	19
Average temperature	Average Temperature	Average Temperature	API: Average Temperature	20
Concentration measurement				
Density at reference	Referred Density	Density at Reference Temperature	CM: Density at Ref	21
Specific gravity	Specific Gravity	Density (Fixed SG Units)	CM: Density (SGU)	22
Standard volume flow rate	Standard Vol Flow	Volume Flow Rate at Reference Temperature	CM: Standard Volume Flow Rate	23
Net mass flow rate	Net Mass Flow	Net Mass Flow Rate	CM: Net Mass Flow Rate	26
Net volume flow rate	Net Volume Flow Rate	Net Volume Flow Rate	CM: Net Volume Flow rate	29
Concentration	Concentration	Concentration	CM: Concentration	32
Advanced Phase Measurement				
Net oil flow at line	NetOilFlow @ Line	Net Oil Flow @ Line	APM: Net Oil Flow at Line	73
Water cut at line	Watercut @ Line	Watercut @ Line	APM: Watercut at Line	74
Net water flow at line	NetWaterFlow @ Line	Net Water Flow @ Line	APM: Net Water Flow at Line	75
Net oil flow at reference	NetOilFlow @ Ref	Net Oil Flow @ Ref	APM: Net Oil Flow at Reference	78
Water cut at reference	Watercut @ Ref	Watercut @ Ref	APM: Watercut at Ref	79
Net water flow at reference	NetWaterFlow @ Ref	Net Water Flow @ Ref	APM: Net Flow Water at Ref	81
Gas void fraction	Gas Void Fraction	Gas Void Fraction	APM: Gas Void Fraction	205
Unremediated mass flow	Unremediated Mass Flow	Unremediated Mass Flow	APM: Unremediated Mass Flow	210
Unremediated density	Unremediated Density	Unremediated Density	APM: Unremediated Density	211
Unremediated volume flow	Unremediated Volume Flow	Unremediated Volume Flow	APM: Unremediated Volume Flow	212
Liquid mass flow	Liquid Mass Flow	Liquid Mass Flow	APM: TMR Liquid Flow	230

Configure Lower Range Value (LRV) and Upper Range Value (URV) for the mA Output

Display	**Menu → Configuration → Inputs/Outputs → Channel B → I/O Settings → Lower Range Value Menu → Configuration → Inputs/Outputs → Channel B → I/O Settings → Upper Range Value**
ProLink III	**Device Tools → Configuration → I/O → Outputs → mA Output → Lower Range Value** **Device Tools → Configuration → I/O → Outputs → mA Output → Upper Range Value**
DeltaV AMS	**Configure → Manual Setup → mA Output → Settings → Lower Range Value** **Configure → Manual Setup → mA Output → Settings → Upper Range Value**
Siemens PDM	**Device → Manual Setup → mA Output → Settings → Lower Range Value** **Device → Manual Setup → mA Output → Settings → Upper Range Value**

The **Lower Range Value** (LRV) and **Upper Range Value** (URV) are used to scale the mA Output, that is, to define the relationship between **mA Output Process Variable** and the mA Output signal.

LRV is the value of **mA Output Source** represented by an output of 4 mA. **URV** is the value of **mA Output Source** represented by an output of 20 mA. Between **LRV** and **URV**, the mA Output is linear with the process variable. If the process variable drops below **LRV** or rises above **URV**, the transmitter posts an output saturation alert.

Procedure

Set **LRV** and **URV** as desired.

Enter **LRV** and **URV** in the measurement units used for **mA Output Source**.

- Defaults: Specific to each process variable
- Range: Unlimited

Note
You can set **URV** below **LRV**. For example, you can set **URV** to `50` and **LRV** to `100`. If you do this, the mA Output will be inversely proportional to the value of **mA Output Source**.

Configure mA Output Direction

Display	**Menu → Configuration → Inputs/Outputs → Channel B → I/O Settings → Direction**
ProLink III	**Device Tools → Configuration → I/O → Outputs → mA Output → Direction**
DeltaV AMS	**Configure → Manual Setup → mA Output → Direction → mAO Direction**
Siemens PDM	**Device → Manual Setup → mA Output → Direction → mAO Direction**

mA Output Direction controls how conditions of forward flow and reverse flow affect the flow rates reported by the mA Output.

Actual flow direction interacts with **Sensor Flow Direction Arrow** to determine the flow direction that the transmitter uses in processing. See the following table.

Table 8-1: Interaction between actual flow direction and Sensor Flow Direction Arrow

Actual flow direction	Setting of Sensor Flow Direction Arrow	Flow direction sent to outputs and totalizers
Forward (same direction as Flow arrow on sensor)	With Arrow	Forward
	Against Arrow	Reverse
Reverse (opposite from Flow arrow on sensor)	With Arrow	Reverse
	Against Arrow	Forward

Procedure

Set **mA Output Direction** as desired.

Option	Description
Normal (default)	Appropriate when your application needs to distinguish between forward flow and reverse flow.
Absolute Value	Appropriate when your application does not need to distinguish between forward flow and reverse flow.

Important
mA Output Direction interacts with **Lower Range Value** (LRV). The effect of **mA Output Direction** on the mA Output varies, depending on whether LRV < 0 or LRV ≥ 0.

Related information

Configure Sensor Flow Direction Arrow

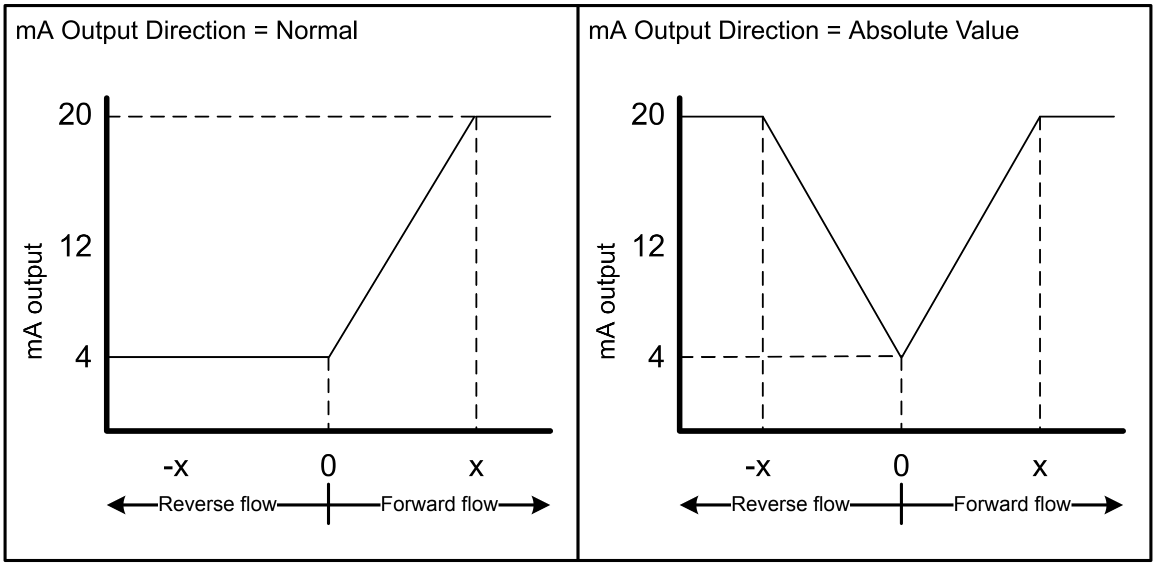
Effect of mA Output Direction on an mA Output

mA Output Direction affects how the transmitter reports flow values via an mA Output. An mA Output is affected by **mA Output Direction** only if **mA Output Source** is set to a flow variable.

The effect of **mA Output Direction** depends on the setting of **Lower Range Value** (LRV).

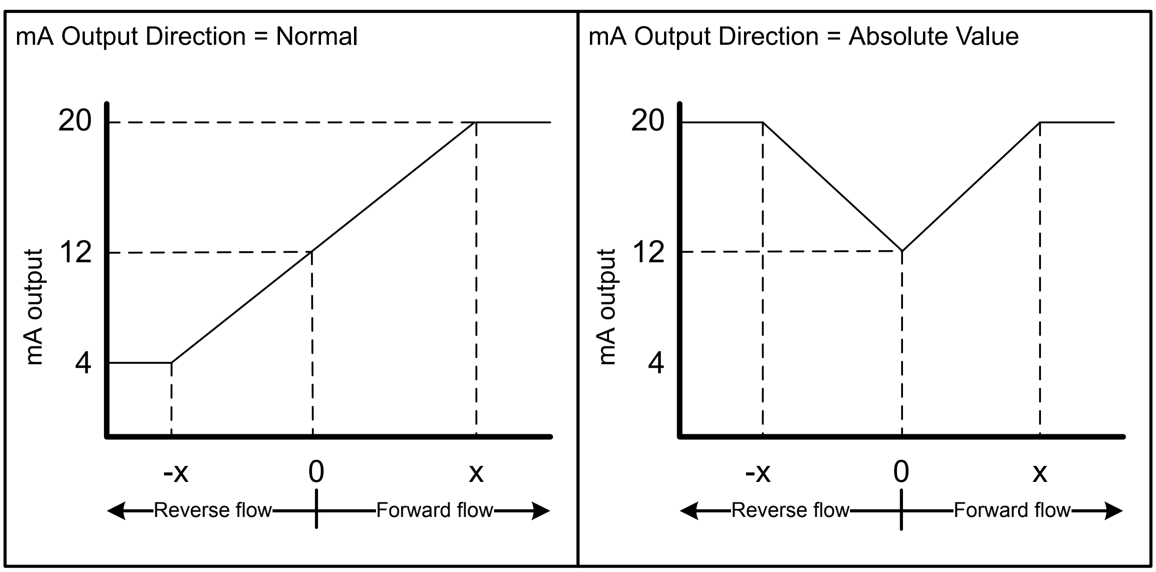
- If **Lower Range Value** = 0, see Figure 8-1.
- If **Lower Range Value** > 0, see Figure 8-1 and adapt the chart.
- If **Lower Range Value** < 0, see Figure 8-2.

Figure 8-1: Effect of mA Output Direction on an mA Output: Lower Range Value = 0



- **Lower Range Value** = 0
- **Upper Range Value** = x

Figure 8-2: Effect of mA Output Direction on an mA Output: Lower Range Value < 0



- **Lower Range Value** = −x
- **Upper Range Value** = x

Example: mA Output Direction = Normal and Lower Range Value = 0

Configuration:

- **mA Output Direction** = Normal
- **Lower Range Value** = 0 g/sec
- **Upper Range Value** = 100 g/sec

Result:

- Under conditions of reverse flow or zero flow, the mA Output is 4 mA.
- Under conditions of forward flow, up to a flow rate of 100 g/sec, the mA Output varies between 4 mA and 20 mA in proportion to the flow rate.
- Under conditions of forward flow, if the flow rate equals or exceeds 100 g/sec, the mA Output will be proportional to the flow rate up to 20.5 mA, and will be level at 20.5 mA at higher flow rates.

Example: mA Output Direction = Normal and Lower Range Value < 0

Configuration:

- **mA Output Direction** = Normal
- **Lower Range Value** = −100 g/sec
- **Upper Range Value** = +100 g/sec

Result:

- Under conditions of zero flow, the mA Output is 12 mA.
- Under conditions of forward flow, for flow rates between 0 and +100 g/sec, the mA Output varies between 12 mA and 20 mA in proportion to (the absolute value of) the flow rate.
- Under conditions of forward flow, if (the absolute value of) the flow rate equals or exceeds 100 g/sec, the mA Output is proportional to the flow rate up to 20.5 mA, and will be level at 20.5 mA at higher flow rates.
- Under conditions of reverse flow, for flow rates between 0 and −100 g/sec, the mA Output varies between 4 mA and 12 mA in inverse proportion to the absolute value of the flow rate.
- Under conditions of reverse flow, if the absolute value of the flow rate equals or exceeds 100 g/sec, the mA Output is inversely proportional to the flow rate down to 3.8 mA, and will be level at 3.8 mA at higher absolute values.

Configure mA Output Cutoff

Display	**Menu → Configuration → Inputs/Outputs → Channel B → I/O Settings → MAO Cutoff**
ProLink III	**Device Tools → Configuration → I/O → Outputs → mA Output → Flow Rate Cutoff**
DeltaV AMS	**Configure → Manual Setup → mA Output → Settings → Flow Rate Cutoff**
Siemens PDM	**Device → Manual Setup → mA Output → Settings → Flow Rate Cutoff**

mA Output Cutoff specifies the lowest flow rate that will be reported through the mA Output. All flow rates below the specified value are reported as 0.

mA Output Cutoff is applicable only when **mA Output Source** is set to a flow rate variable. It is applied to whatever flow variable is assigned to the mA Output.

Procedure

Set **mA Output Cutoff** as desired.

Set **mA Output Cutoff** in the measurement units used for the process variable. If you change the measurement unit, **mA Output Cutoff** is adjusted automatically.

- Default: 0
- Range: 0 or any positive value

Tip
For most applications the default value of **mA Output Cutoff** should be used. Contact customer service before changing **mA Output Cutoff**.

Interaction between mA Output Cutoff and process variable cutoffs

When **mA Output Process Variable** is set to a flow variable (for example, mass flow rate or volume flow rate), **mA Output Cutoff** interacts with **Mass Flow Cutoff** or **Volume Flow Cutoff**. The transmitter puts the cutoff into effect at the highest flow rate at which a cutoff is applicable.

Configure mA Output Damping

Display	**Menu → Configuration → Inputs/Outputs → Channel *x* → I/O Settings → MAO Damping**
ProLink III	**Device Tools → Configuration → I/O → Outputs → mA Output → Added Damping**
DeltaV AMS	**Configure → Manual Setup → mA Output → Settings → Added Damping**
Siemens PDM	**Device → Manual Setup → mA Output → Settings → Added Damping**

mA Output Damping controls the amount of damping that will be applied to the mA Output.

Damping is used to smooth out small, rapid fluctuations in process measurement. The damping value specifies the time period, in seconds, over which the transmitter will spread changes in the process variable. At the end of the interval, the value reported by the mA Output will reflect 63% of the change in the actual measured value.

mA Output Damping affects a process variable only when it is reported via the mA Output. If the process variable is read from the display or digitally, **mA Output Damping** is not applied.

Procedure

Set **mA Output Damping** to the desired value.

- Default: 0.0 seconds
- Range: 0.0 to 440 seconds

Tip
- A high damping value makes the process variable appear smoother because the reported value changes slowly.
- A low damping value makes the process variable appear more erratic because the reported value changes more quickly.
- The combination of a high damping value and rapid, large changes in the process variable assigned to the mA Output can result in increased measurement error.

- Whenever the damping value is non-zero, the damped value will lag the actual measurement because the damped value is being averaged over time.
- In general, lower damping values are preferable because there is less chance of data loss, and less lag time between the actual measurement and the damped value.

Interaction between mA Output Damping and process variable damping

When **mA Output Source** is set to a flow rate variable, density, or temperature, **mA Output Damping** interacts with **Flow Damping**, **Density Damping**, or **Temperature Damping.** If multiple damping parameters are applicable, the effect of damping the process variable is calculated first, and the mA Output damping calculation is applied to the result of that calculation.

Example: Damping interaction

Configuration:

- **Flow Damping** = `1` second
- **mA Output Source** = Mass Flow Rate
- **mA Output Damping** = `2` seconds

Result: A change in the mass flow rate will be reflected in the mA Output over a time period that is greater than 3 seconds. The exact time period is calculated by the transmitter according to internal algorithms which are not configurable.

Configure mA Output Fault Action

Display	**Menu → Configuration → Inputs/Outputs → Channel B → I/O Settings → Fault Action**
ProLink III	**Device Tools → Configuration → I/O → Outputs → mA Output *x* → Fault Action**
DeltaV AMS	**Configure → Manual Setup → mA Output → Fault Setting → Fault Action**
Siemens PDM	**Device → Manual Setup → mA Output → Fault Setting → Fault Action**

mA Output Fault Action controls the behavior of the mA Output if the transmitter detects a fault condition.

Important

- The fault action is implemented only if **Alert Severity** is set to Failure. If **Alert Severity** is set to any other option, the fault action is not implemented.
- For some faults only: If **Fault Timeout** is set to a non-zero value, the transmitter will not implement the fault action until the timeout has elapsed.

Procedure

1. Set **mA Output Fault Action** as desired.

   Default: Downscale

   Important
   If you set **mA Output Fault Action** to None, the mA Output will be controlled by the setting of **Process Variable Fault Action**. In most cases, if you set **mA Output Fault Action** to None, you should also set **Process Variable Fault Action** to None.

2. If you set **mA Output Fault Action** to **Upscale** or **Downscale**, set **mA Output Fault Level** to the signal that the mA Output will produce during a fault.

Related information

Configure Process Variable Fault Action
Interaction between Process Variable Fault Action and other fault actions

Options for mAO Fault Action and mAO Fault Level

Option	mA Output behavior	mA Output Fault Level
Upscale	Goes to the configured fault level	Default: 22.0 mA Range: 21.0 to 23.0 mA
Downscale (default)	Goes to the configured fault level	Default: 2.0 mA Range: 1.0 to 3.6 mA
Internal Zero	Goes to the mA Output level associated with a process variable value of 0 (zero), as determined by **Lower Range Value** and **Upper Range Value** settings	Not applicable
None	Determined by the setting of **Process Variable Fault Action**	Not applicable

8.3 Configure FO/DO Channel C

Display	**Menu → Configuration → Inputs/Outputs → Channel C → I/O Type**
ProLink III	**Device Tools → Configuration → I/O → Channels**
DeltaV AMS	**Configure → Manual Setup → Channels → Channel C → Assignment**
Siemens PDM	**Device → Manual Setup → Channels → Channel C**

Channel C can be used for a Frequency Output or a Discrete Output. It can also be disabled using a PROFIBUS PA host or ProLink III.

8.3.1 Configure a Frequency Output

Use a Frequency Output to report current values of process variables. The frequency varies between 0 Hz and 14500 Hz in proportion to the current value of the assigned process variable.

Related information

Configure Frequency Output Source
Configure Frequency Output Scaling
Configure Frequency Output Direction
Configure Frequency Output Fault Action

Configure Frequency Output Source

Display	**Menu → Configuration → Inputs/Outputs → Channel C → I/O Type → Frequency Output**
ProLink III	
DeltaV AMS	**Configure → Manual Setup → Mapping/Source → Frequency Output Source**
Siemens PDM	**Device → Manual Setup → Mapping/Source → Frequency Output Source**

Frequency Output Source specifies the process variable that is reported by the Frequency Output.

Prerequisites

- If you plan to configure the output to report volume flow, ensure that you have set **Volume Flow Type** as desired: Liquid or Gas Standard Volume.
- If you plan to configure an output to report a concentration measurement process variable, ensure that the concentration measurement application is configured so that the desired variable is available.

Procedure

Set **Frequency Output Source** as desired.

Default: Frequency Output: Mass Flow Rate

Postrequisites

If you change the configuration of **Frequency Output Source**, verify the Frequency Output scaling. The transmitter automatically loads the most recent values for the scaling parameters, and they may not be appropriate for your application.

Related information

Configure Frequency Output Scaling

Options for Frequency Output Source

The transmitter provides a basic set of options for **Frequency Output Source**, plus several application-specific options. Different communications tools may use different labels for the options.

Process variable	Label			
	Display	**PLIII**	**PROFIBUS-PA host**	**Host code**
Standard				
Mass flow rate	Mass Flow Rate	Mass Flow Rate	Mass Flow Rate	0
Volume flow rate	Volume Flow Rate	Volume Flow Rate	Volume Flow Rate	5
Gas Standard Volume flow rate	GSV Flow Rate	Gas Standard Volume Flow Rate	Gas Standard Volume Flow	62
Energy management				
Energy Flow	Energy Flow	Energy Flow	Energy Flow	215

Process variable	Label			
	Display	**PLIII**	**PROFIBUS-PA host**	**Host code**
API Referral				
Temperature-corrected (standard) volume flow rate	Referred Volume Flow	Volume Flow Rate at Reference Temperature	API: Corr Volume Flow	16
Concentration measurement				
Standard volume flow rate	Standard Vol Flow	Volume Flow Rate at Reference Temperature	CM: Standard Volume Flow Rate	23
Net mass flow rate	Net Mass Flow	Net Mass Flow Rate	CM: Net Volume Flow Rate	26
Net volume flow rate	Net Volume Flow Rate	Net Volume Flow Rate	CM: Net Volume Flow Rate	29
Advanced Phase Measurement				
Net Oil Flow At Line	NetOilFlow @ Line	Net Oil Flow @ Line	APM: Net Flow Oil At Line	73
Net Water Flow At Line	NetWaterFlow @ Line	Net Water Flow @ Line	APM: Net Flow Water At Line	75
Net Oil Flow At Ref	NetOilFlow @ Ref	Net Oil Flow @ Ref	APM: Net Flow Oil At Ref	78
Net Water Flow At Ref	NetWaterFlow @ Ref	Net Water Flow @ Ref	APM: Net Flow Water At Ref	81
Unremediated Mass Flow	Unremediated Mass Flow	Unremediated Mass Flow	APM: Unremediated Mass Flow	210
Unremediated Volume Flow	Unremediated Vol Flow	Unremediated Volume Flow	APM: Unremediated Vol Flow	212
Liquid Mass Flow	Liquid Mass Flow	Liquid Mass Flow	APM: TMR Liquid Flow	230

Configure Frequency Output Scaling

Display	**Menu → Configuration → Inputs/Outputs → Channel C → I/O Settings → Scaling Method**
ProLink III	**Device Tools → Configuration → I/O → Outputs → Frequency Output → Scaling Method**
DeltaV AMS	**Configure → Manual Setup → Frequency Output → Scaling → Set Frequency Output Scaling**
Siemens PDM	**Device → Manual Setup → Frequency Output → Scaling → Set Frequency Output Scaling**

Frequency output scaling defines the relationship between **Frequency Output Source** and the pulse of the Frequency Output. Scale the Frequency Output to provide the data in the form required by your frequency receiving device.

Procedure

1. Set **Frequency Output Scaling Method**.

Option	Description
Frequency=Flow (default)	Frequency calculated from flow rate
Pulses/Unit	A user-specified number of pulses represents one flow unit
Units/Pulse	A pulse represents a user-specified number of flow units

2. Set additional required parameters.
    - If you set **Frequency Output Scaling Method** to Frequency=Flow, set **Rate Factor** and **Frequency Factor**.
    - If you set **Frequency Output Scaling Method** to Pulses/Unit, define the number of pulses that will represent one flow unit.
    - If you set **Frequency Output Scaling Method** to Units/Pulse, define the number of units that each pulse will indicate.

Calculate frequency from flow rate

The Frequency=Flow option is used to customize the Frequency Output for your application when you do not know appropriate values for Units/Pulse or Pulses/Unit.

If you specify Frequency=Flow, you must provide values for **Rate Factor** and **Frequency Factor**:

Rate Factor The maximum flow rate that you want the Frequency Output to report.

Frequency Factor A value calculated as follows:

$$FrequencyFactor \frac{RateFactor}{T} \times N$$

where:

T Factor to convert selected time base to seconds

N Number of pulses per flow unit, as configured in the receiving device

The resulting **Frequency Factor** must be within the range of the Frequency Output :

- If **Frequency Factor** is less than 1 Hz, reconfigure the receiving device for a higher pulses/unit setting.

Example: Configure Frequency=Flow

You want the Frequency Output to report all flow rates up to 2000 kg/min.

The frequency receiving device is configured for 10 pulses/kg.

Solution:

$$FrequencyFactor \frac{RateFactor}{T} \times N$$

$$FrequencyFactor \frac{2000}{60} \times 10$$

$$FrequencyFactor = 333.33$$

Set parameters as follows:

- **Rate Factor**: `2000`
- **Frequency Factor**: `333.33`

Configure Frequency Output Direction

Display	**Menu → Configuration → Inputs/Outputs → Channel x → I/O Settings → Direction**
ProLink III	**Device Tools → Configuration → I/O → Outputs → Frequency Output x → Direction**
DeltaV AMS	**Configure → Manual Setup → Direction → Frequency Output Direction**
Siemens PDM	**Device → Manual Setup → Direction → Frequency Output Direction**

Frequency Output Direction controls how conditions of forward flow and reverse flow affect the flow rates reported by the Frequency Output.

Actual flow direction interacts with **Sensor Flow Direction Arrow** to determine the flow direction that the transmitter uses in processing. See the following table.

Table 8-2: Interaction between actual flow direction and Sensor Flow Direction Arrow

Actual flow direction	Setting of Sensor Flow Direction Arrow	Flow direction sent to outputs and totalizers
Forward (same direction as Flow arrow on sensor)	With Arrow	Forward
	Against Arrow	Reverse
Reverse (opposite from Flow arrow on sensor)	With Arrow	Reverse
	Against Arrow	Forward

Procedure

Set **Frequency Output Direction** as desired.

Option	Description
Positive Flow Only	• Forward flow: The Frequency Output reports the flow rate according to the configured scaling method. • Reverse flow: The Frequency Output is 0 Hz.

Option	Description
Negative Flow Only	• Forward flow: The Frequency Output is 0 Hz. • Reverse flow: The Frequency Output reports the absolute value of the flow rate according to the configured scaling method.
Both Positive and Negative Flow	The Frequency Output reports the absolute value of the flow rate according to the configured scaling method. It is not possible to distinguish between forward flow and reverse flow from the Frequency Output alone. This setting is typically used in combination with a discrete output configured to report flow direction.

Related information

Configure Sensor Flow Direction Arrow
Configure Discrete Output Source

Configure Frequency Output Fault Action

Display	**Menu → Configuration → Inputs/Outputs → Channel C → I/O Settings → Fault Action**
ProLink III	**Device Tools → Configuration → I/O → Outputs → Frequency Output x → Fault Action**
DeltaV AMS	**Configure → Manual Setup → Frequency Output → Fault Setting → Fault Action**
Siemens PDM	**Device → Manual Setup → Frequency Output → Fault Setting → Fault Action**

Frequency Output Fault Action controls the behavior of the Frequency Output if the transmitter detects a fault condition.

Important

- The fault action is implemented only if **Alert Severity** is set to Failure. If **Alert Severity** is set to any other option, the fault action is not implemented.
- For some faults only: If **Fault Timeout** is set to a non-zero value, the transmitter will not implement the fault action until the timeout has elapsed.

Procedure

1. Set **Frequency Output Fault Action** as desired.

   Default: Downscale

   Important
   If you set **Frequency Output Fault Action** to None, the Frequency Output will be controlled by the setting of **Process Variable Fault Action**. In most cases, if you set **Frequency Output Fault Action** to None, you should also set **Process Variable Fault Action** to None.

2. If you set **Frequency Output Fault Action** to Upscale, set **Frequency Fault Level** to the desired value.
   - Default: 14500 Hz
   - Range: 10 Hz to 14500 Hz

Related information

Configure Process Variable Fault Action

Options for Frequency Output Fault Action

Label	Frequency Output behavior
Upscale	Goes to configured Upscale value: • Default: 14500 Hz • Range: 10 Hz to 14500 Hz
Downscale	0 Hz
Internal Zero	0 Hz
None (default)	Determined by the setting of **Process Variable Fault Action**

8.3.2 Configure a Discrete Output

Use a Discrete Output to report specific meter or process conditions.

Related information

Configure Discrete Output Source
Configure Discrete Output Polarity
Configure Discrete Output Fault Action

Configure Discrete Output Source

Display	**Menu → Configuration → Inputs/Outputs → Channel C → I/O Settings → Source**
ProLink III	**Device Tools → Configuration → I/O → Outputs → Discrete Output → Source**
DeltaV AMS	**Configure → Manual Setup → Channel → Channel C → Assignment**
Siemens PDM	**Device → Manual Setup → Channel → Channel C → Assignment**

Discrete Output Source specifies the process condition or device condition that is reported by a Discrete Output.

Procedure

Set **Discrete Output Source** to the desired option.

Default: Forward/Reverse

Postrequisites

If you set **Discrete Output Source** to Flow Switch, additional configuration is required.

Related information

Configure Flow Rate Switch

Options for Discrete Output Source

Option	Label				State	DO voltage
	Display	PLIII	PROFIBUS-PA host	Host code		
Enhanced Event 1–5 [(1)]	Enhanced Event x	Enhanced Event x	Discrete Event x	57–61	ON	Externally powered: Site-specific
					OFF	0 V
Flow Rate Switch	Flow Rate Switch	Flow Switch Indicator	Flow Switch Indicator	101	ON	Externally powered: Site-specific
					OFF	0 V
Forward/ Reverse Indicator	Flow Direction	Forward Reverse Indicator	Forward/ Reverse Indication	102	Forward flow	0 V
					Reverse flow	Externally powered: Site-specific
Calibration in Progress	Zero in Progress	Calibration in Progress	Zero Calibration is in Progress	103	ON	Externally powered: Site-specific
					OFF	0 V
Fault	Fault	Fault Indication	Fault Condition Indication	104	ON	Externally powered: Site-specific
					OFF	0 V
Meter Verification Failure	Meter Verification Fail	Meter Verification Failure	Meter Verification Failure	216	ON	Externally powered: Site-specific
					OFF	0 V
APM Remediation	APM Remediation	APM Remediation	APM Remediation	97	ON OFF	Externally powered: Site-specific O V

(1) Events configured using the enhanced event model.

Important

This table assumes that **Discrete Output Polarity** is set to Active High. If **Discrete Output Polarity** is set to Active Low, reverse the voltage values.

Important

Actual flow direction interacts with **Sensor Flow Direction Arrow** to determine the flow direction that the transmitter uses in processing. See the following table.

Table 8-3: Interaction between actual flow direction and Sensor Flow Direction Arrow

Actual flow direction	Setting of Sensor Flow Direction Arrow	Flow direction sent to outputs and totalizers
Forward (same direction as Flow arrow on sensor)	With Arrow	Forward
	Against Arrow	Reverse
Reverse (opposite from Flow arrow on sensor)	With Arrow	Reverse
	Against Arrow	Forward

Configure Discrete Output Polarity

Display	**Menu → Configuration → Inputs/Outputs → Channel C → I/O Settings → Polarity**
ProLink III	**Device Tools → Configuration → I/O → Outputs → Discrete Output → Polarity**
DeltaV AMS	**Configure → Manual Setup → Discrete Output → Discrete Output → Polarity**
Siemens PDM	**Device → Manual Setup → Discrete Output → Discrete Output → Polarity**

A Discrete Output has two states: ON (active, asserted) and OFF (inactive). Two different voltages are used to represent these states. Discrete Output Polarity controls which voltage represents which state.

Procedure

Set **Discrete Output Polarity** as desired.

Default: Active High

Configure Discrete Output Fault Action

Display	
ProLink III	**Device Tools → Configuration → I/O → Outputs → Discrete Output → Fault Action**
DeltaV AMS	**Configure → Manual Setup → Discrete Output → Discrete Output → Fault Action**
Siemens PDM	**Device → Manual Setup → Discrete Output → Discrete Output → Fault Action**

Discrete Output Fault Action controls the behavior of a Discrete Output if the transmitter detects a fault condition.

Important

- The fault action is implemented only if **Alert Severity** is set to Failure. If **Alert Severity** is set to any other option, the fault action is not implemented.
- For some faults only: If **Fault Timeout** is set to a non-zero value, the transmitter will not implement the fault action until the timeout has elapsed.

NOTICE

Do not use **Discrete Output Source** as a fault indicator. If you do, you may not be able to distinguish a fault condition from a normal operating condition. If you want to use the Discrete Output as a fault indicator, see Fault indication with a Discrete Output.

Procedure

Set **Discrete Output Fault Action** as desired.

Default: None

Related information

Interaction between Process Variable Fault Action and other fault actions

Options for Discrete Output Fault Action

Label	Discrete Output behavior	
	Polarity=Active High	Polarity=Active Low
Upscale	• Fault: Discrete Output is ON (24 VDC or site-specific voltage) • No fault: Discrete Output is controlled by its assignment	• Fault: Discrete Output is OFF (0 V • No fault: Discrete Output is controlled by its assignment
Downscale	• Fault: Discrete Output is OFF (0 V • No fault: Discrete Output is controlled by its assignment	• Fault: Discrete Output is ON (24 VDC or site-specific voltage) • No fault: Discrete Output is controlled by its assignment
None (default)	Discrete Output is controlled by its assignment	

Fault indication with a Discrete Output

To indicate faults via a Discrete Output, set **Discrete Output Source** to Fault. Then, if a fault occurs, the Discrete Output is always ON and the setting of **Discrete Output Fault Action** is ignored.

9 Complete the configuration

9.1 Test or tune the system using sensor simulation

Display	**Menu → Startup Tasks → Commissioning Tools → Sensor Simulation**
ProLink III	**Device Tools → Diagnostics → Testing → Sensor Simulation**
DeltaV AMS	**Service Tool → Simulate → Process Variables**
Siemens PDM	**Diagnostics → Simulate → Process Variables**

Use sensor simulation to test the system's response to a variety of process conditions, including boundary conditions, problem conditions, or alert conditions, or to tune the loop.

Restriction
Sensor simulation is available only on flow meters with the enhanced core processor.

Prerequisites

Before enabling sensor simulation, ensure that your process can tolerate the effects of the simulated process values.

Procedure

1. Enable sensor simulation.
2. For mass flow, set **Wave Form** as desired and enter the required values.

Option	Required values
Fixed	Fixed Value
Sawtooth	Period Minimum Maximum
Sine	Period Minimum Maximum

3. For density, set **Wave Form** as desired and enter the required values.

Option	Required values
Fixed	Fixed Value
Sawtooth	Period Minimum Maximum
Sine	Period Minimum Maximum

4. For temperature, set **Wave Form** as desired and enter the required values.

Option	Required values
Fixed	Fixed Value
Sawtooth	Period Minimum Maximum
Sine	Period Minimum Maximum

5. Observe the system response to the simulated values and make any appropriate changes to the transmitter configuration or to the system.
6. Modify the simulated values and repeat.
7. When you have finished testing or tuning, disable sensor simulation.

9.1.1 Sensor simulation

Sensor simulation allows you to test the system or tune the loop without having to create the test conditions in your process. When sensor simulation is enabled, the transmitter reports the simulated values for mass flow, density, and temperature, and takes all appropriate actions. For example, the transmitter might apply a cutoff, activate an event, or post an alert.

When sensor simulation is enabled, the simulated values are stored in the same memory locations used for process data from the sensor. The simulated values are then used throughout transmitter functioning. For example, sensor simulation will affect:

- All mass flow rate, temperature, and density values displayed or reported via outputs or digital communications
- The mass total and mass inventory values
- All volume calculations and data, including reported values, volume totals, and volume inventories
- All mass, temperature, density, or volume values logged to Data Logger

Sensor simulation does not affect any diagnostic values.

Unlike actual mass flow rate and density values, the simulated values are not temperature-compensated (adjusted for the effect of temperature on the sensor's flow tubes).

9.2 Enable or disable software write-protection

Display	Use the mechanical switch on the display.
ProLink III	**Device Tools** → **Configuration** → **Write-Protection**
DeltaV AMS	**Configure** → **Manual Setup** → **Security and Simulation** → **Profibus PA** → **Write Lock**
Siemens PDM	**Device** → **Manual Setup** → **Security and Simulation** → **Profibus PA** → **Write Lock**

When enabled, **Write-Protection** prevents changes to the transmitter configuration. You can perform all other functions, and you can view the transmitter configuration parameters.

Note
The write protection setting via software methods (such as ProLink III) is available only on transmitters without a display.
For transmitters with a display, write protection is available only using the lock switch on the display. See Lock or unlock the transmitter.

Write-protecting the transmitter primarily prevents accidental changes to configuration, not intentional changes. Any user who can make changes to the configuration can disable write protection.

10 Transmitter operation

10.1 View process and diagnostic variables

Process variables provide information about the state of the process fluid. Diagnostic variables provide data about device operation. You can use this data to monitor and troubleshoot your process.

10.1.1 View process and diagnostic variables using the display

The display reports the name of the variable (for example, *Density*), the current value of the variable, and the associated unit of measure (for example, kg/m^3).

Prerequisites

For a process or diagnostic variable to be viewed using the display, it must be configured as a display variable.

Procedure

- If **Auto Scroll** is not enabled, activate ⇩ or ⇧ to move through the list of display variables.
- If **Auto Scroll** is enabled, wait until the variable is displayed automatically. If you do not want to wait, you can activate ⇩ or ⇧ to force the display to scroll.

10.1.2 View process variables and other data using ProLink III

Monitor process variables, diagnostic variables, and other data to maintain process quality.

ProLink III automatically displays process variables, diagnostic variables, and other data on the main screen.

Tip
ProLink III allows you to choose the process variables that appear on the main screen. You can also choose whether to view data in Analog Gauge view or digital view, and you can customize the gauge settings. For more information, see the *Micro Motion ProLink III with ProcessViz Software User Manual*.

10.1.3 View process variables and diagnostic variables using the PROFIBUS-PA host

The DeltaV AMS or Siemens PDM displays three process variables on the ***Overview*** page.

Procedure

- To view all process variables, choose **Overview** → **Variables**.
- To view diagnostic variables, choose **Service Tools** → **Maintenance** → **Diagnostic Variables**.

10.1.4 Effect of Sensor Flow Direction Arrow on digital communications

Flow rates on the transmitter display or reported via digital communications are shown as positive or negative. The sign depends on the interaction between **Sensor Flow Direction Arrow** and the actual flow direction.

This interaction affects flow rates shown on the transmitter display, ProLink III, and all other user interfaces.

Actual flow direction	Setting of Sensor Flow Direction Arrow	Flow rate value	
		Transmitter display	Digital communications
Forward (same direction as Flow arrow on sensor)	With Arrow	Positive (no sign)	Positive
	Against Arrow	Negative	Negative
Reverse (opposite from Flow arrow on sensor)	With Arrow	Negative	Negative
	Against Arrow	Positive (no sign)	Positive

10.2 View and acknowledge status alerts

The transmitter posts a status alert whenever one of the specified conditions occurs. You can view active alerts and you can acknowledge alerts. You do not have to acknowledge alerts: The transmitter will perform normal measurement and reporting functions with unacknowledged alerts.

10.2.1 View and acknowledge alerts using the display

You can view information about all active or unacknowledged alerts, and you can acknowledge alerts.

The display uses the alert banner and the alert symbol ⓘ to provide information about alerts.

Table 10-1: Alert information on display

Display status	Cause	User action
Alert banner	One or more alerts are active.	Resolve the conditions to clear the alert. When the alert is cleared or acknowledged, the banner will be removed.
Alert symbol ⓘ	One or more alerts are unacknowledged.	Acknowledge the alert. When all alerts are acknowledged, the alert icon will be removed.

If alert security is enabled, the alert banner is never displayed. To view detailed information, you must use the alert menu: **Menu** → **(i) Alert List**.

Note
Certain alerts do not clear until the transmitter is rebooted.

Procedure

- If the alert banner appears:
  a) Activate **Info** to view information about the alert.
  b) Take appropriate steps to clear the alert.
  c) Activate **Ack** to acknowledge the alert.

- If ⓘ appears:
    a) Choose **Menu** → **(i) Alert List**.
    b) Select an alert to view more information about the specific alert or to acknowledge it individually.
    c) Choose **Acknowledge All Alerts** to acknowledge all alerts on the list.

10.2.2 View and acknowledge alerts using ProLink III

You can view a list containing all alerts that are active, or inactive but unacknowledged. From this list, you can acknowledge individual alerts or choose to acknowledge all alerts at once.

Note
Certain alerts do not clear until the transmitter is rebooted.

Procedure

1. View alerts on the ProLink III main screen under **Alerts**.

   All active or unacknowledged alerts are listed. Take appropriate steps to clear all active alerts.

2. To acknowledge a single alert, check the **Ack** check box for that alert. To acknowledge all alerts at once, select **Ack All**.

10.3 Read totalizer and inventory values

Display	**Menu** → **Operations** → **Totalizers** → **See Totals**
ProLink III	**Device Tools** → **Totalizer Control** → **Totalizers** **Device Tools** → **Totalizer Control** → **Inventories**
DeltaV AMS	**Overview** → **Variables** → **Totalizers** → **View Totalizers (1–4)** **Overview** → **Variables** → **Totalizers** → **View Totalizers (5–7)** **Overview** → **Variables** → **Totalizers** → **View Inventories (1-4)** **Overview** → **Variables** → **Totalizers** → **View Inventories (5–7)** **Overview** → **Variables** → **Totalizers** → **View Contract Totals**
Siemens PDM	**View** → **Overview** → **Variables** → **Totalizers** → **View Totalizers (1–4)** **View** → **Overview** → **Variables** → **Totalizers** → **View Totalizers (5–7)** **View** → **Overview** → **Variables** → **Totalizers** → **View Inventories (1-4)** **View** → **Overview** → **Variables** → **Totalizers** → **View Inventories (5–7)** **View** → **Overview** → **Variables** → **Totalizers** → **View Contract Totals**

Totalizers keep track of the total amount of mass or volume measured by the transmitter since the last totalizer reset. Inventories keep track of the total amount of mass or volume measured by the transmitter since the last inventory reset.

10.4 Start, stop, and reset totalizers and inventories

When a totalizer or inventory is started, its value increases or decreases depending on the interaction of the flow direction parameters. It continues tracking flow until it is stopped.

When a totalizer or inventory is reset, its value is set to 0. You can reset a totalizer or inventory while it is started or while it is stopped.

- You can start, stop, or reset each totalizer or inventory independently.
- You can start, stop, or reset all totalizers and inventories as a group.

10.4.1 Start, stop, and reset totalizers using the display

Prerequisites

To stop, start, or reset a single totalizer or inventory, the totalizer or inventory must be configured as a display variable.

To reset an inventory using the display, this function must be enabled. To enable inventory reset using the display, choose **Menu** → **Configuration** → **Security** and set **Totalizer Reset** to Allowed. Note that this affects only the display functions. Resetting inventories using other tools is not affected.

Procedure

- To start or stop a single totalizer or inventory:
  a) Wait or scroll until the totalizer or inventory appears on the display.
  b) Choose **Options**.
  c) Choose **Start** or **Stop**.
- To start or stop all totalizers and inventories as a group:
  a) Choose **Menu** → **Operations** → **Totalizers**.
  b) Choose **Start** or **Stop**.
- To reset a single totalizer or inventory:
  a) Wait or scroll until the totalizer or inventory appears on the display.
  b) Choose **Options**.
  c) Choose **Reset**.
- To reset all totalizers and inventories as a group:
  a) Choose **Menu** → **Operations** → **Totalizers**.
  b) Choose **Reset All**.

10.4.2 Start, stop, and reset totalizers using ProLink III

Prerequisites

To reset an inventory using ProLink III, this function must be enabled. To enable inventory reset using ProLink III, choose **Tools** → **Options** and enable **Reset Inventories from ProLink III**. Note that this affects only ProLink III. Resetting inventories using other tools is not affected.

Procedure

- To start or stop a single totalizer:
  a) Choose **Device Tools** → **Totalizer Control** → **Totalizers**.
  b) Scroll to the totalizer that you want to start or stop, and click **Start** or **Stop**.
- To start or stop a single inventory:
  a) Choose **Device Tools** → **Totalizer Control** → **Inventories**.
  b) Scroll to the inventory that you want to start or stop, and click **Start** or **Stop**.
- To start or stop all totalizers as a group:
  a) Choose **Device Tools** → **Totalizer Control** → **Totalizers** or **Device Tools** → **Totalizer Control** → **Inventories**.
  b) Select **Start All Totals** or **Stop All Totals**.
- To reset a single totalizer:
  a) Choose **Device Tools** → **Totalizer Control** → **Totalizers**.
  b) Scroll to the totalizer that you want to reset, and click **Reset**.
- To reset a single inventory:
  a) Choose **Device Tools** → **Totalizer Control** → **Inventories**.
  b) Scroll to the inventory that you want to reset, and click **Reset**.
- To reset all totalizers as a group:
  a) Choose **Device Tools** → **Totalizer Control** → **Totalizers**.
  b) Select **Reset All Totals**.
- To reset all inventories as a group:
  a) Choose **Device Tools** → **Totalizer Control** → **Inventories**.
  b) Select **Reset All Inventories**.

10.4.3 Start, stop, and reset totalizers using a PROFIBUS PA host

Procedure

- To start or stop a single totalizer:
  a) Choose **Overview** → **Totalizer Control** → **Totalizers 1-7**.
  b) Select the totalizer that you want to start or stop.
  c) Choose **Start** or **Stop**.
- To start or stop a single inventory:
  a) Choose **Overview** → **Totalizer Control** → **Inventories 1-7**.
  b) Select the inventory that you want to start or stop.
  c) Choose **Start** or **Stop**.

- To start or stop all totalizers and inventories as a group:
    a) Choose **Overview** → **Totalizer Control**.
    b) Click **Start Totalizers** or **Stop Totalizers**.
- To reset a single totalizer:
    a) Choose **Overview** → **Totalizer Control** → **Totalizers 1-7**.
    b) Select the totalizer that you want to reset.
    c) Choose **Reset**.
- To reset a single inventory:
    a) Choose **Overview** → **Totalizer Control** → **Inventories 1-7**.
    b) Select the inventory that you want to reset.
    c) Choose **Reset**.
- To reset all totalizers as a group, choose **Overview** → **Totalizer Control** → **Reset All Totals**.
- To reset all inventories as a group, choose **Overview** → **Totalizer Control** → **Reset All Inventories**.

11 Measurement support

11.1 Use Smart Meter Verification

Smart Meter Verification™ provides in-process flow meter health verification by analyzing the meter components related to measurement performance. You can run Smart Meter Verification without stopping the process. Use this section to run a Smart Meter Verification test, view and interpret the results, set up automatic execution, and check if a field reference point has been established.

Important
Run the first Smart Meter Verification Basic or Professional test when the flow meter is installed in the pipeline and the flow meter is at its normal operating conditions.

Prerequisites

The following information pertains to 5700 PROFIBUS-PA firmware ≥ v1.0.

- To avoid or reduce corrosion, erosion, and other process effects, make sure the sensor tube material is compatible with the process fluid in use. For more information, see the *Micro Motion Corrosion Guide*.
- **Important**
  Micro Motion highly recommends:
  - Running the first Smart Meter Verification test when the flow meter is installed in the pipeline according to the installation instructions, and the process is running at its normal operating conditions
  - Running all tests thereafter at similar operating conditions
- The Smart Meter Verification test runs best when process conditions are stable. If process conditions are too unstable, the test will abort. To maximize process stability:
  - Maintain a constant fluid temperature and pressure.
  - Maintain a constant flow rate. If possible, stop flow through the sensor. The sensor should be full of process fluid.
  - Avoid changes to fluid composition; for example, two-phase flow or settling.
- For all applications, run Smart Meter Verification while commissioning the meter at normal operating conditions and then run it regularly. Micro Motion also recommends using Smart Meter Verification results along with other diagnostics like drive gain and density to help determine the health of a sensor.
- In certain scenarios, Smart Meter Verification field upgrades for pre-installed meters are possible. Contact factory support to discuss pre-installed meter upgrades.

11.1.1 Smart Meter Verification capabilities

Capability	Basic	Professional
	Included	90-day trial, licensed
Calibration coefficients audit	•	•
Zero audit	•	•
Electronics verification	•	•

Capability	Basic	Professional
	Included	90-day trial, licensed
Automatic test scheduler	•	•
History of previous 20 results	•	•
Verification report		•(1)
Non-uniform coating diagnostic		•
Multiphase diagnostic		•(2)
Flow range diagnostic		•(2)

(1) *Create and export with ProLink III, web page, or AMS SNAP-ON.*
(2) *24-hour historian visualization in ProLink III Professional*

11.1.2 Run a Smart Meter Verification test

Run a Smart Meter Verification Basic or Professional test to diagnose the flow meter (and flow meter system) and verify if the flow meter is functioning properly and performing within factory specifications.

Important
Run the first Smart Meter Verification Basic or Professional test when the flow meter is installed in the pipeline and the flow meter is at its normal operating conditions.

Run a Smart Meter Verification test using the display

Procedure

1. Read the Smart Meter Verification prerequisites in Use Smart Meter Verification if you have not done so already.
2. Choose **Menu** → **Operations** → **Smart Meter Verification** → **Run Verification**.
3. Select the desired output behavior.

Option	Description
Continue Measuring	During the test, all outputs will continue to report their assigned process variables. The test will run for approximately 90 seconds.
Fix at Last Measured Value	During the test, all outputs will report the last measured value of their assigned process variable. The test will run for approximately 140 seconds.
Fix at Fault	During the test, all outputs will go to their configured fault action. The test will run for approximately 140 seconds.

   The test starts immediately.
4. Wait for the test to complete.

   Note
   At any time during the process, you can abort the test. If the outputs were fixed, they will return to normal behavior.

Run a Smart Meter Verification test using ProLink III Basic or Professional

Procedure

1. Read the Smart Meter Verification prerequisites in Use Smart Meter Verification if you have not done so already.
2. Run Smart Meter Verification Basic or Professional using ProLink III Basic or Professional:
   - Smart Meter Verification Basic: **Device Tools → Diagnostics → Meter Verification → Basic Meter Verification**
   - Smart Meter Verification Professional: **Smart Meter Verification Overview → Meter Verification → Run Verification**
   - Smart Meter Verification Professional: **Device Tools → Diagnostics → Meter Verification → Run Test**
3. In the *SMV Test Definition* window, enter any desired information and click **Next**.

   None of this information is required. It does not affect Smart Meter Verification processing.

   ProLink III stores this information in the Smart Meter Verification database on the PC. It is not saved to the transmitter.
4. Select the desired output behavior.

Option	Description
Continue Measuring	During the test, all outputs will continue to report their assigned process variables. The test will run for approximately 90 seconds.
Fix at Last Measured Value	During the test, all outputs will report the last measured value of their assigned process variable. The test will run for approximately 140 seconds.
Fix at Fault	During the test, all outputs will go to their configured fault action. The test will run for approximately 140 seconds.

5. Select **Start** and wait for the test to complete.

Note
At any time during the process, you can abort the test. If the outputs were fixed, they will return to normal behavior.

Run a Smart Meter Verification test using a PROFIBUS-PA host

PROFIBUS-PA host	**Overview → Smart Meter Verification**

Procedure

1. Read the Smart Meter Verification prerequisites in Use Smart Meter Verification if you have not done so already.
2. Select the desired output behavior.

Option	Description
Continue Measuring	During the test, all outputs will continue to report their assigned process variables. The test will run for approximately 90 seconds.
Fix at Last Measured Value	During the test, all outputs will report the last measured value of their assigned process variable. The test will run for approximately 140 seconds.
Fix at Fault	During the test, all outputs will go to their configured fault action. The test will run for approximately 140 seconds.

The test starts immediately.

3. Wait for the test to complete.

Note
At any time during the process, you can abort the test. If the outputs were fixed, they will return to normal behavior.

11.1.3 View Smart Meter Verification test results

When the Smart Meter Verification Basic test is complete, a pass/fail result is displayed. With Smart Meter Verification Professional, detailed results and reports are available.

Note
With Smart Meter Verification Professional, the twenty most recent results are available. If viewed using ProLink III Basic or Professional, results for all tests that are in the PC database are available.

View Smart Meter Verification test results using the display

Results of the current Smart Meter Verification Basic or Professional test display automatically after the test is complete.

With Smart Meter Verification Professional, use the following procedure to view previous test results.

Procedure

1. Choose **Menu** → **Operations** → **Smart Meter Verification** → **Read Verification History**.
2. To view detailed data for an individual test, select it from the list.

View Smart Meter Verification test results using ProLink III Basic or Professional

Results of the current Smart Meter Verification Basic or Professional test display automatically after the test is complete.

With Smart Meter Verification Professional, use the following procedure to view previous test results.

To generate a previous test report, the Smart Meter Verification Professional test must have been run on the current PC in use.

Procedure

1. Choose one of the following options:
   - **Device Tools** → **Diagnostics** → **Meter Verification** → **View Previous Test Results**
   - **Smart Meter Verification Overview** → **Meter Verification** → **History**
2. To view details, choose the results of interest: **Show Report** (or **Next** to show the report).
   ProLink III displays a report containing details of the most recent tests. The report is automatically saved to the Smart Meter Verification database. You can print or export the report.

View Smart Meter Verification test results using a PROFIBUS-PA host

DeltaV AMS	**Service Tools** → **Maintenance** → **Routine Maintenance** → **Smart Meter Verification**
Siemens PDM	**Diagnostics** → **Maintenance** → **Routine Maintenance** → **Smart Meter Verification**

Results of the current Smart Meter Verification Basic or Professional test display automatically after the test is complete.

With Smart Meter Verification Professional, use the following procedure to view previous test results.

Procedure

- To view detailed results for the current test, choose **Most Recent Test Results**.
- To view the last 20 Smart Meter Verification Professional test results, choose **Show Last 20 Results**.

Interpreting Smart Meter Verification results

When the Smart Meter Verification Basic or Professional test is completed, the result is reported as Pass, Fail, or Abort. (Some tools report the Fail result as `Advisory` instead.)

Pass The meter is performing within factory specifications.

Abort When you execute a Smart Meter Verification Basic or Professional test, the test performs a self-diagnostic check to ensure that the flow meter is stable prior to running the test. In the rare case that this check reveals an issue, Smart Meter Verification will report an abort code.

If you manually cancel an in-process Smart Meter Verification Basic or Professional test, the test result displays `Abort Code 1: User-Initiated Abort`. In this case, you can restart Smart Meter Verification without any further action. In the rare case any other abort occurs, contact factory support.

In all cases where a Smart Meter Verification Professional test aborts, no report will be generated.

Fail If a Smart Meter Verification Basic or Professional test ran at normal operating conditions while conditions were stable and failed, see Resolve a failed Smart Meter Verification test to determine the appropriate actions.

