FLUKE®
Calibration

KIT-EMM300

Electrical Measurement Module Kit with Docking Station

Instructions

Introduction

The Electrical Measurement Module with Docking Station (the Product) is an accessory to allow electrical measurements to be made from pressure Devices Under Test (DUT) such as transmitters, transducers, and more. The Product includes an EMM300 Electrical Measurement Module and its dock, the DS70-KIT-EMM Docking Station that enables connection of the Electrical Measurement Module (EMM) to a pressure calibrator. The EMM module measures mA, V dc, and can supply 24 V loop power. It also provides basic analog trimming of HART devices.

How to Contact Fluke Calibration

To contact Fluke Calibration, call one of the following telephone numbers:

- Technical Support USA: 1-877-355-3225
- Calibration/Repair USA: 1-877-355-3225
- Canada: 1-800-36-FLUKE (1-800-363-5853)
- Europe: +31-40-2675-200
- Japan: +81-3-6714-3114
- Singapore: +65-6799-5566
- China: +86-400-810-3435
- Brazil: +55-11-3759-7600
- Anywhere in the world: +1-425-446-6110

To see product information and download the latest manual supplements, visit Fluke Calibration's website at www.flukecal.com.
To register your product, visit http://flukecal.com/register-product.

PN 5007312
July 2018
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Fluke Corporation
P.O. Box 9090
Everett, WA 98206-9090
U.S.A.

Fluke Europe B.V.
P.O. Box 1186
5602 BD Eindhoven
The Netherlands

ООО «Флюк СИАЙЭС»
125167, г. Москва, Ленинградский
проспект дом 37,
корпус 9, подъезд 4, 1 этаж

Safety Information

A **Warning** identifies conditions and procedures that are dangerous to the user. A **Caution** identifies conditions and procedures that can cause damage to the Product or the equipment under test.

⚠Warning

To prevent possible electrical shock, fire, or personal injury:

- **Read all safety information before you use the Product.**
- **Do not alter the Product and use only as specified, or the protection supplied by the Product can be compromised.**
- **Do not connect directly to mains.**
- **Use only the external mains power supply included with the Product.**
- **Do not use the Product if it operates incorrectly.**
- **Carefully read all instructions.**
- **Do not touch voltages >30 V ac rms, 42 V ac peak, or 60 V dc.**

Symbols

The symbols shown in Table 1 are found in these instructions.

Table 1. Symbols

Symbol	Definition
	WARNING, RISK OF DANGER.
	Consult user documentation.
	Certified by CSA Group to North American safety standards.
	Conforms to relevant Australian Safety and EMC standards.
	Conforms to European Union directives.
	Earth
	This product complies with the WEEE Directive marking requirements. The affixed label indicates that you must not discard this electrical/electronic product in domestic household waste. Product Category: With reference to the equipment types in the WEEE Directive Annex I, this product is classed as category 9 "Monitoring and Control Instrumentation" product. Do not dispose of this product as unsorted municipal waste.

Shipping Contents

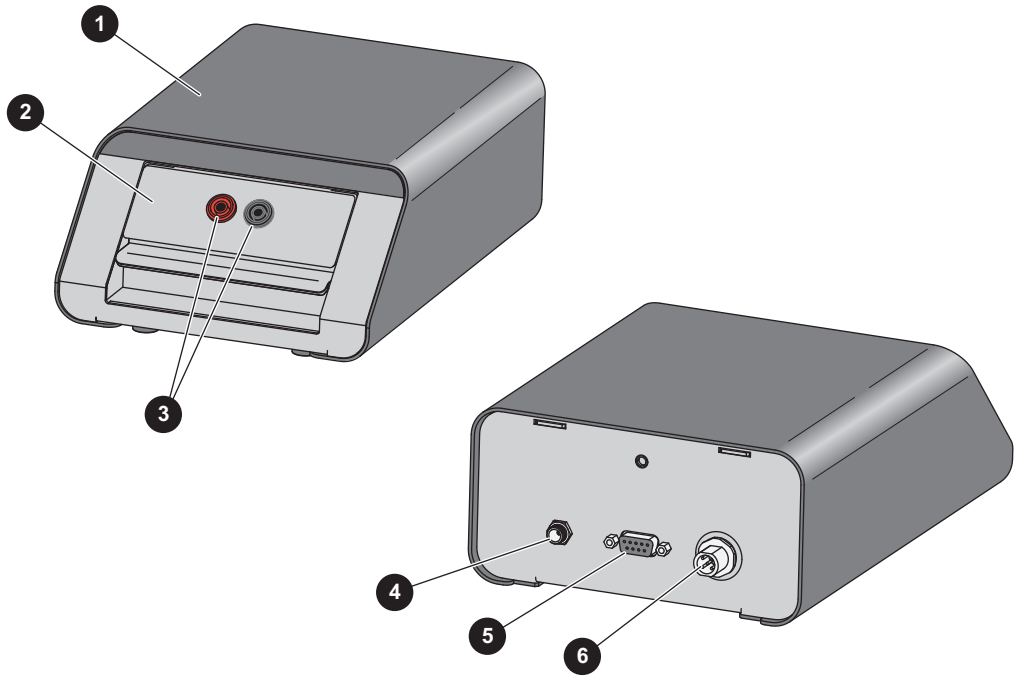
The Product ships with:

- EMM300, Electrical Measurement Module
- DS70-KIT-EMM Docking Station
- Power Supply
- Adapter cable RS232 null modem to USB
- CAN bus cable
- Test Leads
- Instructions

The Product

Table 2 shows the Product.

Table 2. The Product



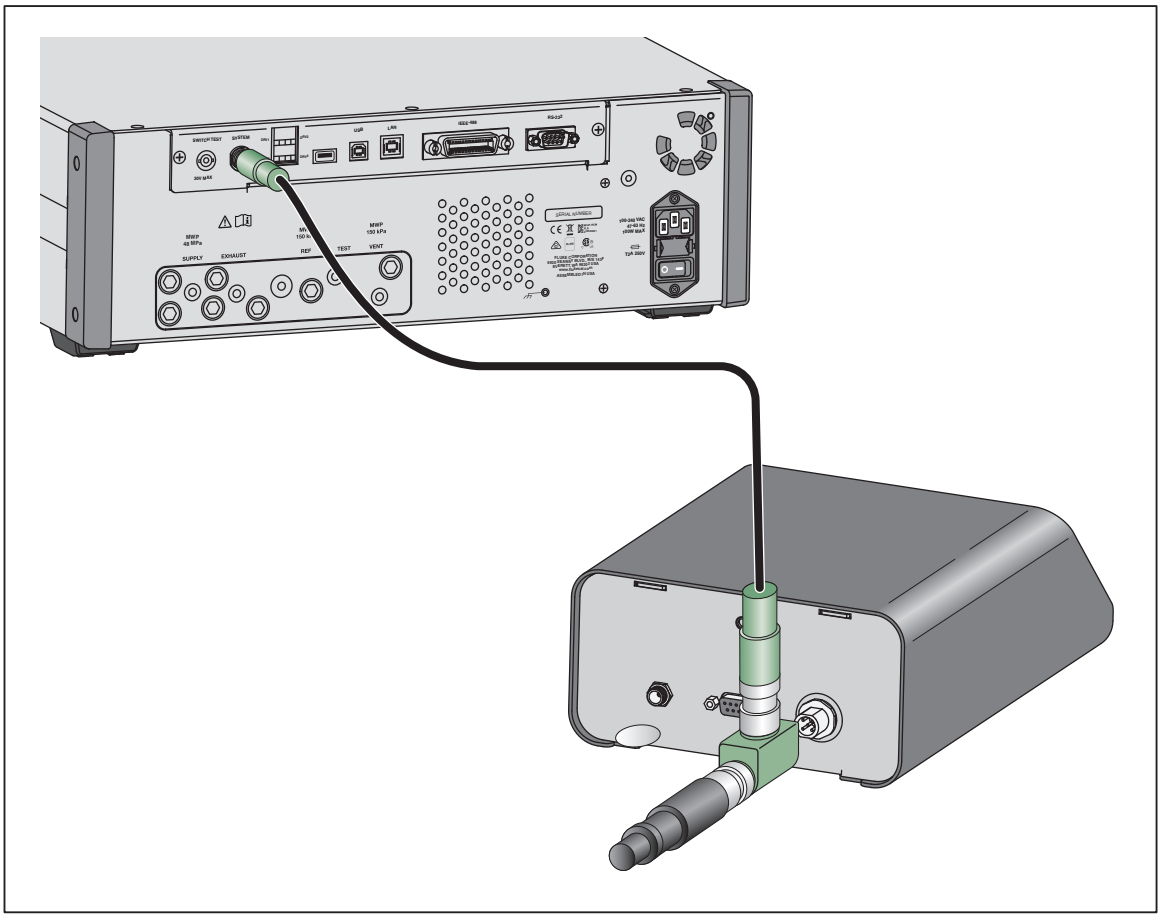
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Number	Description
1	Docking Station, DS70-KIT-EMM
2	Electrical measurement Module, EMM300
3	Input Terminals
4	Power Socket
5	RS232 Connector
6	CAN bus Connector