11.1.4 Resolve a failed Smart Meter Verification test

Use this procedure if a Smart Meter Verification Basic or Professional test ran at normal operating conditions while conditions were stable and failed.

Procedure

1. Verify the sensor by performing a visual inspection, density verification, or field proving.
2. If possible, run Smart Meter Verification Professional with ProLink III Basic or Professional and save the results as follows:
    - In a `.csv` file
    - In a report
    - If the transmitter has a historian, retrieve the Smart Meter Verification results from the service or historian files.
3. Contact the factory for further evaluation and instructions.

11.1.5 Set up Smart Meter Verification automatic execution

You can execute a Smart Meter Verification Basic or Professional test on demand or automatically schedule future runs. You can schedule future runs via two different options: as a single test at a user-defined future time, or automatically on a regular schedule.

Tip
The time between test runs must be between 1 and 1000 hours. The time for the first test run can be any positive floating number.

Set up Smart Meter Verification automatic execution using the display

Procedure

1. Choose **Menu** → **Operations** → **Smart Meter Verification** → **Schedule Verification**.
2. To schedule a single test:
    a) Set **Hours to 1st Run** to the number of hours to elapse before the test is run.
    b) Set **Hours Between** to `0`.
3. To schedule a recurring execution:
    a) Set **Specify Time Until Next Run** to the number of days, hours, and minutes to elapse before the first test is run.
    b) Set **Specify Time Between Recurring Runs** to the number of days, hours, and minutes to elapse between runs.
4. To disable scheduled execution:
    a) Set **Specify Time Until Next Run** to `0` **days**, `0` **hours**, and `0` **minutes**.
    b) Set **Specify Time Between Recurring Runs** to `0` **days**, `0` **hours**, and `0` **minutes**.

Set up Smart Meter Verification automatic execution using ProLink III Basic or Professional

Procedure

1. Select one of the following paths to access the Smart Meter Verification scheduler .
   - ProLink III Basic or Professional: Choose **Device Tools** → **Diagnostics** → **Meter Verification** → **Schedule Meter Verification**.
   - ProLink III Professional: Choose **Smart Meter Verification Overview** → **Tools** → **Schedule Smart Meter Verification**.
2. To schedule a single test:
   a) Set **Specify Time Until Next Run** to the number of days, hours, and minutes to elapse before the test is run.
   b) Set **Specify Time Between Recurring Runs** to `0` **days**, `0` **hours**, and `0` **minutes**.
3. To schedule a recurring execution:
   a) Set **Specify Time Until Next Run** to the number of days, hours, and minutes to elapse before the first test is run.
   b) Set **Specify Time Between Recurring Runs** to the number of days, hours, and minutes to elapse between runs.
4. To disable scheduled execution, choose **Disable Scheduled Execution**.

Set up Smart Meter Verification automatic execution using a PROFIBUS PA host

DeltaV AMS	**Service Tools** → **Maintenance** → **Routine Maintenance** → **Smart Meter Verification** → **Automatic Verification** → **Schedule**
Siemens PDM	**Diagnostics** → **Maintenance** → **Routine Maintenance** → **Smart Meter Verification** → **Automatic Verification** → **Schedule**

Procedure

1. To schedule a single test:
   a) Set **Hours Until Next Run** to the number of hours to elapse before the test is run.
   b) Set **Recurring Hours** to `0`.
2. To schedule a recurring execution:
   a) Set **Specify Time Until Next Run** to the number of days, hours, and minutes to elapse before the first test is run.
   b) Set **Specify Time Between Recurring Runs** to the number of days, hours, and minutes to elapse between runs.
3. To disable scheduled execution:
   a) Set **Specify Time Until Next Run** to `0` **days**, `0` **hours**, and `0` **minutes**.

b) Set **Specify Time Between Recurring Runs** to 0 **days**, 0 **hours**, and 0 **minutes**.

Check for a field reference point

Use this procedure to check if a field reference point was created.

Prerequisites

- Smart Meter Verification Professional
- ProLink III Basic or Professional
- 5700 PROFIBUS-PA firmware ≥ v1.0

Procedure

1. From ProLink III Basic or Professional, choose one of the following options:
    - **Device Tools → Diagnostics → Meter Verification → View Previous Test Results**
    - **Smart Meter Verification Overview → Meter Verification → History**
2. Select **Export Data to CSV File**.
3. Save the CSV file to your computer.
4. Locate and open the CSV file.
5. Locate and examine the two columns labeled, **SMV Meter Factor LPO** and **SMV Meter Factor RPO**.
    - If the field reference point has not been established, the numbers in both columns will be exactly 1.
    - If the field reference point has been established, the numbers located in both columns will be close to 1. The **SMV Meter Factor LPO** and **SMV Meter Factor RPO** numbers do not have to match.

11.2 Zero the meter

Display	**Menu → Service Tools → Verification & Calibration → Meter Zero → Zero Calibration**
ProLink III	**Device Tools → Calibration → Smart Zero Verification and Calibration → Calibrate Zero**
DeltaV AMS	**Service Tools → Maintenance → Calibration → Zero Calibration → Setting → Perform Auto Zero**
Siemens PDM	**Diagnostics → Maintenance → Calibration → Zero Calibration → Setting → Perform Auto Zero**

Zeroing the meter establishes a baseline for process measurement by analyzing the sensor's output when there is no flow through the sensor tubes.

Important

In most cases, the factory zero is more accurate than the field zero. Do not zero the meter unless one of the following is true:

- The zero is required by site procedures.
- The stored zero value fails the zero verification procedure.

Do not verify the zero or zero the meter if a high-severity alert is active. Correct the problem, then verify the zero or zero the meter. You may verify the zero or zero the meter if a low-severity alert is active.

Prerequisites

Before performing a field zero, execute the zero verification procedure to see whether or not a field zero can improve measurement accuracy.

Important
Do not verify the zero or zero the meter if a high-severity alert is active. Correct the problem, then verify the zero or zero the meter. You may verify the zero or zero the meter if a low-severity alert is active.

Procedure

1. Prepare the meter:
   a) Allow the meter to warm up for at least 20 minutes after applying power.
   b) Run the process fluid through the sensor until the sensor temperature reaches the normal process operating temperature.
   c) Stop flow through the sensor by shutting the downstream valve, and then the upstream valve if available.
   d) Verify that the sensor is blocked in, that flow has stopped, and that the sensor is completely full of process fluid.
   e) Observe the drive gain, temperature, and density readings. If they are stable, check the **Live Zero** or **Field Verification Zero** value. If the average value is close to 0, you should not need to zero the meter.
2. Modify **Zero Time**, if desired.

   Zero Time controls the amount of time the transmitter takes to determine its zero-flow reference point. The default **Zero Time** is 20 seconds. For most applications, the default **Zero Time** is appropriate.
3. Start the zero procedure and wait until it completes.
   When the calibration is complete:
   - If the zero procedure was successful, a `Calibration Success` message and a new zero value are displayed.
   - If the zero procedure failed, a `Calibration Failed` message is displayed.

Postrequisites

Restore normal flow through the sensor by opening the valves.

Need help?
If the zero fails:

- Ensure that there is no flow through the sensor, then retry.
- Remove or reduce sources of electromechanical noise, then retry.
- Set **Zero Time** to a lower value, then retry.
- If the zero continues to fail, contact customer service.
- If you want to restore the most recent valid value from transmitter memory:
  — Using the display: **Menu** → **Service Tools** → **Verification and Calibration** → **Meter Zero** → **Restore Zero** → **Restore Previous Zero**

  - Using ProLink III: **Device Tools → Calibration → Smart Zero Verification and Calibration → Calibrate Zero → Restore Prior Zero**
  - Using DeltaV AMS: **Service Tools → Maintenance → Calibration → Zero Calibration → Setting → Restore Previous Zero**
  - Using Siemens PDM: **Diagnostics → Maintenance → Calibration → Zero Calibration → Setting → Restore Previous Zero**
- If you want to restore the factory zero:
  - Using the display: **Menu → Service Tools → Verification and Calibration → Meter Zero → Restore Zero → Restore Factory Zero**
  - Using ProLink III: **Device Tools → Calibration → Smart Zero Verification and Calibration → Calibrate Zero → Restore Factory Zero**
  - Using DeltaV AMS: **Service Tools → Maintenance → Calibration → Zero Calibration → Setting → Restore Factory Zero**
  - Using Siemens PDM: **Diagnostics → Maintenance → Calibration → Zero Calibration → Setting → Restore Previous Zero**

Restriction
Restore the factory zero only if your meter was purchased as a unit, it was zeroed at the factory, and you are using the original components.

Related information

Verify the zero

11.2.1 Terminology used with zero verification and zero calibration

Term	Definition
Zero	In general, the offset required to synchronize the left pickoff and the right pickoff under conditions of zero flow. Unit = microseconds.
Factory Zero	The zero value obtained at the factory, under laboratory conditions.
Field Zero	The zero value obtained by performing a zero calibration outside the factory.
Prior Zero	The zero value stored in the transmitter at the time a field zero calibration is begun. May be the factory zero or a previous field zero.
Manual Zero	The zero value stored in the transmitter, typically obtained from a zero calibration procedure. It may also be configured manually. Also called "mechanical zero" or "stored zero".
Live Zero	The real-time bidirectional mass flow rate with no flow damping or mass flow cutoff applied. An adaptive damping value is applied only when the mass flow rate changes dramatically over a very short interval. Unit = configured mass flow measurement unit.
Zero Stability	A laboratory-derived value used to calculate the expected accuracy for a sensor. Under laboratory conditions at zero flow, the average flow rate is expected to fall within the range defined by the Zero Stability value (0 ± Zero Stability). Each sensor size and model has a unique Zero Stability value.
Zero Calibration	The procedure used to determine the zero value.

Term	Definition
Zero Time	The time period over which the Zero Calibration procedure is performed. Unit = seconds.
Field Verification Zero	A 3-minute running average of the Live Zero value, calculated by the transmitter. Unit = configured mass flow measurement unit.
Zero Verification	A procedure used to evaluate the stored zero and determine whether or not a field zero can improve measurement accuracy.

11.3 Set up pressure compensation

Pressure compensation adjusts process measurement to compensate for the pressure effect on the sensor. The pressure effect is the change in the sensor's sensitivity to flow and density caused by the difference between the calibration pressure and the process pressure.

Tip
Not all sensors or applications require pressure compensation. The pressure effect for a specific sensor model can be found in the product data sheet located at www.emerson.com. If you are uncertain about implementing pressure compensation, contact customer service.

Prerequisites

You will need the flow factor, density factor, and calibration pressure values for your sensor.

- For the flow factor and density factor, see the product data sheet for your sensor.
- For the calibration pressure, see the calibration sheet for your sensor. If the data is unavailable, use 20 psi (1.38 bar).

You must be able to supply pressure data to the transmitter.

11.3.1 Set up pressure compensation using the display

Procedure

1. Choose **Menu** → **Configuration** → **Process Measurement** → **Pressure**.
2. Set **Units** to the pressure unit used by the external pressure device.
3. Enter **Flow Factor** for your sensor.

   The flow factor is the percent change in the flow rate per PSI. When entering the value, reverse the sign.

   Example

   If the flow factor is −0.0002 % per PSI, enter `+0.0002 % per PSI`.

4. Enter **Density Factor** for your sensor.

   The density factor is the change in fluid density, in g/cm^3/PSI. When entering the value, reverse the sign.

   Example

   If the density factor is −0.000006 g/cm^3/PSI, enter `+0.000006 g/cm3/PSI`.

5. Set **Calibration Pressure** to the pressure at which your sensor was calibrated.

   The calibration pressure is the pressure at which your sensor was calibrated, and defines the pressure at which there is no pressure effect. If the data is unavailable, enter `20` PSI.

Postrequisites

Option	Description	Setup
Digital communications	A host writes pressure data to the meter at appropriate intervals.	1. Set **Pressure Source** to Fixed Value or Digital Communications. 2. Perform the necessary host programming and communications setup to write pressure data to the meter at appropriate intervals.

Choose **Menu** → **Service Tools** → **Service Data** → **View Process Variables** and verify the external pressure value.

Need help?

If the value is not correct:

- Ensure that the external device and the meter are using the same measurement unit.
- For digital communications:
  - Verify that the host has access to the required data.
  - Verify that the output variable is being correctly received and processed by the transmitter.

11.3.2 Set up pressure compensation using ProLink III

Procedure

1. Choose **Device Tools** → **Configuration** → **Process Measurement** → **Pressure Compensation**.
2. Set **Pressure Compensation Status** to Enabled.
3. Set **Pressure Unit** to the unit used by the external pressure device.
4. Enter the **Density Factor** and **Flow Factor** for your sensor.
   a) Set **Process Fluid** to Liquid Volume or Gas Standard Volume, as appropriate.
   b) Compare the values shown in **Recommended Density Factor** and **Recommended Flow Factor** to the values from the product data sheet.
   c) To use the recommended values, click **Accept Recommended Values**.
   d) To use different factors, enter your values in the **Density Factor** and **Flow Factor** fields.

      The density factor is the change in fluid density, in g/cm^3/PSI. When entering the value, reverse the sign.

      #### Example

      If the density factor is −0.000006 g/cm^3/PSI, enter `+0.000006` g/cm3/PSI.

      The flow factor is the percent change in the flow rate per PSI. When entering the value, reverse the sign.

Example

If the flow factor is −0.0002 % per PSI, enter `+0.0002 %  per  PSI`.

5. Set **Flow Calibration Pressure** to the pressure at which your sensor was calibrated.

   The calibration pressure is the pressure at which your sensor was calibrated, and defines the pressure at which there is no pressure effect. If the data is unavailable, enter `20` PSI.

6. Choose the method you will use to supply pressure data, and perform the required setup.

Option	Description	Setup
Digital communications	A host writes pressure data to the meter at appropriate intervals.	a. Set **Pressure Source** to Fixed Value or Digital Communications. b. Perform the necessary host programming and communications setup to write pressure data to the meter at appropriate intervals.

Postrequisites

The current pressure value is displayed in the **External Pressure** field. Verify that the value is correct.

Need help?

If the value is not correct:

- Ensure that the external device and the meter are using the same measurement unit.
- For digital communications:
  - Verify that the host has access to the required data.
  - Verify that the output variable is being correctly received and processed by the transmitter.

11.3.3 Configure pressure compensation using a PROFIBUS-PA host

DeltaV AMS	**Configure** → **Manual Setup** → **Measurements** → **Optional Setup** → **External Variables** → **Pressure**
Siemens PDM	**Device** → **Manual Setup** → **Measurements** → **Optional Setup** → **External Variables** → **Pressure**

Procedure

1. Set **Pressure Unit** to the unit used by the external pressure device.
2. Enable **Pressure Compensation**.
3. Set **Flow Calibration Pressure** to the pressure at which your sensor was calibrated.

   The calibration pressure is the pressure at which your sensor was calibrated, and defines the pressure at which there is no pressure effect. If the data is unavailable, enter `20` PSI.

4. Enter the **Flow Pressure Factor** for your sensor.

   The flow factor is the percent change in the flow rate per PSI. When entering the value, reverse the sign.

Example

If the flow factor is -0.0002 % per PSI, enter `+0.0002 %` per PSI.

5. Enter **Density Pressure Factor** for your sensor.

   The density factor is the change in fluid density, in g/cm^3/PSI. When entering the value, reverse the sign.

   ### Example

   If the density factor is -0.000006 g/cm^3/PSI, enter `+0.000006` g/cm^3/PSI.

6. Supply pressure data, and perform the required setup.
   a) Set **Pressure Compensation** to Enable.
   b) Perform the necessary host programming and communications setup to write pressure data to the transmitter at appropriate intervals.

11.4 Validate the meter

Display	**Menu → Configuration → Process Measurement → Flow Variables → Mass Flow Settings → Meter Factor** **Menu → Configuration → Process Measurement → Flow Variables → Volume Flow Settings → Meter Factor** **Menu → Configuration → Process Measurement → Density → Meter Factor**
ProLink III	**Device Tools → Configuration → Process Measurement → Flow → Mass Flow Rate Meter Factor** **Device Tools → Configuration → Process Measurement → Flow → Volume Flow Rate Meter Factor** **Device Tools → Configuration → Process Measurement → Density → Density Meter Factor**
DeltaV AMS	**Configure → Manual Setup → Measurements → Mass Flow → Factor** **Configure → Manual Setup → Measurements → Volume Flow → Factor** **Configure → Manual Setup → Measurements → Density → Factor**
Siemens PDM	**Device → Manual Setup → Measurements → Mass Flow → Factor** **Device → Manual Setup → Measurements → Volume Flow → Factor** **Device → Manual Setup → Measurements → Density → Factor**

Meter validation compares flow meter measurements reported by the transmitter to an external measurement standard. If the transmitter value for mass flow, volume flow, or density measurement is significantly different from the external measurement standard, you may want to adjust the corresponding meter factor. The flow meter's actual measurement is multiplied by the meter factor, and the resulting value is reported and used in further processing.

Prerequisites

Identify the meter factor(s) that you will calculate and set. You may set any combination of the three meter factors: mass flow, volume flow, and density. Note that all three meter factors are independent:

- The meter factor for mass flow affects only the value reported for mass flow.
- The meter factor for density affects only the value reported for density.
- The meter factor for volume flow affects only the value reported for volume flow or gas standard volume flow.

Important
To adjust volume flow, you must set the meter factor for volume flow. Setting a meter factor for mass flow and a meter factor for density will not produce the desired result. The volume flow calculations are based on original mass flow and density values, before the corresponding meter factors have been applied.

If you plan to calculate the meter factor for volume flow, be aware that validating volume in the field may be expensive, and the procedure may be hazardous for some process fluids. Therefore, because volume is inversely proportional to density, an alternative to direct measurement is to calculate the meter factor for volume flow from the meter factor for density. For instructions on this method, see Alternate method for calculating the meter factor for volume flow.

Obtain a reference device (external measurement device) for the appropriate process variable.

Important
For good results, the reference device must be highly accurate.

Procedure

1. Determine the meter factor as follows:
   a) Use the flow meter to take a sample measurement.
   b) Measure the same sample using the reference device.
   c) Calculate the meter factor using the following formula:

$$NewMeterFactor = ConfiguredMeterFactor \times \left(\frac{ReferenceMeasurement}{FlowmeterMeasurement}\right)$$

2. Ensure that the calculated meter factor does not fall outside 0.98 and 1.02. If the meter factor is outside these limits, contact customer service.
3. Configure the meter factor in the transmitter.

Calculating the meter factor for mass flow

The flow meter is installed and validated for the first time. The mass flow measurement from the transmitter is 250.27 lb. The mass flow measurement from the reference device is 250 lb. The mass flow meter factor is calculated as follows:

$$MeterFlow_{MassFlow} = 1 \text{ x} \left(\frac{250}{250.27}\right) = 0.9989$$

The first meter factor for mass flow is 0.9989.

One year later, the flow meter is validated again. The mass flow measurement from the transmitter is 250.07 lb. The mass flow measurement from the reference device is 250.25 lb. The new mass flow meter factor is calculated as follows:

$$MeterFlow_{MassFlow} = 0.9989 \text{ x} \left(\frac{250.25}{250.07}\right) = 0.9996$$

The new meter factor for mass flow is 0.9996.

11.4.1 Alternate method for calculating the meter factor for volume flow

The alternate method for calculating the meter factor for volume flow is used to avoid the difficulties that may be associated with the standard method.

This alternate method is based on the fact that volume is inversely proportional to density. It provides partial correction of the volume flow measurement by adjusting for the portion of the total offset that is caused by the density measurement offset. Use this method only when a volume flow reference is not available, but a density reference is available.

Procedure

1. Calculate the meter factor for density, using the standard method.
2. Calculate the meter factor for volume flow from the meter factor for density:

$$MeterFactor_{Volume} = \left(\frac{1}{MeterFactor_{Density}}\right)$$

   The following equation is mathematically equivalent to the first equation. You may use whichever version you prefer.

$$MeterFactor_{Volume} = ConfiguredMeterFactor_{Density} \times \left(\frac{Density_{Flowmeter}}{Density_{ReferenceDevice}}\right)$$

3. Ensure that the calculated meter factor does not fall outside 0.98 and 1.02. If the meter factor is outside these limits, contact customer service.
4. Configure the meter factor for volume flow in the transmitter.

11.5 Perform a (standard) D1 and D2 density calibration

Density calibration establishes the relationship between the density of the calibration fluids and the signal produced at the sensor. Density calibration includes the calibration of the D1 (low-density) and D2 (high-density) calibration points.

Important
Micro Motion flow meters are calibrated at the factory, and normally do not need to be calibrated in the field. Calibrate the flow meter only if you must do so to meet regulatory requirements. Contact customer support before calibrating the flow meter.

Tip
Use meter validation and meter factors, rather than calibration, to prove the meter against a regulatory standard or to correct measurement error.

Prerequisites

- During density calibration, the sensor must be completely filled with the calibration fluid, and flow through the sensor must be at the lowest rate allowed by your application. This is usually accomplished by closing the shutoff valve downstream from the sensor, then filling the sensor with the appropriate fluid.
- D1 and D2 density calibration require a D1 (low-density) fluid and a D2 (high-density) fluid. You may use air and water.
- The calibrations must be performed without interruption, in the order shown. Make sure that you are prepared to complete the process without interruption.

- Before performing the calibration, record your current calibration parameters. You can do this by saving the current configuration to a file on the PC. If the calibration fails, restore the known values.

Restriction
For T-Series sensors, the D1 calibration must be performed on air and the D2 calibration must be performed on water.

11.5.1 Perform a D1 and D2 density calibration using the display

Procedure

1. Read the Prerequisites in Perform a (standard) D1 and D2 density calibration if you have not already done so.
2. Close the shutoff valve downstream from the sensor.
3. Fill the sensor with the D1 fluid and allow the sensor to achieve thermal equilibrium.
4. Choose **Menu** → **Service Tools** → **Verification and Calibration** → **Density Calibration**.
5. Perform the D1 calibration.
    a) Choose **D1 (Air)**.
    b) Enter the density of your D1 fluid.
    c) Choose **Start Calibration**.
    d) Wait for the calibration to complete.
    e) Choose **Finished**.
6. Fill the sensor with the D2 fluid and allow the sensor to achieve thermal equilibrium.
7. Perform the D2 calibration.
    a) Choose **D2 (Water)**.
    b) Enter the density of your D2 fluid.
    c) Choose **Start Calibration**.
    d) Wait for the calibration to complete.
    e) Choose **Finished**.
8. Open the shutoff valve.

11.5.2 Perform a D1 and D2 density calibration using ProLink III

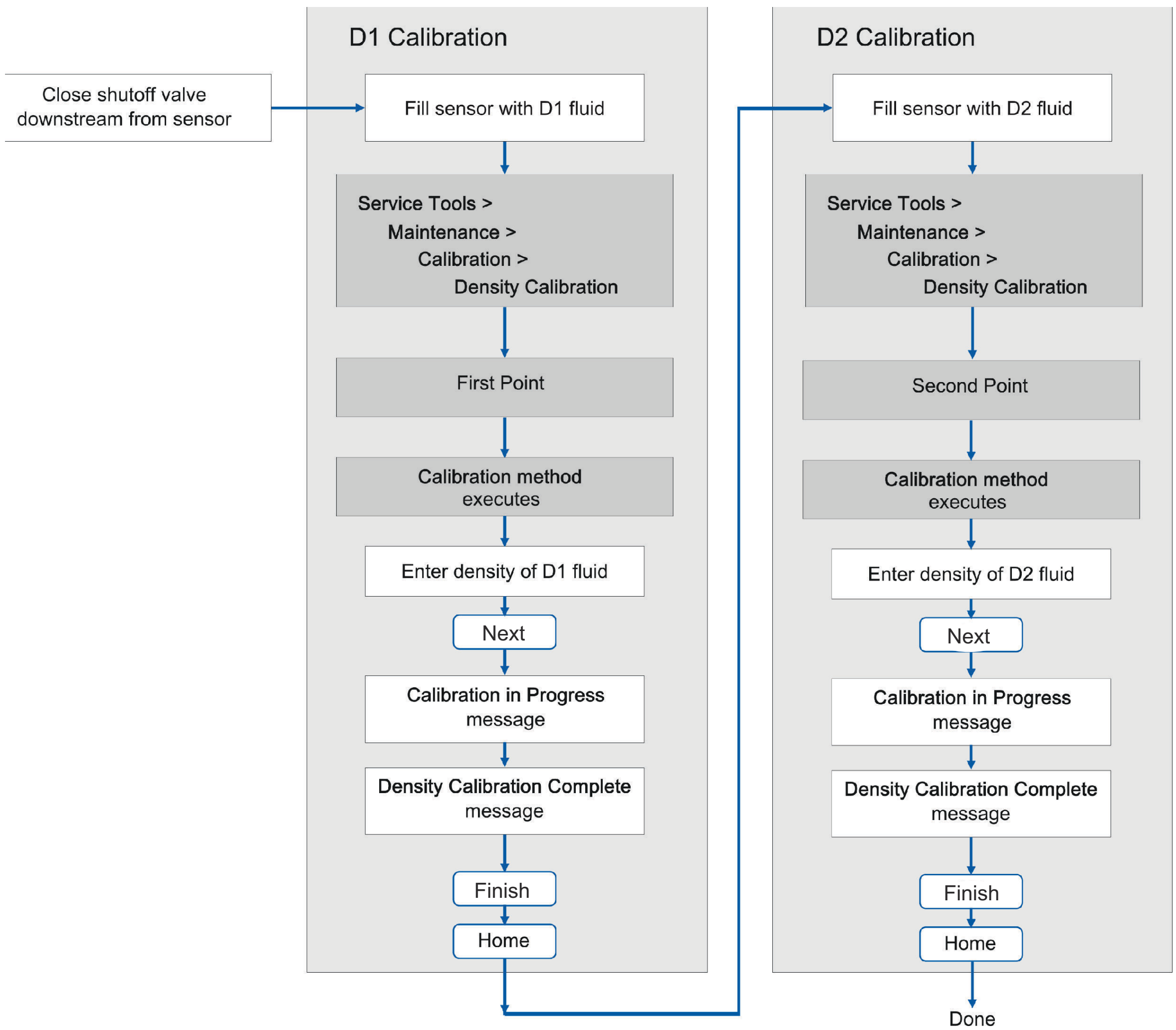
Procedure

1. Read the Prerequisites in Perform a (standard) D1 and D2 density calibration if you have not already done so.
2. See the following figure.

11.5.3 Perform a D1 and D2 density calibration using a PROFIBUS-PA host

Procedure

1. Read the Prerequisites in Perform a (standard) D1 and D2 density calibration if you have not already done so.
2. See the following figure.



11.6 Adjust concentration measurement with Trim Slope and Trim Offset

Trim Slope and **Trim Offset** adjust the meter's concentration measurement to match a reference value.

Tip
You can adjust concentration measurement by applying the trim offset only, or by applying both the trim offset and the trim slope. For most applications, the trim offset is sufficient.

Prerequisites

Ensure that the active matrix is the one that you want to trim. You can set the offset and slope separately for each matrix on your transmitter.

You must be able to take measurements of your process fluid at two different concentrations.

You must be able to take a sample of your process fluid at each of these concentrations.

For each sample, you must be able to obtain a laboratory concentration value at line density and line temperature.

Procedure

1. Collect data for Comparison 1.
    a) Take a concentration reading from the meter and record line density and line temperature.
    b) Take a sample of the process fluid at the current concentration.
    c) Obtain a laboratory value for concentration at line density and line temperature, in the units used by the meter.
2. Collect data for Comparison 2.
    a) Change the concentration of your process fluid.
    b) Take a concentration reading from the meter and record line density and line temperature.
    c) Take a sample of the process fluid at the current concentration.
    d) Obtain a laboratory value for concentration at line density and line temperature, in the units used by the meter.
3. Populate the following equation with values from each comparison.

$$\text{Concentration}_{\text{Lab}} = (A \times \text{Concentration}_{\text{Meter}}) + B$$

4. Solve for A (slope).
5. Solve for B (offset), using the calculated slope and one set of values.
6. Enter the results as the trim slope and the trim offset.
    - Using ProLink III: Choose **Device Tools** → **Configuration** → **Process Measurement** → **Concentration Measurement**, set **Matrix Being Configured** to your matrix, and enter **Trim Slope** and **Trim Offset**.
    - Using a DeltaV AMS: Choose **Configure** → **Manual Setup** → **Measurement** → **Optional Setup** → **Concentration Measurement** → **Trim CM Process Variables** and set **Matrix Being Configured** to your matrix, and enter **Trim Slope** and **Trim Offset**.

7. Take another concentration reading from the meter, and compare it to the laboratory value.
   - If the two values are acceptably close, the trim is complete.
   - If the two values are not acceptably close, repeat this procedure.

Calculating the trim slope and the trim offset

Comparison 1	Laboratory value	50.00%
	Meter value	49.98%
Comparison 2	Laboratory value	16.00%
	Meter value	15.99%

Populate the equations:

$$50 = (A \times 49.98) + B$$

$$16 = (A \times 15.99) + B$$

Solve for A:

$$50.00 - 16.00 = 34.00$$

$$49.98 - 15.99 = 39.99$$

$$34 = A \times 33.99$$

$$A = 1.00029$$

Solve for B:

$$50.00 = (1.00029 \times 49.98) + B$$

$$50.00 = 49.99449 + B$$

$$B = 0.00551$$

Concentration slope (A): 1.00029

Concentration offset (B): 0.00551

12 Maintenance

12.1 Install a new transmitter license

Display	**Menu → Service Tools → License Manager**
ProLink III	**Device Tools → Configuration → Feature License**
DeltaV AMS	**Overview → Device Information → Licenses**
Siemens PDM	**View → Overview → Device Information → Licenses**

Whenever you purchase additional features or request a trial license, you must install a new transmitter license. The new license makes the new features available on your transmitter. For concentration measurement and API Referral, you may still need to enable the application.

Prerequisites

- You must have a license file provided by Micro Motion:
  - `perm.lic`: Permanent license file
  - `temp.lic`: Temporary license file
- A USB drive

If you are planning to use the USB drive, the service port must be enabled. It is enabled by default. However, if you need to enable it, choose **Menu → Configuration → Security** and set **Service Port** to On.

Procedure

- To install a license using the display:
  a) Copy the license file to a folder on a USB drive.

     Important
     You must copy the license file to a folder. You cannot put it in the root.

  b) **WARNING**
     If the transmitter is in a hazardous area, do not remove the housing cover while the transmitter is powered up. Failure to follow these instructions can cause an explosion resulting in injury or death.

     Open the wiring compartment on the transmitter and insert the USB drive into the service port.
  c) Choose **Menu → USB Options → USB Drive → Transmitter → Load License File**.
  d) Select the folder containing the license file and follow the prompts.
- To install a license using ProLink III:
  a) Open the license file.
  b) Choose **Device Tools → Configuration → Feature License**.
  c) Copy the license from the file to the appropriate **License Key** field.

- To install a license using a DeltaV AMS:
    a) Choose **Overview** → **Device Information** → **Licenses** → **Upload License**.
    b) Select the license feature to upload, Permanent Feature or Temporary Feature.
    c) Write the license key.

The features supported by the new license are displayed.

If you installed a temporary license, the transmitter will revert to its original feature set when the license period has expired. To purchase a feature for permanent use, contact customer support.

Postrequisites

If you installed a permanent license, update the options model code to match the new license. The options model code represents the installed features.

12.2 Upgrade the transmitter firmware

You can upgrade the transmitter firmware to stay current with development and to take advantage of any new features.

12.2.1 Using a USB drive with the display

You can upgrade the transmitter firmware to stay current with development and to take advantage of any new features.

Prerequisites

You must have the firmware upgrade files provided by Micro Motion.

The service port must be enabled. It is enabled by default. However, if you need to enable it, choose **Menu** → **Configuration** → **Security** and set **Service Port** to On.

Procedure

1. Copy the folder containing the firmware upgrade files to a USB drive.
2. ⚠ **WARNING**
   If the transmitter is in a hazardous area, do not remove the housing cover while the transmitter is powered up. Failure to follow these instructions can cause an explosion resulting in injury or death.

   Open the wiring compartment and insert the USB drive into the service port.
3. Follow the prompts once the transmitter recognizes the USB drive.
4. Select **USB Drive –> Transmitter**.
5. Select **Update Device Software**.
6. Select the firmware upgrade folder and follow the prompts.

   Note
   If required, the transmitter upgrade procedure automatically includes an upgrade to the core processor software.

   If you chose to reboot the transmitter at a later date, you can reboot it from the menu, or you can power-cycle it.

7. Verify the transmitter configuration and all safety parameters.
8. Enable write-protection.

12.2.2 Using the USB service port and ProLink III

You can upgrade the transmitter firmware to stay current with development and to take advantage of any new features.

This procedure is not available over the PROFIBUS-PA connection. You must use a service port.

⚠ WARNING
If the transmitter is in a hazardous area, do not remove the housing cover while the transmitter is powered up. Failure to follow these instructions can cause an explosion resulting in injury or death.

Prerequisites

You must have the firmware upgrade files provided by Emerson.

Procedure

1. Choose **Device Tools** → **Transmitter Software Update**.
2. Navigate to the folder containing the firmware upgrade files.
3. Select **Update**.

   Note
   If required, the transmitter upgrade procedure automatically includes an upgrade to the core processor software.

   If you chose to reboot the transmitter at a later date, you can reboot it from the display, or you can power-cycle it.
4. Verify the transmitter configuration and all safety parameters.
5. Enable write-protection.

12.3 Reboot the transmitter

Display	**Menu → Service Tools → Reboot Transmitter**
ProLink III	Not available
DeltaV AMS	**Service Tools → Maintenance → Reset/Restore → Device Reset**
Siemens PDM	**Diagnostics → Maintenance → Reset/Restore → Device Reset**

For certain configuration changes to take effect, the transmitter must be rebooted. You must also reboot the transmitter in order to clear certain status alerts.

Rebooting the transmitter has the same effect as power-cycling the transmitter.

Prerequisites

Follow appropriate procedures to select the appropriate time for rebooting the transmitter. The reboot typically takes about 10 seconds.

Postrequisites

Check the transmitter clock. During the reboot, the transmitter clock is powered by the battery, therefore the transmitter clock and all timestamps should be accurate. If the transmitter clock is not correct, the battery may need replacement.

12.4 Battery replacement

The transmitter contains a battery that is used to power the clock when the transmitter is not powered up. Users cannot service or replace the battery. If the battery requires replacement, contact customer support.

If the battery is non-functional and the transmitter is powered down, then powered up, the clock will restart from the time of the power-down. All timestamps will be affected. You can correct the issue by resetting the transmitter clock. For a permanent resolution, the battery must be replaced.

13 Log files, history files, and service files

13.1 Generate history files

Display	**Menu → USB Options → Transmitter –> USB Drive → Download Historical Files**
ProLink III	**Device Tools → Configuration Transfer → Download Historical Files**
DeltaV AMS	Not available

The transmitter automatically saves historical data of several types, including process and diagnostic variables, Smart Meter Verification test results, and totalizer values. To access the historical data, you can generate a log file, then view it on your PC.

This procedure is not available over the PROFIBUS-PA connection. You must use a service port.

WARNING
If the transmitter is in a hazardous area, do not remove the housing cover while the transmitter is powered up. Failure to follow these instructions can cause an explosion resulting in injury or death.

Prerequisites

If you want to generate a totalizer log, you must have previously configured the transmitter to record totalizer data. However, there is a totalizer history that is logged automatically.

If you plan to use the transmitter display:

- The service port must be enabled. It is enabled by default. However, if you need to enable it, choose **Menu → Configuration → Security** and set **Service Port** to On.
- You must have a USB drive.

Procedure

1. **WARNING**
   If the transmitter is in a hazardous area, do not remove the housing cover while the transmitter is powered up. Failure to follow these instructions can cause an explosion resulting in injury or death.

   If you are using the transmitter display, open the wiring compartment and insert the USB drive into the service port.
2. Select the type of log file that you want to generate.
3. If you selected historian data (process and diagnostic variables):
   a) Set the date and time for the first entry in the historian log file.
   b) Set the number of days that the log file will include.
   c) Select the record type.

Option	Description
1 Second Raw Data	The current values of process and diagnostic variables, recorded at 1-second intervals.
5 Min Average Data	The minimum and maximum values of the 1-second raw data over the last 5 minutes, plus the average and the standard deviation, recorded at 5-minute intervals.

The system provides an estimated file size or transfer time.

4. Specify the location where the log file will be saved.
   - If you are using the display, the log file is written to the USB drive.
   - If you are using ProLink III, the log file is written to a folder on your PC.

The log file is written to the specified location. File names are assigned as follows:

- Historian files: The file name is based on the transmitter tag, the starting date of the log contents, and the record type. The record type is shown as F or S:
  - F=Fast, for 1-second raw data
  - S=Slow, for 5-minute average data
- SMV files:
  - `SmvLast20Data.csv`
  - `SmvLongTermData.csv`
- Totalizer history files: `TotLog.txt`

13.1.1 Historian data and log

The transmitter automatically saves information about specific process and diagnostic variables to its working memory. You can generate a log from this data that tracks all 14 totalizers with 21 days worth of data. The historian log is an ASCII file in `.csv` format.

Contents of the historian log

There are two types of historian records:

1-second raw data The current values of process and diagnostic variables, recorded at 1-second intervals.

5-minute average data The minimum and maximum values of the 1-second raw data, plus the average and the standard deviation, calculated and recorded at 5-minute intervals.

When you generate the log, you can specify which type of record you want to see.

The historian in the transmitter's working memory contains a minimum of 4 weeks of 1-second raw data and 10 years of 5-minute average data.

Each record contains data for the following process and diagnostic variables:

- Timestamp
  - Format: Military time

  - Time and time zone: Transmitter clock
- Mass flow rate (kg/sec)
- Volume flow rate (l/sec) or GSV flow rate
- Density (g/cm³)
- Line temperature (°C)
- External temperature (if available)
- Pressure (if available)
- If concentration measurement is enabled:
  - Standard volume flow rate
  - Net mass flow rate
  - Net volume flow rate
  - Referred density
  - Concentration
- If API Referral is enabled:
  - CTPL or CTL
  - Corrected density
  - Corrected volume flow rate
- Alert status registers (hexadecimal format)
- Live zero (kg/sec)
- Tube frequency (Hz)
- Drive gain (%)
- Left pickoff (filtered) (V)
- Right pickoff (filtered (V)
- Left pickoff (raw) (V)
- Delta T
- Case temperature (°C)
- Voltage applied to the core processor (V)
- Temperature of the core processor board (°C)
- Temperature of the transmitter electronics (°C)

Historian data and power-cycles

Historian data is maintained across transmitter reboots and power-cycles.

Historian data and configuration files

If you restore the factory configuration or upload a configuration file, existing historian data is not affected.

Example: Historian log, 5-minute average data

S TAG:SUPPLY UID:22729F1F SW:000000045 800:000000402	MassFlow	MassFlow	MassFlow	MassFlow	...
DST ON:Mountain GMT-7.0 SM:T075 SN:000000000	kg/s Max	kg/s Min	kg/s Avg	kg/s Std	...
8/25/2020 9:58	0.0082359	0	0.00091223	9.76E-05	...
8/25/2020 10:03	0.001018	0.00084441	0.00091756	1.61E-05	...
8/25/2020 10:08	0.00099489	0.00086279	0.00092519	1.44E-05	...
8/25/2020 10:13	0.0010835	0.00080879	0.00093774	2.01E-05	...
8/25/2020 10:18	0.0011767	0.00084206	0.00094224	2.11E-05	...
8/25/2020 10:23	0.0010243	0.00086888	0.00094534	1.85E-05	...
8/25/2020 10:28	0.0010903	0.00084823	0.00094747	1.81E-05	...
8/25/2020 10:33	0.0010319	0.00085327	0.00095123	1.67E-05	...
8/25/2020 10:38	0.0011232	0.00088614	0.00095222	1.59E-05	...
8/25/2020 10:43	0.0010841	0.00081306	0.00095126	1.99E-05	...
8/25/2020 10:48	0.0010999	0.00086106	0.00095333	1.93E-05	...
8/25/2020 10:53	0.0011523	0.00085537	0.00095528	2.01E-05	...
...					

Note
The historian log displays only in English.

13.1.2 Smart Meter Verification history and log

The transmitter automatically saves test data for all Smart Meter Verification tests. You can generate a log containing data for the 20 most recent tests or for all Smart Meter Verification tests. The log is an ASCII file in `.csv` format.

Contents of Smart Meter Verification log

Each record in the Smart Meter Verification log represents a Smart Meter Verification test. Each record contains the following information:

- Date and time of test
- Data collected during the test
- The abort code (15=test completed normally)
- A pass/fail result for the left pickoff (0=Pass, 1=fail)
- A pass/fail result for the right pickoff (0=Pass, 1=fail)
- The sensor type code
- The sensor serial number

Smart Meter Verification history and power-cycles

If the transmitter is rebooted or power-cycled, Smart Meter Verification history is not affected.

Smart Meter Verification history and configuration files

If you restore the factory configuration or upload a configuration file, Smart Meter Verification history is not affected.

Example: Smart Meter Verification log

Device UID: 577937183

Device Tag: SUPPLY

Time Zone: GMT -7.00

Date Time	LPO Stiff	RPO Stiff	LPO Mass	RPO Mass	Damping	Drv mA	...
8/13/2020 19:27	0.285876	0.289738	0.155294	0.158114	4.41E-05	1.301	...
8/14/2020 7:27	-0.06137	-0.05808	0.154748	0.157556	4.02E-05	1.304	...
8/14/2020 19:27	0.204754	0.20932	0.155185	0.158004	4.35E-05	1.308	...
8/15/2020 7:27	-0.15382	-0.15216	0.154612	0.157416	3.93E-05	1.307	...
8/18/2020 16:27	0.251067	0.251782	0.155217	0.158031	4.34E-05	1.308	...
8/19/2020 19:27	-0.13654	-0.14112	0.154602	0.157396	3.89E-05	1.287	...
8/20/2020 16:27	-0.20837	-0.20671	0.154502	0.157304	3.85E-05	1.291	...
8/21/2020 17:10	-0.11062	-0.11566	0.154641	0.157435	3.84E-05	1.288	...
8/22/2020 10:40	-0.15852	-0.16036	0.154512	0.157308	3.86E-05	1.284	...
8/25/2020 15:40	-0.00172	0.002301	0.154788	0.157599	4E-05	1.295	...
8/27/2020 23:16	0.132787	0.13684	0.155034	0.15785	4.08E-05	1.275	...
8/28/2020 11:16	0.04456	0.046158	0.154845	0.157653	3.99E-05	1.277	...
...							

Note
The Smart Meter Verification log displays only in English.

13.1.3 Totalizer log

The totalizer log can track four configurable totals. The period is configurable; you can configure the transmitter to save totalizer and inventory values at a user-specified interval and then generate a totalizer log. The totalizer log is an ASCII file.

Contents of totalizer log

The totalizer log contains one record for each logged totalizer or inventory value. Each record contains the following information:

- Default totalizer or inventory name (user-specified names are not used)
- Value and measurement unit
- Timestamp

— Format: Military time
— Time and time zone: Transmitter clock

The totalizer log also contains a line item for each totalizer or inventory reset.

Totalizer logs and power cycles

If the transmitter is rebooted or power-cycled, the totalizer log is not affected.

Totalizer logs and configuration files

If you restore the factory configuration or upload a configuration file, the totalizer log is not affected.

Example: Totalizer log

```
================================================================================
Device UID: 22729F1F                          Device Tag: SUPPLY
Name                  Value                   Units                 Time Zone: GMT-7.00
================================================================================
Mass Fwd Total        61.74707                grams                 9/12/2020 20:00
Mass Fwd Inv          61.74705                grams                 9/12/2020 20:00
Mass Fwd Total        61.74707                grams                 9/12/2020 21:00
Mass Fwd Inv          61.74705                grams                 9/12/2020 21:00
Mass Fwd Total        61.74707                grams                 9/12/2020 22:00
Mass Fwd Inv          61.74705                grams                 9/12/2020 22:00
Mass Fwd Total        61.74707                grams                 9/12/2020 23:00
Mass Fwd Inv          61.74705                grams                 9/12/2020 23:00
Mass Fwd Total        61.74707                grams                 9/13/2020 0:00
Mass Fwd Inv          61.74705                grams                 9/13/2020 0:00
...
```

Note
The totalizer history displays only in English.

Read contract totals

You can read contract totals for the current 24-hour contract period and for the previous 24-hour contract period. Depending on the configuration of the totalizer log, you may be able to read contract totals for earlier periods.

The contract totals are derived from existing inventories. However, they are reset automatically at the beginning of each contract period. Therefore, the values shown will probably not match the values shown for the inventories.

Important
You can reset inventories manually, and you can stop and start inventories manually. However, if you do this, data for the current contract period will not reflect the entire 24-hour period. Data for earlier contract periods is not affected.

- The contract totals for the current contract period are stored in the **Today's Total [1-4]** parameters.
- The contract totals for the previous contract period are stored in the **Yesterday's Total [1-4]** parameters.
- The contract totals from earlier contract periods can be read in the totalizer log.

Configure contract totals into the totalizer log

The transmitter can be configured to store contract totals to the totalizer log. This allows you to access totals from earlier contract periods. Otherwise, the transmitter maintains data for only the current contract period (today) and the immediately preceding contract period (yesterday).

Procedure

1. Navigate to the **Totalizer Log**.

Option	Description
Display	**Menu** → **Configuration** → **Totalizer Log**
ProLink III	**Device Tools** → **Configuration** → **Totalizer Log**

2. Set **Log Total 1**, **Log Total 2**, **Log Total 3**, and/or **Log Total 4** to the desired contract total.

   You can configure the totalizer history log to include both Advanced Phase Measurement and standard totals.

13.2 Generate service files

The transmitter automatically saves several types of service data that is useful in troubleshooting, device maintenance, and administration. You can view the data by generating a service file and downloading it to a USB drive, then using your PC to open the file.

Prerequisites

The service port must be enabled. It is enabled by default. However, if you need to enable it, choose **Menu** → **Configuration** → **Security** and set **Service Port** to On.

You must have a USB drive.

Procedure

1. **WARNING**

   If the transmitter is in a hazardous area, do not remove the housing cover while the transmitter is powered up. Failure to follow these instructions can cause an explosion resulting in injury or death.

   Open the wiring compartment on the transmitter and insert the USB drive into the service port.
2. Choose **Menu** → **USB Options** → **Transmitter –> USB** → **Download Service Files**.
3. Select the service file that you want to generate.

Service file	Description	File name
Configuration Audit Log	All changes to configuration, including changes made by procedures such as zero calibration or density calibration.	`ConfgAuditLog.txt`

Service file	Description	File name
Alert History	All occurrences of alerts and conditions, independent of alert severity.	`AlertLog.txt`
Historian: 30 Days	5-minute average values for selected process and diagnostic variables for the last 30 days.	Concatenated from transmitter tag and date
Historian: 1 Day	Values of selected process and diagnostic variables for the last 24 hours, recorded at 1-second intervals.	Concatenated from transmitter tag and date
SMV: 20 Runs	Test data from the 20 most recent SMV tests.	`SmvLast20Data.csv`
Service Snapshot	An ASCII file containing a snapshot of the transmitter's internal database. This file is used by customer service.	`service.dump`
Factory Config File	The configuration file created for this transmitter at the factory.	`FactoryConfig.cfg`
Assert Log	A troubleshooting file used by customer service.	`AssertLog.txt`
Support Contact	A PDF file containing information for contacting customer service.	`SupportContact.pdf`
Security Log	A record of events that might indicate tampering.	`SecurityLog.txt`

4. Specify the folder on the USB drive where the log file will be saved.

13.2.1 Alert history and log

The transmitter automatically saves information about all alert occurrences to its working memory, and periodically updates an alert history file on its SD card. The alert history log is an ASCII file.

Contents of alert history

The alert history in the transmitter's working memory contains the 1000 most recent alert records. Each alert record contains the following information:

- Name of alert or condition
- Category:
  - F=Failure
  - FC=Function Check
  - M=Maintenance Required
  - OOS=Out of Specification
  - I=Ignore
- Action:
  - Active=Transition from inactive to active
  - Inactive=Transition from active to inactive
  - Toggling=More than 2 transitions in the last 60 seconds
- Timestamp

- Format: Military time
- Time and time zone: Transmitter clock
- Not displayed if Action=Toggling

Alert history and power-cycles

If the transmitter is rebooted or power-cycled, the 20 most recent records in alert history are retained in the transmitter's working memory. All earlier records are cleared from working memory. The alert history file on the SD card is not cleared.

Alert history and configuration files

If you restore the factory configuration or upload a configuration file, alert history is not affected.

Example: alert history log

==

Device UID: DA7F32A6
Device Tag: FT-0000

Name	Cat	Action	Time Zone: GMT +0.00
==			
[107] Power Reset Occurred	I	Active	17/MAR/2020 04:48:06
Core in Init Mode	I	Active	17/MAR/2020 04:48:06
Configuration Changed	I	Active	17/MAR/2020 04:48:06
Core in Init Mode	I	Inactiv	17/MAR/2020 04:49:10
[107] Power Reset Occurred	I	Inactiv	17/MAR/2020 04:49:37
Moderate Two-Phase	OO	Active	18/MAR/2020 08:42:02
Moderate Two-Phase	OO	Inactiv	18/MAR/2020 08:43:05
[107] Power Reset Occurred	I	Active	19/MAR/2020 11:17:11
Core in Init Mode	I	Active	19/MAR/2020 11:17:11
Configuration Changed	I	Active	19/MAR/2020 11:17:11
Fieldbus Bridge Communication Failure	F	Active	19/MAR/2020 11:17:18
Fault Present	I	Active	19/MAR/2020 11:17:41
Core in Init Mode	I	Inactiv	19/MAR/2020 11:18:15
[107] Power Reset Occurred	I	Inactiv	19/MAR/2020 11:18:42
Fault Present	I	Inactiv	19/MAR/2020 11:19:09
Fieldbus Bridge Communication Failure	F	Inactiv	19/MAR/2020 11:19:09
[008] Density OOR	F	Active	20/MAR/2020 14:39:42
[016] Sensor Temp Failure	F	Active	20/MAR/2020 14:39:42
[017] Sensor Case Temp Fail	F	Active	20/MAR/2020 14:39:42
[102] Drive Overrange	M	Active	20/MAR/2020 14:39:42
[105] Two-Phase Flow	00	Active	20/MAR/2020 14:39:42

Fault Present	I	Active	20/MAR/2020 14:39:42
Severe Two-Phase	00	Active	20/MAR/2020 14:39:42
[003] Sensor Error	F	Active	20/MAR/2020 14:39:45
Moderate Two-Phase	00	Inactiv	20/MAR/2020 14:39:45
[008] Density OOR	F	Togglin	
[102] Drive Overrange	M	Togglin	
...			

Note
The alert history log displays only in English.

13.2.2 Configuration audit history and log

The transmitter automatically saves information about all configuration events to its working memory. The configuration audit log is an ASCII file.

Contents of configuration audit log

The configuration audit log contains a record for every change to transmitter configuration, including changes resulting from zero calibration, density calibration, etc. Each record contains:

- Modbus location in transmitter memory
  - C*nnn* = Coil
  - R*nnn* = Register
  - R*nnn xxx* = Array, indexed by register *xxx*
- Name of Modbus location
- Original value
- New value
- Measurement unit, if applicable
- Timestamp
  - Format: Military time
  - Time and time zone: Transmitter clock
- Host or protocol from which the change was made

Configuration audit history and power-cycles

If the transmitter is power-cycled or rebooted, the event is logged in the configuration audit history. Earlier records are not affected.

Configuration audit history and configuration files

If you restore the factory configuration or upload a configuration file, the event is logged in the configuration audit history. Earlier records are not affected.

Example: Configuration audit log

==

Device UID: 22729F1F

Device Tag: SUPPLY

Addr	Name	Old Value	New Value	Unit	Time Zone: GMT-7:00	Host
C167	SYS_CfgFile_Re	0	1		09/SEP/2019 11:35:11	Display
C167	SYS_CfgFile_Re	0	0		09/SEP/2019 11:35:12	Other
1167	IO_ChannelB_As	10	4		09/SEP/2019 11:35:12	Other
351	SNS_API2540Tab	81	100		09/SEP/2019 11:35:12	Other
40	SNS_DensityUni	91	92		09/SEP/2019 11:35:12	Other
44	SNS_PressureUn	6	12		09/SEP/2019 11:35:12	Other
14	FO_1_Source	0	5		09/SEP/2019 11:35:12	Other
1180	MAI_Source	251	55		09/SEP/2019 11:35:12	Other
275	MAI_mA20Var	0	250.0	°C	09/SEP/2019 11:35:12	Other
4961	FO_2_Source	0	5		09/SEP/2019 11:35:12	Other
68	SYS_Tag	FT-0000	SUPPLY		09/SEP/2019 11:35:12	Other
159	SNS_K1	1606.9	1606.4		09/SEP/2019 11:35:12	Other
161	SNS_K2	1606.9	7354		09/SEP/2019 11:35:12	Other
163	SNS_DensityTem	5.66	4.44		09/SEP/2019 11:35:12	Other

...

Note
The configuration audit log displays only in English.

13.2.3 Assert history and log

The transmitter automatically saves information about all asserts. You can generate an assert log for use by customer service. The assert log is an ASCII file.

Contents of assert log

The assert history contains the 1000 most recent asserts. An assert is an unusual event in the transmitter firmware that may indicate an error or malfunction. A list of asserts can be useful for troubleshooting by customer service. The assert log is not designed for customer use.

Assert history and power-cycles

Assert history is not affected by reboots or power-cycles.

Assert history and configuration files

If you restore the factory configuration or upload a configuration file, assert history is not affected.

13.2.4 Security log

The transmitter automatically saves data that helps determine if someone is tampering with the device. Counters are maintained to track the number of illegal configuration change requests, firmware upgrade failures, and failures to enter the display password. The security log is an ASCII file.

Contents of security log

The security log contains a summary of security events that have occurred since the last transmitter reboot. The following items are included:

- Device information
- Timestamp
  - Format: Military time
  - Time and time zone: Transmitter clock
- Number of password entry failures
- Number of transmitter firmware upgrade failures
- Number of database write failures

Security log and power-cycles

If the transmitter is rebooted or power-cycled, the security log is not affected.

Security log and configuration files

If you attempt to restore the factory configuration or upload a configuration file when write-protection is enabled, the Database Write Failures counter is increased.

Example: Security log file

TAG:SUPPLY	UID:22729F1F	SW:0045	DATE:23/SEP/2019 14:42:58
Device:Config I/O		GMT-7.0 DST:DST Zone:(UTC-7:00) Denver	
Addr		Name	Value

5851	Password Failures	0
5852	SW Upgrade Failures	0
5853	Database Write Failures	25636

Note
The security log displays only in English.

14 Troubleshooting

14.1 Status LED and device status

The status LED (**MOD STATUS**) on the transmitter display provides a quick indication of device status by changing color and flashing. If the transmitter was ordered without a display, the LEDs on the outputs board inside the transmitter provide the same information.

Table 14-1: Status LED and device status

Status LED condition	Device status
Solid green	No alerts are active.
Solid yellow	One or more alerts are active with **Alert Severity** = Out of Specification, Maintenance Required, or Function Check.
Solid red	One or more alerts are active with **Alert Severity** = Failure.
Flashing yellow (1 Hz)	The `Function Check in Progress` alert is active.

Table 14-2: Network status LED connection status

Network status LED condition	Network status
Solid green	Connection made with primary protocol host.
Solid red	Configuration error or other error during the PROFIBUS start up sequence.
Off	No connection with primary protocol host.

14.2 API Referral troubleshooting

14.2.1 Extrapolation alert is active

Cause

Line pressure, line temperature, or line density is outside the range of the configured API table.

Recommended actions

1. Check your process conditions against the values reported by the device.
2. Verify the configuration of the API Referral application and related parameters.

14.2.2 Inaccurate referred density reading

Cause

- Inaccurate density measurement
- Inaccurate temperature measurement
- Incorrect reference conditions
- Incorrect API table selection

Recommended actions

1. Verify the line density value.
2. Verify the line temperature value.
3. Ensure that the application is configured to use the appropriate temperature source.
4. Ensure that the pressure source is configured correctly, that the external pressure device is operating correctly, and that both devices are using the same measurement units.
5. Ensure that reference temperature and reference pressure, if applicable, are configured correctly.
6. Ensure that the selected API table is appropriate for the process fluid.

14.3 Concentration measurement troubleshooting

14.3.1 Significantly incorrect CM after loading matrix

Cause

The wrong temperature or density unit was configured when the matrix was loaded.

Recommended actions

Set the temperature and density units to the units used when the matrix was built, then reload the matrix.

For custom matrices, contact customer support.

14.3.2 Inaccurate CM reading

Cause

- Inaccurate density measurement
- Inaccurate temperature measurement
- Incorrect reference conditions
- Incorrect matrix data
- Inappropriate trim values

Recommended actions

1. Verify the line density value.
2. Verify the line temperature value.
3. Ensure that the application is configured to use the appropriate temperature source.
4. Ensure that reference temperature is configured correctly.
5. Ensure that the appropriate matrix is active.
6. Ensure that the matrix is configured correctly.
7. Adjust the extrapolation limits for the active matrix.
8. Adjust measurement with a concentration offset trim.

14.4 Alert when connecting a core processor to a remote 5700 transmitter

When connecting a core processor to a 5700, you will see the following alert from the transmitter display.

Alert

New Core Detected

Cause

A new core processor was detected.

Recommended actions

1. Select one of the following options when prompted by the screen.

Option	Description	Action
Core Only Replacement	The new core processor is replacing an old core processor and the sensor is not getting replaced. The core processor is brand new without a baseline and has default factory values, such as K1 = 1000 and K2 = 5000.	Restore configuration and verify sensor parameters.
Pre-Calibrated Core Replacement	The new core processor is pre-calibrated and matched with the sensor. You are replacing a core processor that has already been paired with a sensor that has already been characterized.	Verify the sensor parameters and save the configuration.
Not Pre-Calibrated Core Replacement	The core processor and sensor are being replaced, but the core processor has not been pre-calibrated or matched with the sensor. The sensor and core processor are being replaced but the new core processor has not been paired (characterized) with the new sensor.	Enter the sensor parameters and save the configuration.
I Don't Know	You do not know if the new core processor has been pre-calibrated and matched with the sensor.	Verify the sensor parameters and save the configuration if there was a change.

2. Select **Continue**.
3. Per the screen message, contact Micro Motion if you have any questions before you select the **Finished** button.

   These screens will not display again until another new core processor has been detected.

14.5 Density measurement troubleshooting

14.5.1 Erratic density reading

Cause

- Normal process noise
- Two-phase flow
- Line pressure too low
- The flow rate is too high for the installation
- Pipe diameter too small
- Contaminants or suspended solids in the process gas
- Contaminants or suspended solids in the process fluid
- Vibration in the pipeline
- Erosion or corrosion

Recommended actions

1. Check your process conditions against the values reported by the device.
2. Increase the density damping value.
3. Decrease the flow rate.
4. Check for two-phase flow.
5. Ensure that line pressure or sample pressure meets installation requirements.
6. Increase back pressure to minimize bubble formation.
7. Minimize vibration in the pipeline.
8. Increase the pipe diameter.
9. Install a flow control method (bypass, flow chamber, expander, etc.).
10. Perform Smart Meter Verification.

14.5.2 Inaccurate density reading

Cause

- Problem with process fluid
- Incorrect density calibration factors
- Wiring problem
- Incorrect grounding
- Two-phase flow
- Plugged or coated sensor tube
- Incorrect sensor orientation

- RTD failure
- Physical characteristics of sensor have changed

Recommended actions

1. Check the wiring between the sensor and the transmitter.
2. Check the grounding of all components.
3. Check your process conditions against the values reported by the device.
4. Ensure that all of the calibration parameters have been entered correctly. See the sensor tag or the calibration sheet for your meter.
5. Check for two-phase flow.
6. If two sensors with similar frequency are too near each other, separate them.
7. Purge the sensor tubes.
8. Perform Smart Meter Verification.

14.5.3 Unusually high density reading

Cause

- Plugged or coated sensor tube
- Incorrect density calibration factors
- Inaccurate temperature measurement
- RTD failure
- In high-frequency meters, erosion, or corrosion
- In low-frequency meters, tube fouling

Recommended actions

1. Ensure that all of the calibration parameters have been entered correctly.

   See the sensor tag or the calibration sheet for your meter.
2. Purge the sensor tubes.
3. Check for coating in the flow tubes.
4. Perform Smart Meter Verification.

14.5.4 Unusually low density reading

Cause

- Two-phase flow
- Incorrect calibration factors
- In low-frequency meters, erosion or corrosion

Recommended actions

1. Check your process conditions against the values reported by the device.

2. Verify all of the characterization or calibration parameters. See the sensor tag or the calibration sheet for your meter.
3. Check the wiring between the sensor and the transmitter.
4. Check for tube erosion, especially if the process fluid is abrasive.
5. Perform Smart Meter Verification.

14.6 Discrete Output troubleshooting

14.6.1 No Discrete Output

Cause

- Output not powered
- Wiring problem
- Channel not configured for desired output
- Channel not licensed
- Circuit failure

Recommended actions

1. Check the power supply and power supply wiring.
2. Verify the output wiring.
3. Verify that the channel is wired and configured as a Discrete Output.
4. Contact customer service.

14.6.2 Loop test failed

Cause

- Output not powered
- Power supply problem
- Wiring problem
- Circuit failure

Recommended actions

1. Check the power supply and power supply wiring.
2. Verify the output wiring.
3. Contact customer service.

14.6.3 Discrete Output readings reversed

Cause

- Wiring problem
- Configuration does not match wiring

Recommended actions

1. Verify the output wiring.
2. Ensure that **Discrete Output Polarity** is set correctly.

14.7 Flow measurement troubleshooting

14.7.1 Flow rate reported as zero when flow is present

Cause

The process condition is below cutoff.

Recommended action

Verify the cutoffs.

14.7.2 Flow indication at no flow conditions or zero offset

Cause

- Misaligned piping (especially in new installations)
- Open or leaking valve
- Incorrect sensor zero

Recommended actions

1. Verify all of the characterization or calibration parameters.
   See the sensor tag or the calibration sheet for your meter.
2. If the reading is not excessively high, review the live zero. You may need to restore the factory zero.
3. Check for open or leaking valves or seals.
4. Check for mounting stress on the sensor (e.g., sensor being used to support piping, misaligned piping).
5. Contact customer service.

14.7.3 Erratic non-zero flow rate at no-flow conditions

Cause

- Leaking valve or seal
- Two-phase flow
- Plugged or coated sensor tube
- Incorrect sensor orientation
- Wiring problem
- Vibration in pipeline at rate close to sensor tube frequency
- Damping value too low

- Mounting stress on sensor

Recommended actions

1. Verify that the sensor orientation is appropriate for your application.
   See the installation manual for your sensor.
2. Check the drive gain and the pickoff voltage.
3. If the wiring between the sensor and the transmitter includes a 9-wire segment, verify that the 9-wire cable shields are correctly grounded.
4. Check the wiring between the sensor and the transmitter.
5. For sensors with a junction box, check for moisture in the junction box.
6. Purge the sensor tubes.
7. Check for open or leaking valves or seals.
8. Check for sources of vibration.
9. Verify damping configuration.
10. Verify that the measurement units are configured correctly for your application.
11. Check for two-phase flow.
12. Check for radio frequency interference.
13. Contact customer service.

14.7.4 Erratic non-zero flow rate when flow is steady

Cause

- Two-phase flow
- Damping value too low
- Plugged or coated sensor tube
- Wiring problem
- Problem with receiving device

Recommended actions

1. Verify that the sensor orientation is appropriate for your application.
   See the installation manual for your sensor.
2. Check the drive gain and the pickoff voltage.
3. If the wiring between the sensor and the transmitter includes a 9-wire segment, verify that the 9-wire cable shields are correctly grounded.
4. Check for air entrainment, tube fouling, flashing, or tube damage.
5. Check the wiring between the sensor and the transmitter.
6. For sensors with a junction box, check for moisture in the junction box.
7. Purge the sensor tubes.
8. Check for open or leaking valves or seals.
9. Check for sources of vibration.
10. Verify damping configuration.

11. Verify that the measurement units are configured correctly for your application.
12. Check for two-phase flow.
13. Check for radio frequency interference.
14. Contact customer service.

14.7.5 Inaccurate flow rate

Cause

- Wiring problem
- Inappropriate measurement unit
- Incorrect flow calibration factor
- Incorrect meter factor
- Incorrect density calibration factors
- Incorrect grounding
- Two-phase flow
- Problem with receiving device
- Incorrect sensor zero

Recommended actions

1. Check the wiring between the sensor and the transmitter.
2. Verify that the measurement units are configured correctly for your application.
3. Verify all of the characterization or calibration parameters. See the sensor tag or the calibration sheet for your meter.
4. Zero the meter.
5. Check the grounding of all components.
6. Check for two-phase flow.
7. Verify the receiving device, and the wiring between the transmitter and the receiving device.
8. Check the sensor coils for electrical shorts. If you find problems, replace the sensor.
9. Replace the core processor or transmitter.

14.8 Frequency Output troubleshooting

14.8.1 No FO

Cause

- Stopped totalizer
- Process condition below cutoff
- Fault condition if **Fault Action** is set to Internal Zero or Downscale
- Two-phase flow

- Flow in reverse direction from configured flow direction parameter
- **Frequency Output Direction** not set correctly
- Bad frequency receiving device
- Output level not compatible with receiving device
- Bad output circuit
- Output not powered
- Wiring problem
- Channel not configured for desired output

Recommended actions

1. Verify that the process conditions are below the low-flow cutoff. Reconfigure the low-flow cutoff if necessary.
2. Check the **Fault Action** settings.
3. Verify that the totalizers are not stopped. A stopped totalizer will cause the Frequency Output to be locked.
4. Check for two-phase flow.
5. Check flow direction.
6. Check the direction parameters.
7. Verify the receiving device, and the wiring between the transmitter and the receiving device.
8. Verify that the channel is wired and configured as a Frequency Output.
9. Perform a loop test.

14.8.2 Consistently incorrect FO measurement

Cause

- Output not scaled correctly
- Incorrect measurement unit configured for process variable

Recommended actions

1. Check the scaling of the Frequency Output.
2. Verify that the measurement units are configured correctly for your application.

14.8.3 Erratic FO

Cause

There is Radio Frequency Interference (RFI) from the environment.

Recommended action

Check for radio frequency interference.

14.8.4 FO goes in and out of fault conditions

Cause

There is a problem with the interaction between the Output Saturated alert and the fault action configured for the output.

Recommended actions

1. Change the severity of the Output Saturated alert from Fault to another option.
2. Configure the transmitter to ignore the Output Saturated alert or the relevant conditions.
3. Change the configuration of **Fault Action** from Downscale to another option.

14.9 mA Output troubleshooting

14.9.1 No mAO

Cause

- Output not powered
- Power supply problem
- Wiring problem
- Circuit failure
- Channel not configured for desired output

Recommended actions

1. If applicable, check the output wiring to verify that the output is powered.
2. Check the power supply and power supply wiring.
3. Verify the output wiring.
4. Check the **Fault Action** settings.
5. Verify channel configuration for the affected mA Output.
6. Measure DC voltage across output terminals to verify that the output is active.
7. Contact customer service.

14.9.2 Loop test failed

Cause

- Output not powered
- Power supply problem
- Wiring problem
- Circuit failure
- Channel not configured for desired output

Recommended actions

1. Check the power supply and power supply wiring.
2. Verify the output wiring.
3. Check the **Fault Action** settings.
4. Verify channel configuration for the affected mA Output.
5. Contact customer service.

14.9.3 mAO below 4 mA

Cause

- Output not powered
- Open in wiring
- Bad output circuit
- Process condition below LRV
- LRV and URV are not set correctly
- Fault condition if **Fault Action** is set to Internal Zero or Downscale
- Bad mA receiving device

Recommended actions

1. Check your process conditions against the values reported by the device.
2. Verify the receiving device, and the wiring between the transmitter and the receiving device.
3. Check the settings of **Upper Range Value** and **Lower Range Value**.
4. Check the **Fault Action** settings.
5. Verify channel configuration for the affected mA Output.

14.9.4 Constant mAO

Cause

- Incorrect process variable assigned to the output
- Fault condition exists
- A loop test is in progress
- Zero calibration failure
- mA Output Direction not set correctly

Recommended actions

1. Verify the output variable assignments.
2. View and resolve any existing alert conditions.
3. Check the direction parameters.
4. Check to see if a loop test is in process (the output is fixed).

5. If related to a zero calibration failure, reboot or power-cycle the transmitter and retry the zeroing procedure.

14.9.5 mAO consistently out of range

Cause

- Incorrect process variable or units assigned to output
- Fault condition if **Fault Action** is set to Upscale or Downscale
- LRV and URV are not set correctly

Recommended actions

1. Verify the output variable assignments.
2. Verify the measurement units configured for the output.
3. Check the **Fault Action** settings.
4. Check the settings of **Upper Range Value** and **Lower Range Value**.
5. Check the mA Output trim.

14.9.6 Consistently incorrect mA measurement

Cause

- Loop problem
- Output not trimmed correctly
- Incorrect measurement unit configured for process variable
- Incorrect process variable configured
- LRV and URV are not set correctly
- mA Output Direction not set correctly

Recommended actions

1. Check the mA Output trim.
2. Verify the measurement units configured for the output.
3. Verify the process variable assigned to the mA Output.
4. Check the direction parameters.
5. Check the settings of **Upper Range Value** and **Lower Range Value**.

14.9.7 mAO correct at lower current, but incorrect at higher current

Cause

The mA loop resistance may be set too high.

Recommended actions

Verify that the mA Output load resistance is below the maximum supported load.

See the installation manual for your transmitter.

14.9.8 mAO goes in and out of fault conditions

Cause

There is a problem with the interaction between the Output Saturated alert and the fault action configured for the output.

Recommended actions

1. Change the severity of the Output Saturated alert from Fault to another option.
2. Configure the transmitter to ignore the Output Saturated alert or the relevant conditions.
3. Change the configuration of **Fault Action** from Downscale to another option.

14.10 Status alerts, causes, and recommendations

Not all of these alerts may apply to your type of transmitter.

14.10.1 [002] RAM Error - Core

Alert

Electronics Failed

Cause

The transmitter has detected a problem with the sensor's electronics.

Recommended actions

1. Cycle power to the meter.
2. If the problem persists, contact customer service.

14.10.2 [003] Sensor Failed

Alert

Sensor Failed

Cause

The sensor is not responding.

Recommended actions

1. Check for two-phase flow.
2. Check the drive gain and the pickoff voltage.
3. Check the wiring between the sensor and the transmitter.
4. Check the sensor coils for electrical shorts. If you find problems, replace the sensor. Refer to Check for internal electrical problems.
5. Check the integrity of the sensor tubes.

6. Ensure that the sensor is completely full or completely empty.
7. Replace the sensor.
8. Contact customer service.

14.10.3 [005] Mass Flow Overrange

Alert

Extreme Primary Purpose Variable

Cause

The measured flow rate is outside the sensor's range.

Recommended actions

1. If other alerts are present, resolve those alert conditions first.
2. Check your process conditions against the values reported by the device.
3. Check for two-phase flow.
   Refer to Check for two-phase flow (slug flow).
   a) Check for two-phase alerts. If two-phase flow is the problem, alerts will be posted.
   b) Check the process for cavitation, flashing, or leaks.
   c) Monitor the density of your process fluid under normal process conditions.
4. Contact customer service.

14.10.4 [008] Density Overrange

Alert

Extreme Primary Purpose Variable

Cause

The measured density is below 0 g/cm^3 or above 10 g/cm^3.

Recommended actions

1. If other alerts are present, resolve those alert conditions first.
2. Check your process conditions against the values reported by the device.
3. Check for two-phase flow by checking for two-phase alerts. If two-phase flow is the problem, alerts will be posted.
   a) Check the process for cavitation, flashing, or leaks.
   b) Monitor the density of your process fluid under normal process conditions.
4. Contact customer service.

14.10.5 [009] Transmitter Initializing

Alert

Flow Meter Initializing

Cause

The transmitter is in power-up mode.

Recommended actions

1. Allow the meter to complete its power-up sequence. The alert should clear automatically.
2. If the alert does not clear:
    a) If other alerts are present, resolve those alert conditions first.
    b) Verify that the transmitter is receiving sufficient power.
        - If it is not, correct the problem and cycle power to the device.
        - If it is, this suggests that the transmitter has an internal power issue. Replace the transmitter.

14.10.6 [010] Calibration Failed

Alert

Function Check Failed

Cause

The calibration failed.

Recommended actions

1. Ensure that your calibration procedure meets the documented requirements.
2. Reboot or power-cycle the transmitter.
3. Retry the procedure.
4. If this alert appears during zeroing, verify that there is no flow through the sensor, cycle power to the meter, then retry the procedure.

14.10.7 [016] Sensor Temperature (RTD) Failure

Alert

Sensor Failed

Cause

The value computed for the resistance of the line RTD is outside limits.

Recommended actions

1. Check the wiring between the sensor and the transmitter.

   a) Refer to the installation manual and ensure that the wiring has been performed according to instructions. Obey all applicable safety messages.
   b) Verify that the wires are making good contact with the terminals.
   c) Perform RTD resistance checks and check for shorts to case. If you find problems, replace the sensor.
   d) Check the continuity of all wires from the transmitter to the sensor.
2. Check your process conditions against the values reported by the device.
3. Contact customer service.

14.10.8 [017] Sensor Case Temperature (RTD) Failure

Alert

Sensor Failed

Cause

The values computed for the resistance of the meter and case RTDs are outside limits.

Recommended actions

1. Check the wiring between the sensor and the transmitter.
   a) Refer to the installation manual and ensure that the wiring has been performed according to instructions. Obey all applicable safety messages.
   b) Verify that the wires are making good contact with the terminals.
   c) Perform RTD resistance checks and check for shorts to case. If you find problems, replace the sensor.
   d) Check the continuity of all wires from the transmitter to the sensor.
2. Check your process conditions against the values reported by the device.
   Temperature should be between -200 °F (-129 °C) and 400 °F (204 °C).
3. Verify that all of the characterization parameters match the data on the sensor tag.
4. Contact customer service.

14.10.9 [018] EEPROM Error

Electronics Failed

Cause

There is an issue with the transmitter's non-volatile memory.

Recommended actions

1. Evaluate the environment for sources of high electromagnetic interference (EMI) and relocate the transmitter or wiring as necessary.
2. Cycle power to the meter.

Important
This alert will not clear until you cycle power to the meter.

3. If the problem persists, replace the transmitter.

14.10.10 [019] RAM Error (Transmitter)

Alert

Electronics Failed

Cause

There is a ROM checksum mismatch in the transmitter or the RAM address location cannot be written in the transmitter. This alert will not clear until you reboot or power cycle the transmitter.

Recommended actions

1. Evaluate the environment for sources of high electromagnetic interference (EMI) and relocate the transmitter or wiring as necessary.
2. Reboot or power-cycle the transmitter to see if the alert clears.
3. If the alert persists, replace the transmitter.

14.10.11 [020] Calibration Factors Missing

Alert

Configuration Error

Cause

Incorrect or missing configuration values are causing an error.

Recommended actions

1. Verify characterization parameters. See the sensor tag or the calibration sheet for your meter.
2. If the problem persists, contact customer support.

14.10.12 [021] Incorrect Sensor Type

Alert

Config Error

Cause

The sensor is recognized as a straight tube but the K1 value indicates a curved tube, or vice versa.

Recommended actions

1. If **Sensor Case Temperature Failure** is active, resolve it first.
2. Check the characterization against the sensor tag. Specifically, verify the Flow FCF, K1, and K2 values.
3. Check the sensor RTD circuitry.

4. If the problem persists, contact customer service.

14.10.13 [022] Configuration Database Corrupt

Alert

Electronics Failed

Cause

There is an issue with the core processor's non-volatile memory.

Recommended actions

1. Cycle power to the meter.
2. If the problem persists, replace the core processor.

14.10.14 [024] Program Corrupt - Core

Alert

Electronics Failed

Cause

There is an issue with the core processor's non-volatile memory.

Recommended actions

1. Cycle power to the meter.
2. If the problem persists, replace the core processor.

14.10.15 [026] Sensor/Transmitter Communications Failure

Alert

Sensor Communication Failure

Cause

The transmitter has lost communication with the core processor, or there have been too many communications errors.

Recommended actions

1. Check the wiring between the sensor and the transmitter.
2. Verify the power to both the transmitter and core processor.
3. Cycle power to the transmitter.
4. If the alert persists:
    a) Replace the core processor.
    b) If that does not solve the problem, restore the original core processor and replace the transmitter.
    c) If that does not solve the problem, replace both the transmitter and the core processor.

5. If the problem persists, contact customer support.

14.10.16 [028] Core Process Write Failure

Alert

Core Write Failure

Cause

A write to the core processor failed.

Recommended actions

1. Reboot or power-cycle the transmitter to see if the alert clears.
2. Contact customer service about servicing or replacing the core processor or transmitter.

14.10.17 [030] Incorrect Board Type

Alert

Configuration Error

Cause

The firmware or configuration loaded in the transmitter is incompatible with the board type.

Recommended actions

1. If this alarm occurred in conjunction with an effort to load a configuration into the transmitter, confirm that the transmitter is of the same model as the one the configuration came from.
2. Reboot or power-cycle the transmitter to see if the alert clears.
3. If the problem persists, contact customer service.

14.10.18 [031] Low Power

Alert

Core Low Power

Cause

The core processor is not receiving sufficient power. This alert will not clear until you reboot or power cycle the transmitter.

Recommended actions

1. Check the wiring between the sensor and the transmitter.
2. Cycle power to the meter.
3. Measure the voltage at the core processor terminals and ensure that it is receiving a minimum of 11.5 volts at all times.
   - If there is less than 11.5 volts, confirm that the transmitter is receiving sufficient voltage.

- If the transmitter is receiving sufficient voltage, and the problem still persists, replace the transmitter.

14.10.19 [033] Tube Not Full

Alert

Tube Not Full

Cause

The sensor is not responding.

Recommended actions

1. Check for possible fluid separation by monitoring the density value and comparing the results against expected density values.
2. Check for plugging, coating, or two-phase flow.
3. Verify that the sensor is oriented correctly.

   Settling from a two-phase or three-phase fluid can cause this alert even if the flow tubes are full. Refer to the sensor installation manual.

14.10.20 [034] Smart Meter Verification Failed

Alert

Function Check Failed

Cause

Smart Meter Verification has failed. The test result is not within the specification uncertainty limit.

Recommended actions

1. Rerun the test with outputs set to **Fault** or **Last Measured Value** instead of **Continue Measurement**.
2. If the meter passes the second test, ignore the first result.
3. If the meter fails the second test, the flow tubes may be damaged. Use your process knowledge to determine the possibilities for damage and the appropriate actions for each.

14.10.21 [035] Smart Meter Verification Aborted

Alert

FC Failed

Cause

The SMV test did not complete, possibly because it was manually aborted or because process conditions were too unstable.

Abort code 1

Cause

A user initiated an abort.

Recommended actions

Wait for 15 seconds before starting SMV again.

Abort code 3

Cause

Frequency drift

Recommended actions

Ensure temperature, flow, and density are stable before running SMV again.

Abort code 5

Cause

High drive gain

Recommended actions

Ensure flow is steady with minimized entrained gas before running SMV again.

Abort code 8

Cause

Unstable flow

Recommended actions

Reduce flow rate and run SMV again.

Abort code 13

Cause

No air reference

Recommended actions

Perform factory calibration on air.

Abort code 14

Cause

No water reference

Recommended actions

Perform factory calibration on water.

Abort code 15

Cause

Missing configuration

Recommended actions

Load verification parameter registers with proper values.

Abort code other

Cause

Other

Recommended actions

1. Run SMV again.
2. If abort persists, call customer support.

14.10.22 [102] Drive Overrange

Alert

Drive Over-Range

Cause

The drive power (current/ voltage) is at its maximum.

Recommended actions

1. Check your process conditions against the values reported by the device.
2. Check for air in the flow tubes, tubes not filled, foreign material in the tubes, coating in the tubes, or other process problems.
3. Verify that the tubes are full of process fluid.
4. Check the drive gain and the pickoff voltage.
   Refer to Check the pickoff voltage.
5. Check the sensor coils for electrical shorts. If you find problems, replace the sensor.
   Refer to Check for internal electrical problems.
6. Ensure that the sensor orientation is appropriate for your application.
   Settling from a two-phase or three-phase fluid can cause this alert even if the flow tubes are full.

14.10.23 [103] Data Loss Possible

Alert

Data Loss Possible

Cause

The totalizers are not being saved properly. The core processor was unable to store the totalizers on the last power down and must rely on the saved totals. The saved totals can be as much as two hours out of date.

Recommended actions

1. Make sure the transmitter and core processor are receiving sufficient power.
   - If it is not, correct the problem and reboot or power-cycle the transmitter.
   - If it is, this suggests that the transmitter has an internal power issue. Replace the transmitter.
2. Check the power supply and power supply wiring.

14.10.24 [104] Calibration in Progress

Alert

Function check in progress

Cause

A calibration procedure is in progress.

Recommended actions

1. Allow the test to complete.
2. For zero calibration procedures, you can abort the calibration, set the zero time parameter to a lower value, and restart the calibration.

14.10.25 [105] Two-Phase Flow

Alert

Process Aberration

Cause

The density has exceeded the user-defined two-phase flow (density) limits.

Recommended actions

Check for two-phase flow.

Refer to Configure Lower Range Value (LRV) and Upper Range Value (URV) for the mA Output.

14.10.26 [110] Frequency Output Saturated

Alert

Output Saturated

Cause

The process variable assigned to the Frequency Output is outside the configured scale limits.

Recommended actions

1. Check the scaling of the **Frequency Output Scaling Method** parameter.
2. Check your process conditions against the values reported by the device.
3. Verify process conditions, checking especially for air in the flow tubes, tubes not filled, foreign material in the tubes, or coating in the tubes.
4. Verify that the measurement units are configured correctly for your application.
5. Purge the sensor tubes.

14.10.27 [111] Frequency Output Fixed

Alert

Output Fixed

Cause

Totalizers have been stopped or output simulation (loop testing) is enabled.

Recommended actions

1. Stop the totalizer to set the Frequency Output to zero.
2. Cycle power to the transmitter to restore the Frequency Output to normal operation.
3. Disable output simulation, if applicable.
4. Check if the output has been set to a constant value via digital communication.

14.10.28 [113] mA Output Saturated

Alert

Output Saturated

Cause

The calculated output value is outside the range of the output.

Recommended actions

1. Check the settings of **Upper Range Value** and **Lower Range Value**.

   Refer to Configure Lower Range Value (LRV) and Upper Range Value (URV) for the mA Output.
2. Check your process conditions against the values reported by the device.
3. Ensure that both devices are using the same measurement unit.
4. Purge the sensor tubes.

14.10.29 [114] mA Output Fixed

Alert

Output Fixed

Cause

Output simulation (loop testing) is enabled or mA Output trim is in progress.

Recommended actions

1. Disable output simulation, if applicable.
2. Exit mA Output trim, if applicable.
3. Check whether the output has been set to a constant value vial digital communication.

14.10.30 [116] Temperature Out of Range

Alert

Process Aberration

Cause

The measured temperature is outside the range of the API table.

Recommended actions

1. Check your process conditions against the values reported by the device.
2. Verify the configuration of the API referral application and related parameters.

14.10.31 [117] Density Out of Range

Alert

Process Aberration

Cause

The measured density is below 0 g/cm^3 or above 10 g/cm^3.

Recommended actions

1. If other alerts are present, resolve those alert conditions first.
2. If the current alert persists, continue with the recommended actions.
3. Check for two-phase flow.
4. Check for foreign material in the process gas, process fluid, coating, or other process problems.
5. Verify all of the characterization or calibration parameters.
   See the sensor tag or the calibration sheet for your meter.
6. Check the drive gain and the pickoff voltage.
7. Perform Smart Meter Verification.
8. Contact customer service.

14.10.32 [119] Discrete Output Fixed

Alert

Output Fixed

Cause

Output simulation (loop testing) is enabled.

Recommended actions

Disable output simulation.

14.10.33 [120] Curve Fit Failure (Concentration)

Alert

Configuration Error

Cause

The configured density/temperature/concentration values do not result in a proper concentration measurement curve.

Recommended actions

1. Verify the configuration of the concentration measurement application.
2. Contact customer service.

14.10.34 [121] Extrapolation Alert (Concentration)

Alert

Process Aberration

Cause

The line density or line temperature is outside the range of the concentration matrix plus the configured extrapolation limit.

Recommended actions

1. Check your process conditions against the values reported by the device.
2. Verify the configuration of the concentration measurement application.

14.10.35 [123] Pressure Out of Range

Alert

Process Aberration

Cause

The line pressure is outside the range of the API table.

Recommended actions

1. Check your process conditions against the values reported by the device.
2. Verify the configuration of the API Referral application and related parameters.

14.10.36 [131] Smart Meter Verification in Progress

Alert

Function Check in Progress

Cause

A Smart Meter Verification test is running.

Recommended actions

Allow the test to complete.

14.10.37 [132] Sensor Simulation On

Alert

Sensor Being Simulated

Cause

- Simulation mode is enabled
- Device simulation is active

Recommended actions

Disable sensor simulation.

14.10.38 [140] APM Remediation

Alert

Process Aberration

Cause

Drive gain is above the configured threshold and transient bubble remediation is active.

Recommended actions

Check for air entrainment, tube fouling, flashing, or tube damage.

14.10.39 Core Has Incompatible ETO

Alert

Configuration Error

Cause

The core processor has an ETO installed that is incompatible with this device. The core can be updated but the ETO will be overwritten.

Recommended actions

Contact customer service to discuss options for reserving the ETO.

14.10.40 Core Processor Update Failed

Alert

Configuration Error

Cause

The core processor software update failed.

Recommended actions

1. Resolve any active alerts.
2. Check the connection between the transmitter and the core processor.
3. Reboot or power-cycle the transmitter, then retry the procedure.
4. Contact customer service.

14.10.41 Core Software Update Failed

Alert

Configuration Error

Cause

The core processor software could not be updated.

Recommended actions

1. Retry the procedure.
2. Contact customer service.

14.10.42 Clock is Constant

Alert

Data Loss Possible

Cause

The real-time clock is not incrementing. Measurement is not affected, but log timestamps will not be accurate.

Recommended actions

Contact customer service.

14.10.43 Discrete Event [1-5] Active

Alert

Event Active

Cause

Discrete Event [1-5] has been triggered.

Recommended actions

No action required.

14.10.44 Fieldbus Bridge Memory Failure

Alert

Fieldbus Bridge Memory Failure

Cause

There is an issue with the transmitter's non-volatile memory.

Recommended actions

1. Reboot or power-cycle the transmitter to see if the alert clears.
2. Contact customer service about replacing the core processor.

14.10.45 Fieldbus Bridge Communication Failure

Alert

Sens Xmtr Comm Error

Cause

The transmitter is detecting too many communication errors with the fieldbus bridge.

Recommended actions

1. Reboot or power-cycle the transmitter to see if the alert clears.
2. Contact customer service about replacing the core processor or transmitter.

14.10.46 Firmware Update Fail

Alert

Data Loss Possible

Cause

An error occurred when updating the firmware.

Recommended actions

1. Verify that the correct hex file is loaded onto the SD card.
2. Contact customer service.

14.10.47 Internal Memory Full

Alert

Data Loss Possible

Cause

The transmitter's internal memory is nearly full.

Recommended actions

Contact customer service.

14.10.48 Moderate Phase Severity

Alert

Process Aberration

Cause

The transmitter has detected moderate two-phase severity.

Recommended actions

Check your process conditions against the values reported by the device.

14.10.49 No Permanent License

Alert

Data Loss Possible

Cause

A permanent license has not been installed in the transmitter firmware.

Recommended actions

1. If you have a permanent license, install it.
2. If you do not have a permanent license, contact customer service.

14.10.50 No Security Password

Alert

Configuration Error

Cause

Display security has been enabled but the display password has not been changed from the default value.

Recommended actions

Set the display password.

14.10.51 Phase Genius Detected Moderate Severity

Alert

Process Aberration

Cause

Phase Genius is reporting moderate two-phase flow

Recommended actions

Verify your process.

14.10.52 SD Card Not Present

Alert

Data Loss Possible

Cause

The internal SD card has failed.

Recommended actions

1. Open the transmitter and verify that an SD card is present.
2. If the problem persists, call customer support.

14.10.53 Severe Phase Severity

Alert

Process Aberration

Cause

The transmitter has detected severe two-phase severity.

Recommended actions

Check your process conditions against the values reported by the device.

14.10.54 Time Not Set

Alert

Configuration Error

Cause

The system time has not been entered. The system time is required for diagnostic logs.

Recommended actions

Set the system time.

14.10.55 Watchdog Error

Alert

Electronics Failed

Cause

The watchdog timer has expired.

Recommended actions

Contact customer support.

14.10.56 Watercut Limited at 0%

Alert

Output Saturated

Cause

Watercut at Line calculation is less than -5% based on input density. Watercut output is limited to 0%.

Recommended actions

1. Check the base oil density.
2. If the problem persists, contact customer service.

14.10.57 Watercut Limited at 100%

Alert

Output Saturated

Cause

Watercut at Line calculation is greater than 105% based on input density. Watercut output is limited to 100%.

Recommended actions

1. Check the base water density.
2. If the problem persists, contact customer service.

14.11 Perform a core processor resistance test

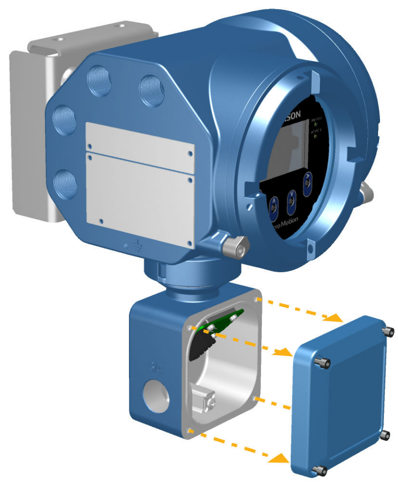
This procedure measures the resistance between the core processor terminals in the transmitter junction box. The procedure applies only to 4-wire remote installations and remote core processor with remote transmitter installations.

Note
Although you can perform the same test on the terminals at the core processor, the transmitter junction box is typically easier to access.

Procedure

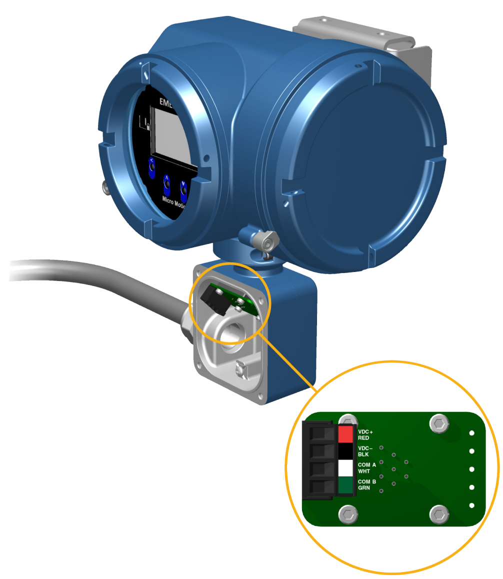
1. Power down the transmitter.
2. Remove the cover of the junction box on the transmitter to access the core processor terminals.

Figure 14-1: Removing the cover of the junction box



3. Disconnect the 4-wire cable between the transmitter and the sensor.
4. Identify the core processor terminals inside the transmitter junction box.

Figure 14-2: Core processor terminals inside the transmitter junction box



5. For the 700 core processor only, measure the resistance between the terminal pairs listed here.

Terminal pair (transmitter)	Terminal pair (core processor)	Function	Expected resistance
White – green	3–4	RS-485/A and RS-485/B	29 kΩ to 33 kΩ

Terminal pair (transmitter)	Terminal pair (core processor)	Function	Expected resistance
Black – white	2–3	VDC– and RS-485/A	29 kΩ to 33 kΩ
Black – green	2–4	VDC– and RS-485/B	16 kΩ to 18 kΩ

6. If any resistance measurements are lower than specified, contact customer service.
7. If the resistance measurements fall within the expected ranges, return the transmitter to normal operation and check the wiring between the transmitter and the core processor. If that does not resolve the problem, contact customer service.

Postrequisites

To return to normal operation:

1. Reconnect the 4-wire cable from the sensor to the core processor terminals.
2. Replace the junction box cover.
3. Restore power to the transmitter.

14.12 Check the cutoffs

If the transmitter cutoffs are configured incorrectly, the transmitter may report zero flow when flow is present, or very small amounts of flow under no-flow conditions.

Procedure

Verify the configuration of all cutoffs.

14.13 Check the direction parameters

If the direction parameters are set incorrectly, flow rate may be reported as reverse when it is actually forward, or vice versa. Totalizers and inventories may increment when they should decrement, or vice versa.

The reported flow rate and flow totals depend on the interaction of four factors: the flow direction arrow on the sensor, actual flow direction, the **Sensor Flow Direction Arrow** parameter, the **Direction** parameter for the mA output or the frequency output, and the **Totalizer Direction** parameter.

Procedure

1. Ensure that **Sensor Flow Direction Arrow** is set correctly for your sensor installation and your process.
2. Verify the configuration of **mA Output Direction**, **Frequency Output Direction**, and **Totalizer Direction**.

14.14 Check the drive gain

Excessive or erratic drive gain may indicate any of a variety of process conditions or sensor problems.

To know whether your drive gain is excessive or erratic, you must collect drive gain data during the problem condition and compare it to drive gain data from a period of normal operation.

Excessive (saturated) drive gain

Table 14-3: Possible causes and recommended actions for excessive (saturated) drive gain

Possible cause	Recommended actions
Bent sensor tube	Check the pickoff voltages (see Check the pickoff voltage). If either of them are close to zero (but neither is zero), the sensor tubes may be bent. The sensor will need to be replaced.
Cracked sensor tube	Replace the sensor.
Core processor or module failure	Contact customer support.
Flow rate out of range	Ensure that the flow rate is within sensor limits.
Open drive or pickoff sensor coil	Contact customer support.
Over-pressurized tubes	Contact customer support.
Plugged sensor tube	A dull, audible hum, and unusually high sensor vibration is usually accompanied by high, even saturated, drive gain. Check the pickoff voltages (see Check the pickoff voltage). If either of them are close to zero (but neither is zero), plugged tubes may be the source of your problem. Purge the tubes. In extreme cases, you may need to replace the sensor.
Sensor case full of process fluid	Replace the sensor.
Sensor imbalance	Contact customer support.
Sensor tubes not completely full	Correct process conditions so that the sensor tubes are full.
Two-phase flow	Check for two-phase flow. See Check for two-phase flow (slug flow).
Vibrating element not free to vibrate	Ensure that the vibrating element is free to vibrate.

Erratic drive gain

Table 14-4: Possible causes and recommended actions for erratic drive gain

Possible cause	Recommended actions
Foreign material caught in sensor tubes	• Purge the sensor tubes. • Replace the sensor.

14.15 Check for internal electrical problems

Shorts between sensor terminals or between the sensor terminals and the sensor case can cause the sensor to stop working.

Possible cause	Recommended action
Moisture inside the sensor junction box	Ensure that the junction box is dry and no corrosion is present.
Liquid or moisture inside the sensor case	Contact customer support.

Possible cause	Recommended action
Internally shorted feedthrough	Contact customer support.
Faulty cable	Replace the cable.
Improper wire termination	Verify wire terminations inside the sensor junction box. See *Micro Motion 9-Wire Flow Meter Cable Preparation and Installation Guide*.
Shorts to the housing created by trapped or damaged wires	Contact customer support.
Loose wires or connectors	Contact customer support.
Liquid or moisture inside the housing	Contact customer support.

14.16 Check Frequency Output Fault Action

The **Frequency Output Fault Action** controls the behavior of the Frequency Output if the transmitter encounters an internal fault condition. If the Frequency Output is reporting a constant value, the transmitter may be in a fault condition.

Procedure

1. Check the status alerts for active fault conditions.
2. If there are active fault conditions, the transmitter is performing correctly. If you want to change its behavior, change the setting of **Frequency Output Fault Action**.
3. If there are no active fault conditions, continue troubleshooting.

14.17 Check the scaling of the Frequency Output

If the process variable assigned to the Frequency Output goes to a value that would set the Frequency Output to a signal below 0 Hz or above 12500 Hz, the meter will post an Output Saturated alert for the affected output, then perform the configured fault action.

Procedure

1. Record your current process conditions.
2. Adjust the scaling of the Frequency Output.

14.18 Check grounding

A sensor and the transmitter must be grounded.

Prerequisites

You will need an:

- Installation manual for your sensor
- Installation manual for your transmitter (remote-mount installations only)

Procedure

Refer to the sensor and transmitter installation manuals for grounding requirements and instructions.

14.19 Perform loop tests

A loop test is a way to verify that the transmitter and the remote device are communicating properly. A loop test also helps you know whether you need to trim mA Outputs.

Prerequisites

- Before performing a loop test, configure the channels for the transmitter outputs that will be used in your application.
- Follow appropriate procedures to ensure that loop testing will not interfere with existing measurement and control loops.

Related information

Perform loop tests using the display
Perform loop tests using ProLink III

14.19.1 Perform loop tests using the display

Procedure

1. Test the mA Output(s).
   a) Choose **Menu** → **Service Tools** → **Output Simulation** and select the mA Output to test.
   b) Set **Simulation Value** to `4`.
   c) Start the simulation.
   d) Read the mA current at the receiving device and compare it to the transmitter output.

      The readings do not need to match exactly. If the values are slightly different, you can correct the discrepancy by trimming the output.
   e) Choose **New Value**.
   f) Set **Simulation Value** to `20`.
   g) Start the simulation.
   h) Read the mA current at the receiving device and compare it to the transmitter output.

      The readings do not need to match exactly. If the values are slightly different, you can correct the discrepancy by trimming the output.
   i) Choose **Exit**.
2. Test the Frequency Output(s).
   a) Choose **Menu** → **Service Tools** → **Output Simulation** and select the Frequency Output to test.
   b) Set **Simulation Value** to `1`.

c) Start the simulation.

d) Read the frequency signal at the receiving device and compare it to the transmitter output.

e) Choose **New Value**.

f) Set **Simulation Value** to `14500`.

g) Start the simulation.

h) Read the frequency signal at the receiving device and compare it to the transmitter output.

i) Choose **Exit**.

3. Test the Discrete Output(s).

a) Choose **Menu** → **Service Tools** → **Output Simulation** and select the discrete output to test.

b) Set **Simulation Value** to ON.

c) Start the simulation.

d) Verify the signal at the receiving device.

e) Choose **New Value**.

f) Set **Simulation Value** to OFF.

g) Start the simulation.

h) Verify the signal at the receiving device.

i) Choose **Exit**.

Postrequisites

- If the mA Output readings are within 20 microamps of the expected values, you can correct this discrepancy by trimming the output.
- If the discrepancy between the mA Output readings is greater than 20 microamps, or if at any step the reading was faulty, verify the wiring between the transmitter and the remote device, and try again.
- If the Discrete Output readings are reversed, check the setting of **Discrete Output Polarity**.

14.19.2 Perform loop tests using ProLink III

Procedure

1. Test the mA Output(s).

a) Choose **Device Tools** → **Diagnostics** → **Testing** and select the mA output to test.

b) Enter `4` in **Fix to:**.

c) Select **Fix mA**.

d) Read the mA current at the receiving device and compare it to the transmitter output.

The readings do not need to match exactly. If the values are slightly different, you can correct the discrepancy by trimming the output.

e) Select **UnFix mA**.

f) Enter `20` in **Fix to:**.

g) Select **Fix mA**.

h) Read the mA current at the receiving device and compare it to the transmitter output.

The readings do not need to match exactly. If the values are slightly different, you can correct the discrepancy by trimming the output.

i) Select **UnFix mA**.

2. Test the Frequency Output(s).
    a) Choose **Device Tools** → **Diagnostics** → **Testing** and select the frequency output to test.
    b) Enter the Frequency Output value in **Fix to**.
    c) Select **Fix FO**.
    d) Read the frequency signal at the receiving device and compare it to the transmitter output.
    e) Select **UnFix FO**.
3. Test the Discrete Output(s).
    a) Choose **Device Tools** → **Diagnostics** → **Testing** → **Discrete Output Test**.
    b) Set **Fix to:** to ON.
    c) Verify the signal at the receiving device.
    d) Set **Fix to:** to OFF.
    e) Verify the signal at the receiving device.
    f) Select **UnFix**.

Postrequisites

- If the mA Output readings are within 20 microamps of the expected values, you can correct this discrepancy by trimming the output.
- If the discrepancy between the mA Output readings is greater than 20 microamps, or if at any step the reading was faulty, verify the wiring between the transmitter and the remote device, and try again.
- If the Discrete Output readings are reversed, check the setting of **Discrete Output Polarity**.

14.19.3 Perform loop tests using a PROFIBUS PA host

DeltaV AMS	**Service Tools** → **Simulate** → **Outputs**
Siemens PDM	**Diagnostics** → **Simulate** → **Outputs**

Procedure

1. Test the mA Output(s).
    a) Choose **mA Output Loop Test** and select the mA Output to test.

b) Select **4 mA**.

c) Read the mA current at the receiving device and compare it to the transmitter output.

The readings do not need to match exactly. If the values are slightly different, you can correct the discrepancy by trimming the output.

d) Press **OK**.

e) Select **20 mA**.

f) Read the mA current at the receiving device and compare it to the transmitter output.

The readings do not need to match exactly. If the values are slightly different, you can correct the discrepancy by trimming the output.

g) Press **OK**.

h) Choose **End**.

2. Test the Frequency Output(s).

   a) Choose **Frequency Output Loop Test** and select the Frequency Output to test.

   b) Select the Frequency Output level.

   c) Press **OK**.

   d) Choose **End**.

3. Test the Discrete Output(s).

   a) Choose **Discrete Output Loop Test** and select the Discrete Output to test.

   b) Choose **Off**.

   c) Verify the signal at the receiving device.

   d) Press **OK**.

   e) Choose **On**.

   f) Verify the signal at the receiving device.

   g) Press **OK**.

   h) Choose **End**.

Postrequisites

- If the mA Output readings are within 20 microamps of the expected values, you can correct this discrepancy by trimming the output.
- If the discrepancy between the mA Output readings is greater than 20 microamps, or if at any step the reading was faulty, verify the wiring between the transmitter and the remote device, and try again.
- If the Discrete Output readings are reversed, check the setting of **Discrete Output Polarity**.

14.20 Check Lower Range Value and Upper Range Value

If the process variable assigned to the mA Output falls below the configured **Lower Range Value** (LRV) or rises above the configured **Upper Range Value** (URV), the meter will post an Output Saturated alert for the affected output, then perform the configured fault action.

Procedure

1. Record your current process conditions.
2. Check the configuration of the LRV and URV.

14.21 Check mA Output Fault Action

The **mA Output Fault Action** controls the behavior of the mA Output if the transmitter encounters an internal fault condition. If the mA Output is reporting a constant value below 4 mA or above 20 mA, the transmitter may be in a fault condition.

Procedure

1. Check the status alerts for active fault conditions.
2. If there are active fault conditions, the transmitter is performing correctly. If you want to change its behavior, change the setting of **mA Output Fault Action**.
3. If there are no active fault conditions, continue troubleshooting.

14.22 Trim mA Output

Trimming an mA Output calibrates the transmitter's mA Output to the receiving device. If the current trim value is inaccurate, the transmitter will under-compensate or over-compensate the output.

Related information

Trim an mA Output using the display
Trim mA Output using ProLink III
Trim mA Outputs using a PROFIBUS PA host

14.22.1 Trim an mA Output using the display

Trimming the mA Output establishes a common measurement range between the transmitter and the device that receives the mA Output.

Prerequisites

Ensure that the mA Output is wired to the receiving device that will be used in production.

Procedure

1. Choose **Menu** → **Service Tools** → **mA Output Trim** and select the output to trim.
2. Follow the instructions in the guided method.
3. Check the trim results. If any trim result is less than −20 microamps or greater than +20 microamps, contact customer service.

14.22.2 Trim mA Output using ProLink III

Trimming the mA Output establishes a common measurement range between the transmitter and the device that receives the mA Output.

Prerequisites

Ensure that the mA Output is wired to the receiving device that will be used in production.

Procedure

1. Follow the instructions in the guided method.
2. Check the trim results. If any trim result is less than −20 microamps or greater than +20 microamps, contact customer service.

14.22.3 Trim mA Outputs using a PROFIBUS PA host

Trimming the mA Output establishes a common measurement range between the transmitter and the device that receives the mA Output.

Prerequisites

Ensure that the mA Output is wired to the receiving device that will be used in production.

Procedure

1. Follow the instructions in the guided method.
2. Check the trim results. If any trim result is less than −20 microamps or greater than +20 microamps, contact customer service.

14.23 Check the pickoff voltage

If the pickoff voltage readings are unusually low, you may have any of a variety of process or equipment problems.

To know whether your pickoff voltage is unusually low, you must collect pickoff voltage data during the problem condition and compare it to pickoff voltage data from a period of normal operation.

Drive gain and pickoff voltage are inversely proportional. As drive gain increases, pickoff voltages decrease and vice versa.

Table 14-5: Possible causes and recommended actions for low pickoff voltage

Possible cause	Recommended actions
Faulty wiring runs between the sensor and transmitter	Verify wiring between sensor and transmitter.
Process flow rate beyond the limits of the sensor	Verify that the process flow rate is not out of range of the sensor.
Sensor tubes are not vibrating	• Check for plugging or deposition. • Ensure that the vibrating element is free to vibrate (no mechanical binding). • Verify wiring.

Table 14-5: Possible causes and recommended actions for low pickoff voltage *(continued)*

Possible cause	Recommended actions
Moisture in the sensor electronics	Eliminate the moisture in the sensor electronics.
The sensor is damaged, or sensor magnets may have become demagnetized	Replace the sensor.

14.24 Check power supply wiring

If the power supply wiring is damaged or improperly connected, the transmitter may not receive enough power to operate properly.

Prerequisites

- You will need the installation manual for your transmitter.
- When using DC power, a minimum of 1.5 amps of startup current is required.

Procedure

1. Use a voltmeter to test the voltage at the transmitter's power supply terminals.
    - If the voltage is within the specified range, you do not have a power supply problem.
    - If the voltage is low, ensure that the power supply is adequate at the source, the power cable is sized correctly, there is no damage to the power cable, and an appropriate fuse is installed.
    - If there is no power, continue with this procedure.
2. **WARNING**
   If the transmitter is in a hazardous area, wait five minutes after disconnecting the power. Failure to do so could result in an explosion causing death or injury.

   Before inspecting the power supply wiring, disconnect the power source.
3. Ensure that the terminals, wires, and wiring compartment are clean and dry.
4. Ensure that the power supply wires are connected to the correct terminals.
5. Ensure that the power supply wires are making good contact, and are not clamped to the wire insulation.
6. **WARNING**
   If the transmitter is in a hazardous area, do not reapply power to the transmitter with the housing cover removed. Reapplying power to the transmitter while the housing cover is removed could cause an explosion.

   Reapply power to the transmitter.
7. Test the voltage at the terminals.
   If there is no power, contact customer service.