Set Up

To set up the Product:

1. Connect the CAN bus cable to the Docking Station and to the CAN bus connector on the rear panel of the Pressure Controller. See Figure 2.
2. Connect the Test Leads from the EMM300 Input Terminals to the DUT connections, observing polarity.
3. Connect mains power to the Docking Station.
4. Ensure that the EMM/HART indicator shows on the lower half of the main screen on the Pressure Controller.
5. Connect the RS232 cable to your computer (optional).
6. Connect the DUT pressure connection(s) to the Pressure Controller TEST port, or to an accessory connected to the TEST port (CPS, SPLT, Test Station, for example).



ifh03.eps

Figure 2. Controller Connections

mA/V dc Operation

The EMM provides measurement of V dc and mA with or without 24 V loop power.

To enable the mA/VDC function:

1. From the Controller Main screen, push **EMM/HART** on the left of the touchscreen.
2. Push **mA/VDC** to go into electrical measurement mode.
3. Choose the measurement mode as required. Push **mA/DCV** to toggle the mode between mA or V dc. In mA measurement mode, push 24V Loop to enable/disable 24V loop power for a mA transmitter. DCV mode disables 24V loop power.

V dc Measurement

In V dc measurement mode, the Product measures the input dc voltage from 0 V to 30 V.

mA Measurement

In the mA measurement mode, the Product measures dc current from 4 mA to 20 mA.

See the Pressure Controller's Operators Manual for how to use the Programs Task with mA or V dc transmitters.

Pressure Transmitter Instructions

The Product tests, troubleshoots, and calibrates analog DUTs and *smart* pressure transmitters with HART functionality. Pressure transmitters are usually classified as *analog* transmitters or *smart* transmitters.

Analog Transmitters

Analog transmitters let the user make two adjustments:

1. Zero the transmitter by adjusting the LRV (Lower Range Value) of the transmitter to the zero-pressure point that supplies an output of 4 mA.
2. Adjust the URV (Upper Range Value) of the transmitter to the upper-working pressure that supplies an output of 20 mA.

These transmitters are usually adjusted with a screwdriver by turning two potentiometers on the top or the side of the transmitter. The Product helps to calibrate these analog transmitters by providing an accurate, easy to control source of pressure while also precisely measuring the analog 4-20 mA signal.

HART Operation

Highway Addressable Remote Transducer (HART) is an industry standard that defines the communications protocol between smart field devices and a control system that uses traditional 4-20 mA wiring. HART allows the technician to configure and adjust variables stored and used by the transmitter. The HART function of the Product allows for calibration and testing of many HART-enabled devices such as transmitters. The Product uses Universal Practice Commands and many Common Practice Commands that allow the user to change parameters and easily make adjustments to the HART device.

Some HART devices require specific device drivers to make changes to parameters for which the EMM is not equipped. In this case, use of a field communicator such as the Fluke 754 Documenting Process Calibrator is necessary.