14.25 Check for radio frequency interference (RFI)

The transmitter's Frequency Output or Discrete Output can be affected by radio frequency interference (RFI). Possible sources of RFI include a source of radio emissions, or a large transformer, pump, or motor that can generate a strong electromagnetic field. Several methods to reduce RFI are available. Use one or more of the following suggestions, as appropriate to your installation.

Procedure

- Use shielded cable between the output and the receiving device.
  - Terminate the shielding at the receiving device. If this is impossible, terminate the shielding at the cable gland or conduit fitting.
  - Do not terminate the shielding inside the wiring compartment.
  - 360-degree termination of shielding is unnecessary.
- Eliminate the RFI source.
- Move the transmitter.

14.26 Check sensor-to-transmitter wiring

A number of power-supply and output problems may occur if the wiring between the sensor and the transmitter is improperly connected, or if the wiring becomes damaged.

Be sure to check all wiring segments:

- If you have a 4-wire transmitter, check the wiring between the transmitter and the core processor.
- If you have a 9-wire transmitter, check the wiring between the transmitter and the sensor junction box.
- If you have a remote transmitter with remote core processor, check the wiring between the transmitter and the core processor and the wiring between the core processor and the sensor junction box.

Prerequisites

You will need the installation manual for your transmitter.

Procedure

1. Before opening the wiring compartments, disconnect the power source.

   ⚠ WARNING
   If the transmitter is in a hazardous area, wait five minutes after disconnecting the power. Failure to do so could result in an explosion causing death or injury.

2. Verify that the transmitter is connected to the sensor according to the information provided in the installation manual.
3. Verify that the wires are making good contact with the terminals.
4. Check the continuity of all wires from the transmitter to the sensor.

14.27 Check the sensor coils

Checking the sensor coils can identify a cause for a no sensor response alert.

Restriction
This procedure applies only to 9-wire remote-mount transmitters and remote transmitters with remote core processors. For integral mount transmitters, consult the factory.

Procedure

1. Disconnect power to the transmitter.

   WARNING
   If the transmitter is in a hazardous area, wait five minutes after disconnecting the power. Failure to do so could result in an explosion causing death or injury.

2. Unplug the terminal blocks from the terminal board on the core processor.
3. Remove the wires from the sensor junction box.
4. Using a digital multimeter (DMM), check the pickoff coils by placing the DMM leads on the unplugged terminal blocks for each terminal pair. See Table 14-6 for a list of the coils. Record the values.

   Table 14-6: Coils and test terminal pairs

Coil	Sensor model	Terminal colors
Drive coil	All	Brown to red
Left pickoff coil (LPO)	All	Green to white
Right pickoff coil (RPO)	All	Blue to gray
Resistance temperature detector (RTD)	All	Yellow to violet
Lead length compensator (LLC)	All except T-Series and CMF400 (see note)	Yellow to orange
Composite RTD	CMFS025-150 and T-Series	Yellow to orange
Fixed resistor (see note)	CMFS007, CMFS010, CMFS015, CMF400, and F300	Yellow to orange

   Note
   The CMF400 fixed resistor applies only to certain specific CMF400 releases. Contact customer support for more information.

   There should be no open circuits, that is, no infinite resistance readings. The left pickoff and right pickoff readings should be the same or very close (±5 Ω). If there are any unusual readings, repeat the coil resistance tests at the sensor junction box to eliminate the possibility of faulty cable. The readings for each coil pair should match at both ends.

5. Test the terminals in the sensor junction box for shorts to case.
   a) Leave the terminal blocks disconnected.
   b) Remove the lid of the junction box.
   c) Testing one terminal at a time, place a DMM lead on the terminal and the other lead on the sensor case.

      With the DMM set to its highest range, there should be infinite resistance on each lead. If there is any resistance at all, there is a short to case.

6. Test the resistance of junction box terminal pairs.
   a) Test the brown terminal against all other terminals except the red one.

b) Test the red terminal against all other terminals except the brown one.

c) Test the green terminal against all other terminals except the white one.

d) Test the white terminal against all other terminals except the green one.

e) Test the blue terminal against all other terminals except the gray one.

f) Test the gray terminal against all other terminals except the blue one.

g) Test the orange terminal against all other terminals except the yellow and violet ones.

h) Test the yellow terminal against all other terminals except the orange and violet ones.

i) Test the violet terminal against all other terminals except the yellow and orange ones.

There should be infinite resistance for each pair. If there is any resistance at all, there is a short between terminals.

Postrequisites

To return to normal operation:

1. Plug the terminal blocks into the terminal board.
2. Replace the lid on the sensor junction box.

Important
When reassembling the meter components, be sure to grease all O-rings.

14.28 Using sensor simulation for troubleshooting

When sensor simulation is enabled, the transmitter reports user-specified values for basic process variables. This allows you to reproduce various process conditions or to test the system.

You can use sensor simulation to help distinguish between legitimate process noise and externally caused variation. For example, consider a receiving device that reports an unexpectedly erratic density value. If sensor simulation is enabled and the observed density value does not match the simulated value, the source of the problem is likely to be somewhere between the transmitter and the receiving device.

Sensor simulation requires an enhanced core and a communication device.

Important
When sensor simulation is active, the simulated value is used in all transmitter outputs and calculations, including totals and inventories, volume flow calculations, and concentration calculations. Disable all automatic functions related to the transmitter outputs and place the loop in manual operation. Do not enable simulation mode unless your application can tolerate these effects, and be sure to disable simulation mode when you have finished testing.

14.29 Check for two-phase flow (slug flow)

Two-phase flow can cause rapid changes in the drive gain. This can cause a variety of measurement issues.

Procedure

1. Check for two-phase flow alerts (e.g., A105).

If the transmitter is not generating two-phase flow alerts, verify that two-phase flow limits have been set. If limits are set, two-phase flow is not the source of your problem.

2. Check the process for cavitation, flashing, or leaks.
3. Monitor the density of your process fluid output under normal process conditions.
4. Check the settings of **Two-Phase Flow Low Limit**, **Two-Phase Flow High Limit**, and **Two-Phase Flow Timeout**.

Tip
You can reduce the occurrence of two-phase flow alerts by setting **Two-Phase Flow Low Limit** to a lower value, **Two-Phase Flow High Limit** to a higher value, or **Two-Phase Flow Timeout** to a higher value.

14.30 Simulation problems

14.30.1 [132] Sensor Simulation On

Alert

Sensor Being Simulated

Cause

- Simulation mode is enabled
- Device simulation is active

Recommended actions

Disable sensor simulation.

14.30.2 Alert Simulation Enabled

Alert

Alert Simulation Active

Cause

Alert simulation is enabled. The active alerts are simulated and any real alerts are suppressed.

Recommended actions

To view real alerts, disable the alerts simulation.

14.30.3 Analog Input Simulation On

Alert

Simulation Active

Cause

The Analog Input function block is under manual mode or the block is in simulation.

Recommended actions

1. If the block is in **Manual Mode**, change the **Target** mode.
2. If **Simulation** is enabled, disable it.

14.30.4 Discrete Input Simulation On

Alert

Simulation Active

Cause

The Discrete Input function block is under manual mode or the block is in simulation.

Recommended actions

1. If the block is in **Manual Mode**, change the **Target** mode.
2. If **Simulation** is enabled, disable it.

14.30.5 Totalizer Simulation On

Alert

Simulation Active

Cause

The totalizer function block is under manual mode.

Recommended actions

Change the **Target** mode of the block.

14.31 Temperature measurement troubleshooting

Table 14-7: Temperature measurement problems and recommended actions

Problem	Possible causes	Recommended actions
Temperature reading significantly different from process temperature	• RTD failure • Wiring problem • Incorrect calibration factors • Line temperature in bypass does not match temperature in main line	• For sensors with a junction box, check for moisture in the junction box. • Check the sensor coils for electrical shorts. If you find problems, replace the sensor. • Ensure that all of the calibration parameters have been entered correctly. See the sensor tag or the calibration sheet for your meter. • Refer to status alerts (especially RTD failure alerts). • Disable external temperature compensation. • Verify temperature calibration. • Check the wiring between the sensor and the transmitter.
Temperature reading slightly different from process temperature	• Sensor temperature not yet equalized • Sensor leaking heat	• If the error is within the temperature specification for the sensor, there is no problem. If the temperature measurement is outside the specification, contact customer service. • The temperature of the fluid may be changing rapidly. Allow sufficient time for the sensor to equalize with the process fluid. • Install thermal installation, up to but not over, the transmitter housing. • Check the sensor coils for electrical shorts. If you find problems, replace the sensor. • The RTD may not be making good contact with the sensor. The sensor may need to be replaced.
Inaccurate temperature data from external device	• Wiring problem • Problem with input configuration • Problem with external device	• Verify the wiring between the transmitter and the external device. • Verify that the external device is operating correctly. • Verify the configuration of the temperature input. • Ensure that both devices are using the same measurement unit.

14.32 Velocity measurement troubleshooting

Important
If you are measuring gas, minor inaccuracy in velocity readings is expected. If this is an issue for your application, contact customer support.

Table 14-8: Velocity measurement problems and recommended actions

Problem	Possible causes	Recommended actions
Non-zero velocity reading at no-flow conditions or at zero offset	• Misaligned piping (especially in new installations) • Open or leaking valve • Incorrect sensor zero	• Zero the meter. • Check for open or leaking valves or seals. • Check for mounting stress on the sensor (for example, the sensor being used to support piping, misaligned piping). • Contact customer service.
Erratic non-zero flow rate at no-flow conditions	• Leaking valve or seal • Two-phase flow • Plugged or coated sensor tube • Incorrect sensor orientation • Wiring problem • Vibration in pipeline at rate close to sensor tube frequency • Damping value too low • Mounting stress on sensor	• Verify that the sensor orientation is appropriate for your application. See the installation manual for your sensor. • Check the drive gain and the pickoff voltage. • Purge the sensor tubes. • Check for open or leaking valves or seals. • Check for sources of vibration. • Verify damping configuration. • Verify that the measurement units are configured correctly for your application. • Check for two-phase flow. • Check for radio frequency interference. • Contact customer service.

Table 14-8: Velocity measurement problems and recommended actions *(continued)*

Problem	Possible causes	Recommended actions
Erratic non-zero velocity reading when velocity is steady	• Two-phase flow • Damping value too low • Plugged or coated sensor tube • Output wiring problem • Problem with receiving device • Wiring problem	• Verify that the sensor orientation is appropriate for your application. See the installation manual for your sensor. • Check the drive gain and the pickoff voltage. • Check for air entrainment, tube fouling, flashing, or tube damage. • Purge the sensor tubes. • Check for open or leaking valves or seals. • Check for sources of vibration. • Verify damping configuration. • Verify that the measurement units are configured correctly for your application. • Check for two-phase flow. • Check for radio frequency interference. • Contact customer service.
Inaccurate velocity reading	• Wiring problem • Inappropriate measurement unit • Incorrect flow calibration factor • Incorrect density calibration factors • Incorrect grounding • Two-phase flow • Problem with receiving device • Incorrect sensor zero	• Verify that the measurement units are configured correctly for your application. • Zero the meter. • Check the grounding of all components. • Check for two-phase flow. • Verify the receiving device, and the wiring between the transmitter and the receiving device. • Replace the core processor or transmitter.

A 5700 PROFIBUS-PA transducer blocks

A.1 Transducer block overview

Use this section to help you understand the tables included in this appendix.

Types of transducer blocks

The 5700 contains the following transducer blocks:

Measurement	Process variables and process measurement configurations
Device	Informational static data such as software revisions, serial numbers, calibration data, display configuration data, and physical IO configuration data
Totalizer/Inventory	Seven configurable totalizer and inventory data along with their configurations
Meter verification	The meter verification configurations and processes
API	API referral process variables and configuration data
Concentration measurement	Concentration measurement process variables and configuration data
Advanced Phase Measurement	Advanced Phase Measurement variables and configuration data

5700 PROFIBUS-PA function blocks

- Four Analog Input (AI) blocks
- Two Analog Output (AO) blocks
- Four totalizer (TOT) blocks
- One Discrete Output (DO) block
- One Discrete Input (DI) block

Table column descriptions

This appendix contains tables with the following values.

Table value	Description
Index	The index of the PROFIBUS-PA parameter in the object dictionary
Parameter name	The name of the parameter as it is used in code
Data type	A data attribute that describes how the data is stored. An internet search can provide definitions and details.
Size	The size of the parameter in bytes

Table value	Description
Access	R = Read only RW (any) = Read/write with the transducer block in any mode RW (OOS) = Read/write with the transducer block in Out of Service (OOS) mode RW (Auto) = Read/write with the transducer block in Auto mode
Default value	The default value of the parameter
Release	The release when the parameter became available
Enumerated list of values	A list of allowed values for the parameter

A.2 Slot identification

The following table shows the slot assignment for blocks.

Slot	Assigned block
0	Physical block
1	Analog Input block 1 -- Composite Directory
2	Analog Input block 2
3	Analog Input block 3
4	Totalizer block 1
5	Analog Input block 4
6	Totalizer block 2
7	Totalizer block 3
8	Totalizer block 4
9	Analog Output block 1
10	Analog Output block 2
11	Discrete Output block
12	Discrete Input block
13	Measurement block
14	Device block
15	Device totalizer and inventory
16	Meter verification block
17	API referral block
18	Concentration measurement block
19	Advanced Phase Measurement block

A.3 PROFIBUS-PA parameters 0 through 7

Index	Parameter name	Definition	Enumerated list of values
0	BLOCK_OBJECT Data type = DS-32 Size = 20	The first parameter of every block. It contains the characteristics of the block, e.g., block type and profile number. Access = R Default value = — Release = 1.0	—
1	ST_REV Data type = Unsigned16 Size = 2	A block has static block parameters that are not changed by the process. Values are assigned to this parameter during the configuration of optimization. ST_REV is incremented by at least one if one static parameter in the corresponding block has been modified. Access = R Default value = 0 Release = 1.0	—
2	TAG_DESC Data type = OctetString Size = 32	A user-supplied description of the block. Every block can be assigned a textual tag description. Access = RW Default value = ' ' Release = 1.0	—
3	STRATEGY Data type = Unsigned16 Size = 2	A user-specified value that can be used in configuration or diagnostics as a key in sorting block information. Access = RW Default value = 0 Release = 1.0	—
4	ALERT_KEY Data type = Unsigned8 Size = 1	A user-assigned value that can be used in sorting alarms or events generated by a block Access = RW Default value = 0 Release = 1.0	—
5	TARGET_MODE Data type = Unsigned8 Size = 1	Indicates which mode will be used for the block. Access = RW Default value = block spec. Release = 1.0	0x08 = AUTO 0x80 = OOS

Index	Parameter name	Definition	Enumerated list of values
6	MODE_BLK Data type = DS-37 Size = 3	A structured parameter composed of the actual mode, the normal mode, and the permitted mode. Access = R Default value = MODE_AUTO, MODE_AUTO | MODE_OOS, MODE_AUTO Release = 1.0	—
7	ALARM_SUM Data type = DS-42 Size = 8	Summarizes the status of up to 16 block alarms. For each alarm, the current states, unacknowledged states, unreported states, and disabled states are maintained. Access = R Default value = 0,0,0,0 Release = 1.0	—

A.4 I & M functions

I&M0 (sub-index 65000)

Parameter	Description
Header Data type = Octet String Size = 10	Reserved Initial value = 0x00
MANUFACTURER_ID Data type = Unsigned16 Size = 2	Identification code of the PA device Initial value = DEV_MAN_ ID_DFLT
ORDER_ID Data type = Visible String Size = 20	Order number of the device Initial value = DEV_ID_DFLT
SERIAL_NUMBER Data type = Visible String Size = 10	Unique serial number Initial value = —
HARDWARE_ REVISION Data type = Unsigned16 Size = —	Revision of the hardware Initial value = —
SOFTWARE_ REVISION Data type = Visible String, Unsigned8 Size = 1, 3	Firmware revision of the device or module Initial value = —

Parameter	Description
REV_COUNTER Data type = Unsigned16 Size = 2	Incremented if parameter content with the static attribute in the according slot has changed or a module exchange has been carried out. Slot 0 carries a REV_COUNTER that counts all changes of static parameters of the whole device. Initial value = —
PROFILE_ID Data type = Unsigned16 Size = 2	Fixed to 0x9700 for PA devices Initial value = 0x9700
PROFILE_ SPECIFIC_TYPE Data type = Octet String Size = 2	Specifies the block used in this slot. If more than one block is located in this slot, use the following rules to determine the block whose information has to be mapped: 1. Physical block (if available) 2. Function block (if available) 3. Transducer block Initial value = —
IM_VERSION Data type = Unsigned8 Size = 2	Implemented version of I & M function Initial value = —
IM_SUPPORTED Data type = Octet String Size = 2	This parameter indicates the availability of the I & M records Initial value = —

I&M1 (sub-index 65001)

Parameter	Description
Header Data type = Octet String Size = 10	Reserved Initial value = —
TAG_FUNCTION Data type = Visible String Size = 32	Device identification tag Initial value = —
TAG_LOCATION Data type = Visible String Size = 22	Device location identification tag Initial value = —

I&M2 (sub-index 65002)

Parameter	Description
Header Data type = Octet String Size = 10	Reserved Initial value = —
INSTALLATION_ DATE Data type = Visible String Size = 16	Device installation date Initial value = —
Reserved Data type = Octet String Size = 38	Initial value = —

PA_I&M0 (sub-index 65016)

Parameter	Description
Header Data type = Octet String Size = 10	Reserved Initial value = —
PA_IM_VERSION Data type = Unsigned8 Size = 2	Version of the process device profile specific extensions of I & M Initial value = —
HARDWARE_ REVISION Data type = — Size = —	Hardware revision according to physical component Initial value = —
SOFTWARE_ REVISION Data type = — Size = —	Firmware revision according to physical component Initial value = —
Reserved	
PA_IM_ SUPPORTED Data type = Octet String Size = 2	Initial value = —

A.5 Physical block

Standard PROFIBUS-PA block parameters

Index	Parameter name	Definition	Enumerated list of values
16	BLOCK_OBJECT Data type = DS-32 Size = 20	The first parameter of every block. It contains the characteristics of the block, e.g., block type and profile number. Access = R Default value = — Release = 1.0	—
17	ST_REV Data type = Unsigned16 Size = 2	A block has static block parameters that are not changed by the process. Values are assigned to this parameter during the configuration of optimization. ST_REV is incremented by at least one if one static parameter in the corresponding block has been modified. Access = R Default value = 0 Release = 1.0	—
18	TAG_DESC Data type = Octet String Size = 32	A user-supplied description of the block. Every block can be assigned a textual tag description. Access = RW Default value = ' ' Release = 1.0	—
19	STRATEGY Data type = Unsigned16 Size = 2	A user-specified value used in configuration or diagnostics as a key in sorting block information. Access = RW Default value = 0 Release = 1.0	—
20	ALERT_KEY Data type = Unsigned8 Size = 1	A user-assigned value that can be used in sorting alarms or events generated by a block Access = RW Default value = 0 Release = 1.0	—
21	TARGET_MODE Data type = Enumerated8 Size = 1	Indicates which mode will be used for the block. Access = RW Default value = block spec. Release = 1.0	0x08 = AUTO 0X80 = OOS

Index	Parameter name	Definition	Enumerated list of values
22	MODE_BLK Data type = DS-37 Size = 3	A structured parameter composed of the actual mode, the normal mode, and the permitted mode. Access = R Default value = MODE_AUTO, MODE_AUTO | MODE_OOS, MODE_AUTO Release = 1.0	—
23	ALARM_SUM Data type = DS-42 Size = 8	Summarizes the status of up to 16 block alarms. For each alarm, the current states, unacknowledged states, unreported states, and disabled states are maintained. Access = R Default value = 0,0,0,0 Release = 1.0	—

Physical block parameters

Index	Parameter name	Definition	Enumerated list of values
24	SOFTWARE_ REVISION Data type = Visible String Size = 16	Software revision number of the field device. Access = R Default value = — Release = 1.0	—
25	HARDWARE_ REVISION Data type = Visible String Size = 16	Hardware revision number of the field device. Access = R Default value = — Release = 1.0	—
26	DEVICE_MAN_ ID Data type = Unsigned16 Size = 2	Manufacturer identification code of the field device. Access = R Default value = 31 Release = 1.0	—
27	DEVICE_ID Data type = Visible String Size = 16	Manufacturer-specific identification of the device. Access = R Default value = — Release = 1.0	—

Index	Parameter name	Definition	Enumerated list of values
28	DEVICE_SER_ NUM Data type = Visible String Size = 16	Serial number of the field device. Access = R Default value = — Release = 1.0	—
29	DIAGNOSIS Data type = Octet String Size = 4	Detailed information of the device, bitwise coded. Access = R Default value = — Release = 1.0	See DIAGNOSIS
30	DIAGNOSIS_ EXTENSION Data type = Octet String Size = 6	Additional manufacturer-specific information of the device, bitwise coded. Access = R Default value = — Release = 1.0	See DIAGNOSIS_ EXTENSION
31	DIAGNOSIS_ MASK Data type = Octet String Size = 4	Definition of supported DIAGNOSIS information bits. Access = R Default value = — Release = 1.0	0 = Not supported 1 = Supported
32	DIAGNOSIS_MASK_ EXTENSION Data type = Octet String Size = 6	Definition of supported DIAGNOSIS_EXTENSION information-bits. Access = R Default value = — Release = 1.0	0 = Not supported 1 = Supported
33	DEVICE_CERTIFICATION Data type = Visible String Size = 32	Certifications of the field device. Access = R Default value = — Release = 1.0	—
34	WRITE_LOCKING Data type = Unsigned16 Size = 2	Software write protection Access = RW Default value = — Release = 1.0	0 = Lock Acyclic (acyclic write services to all parameter are refused, except WRITE_LOCKING itself, i.e. access is denied.) 2457 = Unlock All (all writeable parameters of a device are writeable.)

Index	Parameter name	Definition	Enumerated list of values
35	FACTORY_RESET Data type = Unsigned16 Size = 2	Factory reset Access = RW Default value = Device Running Release = 1.0	1 = Restart with Defaults 2506 = Restart Processor 32768 = Device Running
36	DESCRIPTOR Data type = Octet String Size = 32	User-definable text (a string) to describe the device within the application. Access = RW Default value = — Release = 1.0	—
37	DEVICE_MESSAGE Data type = Octet String Size = 32	User-definable MESSAGE (a string) to describe the device within the application or in the plant. Access = RW Default value = — Release = 1.0	—
38	DEVICE_INSTALL_DATE Data type = Octet String Size = 16	Date of installation of the device. Access = RW Default value = — Release = 1.0	—
39	LOCAL_OP_ENA Data type = Unsigned8 Size = 1	Enables local operation. Access = RW Default value = 1 Release = 1.0	0 = Disable 1 = Enable
40	IDENT_NUMBER_ SELECTOR Data type = Unsigned8 Size = 1	Each PROFIBUS DP device according to IEC 61784-1 CP 3/1 must have an Ident_Number provided by the PI. The Ident_Number specifies the cyclic behavior of a device that is described in the corresponding GSD file. Access = RW Default value = 127 Release = 1.0	0 = Profile Specific Ident Number 1 = Manufacturer Specific Ident Number 127 = Adaptation Mode

Index	Parameter name	Definition	Enumerated list of values
41	HW_WRITE_PROTECTION Data type = Unsigned8 Size = 1	Indicates the position of a write blocking mechanism that cannot be modified by remote access (e.g. hardware jumper or local user interface). This mechanism protects parameter modification on the device. Access = R Default value = — Release = 1.0	0 = Unprotected 1 = Protected, Manual Operation Permitted
42	FEATURE Data type = DS-68 Size = 8	Indicates optional features implemented on the device, the status of those features, and whether or not the feature is supported/not supported. Access = R Default value = — Release = 1.0	—
43	COND_STATUS_DIAG Data type = Unsigned8 Size = 1	Indicates the mode of a device that can be configured for status and diagnostic behavior. Access = RW Default value = 1 Release = 1.0	0 = Status and diagnosis is provided 1 = Condensed status and diagnosis information is provided 2...255 = Reserved by PI
44-63	Reserved		

DIAGNOSIS

1.0 - 2.2 = Reserved
2.3 = DIA_WARMSTART
2.4 = DIA_COLDSTART
2.5 = DIA_MAINTENANCE
2.6 = Reserved (1)
2.7 = IDENT_NUMBER_VIOLATION
3.0 = DIA_MAINTENANCE_ALARM
3.1 = DIA_MAINTENANCE_DEMANDED
3.2 = DIA_FUNCTION_CHECK
3.3 = DIA_INV_PRO_COND
3.4 to 4.6 = Reserved
4.7 = EXTENSION_AVAILABLE

DIAGNOSIS_ EXTENSION

0.0 = Electronics Failed
0.1 = Sensor Failed
0.2 = Configuration Error
0.3 = Core Low Power
0.4 = Undefined
0.5 = Sensor/Transmitter Comm Error
0.6 = Tube Not Full
0.7 = Extreme Primary Purpose Variable
1.0 = Undefined
1.1 = Flow Meter Initializing
1.2 = Function Check in Progress
1.3 = Sensor Being Simulated
1.4 = Output Fixed
1.5 = Drive Overrange
1.6 = Process Aberration
1.7 = Active Event
2.0 = Output Saturated
2.1 = Function Check Failed
2.2 = Data Loss Possible

Physical block View_1

Index	Parameter	Size
1	ST_REV	2
6	MODE_BLK	3
7	ALARM_SUM	8
13	DIAGNOSIS	4
Overall sum of bytes in View-Object		17

A.6 Totalizer block parameters (slots 4, 6, 7, and 8)

Standard PROFIBUS-PA block parameters

Index	Parameter name	Definition	Enumerated list of values
16	BLOCK_OBJECT Data type = DS-32 Size = 20	The first parameter of every block. It contains the characteristics of the block, e.g., block type and profile number. Access = R Default value = — Release = 1.0	—
17	ST_REV Data type = Unsigned16 Size = 2	A block has static block parameters that are not changed by the process. Values are assigned to this parameter during the configuration of optimization. ST_REV is incremented by at least one if one static parameter in the corresponding block has been modified. Access = R Default value = 0 Release = 1.0	—

Index	Parameter name	Definition	Enumerated list of values
18	TAG_DESC Data type = OctetString Size = 32	A user-supplied description of the block. Every block can be assigned a textual tag description. Access = RW Default value = ' ' Release = 1.0	—
19	STRATEGY Data type = Unsigned16 Size = 2	A user-specified value used in configuration or diagnostics as a key in sorting block information. Access = RW Default value = 0 Release = 1.0	—
20	ALERT_KEY Data type = Unsigned8 Size = 1	A user-assigned value that can be used in sorting alarms or events generated by a block Access = RW Default value = 0 Release = 1.0	—
21	TARGET_MODE Data type = Unsigned8 Size = 1	Indicates which mode will be used for the block. Access = RW Default value = block spec. Release = 1.0	0x08 = AUTO 0x10 = MANUAL 0x80 = OOS
22	MODE_BLK Data type = DS-37 Size = 3	A structured parameter composed of the actual mode, the normal mode, and the permitted mode. Access = R Default value = MODE_AUTO, MODE_AUTO | MODE_OOS | MODE_MAN, MODE_AUTO Release = 1.0	—
23	ALARM_SUM Data type = DS-42 Size = 8	Summarizes the status of up to 16 block alarms. For each alarm, the current states, unacknowledged states, unreported states, and disabled states are maintained. Access = R Default value = 0,0,0,0 Release = 1.0	—

Index	Parameter name	Definition	Enumerated list of values
24	BATCH Data type = DS-67 Size = 10	Used in batch applications according to IEC 61512-1. Only function blocks carry this parameter. There is no algorithm necessary within a function block. The batch parameter is necessary in a distributed fieldbus system to identify used and available channels, in addition to identify the current batch in case of alerts. Access = RW Default value = 0,0,0,0 Release = 1.0	—

Totalizer block parameters

Index	Parameter name	Definition	Enumerated list of values
25	Reserved		
26	TOTAL Data type = 101 Size = 5	Contains the integrated quantity of the rate parameter provided by CHANNEL and the associated status. Access = RW (manual) Default value = 0 Release = 1.0	—
27	UNIT_TOT Data type = Enumerated16 Size = 2	Unit of the totalized quantity. Access = RW (OOS) Default value = — Release = 1.0	—
28	CHANNEL Data type = Enumerated16 Size = 2	Reference to the active transducer block that provides the measurement value to the function block. Access = RW (OOS) Default value = Default Channel Assignment Release = 1.0	See Totalizer function block channels
29	SET_TOT Data type = Enumerated8 Size = 1	Reset of the internal value of the FB algorithm to 0 or set this value to PRESET_TOT. Access = RW Default value = 0 Release = 1.0	0 = TOTALIZE 1 = RESET 2 = PRESET

Index	Parameter name	Definition	Enumerated list of values
30	MODE_TOT Data type = Enumerated8 Size = 1	Governs the behavior of the totalization. Access = RW Default value = — Release = 1.0	0 = BALANCED 1 = POS_ONLY 2 = NEG_ONLY 3 = HOLD
31	FAIL_TOT Data type = Enumerated8 Size = 1	Fail-safe mode of the totalizer function block. This parameter governs the behavior of the function block during the occurrence of input values with BAD status. Access = RW Default value = 0 Release = 1.0	0 = RUN 1 = HOLD 2 = MEMORY
32	PRESET_TOT Data type = Float Size = 4	used as a preset for the internal value of the FB algorithm. The value is effective if using the SET_TOT function. Access = RW Default value = 0 Release = 1.0	—
33	ALARM_HYS Data type = Float Size = 4	Hysteresis Access = RW (OOS) Default value = 0 Release = 1.0	—
34	HI_HI_LIM Data type = Float Size = 4	Value for upper limit of alarms. Access = RW (OOS) Default value = max value Release = 1.0	—
35	HI_LIM Data type = Float Size = 4	Value for upper limit of warnings. Access = RW (OOS) Default value = max value Release = 1.0	—
36	LO_LIM Data type = Float Size = 4	Value for lower limit of warnings. Access = RW (OOS) Default value = min value Release = 1.0	—
37	LO_LO_LIM Data type = Float Size = 4	Value for lower limit of alarms. Access = RW (OOS) Default value = min value Release = 1.0	—
38-51	Reserved		

Totalizer function block View_1

Index	Parameter	Size
1	ST_REV	2
6	MODE_BLK	3
7	ALARM_SUM	8
10	TOTAL	5
Overall sum of bytes in View-Object		18

A.7 Analog Output block parameters (slots 9 and 10)

Standard PROFIBUS-PA block parameters

Index	Parameter name	Definition	Enumerated list of values
16	BLOCK_OBJECT Data type = DS-32 Size = 20	The first parameter of every block. It contains the characteristics of the block, e.g., block type and profile number. Access = R Default value = — Release = 1.0	—
17	ST_REV Data type = Unsigned16 Size = 2	A block has static block parameters that are not changed by the process. Values are assigned to this parameter during the configuration of optimization. ST_REV is incremented by at least one if one static parameter in the corresponding block has been modified. Access = R Default value = 0 Release = 1.0	—
18	TAG_DESC Data type = Octet String Size = 32	A user-supplied description of the block. Every block can be assigned a textual tag description. Access = RW Default value = ' ' Release = 1.0	—
19	STRATEGY Data type = Unsigned16 Size = 2	A user-specified value used in configuration or diagnostics as a key in sorting block information. Access = RW Default value = 0 Release = 1.0	—

Index	Parameter name	Definition	Enumerated list of values
20	ALERT_KEY Data type = Unsigned8 Size = 1	A user-assigned value that can be used in sorting alarms or events generated by a block Access = RW Default value = 0 Release = 1.0	—
21	TARGET_MODE Data type = Unsigned8 Size = 1	Indicates which mode will be used for the block. Access = RW Default value = block spec. Release = 1.0	0x08 = AUTO 0x10 = MANUAL 0x80 = OOS 0x02 = RCAS
22	MODE_BLK Data type = DS-37 Size = 3	A structured parameter composed of the actual mode, the normal mode, and the permitted mode. Access = R Default value = MODE_AUTO, MODE_AUTO | MODE_OOS | MODE_MAN | MODE_RCAS, MODE_AUTO Release = 1.0	—
23	ALARM_SUM Data type = DS-42 Size = 8	Summarizes the status of up to 16 block alarms. For each alarm, the current states, unacknowledged states, unreported states, and disabled states are maintained. Access = R Default value = 0,0,0,0 Release = 1.0	—
24	BATCH Data type = DS-67 Size = 10	Used in batch applications according to IEC 61512-1. Only function blocks carry this parameter. There is no algorithm necessary within a function block. The batch parameter is necessary in a distributed fieldbus system to identify used and available channels, in addition to identify the current batch in case of alerts. Access = RW Default value = 0,0,0,0 Release = 1.0	—

Analog Output block parameters

Index	Parameter name	Definition	Enumerated list of values
25	SP Data type = 101 Size = 5	Set point. Defines the position of the final control element within the travel span (between OPEN and CLOSE position) in units of PV_SCALE in mode AUTO. Access = RW Default value = — Release = 1.0	—
26	Reserved		
27	PV_SCALE Data type = DS-36 Size = 11	Conversion of the process variable in engineering units to the process variable in percent as the input value of the function block. Access = RW (OOS) Default value = 100, 0, % Release = 1.0	—
28	READBACK Data type = 101 Size = 5	Access = R Default value = — Release = 1.0	—
29	Reserved		
30	RCAS_IN Data type = 101 Size = 5	Target set point in units of PV_SCALE and status provided by a supervisory host to the analog control or output block in mode RCas. Access = RW Default value = — Release = 1.0	—
31-36	Reserved		
37	IN_CHANNEL Data type = Unsigned16 Size = 2	Reference to the active transducer block and its parameter that provides the actual position of the final control element. Access = RW (OOS) Default value = Default Channel Release = 1.0	See Analog Output function block channels

Index	Parameter name	Definition	Enumerated list of values
38	OUT_CHANNEL Data type = Unsigned16 Size = 2	Reference to the active transducer block and its parameter that provides the actual position for the final control element. Access = RW (OOS) Default value = Default Channel Release = 1.0	See Analog Output function block channels
39	FSAFE_TIME Data type = Float Size = 4	Time in seconds from detection of failure of the actual used set point (SP = BAD or RCAS_IN <> GOOD) to the action of the block if the condition still exists. Access = RW (OOS) Default value = 0 Release = 1.0	—
40	FSAFE_TYPE Data type = Unsigned8 Size = 1	Defines reaction of the device if a failure of the actual used set point is still detected after FSAFE_TIME, or if the status of actual used set point is Initiate Fail Safe. Access = RW (OOS) Default value = 2 Release = 1.0	0 = Fail safe value is used as a setpoint 1 = Use last valid setpoint
41	FSAFE_VALUE Data type = Float Size = 4	Set point used if FSAFE_TYPE = 1 and FSAFE is activated. Access = RW (OOS) Default value = 0 Release = 1.0	—
42	Reserved		
43	RCAS_OUT Data type = 101 Size = 5	Function Block set point in units of PV_SCALE and status. Provided to a supervisory host for monitoring / back calculation and to allow action to be taken under limited conditions or mode change. Access = R Default value = — Release = 1.0	—
44-46	Reserved		
47	POS_D Data type = 102 Size = 2	The current position of the valve (discrete). Access = R Default value = — Release = 1.0	0 = Not initialized 1 = Closed 2 = Opened 3 = Intermediate

Index	Parameter name	Definition	Enumerated list of values
48	Reserved		
49	CHECK_BACK Data type = Octet String Size = 3	Detailed information of the device, bit-wise coded. More than one message is possible at once. Access = R Default value = — Release = 1.0	—
50	CHECK_BACK_MASK Data type = Octet String Size = 3	Definition of supported CHECK_BACK information bits. Access = R Default value = — Release = 1.0	0 = Not supported 1 = Supported
51	SIMULATE Data type = DS-50 Size = 6	For commissioning and maintenance reasons, it is possible to simulate the READBACK by defining the value and the status. This means that the signal path from the transducer block to the AO FB will be disconnected. Access = RW Default value = disabled Release = 1.0	—
52	INCREASE_CLOSE Data type = Unsigned8 Size = 1	Defines actuator movement relative to the set point in mode RCAS and AUTO. Access = RW Default value = 0 Release = 1.0	0 = Rising (increasing of set point results in OPENING of the valve) 1 = Falling (increasing of set point results in CLOSING of the valve)
53	OUT Data type = 101 Size = 5	This parameter is the process variable of the Analog Output block in engineering units in AUTO and RCas mode and is the value specified by the operator/engineer in MAN and LO mode. Access = RW Default value = — Release = 1.0	—

Index	Parameter name	Definition	Enumerated list of values
54	OUT_SCALE Data type = DS-36 Size = 11	Converts the OUT in the function block from percent to engineering units as the output value of the function block. OUT consists of the high and low scale values, engineering unit code, and the number of digits to the right of the decimal point. Access = RW (OOS) Default value = — Release = 1.0	—
55-64	Reserved		
65	PV_UNIT Data type = Unsigned16 Size = 2	Access = R Default value = — Release = 1.0	—

Analog Output function block View_1

Index	Parameter	Size
1	ST_REV	2
6	MODE_BLK	3
7	ALARM_SUM	8
12	READBACK	5
31	POS_D	2
33	CHECK_BACK	3
Overall sum of bytes in View-Object		23

A.8 Analog Input block parameters (slots 1, 2, 3, and 5)

Standard PROFIBUS-PA block parameters 16 through 24

See PROFIBUS-PA block parameters 16 through 24.

Analog Input block parameters

Index	Parameter name	Definition	Enumerated list of values
25	Reserved		
26	OUT Data type = 101 Size = 5	Contains the current measurement value in a vendor-specific, or configuration-adjusted engineering unit, and the belonging status in AUTO MODE. The function block parameter OUT contains the value and status set by an operator in MAN MODE. Access = RW (manual) Default value = — Release = 1.0	—
27	PV_SCALE Data type = Float Size = 8	Conversion of the process variable into percent using the high and low scale values. Access = RW (OOS) Default value = — Release = 1.0	—
28	OUT_SCALE Data type = DS-36 Size = 11	Scale of the process variable. Access = RW (OOS) Default value = AI1 - 1318, AI2 - 1001, AI3 - 1100, AI4 - 1351 Release = 1.0	—
29	LIN_TYPE Data type = Enumerated8 Size = 1	Type of linearization. Access = RW (OOS) Default value = AI1 - 0, AI2 - 0, AI3 - 0, AI4 - 0 Release = 1.0	0 = No linearization 10 = Square root
30	CHANNEL Data type = Enumerated16 Size = 2	Reference to the active transducer block which provides the measurement value to the function block. Access = RW (OOS) Default value = Default Channel Assignment Release = 1.0	See Analog Input function block channels
31	Reserved		
32	PV_FTIME Data type = Float Size = 4	Filter time for the process variable. Access = RW (OOS) Default value = 0 Release = 1.0	—

Index	Parameter name	Definition	Enumerated list of values
33	FSAFE_ TYPE Data type = Enumerated8 Size = 1	Defines the reaction of the device if a fault is detected. The calculated ACTUAL MODE remains in AUTO. Access = RW (OOS) Default value = 1 Release = 1.0	0 = value FSAFE_VALUE is used as OUT 1 = use last stored valid OUT value Status = UNCERTAIN-last usable value (if no valid value is available UNCERTAIN-initial value shall be used; OUT value is initial value in this case) 2 = OUT has the wrong calculated value and status Status - BAD
34	FSAFE_VALUE Data type = Float Size = 4	Default value for the OUT parameter if a sensor or sensor electronic fault is detected. The unit of this parameter is the same as the OUT. Access = RW (OOS) Default value = — Release = 1.0	—
35	ALARM_HYS Data type = Float Size = 4	Hysteresis Access = RW (OOS) Default value = 0.5% of range Release = 1.0	—
36	Reserved		
37	HI_HI_LIM Data type = Float Size = 4	Value for upper limit of alarms. Access = RW (OOS) Default value = max value Release = 1.0	—
38	Reserved		
39	HI_LIM Data type = Float Size = 4	Value for upper limit of warnings Access = RW (OOS) Default value = max value Release = 1.0	—
40	Reserved		
41	LO_LIM Data type = Float Size = 4	Value for lower limit of warnings. Access = RW (OOS) Default value = min value Release = 1.0	—
42	Reserved		
43	LO_LO_LIM Data type = Float Size = 4	Value for the lower limit of alarms. Access = RW (OOS) Default value = min value Release = 1.0	—

Index	Parameter name	Definition	Enumerated list of values
44-45	Reserved		
46	HI_HI_ALM Data type = DS-39 Size = 16	State of the upper limit of alarms. Access = R Default value = 0 Release = 1.0	—
47	HI_ALM Data type = DS-39 Size = 16	State of the upper limit of warnings. Access = R Default value = 0 Release = 1.0	—
48	LO_ALM Data type = DS-39 Size = 16	State of the lower limit of warnings. Access = R Default value = 0 Release = 1.0	—
49	LO_LO_ALM Data type = DS-39 Size = 16	State of the lower limit of alarms. Access = R Default value = 0 Release = 1.0	—
50	SIMULATE Data type = DS-50 Size = 6	For commissioning and test purposes, the input value from the transducer block into the Analog Input function block AI-FB can be modified. In other words, the transducer and AI-FB will be disconnected. Access = RW Default value = Disable Release = 1.0	—
51	OUT_UNIT_TEXT Data type = Octet String Size = 16	If a specific OUT parameter unit is not in the code list, the user can write the specific text into this parameter. The unit code is then equal to the textual unit definition. Access = RW (OOS) Default value = — Release = 1.0	—
52-60	Reserved		

Index	Parameter name	Definition	Enumerated list of values
61	PV_UNIT Data type = Unsigned16 Size = 2	Unit of process variable from the transducer block. Access = R Default value = — Release = 1.0	MASS_FLOW_UNITS VOLUME_FLOW_UNITS GSV_FLOW_UNITS ENERGY_UNITS TEMPERATURE_UNITS DENSITY_UNITS FLOW_VELOCITY_UNITS CM_CONC_UNITS % NO_UNITS

Analog Input function block View_1

Index	Parameter	Size
1	ST_REV	2
6	MODE_BLK	3
7	ALARM_SUM	8
10	OUT	5
Overall sum of bytes in View-Object		18

A.9 Discrete Output block parameters (slot 11)

Standard PROFIBUS-PA block parameters

Index	Parameter name	Definition	Enumerated list of values
16	BLOCK_OBJECT Data type = DS-32 Size = 20	The first parameter of every block. It contains the characteristics of the block, e.g., block type and profile number. Access = R Default value = — Release = 1.0	—
17	ST_REV Data type = Unsigned16 Size = 2	A block has static block parameters that are not changed by the process. Values are assigned to this parameter during the configuration of optimization. ST_REV is incremented by at least one if one static parameter in the corresponding block has been modified. Access = R Default value = 0 Release = 1.0	—

Index	Parameter name	Definition	Enumerated list of values
18	TAG_DESC Data type = Octet String Size = 32	A user-supplied description of the block. Every block can be assigned a textual tag description. Access = RW Default value = ' ' Release = 1.0	—
19	STRATEGY Data type = Unsigned16 Size = 2	A user-specified value used in configuration or diagnostics as a key in sorting block information. Access = RW Default value = 0 Release = 1.0	—
20	ALERT_KEY Data type = Unsigned8 Size = 1	A user-assigned value that can be used in sorting alarms or events generated by a block Access = RW Default value = 0 Release = 1.0	—
21	TARGET_MODE Data type = Enumerated8 Size = 1	Indicates which mode will be used for the block. Access = RW Default value = block spec. Release = 1.0	0x08 = AUTO 0x10 = MANUAL 0x80 = OOS 0x02 = RCAS
22	MODE_BLK Data type = DS-37 Size = 3	A structured parameter composed of the actual mode, the normal mode, and the permitted mode. Access = R Default value = MODE_AUTO, MODE_AUTO | MODE_OOS | MODE_MAN | MODE_RCAS, MODE_AUTO Release = 1.0	—
23	ALARM_SUM Data type = DS-42 Size = 8	Summarizes the status of up to 16 block alarms. For each alarm, the current states, unacknowledged states, unreported states, and disabled states are maintained. Access = R Default value = 0,0,0,0 Release = 1.0	—

Index	Parameter name	Definition	Enumerated list of values
24	BATCH Data type = DS-67 Size = 10	Used in batch applications according to IEC 61512-1. Only function blocks carry this parameter. There is no algorithm necessary within a function block. The batch parameter is necessary in a distributed fieldbus system to identify used and available channels, in addition to identify the current batch in case of alerts. Access = RW Default value = 0,0,0,0 Release = 1.0	—

Discrete Output block parameters

Index	Parameter name	Definition	Enumerated list of values
25	SP_D Data type = 102 Size = 2	Set point of the function block used in MODE AUTO. Access = RW Default value = — Release = 1.0	—
26	OUT_D Data type = 102 Size = 2	This parameter is the process variable of the Discrete Output block in AUTO and RCas mode and is the value specified by the operator/engineer in MAN and LO. In case of BAD status, the valve goes to the position specified in ACTUATOR_ACTION. Access = RW (manual) Default value = — Release = 1.0	—
27	Reserved		
28	READBACK_D Data type = 102 Size = 2	Can be the actual position of the final control element and its sensors. Access = R Default value = — Release = 1.0	—
29	Reserved		

Index	Parameter name	Definition	Enumerated list of values
30	RCAS_IN_D Data type = 102 Size = 2	Target set point and status provided by a supervisory host to the Discrete Output block used in MODE RCAS. Access = RW Default value = — Release = 1.0	—
31-32	Reserved		
33	IN_CHANNEL Data type = Enumerated16 Size = 2	References the active transducer block and its parameter, which provides the actual position of the final control element (FEEDBACK_VALUE_D). Access = RW (OOS) Default value = Default Channels Release = 1.0	See Discrete Output function block channels
34	INVERT Data type = Enumerated8 Size = 1	Indicates whether the SP_D should be logically inverted before writing to OUT_D in mode AUTO or RCAS. Access = RW (OOS) Default value = 0 Release = 1.0	0 = Not inverted 1 = Inverted
35	FSAFE_TIME Data type = Float Size = 4	Time in seconds from detection of failure of the actual used set point (SP_D = BAD or RCAS_IN <> GOOD) to the action of the block if the condition still exists. Access = RW (OOS) Default value = 0 Release = 1.0	—
36	FSAFE_TYPE Data type = Unsigned8 Size = 1	Defines the reaction of the device if a failure of the actual used set point is still detected after FSAFE_TIME, or if the status of the actual used set point is Initiate Fail Safe. Access = RW (OOS) Default value = — Release = 1.0	0 = Fail safe value is used as a setpoint 1 = Use last valid setpoint 2 = Actuator goes to fail safe position
37	FSAFE_VAL_D Data type = Unsigned8 Size = 1	OUT_D transfers this value if FSAFE_TYPE = 0 and FSAFE is activated. Access = RW (OOS) Default value = 0 Release = 1.0	—

Index	Parameter name	Definition	Enumerated list of values
38	RCAS_OUT_D Data type = 102 Size = 2	Function block set point and status provided to a supervisory host for monitoring / back calculation and to allow action to be taken under limited conditions or mode change. Access = R Default value = — Release = 1.0	—
39	Reserved		
40	SIMULATE_D Data type = DS-51 Size = 3	For commissioning and maintenance reasons, it is possible to simulate the READBACK by defining the value and the status. This means that the transducer block and the DO-FB will be disconnected. Access = RW Default value = Disabled Release = 1.0	—
41-48	Reserved		
49	CHECK_BACK Data type = OctetString Size = 3	Detailed information of the device, bit-wise coded. Access = R Default value = — Release = 1.0	—
50	CHECK_BACK_MASK Data type = OctetString Size = 3	Definition of supported CHECK_BACK information bits. Access = R Default value = — Release = 1.0	0 = Not supported 1 = Supported
51	OUT_CHANNEL Data type = Unsigned16 Size = 2	Access = RW (OOS) Default value = Default Channels Release = 1.0	See Discrete Output function block channels
52-60	Reserved		

Discrete Output function block View_1

Index	Parameter	Size
1	ST_REV	2
6	MODE_BLK	3
7	ALARM_SUM	8
9	SP_D	2

Index	Parameter	Size
10	OUT_D	2
14	RCAS_IN_D	2
22	RCAS_OUT_D	2
33	CHECK_BACK	3
Overall sum of bytes in View-Object		24

A.10 Discrete Input block parameters (slot 12)

Standard PROFIBUS-PA block parameters

Index	Parameter name	Definition	Enumerated list of values
16	BLOCK_OBJECT Data type = DS-32 Size = 20	The first parameter of every block. It contains the characteristics of the block, e.g., block type and profile number. Access = R Default value = — Release = 1.0	—
17	ST_REV Data type = Unsigned16 Size = 2	A block has static block parameters that are not changed by the process. Values are assigned to this parameter during the configuration of optimization. ST_REV is incremented by at least one if one static parameter in the corresponding block has been modified. Access = R Default value = 0 Release = 1.0	—
18	TAG_DESC Data type = OctetString Size = 32	A user-supplied description of the block. Every block can be assigned a textual tag description. Access = RW Default value = ' ' Release = 1.0	—
19	STRATEGY Data type = Unsigned16 Size = 2	A user-specified value used in configuration or diagnostics as a key in sorting block information. Access = RW Default value = 0 Release = 1.0	—

Index	Parameter name	Definition	Enumerated list of values
20	ALERT_KEY Data type = Unsigned8 Size = 1	A user-assigned value that can be used in sorting alarms or events generated by a block Access = RW Default value = 0 Release = 1.0	—
21	TARGET_MODE Data type = Enumerated8 Size = 1	Indicates which mode will be used for the block. Access = RW Default value = block spec. Release = 1.0	0x08 = AUTO 0x10 = MANUAL 0x80 = OOS
22	MODE_BLK Data type = DS-37 Size = 3	A structured parameter composed of the actual mode, the normal mode, and the permitted mode. Access = R Default value = MODE_AUTO, MODE_AUTO, MODE_OOS, MODE_AUTO Release = 1.0	—
23	ALARM_SUM Data type = DS-42 Size = 8	Summarizes the status of up to 16 block alarms. For each alarm, the current states, unacknowledged states, unreported states, and disabled states are maintained. Access = R Default value = 0,0,0,0 Release = 1.0	—
24	BATCH Data type = DS-67 Size = 10	Used in batch applications according to IEC 61512-1. Only function blocks carry this parameter. There is no algorithm necessary within a function block. The batch parameter is necessary in a distributed fieldbus system to identify used and available channels, in addition to identify the current batch in case of alerts. Access = RW Default value = 0,0,0,0 Release = 1.0	—

Discrete Input block parameters

Index	Parameter name	Definition	Enumerated list of values
25	Reserved		
26	OUT_D Data type = 102 Size = 2	The output of the function block. The value is specified by the operator in MODE Man. Access = RW (manual) Default value = — Release = 1.0	—
27-29	Reserved		
30	CHANNEL Data type = Unsigned16 Size = 2	The active transducer block that provides the measurement value to the function block. Access = RW (OOS) Default value = Default Channel Release = 1.0	See Discrete Input function block channels
31	INVERT Data type = Unsigned8 Size = 1	Indicates whether the input value of the PV_D should be logically inverted before it is stored in the OUT_D. Access = RW (OOS) Default value = 0 Release = 1.0	0 = Not inverted 1 = Inverted
32-35	Reserved		
36	FSAFE_TYPE Data type = Unsigned8 Size = 1	The reaction of the device if a fault is detected. Access = RW (OOS) Default value = — Release = 1.0	0 = Value FSAFE_VAL_D is used as OUT_D Status = UNCERTAIN-substitute value 1 = Use of last stored valid OUT_D value Status = UNCERTAIN-last usable value (if no valid value is available UNCERTAIN-Initial Value shall be used) 2 = OUT_D has the wrong calculated value and Status = BAD
37	FSAFE_VAL_D Data type = Unsigned8 Size = 1	Default value for the OUT_D parameter if a sensor or sensor electronic fault is detected. Access = RW (OOS) Default value = 0 Release = 1.0	—
38-39	Reserved		

Index	Parameter name	Definition	Enumerated list of values
40	SIMULATE_D Data type = DS-51 Size = 3	For commissioning and test purposes, the input value from the transducer block in the Discrete Input function block DI-FB can be modified. That means that the transducer and DI-FB will be disconnected. Access = RW Default value = Disabled Release = 1.0	—
41-50	Reserved		

Discrete Input function block View_1

Index	Parameter	Size
1	ST_REV	2
6	MODE_BLK	3
7	ALARM_SUM	8
10	OUT_D	2
Overall sum of bytes in View- Object		15

A.11 PROFIBUS-PA channels

A.11.1 Analog Input function block channels

Channel number	Channel description	Transducer block value reference	Valid unit codes or transducer block units reference	Release
0x0D15	Mass Flow	MEASUREMENT TB → MASS FLOW	MASS FLOW UNITS	1.0
0x0D1D	Temperature	MEASUREMENT TB → TEMPERATURE	TEMPERATURE_UNITS	1.0
0x0D19	Density	MEASUREMENT TB → DENSITY	DENSITY_UNITS	1.0
0x0D11	Volume Flow	MEASUREMENT TB → VOLUME_FLOW	VOLUME_FLOW_UNITS	1.0
0x0D91	Drive Gain	MEASUREMENT TB → DRIVE_GAIN	1342 = %	1.0
0x0DAC	Flow Velocity	MEASUREMENT TB → FLOW_VELOCITY	FLOW_VELOCITY_UNIT	1.0
0x1108	API Corr Density	API → API_CORR_DENSITY	DENSITY_UNITS	1.0
0x1109	API Corr Vol Flow	API → API_CORR_VOL_FLOW	VOLUME_FLOW_UNITS	1.0

Channel number	Channel description	Transducer block value reference	Valid unit codes or transducer block units reference	Release
0x110A	API Avg Corr Density	API → API_AVG_CORR_DENSITY	DENSITY_UNITS	1.0
0x110B	API Avg Corr Temp	API → API_AVG_CORR_TEMP	TEMPERATURE_UNITS	1.0
0x110C	API CTL	API → API_CTPL	1997 = No Units	1.0
0x1208	CM Ref Density	CM → CM_REF_DENS	DENSITY_UNITS	1.0
0x1209	CM Specific Gravity	CM → CM_SPEC_GRAV	1997 = No Units	1.0
0x120A	CM Std Vol Flow	CM → CM_STD_VOL_FLOW	VOLUME_FLOW_UNITS	1.0
0x120B	CM Net Mass Flow	CM → CM_NET_MASS_FLOW	MASS_FLOW_UNITS	1.0
0x120C	CM Net Vol Flow	CM → CM_NET_VOL_FLOW	VOLUME_FLOW_UNITS	1.0
0x120D	CM Conc	CM → CM_CONC	CM → CM_ACT_CUR_CONC_UNITS	1.0
0x0D53	Std Gas Volume Flow	MEASUREMENT TB → GSV_VOL_FLOW	GSV_FLOW_UNITS	1.0
0x0D8F	Phase Flow Severity	MEASUREMENT TB → PHGN_FLOW_SEVERITY	1997 = No Units	1.0
0x130E	APM Net Flow Oil At Line	APM TB → NET_OIL_FLOW_LINE	VOLUME_FLOW_UNITS	1.0
0x1312	APM Watercut At Line	APM TB → WATERCUT_LINE	1342 = %	1.0
0x1310	APM Net Water Flow At Line	APM TB→ WATER_FLOW_LINE	VOLUME_FLOW_UNITS	1.0
0x130F	APM Net Oil Flow At Ref	APM TB → NET_OIL_FLOW_REF	VOLUME_FLOW_UNITS	1.0
0x1313	APM Watercut At Ref	APM TB → WATERCUT_REF	1342 = %	1.0
0x1311	APM Net Flow Water At Ref	APM TB → NET_WATER_FLOW_REF	VOLUME_FLOW_UNITS	1.0
0x1308	APM Gas Void Fraction	APM TB → GAS_VOID_FRACTION	1342 = %	1.0
0x1309	APM Unremediated mass flow	APM TB → UNREMEDIATED_MASS_FLOW	MASS_FLOW_UNITS	1.0
0x130B	APM Unremediated density	APM TB → UNREMEDIATED_DENSITY	DENSITY_UNITS	1.0
0x130A	APM Unremediated volume flow	APM TB → UNREMEDIATED_VOLUME FLOW	VOLUME_FLOW_UNITS	1.0
0x1317	TMR Liquid Flow	APM TB → TMR LIQUID MASS FLOW	MASS_FLOW_UNITS	1.0
0x0DC0	Energy Flow	Measurement TB → ENERGY_FLOW	ENERGY_UNITS	1.0

Related information

Measurement parameters (slot 13)
API process variables block parameters (slot 17)
Concentration measurement block parameters (slot 18)
Advanced Phase Measurement block parameters (slot 19)

A.11.2 Analog Output function block channels

Channel number	Channel description	Transducer block value reference	Valid unit codes or transducer block units reference	Release
0x0D5C	Pressure	MEASUREMENT TB → PRESSURE_COMP	PRESSURE_UNITS	1.0
0x0D62	Temperature	MEASUREMENT TB → TEMPERATURE_COMP	TEMPERATURE_UNIT	1.0
0x1328	Watercut	APM TB → EXTR_WATERCUT	1342 = %	1.0
0x0D44	Gas Density	MEASUREMENT TB → EXT_GAS_DENSITY	DENSITY_UNITS	1.0
0X0DC2	Calorific Value	Measurement TB → CALORIFIC_VALUE	CALORIFIC_VALUE_UNITS	1.0

Related information

Measurement parameters (slot 13)

A.11.3 Discrete Input function block channels

Channel	Description	Transducer Block Value Reference
0x0D35	Actual Flow Direction	**MEASUREMENT TB → ACTUAL_FLOW_DIRECTION**
0x0D7D	Zero In Progress	**MEASUREMENT TB → ZERO_IN_PROGRESS**
0x0E2C	Analog Output Fault	**DEVICE → ANALOG_OUTPUT_FAULT**
0x1011	Meter Verification Failed	**MV → FRF_MV_FAILED**

Related information

Measurement parameters (slot 13)
Device slot parameters (slot 14)
Smart Meter Verification block parameters (slot 16)

A.11.4 Discrete Output function block channels

Channel number	Channel description	Transducer block value reference	Valid unit codes or transducer block units reference	Release
0x0D7B	Start Sensor Zero	MEASURMENT TB → ZERO_CAL	—	1.0
0x122C	Increment CM Curve	CM → CM_INC_CURVE	—	1.0
0x1009	Start Meter Verification in Continuous Measurement Mode	MV → FRF_ONLINE_MV_START	—	1.0
0x0F41	Reset All Process Totals	TOTAL_INV → ALL_TOT_RESET	—	1.0
0x0F42	Start/Stop All Totals	TOTAL_INV → START_STOP_ALL_TOTALS	—	1.0
0x0F10	Reset Config Total 1	TOTAL_INV → CFG_TOT1_RESET	—	1.0
0x0F18	Reset Config Total 2	TOTAL_INV → CFG_TOT2_RESET	—	1.0
0x0F20	Reset Config Total 3	TOTAL_INV → CFG_TOT3_RESET	—	1.0
0x0F28	Reset Config Total 4	TOTAL_INV → CFG_TOT4_RESET	—	1.0
0x0F30	Reset Config Total 5	TOTAL_INV → CFG_TOT5_RESET	—	1.0
0x0F38	Reset Config Total 6	TOTAL_INV → CFG_TOT6_RESET	—	1.0
0x0F40	Reset Config Total 7	TOTAL_INV → CFG_TOT7_RESET	—	1.0

Related information

Measurement parameters (slot 13)
Concentration measurement block parameters (slot 18)
Smart Meter Verification block parameters (slot 16)
Totalizer block parameters (slots 4, 6, 7, and 8)

A.11.5 Totalizer function block channels

Channel number	Channel description	Transducer block value reference	Valid unit codes or transducer block units reference	Release
0x0D15	Mass Flow	MEASUREMENT TB → MASS_FLOW	MASS_FLOW_UNITS	1.0
0x0D11	Volume Flow	MEASUREMENT TB → VOLUME_FLOW	VOLUME_FLOW_UNITS	1.0
0x1109	API Corr Vol Flow	API → API_CORR_VOL_FLOW	VOLUME_FLOW_UNITS	1.0
0x120A	CM Std Vol Flow	CM → CM_STD_VOL_FLOW	VOLUME_FLOW_UNITS	1.0
0x120B	CM Net Mass Flow	CM → CM_NET_MASS_FLOW	MASS_FLOW_UNITS	1.0
0x120C	CM Net Vol Flow	CM → CM_NET_VOL_FLOW	VOLUME_FLOW_UNITS	1.0
0x0D53	Std Gas Volume Flow	MEASUREMENT TB → GSV_VOL_FLOW	GSV_FLOW_UNITS	1.0
0x130E	APM: Net Flow Oil At Line	APM TB → NET_OIL_FLOW_LINE	VOLUME_FLOW_UNITS	1.0
0x1310	APM: Net Flow Water At Line	APM TB → WATER_FLOW_LINE	VOLUME_FLOW_UNITS	1.0
0x130F	APM: Net Flow Oil At Ref	APM TB → NET_OIL_FLOW_REF	VOLUME_FLOW_UNITS	1.0
0x1311	APM: Net Flow Water At Ref	APM TB → NET_WATER_FLOW_REF	VOLUME_FLOW_UNITS	1.0
0x1309	APM: Unremediated Mass Flow	APM TB → UNREMEDIATED_MASS_FLOW	VOLUME_FLOW_UNITS	1.0
0x130A	APM: Unremediated Vol Flow	APM TB → UNREMEDIATED_VOLUME FLOW	VOLUME_FLOW_UNITS	1.0
0x1317	TMR : Liquid Mass Flow	APM TB → TMR LIQUID MASS FLOW	MASS_FLOW_UNITS	1.0
0x0F09	Internal Totalizer 1	DEV_TOT_INV TB → CFG_TOT1	DEV_TOT_INV TB → CFG_TOT1_UNIT	1.0
0x0F11	Internal Totalizer 2	DEV_TOT_INV TB → CFG_TOT2	DEV_TOT_INV TB → CFG_TOT2_UNIT	1.0
0x0F19	Internal Totalizer 3	DEV_TOT_INV TB → CFG_TOT3	DEV_TOT_INV TB → CFG_TOT3_UNIT	1.0
0x0F21	Internal Totalizer 4	DEV_TOT_INV TB → CFG_TOT4	DEV_TOT_INV TB → CFG_TOT4_UNIT	1.0
0x0F29	Internal Totalizer 5	DEV_TOT_INV TB → CFG_TOT5	DEV_TOT_INV TB → CFG_TOT5_UNIT	1.0
0x0F31	Internal Totalizer 6	DEV_TOT_INV TB → CFG_TOT6	DEV_TOT_INV TB → CFG_TOT6_UNIT	1.0

Channel number	Channel description	Transducer block value reference	Valid unit codes or transducer block units reference	Release
0x0F39	Internal Totalizer 7	DEV_TOT_INV TB → CFG_TOT7	DEV_TOT_INV TB → CFG_TOT7_UNIT	1.0
0x0F43	Internal Inventory 1	DEV_TOT_INV TB → CFG_INV1	DEV_TOT_INV TB → CFG_INV1_UNIT	1.0
0x0F4A	Internal Inventory 2	DEV_TOT_INV TB → CFG_INV2	DEV_TOT_INV TB → CFG_INV2_UNIT	1.0
0x0F51	Internal Inventory 3	DEV_TOT_INV TB → CFG_INV3	DEV_TOT_INV TB → CFG_INV3_UNIT	1.0
0x0F58	Internal Inventory 4	DEV_TOT_INV TB → CFG_INV4	DEV_TOT_INV TB → CFG_INV4_UNIT	1.0
0x0F5F	Internal Inventory 5	DEV_TOT_INV TB → CFG_INV5	DEV_TOT_INV TB → CFG_INV5_UNIT	1.0
0x0F66	Internal Inventory 6	DEV_TOT_INV TB → CFG_INV6	DEV_TOT_INV TB → CFG_INV6_UNIT	1.0
0x0F6D	Internal Inventory 7	DEV_TOT_INV TB → CFG_INV7	DEV_TOT_INV TB → CFG_INV7_UNIT	1.0

Related information

Totalizer block parameters (slots 4, 6, 7, and 8)
Measurement parameters (slot 13)
API process variables block parameters (slot 17)
Concentration measurement block parameters (slot 18)
Advanced Phase Measurement block parameters (slot 19)

A.11.6 Default channel assignments

Block	Channel
AI1	Mass Flow
AI2	Temperature
AI3	Density
AI4	Volume Flow
AO1	Temperature
AO2	Pressure
TOT1	Mass Flow
TOT2	Mass Flow
TOT3	Volume Flow
TOT4	Volume Flow
DI	Analog Output Fault

Block	Channel
DO	Start Sensor Zero

A.12 Measurement parameters (slot 13)

Standard PROFIBUS-PA block parameters 0 through 7

See PROFIBUS-PA parameters 0 through 7.

Standard flow parameters

Index	Parameter name	Definition	Enumerated list of values
8	CALIBR_FACTOR Data type = Float Size = 4	Gain compensation value for the flow sensor, so that flow indication is as accurate as specified by the manufacturer (sensor specific, shall not be downloaded). Access = RW Default value = 1.0f Release = 1.0	0.0f < x ≤ 99999.0f
9	LOW_FLOW_CUTOFF Data type = Float Size = 4	The process variable is set to zero if the absolute value of the process variable is less than LOW_FLOW_CUTOFF. The value can have a hysteresis. LOW_FLOW_CUTOFF defines the lower switching point in this case. The unit of LOW_FLOW_CUTOFF is the unit of the process variable. Access = RW Default value = 0.0f Release = 1.0	0 ≤ x ≤ MMI_MFLOW_HIGH_LIMIT
10	MEASUREMENT_MODE Data type = Enumerated8 Size = 1	The mode of flow measurement, either unidirectional or bidirectional measurement. Access = RW Default value = — Release = 1.0	0 = Unidirectional 1 = Bidirectional
11	FLOW_DIRECTION Data type = Enumerated8 Size = 1	Assigns an arbitrary positive or negative sign to the measured PV value. Access = RW Default value = 0 Release = 1.0	0 = Forward 1 = Backward

Index	Parameter name	Definition	Enumerated list of values
12	ZERO_POINT Data type = Float Size = 4	Offset compensation value for the flow sensor so that true zero flow value can be indicated during no flow condition (sensor specific, shall not be downloaded). Access = RW Default value = — Release = 1.0	-5.0 ≤ x ≤ 5.0
13	ZERO_POINT_ADJUST Data type = Enumerated8 Size = 1	Initiates a device specific adjustment cycle that determines the true ZERO_POINT value during no-flow process conditions. The result is placed in ZERO_POINT. Access = RW Default value = 0 Release = 1.0	0 = Cancel 1 = Execute
14	ZERO_POINT_UNIT Data type = Enumerated16 Size = 2	Selected unit code for ZERO_POINT parameter. Access = RW Default value = — Release = 1.0	1062 = mm/s
15	NOMINAL_SIZE Data type = Float Size = 4	Ideal size of the measuring pipe, or process pipe size for insertion type flow transmitter. Access = RW Default value = — Release = 1.0	—
16	NOMINAL_SIZE_UNITS Data type = Enumerated16 Size = 2	Selects the unit for NOMINAL_SIZE parameter. Access = RW Default value = 1013 Release = 1.0	1013 = mm 1019 = inch
17	VOLUME_FLOW Data type = 101 Size = 5	Measuring value, measured volume flow value. Access = R Default value = — Release = 1.0	VFLOW_LOW_LIMIT ≤ x ≤ VFLOW_HIGH_LIMIT

Index	Parameter name	Definition	Enumerated list of values
18	VOLUME_FLOW_UNITS Data type = Enumerated16 Size = 2	Selected unit code for VOLUME_FLOW, VOLUME_FLOW_LO_LIMIT, and VOLUME_FLOW_HI_LIMIT parameters. Access = RW Default value = 1351 Release = 1.0	See VOLUME_FLOW_UNITS
19	VOLUME_FLOW_LO_LIMIT Data type = Float Size = 4	Absolute value of the lower range value (volume flow) of the sensor. Access = RW Default value = — Release = 1.0	—
20	VOLUME_FLOW_HI_LIMIT Data type = Float Size = 4	Absolute value of the upper range value (volume flow) of the sensor. Access = RW Default value = — Release = 1.0	—
21	MASS_FLOW Data type = 101 Size = 5	Measuring value, measured mass flow. Access = R Default value = — Release = 1.0	MMI_MFLOW_LOW_LIMIT ≤ x ≤ MMI_MFLOW_HIGH_LIMIT
22	MASS_FLOW_UNITS Data type = Enumerated16 Size = 2	Selected unit code for MASS FLOW, MASS_FLOW_HI_LIMIT, and MASS_FLOW_LO_LIMIT parameters. Access = RW Default value = 1318 = g/s Release = 1.0	See MASS_FLOW_UNITS
23	MASS_FLOW_LO_LIMIT Data type = Float Size = 4	' Absolute value of lower range value (mass flow) of the sensor. Access = RW Default value = — Release = 1.0	—
24	MASS_FLOW_HI_LIMIT Data type = Float Size = 4	Absolute value of the upper range value (mass flow) of the sensor. Access = RW Default value = — Release = 1.0	—

Index	Parameter name	Definition	Enumerated list of values
25	DENSITY Data type = 101 Size = 5	Measuring value, measured medium density. Access = R Default value = — Release = 1.0	DENSITY_LOW_LIMIT ≤ x ≤ DENSITY_HIGH_LIMIT
26	DENSITY_UNITS Data type = Enumerated16 Size = 2	Selected unit code for DENSITY, DENSITY_HI_LIMIT, and DENSITY_LO_LIMIT parameters Access = RW Default value = 1100 Release = 1.0	See DENSITY_UNITS
27	DENSITY_LO_LIMIT Data type = Float Size = 4	Lower range value (density) of the sensor. Access = RW Default value = — Release = 1.0	—
28	DENSITY_HI_LIMIT Data type = Float Size = 4	Upper range value (density) of the sensor. Access = RW Default value = — Release = 1.0	—
29	TEMPERATURE Data type = 101 Size = 5	Measured sensor temperature. Access = R Default value = — Release = 1.0	TEMP_LOW_LIMIT ≤ x ≤ TEMP_HIGH_LIMIT
30	TEMPERATURE_UNITS Data type = Enumerated16 Size = 2	Selected unit code for TEMPERATURE, TEMPERATURE_HI_LIMIT, and TEMPERATURE_LO_LIMIT parameters. Access = RW Default value = 1001 Release = 1.0	1000 = K 1001 = °C 1002 = °F 1003 = °R
31	TEMPERATURE_LO_LIMIT Data type = Float Size = 4	Lower range value (temperature) of the sensor. Access = RW Default value = — Release = 1.0	—

Index	Parameter name	Definition	Enumerated list of values
32	TEMPERATURE_HI_LIMIT Data type = Float Size = 4	Upper range value (temperature) of the sensor. Access = RW Default value = — Release = 1.0	—
33 - 52	Reserved		

VOLUME_FLOW_UNITS

1347 = m3/s
1348 = m3/min
1349 = m3/h
1350 = m3/d
1351 = L/s
1352 = L/min
1353 = L/h
1355 = ML/d
1356 = ft3/s
1357 = ft3/min
1358 = ft3/h
1359 = ft³/d
1362 = gal/s
1363 = gal/min
1364 = gal/h
1365 = gal/d
1366 = Mgal/d
1367 = ImpGal/s
1368 = ImpGal/min
1369 = ImpGal/h
1370 = Impgal/d
1371 = bbl/s
1372 = bbl/min
1373 = bbl/h
1374 = bbl/d
1645 = bbl(fed)/d
1644 = bbl(fed)/h
1643 = bbl(fed)/min
1642 = bbl(fed)/s
1999 = special

MASS_FLOW_UNITS

1318 = g/s
1319 = g/min
1320 = g/h
1322 = kg/s
1323 = kg/min
1324 = kg/h
1325 = kg/d
1327 = t/min
1328 = t/h
1329 = t/d
1330 = lb/s
1331 = lb/min
1332 = lb/h
1333 = lb/d
1335 = STon/min
1336 = STon/h
1337 = Ston/d
1340 = LTon/h
1341 = LTon/d
1999 = special

DENSITY_UNITS

1097 = kg/m3
1100 = g/cm3
1103 = kg/L
1104 = g/ml
1105 = g/L
1106 = lb/in3
1107 = lb/ft3
1108 = lb/gal
1109 = STon/yd³
1113 = °API
1114 = SGU

Mass flow configuration

Index	Parameter name	Definition	Enumerated list of values
53	ACTUAL_FLOW_DIRECTION Data type = 102 Size = 2	Flow direction of flow Access = R Default value = 0 Release = 1.0	0 = Forward/Zero Flow 1 = Reverse Flow

Index	Parameter name	Definition	Enumerated list of values
54	MFLOW_MASS_FACTOR Data type = Float Size = 4	Mass Rate Factor Access = RW Default value = 1.0f Release = 1.0	0.8 ≤ x ≤ 1.2
55	FLOW_DAMPING Data type = Float Size = 4	Flow rate (mass and volume) internal damping (seconds) Access = RW Default value = 0.64f Release = 1.0	0.0 ≤ x ≤ 60.0 (rounded to 60 if x > 60)
56	MFLOW_SPL_UNIT_STR Data type = Visible String Size = 8	Special unit mass flow text Access = RW Default value = "NONE" Release = 1.0	Any 8 characters
57	MFLOW_TOTINV_SPL_UNIT_STR Data type = Visible String Size = 8	Special unit mass total text Access = RW Default value = "NONE" Release = 1.0	Any 8 characters
58	MFLOW_SPL_UNIT_BASE Data type = Enumerated16 Size = 2	Base mass unit for special mass unit Access = RW Default value = 1089 Release = 1.0	1089 = g 1088 = kg 1092 = t 1094 = lb 1095 = STon 1096 = LTon
59	MFLOW_SPL_UNIT_TIME Data type = Enumerated16 Size = 2	Base time unit for special mass unit Access = RW Default value = 1054 Release = 1.0	1054 = s 1058 = min 1059 = h 1060 = d
60	MFLOW_SPL_UNIT_CON Data type = Float Size = 4	Special mass unit conversion factor. Access = RW Default value = 1.0f Release = 1.0	x > 0.0
61	MMI_MFLOW_LOW_LIMIT Data type = Float Size = 4	Low mass flow limit of sensor. Access = R Default value = -200.0f Release = 1.0	—
62	MMI_MFLOW_HIGH_LIMIT Data type = Float Size = 4	High mass flow limit of sensor. Access = R Default value = 200.0f Release = 1.0	—

Density configuration

Index	Parameter name	Definition	Enumerated list of values
63	DENSITY_M_FACTOR Data type = Float Size = 4	Density factor Access = RW Default value = 1.0f Release = 1.0	0.8 ≤ x ≤ 1.2
64	DENSITY_LOW_CUTOFF Data type = Float Size = 4	Density cutoff for internal totalizers Access = RW Default value = 0.2 Release = 1.0	0.0 ≤ x ≤ 0.5 (g/cm3)
65	DENSITY_DAMPING Data type = Float Size = 4	Density internal damping (seconds) Access = RW Default value = 1.28 Release = 1.0	0.0 ≤ x ≤ 60.0 (rounded to 60 if x > 60)
66	MMI_DENSITY_LOW_LIMIT Data type = Float Size = 4	Low density limit of sensor (g/cc) Access = R Default value = 0.0f Release = 1.0	—
67	MMI_DENSITY_HIGH_LIMIT Data type = Float Size = 4	High density limit of sensor (g/cc) Access = R Default value = 10.0f Release = 1.0	—
68	EXT_GAS_DENSITY Data type = 101 Size = 5	Gas density from external device for GSV calculations Access = RW Default value = — Release = 1.0	—

Volume flow configuration

Index	Parameter name	Definition	Enumerated list of values
69	VFLOW_M_FACTOR Data type = Float Size = 4	Volume rate factor Access = RW Default value = 1.0f Release = 1.0	0.8 ≤ x ≤ 1.2
70	VFLOW_LOW_CUTOFF Data type = Float Size = 4	Volume flow cutoff for internal totalizers Access = RW Default value = 0.0f Release = 1.0	0 ≤ x ≤ VFLOW_HIGH_LIMIT

Index	Parameter name	Definition	Enumerated list of values
71	VFLOW_SPL_UNIT_STR Data type = Visible String Size = 8	Special unit volume flow text Access = RW Default value = “NONE” Release = 1.0	Any 8 characters
72	VFLOW_TOTINV_SPL_UNIT_STR Data type = Visible String Size = 8	Special unit volume total text Access = RW Default value = “NONE” Release = 1.0	Any 8 characters
73	VFLOW_SPL_UNIT_BASE Data type = Enumerated16 Size = 2	Base volume unit for special volume unit Access = RW Default value = 1038 Release = 1.0	1048 = gallon 1038 = L 1049 = ImpGal 1053 = ft^3 1034 = m^3 1051 = bbl 1641 = bbl (fed)
74	VFLOW_SPL_UNIT_TIME Data type = Enumerated16 Size = 2	Base time unit for special volume unit Access = RW Default value = 1054 Release = 1.0	1054 = s 1058 = min 1059 = h 1060 = d
75	VFLOW_SPL_UNIT_COVN Data type = Float Size = 4	Special volume unit conversion factor Access = RW Default value = 1.0f Release = 1.0	x > 0.0
76	MMI_VFLOW_LOW_LIMIT Data type = Float Size = 4	Low volume flow limit of sensor Access = R Default value = -10.0f Release = 1.0	—
77	MMI_VFLOW_HIGH_LIMIT Data type = Float Size = 4	High volume flow limit of sensor Access = R Default value = 10.0f Release = 1.0	—

Temperature configuration

Index	Parameter name	Definition	Enumerated list of values
78	TEMP_DAMPING Data type = Float Size = 4	Temperature internal damping in seconds Access = RW Default value = 4.8 Release = 1.0	0.0 ≤ x ≤ 80.0 (rounded to 80 if x > 80)

Index	Parameter name	Definition	Enumerated list of values
79	MMI_TEMP_LOW_LIMIT Data type = Float Size = 4	Low temperature limit of sensor Access = R Default value = -270.0f Release = 1.0	—
80	MMI_TEMP_HIGH_LIMIT Data type = Float Size = 4	High temperature limit of sensor Access = R Default value = 450.0f Release = 1.0	—

Gas process variables

Index	Parameter name	Definition	Enumerated list of values
81	VOL_FLOW_TYPE Data type = Enumerated16 Size = 2	Enable/Disable Gas Standard Volume flow and totals Access = RW Default value = 0 Release = 1.0	0 = Liquid 1 = Gas
82	GSV_GAS_DENSITY Data type = Float Size = 4	Gas density used to calculate reference volume gas flow and totals Access = RW Default value = 0.001205f Release = 1.0	MMI_DENSITY_LOW_LIMIT ≤ x ≤ MMI_DENSITY_HIGH_LIMIT
83	GSV_VOL_FLOW Data type = 101 Size = 5	Reference volume gas flow rate (not valid when API or ED is enabled) Access = R Default value = 0.0f Release = 1.0	VFLOW_LOW_LIMIT ≤ x ≤ VFLOW_HIGH_LIMIT
84	GSV_FLOW_UNITS Data type = Enumerated16 Size = 2	Gas Standard Volume flow engineering units Access = RW Default value = 1360 Release = 1.0	See GSV_FLOW_UNITS
85	GSV_CUTOFF Data type = Float Size = 4	Gas Standard Volume low flow cutoff Access = RW Default value = 0.0f Release = 1.0	x ≥ 0.0

Index	Parameter name	Definition	Enumerated list of values
86	GSV_FLOWTEXT Data type = Visible String Size = 8	Special unit GSV volume flow text Access = RW Default value = "NONE" Release = 1.0	Any 8 characters
87	GSV_TOTINV_SPL_ UNIT_STR Data type = Visible String Size = 8	Special unit volume total text Access = RW Default value = "NONE" Release = 1.0	Any 8 characters
88	GSV_FLOW_BASEUNIT Data type = Enumerated16 Size = 2	Base Gas Standard Volume unit Access = RW Default value = 1053 Release = 1.0	1573 = m3 normal 1574 = L normal 1053 = ft3 std. 1576 = L std. 1575 = m3 std.
89	GSV_FLOW_BASETIME Data type = Enumerated16 Size = 2	Base time unit for special Gas Standard Volume unit. Access = RW Default value = 1054 Release = 1.0	1054 = s 1058 = min 1059 = h 1060 = d
90	GSV_FLOWFACTOR Data type = Float Size = 4	Special Gas Standard Volume unit conversion factor Access = RW Default value = 1.0f Release = 1.0	> 0.0

GSV_FLOW_UNITS

1360 = ft3/min std.
1361 = ft3/h std.
1588 = m³/s normal
1589 = m³/min normal
1590 = m³/h normal
1591 = m³/d normal
1596 = m³/s std.
1597 = m³/min std.
1598 = m³/h std.
1599 = Sm³/d std.
1592 = L/s normal
1593 = L/min normal
1594 = L/h normal
1595 = NL/d normal
1600 = L/s std.
1601 = L/min std.
1602 = L/h std.
1603 = L/d std.
1604 = ft3/s std.
1605 = ft3/d std.
1999 = special

Pressure compensation

Index	Parameter name	Definition	Enumerated list of values
91	PRESSURE_COMP_EN Data type = Enumerated16 Size = 2	Enable/Disable pressure compensation Access = RW Default value = 0 Release = 1.0	0 = Disabled 1 = Enabled

Index	Parameter name	Definition	Enumerated list of values
92	PRESSURE_COMP Data type = 101 Size = 5	Pressure Access = RW Default value = 0.0f Release = 1.0	-1.5 BAR ≤ x ≤ 10000.0 BAR
93	PRESSURE_UNITS Data type = Enumerated16 Size = 2	Pressure unit Access = RW Default value = 1141 Release = 1.0	See PRESSURE_UNITS
94	PRESSURE_FACTOR_FLOW Data type = Float Size = 4	Pressure correction factor for flow Access = RW Default value = 0.0f Release = 1.0	-0.1 ≤ x ≤ 0.1
95	PRESSURE_FACTOR_DENS Data type = Float Size = 4	Pressure correction factor for density Access = RW Default value = 0.0f Release = 1.0	-0.1 ≤ x ≤ 0.1
96	PRESSURE_FLOW_CAL Data type = Float Size = 4	Flow calibration pressure Access = RW Default value = 1.37895f Release = 1.0	≥ 0.0

PRESSURE_UNITS

1148 = inH2O (68°F)
1156 = inHg (0°C)
1154 = ftH2O (68°F)
1151 = mmH2O (68°F)
1141 = psi
1137 = bar
1138 = mbar
1144 = gf/cm2
1145 = kgf/cm2
1130 = Pa
1132 = MPa
1133 = kPa
1139 = torr
1140 = atm
1147 = inH2O (4°C)
1150 = mmH2O (4°C)
1146 = inH2O
1158 = mmHg (0°C)
33003 = inH2O (60°F)

Temperature compensation

Index	Parameter name	Definition	Enumerated list of values
97	TEMPERATURE_COMP_EN Data type = Enumerated16 Size = 2	Enable/Disable external temperature Access = RW Default value = 0 Release = 1.0	0 = Disabled 1 = Enabled

Index	Parameter name	Definition	Enumerated list of values
98	TEMPERATURE_COMP Data type = 101 Size = 5	External temperature calibration input Access = RW Default value = 0.0f Release = 1.0	—

Sensor configuration

Index	Parameter name	Definition	Enumerated list of values
99	FCF_STR Data type = Visible String Size = 16	Flow calibration factor and temperature coefficient for flow Access = RW Default value = — Release = 1.0	—
100	MASS_FLOW_T_COMP Data type = Float Size = 4	Temperature coefficient for flow Access = RW Default value = 5.13f Release = 1.0	0.0f ≤ x ≤ 999.0f
101	K1 Data type = Float Size = 4	Density calibration constant 1 (msec) Access = RW Default value = 1000.0f Release = 1.0	1000.0f ≤ x ≤ 50000.0f
102	K2 Data type = Float Size = 4	Density calibration constant 2 (msec) Access = RW Default value = 50000.0f Release = 1.0	1000.0f ≤ x ≤ 50000.0f
103	FD Data type = Float Size = 4	Flowing density calibration constant Access = RW Default value = 0.0f Release = 1.0	≥ 0
104	K3 Data type = Float Size = 4	Density calibration constant 3 (msec) Access = RW Default value = 0.0f Release = 1.0	1000.0f ≤ x ≤ 50000.0f

Index	Parameter name	Definition	Enumerated list of values
105	K4 Data type = Float Size = 4	Density calibration constant 4 (msec) Access = RW Default value = 0.0f Release = 1.0	1000.0f ≤ x ≤ 50000.0f
106	D1 Data type = Float Size = 4	Density 1 (g/cc) Access = RW Default value = 0.0f Release = 1.0	MMI_DENSITY_LOW_LIMIT ≤ x ≤ MMI_DENSITY_HIGH_LIMIT
107	D2 Data type = Float Size = 4	Density 2 (g/cc) Access = RW Default value = 1 Release = 1.0	MMI_DENSITY_LOW_LIMIT ≤ x ≤ MMI_DENSITY_HIGH_LIMIT
108	FD_VALUE Data type = Float Size = 4	Flowing density (g/cc) Access = RW Default value = 0.0f Release = 1.0	MMI_DENSITY_LOW_LIMIT ≤ x ≤ MMI_DENSITY_HIGH_LIMIT
109	D3 Data type = Float Size = 4	Density 3 (g/cc) Access = RW Default value = 0.0f Release = 1.0	MMI_DENSITY_LOW_LIMIT ≤ x ≤ MMI_DENSITY_HIGH_LIMIT
110	D4 Data type = Float Size = 4	Density 4 (g/cc) Access = RW Default value = 0.0f Release = 1.0	MMI_DENSITY_LOW_LIMIT ≤ x ≤ MMI_DENSITY_HIGH_LIMIT
111	DENS_T_COEFF Data type = Float Size = 4	Density temperature coefficient Access = RW Default value = 4.44f Release = 1.0	-20.0f ≤ x ≤ 20.0f
112	T_FLOW_TG_COEFF Data type = Float Size = 4	T-Series: Flow TG Coefficient (FTG) Access = RW Default value = 0.0f Release = 1.0	—
113	T_FLOW_FQ_COEFF Data type = Float Size = 4	T-Series: Flow FQ Coefficient (FFQ) Access = RW Default value = 0.0f Release = 1.0	—

Index	Parameter name	Definition	Enumerated list of values
114	T_DENSITY_TG_COEFF Data type = Float Size = 4	T-Series: Density TG Coefficient (DTG) Access = RW Default value = 0.0f Release = 1.0	—
115	T_DENSITY_FQ_COEFF1 Data type = Float Size = 4	T-Series: Density FQ Coefficient #1 (DFQ1) Access = RW Default value = 0.0f Release = 1.0	—
116	T_DENSITY_FQ_COEFF2 Data type = Float Size = 4	T-Series: Density FQ Coefficient #2 (DFQ2) Access = RW Default value = 0.0f Release = 1.0	—
117	SENSOR_CODE Data type = Enumerated16 Size = 2	Sensor type code Access = RW Default value = 0 Release = 1.0	0 = Curve Tube 1 = Straight Tube
118	PROCESS_RESPONSE Data type = Enumerated16 Size = 2	Transmitter process response Access = RW Default value = — Release = 1.0	2 = Normal (Default) 3 = Fast (Proving) 4 = Smooth (Gas)

Temperature calibration

Index	Parameter name	Definition	Enumerated list of values
119	TEMP_OFFSET Data type = Float Size = 4	Temperature offset Access = RW Default value = 0.0f Release = 1.0	-9999.0f ≤ x ≤ 99999.0f
120	TEMP_SLOPE Data type = Float Size = 4	Temperature slope Access = RW Default value = 1.0f Release = 1.0	0.0f ≤ x ≤ 999999.0f

Zero calibration

Index	Parameter name	Definition	Enumerated list of values
121	ZERO_TIME Data type = Unsigned16 Size = 2	Maximum zeroing time Access = RW Default value = 20 Release = 1.0	5 ≤ x ≤ 300
122	ZERO_STD_DEV Data type = Float Size = 4	Standard deviation of auto zero Access = R Default value = 0.0f Release = 1.0	—
123	ZERO_CAL Data type = 102 Size = 2	Access = RW Default value = — Release = 1.0	0 = Abort Zero Cal 1 = Start Zero Cal
124	ZERO_FAILCM_VALUE Data type = Float Size = 4	Zero failed value Access = R Default value = 0.0f Release = 1.0	—
125	ZERO_IN_PROGRESS Data type = 102 Size = 2	Indicates whether a zero calibration, density calibration or temperature calibration is running. Access = R Default value = 0 Release = 1.0	0 = Not Running 1 = Calibration Running
126	ZERO_RESTORE_FACTORY Data type = Enumerated16 Size = 2	Restore factory zero Access = RW Default value = 0 Release = 1.0	0 = No Action 1 = Restore
127	ZERO_FACTORY Data type = Float Size = 4	Factory flow signal offset at zero flow (units of uSec) Access = R Default value = 0.0f Release = 1.0	—
128	VERIFY_ZERO Data type = Enumerated16 Size = 2	Perform verify zero Access = RW Default value = 0 Release = 1.0	0 = No Action 1 = Start verify Zero
129	FLOW_VERIFY_ZERO Data type = Enumerated16 Size = 2	Flow verification zero result Access = R Default value = 0 Release = 1.0	0 = Existing zero is good 1 = New Zero Calibration Recommended 2 = Block-In Ineffective 3 = Fault Active

Index	Parameter name	Definition	Enumerated list of values
130	VERIFY_PERCENT Data type = Float Size = 4	Percentage of zero verification Access = R Default value = 0.0f Release = 1.0	—
131	ZERO_RESTORE_PREVIOUS Data type = Enumerated16 Size = 2	Restore previous zero Access = RW Default value = 0 Release = 1.0	0 = No Action 1 = Restore

Density calibration

Index	Parameter name	Definition	Enumerated list of values
132	LOW_DENSITY_CAL Data type = Enumerated16 Size = 2	Perform low-density calibration Access = RW Default value = 0 Release = 1.0	0 = None 1 = Start Cal
133	HIGH_DENSITY_CAL Data type = Enumerated16 Size = 2	Perform high-density calibration Access = RW Default value = 0 Release = 1.0	0 = None 1 = Start Cal
134	FLOWING_DENSITY_CAL Data type = Enumerated16 Size = 2	Perform flowing-density calibration Access = RW Default value = 0 Release = 1.0	0 = None 1 = Start Cal
135	D3_DENSITY_CAL Data type = Enumerated16 Size = 2	Perform third point calibration Access = RW Default value = 0 Release = 1.0	0 = None 1 = Start Cal
136	D4_DENSITY_CAL Data type = Enumerated16 Size = 2	Perform fourth point calibration Access = RW Default value = 0 Release = 1.0	0 = None 1 = Start Cal

Miscellaneous controls

Index	Parameter name	Definition	Enumerated list of values
137	FACTORY_CONFIG_RESTORE Data type = Enumerated16 Size = 2	Restore factory configuration Access = RW Default value = 0 Release = 1.0	0 = No Action 1 = Restore

Index	Parameter name	Definition	Enumerated list of values
138	RESET_POWERON_TIME Data type = Enumerated16 Size = 2	Reset power-on time Access = RW Default value = 0 Release = 1.0	0 = No Action 1 = Restore
139	EN_LD_OPTIMIZATION Data type = Enumerated16 Size = 2	Enable/Disable LD Optimization for liquid hydrocarbons Access = RW Default value = 0 Release = 1.0	0 = Disable 1 = Enable

Two-phase flow setup

Index	Parameter name	Definition	Enumerated list of values
140	TWO_PHASE_TIME Data type = Float Size = 4	Two-phase flow duration in seconds Access = RW Default value = 0.0f Release = 1.0	0.0f ≤ x ≤ 60.0f
141	TWO_PHASE_LO_LIMIT Data type = Float Size = 4	Low density limit (g/cc) Access = RW Default value = 0.0f Release = 1.0	DENSITY_LOW_LIMIT ≤ x ≤ DENSITY_HIGH_LIMIT
142	TWO_PHASE_HI_LIMIT Data type = Float Size = 4	High density limit (g/cc) Access = RW Default value = 5.0f Release = 1.0	DENSITY_LOW_LIMIT ≤ x ≤ DENSITY_HIGH_LIMIT
143	PHASE_FLOW_SEVERITY Data type = 101 Size = 5	Phase Genius flow severity Access = R Default value = 0 Release = 1.0	—
144	FLOW_RANGE_STATUS Data type = Enumerated16 Size = 2	Flow range status Access = R Default value = 0 Release = 1.0	0 = Optimum 1 = Needs Zero 2 = Flow Rate too Low

Device diagnostics

Index	Parameter name	Definition	Enumerated list of values
145	DRIVE_GAIN Data type = 101 Size = 5	Drive gain Access = R Default value = — Release = 1.0	—
146	TUBE_FREQ Data type = Float Size = 4	Raw tube frequency Access = R Default value = — Release = 1.0	—
147	LIVE_ZERO Data type = Float Size = 4	Live zero (mass flow) Access = R Default value = — Release = 1.0	—
148	LEFT_PICKUP_VOL Data type = Float Size = 4	Left pickoff voltage Access = R Default value = — Release = 1.0	—
149	RIGHT_PICKUP_VOL Data type = Float Size = 4	Right pickoff voltage Access = R Default value = — Release = 1.0	—
150	CORE_BOARD_TEMP Data type = Float Size = 4	Core board temperature (degC) Access = R Default value = — Release = 1.0	—
151	ELECT_TEMP_MAX Data type = Float Size = 4	Maximum electronics temperature Access = R Default value = — Release = 1.0	—
152	ELECT_TEMP_MIN Data type = Float Size = 4	Minimum electronics temperature Access = R Default value = — Release = 1.0	—
153	ELECT_TEMP_AVG Data type = Float Size = 4	Average electronics temperature Access = R Default value = — Release = 1.0	—

Index	Parameter name	Definition	Enumerated list of values
154	SENSOR_TEMP_MAX Data type = Float Size = 4	Maximum sensor temperature Access = R Default value = — Release = 1.0	—
155	SENSOR_TEMP_MIN Data type = Float Size = 4	Minimum sensor temperature Access = R Default value = — Release = 1.0	—
156	SENSOR_TEMP_AVG Data type = Float Size = 4	Average sensor temperature Access = R Default value = — Release = 1.0	—
157	RTD_RESIS_CABLE Data type = Float Size = 4	9-wire cable RTD resistance (ohms) Access = R Default value = — Release = 1.0	—
158	RTD_RESIS_METER Data type = Float Size = 4	Meter RTD resistance (ohms) Access = R Default value = — Release = 1.0	—
159	CP_POWER_CYCLE Data type = Unsigned16 Size = 2	Number of core processor power cycles Access = R Default value = — Release = 1.0	—
160	POWER_ONTIME Data type = Unsigned32 Size = 4	Power on time (seconds since last reset) Access = R Default value = — Release = 1.0	—
161	INPUT_VOL Data type = Float Size = 4	Input voltage (volts) Access = R Default value = — Release = 1.0	—
162	TARGET_AMP Data type = Float Size = 4	Actual target amplitude (mV/Hz) (Pre 700 2.1, actual & override) Access = R Default value = — Release = 1.0	—

Index	Parameter name	Definition	Enumerated list of values
163	CASE_TEMPERATURE Data type = Float Size = 4	Case temperature for T-Series sensor Access = R Default value = — Release = 1.0	—
164	TRANSMITTER_TEMP Data type = Float Size = 4	Transmitter temperature Access = R Default value = — Release = 1.0	—
165	LPO_VOLT_FILTERED Data type = Float Size = 4	Filtered left pickoff amplitude Access = R Default value = — Release = 1.0	—
166	RPO_VOLT_FILTERED Data type = Float Size = 4	Filtered right pickoff amplitude Access = R Default value = — Release = 1.0	—
167	XMTR_MAX_TEMPERATURE Data type = Float Size = 4	Transmitter maximum temperature resetable Access = R Default value = — Release = 1.0	—
168	XMTR_MIN_TEMPERATURE Data type = Float Size = 4	Transmitter minimum temperature Access = R Default value = — Release = 1.0	—
169	XMTR_AVG_TEMPERATURE Data type = Float Size = 4	Transmitter average temperature Access = R Default value = — Release = 1.0	—
170	DELTA_T Data type = Float Size = 4	Access = R Default value = — Release = 1.0	—
171	FLOW_VERIFICATION_ZERO Data type = 101 Size = 5	Access = R Default value = — Release = 1.0	—

Flow velocity

Index	Parameter name	Definition	Enumerated list of values
172	FLOW_VELOCITY Data type = 101 Size = 5	Flow velocity Access = R Default value = — Release = 1.0	—
173	FLOW_VELOCITY_UNITS Data type = Enumerated16 Size = 2	Flow velocity units Access = RW Default value = 1061 (m/s) Release = 1.0	1067 = ft/s 1061 = m/s 1063 = m/h 1066 = in/s 1069 = in/min 1070 = ft/min

Process variable simulation

Index	Parameter name	Definition	Enumerated list of values
174	PROC_VAR_SIMULATION Data type = Enumerated16 Size = 1	Process variable simulation Access = RW Default value = — Release = 1.0	0 = None 1 = Enable
175	SIMU_VAR_SEL Data type = Enumerated16 Size = 2	Process variable simulation selection for variable Access = RW Default value = — Release = 1.0	0 = Mass Flow 1 = Density 2 = Temperature
176	SIMU_VAR_WAVEFORM_SEL Data type = Enumerated16 Size = 2	Simulation variable waveform selection Access = RW Default value = — Release = 1.0	1 = Fixed Value 2 = Sawtooth 3 = Sine Wave
177	SIMU_VAR_FIXED_VALUE Data type = Float Size = 4	Simulation variable fixed value Access = RW Default value = — Release = 1.0	—
178	SIMU_VAR_MIN_AMP Data type = Float Size = 4	Simulation variable minimum amplitude of sine / sawtooth wave Access = RW Default value = — Release = 1.0	—

Index	Parameter name	Definition	Enumerated list of values
179	SIMU_VAR_MAX_AMP Data type = Float Size = 4	Simulation variable maximum amplitude of sine / sawtooth wave Access = RW Default value = — Release = 1.0	—
180	SIMU_VAR_PERIOD Data type = Float Size = 4	Simulation variable period in seconds of sine / sawtooth wave Access = RW Default value = — Release = 1.0	—
181	SIMU_VAR_UNITS Data type = Unsigned16 Size = 2	Simulated variable units Access = R Default value = — Release = 1.0	—

Installation verification

Index	Parameter name	Definition	Enumerated list of values
182	INSTALL_VERIFY Data type = Enumerated16 Size = 2	Performs installation verification Access = RW Default value = — Release = 1.0	0 = Idle 1 = Without Flow 2 = With Flow
183	INSTALL_VERIFY_PROGRESS Data type = Float Size = 4	Install verification progress Access = R Default value = — Release = 1.0	—
184	INSTALL_VERIFY_ STATUS Data type = Enumerated16 Size = 2	Install verification status Access = R Default value = 0 Release = 1.0	0 = Idle 1 = Running 2 = Pass 3 = Failed-Noisy 4 = Failed-Meter Unstable 5 = Needs zero

Gas linearization

Index	Parameter name	Definition	Enumerated list of values
185	GL_EN Data type = Enumerated16 Size = 2	Enable gas linearization Access = RW Default value = — Release = 1.0	0 = Disable 1 = Enable

Index	Parameter name	Definition	Enumerated list of values
186	GL_CORRECTION_FACTOR Data type = Float Size = 4	Correction factor Access = R Default value = 0.0f Release = 1.0	—
187	GL_UNCORRECTED_FLOW Data type = Float Size = 4	Mass flow rate without applying 10 point gas linearization Access = R Default value = 0.0f Release = 1.0	—
188	GL_PRESSURE_COMP Data type = Enumerated16 Size = 2	Gas linearization as found data collected with pressure compensation Access = R Default value = — Release = 1.0	0 = Disabled 1 = Enabled
189	GL_INDEX_10_POINT Data type = Unsigned16 Size = 2	Linearization configuration index Access = RW Default value = — Release = 1.0	0 ≤ x < 10
190	GL_FLOW_10_POINT Data type = Float Size = 4	10 points of flow rates Access = R Default value = — Release = 1.0	> 0.0
191	GL_CORRECTION_10_POIN T Data type = Float Size = 4	10 points of correction factors Access = R Default value = — Release = 1.0	—

Energy flow

Index	Parameter name	Definition	Enumerated list of values
192	ENERGY_FLOW Data type = 101 Size = 5	Energy flow Access = R Default value = — Release = 1.0	—
193	ENERGY_UNITS Data type = Enumerated16 Size = 2	Energy flow units Access = RW Default value = 1196 = MJ/h Release = 1.0	1196 = MJ/h 1197 = Btu/h 1443 = MJ/min 1446 = Btu/min 1447 = Btu/day

Calorific value

Index	Parameter name	Definition	Enumerated list of values
194	CALORIFIC_VALUE Data type = 101 Size = 5	Calorific value Access = RW Default value = — Release = 1.0	—
195	CALORIFIC_UNITS Data type = Enumerated16 Size = 2	Calorific units Access = RW Default value = 33006 = MJ/m³ Release = 1.0	1207 = MJ/kg 33006 = MJ/m³ 1516 = Btu/lb 33005 = Btu/scf

Measurement transducer function block View_1

Index	Parameter	Size
1	ST_REV	2
6	MODE_BLK	3
7	ALARM_SUM	8
21	MASS_FLOW	5
25	DENSITY	5
29	TEMPERATURE	5
Overall sum of bytes in View- Object		28

A.13 Device slot parameters (slot 14)

Standard PROFIBUS-PA block parameters 0 through 7

See PROFIBUS-PA parameters 0 through 7.