Smart Transmitters

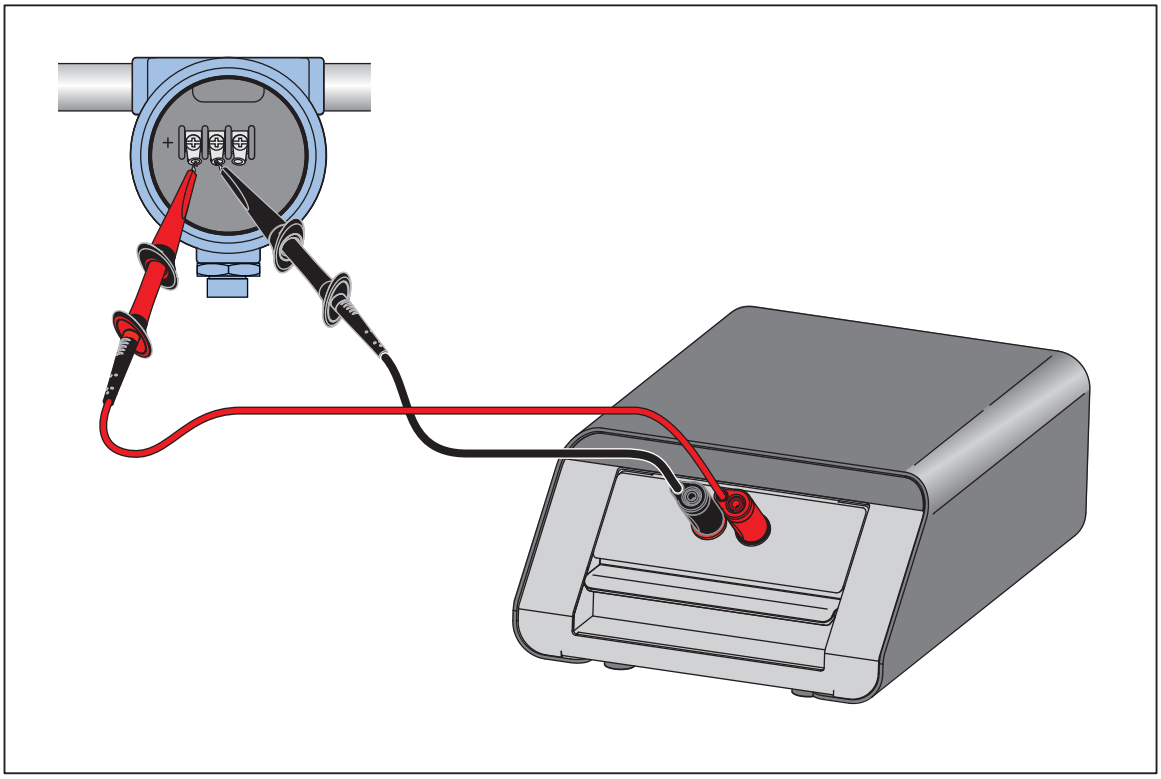
Smart transmitters are more complex than analog transmitters and offer more features that allow the transmitters to store and transmit more information to a central control center. For example, many smart transmitters have a digital signal that transmits not only the analog 4-20 mA signal, but also the pressure reading back to the central control center. While many newer systems use this digital signal, most use the analog 4-20 mA signal that requires the analog circuit to be adjusted when calibrated.

To communicate with smart transmitters, HART communication protocol is used. Many of the HART variables are used to calibrate the smart transmitter. The EMM is HART-enabled and uses Universal Practice Commands and many HART Common Practice Commands to change parameters and make adjustments to the HART device. Many smart transmitters use specific commands that are not part of the common practice or universal command library. These commands are sometimes needed to perform a digital sensor trim (for example) and are referred to as *device drivers*. The EMM does not contain any device drivers.

Connect to a HART Transmitter

To connect the Product to a HART transmitter:

1. Connect the test leads from the Product to the appropriate terminals on the HART device. Observe polarity. See Figure 2.
2. Push **MAIN>EMM/HART.** The HART connection menu shows these settings:
   - **250 Ohm Resistor** – When ON, the Product uses the built-in 250 Ω resistor required for HART communication.
   - **Use HART Unit** – When YES, the pressure unit of the controller changes to match the unit of the pressure transmitter.
   - **Write Lock** – When ON, the transmitter is protected from data changes.
3. Push **Connect**. The controller scans (polls) for connected devices from addresses 0 to 65. When a transmitter is found, data is obtained. If the controller does not detect a device, check the connections and wire polarity and then push **Connect** again. If a connection cannot be made after multiple attempts, troubleshoot the transmitter with the mA mode. See *Using the mA Function to Test and Troubleshoot*.