A.13.1 Transmitter information

Index	Parameter name	Definition	Enumerated list of values
8	OPTION_PRODUCT_CODE Data type = Visible String Size = 32	"Options" portion of product code string Access = R Default value = — Release = 1.0	—
9	BASE_PRODUCT_CODE Data type = Visible String Size = 18	"Base" portion of product code string Access = R Default value = — Release = 1.0	—

Index	Parameter name	Definition	Enumerated list of values
10	TRANSMITTER_SW_REV Data type = Unsigned16 Size = 2	Transmitter software revision Access = R Default value = — Release = 1.0	—
11	TRANSMITTER_SW_CHKSUM Data type = Unsigned32 Size = 4	Transmitter software checksum Access = R Default value = — Release = 1.0	—
12	CEQ_NUMBER Data type = Unsigned16 Size = 2	Transmitter CEQ number Access = R Default value = — Release = 1.0	—
13	TRANSMITTER_NE53_REV Data type = Visible String Size = 8	Transmitter NE53 revision Access = R Default value = — Release = 1.0	—
14	DEV_BOOT_VERSION Data type = Unsigned16 Size = 2	Transmitter boot loader revision Access = R Default value = — Release = 1.0	—

A.13.2 Core processor information

Index	Parameter name	Definition	
15	CORE_SERIAL_NUMBER Data type = Unsigned32 Size = 4	Attached core serial number Access = R Default value = — Release = 1.0	—
16	CORE_SW_REV Data type = Unsigned16 Size = 2	Attached core software revision Access = R Default value = — Release = 1.0	—
17	CORE_SW_CHKSUM Data type = Unsigned32 Size = 4	Attached core software checksum Access = R Default value = — Release = 1.0	—
18	CORE_DEVICE_TYPE Data type = Enumerated16 Size = 2	Attached core device type Access = R Default value = — Release = 1.0	40 = 700 CP 50 = 800 ECP 1000 = No Core

A.13.3 Protocol processor information

Index	Parameter name	Definition	Enumerated list of values
19	PROTO_SW_REV Data type = Unsigned16 Size = 2	Protocol converter micro-processor software revision Access = R Default value = — Release = 1.0	—
20	PROTO_SW_CHKSUM Data type = Unsigned32 Size = 4	Protocol converter micro-processor software checksum Access = R Default value = — Release = 1.0	—

A.13.4 Sensor information

Index	Parameter name	Definition	Enumerated list of values
21	SENSOR_SN Data type = Unsigned32 Size = 4	Sensor serial number Access = RW (any) Default value = 0 Release = 1.0	0 ≤ x ≤ 16777215
22	SENSOR_TYPE Data type = Visible String Size = 16	Sensor type (i.e.,. F200, CMF025) Access = R Default value = — Release = 1.0	—
23	SENSOR_CODE Data type = Enumerated16 Size = 2	Sensor type code Access = RW (any) Default value = 0 Release = 1.0	0 = Curve Tube 1 = Straight Tube
24	SENSOR_MATERIAL Data type = Enumerated16 Size = 2	Sensor material Access = RW (any) Default value = 253 Release = 1.0	003 = Hastelloy C-22 004 = Monel 005 = Tantalum 006 = Titanium 019 = 316L stainless steel 023 = Inconel 050 = 304 Stainless Steel 252 = Unknown 253 = Special

Index	Parameter name	Definition	Enumerated list of values
25	SENSOR_LINER Data type = Enumerated16 Size = 2	Liner material Access = RW (any) Default value = 253 Release = 1.0	10 = PTFE (Teflon) 11 = Halar 16 = Tefzel 251 = None 252 = Unknown 253 = Special
26	SENSOR_END Data type = Enumerated16 Size = 2	Flange type Access = RW (any) Default value = 253 Release = 1.0	See SENSOR_END

SENSOR_END

0 = ANSI 150
1 = ANSI 300
2 = ANSI 600
5 = PN 40
7 = JIS 10K
8 = JIS 20K
9 = ANSI 900
10 = Sanitary Clamp Fitting
11 = Union
12 = PN 100
251 = None
252 = Unknown
253 = Special

A.13.5 Alarm status

Index	Parameter name	Definition	Enumerated list of values
27	ALERT1_CONDITION Data type = BitEnumerated16 Size = 2	Alert conditions 1 Access = R Default value = — Release = 1.0	See ALERT1
28	ALERT2_CONDITION Data type = BitEnumerated16 Size = 2	Alert conditions 2 Access = R Default value = — Release = 1.0	See ALERT2
29	ALERT3_CONDITION Data type = BitEnumerated16 Size = 2	Alert conditions 3 Access = R Default value = — Release = 1.0	See ALERT3
30	ALERT4_CONDITION Data type = BitEnumerated16 Size = 2	Alert conditions 4 Access = R Default value = — Release = 1.0	See ALERT4

Index	Parameter name	Definition	Enumerated list of values
31	ALERT5_CONDITION Data type = BitEnumerated16 Size = 2	Alert conditions 5 Access = R Default value = — Release = 1.0	See ALERT5
32	ALERT6_CONDITION Data type = BitEnumerated16 Size = 2	Alert conditions 6 Access = R Default value = — Release = 1.0	See ALERT6
33	ALERT7_CONDITION Data type = BitEnumerated16 Size = 2	Alert conditions 7 Access = R Default value = — Release = 1.0	See ALERT7
34	ALERT1_IGNOR Data type = BitEnumerated16 Size = 2	Status Word 1 Alert suppress Access = RW (any) Default value = 0 Release = 1.0	See ALERT1
35	ALERT2_IGNOR Data type = BitEnumerated16 Size = 2	Status Word 2 Alert suppress Access = RW (any) Default value = 0 Release = 1.0	See ALERT2
36	ALERT3_IGNOR Data type = BitEnumerated16 Size = 2	Status Word 3 Alert suppress Access = RW (any) Default value = 0 Release = 1.0	See ALERT3
37	ALERT4_IGNOR Data type = BitEnumerated16 Size = 2	Status Word 4 Alert suppress Access = RW (any) Default value = 0 Release = 1.0	See ALERT4
38	ALERT5_IGNOR Data type = BitEnumerated16 Size = 2	Status Word 5 Alert suppress Access = RW (any) Default value = 0 Release = 1.0	See ALERT5

Index	Parameter name	Definition	Enumerated list of values
39	ALERT6_IGNOR Data type = BitEnumerated16 Size = 2	Status Word 6 Alert suppress Access = RW (any) Default value = 0 Release = 1.0	See ALERT6
40	ALERT7_IGNOR Data type = BitEnumerated16 Size = 2	Status Word 7 Alert suppress Access = RW (any) Default value = 0 Release = 1.0	See ALERT7
41	ALERT_RESTORE_FACTORY Data type = Enumerated16 Size = 2	Restore Factory Default severity of alerts Access = RW Default value = 0 Release = 1.0	0 = No 1 = Restore
42	FAULT_LIMIT Data type = Enumerated16 Size = 2	Fault Limit Code Access = RW Default value = 5 Release = 1.0	0 = Upscale 1 = Downscale 2 = Zero 3 = NAN 4 = Flow goes to zero 5 = None
43	LMV_FLT_TIMEOUT Data type = Unsigned16 Size = 2	Last Measure Value Fault Timeout Access = RW (any) Default value = 0 Release = 1.0	0 ≤ x ≤ 60 sec
44	ANALOG_OUTPUT_FAULT Data type = 102 Size = 2	Indicates whether there is a critical fault present Access = R Default value = — Release = 1.0	0 = No Critical Fault 1 = Critical Fault Present

ALERT1

0x0001 = RAM Error - Core (002)
0x0002 = Mass Flow Overrange (005)
0x0004 = Density Out of Range (008)
0x0008 = Calibration Failure (010)
0x0010 = Sensor Temperature Failure (016)
0x0020 = Sensor Case Temperature Failure (017)
0x0040 = EEPROM Error (018)
0x0080 = RAM Error-Transmitter(019)
0x0100 = Cal Factors Missing (020)
0x0200 = Incorrect Sensor Type (021)
0x0400 = Configuration Data Corrupt (022)
0x0800 = Program Corrupt Core (024)
0x1000 = Sensor Communication Failure (026)
0x2000 = Undefined
0x4000 = Core Write Failure (028)
0x8000 = Incorrect Board Type (030)

ALERT2

0x0001 = Low Power- Core (031)
0x0002 = Undefined
0x0004 = Tube Not Full (033)
0x0008 = Meter Verification Failed (034)
0x0010 = Meter Verification Aborted (035)
0x0020 = Undefined
0x0040 = Undefined
0x0080 = Drive Overrange (102)
0x0100 = Data Loss Possible (103)
0x0200 = Calibration in progress (104)
0x0400 = Two Phase Flow (105)
0x0800 = Undefined
0x1000 = Power Reset (107)
0x2000 = Undefined
0x4000 = Undefined
0x8000 = Frequency Output Saturated (110)

ALERT3

0x0001 = Frequency Output Fixed (111)
0x0002 = mA Output Saturated (113)
0x0004 = mA Output Fixed (114)
0x0008 = No Input (115)
0x0010 = Temperature Out range (116)
0x0020 = API-Density Out of Range (117)
0x0040 = Undefined
0x0080 = Discrete Output Fixed (119)
0x0100 = Curve Fit Failure(120)
0x0200 = Extrapolation Alert (121)
0x0400 = Undefined
0x0800 = Smart Meter Verification in progress (131)
0x1000 = Sensor Simulation On (132)
0x2000 = APM Remediation (138)
0x4000 = Undefined
0x8000 = Discrete Output Present Value

ALERT4

0x0001 = Undefined
0x0002 = Undefined
0x0004 = Flow Direction (on = forward/zero, off = reverse)
0x0008 = Sensor Failed (003)
0x0010 = Transmitter Initializing (009)
0x0020 = Enhanced Event 1 Active
0x0040 = Enhanced Event 2 Active
0x0080 = Enhanced Event 3 Active
0x0100 = Enhanced Event 4 Active
0x0200 = Enhanced Event 5 Active
0x0400 = Programming Core Processor
0x0800 = Core Software update Failed
0x1000 = Core Processor NOT Communicating with Transmitter
0x2000 = Undefined
0x4000 = Configuration Changed
0x8000 = Watchdog Error

ALERT5

0x0001 = System is in fault
0x0002 = Undefined
0x0004 = Undefined
0x0008 = Undefined
0x0010 = Undefined
0x0020 = Undefined
0x0040 = SD Card not Present
0x0080 = Pressure Out of Range (123)
0x0100 = Time Not Set
0x0200 = No Permanent License
0x0400 = Firmware Update failed
0x0800 = Phase Genius moderate severity
0x1000 = Phase Genius severe severity
0x2000 = Clock not incrementing
0x4000 = Undefined
0x8000 = Undefined

ALERT6

0x0001 = No Password
0x0002 = Internal Memory Full
0x0004 = Core Processor has incompatible ETO
0x0008 = New Core Processor detected
0x0010 = Undefined
0x0020 = APM Remediation
0x0040 = Fieldbus Bridge Memory Failure
0x0080 = Undefined
0x0100 = Watercut Limited to 100%
0x0200 = Watercut Limited to 0%
0x0400 = Undefined
0x0800 = Display Readback Failure
0x1000 = Display Comm Error
0x2000 = Fieldbus Bridge Comm Error
0x4000 = Undefined
0x8000 = Undefined

ALERT7

0x0001 = Undefined
0x0002 = Undefined
0x0004 = Undefined
0x0008 = Undefined
0x0010 = Undefined
0x0020 = Undefined
0x0040 = Undefined
0x0080 = Undefined
0x0100 = AI Function Block Simulation
0x0200 = DI Function Block Simulation
0x0400 = TOT Function Block Simulation
0x0800 = Undefined
0x1000 = Undefined
0x2000 = Undefined
0x4000 = Undefined
0x8000 = Undefined

A.13.6 Alert condition simulation

Index	Parameter name	Definition	Enumerated list of values
45	SIMULATE_ALERT_CONDITION Data type = Enumerated16 Size = 2	Simulates the alert condition Access = RW (any) Default value = 0 Release = 1.0	0 = Disable 1 = Enable
46	ALERT1_SIMULATE Data type = BitEnumerated16 Size = 2	Status word 1 alert simulation Access = RW (any) Default value = 0 Release = 1.0	See ALERT1
47	ALERT2_SIMULATE Data type = BitEnumerated16 Size = 2	Status word 2 alert simulation Access = RW (any) Default value = 0 Release = 1.0	See ALERT2
48	ALERT3_SIMULATE Data type = BitEnumerated16 Size = 2	Status word 3 alert simulation Access = RW (any) Default value = 0 Release = 1.0	See ALERT3
49	ALERT4_SIMULATE Data type = BitEnumerated16 Size = 2	Status word 4 alert simulation Access = RW (any) Default value = 0 Release = 1.0	See ALERT4

Index	Parameter name	Definition	Enumerated list of values
50	ALERT5_SIMULATE Data type = BitEnumerated16 Size = 2	Status word 5 alert simulation Access = RW (any) Default value = 0 Release = 1.0	See ALERT5
51	ALERT6_SIMULATE Data type = BitEnumerated16 Size = 2	Status word 6 alert simulation Access = RW (any) Default value = 0 Release = 1.0	See ALERT6
52	ALERT7_SIMULATE Data type = BitEnumerated16 Size = 2	Status word 7 alert simulation Access = RW (any) Default value = 0 Release = 1.0	See ALERT7

A.13.7 Local display

Index	Parameter name	Description	Enumerated list of values
53	LDO_BACKLIGHT_INTEN Data type = Unsigned16 Size = 2	LDO backlight intensity control Access = RW (any) Default value = 50 Release = 1.0	$0 \leq x \leq 100$
54	LDO_CONTRAST Data type = Unsigned16 Size = 2	LDO contrast control Access = RW (any) Default value = 50 Release = 1.0	$0 \leq x \leq 100$
55	LDO_LANG Data type = Enumerated16 Size = 2	Display language selection Access = RW (any) Default value = 0 Release = 1.0	0 = English 1 = German 2 = French 3 = Katakana (Japanese) 4 = Spanish 5 = Chinese 6 = Russian 7 = Portuguese
56	LDO_BACKLIGHT_EN Data type = Enumerated16 Size = 2	LDO backlight control Access = RW (any) Default value = 0 Release = 1.0	0 = Off 1 = On
57	LDO_TOT_RESET_EN Data type = Enumerated16 Size = 2	Enable/Disable LDO totalizer reset Access = RW (any) Default value = 1 Release = 1.0	0 = None 1 = Reset

Index	Parameter name	Description	Enumerated list of values
58	LDO_TOT_START_STOP_EN Data type = Enumerated16 Size = 2	Enable/Disable LDO totalizer start/ stop option Access = RW (any) Default value = 1 Release = 1.0	0 = Stop Totalizers 1 = Start Totalizers
59	LDO_AUTO_SCROLL_EN Data type = Enumerated16 Size = 2	Enable/Disable LDO auto scroll feature Access = RW (any) Default value = 0 Release = 1.0	0 = Disable 1 = Enable
60	LDO_AUTO_SCROLL_RATE Data type = Unsigned16 Size = 2	LDO auto scroll rate Access = RW (any) Default value = 10 Release = 1.0	$1 \leq x \leq 30$
61	LDO_MAIN_MENU_EN Data type = Enumerated16 Size = 2	Displays main menu if enabled Access = RW (any) Default value = 0 Release = 1.0	0 = Hide 1 = View
62	LDO_OFFLINE_PWD Data type = Visible String Size = 4	LDO offline password Access = RW (any) Default value = “AAAA” Release = 1.0	ASCII alphanumeric
63	LDO_VAR1_CODE Data type = Enumerated16 Size = 2	Displays the variable associated with the code on the LDO Access = RW (any) Default value = 0 Release = 1.0	See LDO variable codes
64	LDO_VAR2_CODE Data type = Enumerated16 Size = 2	Displays the variable associated with the code on the LDO Access = RW (any) Default value = 2 Release = 1.0	See LDO variable codes
65	LDO_VAR3_CODE Data type = Enumerated16 Size = 2	Displays the variable associated with the code on the LDO Access = RW (any) Default value = 5 Release = 1.0	See LDO variable codes

Index	Parameter name	Description	Enumerated list of values
66	LDO_VAR4_CODE Data type = Enumerated16 Size = 2	Displays the variable associated with the code on the LDO Access = RW (any) Default value = 6 Release = 1.0	See LDO variable codes
67	LDO_VAR5_CODE Data type = Enumerated16 Size = 2	Displays the variable associated with the code on the LDO Access = RW (any) Default value = 3 Release = 1.0	See LDO variable codes
68	LDO_VAR6_CODE Data type = Enumerated16 Size = 2	Displays the variable associated with the code on the LDO Access = RW (any) Default value = 1 Release = 1.0	See LDO variable codes
69	LDO_VAR7_CODE Data type = Enumerated16 Size = 2	Displays the variable associated with the code on the LDO Access = RW (any) Default value = 47 Release = 1.0	See LDO variable codes
70	LDO_VAR8_CODE Data type = Enumerated16 Size = 2	Displays the variable associated with the code on the LDO Access = RW (any) Default value = 251 Release = 1.0	See LDO variable codes
71	LDO_VAR9_CODE Data type = Enumerated16 Size = 2	Displays the variable associated with the code on the LDO Access = RW (any) Default value = 251 Release = 1.0	See LDO variable codes
72	LDO_VAR10_CODE Data type = Enumerated16 Size = 2	Displays the variable associated with the code on the LDO Access = RW (any) Default value = 251 Release = 1.0	See LDO variable codes
73	LDO_VAR11_CODE Data type = Enumerated16 Size = 2	Displays the variable associated with the code on the LDO Access = RW (any) Default value = 251 Release = 1.0	See LDO variable codes

Index	Parameter name	Description	Enumerated list of values
74	LDO_VAR12_CODE Data type = Enumerated16 Size = 2	Displays the variable associated with the code on the LDO Access = RW (any) Default value = 251 Release = 1.0	See LDO variable codes
75	LDO_VAR13_CODE Data type = Enumerated16 Size = 2	Displays the variable associated with the code on the LDO Access = RW (any) Default value = 251 Release = 1.0	See LDO variable codes
76	LDO_VAR14_CODE Data type = Enumerated16 Size = 2	Displays the variable associated with the code on the LDO Access = RW (any) Default value = 251 Release = 1.0	See LDO variable codes
77	LDO_VAR15_CODE Data type = Enumerated16 Size = 2	Displays the variable associated with the code on the LDO Access = RW (any) Default value = 251 Release = 1.0	See LDO variable codes
78	LDO_2PV_VAR1_CODE Data type = Enumerated16 Size = 2	Displays the variable associated with the code on the LDO Access = RW (any) Default value = 251 Release = 1.0	See LDO variable codes
79	LDO_2PV_VAR2_CODE Data type = Enumerated16 Size = 2	Displays the variable associated with the code on the LDO Access = RW (any) Default value = 251 Release = 1.0	See LDO variable codes
80	LDO_PROC_VAR_INDEX Data type = Enumerated16 Size = 2	Process variable code Access = RW (any) Default value = 0 Release = 1.0	See LDO variable codes
81	LDO_NUM_DECIMALS Data type = Unsigned16 Size = 2	The number of digits displayed to the right of the decimal point for the process variable selected with index 34 Access = RW (any) Default value = 4 Release = 1.0	$0 \leq x \leq 5$

Index	Parameter name	Description	Enumerated list of values
82	LDO_UPDATE_PERIOD Data type = Unsigned16 Size = 2	The period in milliseconds in which the display is updated Access = RW (any) Default value = 250 Release = 1.0	100 ≤ x ≤ 10000
83	LDO_PASSWORD_EN Data type = Enumerated16 Size = 2	Enable/Disable display alarm screen password Access = RW (any) Default value = 0 Release = 1.0	0 = Disable 1 = Enable
84	LDO_WL_STATUS Data type = Enumerated16 Size = 2	Write lock switch status Access = R Default value = — Release = 1.0	0 = Disabled 1 = Enabled
85	LDO_INV_RESET_EN Data type = Enumerated16 Size = 2	Allows inventory reset control through the display Access = RW (any) Default value = 0 Release = 1.0	0 = None 1 = Reset
86	LDO_INV_START_STOP_EN Data type = Enumerated16 Size = 2	Allows inventory start-stop control through the display Access = RW (any) Default value = 0 Release = 1.0	0 = Stop Inventories 1 = Start Inventories
87	LDO_TOTINV_CONTEXT_PASS_EN Data type = Enumerated16 Size = 2	Enable/Disable display password for totalizer context menus Access = RW (any) Default value = 0 Release = 1.0	0 = Disabled 1 = Enabled
88	LDO_TOTINV_CONTEXT_PASSWORD Data type = Visible String Size = 4	Password for totalizer inventory start/stop/reset context menu Access = RW (any) Default value = “AAAA” Release = 1.0	ASCII alphanumeric
89	LDO_MENU_SECURITY Data type = Enumerated16 Size = 2	Enable/Disable display offline menu Access = RW (any) Default value = 0 Release = 1.0	0 = No Password 1 = Password When Entering Menu 2 = Password at Write

LDO variable codes

0 = Mass Flow Rate
1 = Temperature
2 = Cfg Total 1
3 = Density
4 = Cfg Inv 1
5 = Volume Flow Rate
6 = Cfg Total 2
7 = Cfg Inv 2
15 = API: Corr Density (PM)*
16 = API: Corr Vol Flow (PM)*
17 = Cfg Total 3
18 = Cfg Inv 3
19 = API: Avg Density (PM)*
20 = API: Avg Temp (PM)*
21 = ED: Density At Ref (CM)*
22 = ED: Density (SGU) (CM)*
23 = ED: Std Vol Flow Rate (CM)*
24 = Cfg Total 5
25 = Cfg Inv 5
26 = ED: Net Mass Flow (CM)*
27 = Cfg Total 6
28 = Cfg Inv 6
29 = ED: Net Vol Flow Rate (CM)*
30 = Cfg Total 7
31 = Cfg Inv 7
32 = ED: Concentration (CM)*
33 = API: CTL (PM)*
46 = Raw Tube Frequency
47 = Drive Gain
48 = Case Temperature
49 = LPO Amplitude
50 = RPO Amplitude
51 = Board Temperature
52 = Input Voltage
53 = Ext. Input Pressure
55 = Ext. Input Temp
56 = ED: Density (Baume) (CM)*
62 = Gas Std Vol Flow (GSV)*
63 = Cfg Total 4
64 = Cfg Inv 4
68 = Field Verification Zero
69 = Live Zero
73 = APM: Net Flow Oil At Line (APM)*
74 = APM: Water Cut At Line (APM)*
75 = APM: Net Flow Water At Line(APM)*
78 = APM: Net Flow Oil At Ref(APM)*
79 = APM: Water Cut At Ref (APM)*
81 = APM: Net Flow Water At Ref (APM)*
101 = Flow Switch Indicator
157 = Calorific Value
187 = APM: Net Oil Density at Line (Fixed API Units) (APM)*
205 = APM: Gas Void Fraction (APM)*
208 = Mass Flow Velocity
210 = APM: Unremediated Mass Flow (APM)*
211 = APM: Unremediated Density (APM)*
212 = APM: Unremediated Vol Flow (APM)*
230 = APM: TMR Liquid Flow (APM)*
215 = Energy Flow
228 = Phage Genius Flow Severity
251 = None (not allowed for LDO_VAR1_CODE and LDO_PROC_VAR_INDEX)

A.13.8 Channels assignment

Index	Parameter name	Definition	Enumerated list of values
90	CH_SEL_B Data type = Enumerated16 Size = 2	Output Channel B selection Access = RW Default value = 3 Release = 1.0	3 = mAO Output 6 = None
91	CH_SEL_C Data type = Enumerated16 Size = 2	Output Channel C selection Access = RW Default value = 1 Release = 1.0	1 = Frequency Output 11 = Discrete Output 6 = None

A.13.9 Analog Output configuration

Analog Output configuration

Index	Parameter name	Definition	Enumerated list of values
92	MAO_SRC_VAR Data type = Enumerated16 Size = 2	Source variable for mA Output Access = RW Default value = 0 Release = 1.0	See MAO_SRC_VAR
93	MAO_SRC_UNITS Data type = Enumerated16 Size = 2	Source variable for mA Output Access = R Default value = — Release = 1.0	See MAO_SRC_UNITS
94	MAO_DAMPING Data type = Float Size = 4	Added damping on mA Output Access = RW Default value = 0.0f Release = 1.0	0.0f ≤ x ≤ 440.0f
95	MAO_VAR_LO Data type = Float Size = 4	mA variable low range value Access = RW Default value = -200 Release = 1.0	—
96	MAO_VAR_HI Data type = Float Size = 4	mA variable high range value Access = RW Default value = 200 Release = 1.0	—
97	MAO_FLT_ACT Data type = Enumerated16 Size = 2	mA Output fault action Access = RW Default value = 1 Release = 1.0	0 = Upscale 1 = Downscale 3 = Internal Zero 4 = None
98	MAO_FLT_LEV Data type = Float Size = 4	mA Output fault generation level Access = RW Default value = 2.0f Release = 1.0	1.0 ≤ x ≤ 3.6 (if MAO_FAULT_ACTION is downscale) 21.0 ≤ x ≤ 23.00 (if MAO_FAULT_ACTION is upscale)
99	MAO_START_LO_TRM Data type = Enumerated16 Size = 2	Start mA Output low level trim Access = RW Default value = 0 Release = 1.0	0 = None 1 = Start Lo Trim
100	MAO_START_HO_TRM Data type = Enumerated16 Size = 2	Start mA Output low level trim Access = RW Default value = 0 Release = 1.0	0 = None 1 = Start Hi Trim

Index	Parameter name	Definition	Enumerated list of values
101	MAO_DIR Data type = Enumerated16 Size = 2	mA Output direction setting Access = RW Default value = 0 Release = 1.0	0 = Normal 1 = Absolute Value
102	MAO_FLOW_CUTOFF Data type = Float Size = 4	Flow cutoff for mA Output Access = RW Default value = 0.0f Release = 1.0	x ≥ 0.0
103	MAO_MIN_SPAN Data type = Float Size = 4	mA Output source variable minimum span Access = R Default value = — Release = 1.0	—
104	MAO_SENSOR_LO_LIMIT Data type = Float Size = 4	mA Output source variable lower sensor limit Access = R Default value = — Release = 1.0	—
105	MAO_SENSOR_HI_LIMIT Data type = Float Size = 4	mA Output source variable upper sensor limit Access = R Default value = — Release = 1.0	—
106	MAO_SIMULATE Data type = Enumerated16 Size = 2	Enable fixing the mA Output value Access = RW (any) Default value = 0 Release = 1.0	0 = Disable 1 = Enable
107	MAO_FIXED_CURRENT Data type = Float Size = 4	mA Output fixed current value Access = RW (any) Default value = 0.0f Release = 1.0	1.0 ≤ x ≤ 23.0 or 0
108	MAO_ACTUAL_CURRENT Data type = Float Size = 4	mA Output present current value Access = R Default value = — Release = 1.0	—

MAO_SRC_VAR

0 = Mass Flow Rate
1 = Temperature
3 = Density
5 = Volume Flow Rate
47 = Drive Gain
53 = Ext Press
55 = Ext Temp
157 = Calorific Value
208 = Flow Velocity
215 = Energy Flow
228 = Phage Genius Flow Severity
62 = Gas Std Vol Flow (GSV)*
15 = API Corr Density (PM)*
16 = API Corr Volume Flow (PM)*
19 = API Average Density (PM)*
20 = API Average Temperature (PM)*
21 = CM Ref Density (CM)*
22 = CM: Density (CM)*
23 = CM: Std Vol Flow Rate (CM)*
26 = CM: Net Mass Flow Rate (CM)*
29 = CM: Net Vol Flow Rate (CM)*
32 = CM: Concentration (CM)*
56 = CM: Density (Baume) (CM)*
73 = APM: Net Flow Oil At Line (APM)*
74 = APM: Water Cut At Line (APM)*
75 = APM: Net Flow Water At Line(APM)*
78 = APM: Net Flow Oil At Ref(APM)*
79 = APM: Water Cut At Ref (APM)*
81 = APM: Net Flow Water At Ref (APM)*
205 = APM: Gas Void Fraction(APM)*
210 = APM: Unremediated Mass Flow (APM)*
211 = APM: Unremediated Density (APM)*
212 = APM: Unremediated Vol Flow (APM)*
230 = APM: TMR Liquid Flow (APM)*

MAO_SRC_UNITS

MASS_FLOW_UNITS
VOLUME_FLOW_UNITS
TEMPERATURE_UNITS
DENSITY_UNITS
PRESSURE_UNITS
GSV_FLOW_UNITS
FLOW_VELOCITY_UNIT
Hz
%
Volts
BAUM
NO_UNIT
ENERGY_UNITS
CALORIFIC_UNITS

A.13.10 Frequency Output configuration

Frequency Output configuration

Index	Parameter name	Definition	Enumerated list of values
109	FO_SRC_VAR Data type = Enumerated16 Size = 2	Source variable for Frequency Output Access = RW Default value = 0 Release = 1.0	See FO_SRC_VAR
110	FO_SRC_UNITS Data type = Enumerated16 Size = 2	Source variable units Access = R Default value = — Release = 1.0	MASS_FLOW_UNITS VOLUME_FLOW_UNITS GSV_FLOW_UNITS ENERGY_UNITS
111	FO_FLOW_FAC Data type = Float Size = 4	Flow rate factor for Frequency Output Access = RW Default value = 16.66667f Release = 1.0	x ≥ 0.0

Index	Parameter name	Definition	Enumerated list of values
112	FO_FRQ_FAC Data type = Float Size = 4	Frequency factor Access = RW Default value = 1000.0f Release = 1.0	0.00 1 ≤ x ≤ 10000.0
113	FO_PULSES_PER_UNIT Data type = Float Size = 4	Pulses per unit for Frequency Output Access = RW Default value = 60.0f Release = 1.0	x > 0.0
114	FO_UNITS_PER_PULSE Data type = Float Size = 4	Units per pulse for Frequency Output Access = RW Default value = 0.01666667f Release = 1.0	x > 0.0
115	FO_FLT_ACT Data type = Enumerated16 Size = 2	Frequency Output fault action Access = RW Default value = 1 Release = 1.0	0 = Upscale 1 = Downscale 3 = Internal Zero 4 = None
116	FO_FLT_LEV Data type = Float Size = 4	Frequency Output fault generation level Access = RW Default value = 145000.0f Release = 1.0	10 ≤ x ≤ 15000 (rounded of to 14500 above 14500)
117	FO_DIR Data type = Enumerated16 Size = 2	Frequency Output direction Access = RW Default value = 0 Release = 1.0	0 = Pulse on Positive Flow Only 1 = Pulse on Negative Flow Only 2 = Pulse on both Positive and Negative Flow
118	FO_SCALING_METHOD Data type = Enumerated16 Size = 2	Frequency Output scaling method Access = RW Default value = 0 Release = 1.0	0 = Frequency = Flow 1 = Pulses/Unit 2 = Units/Pulse
119	FO_SIMULATE Data type = Enumerated16 Size = 2	Simulate FO Access = RW (any) Default value = 0 Release = 1.0	0 = Disable 1 = Enable
120	FO_FIXED_VALUE Data type = Float Size = 4	Frequency Output fixed value Access = RW (any) Default value = 0.0f Release = 1.0	0.0 ≤ x ≤ 14500.0

Index	Parameter name	Definition	Enumerated list of values
121	FO_OUT Data type = Float Size = 4	Current Frequency Output Access = R Default value = — Release = 1.0	$0.0 \le x \le 14500.0$

FO_SRC_VAR

0 = Mass Flow Rate
5 = Volume Flow Rate
62 = Gas Std Vol Flow (GSV)*
16 = API: Corr Vol Flow (PM)*
23 = CM: Std Vol Flow Rate (CM)*
26 = CM: Net Mass Flow Rate (CM)*
29 = CM: Net Vol Flow Rate (CM)*
73 = APM: Net Flow Oil At Line (APM)*
75 = APM: Net Flow Water At Line(APM)*
78 = APM: Net Flow Oil At Ref(APM)*
81 = APM: Net Flow Water At Ref (APM)*
210 = APM: Unremediated Mass Flow (APM)*
212 = APM: Unremediated Vol Flow (APM)*
230 = APM: TMR Liquid Flow (APM)*
215 = Energy Flow

A.13.11 Discrete Output configuration

Index	Parameter name	Definition	Enumerated list of values
122	DO_VAR Data type = Enumerated16 Size = 2	Discrete Output assignment Access = RW Default value = 102 Release = 1.0	See DO_VAR
123	DO_POLARITY Data type = Enumerated16 Size = 2	Discrete Output polarity Access = RW Default value = 1 Release = 1.0	0 = Active Low 1 = Active High
124	DO_FLT_ACT Data type = Enumerated16 Size = 2	Discrete Output Fault Action Access = RW Default value = 4 Release = 1.0	0 = Upscale 1 = Downscale 4 = None
125	DO_FIX_STATE Data type = Enumerated16 Size = 2	Discrete Output Simulation State Access = RW (any) Default value = 255 Release = 1.0	0 = Off 1 = On 255 = Unfix
126	DO_SIMULATE Data type = Enumerated16 Size = 2	Discrete Output Simulation Access = RW Default value = 0 Release = 1.0	0 = Disable 1 = Enable

DO_VAR

57 = Discrete Event 1
58 = Discrete Event 2
59 = Discrete Event 3
60 = Discrete Event 4
61 = Discrete Event 5
97 = TMR Active
101 = Flow Switch Indicator
102 = Forward/Reverse Indication
103 = Zero Calibration in Progress
104 = Fault Condition Indication
216 = Meter Verification Failure (MV)*
251 = None

A.13.12 Flow rate switch

Index	Parameter name	Definition	Enumerated list of values
127	FLW_RATE_SW_SOURCE Data type = Enumerated16 Size = 2	Flow rate switch Process Variable Access = RW Default value = 0 Release = 1.0	See FO_SRC_VAR
128	FLW_RATE_SW_SETPOINT Data type = Float Size = 4	Flow rate switch setpoint Access = RW Default value = 0.0f Release = 1.0	x ≥ 0.0
129	FLW_RATE_SW_HYS Data type = Float Size = 4	Flow rate switch hysteresis Access = RW Default value = 5 Release = 1.0	0.1 ≤ x ≤ 10.0
130	FLW_RATE_SOURCE_UNITS Data type = Enumerated16 Size = 2	Flow rate switch hysteresis source variable unit Access = R Default value = — Release = 1.0	MASS_FLOW_UNITS VOLUME_FLOW_UNITS GSV_FLOW_UNITS

A.13.13 System time

Index	Parameter name	Definition	Enumerated list of values
131	RTC_TIME_ZONE Data type = Enumerated16 Size = 2	World Time zone Access = RW Default value = 13 Release = 1.0	See RTC_TIME_ZONE
132	RTC_TIME_ZONE_OFFSET Data type = Float Size = 4	Time Zone Units offset of hours for user time Access = RW Default value = 0.0f Release = 1.0	-24.0f ≤ x ≤ 24.0f

Index	Parameter name	Definition	Enumerated list of values
133	RTC_DAY_LIGHT_SAVING Data type = Enumerated16 Size = 2	Force Day Light saving to current time Access = RW (any) Default value = 0 Release = 1.0	0 = Disable 1 = Enable
134	RTC_DATE_TIME Data type = Date Size = 7	Gives current Date and Time Access = R Default value = — Release = 1.0	—

RTC_TIME_ZONE

- 0 = Dateline (-12.0)
- 1 = Soma (-11.0)
- 2 = Hawaii (-10.0)
- 3 = Alaska (-9.0)
- 4 = Pacific (-8.0)
- 5 = Mountain (-7.0)
- 6 = Central (-6.0)
- 7 = Eastern (-5.0)
- 8 = Atlantic (-4.0)
- 9 = Newfoundland (-3.5)
- 10 = saEastern (-3.0)
- 11 = MidAtlantic (-2.0)
- 12 = Azores (-1.0)
- 13 = Greenwich (0.0)
- 14 = Central EU (+1.0)
- 15 = Europe (+2.0)
- 16 = Russian (+3.0)
- 17 = Iran (+3.5)
- 18 = Arabian (+4.0)
- 19 = Afghan (+4.5)
- 20 = West Asia (+5.0)
- 21 = India (+5.5)
- 22 = Nepal (+5.75)
- 23 = Central Asia (+6.0)
- 24 = Myanmar (+6.5)
- 25 = South East Asia (+7.0)
- 26 = China (+8.0)
- 27 = Korea (+9.0)
- 28 = Central Australia (+9.5)
- 29 = East Australia (+10.0)
- 30 = Central Pacific (+11.0)
- 31 = Fiji (+12.0)
- 32 = Tonga (+13.0)
- 33 = special

A.13.14 Device feature control

Index	Parameter name	Definition	Enumerated list of values
135	DEVICE_UNIQUE_ID Data type = Unsigned32 Size = 4	Access = R Default value = — Release = 1.0	—
136	PERM_LICENSE_KEY Data type = Visible String Size = 16	Access = RW Default value = 0 Release = 1.0	16 ASCII characters that represent hexadecimal values (0-9, A-F)
137	TEMP_LICENSE_KEY Data type = Visible String Size = 16	Access = RW Default value = 0 Release = 1.0	16 ASCII characters that represent hexadecimal values (0-9, A-F)
138	DEVICE_TEMP_LICENSE Data type = BitEnumerated32 Size = 4	Transmitter Temporary license information Access = R Default value = — Release = 1.0	See Device licenses

Index	Parameter name	Definition	Enumerated list of values
139	DEV_TEMP_LICS_EXPIRY Data type = Unsigned16 Size = 2	Temporary license key expiration time stamp Access = R Default value = — Release = 1.0	—
140	DEVICE_PERM_LICENSE Data type = BitEnumerated32 Size = 4	Transmitter permanent license information Access = R Default value = — Release = 1.0	See Device licenses
141	DEV_PERM_LICS_EXPIRY Data type = Unsigned16 Size = 2	Permanent license key expiration time stamp Access = R Default value = — Release = 1.0	—
142	CM_EN Data type = Enumerated16 Size = 2	Enable concentration measurement Access = RW Default value = 0 Release = 1.0	0 = Disable 1 = Enable
143	PM_EN Data type = Enumerated16 Size = 2	Enable petroleum measurement Access = RW Default value = 0 Release = 1.0	0 = Disable 1 = Enable
144	USB_PORT_EN Data type = Enumerated16 Size = 2	USB port control options Access = RW Default value = 1 Release = 1.0	0 = Disable 1 = Enable

Device licenses

0x00008000 = APM for Single Liquid and Gas
0x00000040 = Gas Linearization
0x00000010 = API Referral
0x00000008 = Concentration Measurement
0x00000800 = APM for Wet Gas
0x00002000 = APM for 3 Phase Flow and NOC
0x00004000 = Historian download
0x00001000 = Smart Meter Verification Professional

A.13.15 Configuration file operations

Index	Parameter name	Definition	Enumerated list of values
145	CONF_FILE_TYPE Data type = Enumerated16 Size = 2	Configuration file type Access = RW Default value = 255 Release = 1.0	1 = Spare File 3 = Transfer File 5 = ED Matrix File 255 = None
146	CONF_FILE_SAVE Data type = Enumerated16 Size = 2	Save the configuration file Access = RW Default value = 0 Release = 1.0	0 = None 1 = Save Config File
147	CONF_FILE_RESTORE Data type = Enumerated16 Size = 2	Restore the configuration file Access = RW Default value = 0 Release = 1.0	0 = None 1 = Restore Config File
148	CONF_FILE_NAME Data type = Visible String Size = 20	Configuration filename Access = RW Default value = "MMI" Release = 1.0	—
149	CONF_FILE_STATUS Data type = Enumerated16 Size = 2	Configuration file save/restore status Access = R Default value = — Release = 1.0	0 = Done 1 = Error/Aborted 2 = In progress
150	CONF_FILE_CURVE_NUM Data type = Enumerated16 Size = 2	Configuration file matrix curve number Access = RW Default value = 0 Release = 1.0	0 = Curve 1 1 = Curve 2 2 = Curve 3 3 = Curve 4 4 = Curve 5 5 = Curve 6

A.13.16 Discrete events

Index	Parameter name	Definition	Enumerated list of values
151	DIS_EVENT_INDEX Data type = Enumerated16 Size = 2	Discrete Event Index Access = RW (any) Default value = 0 Release = 1.0	0 ≤ x ≤ 4
152	DIS_EVENT_ACTION Data type = Enumerated16 Size = 2	Discrete Event Action Access = RW Default value = 1 Release = 1.0	See DIS_EVENT_ACTION

Index	Parameter name	Definition	Enumerated list of values
153	DIS_EVENT_SETPOINTA Data type = Float Size = 4	Discrete Event Action Setpoint A Access = RW Default value = 0.0f Release = 1.0	—
154	DIS_EVENT_SETPOINTB Data type = Float Size = 4	Discrete Event Action Setpoint B Access = RW Default value = 0.0f Release = 1.0	—
155	DIS_EVENT_PV Data type = Enumerated16 Size = 2	Discrete Event Process Variables Access = RW Default value = 3 Release = 1.0	See DIS_EVENT_PV
156	DIS_EVENT_TRIGGER Data type = BitEnumerated32 Size = 4	Discrete Event Action Trigger Access = RW Default value = — Release = 1.0	See DIS_EVENT_TRIGGER
157	DIS_EVENT_UNITS Data type = Enumerated16 Size = 2	Discrete Event Process Variable Units Access = R Default value = — Release = 1.0	See DIS_EVENT_UNITS
158	DIS_FEATURE Data type = BitEnumerated32 Size = 4	Enable\disable update local feature information Access = R Default value = — Release = 1.0	See DIS_FEATURE

DIS_EVENT_ACTION

0 = > Set-Point A (Process Value > A)
1 = < Set-Point A (Process Value < A)
2 = In Range (A < Process Value < B)
3 = Out of Range (Process Value < A or Process Value > B)

DIS_EVENT_PV

0 = Mass Flow Rate
1 = Temperature
2 = Cfg Total 1
3 = Density
4 = Cfg Inv 1
5 = Volume Flow Rate
6 = Cfg Total 2
7 = Cfg Inv 2
15 = API: Corr Density (PM)*
16 = API: Corr Vol Flow(PM)*
17 = Cfg Total 3
18 = Cfg Inv 3
19 = API: Avg Density (PM)*
20 = API: Avg Temp (PM)*
21 = ED: Density At Ref (CM)*
22 = ED: Density (SGU)(CM)*
23 = ED: Std Vol Flow Rate (CM)*
25 = Cfg Inv 5
26 = ED: Net Mass Flow (CM)*
27 = Cfg Total 6
28 = Cfg Inv 6
29 = ED: Net Vol Flow Rate (CM)*
30 = Cfg Total 7
31 = Cfg Inv 7
32 = ED: Concentration (CM)*
33 = API: CTL(PM)
46 = Raw Tube Frequency
47 = Drive Gain
48 = Case Temperature
49 = LPO Amplitude
50 = RPO Amplitude
51 = Board Temperature
53 = Ext. Input Pressure
55 = Ext. Input Temp
56 = ED: Density (Baume)(CM)*
62 = Gas Std Vol Flow (GSV)*
63 = Cfg Total 4
64 = Cfg Inv 4
68 = Field Verification Zero
69 = Live Zero
73 = APM: Net Flow Oil At Line (APM)*
74 = APM: Water Cut At Line (APM)*
75 = APM: Net Flow Water At Line(APM)*
78 = APM: Net Flow Oil At Ref(APM)*
79 = APM: Water Cut At Ref (APM)*
81 = APM: Net Flow Water At Ref
(APM)*
187 = APM: Dens Oil at Line(APM)*
205 = APM: Gas Void Fraction(APM)*
208 = Mass Flow Velocity
210 = APM:Unremediated Mass Flow (APM)*
212 = APM:Unremediated Volume flow(APM)*
230 = APM: TMR Liquid Flow(APM)*
251 = None

DIS_EVENT_TRIGGER

0x00000001 = Start Sensor Zero
0x00000002 = Reset Total 1
0x00000004 = Reset Total 2
0x00000008 = Reset Total 3
0x00000010 = Reset Total 4
0x00000020 = Reset Total 5
0x00000040 = Reset Total 6
0x00000080 = Reset Total 7
0x00000100 = Reset All Totals
0x00000200 = Start/Stop All Totals
0x00000400 = Increment ED Curve,(CM)*
0x00000800 = Start Smart Meter Verification(MV)*
0x00001000 = Start/Stop Total1
0x00002000 = Start/Stop Total2
0x00004000 = Start/Stop Total3
0x00008000 = Start/Stop Total4
0x00010000 = Start/Stop Total5
0x00020000 = Start/Stop Total6
0x00040000 = Start/Stop Total7
0x00080000 = Start/Stop Inventory1
0x00100000 = Start/Stop Inventory2
0x00200000 = Start/Stop Inventory3
0x00400000 = Start/Stop Inventory4
0x00800000 = Start/Stop Inventory5
0x01000000 = Start/Stop Inventory6
0x02000000 = Start/Stop Inventory7

DIS_EVENT_UNITS

MASS_FLOW_UNITS
VOLUME_FLOW_UNITS
TEMPERATURE_UNITS
DENSITY_UNITS
PRESSURE_UNITS
GSV_FLOW_UNITS
FLOW_VELOCITY_UNIT
Hz
%
Volts
BAUM
NO_UNIT
TI_MASS_STD_UNITS
TI_VOL_STD_UINTS
TI_GSV_STD_UINTS

DIS_FEATURE

0x00000001 = Basic Meter Verification
0x00000002 = Professional Meter Verification
0x00000004 = API
0x00000008 = CM
0x00000010 = Gas Linearization
0x00000020 = APM NOC
0x00000040 = APM TMR
0x00000080 = APM TBR
0x00000100 = APM Manual
0x00010000 = GSV Enabled
0x00020000 = API Enabled
0x00040000 = CM Enabled
0x00080000 = Gas Linearization Enabled
0x00100000 = APM Liquid With Gas Consistent Flow
0x00200000 = APM Net Oil (NOC) and Liquid with Gas Consistent Flow
0x00400000 = APM Liquid with Gas Variable Flow
0x00800000 = APM Net Oil (NOC) and Liquid with Gas Variable Flow
0x01000000 = APM Gas with Liquid
0x02000000 = APM Net Oil
0x04000000 = APM Shrinkage Enabled

A.13.17 Transducer block View_1

Index	Parameter	Size
1	ST_REV	2
6	MODE_BLK	3
7	ALARM_SUM	8
Overall sum of bytes in View- Object		13

A.14 Configurable totalizer and inventory block parameters (slot 15)

Standard PROFIBUS-PA block parameters 0 through 7

See PROFIBUS-PA parameters 0 through 7.

A.14.1 Configurable totalizers and inventories

Configurable totalizers

Index	Parameter name	Definition	Enumerated list of values
8	TOT_INV_CON Data type = Enumerated16 Size = 2	Totalizer and inventory control codes Access = RW Default value = 00 - None Release = 1.0	See TOT_INV_CON
9	CFG_TOT1 Data type = 101 Size = 5	Configurable Totalizer 1 Access = R Default value = — Release = 1.0	—
10	CFG_TOT1_SRC Data type = Enumerated16 Size = 2	Source variable for CFG_TOT1 Access = RW Default value = 0 Release = 1.0	See CFG source variables
11	CFG_TOT1_UNIT_SRC Data type = Enumerated16 Size = 2	Unit source for CFG_TOT1 Access = RW Default value = 224 Release = 1.0	224 = Mass Total Units 225 = Volume Total Units 226 = Alt Volume Total Units 227 = Alt Mass Total Units
12	CFG_TOT1_UNIT Data type = Enumerated16 Size = 2	Unit for CFG_TOT1 Access = R Default value = — Release = 1.0	See CFG units
13	CFG_TOT1_DIRECTION Data type = Enumerated16 Size = 2	Totalizer measurement direction for CFG_TOT1 Access = RW Default value = 0 Release = 1.0	See CFG directions
14	CFG_TOT1_NAME Data type = Visible String Size = 16	Name for CFG_TOT1 Access = R Default value = — Release = 1.0	—
15	CFG_TOT1_USER_NAME Data type = Visible String Size = 16	User defined name for CFG_TOT1 Access = RW Default value = " " Release = 1.0	—

Index	Parameter name	Definition	Enumerated list of values
16	CFG_TOT1_RESET Data type = 102 Size = 2	Reset CFG_TOT1 Access = RW Default value = 0 Release = 1.0	1 = Reset 0 = None
17	CFG_TOT2 Data type = 101 Size = 5	Configurable Totalizer 2 Access = R Default value = — Release = 1.0	—
18	CFG_TOT2_SRC Data type = Enumerated16 Size = 2	Source variable for CFG_TOT2 Access = RW Default value = 5 Release = 1.0	See CFG source variables
19	CFG_TOT2_UNIT_SRC Data type = Enumerated16 Size = 2	Unit source for CFG_TOT2 Access = RW Default value = 225 Release = 1.0	224 = Mass Total Units 225 = Volume Total Units 226 = Alt Volume Total Units 227 = Alt Mass Total Units
20	CFG_TOT2_UNIT Data type = Enumerated16 Size = 2	Unit for CFG_TOT2 Access = R Default value = — Release = 1.0	See CFG units
21	CFG_TOT2_DIRECTION Data type = Enumerated16 Size = 2	Totalizer measurement direction for CFG_TOT2 Access = RW Default value = 0 Release = 1.0	See CFG directions
22	CFG_TOT2_NAME Data type = Visible String Size = 16	Name for CFG_TOT2 Access = R Default value = — Release = 1.0	—
23	CFG_TOT2_USER_NAME Data type = Visible String Size = 16	User defined name for CFG_TOT2 Access = RW Default value = " " Release = 1.0	—
24	CFG_TOT2_RESET Data type = 102 Size = 2	Reset CFG_TOT2 Access = RW Default value = 0 Release = 1.0	1 = Reset 0 = None

Index	Parameter name	Definition	Enumerated list of values
25	CFG_TOT3 Data type = 101 Size = 5	Configurable Totalizer 3 Access = R Default value = — Release = 1.0	—
26	CFG_TOT3_SRC Data type = Enumerated16 Size = 2	Source variable for CFG_TOT3 Access = RW Default value = 16 Release = 1.0	See CFG source variables
27	CFG_TOT3_UNIT_SRC Data type = Enumerated16 Size = 2	Unit Source for CFG_TOT3 Access = RW Default value = 225 Release = 1.0	224 = Mass Total Units 225 = Volume Total Units 226 = Alt Volume Total Units 227 = Alt Mass Total Units
28	CFG_TOT3_UNIT Data type = Enumerated16 Size = 2	Unit for CFG_TOT3 Access = R Default value = — Release = 1.0	See CFG units
29	CFG_TOT3_DIRECTION Data type = Enumerated16 Size = 2	Totalizer measurement direction for CFG_TOT3 Access = RW Default value = 0 Release = 1.0	See CFG directions
30	CFG_TOT3_NAME Data type = Visible String Size = 16	Name for CFG_TOT3 Access = R Default value = — Release = 1.0	—
31	CFG_TOT3_USER_NAME Data type = Visible String Size = 16	User defined name for CFG_TOT3 Access = RW Default value = " " Release = 1.0	—
32	CFG_TOT3_RESET Data type = 102 Size = 2	Reset CFG_TOT3 Access = RW Default value = 0 Release = 1.0	1 = Reset 0 = None
33	CFG_TOT4 Data type = 101 Size = 5	Configurable Totalizer 4 Access = R Default value = — Release = 1.0	—

Index	Parameter name	Definition	Enumerated list of values
34	CFG_TOT4_SRC Data type = Enumerated16 Size = 2	Source variable for CFG_TOT4 Access = RW Default value = 62 Release = 1.0	See CFG source variables
35	CFG_TOT4_UNIT_SRC Data type = Enumerated16 Size = 2	Unit source for CFG_TOT4 Access = RW Default value = 226 Release = 1.0	224 = Mass Total Units 225 = Volume Total Units 226 = Alt Volume Total Units 227 = Alt Mass Total Units
36	CFG_TOT4_UNIT Data type = Enumerated16 Size = 2	Unit for CFG_TOT4 Access = R Default value = — Release = 1.0	See CFG units
37	CFG_TOT4_DIRECTION Data type = Enumerated16 Size = 2	Totalizer measurement direction for CFG_TOT4 Access = RW Default value = 0 Release = 1.0	See CFG directions
38	CFG_TOT4_NAME Data type =Visible String Size = 16	Name for CFG_TOT4 Access = R Default value = — Release = 1.0	—
39	CFG_TOT4_USER_NAME Data type = Visible String Size = 16	User defined name for CFG_TOT4 Access = RW Default value = " " Release = 1.0	—
40	CFG_TOT4_RESET Data type = 102 Size = 2	Reset CFG_TOT4 Access = RW Default value = 0 Release = 1.0	1 = Reset 0 = None
41	CFG_TOT5 Data type = 101 Size = 5	Configurable Totalizer 5 Access = R Default value = — Release = 1.0	—
42	CFG_TOT5_SRC Data type = Enumerated16 Size = 2	Source variable for CFG_TOT5 Access = RW Default value = 23 Release = 1.0	See CFG source variables

Index	Parameter name	Definition	Enumerated list of values
43	CFG_TOT5_UNIT_SRC Data type = Enumerated16 Size = 2	Unit Source for CFG_TOT5 Access = RW Default value = 225 Release = 1.0	224 = Mass Total Units 225 = Volume Total Units 226 = Alt Volume Total Units 227 = Alt Mass Total Units
44	CFG_TOT5_UNIT Data type = Enumerated16 Size = 2	Unit for CFG_TOT5 Access = R Default value = — Release = 1.0	See CFG units
45	CFG_TOT5_DIRECTION Data type = Enumerated16 Size = 2	Totalizer measurement direction for CFG_TOT5 Access = RW Default value = 0 Release = 1.0	See CFG directions
46	CFG_TOT5_NAME Data type = Visible String Size = 16	Name for CFG_TOT5 Access = R Default value = — Release = 1.0	—
47	CFG_TOT5_USER_NAME Data type = Visible String Size = 16	User defined name for CFG_TOT5 Access = RW Default value = " " Release = 1.0	—
48	CFG_TOT5_RESET Data type = 102 Size = 2	Reset CFG_TOT5 Access = RW Default value = 0 Release = 1.0	1 = Reset 0 = None
49	CFG_TOT6 Data type = 101 Size = 5	Configurable Totalizer 6 Access = R Default value = — Release = 1.0	—
50	CFG_TOT6_SRC Data type = Enumerated16 Size = 2	Source variable for CFG_TOT6 Access = RW Default value = 26 Release = 1.0	See CFG source variables
51	CFG_TOT6_UNIT_SRC Data type = Enumerated16 Size = 2	Unit Source for CFG_TOT6 Access = RW Default value = 225 Release = 1.0	224 = Mass Total Units 225 = Volume Total Units 226 = Alt Volume Total Units 227 = Alt Mass Total Units

Index	Parameter name	Definition	Enumerated list of values
52	CFG_TOT6_UNIT Data type = Enumerated16 Size = 2	Unit for CFG_TOT6 Access = R Default value = — Release = 1.0	See CFG units
53	CFG_TOT6_DIRECTION Data type = Enumerated16 Size = 2	Totalizer measurement direction for CFG_TOT6 Access = RW Default value = 0 Release = 1.0	See CFG directions
54	CFG_TOT6_NAME Data type = Visible String Size = 16	Name for CFG_TOT6 Access = R Default value = — Release = 1.0	—
55	CFG_TOT6_USER_NAME Data type = Visible String Size = 16	User defined name for CFG_TOT6 Access = RW Default value = " " Release = 1.0	—
56	CFG_TOT6_RESET Data type = 102 Size = 2	Reset CFG_TOT6 Access = RW Default value = 0 Release = 1.0	1 = Reset 0 = None
57	CFG_TOT7 Data type = 101 Size = 5	Configurable Totalizer 7 Access = R Default value = — Release = 1.0	—
58	CFG_TOT7_SRC Data type = Enumerated16 Size = 2	Source variable for CFG_TOT7 Access = RW Default value = 29 Release = 1.0	See CFG source variables
59	CFG_TOT7_UNIT_SRC Data type = Enumerated16 Size = 2	Unit Source for CFG_TOT7 Access = RW Default value = 225 Release = 1.0	224 = Mass Total Units 225 = Volume Total Units 226 = Alt Volume Total Units 227 = Alt Mass Total Units
60	CFG_TOT7_UNIT Data type = Enumerated16 Size = 2	Unit for CFG_TOT7 Access = R Default value = — Release = 1.0	See CFG units

Index	Parameter name	Definition	Enumerated list of values
61	CFG_TOT7_DIRECTION Data type = Enumerated16 Size = 2	Totalizer measurement direction for CFG_TOT7 Access = RW Default value = 0 Release = 1.0	See CFG directions
62	CFG_TOT7_NAME Data type = Visible String Size = 16	Name for CFG_TOT7 Access = R Default value = — Release = 1.0	—
63	CFG_TOT7_USER_NAME Data type = Visible String Size = 16	User defined name for CFG_TOT7 Access = RW Default value = " " Release = 1.0	—
64	CFG_TOT7_RESET Data type = 102 Size = 2	Reset CFG_TOT7 Access = RW Default value = 0 Release = 1.0	1 = Reset 0 = None
65	ALL_TOT_RESET Data type = 102 Size = 2	Reset all totals Access = RW Default value = 0 Release = 1.0	1 = Reset 0 = None
66	START_STOP_ALL_TOTALS Data type = 102 Size = 2	Start/Stop all totalizers Access = RW Default value = 1 Release = 1.0	0 = Stop Totalizers 1 = Start Totalizers

TOT_INV_CON

00 - None
01 - Start All Totalizers
02 - Stop All Totalizers
03 - Reset All Totalizers
04 - Reset All Inventories
05 - Totalizer1 Start
06 - Totalizer2 Start
07 - Totalizer3 Start
08 - Totalizer4 Start
09 - Totalizer5 Start
10 - Totalizer6 Start
11 - Totalizer7 Start
12 - Inventory1 Start
13 - Inventory2 Start
14 - Inventory3 Start
15 - Inventory4 Start
16 - Inventory5 Start
17 - Inventory6 Start
18 - Inventory7 Start
19 - Totalizer1 Stop
20 - Totalizer2 Stop
21 - Totalizer3 Stop
22 - Totalizer4 Stop
23 - Totalizer5 Stop
24 - Totalizer6 Stop
25 - Totalizer7 Stop
26 - Inventory1 Stop
27 - Inventory2 Stop
28 - Inventory3 Stop
29 - Inventory4 Stop
30 - Inventory5 Stop
31 - Inventory6 Stop
32 = Inventory7 Stop
33 = Totalizer1 Reset
34 = Totalizer2 Reset
35 = Totalizer3 Reset
36 = Totalizer4 Reset
37 = Totalizer5 Reset
38 = Totalizer6 Reset
39 = Totalizer7 Reset
40 = Inventory1 Reset
41 = Inventory2 Reset
42 = Inventory3 Reset
43 = Inventory4 Reset
44 = Inventory5 Reset
45 = Inventory6 Reset
46 = Inventory7 Reset