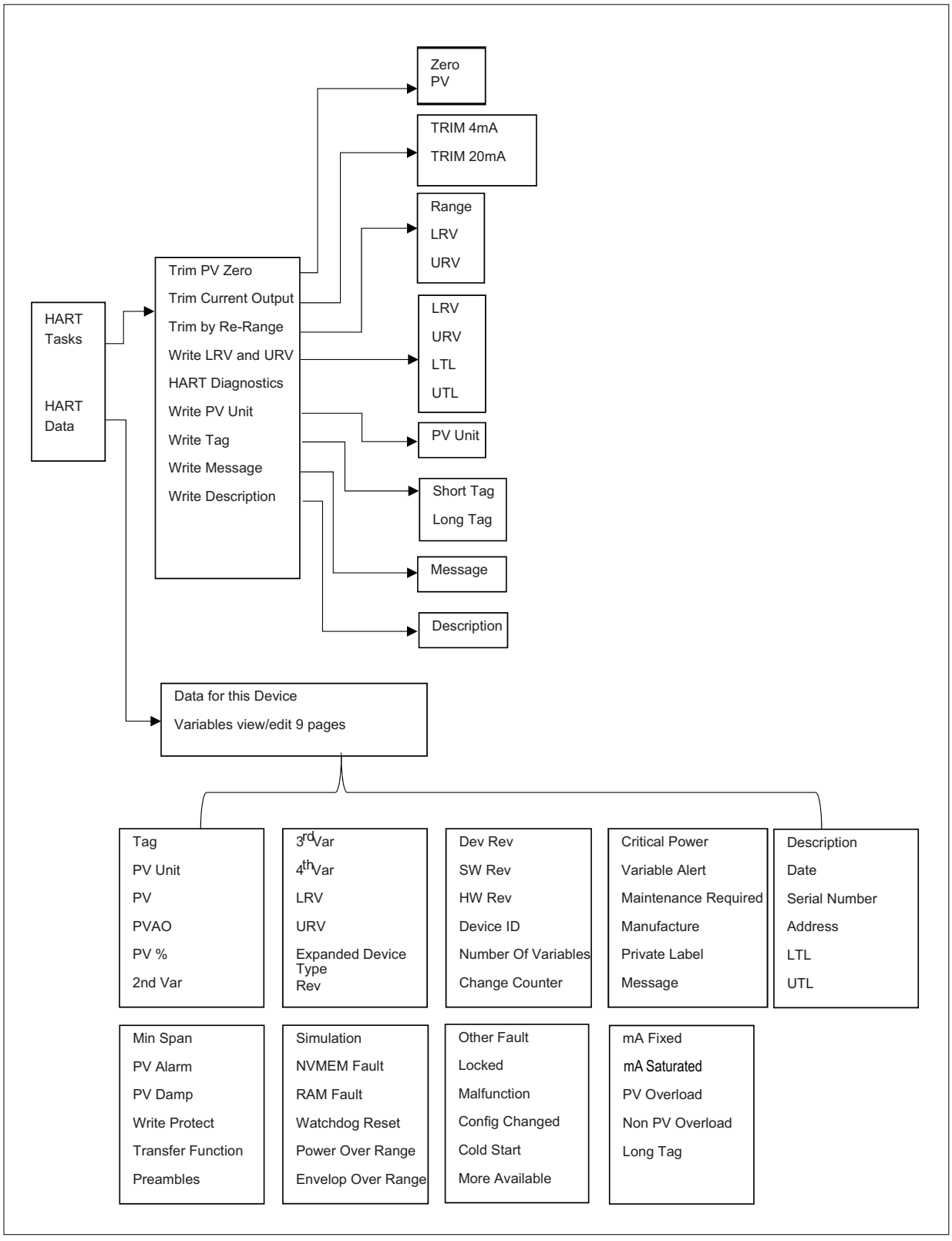


ilfh02.eps

Figure 2. Transmitter Connection

HART Tasks

The HART tasks are explained in the subsequent sections. See Figure 3 for an overview of the menus.