CFG source variables

00 = Mass Flow Rate
05 = Line (Gross) Volume Flow Rate
16 = PM: Temp Corrected (Standard) Volume Flow (PM)*
23 = CM: Standard Volume Flow Rate (CM)*
26 = CM:Net Mass Flow Rate(CM)*
29 = CM:Net Volume Flow Rate (CM)*
62 = Gas Standard Volume Flow Rate (GSV)*
73 = APM: Net Flow Oil at Line (APM)*
75 = APM: Net Flow Water at Line(APM)*
78 = APM: Net Flow Oil At Reference(APM)*
81 = APM: Net Flow Water At Reference (APM)*
188 = APM: SF Net Oil Flow at Line(APM)*
189 = APM: SF Net Oil Flow at Reference(APM)*
190 = APM: SF Volume Flow at Reference(APM)*
210 = APM: Unremediated Mass Flow (APM)*
212 = APM: Unremediated Vol Flow (APM)*
230 = APM: TMR Liquid Flow (APM)*

CFG units

1089 = g
1088 = kg
1092 = t
1094 = lb
1095 = STon
1096 = Lton
1093 = oz
1999 = Special units
1048 = gallon
1038 = L
1049 = ImpGal
1043 = ft^3
1034 = m^3
1051 = bbl
1053 = SCF
1573 = m3 normal
1575 = m3 std.
1531 = NL
1536 = SL
1050 = bushel
1041 = hl
1042 = in3
1043 = ft3
1044 = yd3

CFG directions

0 = Forward Only (Totalizers Increment for Positive Flow)
1 = Reverse Only (Totalizers Increment for Negative Flow)
2 = Bi-Directional (Totalizers Increment for Positive Flow Decrement for Negative Flow)
3 = Absolute (Totalizers Increment for Positive and Negative Flow)

Configurable inventories

Index	Parameter name	Definition	Enumerated list of values
67	CFG_INV1 Data type = 101 Size = 5	Configurable Inventory 1 Access = R Default value = — Release = 1.0	—
68	CFG_INV1_SRC Data type = Enumerated16 Size = 2	Source variable for CFG_INV1 Access = RW Default value = 0 Release = 1.0	See CFG source variables
69	CFG_INV1_UNIT_SRC Data type = Enumerated16 Size = 2	Unit Source for CFG_INV1 Access = RW Default value = 224 Release = 1.0	224 = Mass Total Units 225 = Volume Total Units 226 = Alt Volume Total Units 227 = Alt Mass Total Units
70	CFG_INV1_UNIT Data type = Enumerated16 Size = 2	Unit for CFG_INV1 Access = R Default value = — Release = 1.0	See CFG units
71	CFG_INV1_ DIRECTION Data type = Enumerated16 Size = 2	Inventory measurement direction for CFG_INV1 Access = RW Default value = 0 Release = 1.0	See CFG directions
72	CFG_INV1_ NAME Data type = Visible String Size = 16	Name for CFG_INV1 Access = R Default value = — Release = 1.0	—
73	CFG_INV1_ USER_NAME Data type = Visible String Size = 16	User defined name for CFG_INV1 Access = RW Default value = " " Release = 1.0	—
74	CFG_INV2 Data type = 101 Size = 5	Configurable Inventory 1 Access = R Default value = — Release = 1.0	—
75	CFG_INV2_SRC Data type = Enumerated16 Size = 2	Source variable for CFG_INV2 Access = RW Default value = 5 Release = 1.0	See CFG source variables

Index	Parameter name	Definition	Enumerated list of values
76	CFG_INV2_UNIT_SRC Data type = Enumerated16 Size = 2	Unit Source for CFG_INV2 Access = RW Default value = 225 Release = 1.0	224 = Mass Total Units 225 = Volume Total Units 226 = Alt Volume Total Units 227 = Alt Mass Total Units
77	CFG_INV2_UNIT Data type = Enumerated16 Size = 2	Unit for CFG_INV2 Access = R Default value = — Release = 1.0	See CFG units
78	CFG_INV2_DIRECTION Data type = Enumerated16 Size = 2	Inventory measurement direction for CFG_INV2 Access = RW Default value = 0 Release = 1.0	See CFG directions
79	CFG_INV2_NAME Data type = Visible String Size = 16	Name for CFG_INV2 Access = R Default value = — Release = 1.0	—
80	CFG_INV2_USER_NAME Data type = Visible String Size = 16	User defined name for CFG_INV2 Access = RW Default value = " " Release = 1.0	—
81	CFG_INV3 Data type = 101 Size = 5	Configurable Inventory 3 Access = R Default value = — Release = 1.0	—
82	CFG_INV3_SRC Data type = Enumerated16 Size = 2	Source variable for CFG_INV3 Access = RW Default value = — Release = 1.0	See CFG source variables
83	CFG_INV3_UNIT_SRC Data type = Enumerated16 Size = 2	Unit Source for CFG_INV3 Access = RW Default value = 225 Release = 1.0	224 = Mass Total Units 225 = Volume Total Units 226 = Alt Volume Total Units 227 = Alt Mass Total Units
84	CFG_INV3_UNIT Data type = Enumerated16 Size = 2	Unit for CFG_INV3 Access = R Default value = — Release = 1.0	See CFG units

Index	Parameter name	Definition	Enumerated list of values
85	CFG_INV3_DIRECTION Data type = Enumerated16 Size = 2	Inventory measurement direction for CFG_INV3 Access = RW Default value = 0 Release = 1.0	See CFG directions
86	CFG_INV3_NAME Data type = Visible String Size = 16	Name for CFG_INV3 Access = R Default value = — Release = 1.0	—
87	CFG_INV3_USER_NAME Data type = Visible String Size = 16	User defined name for CFG_INV3 Access = RW Default value = " " Release = 1.0	—
88	CFG_INV4 Data type = 101 Size = 5	Configurable Inventory 4 Access = R Default value = — Release = 1.0	—
89	CFG_INV4_SRC Data type = Enumerated16 Size = 2	Source variable for CFG_INV4 Access = RW Default value = 62 Release = 1.0	See CFG source variables
90	CFG_INV4_UNIT_SRC Data type = Enumerated16 Size = 2	Unit Source for CFG_INV4 Access = RW Default value = 226 Release = 1.0	224 = Mass Total Units 225 = Volume Total Units 226 = Alt Volume Total Units 227 = Alt Mass Total Units
91	CFG_INV4_UNIT Data type = Enumerated16 Size = 2	Unit for CFG_INV4 Access = R Default value = — Release = 1.0	See CFG units
92	CFG_INV4_DIRECTION Data type = Enumerated16 Size = 2	Inventory measurement direction for CFG_INV4 Access = RW Default value = 0 Release = 1.0	See CFG directions
93	CFG_INV4_NAME Data type = Visible String Size = 16	Name for CFG_INV4 Access = R Default value = — Release = 1.0	—

Index	Parameter name	Definition	Enumerated list of values
94	CFG_INV4_USER_NAME Data type = Visible String Size = 16	User defined name for CFG_INV4 Access = RW Default value = " " Release = 1.0	—
95	CFG_INV5 Data type = 101 Size = 5	Configurable Inventory 5 Access = R Default value = — Release = 1.0	—
96	CFG_INV5_SRC Data type = Enumerated16 Size = 2	Source variable for CFG_INV5 Access = RW Default value = 23 Release = 1.0	See CFG source variables
97	CFG_INV5_UNIT_SRC Data type = Enumerated16 Size = 2	Unit source for CFG_INV5 Access = RW Default value = 225 Release = 1.0	224 = Mass Total Units 225 = Volume Total Units 226 = Alt Volume Total Units 227 = Alt Mass Total Units
98	CFG_INV5_UNIT Data type = Enumerated16 Size = 2	Unit for CFG_INV5 Access = R Default value = — Release = 1.0	See CFG units
99	CFG_INV5_DIRECTION Data type = Enumerated16 Size = 2	Inventory measurement direction for CFG_INV5 Access = RW Default value = 0 Release = 1.0	See CFG directions
100	CFG_INV5_NAME Data type = Visible String Size = 16	Name for CFG_INV5 Access = R Default value = — Release = 1.0	—
101	CFG_INV5_USER_NAME Data type = Visible String Size = 16	User defined name for CFG_INV5 Access = RW Default value = " " Release = 1.0	—
102	CFG_INV6 Data type = 101 Size = 5	Configurable Inventory 6 Access = R Default value = — Release = 1.0	—

Index	Parameter name	Definition	Enumerated list of values
103	CFG_INV6_SRC Data type = Enumerated16 Size = 2	Source variable for CFG_INV6 Access = RW Default value = 26 Release = 1.0	See CFG source variables
104	CFG_INV6_UNIT_SRC Data type = Enumerated16 Size = 2	Unit Source for CFG_INV6 Access = RW Default value = 224 Release = 1.0	224 = Mass Total Units 225 = Volume Total Units 226 = Alt Volume Total Units 227 = Alt Mass Total Units
105	CFG_INV6_UNIT Data type = Enumerated16 Size = 2	Unit for CFG_INV6 Access = R Default value = — Release = 1.0	224 = Mass Total Units 225 = Volume Total Units 226 = Alt Volume Total Units 227 = Alt Mass Total Units
106	CFG_INV6_DIRECTION Data type = Enumerated16 Size = 2	Inventory measurement direction for CFG_INV6 Access = RW Default value = 0 Release = 1.0	See CFG directions
107	CFG_INV6_NAME Data type = Visible String Size = 16	Name for CFG_INV6 Access = R Default value = — Release = 1.0	—
108	CFG_INV6_USER_NAME Data type = Visible String Size = 16	User defined name for CFG_INV6 Access = RW Default value = " " Release = 1.0	—
109	CFG_INV7 Data type = 101 Size = 5	Configurable Inventory 7 Access = R Default value = — Release = 1.0	—
110	CFG_INV7_SRC Data type = Enumerated16 Size = 2	Source variable for CFG_INV7 Access = RW Default value = 29 Release = 1.0	See CFG source variables
111	CFG_INV7_UNIT_SRC Data type = Enumerated16 Size = 2	Unit Source for CFG_INV7 Access = RW Default value = 225 Release = 1.0	224 = Mass Total Units 225 = Volume Total Units 226 = Alt Volume Total Units 227 = Alt Mass Total Units

Index	Parameter name	Definition	Enumerated list of values
112	CFG_INV7_UNIT Data type = Enumerated16 Size = 2	Unit for CFG_INV7 Access = R Default value = — Release = 1.0	See CFG units
113	CFG_INV7_DIRECTION Data type = Enumerated16 Size = 2	Inventory measurement direction for CFG_INV7 Access = RW Default value = 0 Release = 1.0	See CFG directions
114	CFG_INV7_NAME Data type = Visible String Size = 16	Name for CFG_INV7 Access = R Default value = — Release = 1.0	—
115	CFG_INV7_USER_NAME Data type = Visible String Size = 16	User defined name for CFG_INV7 Access = RW Default value = " " Release = 1.0	—

A.14.2 Total / inventory units

Index	Parameter name	Definition	Enumerated list of values
116	TI_MASS_STD_UNITS Data type = Enumerated16 Size = 2	Standard units for mass total Access = RW Default value = 1089 - g Release = 1.0	1089 = g 1088 = kg 1092 = t 1094 = lb 1095 = STon 1096 = Lton 1093 = oz 1999 = special
117	TI_MASS_ALT_UNITS Data type = Enumerated16 Size = 2	Alternate units for mass total Access = RW Default value = 1089 - g Release = 1.0	
118	TI_VOL_STD_UNITS Data type = Enumerated16 Size = 2	Standard units for volume or Gas Standard Volume total and inventory Access = RW Default value = 1038 - L Release = 1.0	See TI_VOL_*_UNITS
119	TI_VOL_ALT_UNITS Data type = Enumerated16 Size = 2	Standard units for volume or Gas Standard Volume total and inventory Access = RW Default value = 1043 - ft^3 Release = 1.0	See TI_VOL_*_UNITS

TI_VOL_*_UNITS

1048 = gal	1043 = ft3	1574 = L normal
1038 = L	1042 = in3	1053 = ft3 std.
1049 = ImpGal	1051 = bbl	1576 = L std.
1034 = m³	1052 = bbl (liq)	1575 = m3 std.
1050 = bushel	1041 = hl	1999 = special
1044 = yd3	1573 = m3 normal	

A.14.3 Transducer block View_1

Index	Parameter	Size
1	ST_REV	2
6	MODE_BLK	3
7	ALARM_SUM	8
Overall sum of bytes in View- Object		13

A.15 Smart Meter Verification block parameters (slot 16)

Standard PROFIBUS-PA block parameters 0 through 7

See PROFIBUS-PA parameters 0 through 7.

A.15.1 Smart Meter Verification

Index	Parameter name	Definition	Enumerated list of values
8	FRF_EN Data type = Enumerated16 Size = 2	Start/Stop meter verification - applicable only if meter verification is enabled Access = RW Default value = 0 Release = 1.0	0 = Disabled 1 = Fixed Output Mode 2 = Factory Air Verification 3 = Factory Water Verification 4 = Special debug mode 5 = Abort 6 = Continue Measurement Mode 7 = Single Point Baseline 8 = Meter Factor Calculation
9	FRF_ONLINE_MV_START Data type = 102 Size = 2 Access = RW	Start On-Line meter verification (equivalent to Reg 3000 = 6) - applicable only if meter verification is enabled Access = RW Default value = 0 Release = 1.0	0 = No Action 1 = Start Meter Verification in continue measurement mode

Index	Parameter name	Definition	Enumerated list of values
10	FRF_MV_FAULT_ALARM Data type = Enumerated16 Size = 2	The state of the outputs when the meter verification routine is running - applicable only if meter verification is enabled Access = RW Default value = 0 Release = 1.0	0 = Last Value 1 = Fault
11	FRF_RUN_COUNT Data type = Unsigned16 Size = 2	MV Run Count Access = R Default value = — Release = 1.0	—
12	FRF_MV_INPROGRESS Data type = Enumerated16 Size = 2	FCF status Access = R Default value = — Release = 1.0	0 = None 1 = MV In Progress
13	FRF_MV_ALGOSTATE Data type = Unsigned16 Size = 2	The current state of the meter verification routine. Access = R Default value = — Release = 1.0	—
14	FRF_MV_PROGRESS Data type = Unsigned16 Size = 2	Progress (% complete) Access = R Default value = — Release = 1.0	—
15	FRF_MV_ABORTCODE Data type = Enumerated16 Size = 2	The reason the meter verification routine aborted. Access = R Default value = — Release = 1.0	See FRF_MV_ABORTCODE
16	FRF_MV_ABORTSTATE Data type = Unsigned16 Size = 2	The state of the meter verification routine when it aborted. Access = R Default value = — Release = 1.0	—
17	FRF_MV_FAILED Data type = 102 Size = 2	Indicates whether meter verification failed Access = R Default value = — Release = 1.0	0 = Meter Verification did not Fail 1 = Meter Verification Failed

Index	Parameter name	Definition	Enumerated list of values
18	FRF_STIFFNESS_LIMIT Data type = Float Size = 4	The setpoint of the stiffness limit. Represents percentage. (Applicable only if meter verification is enabled). Access = RW Default value = 0.0f Release = 1.0	0.0f ≤ x ≤ 1.0f
19	FRF_STFLMT_LPO Data type = Unsigned16 Size = 2	Is the LPO stiffness out of limits? Access = R Default value = — Release = 1.0	—
20	FRF_STFLMT_RPO Data type = Unsigned16 Size = 2	Is the RPO stiffness out of limits? Access = R Default value = — Release = 1.0	—
21	FRF_STF_LPO_AIR Data type = Float Size = 4	The LPO stiffness calculated as a mean during Factory Cal of Air Access = R Default value = — Release = 1.0	—
22	FRF_STF_RPO_AIR Data type = Float Size = 4	The RPO stiffness calculated as a mean during Factory Cal of Air Access = R Default value = — Release = 1.0	—
23	FRF_STF_LPO_WATER Data type = Float Size = 4	The LPO stiffness calculated as a mean during Factory Cal of Water Access = R Default value = — Release = 1.0	—
24	FRF_STF_RPO_WATER Data type = Float Size = 4	The RPO stiffness calculated as a mean during Factory Cal of Water Access = R Default value = — Release = 1.0	—
25	FRF_MASS_LPO_AIR Data type = Float Size = 4	The LPO mass calculated as a mean during Factory Cal of Air Access = R Default value = — Release = 1.0	—

Index	Parameter name	Definition	Enumerated list of values
26	FRF_MASS_RPO_AIR Data type = Float Size = 4	The RPO mass calculated as a mean during Factory Cal of Air Access = R Default value = — Release = 1.0	—
27	FRF_MASS_LPO_WATER Data type = Float Size = 4	The LPO mass calculated as a mean during Factory Cal of Water Access = R Default value = — Release = 1.0	—
28	FRF_MASS_RPO_WATER Data type = Float Size = 4	The RPO mass calculated as a mean during Factory Cal of Water Access = R Default value = — Release = 1.0	—
29	FRF_DAMPING_AIR Data type = Float Size = 4	The damping calculated as a mean during Factory Cal of Air Access = R Default value = — Release = 1.0	—
30	FRF_DAMPING_WATER Data type = Float Size = 4	The damping calculated as a mean during Factory Cal of Water Access = R Default value = — Release = 1.0	—
31	FRF_OUTPUT_STATE Data type = BitEnumerated16 Size = 2	SMV Fail reason bits Access = R Default value = — Release = 1.0	See FRF_OUTPUT_STATE
32	FRF_MV_PASSCOUNTER Data type = Unsigned16 Size = 2	Counts the number of times the meter verification algorithm has run successfully. Access = R Default value = — Release = 1.0	—
33	FRF_DRIVE_CURRENT Data type = Float Size = 4	Drive Current Access = R Default value = — Release = 1.0	—

Index	Parameter name	Definition	Enumerated list of values
34	FRF_DL_T Data type = Float Size = 4	Delta T Access = R Default value = — Release = 1.0	—
35	FRF_TEMP Data type = Float Size = 4	Temperature Access = R Default value = — Release = 1.0	—
36	FRF_DENSITY Data type = Float Size = 4	Density Access = R Default value = — Release = 1.0	—
37	FRF_DRIVE_FREQ Data type = Float Size = 4	Drive Frequency Access = R Default value = — Release = 1.0	—
38	FRF_LPO_FILTER Data type = Float Size = 4	LPO Filter Access = R Default value = — Release = 1.0	—
39	FRF_RPO_FILTER Data type = Float Size = 4	RPO Filter Access = R Default value = — Release = 1.0	—
40	FRF_MV_FIRSTRUN_TIME Data type = Float Size = 4	FCF Timers: Time until first run in hours Access = RW Default value = 0.0f Release = 1.0	—
41	FRF_MV_ELAPSE_TIME Data type = Float Size = 4	FCF Timers: Time between each run after the first run initiated in hours Access = RW Default value = 0.0f Release = 1.0	—
42	FRF_MV_TIME_LEFT Data type = Float Size = 4	FCF Timers: Time until next run in hours Access = R Default value = — Release = 1.0	—

Index	Parameter name	Definition	Enumerated list of values
43	FRF_TONE_LEVEL Data type = Float Size = 4	FRF tone level (mA) Access = RW Default value = 0.0f Release = 1.0	—
44	FRF_TONE_RAMP_TIME Data type = Float Size = 4	Tone ramp time (seconds) Access = RW Default value = 0.0f Release = 1.0	—
45	FRF_BL_COE Data type = Float Size = 4	BL coefficient Access = RW Default value = 0.0f Release = 1.0	—
46	FRF_DRIVE_TARGET Data type = Float Size = 4	FRF drive target Access = RW Default value = 0.0f Release = 1.0	—
47	FRF_DRIVE_PCOE Data type = Float Size = 4	FRF drive P coefficient Access = RW Default value = 0.0f Release = 1.0	—
48	FRF_TONE_SPACING_MUL Data type = Float Size = 4	Tone spacing multiplier Access = RW Default value = 0.0f Release = 1.0	—
49	FRF_FREQ_DRIFT_LMT Data type = Float Size = 4	Frequency drift limit Access = RW Default value = 0.0f Release = 1.0	—
50	FRF_MAX_CURRENT_MA Data type = Float Size = 4	Maximum sensor current Access = RW Default value = 0.0f Release = 1.0	—
51	FRF_KFQ2 Data type = Float Size = 4	KFQ2 linear density correction for stiffness value Access = RW Default value = 0.0f Release = 1.0	—

FRF_MV_ABORTCODE

0 = No error
1 = Manual abort
2 = Drive settle time error
3 = Frequency drift error
4 = Drive voltage too high
5 = Drive current too high
6 = Drive current erratic
7 = General drive error
8 = Delta T erratic
9 = Delta To too high
10 = State Running
11 = State complete
12 = MV data error
13 = No Air Calibration
14 = No Water Calibration
15 = In correct Configuration

FRF_OUTPUT_STATE

0x0001 = Left Stiffness Changed High
0x0002 = Left Stiffness Changed Low
0x0004 = Right Stiffness Changed High
0x0008 = Right Stiffness Changed Low
0x0010 = Symmetry Right High
0x0020 = Symmetry Right Low
0x0040 = Uncertainty Too High
0x0080 = Possible coating or erosion/corrosion
0x0100 = Possible corrosion
0x0200 = Possible freezing or overpressure
0x0400 = Possible coating or damage
0x0800 = Possible corrosion/erosion
0x1000 = Possible coating
0x2000 = Undefined
0x4000 = Undefined
0x8000 = SMV Factors mode (mode 8) failed

A.15.2 Meter verification history

Index	Parameter name	Definition	Enumerated list of values
52	FRF_DS_INDEX Data type = Unsigned16 Size = 2	Meter verification data storage index Access = RW Default value = 0 Release = 1.0	0 ≤ x ≤ 19
53	FRF_DS_TIME Data type = Date Size = 7	Time stamp of Smart Meter Verification run Access = R Default value = — Release = 1.0	—
54	FRF_DS_LPO_STIFF Data type = Float Size = 4	LPO stiffness Access = R Default value = — Release = 1.0	—
55	FRF_DS_RPO_STIFF Data type = Float Size = 4	RPO stiffness Access = R Default value = — Release = 1.0	—
56	FRF_DS_LPO_MASS Data type = Float Size = 4	LPO mass data Access = R Default value = — Release = 1.0	—

Index	Parameter name	Definition	Enumerated list of values
57	FRF_DS_RPO_MASS Data type = Float Size = 4	RPO mass data Access = R Default value = — Release = 1.0	—
58	FRF_DS_DAMPING Data type = Float Size = 4	Damping Access = R Default value = — Release = 1.0	—
59	FRF_DS_DRIVE_MA Data type = Float Size = 4	Drive current in mA Access = R Default value = — Release = 1.0	—
60	FRF_DS_DELTA_T Data type = Float Size = 4	Delta T in usec Access = R Default value = — Release = 1.0	—
61	FRF_DS_TEMPERATURE Data type = Float Size = 4	Temperature Access = R Default value = — Release = 1.0	—
62	FRF_DS_DENSITY Data type = Float Size = 4	Density Access = R Default value = — Release = 1.0	—
63	FRF_DS_LPO_AMP Data type = Float Size = 4	LPO Amplitude Access = R Default value = — Release = 1.0	—
64	FRF_DS_RPO_AMP Data type = Float Size = 4	RPO amplitude Access = R Default value = — Release = 1.0	—
65	FRF_DS_DRV_FREQ Data type = Float Size = 4	Drive frequency Access = R Default value = — Release = 1.0	—

Index	Parameter name	Definition	Enumerated list of values
66	FRF_DS_LPO_EXP Data type = Float Size = 4	LPO export Access = R Default value = — Release = 1.0	—
67	FRF_DS_RPO_EXP Data type = Float Size = 4	RPO export Access = R Default value = — Release = 1.0	—
68	FRF_DS_LPO_CONF Data type = Float Size = 4	LPO conf Access = R Default value = — Release = 1.0	—
69	FRF_DS_RPO_CONF Data type = Float Size = 4	RPO conf Access = R Default value = — Release = 1.0	—
70	FRF_DS_LPO_FLEX Data type = Float Size = 4	LPO flex Access = R Default value = — Release = 1.0	—
71	FRF_DS_RPO_FLEX Data type = Float Size = 4	RPO flex Access = R Default value = — Release = 1.0	—
72	FRF_DS_ABORT_CODE Data type = Enumerated16 Size = 2	MV abort code Access = R Default value = — Release = 1.0	See FRF_DS_ABORTCODE
73	FRF_DS_ABORT_STATE Data type = Unsigned16 Size = 2	MV abort state Access = R Default value = — Release = 1.0	—
74	FRF_DS_LPO_P_F Data type = Unsigned16 Size = 2	LPO P/F Access = R Default value = — Release = 1.0	—

Index	Parameter name	Definition	Enumerated list of values
75	FRF_DS_RPO_P_F Data type = Unsigned16 Size = 2	RPO P/F Access = R Default value = — Release = 1.0	—
76	FRF_DS_SENSOR_CD Data type = Unsigned16 Size = 2	Sensor type code Access = R Default value = — Release = 1.0	—
77	FRF_DS_SENSOR_SN Data type = Unsigned32 Size = 4	Sensor serial number Access = R Default value = — Release = 1.0	—
78	FRF_DS_OUTPUT_STATE Data type = BitEnumerated16 Size = 2	Meter verification result Access = R Default value = — Release = 1.0	See FRF_DS_OUTPUT_STATE
79	FRF_LAST_RUN_INDEX Data type = Unsigned16 Size = 2	Last MV run index Access = R Default value = — Release = 1.0	—
80	FRF_LPO_METER_FACTOR Data type = Float Size = 4	LPO meter factor Access = RW Default value = 1.0f Release = 1.0	$0.8 \leq x \leq 1.2$
81	FRF_RPO_METER_FACTOR Data type = Float Size = 4	RPO meter factor Access = RW Default value = 1.0f Release = 1.0	$0.8 \leq x \leq 1.2$
82	FRF_ACK_ALERT Data type = Unsigned16 Size = 2	Acknowledge all alert Access = RW Default value = 0 Release = 1.0	0 = No Action 1 = Acknowledge All Alerts

FRF_DS_ABORTCODE

0 = No error
1 = Manual abort
2 = Drive settle time error
3 = Frequency drift error
4 = Drive voltage too high
5 = Drive current too high
6 = Drive current erratic
7 = General drive error
8 = Delta T erratic
9 = Delta To too high
10 = State Running
11 = State complete
12 = MV data error
13 = No Air Calibration
14 = No Water Calibration
15 = In correct Configuration

FRF_DS_OUTPUT_STATE

0x0001 = Left Stiffness Changed High
0x0002 = Left Stiffness Changed Low
0x0004 = Right Stiffness Changed High
0x0008 = Right Stiffness Changed Low
0x0010 = Symmetry Right High
0x0020 = Symmetry Right Low
0x0040 = Uncertainty Too High
0x0080 = Possible coating or erosion/corrosion
0x0100 = Possible corrosion
0x0200 = Possible freezing or overpressure
0x0400 = Possible coating or damage
0x0800 = Possible corrosion/erosion
0x1000 = Possible coating
0x2000 = Undefined
0x4000 = Undefined
0x8000 = SMV Factors mode (mode 8) failed

A.15.3 Transducer block View_1

Index	Parameter	Size
1	ST_REV	2
6	MODE_BLK	3
7	ALARM_SUM	8
Overall sum of bytes in View- Object		13

A.16 API process variables block parameters (slot 17)

Standard PROFIBUS-PA block parameters 0 through 7

See PROFIBUS-PA parameters 0 through 7.

API process variables

Index	Parameter name	Definition	Enumerated list of values
8	API_CORR_DENSITY Data type = 101 Size = 5	Temperature corrected density Access = R Default value = — Release = 1.0	—
9	API_CORR_VOL_FLOW Data type = 101 Size = 5	Temperature corrected (standard) volume flow Access = R Default value = — Release = 1.0	—
10	API_AVG_CORR_DENSITY Data type = 101 Size = 5	Batch weighted average density Access = R Default value = — Release = 1.0	—

Index	Parameter name	Definition	Enumerated list of values
11	API_AVG_CORR_TEMP Data type = 101 Size = 5	Batch weighted average temperature Access = R Default value = — Release = 1.0	—
12	API_CTPL Data type = 101 Size = 5	Combined Temperature and Pressure Correction Factor (CTPL) Access = R Default value = — Release = 1.0	—
13	API_REF_TEMP Data type = Float Size = 4	API Reference temperature Access = RW Default value = 15.0 Release = 1.0	-50.0f ≤ x ≤ 150.0f deg C.
14	API_TEC Data type = Float Size = 4	API Thermal Expansion Coeff Access = RW Default value = 0.001 Release = 1.0	0.000413f ≤ x ≤ 0.001675f
15	API_TABLE_TYPE Data type = Enumerated16 Size = 2	API 2540 CTL table type Access = RW Default value = 81 Release = 1.0	See API_TABLE_TYPE
16	API_REF_PRESSURE Data type = Float Size = 4	API Reference pressure Access = RW Default value = 0.0f Release = 1.0	0.0f ≤ x ≤ 1500.0f PSI

API_TABLE_TYPE

17 = Table 5A
18 = Table 5B
19 = Table 5D
36 = Table 6C
49 = Table 23A
50 = Table 23B
51 = Table 23D
53 = Table 23E
68 = Table 24C
69 = Table 24E
81 = Table 53A
82 = Table 53B
83 = Table 53D
85 = Table 53E
100 = Table 54C
101 = Table 54E
113 = Table 59A
114 = Table 59B
115 = Table 59D
117 = Table 59E
129 = Table 60A
130 = Table 60B
131 = Table 60D
133 = Table 60E

A.16.1 Transducer block View_1

Index	Parameter	Size
1	ST_REV	2

Index	Parameter	Size
6	MODE_BLK	3
7	ALARM_SUM	8
Overall sum of bytes in View- Object		13

A.17 Concentration measurement block parameters (slot 18)

Standard PROFIBUS-PA block parameters 0 through 7

See PROFIBUS-PA parameters 0 through 7.

Concentration measurement process variables

Index	Parameter name	Definition	Enumerated list of values
8	CM_REF_DENS Data type = 101 Size = 5	Density at reference Access = R Default value = — Release = 1.0	—
9	CM_SPEC_GRAV Data type = 101 Size = 5	Density (fixed SG units) Access = R Default value = — Release = 1.0	—
10	CM_STD_VOL_FLOW Data type = 101 Size = 5	Standard volume flow rate Access = R Default value = — Release = 1.0	—
11	CM_NET_MASS_FLOW Data type = 101 Size = 5	Net mass flow rate Access = R Default value = — Release = 1.0	—
12	CM_NET_VOL_FLOW Data type = 101 Size = 5	Net volume flow rate Access = R Default value = — Release = 1.0	—
13	CM_CONC Data type = 101 Size = 5	Concentration Access = R Default value = — Release = 1.0	—

Concentration measurement setup data

Index	Parameter name	Definition	Enumerated list of values
14	CM_CURVE_LOCK Data type = Enumerated16 Size = 2	Lock enhanced density tables Access = RW Default value = 0 Release = 1.0	0 = Not Locked 1 = Locked
15	CM_MODE Data type = Enumerated16 Size = 2	Enhanced density mode Access = RW Default value = 3 Release = 1.0	1 = Dens at Ref Temp 2 = Specific Gravity 3 = Mass Conc (Dens) 4 = Mass Conc (SG) 5 = Vol Conc (Dens) 6 = Vol Conc (SG) 7 = Conc (Dens) 8 = Conc (SG)
16	CM_ACTIVE_CURVE Data type = Enumerated16 Size = 2	Active calculation curve Access = RW Default value = 0 Release = 1.0	0 through 5
17	CM_CURVE_INDEX Data type = Enumerated16 Size = 2	Curve configuration index (n) Access = RW Default value = 0 Release = 1.0	0 through 5
18	CM_TEMP_INDEX Data type = Enumerated16 Size = 2	Curven temperature isotherm index (x-axis) Access = RW Default value = 0 Release = 1.0	0 through 5
19	CM_CONC_INDEX Data type = Enumerated16 Size = 2	Curven concentration index (y-axis) Access = RW Default value = 0 Release = 1.0	0 through 5
20	CM_TEMP_ISO Data type = Float Size = 4	Curven (6x5) temperature isothermX value (x-axis) Access = RW Default value = NAN Release = 1.0	Any float number
21	CM_DENS_AT_TEMP_ISO Data type = Float Size = 4	Curven (6x5) density @ temperature isothermX, concentrationY Access = RW Default value = NAN Release = 1.0	Any float number

Index	Parameter name	Definition	Enumerated list of values
22	CM_DENS_AT_TEMP_COE Data type = Float Size = 4	Curven (6x5) coeff @ temperature isothermX, concentrationY Access = RW Default value = NAN Release = 1.0	Any float number
23	CM_CONC_LABEL_55 Data type = Float Size = 4	Curven (6x5) concentrationY value (label for y-axis) Access = RW Default value = NAN Release = 1.0	Any float number
24	CM_DENS_AT_CONC Data type = Float Size = 4	Curven (5x1) density at concentrationY (at reference temperature) Access = RW Default value = NAN Release = 1.0	Any float number
25	CM_DENS_AT_CONC_COE Data type = Float Size = 4	Curven (5x1) coeff at concentrationY (at reference temperature) Access = RW Default value = NAN Release = 1.0	Any float number
26	CM_CONC_LABLE_51 Data type = Float Size = 4	Curven (5x1) concentrationY value (y-axis) Access = RW Default value = NAN Release = 1.0	Any float number
27	CM_REF_TEMP Data type = Float Size = 4	Curven reference temperature Access = RW Default value = 0.0f Release = 1.0	Any float number
28	CM_SG_WATER_REF_TEMP Data type = Float Size = 4	Curven SG water reference temperature Access = RW Default value = 4.0f Release = 1.0	TEMP_LOW_LIMIT ≤ x ≤ TEMP_HIGH_LIMIT
29	CM_SG_WATER_REF_DENS Data type = Float Size = 4	Curven SG water reference density Access = RW Default value = 1.0f Release = 1.0	Density Lo Limit ≤ x ≤ Density Hi Limit

Index	Parameter name	Definition	Enumerated list of values
30	CM_SLOPE_TRIME Data type = Float Size = 4	Curven slope trim Access = RW Default value = 1.0f Release = 1.0	0.8f ≤ x ≤ 1.2f
31	CM_SLOPE_OFFSET Data type = Float Size = 4	Curven offset trim Access = RW Default value = 0.0f Release = 1.0	Any float number
32	CM_EXTRAP_ALARM_LIMIT Data type = Float Size = 4	Curven extrapolation alarm limit: % Access = RW Default value = 5.0f Release = 1.0	0.0f ≤ x ≤ 270.0f
33	CM_CURVE_NAME Data type = Visible String Size = 12	Curven ASCII string - name of curve Access = RW Default value = "Empty Curve" Release = 1.0	—
34	CM_MAX_FIT_ORDER Data type = Unsigned16 Size = 2	Maximum fit order for 5x5 curve Access = RW Default value = 3 Release = 1.0	2, 3, 4, 5 (accepts only enum values)
35	CM_FIT_RESULT Data type = Enumerated16 Size = 2	Curven curve fit results Access = R Default value = 0 Release = 1.0	0 = Good 1 = Poor 2 = Failed 3 = Empty
36	CM_CONC_UNITS Data type = Enumerated16 Size = 2	Curven concentration units code Access = RW Default value = 1343 Release = 1.0	1110 = degTwad 1426 = degBrix 1111 = degBaum hv 1112 = degBaum lt 1343 = % sol/wt 1344 = % sol/vol 1427 = degBall 1428 = proof/vol 1429 = proof/mass 1346 = deg plato 1999 = Special Unit
37	CM_EXPECTED_ACC Data type = Float Size = 4	Curven curve fit expected accuracy Access = R Default value = 0 Release = 1.0	—

Index	Parameter name	Definition	Enumerated list of values
38	CM_CONC_SPEC_TEXT Data type = Visible String Size = 8	Curven concentration units special unit label Access = RW Default value = "None" Release = 1.0	—
39	CM_CURVE_RESET Data type = Enumerated16 Size = 2	Reset all enhanced density curve information Data type = Enumerated16 Size = 2	1 = Reset 0 = None
40	CM_DENS_LO_EXTRAP_EN Data type = Enumerated16 Size = 2	Enable density low extrapolation (enhanced density extrapolation alarm) Access = RW Default value = 0 Release = 1.0	1 = Enable 0 = None
41	CM_DENS_HI_ EXTRAP_EN Data type = Enumerated16 Size = 2	Enable density high extrapolation (enhanced density extrapolation alarm) Access = RW Default value = 0 Release = 1.0	1 = Enable 0 = None
42	CM_TEMP_LO_EXTRAP_EN Data type = Enumerated16 Size = 2	Enable temperature low extrapolation (enhanced density extrapolation alarm) Access = RW Default value = 0 Release = 1.0	1 = Enable 0 = None
43	CM_TEMP_HI_EXTRAP_EN Data type = Enumerated16 Size = 2	Enable temperature high extrapolation (enhanced density extrapolation alarm) Access = RW Default value = 0 Release = 1.0	1 = Enable 0 = None
44	CM_INC_CURVE Data type = 102 Size = 2	Increment the active curve to the next one Access = RW Default value = 0 Release = 1.0	0 = None 1 = Increment
45	CM_ACT_CUR_NAME Data type = Visible String Size = 12	Name of active curve Access = R Default value = — Release = 1.0	—

Index	Parameter name	Definition	Enumerated list of values
46	CM_ACT_CUR_CONC_UNITS Data type = Unsigned16 Size = 2	Active curve concentration unit code Access = R Default value = — Release = 1.0	—

A.17.1 Transducer block View_1

Index	Parameter	Size
1	ST_REV	2
6	MODE_BLK	3
7	ALARM_SUM	8
Overall sum of bytes in View- Object		13

A.18 Advanced Phase Measurement block parameters (slot 19)

Standard PROFIBUS-PA block parameters 0 through 7

See PROFIBUS-PA parameters 0 through 7.

Advanced Phase Measurement process variables

Index	Parameter name	Definition	Enumerated list of values
8	GAS_VOID_FRACTION Data type = 101 Size = 5	Gas void fraction Access = R Default value = — Release = 1.0	—
9	APM_UNREM_MASS_FLOW Data type = 101 Size = 5	Unremediated mass flow Access = R Default value = — Release = 1.0	—
10	APM_UNREM_VOL_FLOW Data type = 101 Size = 5	Unremediated volume flow Access = R Default value = — Release = 1.0	—
11	APM_UNREM_DENS Data type = 101 Size = 5	Unremediated density Access = R Default value = — Release = 1.0	—

Index	Parameter name	Definition	Enumerated list of values
12	OIL_DENSITY_LINE_SGU Data type = Float Size = 4	Line density (net) oil Access = R Default value = — Release = 1.0	—
13	OIL_DENSITY_LINE_API Data type = Float Size = 4	Line density (net) oil -- fixed API units Access = R Default value = — Release = 1.0	—
14	NET_OIL_FLOW_LINE Data type = 101 Size = 5	Actual uncorrected oil flow Access = R Default value = — Release = 1.0	—
15	NET_OIL_FLOW_REF Data type = 101 Size = 5	Actual net oil flow rate Access = R Default value = — Release = 1.0	—
16	WATER_FLOW_LINE Data type = 101 Size = 5	Actual uncorrected water flow Access = R Default value = — Release = 1.0	—
17	NET_WATER_FLOW_REF Data type = 101 Size = 5	Actual net water flow rate Access = R Default value = — Release = 1.0	—
18	WATERCUT_LINE Data type = 101 Size = 5	Actual uncorrected watercut Access = R Default value = — Release = 1.0	—
19	WATERCUT_REF Data type = 101 Size = 5	Actual net watercut Access = R Default value = — Release = 1.0	—
20	PRE_EVENT_PERIOD Data type = Unsigned16 Size = 2	TMR pre-event time Access = RW Default value = 15 Release = 1.0	$(2 \leq x \leq 128)$

Index	Parameter name	Definition	Enumerated list of values
21	POST_EVENT_PERIOD Data type = Unsigned16 Size = 2	TMR post-event time Access = RW Default value = 15 Release = 1.0	(2 ≤ x ≤ 128)
22	TMR_ACTIVE_TIME Data type = Unsigned32 Size = 4	TMR active time Access = R Default value = — Release = 1.0	—
23	APM_TMR_LIQUID_FLOW Data type = 101 Size = 5	TMR liquid flow Access = R Default value = — Release = 1.0	—

Advanced Phase Measurement setup variables

Index	Parameter name	Definition	Enumerated list of values
24	PAO_PRODUCTION_TYPE Data type = Enumerated16 Size = 2	Production type Access = RW Default value = 0 Release = 1.0	0 = Continuous Flow 1 = Variable Flow
25	PAO_FLUID_TYPE Data type = Enumerated16 Size = 2	Measurement fluid type Access = RW Default value = 0 Release = 1.0	0 = Disable 1 = Liquid with Gas 2 = NetOil 3 = Gas with Liquid 4 = NOC Liquid with gas
26	PAO_GAS_DENSITY Data type = Float Size = 4	Gas density for the snapshot Access = RW Default value = 0.0f Release = 1.0	Density Lo Limit ≤ x ≤ Density Hi Limit
27	APM_DG_THRESHOLD_MODE Data type = Enumerated16 Size = 2	Drive Gain threshold mode for APM control Access = RW Default value = 1 Release = 1.0	0 = Manual 1 = Auto
28	APM_DG_THRESHOLD Data type = Float Size = 4	User input drive gain threshold for APM control Access = RW Default value = 30.0f Release = 1.0	0.0f ≤ x ≤ 100.0f

Index	Parameter name	Definition	Enumerated list of values
29	NOC_DENSITY_ACTION Data type = Enumerated16 Size = 2	Density corrective action Access = RW Default value = 0 Release = 1.0	0 = Hold Last Value 1 = Density Oil at Line
30	APM_DENS_OVERRIDE Data type = Float Size = 4	Density hold override for APM calculation Access = RW Default value = -1 g/cc Release = 1.0	-1.1 g/cc to 5 g/cc
31	DRY_OIL_DENSITY_REF Data type = Float Size = 4	Oil density at reference Access = RW Default value = 0.8 Release = 1.0	0.2 ≤ x ≤ 10.0
32	WATER_DENSITY_REF Data type = Float Size = 4	Reference water density Access = RW Default value = 1 Release = 1.0	0.5 ≤ x ≤ 10.0
33	REF_TEMPERATURE Data type = Float Size = 4	Reference temperature Access = RW Default value = 15 Release = 1.0	-50 ≤ x ≤ 150 degC
34	APM_ACTION Data type = Enumerated16 Size = 2	Drive gain corrective action Access = RW Default value = 0 Release = 1.0	0 = Hold Last Value 1 = Line Density
35	APM_OUTPUT_TYPE Data type = Enumerated16 Size = 2	APM output type Access = RW Default value = 0 Release = 1.0	0 = Disabled 1 = Liquid with Gas Consistent Flow 2 = NOC Liquid with Gas Consistent Flow 3 = Liquid with Gas Variable Flow 4 = NOC Liquid with Gas Variable Flow 5 = Gas With Liquid 6 = Net Oil

Advanced Phase Measurement shrinkage

Index	Parameter name	Definition	Enumerated list of values
36	SHRINKAGE_CALCULATION_ENABLE Data type = Enumerated16 Size = 2	Shrinkage calculation enable Access = RW Default value = 0 Release = 1.0	0 = Disabled 1 = Enabled
37	APM_SHRINKAGE_FACT Data type = Float Size = 4	Shrinkage factor Access = RW Default value = 1 Release = 1.0	0.5f ≤ x ≤ 1.0f
38	APM_SHRINKAGE_MFACT Data type = Float Size = 4	Shrinkage meter factor Access = RW Default value = 1 Release = 1.0	0.8f ≤ x ≤ 1.2f
39	APM_SF_OIL_FLW_AT_LN Data type = 101 Size = 5	Shrinkage factor oil flow at line Access = R Default value = — Release = 1.0	—
40	APM_SF_OIL_FLW_AT_REF Data type = 101 Size = 5	Shrinkage factor oil flow at reference Access = R Default value = — Release = 1.0	—
41	APM_SF_VOL_FLW_AT_REF Data type = 101 Size = 5	Shrinkage factor volume flow at reference Access = R Default value = — Release = 1.0	—

External watercut

Index	Parameter name	Definition	Enumerated list of values
42	EXTR_WATERCUT Data type = 101 Size = 5	External watercut Access = RW Default value = — Release = 1.0	0.0f ≤ x ≤ 100.0f
43	EN_EXTR_WATERCUT Data type = Enumerated16 Size = 2	Enable/disable external watercut Data type = Enumerated16 Size = 2 Access = RW Default value = 0 Release = 1.0	0 = Disable 1 = Enable

Period averaged outputs

Index	Parameter name	Definition	Enumerated list of values
44	PAO_PERIOD Data type = Unsigned16 Size = 2	Period Average Outputs period Access = RW Default value = 60 Release = 1.0	1 ≤ x ≤ 1440
45	PAO_MASS_FLOW Data type = Float Size = 4	Period Average Output mass flow Access = R Default value = — Release = 1.0	—
46	PAO_DENSITY Data type = Float Size = 4	Period Average Output density Access = R Default value = — Release = 1.0	—
47	PAO_VOL_FLOW Data type = Float Size = 4	Period Average Output volume flow Access = R Default value = — Release = 1.0	—
48	PAO_LINE_NET_OIL_FLOW Data type = Float Size = 4	Period Average Output net oil flow at line Access = R Default value = — Release = 1.0	—
49	PAO_REF_NET_OIL_FLOW Data type = Float Size = 4	Period Average Output net oil flow at reference Access = R Default value = — Release = 1.0	—
50	PAO_LINE_WATER_CUT Data type = Float Size = 4	Period Average Output watercut at line Access = R Default value = — Release = 1.0	—
51	PAO_GAS_VOID_FRACTION Data type = Float Size = 4	Period Average Output gas void fraction Access = R Default value = — Release = 1.0	—

Index	Parameter name	Definition	Enumerated list of values
52	PAO_LINE_TEMPERATURE Data type = Float Size = 4	Period Average Output line temperature Access = R Default value = — Release = 1.0	—

Contract period

Index	Parameter name	Definition	Enumerated list of values
53	CONTRACT_PERIOD_STR Data type = Unsigned16 Size = 2	Contract period start hour Access = RW Default value = 8 Release = 1.0	0 ≤ x ≤ 23
54	CONTRACT_PERIOD1_SRC Data type = Enumerated16 Size = 2	Contract period 1 source selection Access = RW Default value = 4 Release = 1.0	See Contract periods
55	CONTRACT_PERIOD2_SRC Data type = Enumerated16 Size = 2	Contract period 2 source selection Access = RW Default value = 4 Release = 1.0	See Contract periods
56	CONTRACT_PERIOD3_SRC Data type = Enumerated16 Size = 2	Contract period 3 source selection Access = RW Default value = 4 Release = 1.0	See Contract periods
57	CONTRACT_PERIOD4_SRC Data type = Enumerated16 Size = 2	Contract Period 4 source selection Access = RW Default value = 4 Release = 1.0	See Contract periods
58	CONTRACT_TODAY_TOT1 Data type = 101 Size = 5	Contract total 1 of today Access = R Default value = — Release = 1.0	—
59	CONTRACT_TODAY_TOT2 Data type = 101 Size = 5	Contract total 2 of today Access = R Default value = — Release = 1.0	—

Index	Parameter name	Definition	Enumerated list of values
60	CONTRACT_TODAY_TOT3 Data type = 101 Size = 5	Contract total 3 of today Access = R Default value = — Release = 1.0	—
61	CONTRACT_TODAY_TOT4 Data type = 101 Size = 5	Contract total 4 of today Access = R Default value = — Release = 1.0	—
62	CONTRACT_YESTERDAY_TOT1 Data type = Float Size = 4	Contract total 1 of yesterday Access = R Default value = — Release = 1.0	—
63	CONTRACT_YESTERDAY_TOT2 Data type = Float Size = 4	Contract total 2 of yesterday Access = R Default value = — Release = 1.0	—
64	CONTRACT_YESTERDAY_TOT3 Data type = Float Size = 4	Contract total 3 of yesterday Access = R Default value = — Release = 1.0	—
65	CONTRACT_YESTERDAY_TOT4 Data type = Float Size = 4	Contract total 4 of yesterday Access = R Default value = — Release = 1.0	—
66	CONTRACT_TOT1_UNITS Data type = Enumerated16 Size = 2	Contract total 1 unit Access = R Default value = — Release = 1.0	CONTRACT_TOT*_UNITS
67	CONTRACT_TOT2_UNITS Data type = Enumerated16 Size = 2	Contract total 2 unit Access = R Default value = — Release = 1.0	CONTRACT_TOT*_UNITS

Index	Parameter name	Definition	Enumerated list of values
68	CONTRACT_TOT3_UNITS Data type = Enumerated16 Size = 2	Contract total 3 unit Access = R Default value = — Release = 1.0	CONTRACT_TOT*_UNITS
69	CONTRACT_TOT4_UNITS Data type = Enumerated16 Size = 2	Contract total 4 unit Access = R Default value = — Release = 1.0	CONTRACT_TOT*_UNITS

Contract periods

2 = Total 1
6 = Total 2
17 = Total 3
63 = Total 4
24 = Total 5
27 = Total 6
30 = Total 7
4 = Inventory 1
7 = Inventory 2
18 = Inventory 3
64 = Inventory 4
25 = Inventory 5
28 = Inventory 6
31 = Inventory 7

CONTRACT_TOT*_UNITS

1089 = g
1088 = kg
1092 = t
1094 = lb
1095 = STon
1096 = Lton
1093 = oz
1999 = Special units
1048 = gallon
1038 = L
1049 = ImpGal
1043 = ft^3
1034 = m^3
1051 = bbl
1053 = SCF
1573 = m3 normal
1575 = m3 std.
1574 = L normal
1576 = L std.
1050 = bushel
1041 = hl
1042 = in3
1043 = ft3
1044 = yd3

A.18.1 Transducer block View_1

Index	Parameter	Size
1	ST_REV	2
6	MODE_BLK	3
7	ALARM_SUM	8
Overall sum of bytes in View- Object		13

B PROFIBUS PA function blocks

B.1 Function block overview

B.1.1 PROFIBUS-PA standard implementations

The 5700 uses the *PROFIBUS-PA Profile for Process Control Devices v3.02* specification to define the operations of the physical block, function blocks, and transducer blocks. The 5700 uses the following standard implementations:

- Uses the Flow Transducer Block-Coriolis profile
- Supports condensed diagnostics
- Uses the NE 107 implementation as defined in the *PROFIBUS-PA Profile for Process Control Devices v3.02*
- Supports Ident Selector as the profile specific, manufacturer specific, and adaptation mode
- Supports the flow profile, *PA139742.gsd [Flow, dens, temp 3AI,1TOT (PhyL 1)]* for the profile specific mode
- Supports the device profile defined in *V1x_0E8B.gsd* for manufacturer specific mode
- Adapted to the configuration of the master without any intervention by the user in the adaptation mode, IDENT_NUMBER for the 5700.

B.1.2 Configuration methods

The transmitter supports the following methods of configuration and operation:

- Enhanced Device Description (EDD) language for use with a PROFIBUS configuration tool such as the Siemens SIMATIC Process Device Manager (PDM) or the Emerson DeltaV Asset Management System (AMS).
- FDT/DTM technology for use with DTM files that run inside a frame application (FDT) such as PACTware
- Direct read and write of PROFIBUS-PA bus parameters

B.1.3 Operation methods

A General Station Description (GSD) file with a PROFIBUS host is used to acquire the definition of the cyclic process variables that the host uses. The 5700 transmitter supports the following GSD options:

Profile-specific Created by the PROFIBUS Nutzerorganisation (PNO); the host can use three analog input blocks and one totalizer block.

Manufacturer-specific Created by Micro Motion in order to implement a larger set of function blocks; the host can use four analog input blocks, four totalizer blocks, two analog output blocks, one Discrete Output and one Discrete Input block

In both modes, the status byte output format is condensed mode only.

Slot	Profile-specific mode	Manufacturer-specific mode
1	AI	AI
2	AI	AI

Slot	Profile-specific mode	Manufacturer-specific mode
3	AI	AI
4	TOT	TOT
5	AI	AI
6		TOT
7		TOT
8		TOT
9		AO
10		AO
11		DO
12		DI

B.1.4 Ident selection

The Ident number specifies the cyclic behavior of the 5700 that is described in corresponding GSD file. The 5700 could operate in either profile-specific or manufacturer-specific Ident. The 5700 supports Flow Profile (3 AI + 1 TOT) as profile- specific ident (0x9742). Whereas the manufacturer-specific Ident supports custom profile with 4 AI + 4 TOT + 2 AO + 1DI + 1DO. The manufacture Ident number is 0x0E8B. The active profile of 5700 is governed by the IDENT_NUMBER_SELECTOR parameter of the physical block. If the Ident number is changed, the cyclic behavior of the 5700 (e.g. diagnosis contents/length, current/accepted configuration data) will be changed too.

The IDENT_NUMBER_SELECTOR parameters could have three configuration values:

- 0 = Profile Specific Ident Number
- 1 = Manufacturer Specific Ident Number
- 127 = Adaptation Mode

The 5700 start-up with Ident_Number corresponds to the stored IDENT_NUMBER_SELECTOR value. If the adaptation mode is selected, the 5700 starts up with its last active Ident_Number.

Micro Motion recommends changing the IDENT_NUMBER_SELECTOR parameter if there is no cyclic communication to the 5700. Changes occur immediately without having to wait for a subsequent power cycle/warm start. If the 5700 is switched to the adaptation mode, the Ident_Number remains unchanged. The bit IDENT_NUMBER_VIOLATION of the DIAGNOSIS parameter is not set and remains 0.

If you modify the IDENT_NUMBER_SELECTOR parameter during an active cyclic data transfer, the following 5700 behavior occurs:

1. The new IDENT_NUMBER_SELECTOR value is changed.
2. The Ident_Number as well as the cyclic behavior of the 5700 remains unchanged as long as the cyclic data transfer is active.
3. The Ident_Number changes immediately when the cyclic data transfer is stopped. The bit IDENT_NUMBER_VIOLATION within the parameter DIAGNOSIS is set to 1 as long as the active Ident_Number is not set according to the IDENT_NUMBER_SELECTOR.

4. The bit, IDENT_NUMBER_VIOLATION, is cleared if the cyclic data transfer is stopped and the Ident_Number is changed.
5. If the 5700 is switched to the adaptation mode, the bit IDENT_NUMBER_VIOLATION is cleared/not set.
6. The Ident_Number as well as the cyclic behavior remain unchanged when the cyclic data transfer is stopped.

The factory default for IDENT_NUMBER_SELECTOR is Adaptation Mode, with Ident_Number as Manufacturer Ident Number (0x0E8B).

B.1.5 I&M functions

The Identification and Maintenance (I&M) functions include:

- I&M 0
- I&M 1
- I&M 2
- PA I&M 0

B.1.6 Addressing

Set the 5700 address using either of the following methods:

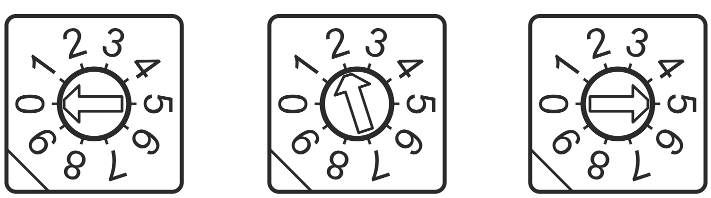
- Locally using rotary switches
- From the software using ProLink III, the display, or from the class 2 PROFIBUS-PA host using the `Set_Slave_Add` command

Set the 5700 PROFIBUS-PA using rotary switches

You can use the three rotary switches on the back side of the 5700 display circuit board to assign the transmitter a PROFIBUS-PA hardware address.

The valid hardware address range is 0 to 125. Setting the rotary switches to ≥ 126 sets the software address.

- SW1 = hundreds
- SW2 = tens
- SW3 = ones



SW1 SW2 SW3

Example

If the SW1:SW2:SW3 switches are set to 0, 2, and 5 respectively, then the 5700 address is (0 x 100) + (2 x 10) + (5 x 1) = 25.

Hardware addressing considerations

- The 5700 needs to power cycle in order to read the new hardware address.
- A hardware address ≥ 126 is an invalid address and the 5700 goes into software addressing.
- If the hardware address shifts from an invalid address (≥126) to a valid hardware address (≤125), the 5700 will accept the hardware address, irrespective of the software address setting.
- If the hardware address shifts from a valid address (≤125) to an invalid hardware address (≥126), the 5700 will stay at address 126 until the software addressing changes the address.
- The 5700 leaves the factory with the hardware address set at 126.

Set the 5700 PROFIBUS-PA with software

Display	**Menu → Configuration → Profibus PA Setting → Profibus PA Address**
ProLink III	**Device Tools → Configuration → Communications → Communication (Profibus PA) → General → Device Address**

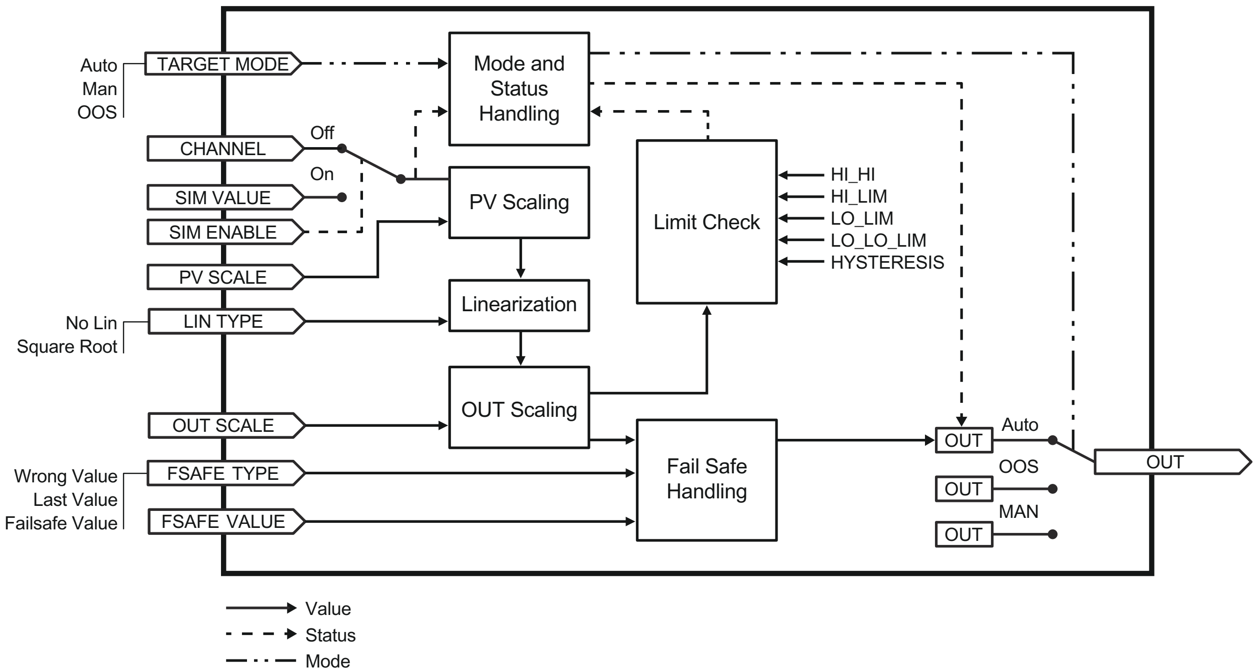
Set the 5700 software address using any of the following methods:

- From the display
- From ProLink III
- From the class 2 PROFIBUS-PA host using the `Set_Slave_Add` command

You can set the 5700 address using the display or ProLink III only if the hardware rotary switches are > 125. If the 5700 address is changed using ProLink III or the display, the 5700 starts communicating on the new address with a PROFIBUS-PA host after a power cycle.

B.2 Analog Input function block

The 5700 supports four Analog Input function blocks. The Analog Input function blocks are at slots 1, 2, 3, and 5.



The Analog Input (AI) function block processes the measurement from the transducer block and makes it available to the host over cyclic communication. The output value from the AI block is in engineering units and contains a status indicating the quality of the measurement. The AI block supports signal scaling through process variable (PV) scaling, linearization, OUT scaling, signal filtering, signal status calculation, mode control, and simulation. In auto mode, the block's output parameter (OUT) reflects the process variable value and status. In manual mode, OUT can be set manually. The manual mode is reflected on the output status. Alarm detection is based on the OUT value and from user-specified alarm limits.

B.2.1 Analog Input PV scaling

The PV scaling section gets input either from CHANNEL selection or from the SIMULATION value. If SIMULATION ENABLE is On, the SIMULATION value is used as input, and if Off, the transducer block value selected by CHANNEL is used as input for PV scaling. The PV SCALE parameter provides the EU_0 and EU_100 for PV scale calculation.

$$\text{Field}_{\text{Val}} = \frac{(PV_{Value} - PV_{EU0})}{(PV_{EU100} - PV_{EU0})}$$

B.2.2 Analog Input linearization

You can set the signal conversion type with the **LIN TYPE** (linearization type) parameter using the following conversion options:

Direct	The $\textit{Field}_{\text{Val}}$ is applied directly to OUT scaling.

Indirect square root signal The $Field_{Val}$ is applied following conversion.

Example1

LIN TYPE, direct:

$$Ld_{Val} = Field_{Val}$$

Example 2

LIN TYPE, square root is $Field_{Val} > 0$:

$$Ld_{Val} = \sqrt{(Field_{Val})}$$

Example 3

LIN TYPE, square root is $Field_{Val} < 0$:

$$Ld_{Val} = \sqrt{abs(Field_{Val})}$$

B.2.3 Analog Input OUT scaling

OUT scaling converts the linearized value to an output value using EU_100 and EU_0 scaling of the **OUT SCALE** parameter.

$$OUT_{val} = (Ld_{val}\,(OUT_{EU100}\; - \;OUT_{EU0}) + OUT_{EU0}$$

B.2.4 Analog Input limit check

Limit check compares the OUT value with limit values to determine limit violations. Limit violation displays in the OUT status. There are four limit violations that modify the OUT status limits. The sensitivity of detection of the limit violation is adjusted by the HYSTERESIS value.

HI_HI_LIM	If the OUT value is equal to or higher than this value, an upper limit alarm is generated.
HI_LIM	If the OUT value is equal to or higher than this value, upper limit warnings are generated.
LO_LIM	If the OUT value is equal to or less than this value, lower limit warnings are generated.
LO_LO_LIM	If the OUT value is equal to or less than this value, a lower limit alarm is generated.
HYSTERESIS	Hysteresis is the value below the high limit and above the low limit that clears the limit alarm or warning.

B.2.5 Analog Input fail safe handling

The output from OUT scaling passes through the fail safe controlling block. The fail safe block checks for the CHANNEL input status. If the CHANNEL variable input status is BAD or UNCERTAIN, the value is modified as per FSAFE TYPE.

0	Fail Safe Value	Passes FAIL SAFE VALUE to OUT
1	Last Usable Value	Outputs the last calculated good value

2	Wrong Calculated Value	Outputs the wrong calculated value as it is

B.2.6 Analog Input mode and status handling

The Analog Input function block mode is assigned by TARGET mode. In auto mode, the block calculated value and status is transferred to the OUT variable. In Out Of Service (OOS) mode, the function block execution is “freeze” and the OUT status is BAD: Passivated. Select manual (Man) mode in order to write value and status to the OUT variable.

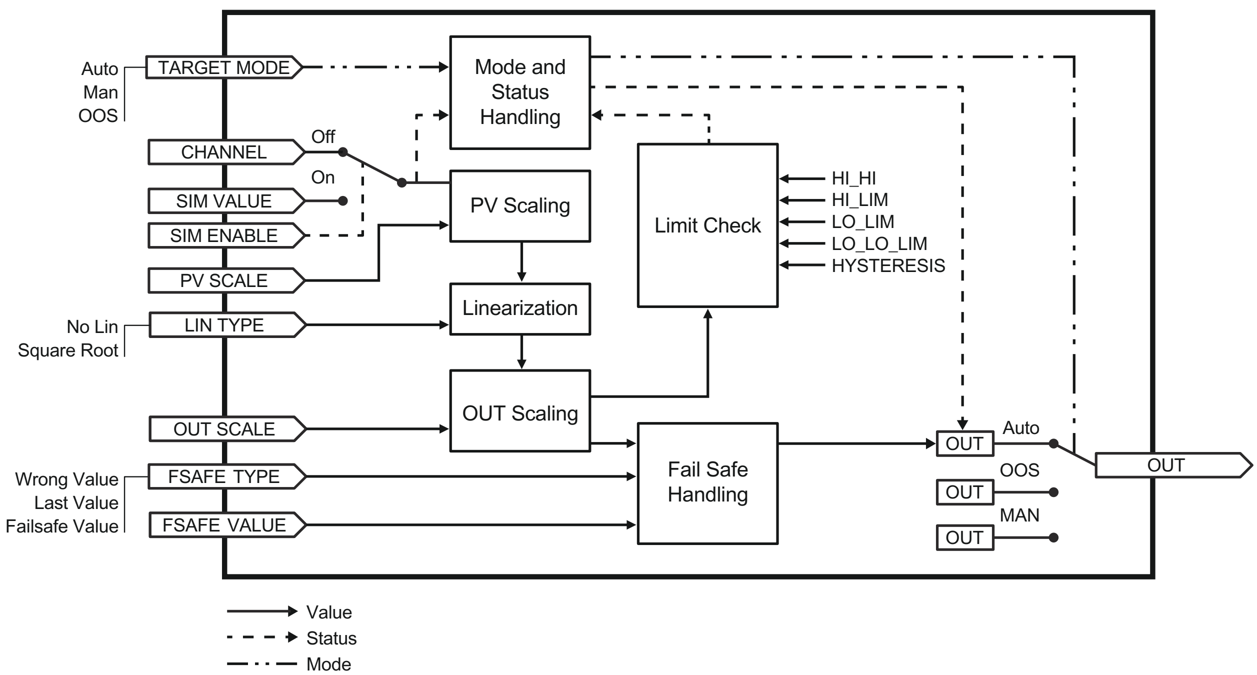
B.2.7 Analog Input modules from the GSD file

The 5700 supports the following modules for the Analog Input function block.

Module number	Module name	Input (size)
2	AI SH	OUT (5)
3	AI LG	OUT (5)

B.3 Totalizer function block

The 5700 supports four totalizer function blocks. The totalizer blocks are at slots 4, 6, 7, and 8.



The totalizer function block integrates mass flow or volume flow over a time period.

The 5700 supports 28 different assignments for CHANNEL. The CHANNEL integrates the transducer block value and status with the totalizer function block. The integrated value is output into TOTAL by applying integration and limit check.

For internal Total1 to internal Inventory7, the totalizer function block functions as a pass through for device total. The device internal totals and inventories are more accurate than the totals calculated by the totalizer block using rate variables.

B.3.1 Totalizer fail safe handling

The CHANNEL input passes through the fail safe controlling block. The fail safe checks for the CHANNEL status. If the CHANNEL variable input status is BAD or UNCERTAIN, the value is modified as per FSAFE TYPE.

0	Run	Uses the input BAD value for integration
1	Hold	Stops the integration and holds the TOTAL value at the last good value
2	Memory	Uses the last usable value of input for integration

Note
The fail safe option Memory is not supported for internal total and inventory selection as CHANNEL.

B.3.2 Totalizer integration

The fail safe value is integrated in units of UNIT TOT according to the control inputs SET TOT and MODE TOT.

The UNIT TOT must be integral or compatible to the integral of the CHANNEL unit. For internal Total1 to Internal7, modifying the UNIT TOT is not allowed. The internal totals and inventories are integrated into the device configured units of the respective total or inventory.

MODE TOT determines which input value to integrate.

0	Balanced	Performs the true arithmetic integration of input
1	Positive Only	Integrates the positive input only
2	Negative Only	Integrates the negative input only
3	Hold	Stops the integration of the input rate

SET TOT controls the integrator operation.

0	Totalize	Integrates input
1	Reset	Resets TOTAL to zero
2	Preset	Presets the TOTAL to TRESET VALUE

B.3.3 Totalizer limit check

Limit check compares the Integrator value with the limit values to determine limit violations. Limit violation displays in the TOTAL status limits. There are four limit violations that modify the TOTAL status limits. The sensitivity of detection of limit violation is adjusted by the HYSTERESIS value.

HI_HI_LIM	If the TOTAL value is equal to or higher than this value, an upper limit alarm is generated.
HI_LIM	If the TOTAL value is equal to or higher than this value, upper limit warnings are generated.

LO_LIM	If the OUT value is equal to or less than this value, lower limit warnings are generated.
LO_LO_LIM	If the OUT value is equal to or less than this value, a lower limit alarm is generated.
HYSTERESIS	Hysteresis is the value below the high limit and above the low limit that clears the limit alarm or warning.

B.3.4 Totalizer mode and status handling

The totalizer function block mode is assigned by the TARGET mode. In auto mode, the block calculated value and status is transferred to as the *TOTAL out* variable. In Out Of Service (OOS) mode, the function block execution is "freeze" and the *TOTAL out* status is BAD: Passivated. Select manual (Man) mode in order to write value and status to the OUT variable.

B.3.5 Totalizer special operation

The totalizer function block outputs the internal 5700 total and inventory values as the *TOTAL out* of the totalizer function block. The 5700 has seven internal configurable totals and seven configurable inventories. All of these totals and inventories can be assigned as channels for the totalizer block. These channels are special values that are internally calculated by the 5700 firmware at a faster rate, and are more accurate than totalizations for standard flow rate channels. For these assignments, the totalizer function block standard behavior is modified as follows:

- The unit for the totalizer block is not configurable for these channels. The TOTAL value is in the device unit. If the device internal total or inventory unit is changed or the flow unit is changed, the *TOTAL out* value is also affected by a unit change.
- The Preset option from Set_Tot is not available for these channels.
- The fail safe option Memory is not available for these channels.

Note
When any internal total or inventory is assigned to any of totalizer function locks, do not operate those totals/ inventories manually from any interface, such as the display or ProLink III.

When the device flow variable unit is set as Special, use the internal totalizer for getting the flow total. The Special unit is not supported for the standard flow channel.

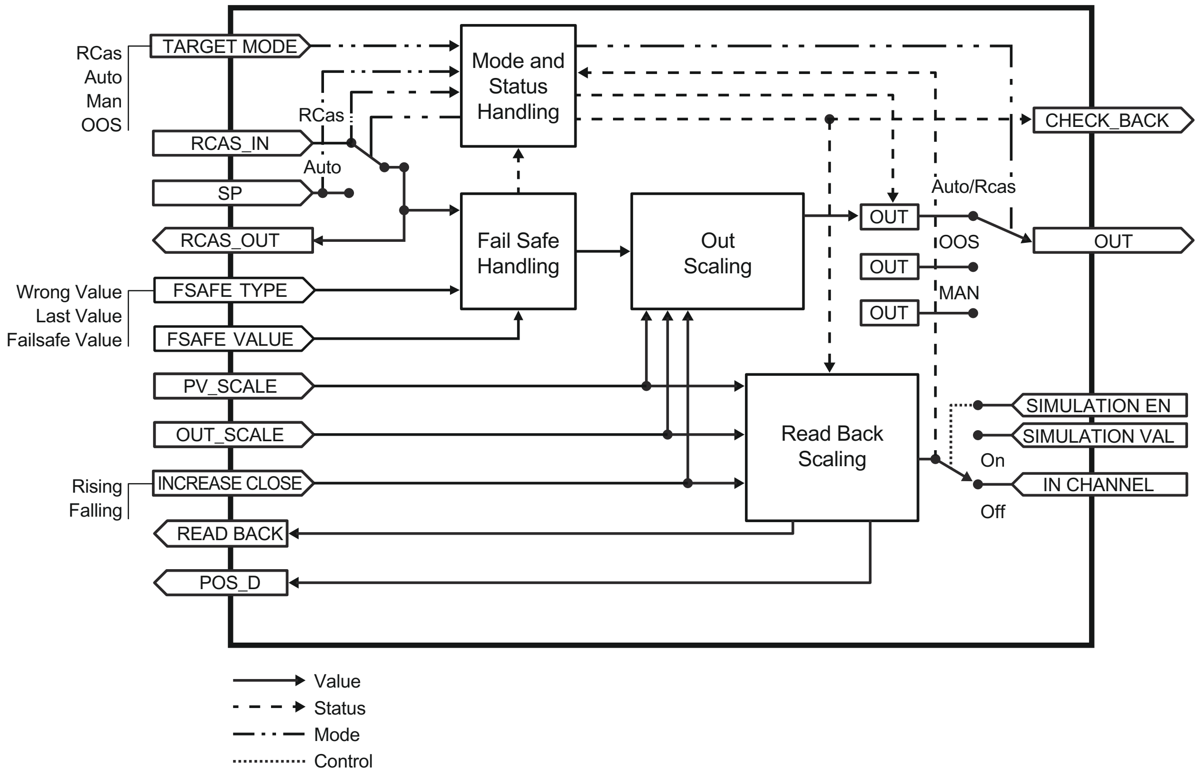
B.3.6 Totalizer modules from the GSD file

The 5700 supports the following modules for the totalizer function block.

Module No.	Module Name	Input (size)	Output (size)
4	TO TOT	TOTAL (5)	
5	TO TOT SETTOT	TOTAL (5)	SET_TOT (1)
6	TO TOT SETTOT MODTOT	TOTAL (5)	SET_TOT (1) MODE_TOT (1)

B.4 Analog Output function block

The 5700 supports two Analog Output function blocks. The Analog Output blocks are at slots 9 and 10.



The Analog Output block converts the field value to the OUT value by using two sets of scaling values. In auto mode, SP is used as field value, whereas the RCAS_IN value is used as the field value in RCAS mode. PV_SCALE is used to convert the field value to percent. The INCREASE_CLOSE (Increase to Close) can be used to reverse the output direction. OUT_SCALE is used to convert the percent field value to the value for the channel, which should be provided by the 5700 through OUT. The READ BACK output is a copy of the value that is sent to the transducer processing via the channel. It can be linked to the input of a controller or control selector to perform valve position control. The CHECK_BACK gives device status information in bitwise coding. The discrete status of the valve is output on POS_D.

The function block algorithm takes the input, either from SP or RCAS_IN, depending upon the TARGATE mode setting. In AUTO mode the SP is used for calculation, whereas the TCAS_IN is used for calculations in RCAS mode. The 5700 must be in cyclic communication to run the function block algorithm.

B.4.1 Analog Output fail safe handing

FSAFE_TYPE defines the reaction of the 5700 if a failure of the actual used set point is still detected after FSAFE_TIME or if the status of the actual used set point is .Initiate Fail Safe.

The calculated ACTUAL MODE is AUTO.

0	Fail Safe Value	Passes the FAIL SAFE VALUE to OUT with out status as UNCERTAIN-Substitute Value

1	Last Usable Value	Last good set point is passed to OUT with status UNCERTAIN-Last Usable Value

B.4.2 Analog Output OUT scaling

After applying the fail safe logic to input, the setpoint is converted to the transducer input OUT value using PV_SCALE and OUT_SCALE. The OUT value is fed to the transducer block.

$$Temp = \frac{(Setpoint\ - PV_{EU0}}{(PV_{EU100}\ - PV_{EU0}}$$

Example

If INCREASE_CLOSE is falling:

$$Temp = 1\ - Temp$$

The *Temp* value is converted to the OUT value as:

$$OUT_{Value} = OUT_{\text{EU0}} + (Temp \text{ x } (OUT_{\text{EU100}}\ - OUT_{\text{EU0}}$$

B.4.3 Analog Output read back scaling

Read back provides the transducer block value to the host system. If simulation is enabled, the simulated value is used as input for read back; otherwise the IN_CHANNEL assignment provides the transducer block value for read back calculation. The read back scaling is the reverse calculation of out scaling so that the host system could read the readback value in its scaling.

$$Temp1 = \frac{CH_{Value}\ - OUT_{EU0}}{(OUT_{EU100}\ - OUT_{EU0}}$$

If INCREASE_CLOSE is falling:

$$Temp = 1 - Temp$$

The Temp value is converted to out value as:

Example

The *Temp* value is converted to the OUT value as:

$$READBACK_{VALUE} = PV_{EU0} + (Temp1 \text{ x } (PV_{EU100} \text{ - } PV_{EU0}))$$

The READBACK carries the status of the simulated value if simulation is enabled; otherwise it carries the status of the transducer block.

The POS_D indicates the current position of valve in accordance to the setpoint and readback value.

B.4.4 Analog Output mode and status handling

The Analog Output function block mode is assigned by TARGET mode. In auto mode, the SP input is used for transducer block input calculation, whereas the RCAS mode, RCAS_IN, is used as input. In Out Of Service (OOS) mode, the function block execution is “freeze” and the OUT status is BAD: Passivated. When manual (Man) mode is selected, the user can write the value and status to the READBACK variable.

When cyclic communication is lost, the status of SP and RCAS_IN is set to Bad, which triggers the fail safe handing in the function block.

B.4.5 Analog Output from the GSD file

The 5700 supports the following modules for analog output function block.

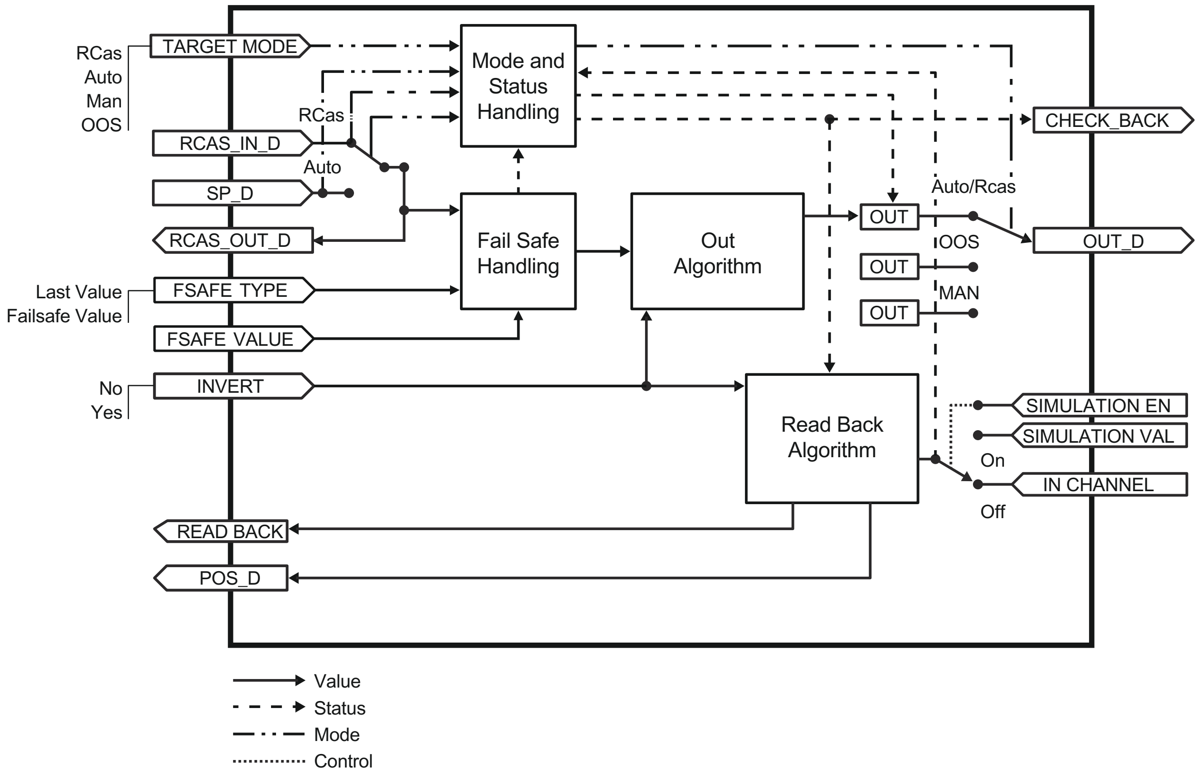
Module No.	Module Name	Input (size)	Output (size)
7	AO SP SH		SP (5)
8	AO SP LG		SP (5)
9	AO SP READBACK POSD SH	READBACK (5) POS_D (2)	SP (5)
10	AO SP READBACK POSD LG	READBACK (5) POS_D (2)	SP (5)
11	AO SP CHECKBACK SH	CHECKBACK (3)	SP (5)
12	AO SP CHECKBACK LG	CHECKBACK (3)	SP (5)
13	AO SP READBACK POSD CHECKBACK SH	READBACK (5) POS_D (2) CHECKBACK (3)	SP (5)
14	AO SP READBACK POSD CHECKBACK LG	READBACK (5) POS_D (2) CHECKBACK (3)	SP (5)
15	AO RCASIN RCASOUT SH	RCAS_OUT (5)	RCAS_IN (5)
16	AO RCASIN RCASOUT LG	RCAS_OUT (5)	RCAS_IN (5)
17	AO RCASIN RCASOUT CHECKBACK SH	RCAS_OUT (5) CHECKBACK (3)	RCAS_IN (5)
18	AO RCASIN RCASOUT CHECKBACK LG	RCAS_OUT (5) CHECKBACK (3)	RCAS_IN (5)
19	AO SP RDBCK RCASIO POSD CHKBCK S	READBACK (5) RCAS_OUT (5) POS_D (2) CHECKBACK (3)	SP (5) RCAS_IN (5)
20	AO SP RDBCK RCASIO POSD CHKBCK L	READBACK (5) RCAS_OUT (5) POS_D (2) CHECKBACK (3)	SP (5) RCAS_IN (5)

Note

The AO SP READBACK POSD CHECKBACK SH, AO RCASIN RCASOUT SH, AO RCASIN RCASOUT CHECKBACK SH, and AO SP RDBCK RCASIO POSD CHKBCK S modules on the Siemens Step 7 system need two slots. Therefore, these modules cannot work with the Siemens Step 7 system. Instead, the long versions of these modules get loaded with the Step 7 system.

B.5 Discrete Output function block

The 5700 supports one Discrete Output function block. The Discrete Output block is at slot 11.



The Discrete Output (DO) function block processes a discrete setpoint and saves it to a specified channel to produce an output signal. The block supports mode control, output tracking, read back, and simulation. In operation, the DO function block determines its setpoint, sets the output, and optionally checks a feedback signal from the field device to confirm the physical output operation.

B.5.1 Discrete Output fail safe handling

The SP_D or RCAS_IN_D input passes through the fail safe controlling block. The device actual mode decides whether the SP_D or the RCAS_IN_D input will be used to process the Fail Safe Handler. The fail safe checks for the inout status. If the input status is BAD or UNCERTAIN, the value is modified as per FSAFE TYPE.

0	Last Value	Uses last usable value for processing
1	Fail Safe Value	Uses user defined fail safe value for processing

B.5.2 Out algorithm

The out algorithm uses the value from fail safe handling and the INVERT input to generate output to OUT_D. If INVERT is set, the input from the fail safe logic is inverted and fed to OUT_D. The OUT_D is input to the transducer block.

B.5.3 Read back algorithm

The read back algorithm uses the IN CHANNEL value or the simulated value (SIMULATION VAL) if the SIMULATION EN is set to 1. If the INVERT variable is set, the input value is inverted before feeding to READBACK.

B.5.4 Discrete Output mode and status handling

The Discrete Output function block mode is assigned by TARGET mode. In auto mode, the block calculated value and status is transferred to the OUT_D variable. In Out Of Service (OOS) mode, the function block execution is “freeze” and the OUT_D status is BAD: Passivated. When manual (Man) mode is selected, you can write the value and status to the OUT_D variable. In RCAS mode, the RCAS_IN_D input is used for processing. The CHECK_BACK status is generated from actual mode and other function handling within the block.

B.5.5 Discrete Output modules from GSD file

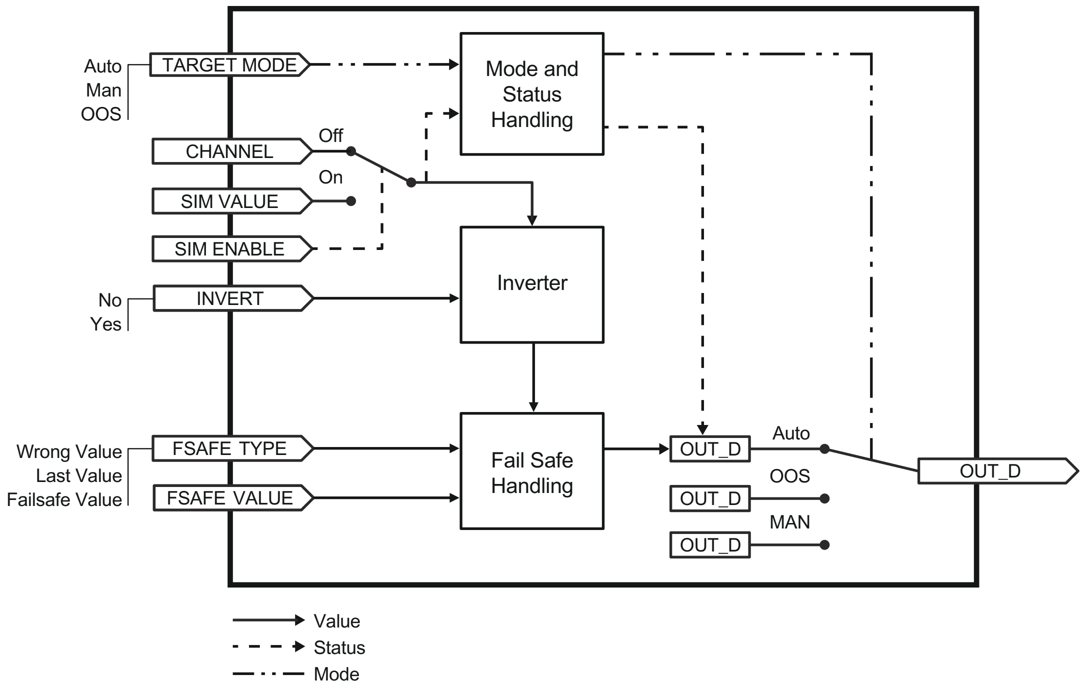
The 5700 supports the following modules for the Discrete Output function block.

Module No.	Module Name	Input (size)	Output (size)
21	DO SPD		SP_D (2)
22	DO SPD READBACKD	READBACK_D (2)	SP_D (2)
23	DO SPD CHECKBACK	CHECKBACK (3)	SP_D (2)
24	DO SPD READBACKD CHECKBACK	READBACK_D (2) CHECKBACK (3)	SP_D (2)
25	DO RCASIND RCAS_OUT_D	RCAS_OUT_D (2)	RCAS_IN_D (2)
26	DO RCASIND RCASOUTD CHKBACK	RCAS_OUT_D (2) CHECKBACK (3)	RCAS_IN_D (2)
27	DO SP READBACKD RCASIOD CHKBACK	READBACK_D (2) RCAS_OUT_D (2) CHECKBACK (3)	SP_D (2) RCAS_IN_D (2)

B.6 Discrete Input function block

The 5700 supports one Discrete Input function block at slot 12.

The Discrete Input (DI) function block processes a single Discrete Input from a field device and makes it available to host over cyclic communication. You can configure inversion and alarm detection on the input value. The Discrete Input function block supports mode control, signal status propagation, and simulation.



B.6.1 Discrete Input inverter

The CHANNEL selected Discrete Input from the transducer block or from a simulated Discrete Input is fed to the inverter. If the INVERT input is Yes, the input is inverted or fed directly to Fail Safe Handling.

B.6.2 Discrete Input fail safe handling

The output from the inverter passes through the fail safe controlling block. The fail safe checks for the CHANNEL input status. If the CHANNEL variable input status is BAD or UNCERTAIN, the value is modified per the FSAFE TYPE.

0	Fail Safe Value	Passes FAIL SAFE VALUE to OUT_D
1	Last Usable Value	Outputs last calculated good value to OUT_D
2	Wrong Calculated Value	Outputs wrong calculated value as it is to OUT_D

B.6.3 Discrete Input mode and status handling

The Discrete Input function block mode is assigned by TARGET mode. In auto mode, the block-calculated value and status is transferred to the OUT_D variable. In Out Of Service (OOS) mode, the function block execution is “freeze” and the OUT_D status is BAD: Passivated. When manual (Man) mode is selected, you can write the value and status to the OUT_D variable.

B.6.4 Discrete Input from the GSD file

The 5700 supports the following modules for the Discrete Input function block

Module No.	Module Name	Input (size)
28	DI OUTD	OUT_D (2)

B.7 Slave diagnostic response

Two sets of diagnostic bytes are sent:

Bytes 1-6 Conform to the standard PROFIBUS specification

Byte 7 The extended diagnostic header byte

Bytes 8–15 The extended diagnostic bytes that conform to the *PROFIBUS-PA Profile for Process Control Devices v3.02* and the *Diagnosis, Alerts, and Time-Stamping Profile Guidelines*

Final 10 bytes The extended diagnostic bytes that correspond to the alerts in the 5700

Byte	Bit	Description
1	0	Station not existent (this is set by the master if the slave does not respond)
	1	Station not ready for data exchange
	2	Configuration fault: slave did not accept last configuration data
	3	Slave has extended diagnostic data to report
	4	Slave does not support requested parameter function
	5	Invalid slave response (this is set by the master)
	6	Parameter fault: slave did not accept last parameterization data
	7	Slave is locked or controlled by another master (this is set by the master)
2	0	Slave must be parameterized
	1	Static diagnostic: master requesting diagnostics until bit is reset
	2	This bit is always set to 1
	3	Response monitoring/watchdog (1 = ON; 0 = OFF)
	4	Slave is in freeze mode (1 = ON; 0 = OFF)
	5	Slave is in sync mode (1 = ON; 0 = OFF)
	6	Reserved
	7	Slave is deactivated in master parameter set (this is set by the master)
3	0	Reserved (always set to 0)
	1	Reserved (always set to 0)
	2	Reserved (always set to 0)
	3	Reserved (always set to 0)
	4	Reserved (always set to 0)

	5	Reserved (always set to 0)
	6	Reserved (always set to 0)
	7	Diagnostic overflow—transmitter has more diagnostic data than it can report
4		Master station address
5		Ident number (MSB)
6		Ident number (LSB)
7	0	Number of extended diagnostic bytes (including this header byte)
	1	
	2	
	3	
	4	
	5	
	6	Identifier for device-related diagnostics status model (0x00)
	7	
8	0	Status type = manufacturer-specific
	1	
	2	
	3	
	4	
	5	
	6	
	7	Identifier for status—always set to 1
9		Slot number of physical block
10	0	Error appears (when any new alert is activated)
	1	Error disappears (when an alert is deactivated)
	2	Reserved
	3	Reserved
	4	Reserved
	5	Reserved
	6	Reserved
	7	Reserved
11	0	Reserved (always set to 0)
	1	Reserved (always set to 0)
	2	Reserved (always set to 0) -- Not used
	3	Reserved (always set to 0)

	4	Reserved (always set to 0)
	5	Reserved (always set to 0)
	6	Reserved (always set to 0)
	7	Reserved (always set to 0)
12	0	Reserved
	1	Reserved
	2	Reserved
	3	New Start-up (Warm-Start) Carried Out
	4	Re-Start-UP (Cold-Start) Carried Out
	5	Maintenance required
	6	Reserved
	7	Ident Number violation
13	0	Maintenance alert
	1	Maintenance demanded
	2	Function check or simulation
	3	Invalid Process Condition
	4	Reserved (always set to 0)
	5	Reserved (always set to 0)
	6	Reserved (always set to 0)
	7	Reserved (always set to 0)
14	0	Reserved (always set to 0)
	1	Reserved (always set to 0)
	2	Reserved (always set to 0)
	3	Reserved (always set to 0)
	4	Reserved (always set to 0)
	5	Reserved (always set to 0)
	6	Reserved (always set to 0)
	7	Extension Available
15	0	Electronics Failed
	1	Sensor Failed
	2	Configuration Error
	3	Low Power - Core
	4	Reserved (always set to 0)
	5	Sensor/Transmitter Comm Error
	6	Tube Not Full

	7	Extreme Primary Purpose Variable
16	0	Reserved (always set to 0)
	1	Flow Meter Initializing
	2	Function Check in Progress
	3	Simulation Active
	4	Output Fixed
	5	Drive Overrange
	6	Process Aberration
	7	Event Active
17	0	Output Saturated
	1	Function Check Failed
	2	Data Loss Possible
	3	Reserved (always set to 0)
	4	Reserved (always set to 0)
	5	Reserved (always set to 0)
	6	Reserved (always set to 0)
	7	Reserved (always set to 0)
18	0	Reserved (always set to 0)
	1	Reserved (always set to 0)
	2	Reserved (always set to 0)
	3	Reserved (always set to 0)
	4	Reserved (always set to 0)
	5	Reserved (always set to 0)
	6	Reserved (always set to 0)
	7	Reserved (always set to 0)

B.8 Alerts

B.8.1 DIG_MAINTENANCE_ALARM

Diagnosis extension bit	NE 107 severity	Condensed status	Alert condition
0	Failure	BAD-maintenance alarm (0x24)	[002] RAM Error - Core [018] EEPROM Error [019] RAM Error (Transmitter) [022] Configuration Database Corrupt [024] Program Corrupt - Core Watchdog Error Fieldbus Bridge Memory Failure
1	Failure	BAD-maintenance alarm (0x24)	[003] Sensor Failed [016] Sensor Temperature (RTD) Failure [017] Sensor Case Temperature (RTD) Failure
2	Failure	BAD-maintenance alarm (0x24)	[020] Calibration Factors Missing [021] Incorrect Sensor Type [030] Incorrect Board Type Core Software Update Failed Time Not Set [120] Curve Fit Failure (Concentration) Core Has Incompatible ETO No Security Password
3	Failure	BAD-maintenance alarm (0x24)	[031] Low Power
5	Failure	BAD-maintenance alarm (0x24)	[026] Sensor/Transmitter Communications Failure [028] Core Process Write Failure Fieldbus Bridge Communication Failure
6	Failure	BAD-process related(0x28)	[033] Tube Not Full
7	Failure	BAD-process related(0x28)	[005] Mass Flow Overrange [008] Density Overrange
9	Failure	BAD-process related(0x28)	[009] Transmitter Initializing

B.8.2 DIG_FUNCTION_CHECK

Diagnosis extension bit	NE 107 severity	Condensed status	Alert condition
10	Function Check	BAD-function check (0x3C)	[104] Calibration in Progress [131] Smart Meter Verification in Progress
11	Function Check	BAD-function check (0x3C)	[132] Sensor Simulation On Analog Input Simulation On Discrete Input Simulation On Totalizer Simulation On
12	Function Check	BAD-function check (0x3C)	[114] mA Output Fixed [111] Frequency Output Fixed [119] Discrete Output Fixed

B.8.3 DIG_MAINTENANCE_DEMANDED

Diagnosis extension bit	NE 107 severity	Condensed status	Alert condition
13	Maintenance	UNCERTAIN maintenance demanded (0x68)	[102] Drive Overrange
17	Maintenance	UNCERTAIN maintenance demanded (0x68)	[010] Calibration Failed See abort codes 1, 3, 5, 8, 13, 14, and 15 in this section: [035] Smart Meter Verification Aborted

B.8.4 DIG_INVALID_PROCESS_CONDITION

Diagnosis extension bit	NE 107 severity	Condensed status	Alert condition
14	Out of Specification	UNCERTAIN-process related (0x78)	[105] Two-Phase Flow [116] Temperature Out of Range [117] Density Out of Range [121] Extrapolation Alert (Concentration) [123] Pressure Out of Range Moderate Phase Severity Severe Phase Severity [140] APM Remediation
15	Out of Specification	UNCERTAIN-process related (0x78)	Discrete Event [1-5] Active

Diagnosis extension bit	NE 107 severity	Condensed status	Alert condition
16	Out of Specification	UNCERTAIN-process related (0x78)	[110] Frequency Output Saturated [113] mA Output Saturated Watercut Limited at 100% Watercut Limited at 0%

B.8.5 DIG_MAINTENANCE

Diagnosis extension bit	NE 107 severity	Condensed status	Alert condition
18	Maintenance	UNCERTAIN maintenance demanded (0x68)	[103] Data Loss Possible SD Card Not Present No Permanent License Clock is Constant Internal Memory Full Firmware Update Fail
19	Alert Simulation Active		Alert Simulation Enabled

C Using the transmitter display

This section explains how to use the 5700 display. Using the display, you can move through the menus, configure the application, monitor and control the application, and perform maintenance and diagnostic tasks.

C.1 Components of the transmitter display

The transmitter display includes two status LEDs, a multi-line LCD panel, two security switches, and four optical switches.

Figure C-1: 5700 transmitter display

Status LEDs

The status LEDs indicate the current state of the transmitter (**MOD STATUS**) and the current state of the Ethernet network (**NET STATUS**).

Figure C-2: 5700 transmitter status LEDs

Table C-1: Status LED and device status

Status LED condition	Device status
Solid green	No alerts are active.
Solid yellow	One or more alerts are active with **Alert Severity** = Out of Specification, Maintenance Required, or Function Check.
Solid red	One or more alerts are active with **Alert Severity** = Failure.
Flashing yellow (1 Hz)	The `Function Check in Progress` alert is active.

Table C-2: Network status LED connection status

Network status LED condition	Network status
Solid green	Connection made with primary protocol host.
Solid red	Configuration error or other error during the PROFIBUS start up sequence.
Off	No connection with primary protocol host.

LCD panel

In normal operation, the LCD panel shows the current value of the display variables, and their measurement units.

Figure C-3: 5700 transmitter LCD panel

The LCD panel also provides access to the display menus and alert information. From the display menus, you can:

- View the current configuration and make configuration changes.
- Perform procedures such as loop testing and zero verification.
- Run batches.

The alert information allows you to see which alerts are active, acknowledge the alerts individually or as a group, and to see more detailed information for individual alerts.

C.2 Access and use the display menus

The display menus allow you to perform most configuration, administration, and maintenance tasks.

The four optical switches, ⇦⇧⇩⇨, are used to navigate the menus, make selections, and enter data. To activate an optical switch, hold your thumb or finger over it to block the light.

Figure C-4: Optical switches

Procedure

1. Observe the action bar at the bottom of the LCD panel.

   The action bar displays **Menu**⇨.

2. Place your thumb or finger over the ⇨ optical switch to activate it.

   The top-level menu is displayed.

3. Navigate the menus using the four optical switches:
   - Activate ⇧ or ⇩ to scroll to the previous or next item in the menu.
   - Activate and hold ⇧ or ⇩ (approximately 1 second to scroll rapidly through numbers or menu options, or to move to the previous screen or next screen in a multi-screen display.
   - Activate ⇨ to drill down to a lower menu or to select an option.
   - Activate and hold ⇨ to save and apply your action.
   - Activate ⇦ to return to the previous menu.
   - Activate and hold ⇦ to cancel your action.

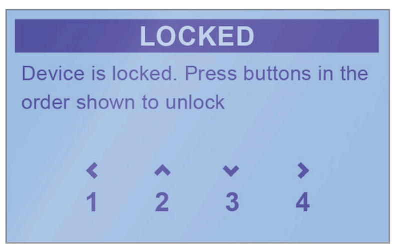
   The action bar is updated with context-sensitive information. The ⇨ and ⇦ symbols indicate the associated optical switch.

   If the menu or the topic is too large for a single display screen, the ⇩ and ⇧ symbols at the bottom and top of the LCD panel are used to indicate that you must scroll down or up to see more information.

Figure C-5: Navigation arrows

4. If you make a menu choice that leads to a possible configuration change, or to certain procedures such as zero calibration:
   - If display security is not enabled, the display prompts you to activate ⇦⇧⇩⇨, in that order. This feature protects against accidental changes to configuration, but does not provide any security.

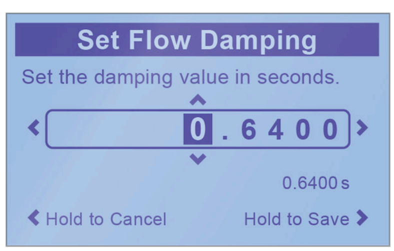
Figure C-6: Security prompts



   - If display security is enabled, the display prompts you to enter the display password.

5. If you make a menu choice that requires entering a numeric value or character string, the display provides a screen similar to the following:

Figure C-7: Numeric values and character strings



   - Activate ⇦ or ⇨ to position the cursor.
   - Activate ⇧ and ⇩ to scroll through the values that are valid for that position.
   - Repeat until all characters are set.
   - Activate and hold ⇨ to save the value.

6. To exit the display menu system, use either of the following methods:
    - Wait until the menu times out and returns to the display variables.
    - Exit each menu separately, working your way back to the top of the menu system.

D Using ProLink III with the transmitter

D.1 Connect with ProLink III

A connection from ProLink III to your transmitter allows you to read process data, configure the transmitter, and perform maintenance and troubleshooting tasks.

D.1.1 ProLink III connection types

You can connect a ProLink III PC to the transmitter with a USB connection to the service port.

To support all the latest features, ProLink III or later is required.

D.1.2 Make a service port connection from ProLink III to the transmitter

⚠ WARNING
If the transmitter is in a hazardous area, do not remove the housing cover while the transmitter is powered up. Failure to follow these instructions can cause an explosion resulting in injury or death.

Prerequisites

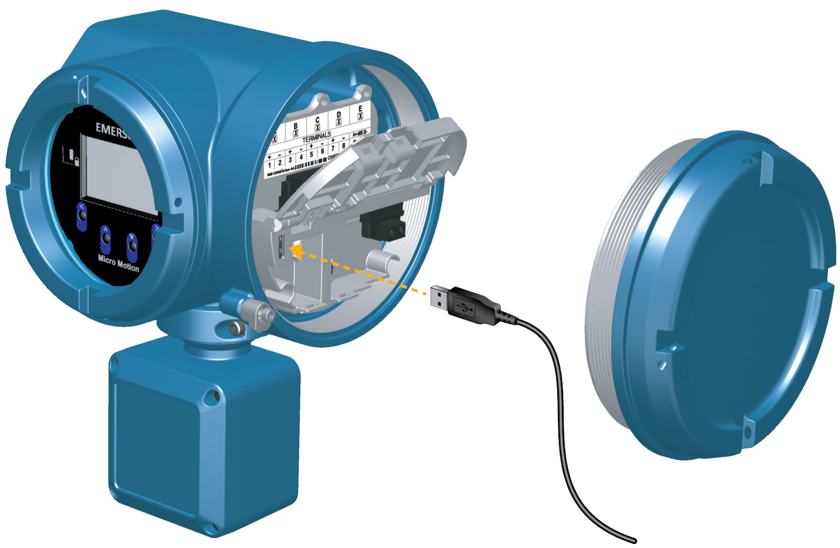
- Ensure the transmitter service port is enabled.
- Obtain a USB type A to type A cable.

Important
The USB cable should be no greater than 1 meter in length.

Procedure

1. Insert one end of the USB cable into the USB port on your PC.
2. Open the wiring compartment on the transmitter, and insert the other end of the USB cable into the service port on the transmitter.

Figure D-1: Service port inside transmitter wiring compartment



3. Start ProLink III.
4. Choose **Connect to Physical Device**.
5. Set parameters as shown here.

Parameter	Setting
Protocol	Service Port
PC Port	The number assigned to the USB port on your PC

6. Click **Connect**.

Need help?
If an error message appears:

- Ensure that you have specified the correct port on your PC.
- Ensure the transmitter service port is enabled at **Menu** → **Configuration** → **Security** → **Service Port**

E Concentration measurement matrices, derived variables, and process variables

E.1 Standard matrices for the concentration measurement application

The standard concentration matrices available from Micro Motion are applicable for a variety of process fluids. These matrices are included in the ProLink III installation.

Tip
If the standard matrices are not appropriate for your application, you can build a custom matrix or purchase a custom matrix from Micro Motion.

Matrix name	Description	Density unit	Temperature unit	Derived variable
Deg Balling	Matrix represents percent extract, by mass, in solution, based on °Balling. For example, if a wort is 10 °Balling and the extract in solution is 100% sucrose, the extract is 10% of the total mass.	g/cm^3	°F	Mass Concentration (Density)
Deg Brix	Matrix represents a hydrometer scale for sucrose solutions that indicates the percent by mass of sucrose in solution at a given temperature. For example, 40 kg of sucrose mixed with 60 kg of water results in a 40 °Brix solution.	g/cm^3	°C	Mass Concentration (Density)
Deg Plato	Matrix represents percent extract, by mass, in solution, based on °Plato. For example, if a wort is 10 °Plato and the extract in solution is 100% sucrose, the extract is 10% of the total mass.	g/cm^3	°F	Mass Concentration (Density)
HFCS 42	Matrix represents a hydrometer scale for HFCS 42 (high-fructose corn syrup) solutions that indicates the percent by mass of HFCS in solution.	g/cm^3	°C	Mass Concentration (Density)
HFCS 55	Matrix represents a hydrometer scale for HFCS 55 (high-fructose corn syrup) solutions that indicates the percent by mass of HFCS in solution.	g/cm^3	°C	Mass Concentration (Density)
HFCS 90	Matrix represents a hydrometer scale for HFCS 90 (high-fructose corn syrup) solutions that indicates the percent by mass of HFCS in solution.	g/cm^3	°C	Mass Concentration (Density)

E.2 Derived variables and calculated process variables

The concentration measurement application calculates a different set of process variables from each derived variable. The process variables are then available for viewing or reporting.

Derived variable	Description	Calculated process variables					
		Density at reference temp	Standard volume flow rate	Specific gravity	Concentration	Net mass flow rate	Net volume flow rate
Density at Reference	Mass/unit volume, corrected to a given reference temperature	✓	✓				
Specific Gravity	The ratio of the density of a process fluid at a given temperature to the density of water at a given temperature The two given temperature conditions do not need to be the same. **Note** The two given temperature conditions do not need to be the same.	✓	✓	✓			
Mass Concentration (Density)	The percent mass of solute or of material in suspension in the total solution, derived from reference density	✓	✓		✓	✓	
Mass Concentration (Specific Gravity)	The percent mass of solute or of material in suspension in the total solution, derived from specific gravity	✓	✓	✓	✓	✓	
Volume Concentration (Density)	The percent volume of solute or of material in suspension in the total solution, derived from reference density	✓	✓		✓		✓
Volume Concentration (Specific Gravity)	The percent volume of solute or of material in suspension in the total solution, derived from specific gravity	✓	✓	✓	✓		✓

Derived variable	Description	Calculated process variables					
		Density at reference temp	Standard volume flow rate	Specific gravity	Concentration	Net mass flow rate	Net volume flow rate
Concentration (Density)	The mass, volume, weight, or number of moles of solute or of material in suspension in proportion to the total solution, derived from reference density	✓	✓		✓		
Concentration (Specific Gravity)	The mass, volume, weight, or number of moles of solute or of material in suspension in proportion to the total solution, derived from specific gravity	✓	✓	✓	✓		

F Environmental compliance

F.1 RoHS and WEEE

In compliance with the RoHS directive (Restriction of Hazardous Substances) and the WEEE directive (Waste Electrical and Electronic Equipment), the battery in the 5700 transmitter cannot be serviced or replaced by users. If the battery requires replacement, contact customer service for replacement and disposal.

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