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Figure 3. HART Tasks Menu Tree

Trim PV Zero

The Trim PV Zero command zeros the pressure sensor in a transmitter. The resulting offset must be within limits by each device. The span of Primary Variable remains constant. This command does not affect or interact with the Upper or Lower-Range values.

1. Select **HART Tasks** on the HART menu.
2. Select **Trim PV Zero**.
3. Push **Zero PV** to zero PV.

Trim Current Output

The Trim Current Output commands adjust the transmitter digital to analog converter (DAC) at the 4 mA and 20 mA points.

To Trim Current Output:

1. Select **HART Tasks** on the Hart menu.
2. Select **Trim Current Output** from the menu.
3. Use **Averaging Measurement** and **Averaging Time** to average the measurement value applied to the trim.
4. Push **Start** to start Trim.
5. Push **Trim 4mA** to start trimming the 4 mA point. The **Send** button is enabled when measuring value is stable.
6. Push **Send** to send the 4 mA trimming value to DUT.
7. After 4 mA trimming is complete, push **Trim 4mA** to repeat the 4 mA trimming, if necessary. Or push **Continue** to move trim to 20 mA.
8. Push **Trim 20mA** to start trimming the 20 mA point. The **Send** button is enabled when measuring value is stable.
9. Push **Send** to send 20 mA trimming value to DUT.
10. After 20 mA trimming is complete, push **Trim 20 mA** to repeat the 20 mA trimming if necessary. Or push **Exit** to exit.

Trim by Re-ranging

You can adjust the transmitter by re-ranging the upper and lower range values. This type of trim is typical for analog and smart transmitters used in analog processes. This trim function alters the transmitter's interpretation of the input signal.

To trim by re-ranging:

1. Push **HART Tasks** on the HART menu.
2. Select **Trim by Re-ranging**.

   In the Trim by Re-ranging menu:

   - **Range: 4 mA/20 mA/Both** – Use to select a point or both to trim
     - **4mA -** Only trim 4 mA
     - **20mA** - Only trim 20 mA
     - **Both -** Trim both 4 mA and 20 mA
   - **LRV -** Configure the lower range value of transmitter

Note

Changing the LRV affects the URV. If the LRV should be tested against ATM, check the ***Set to ATM*** *checkbox. When* ***is Set to ATM*** *is pushed, the LRV is non-editable.*

- **URV** - Configure the upper range value of transmitter.
- **Closed Loop**:
  - **ON** - Automatically sets the pressures to the LRV and URV values and dwells for the time specified in the Dwell Time field. The measurements are taken from the amount of time shown in the Averaging Time field.
  - **OFF** - Trim the function manually.
- **Dwell Time:**

  This is a user-configurable amount of time for how long the pressure dwells before measurements are taken.

Note

*Once at the setpoint and the pressure stabilizes (***Ready** *is shown), the dwell countdown timer starts. Once the dwell is finished, if closed loop was used, then the measurement is taken and the controller continues to the next setpoint. If closed loop is OFF, push* **continue** *to go to the next setpoint.*

3. In the Trim by Re-ranging main menu, push **Start** to start trim.
4. If the **Closed Loop** was ON, the trim process automatically progresses without user interaction. Otherwise, the **Closed Loop** is OFF.
5. Push **Trim** to trim and change to next range.
6. If necessary, push Lower Range or Upper Range, as necessary.
7. When the trim process is finished, follow the display guide Trim Complete, push **Exit** to exit.

Note

This trim process changes the upper and lower range values to compensate the sensor's error.

Write LRV/URV

To change the working range of a HART Transmitter by changing the LRV or URV:

1. Select **Write LRV and URV**.
2. In the change menu, input the new LRV and URV values.

Note

LRV cannot be set to lower than Lower Transmitter Limit (LTL) and the URV cannot be set greater than the Upper Transmitter Limit (UTL).

3. Push **Send** to save the new values.
4. Push **Exit** to exit.

HART Diagnostics

Some HART devices feature a self-test function that check various aspects of the transmitter such as the processor and memory when commanded. Not all HART devices have this feature. If the transmitter has this function, the controller sends the self-test command and shows the results of the self-test on the display. If the feature is not implemented in the transmitter, no information shows.

To start the HART Diagnostics test:

1. Select **HART Tasks** on the HART menu.
2. Select **HART Diagnostics**.
3. Push **Start**.
   HART Diagnostics Results dialog is shown. Errors or faults (if any) are shown if any have occurred.

Write PV Unit

The Write PV Unit command changes the Primary Variable (pressure unit) of the transmitter.

Note

This can also be changed in the HART Data menu.

1. Push **HART Tasks** on the HART menu.
2. Select **Write PV Unit**.
3. Select the new unit.
4. Push **Send**.
5. Push **Exit**.

Write Tag

Write the short tag (maximum 8 characters) as follows:

Note

This can also be changed in the HART Data menu. Short tag is supported by HART revision 5 and above.

1. Push **HART Tasks** on the HART menu.
2. Select **Write Tag**.
3. Push **Short Tag**.
4. Use the on-screen keyboard to enter the tag.
5. Push **Save**.
6. Push **Send**.

Write Message

To write the message (max 32 characters):

Note

This can also be changed in the HART Data menu.

1. Select **HART Tasks** on the HART menu.
2. Select **Write Message**.
3. Use the on-screen keyboard to enter the tag.
4. Push **Send**.
5. Push **Exit**.

Write Description

To write the description (max 16 characters):

Note

This can also be changed in the HART Data menu.

1. Push **HART Tasks** on the HART menu.
2. Select **Write Description**.
3. Use the on-screen keyboard to enter the tag.
4. Push **Send**.
5. Push **Exit**.

Write Poll Address

To use the write poll address:

1. Push **HART Tasks** on the HART menu.
2. Select **Poll Address**.
3. Use keypad to enter value.
4. Push **Send**.
5. Push **Exit**.

HART Data

HART data shows all of the complete data about the transmitter model, hardware and software revision numbers, and many coefficients. From the controller screen push the **HART Data** button to access the HART Information screen. Some data is read-only and cannot be selected. Some data is writable, see Figure 3.

To view and change HART data:

1. Push **HART Data** on the HART menu.
2. Use the navigation keys to navigate between fields. Only editable data fields are selectable.

Note

If no fields are editable, then the HART connection was made with the write lock ON. Go back and reconnect the HART device with the write lock OFF.

3. Select the data to change and enter the information.
4. Push **Send**.
5. Push **Exit**.

Specifications

Operating Temperature ..... 15 °C to 35 °C
Storage Temperature..... -20 °C to +70 °C
Electrical Measurement Module (EMM)
  Connection ..... Banana Jack, CAN bus, RS232
    Maximum 30 V dc
HART Communication and Functions
  HART Modes ..... HART mA measurement with 24 V (Loop)
  Automatic HART Detection..... HART connected with automatic polling
  HART Selectable Resistor..... Built-in 250 Ω loop resistor. Selectable ON/OFF
  HART Commands ..... HART universal and common practice commands (no device specific commands)
  Write Protection ..... HART Write enable/disable

EM300 Modules

Specifications are valid from 18 °C to 28 °C. For temperatures from 15 °C to 18 °C and 28 °C to 35 °C, add 0.002 % FS/°C.

EM300 Module Measurement Specifications

All outputs are positive only.

DC Voltage		
Range	**Resolution**	**1 Year Instrumental Uncertainty**
30 V	1 mV	0.01 % of reading + 2 mV
DC Current		
Range	**Resolution**	**1 Year Instrumental Uncertainty**
24 mA	1 µA	0.01 % of reading + 2 µA

Operating Humidity..... 5 % to 95 % relative humidity, non-condensing
Weight..... 1080 g (2.4 lb)
Dimensions..... 165 x 240 x 85 mm (6.5 x 9.5 x 3.4 in)
Safety
  General..... IEC 61010-1

LIMITED WARRANTY AND LIMITATION OF LIABILITY

This Fluke product will be free from defects in material and workmanship for one year from the date of purchase. This warranty does not cover fuses, disposable batteries, or damage from accident, neglect, misuse, alteration, contamination, or abnormal conditions of operation or handling. Resellers are not authorized to extend any other warranty on Fluke's behalf. To obtain service during the warranty period, contact your nearest Fluke authorized service center to obtain return authorization information, then send the product to that Service Center with a description of the problem.

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