Mid-Range Moisture Transmitter with One or Two Current Loops DewPro® MMR31

Installation and Operation Manual

GE Measurement & Sensing Technologies

GE General Eastern

General Notes

Caution! Caution!
Before installation please read all instructions.

Safety Safety
- The DewPro is designed to be mounted to pressurized systems. Take necessary precautions when mounting or removing the DewPro.

If you should have questions regarding the product described in this document, or need further assistance, please contact your local GE General Eastern Sales Centre

Contents

1.0 General System Information

1. 1 Unpacking and Inspection

Unpacking

Upon receipt of the DewPro MMR 31, examine the shipping carton for broken or open packing, distortion, or any other evidence of mishandling. If inspection indicates damage to the unit or any of its components, notify the carrier (within 15 days of delivery) and request an inspection.
Move the carton to a clean work area and unpack. The carton you receive should contain:

- DewPro MMR 31
- Installation and Operation Manual

Compare the model number (on the product label) with product structure (see below) to ensure you have received everything you ordered.

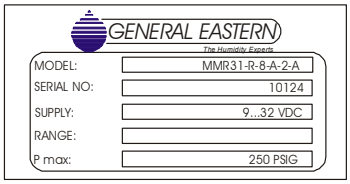


Fig. 1

Product Structure

Check Model Number

Certification/Approvals:

R Standard (not certified)
Y Other

Process Connection

1 3" diameter galvanized floor flange with 12,7 mm (1/2" MNPT) compression fitting
3 1/2" M NPT compression fitting
6 No mounting hardware
8 G 1/2 compression fitting (Male thread), gasket, SS ferrule
9 Other

Protective Cap:

A Standard with 100 micron sintered filter
Y Other

Enclosure Conduit:

1 1/2" FNPT with cable gland and plug
2 PG 16 (Female) with cable gland and plug
9 Other

Output Configuration/Dewpoint Range:

A One output 4-20 mA selectable: RH 0-100% or dewpoint - 15 to +85 OC, absolute humidity, mixing ratio, no display, fault status 22 mA
B Two 4-20 madc output loops: Moisture and temperature - 15 to +85 OC, no display, fault status 22 mA
C As A, fault status hold
D As A, fault status 3.6 mA
E As B, fault status hold
F As B, fault status 3.6 mA
G As A, with integral display, user interface
H As B, with integral display, user interface
Y Other

R	**8**	**A**	**2**	**A**

1.2 Introduction

Unit description

The DewPro MMR 31 comes in two versions:

1. Mid-range moisture transmitter with one isolated 4to 20 mA loop. The loop current represents the selected moisture unit. (See Section 5.4 to set the unit of measure.)
2. Two isolated 4 to 20 mA loops with the second loop representing temperature. Both loops can be powered by a single supply. This unique feature is patented.

The transmitter includes a sensor element a stainless steel probe, a weather-proof enclosure, and microprocessor electronics. It is designed to be inserted into the process. Various mounting hardware, such as flange and compression fittings are available for mounting into a duct, process chamber, wall, etc. The DewPro's MMR 31 measures relative humidity in %, dewpoint temperature in oC or oF, absolute humidity in g/m3, or mixing ratio in g/kg. An optional display with user interface allows the user to configure the MMR31. See section 6.0

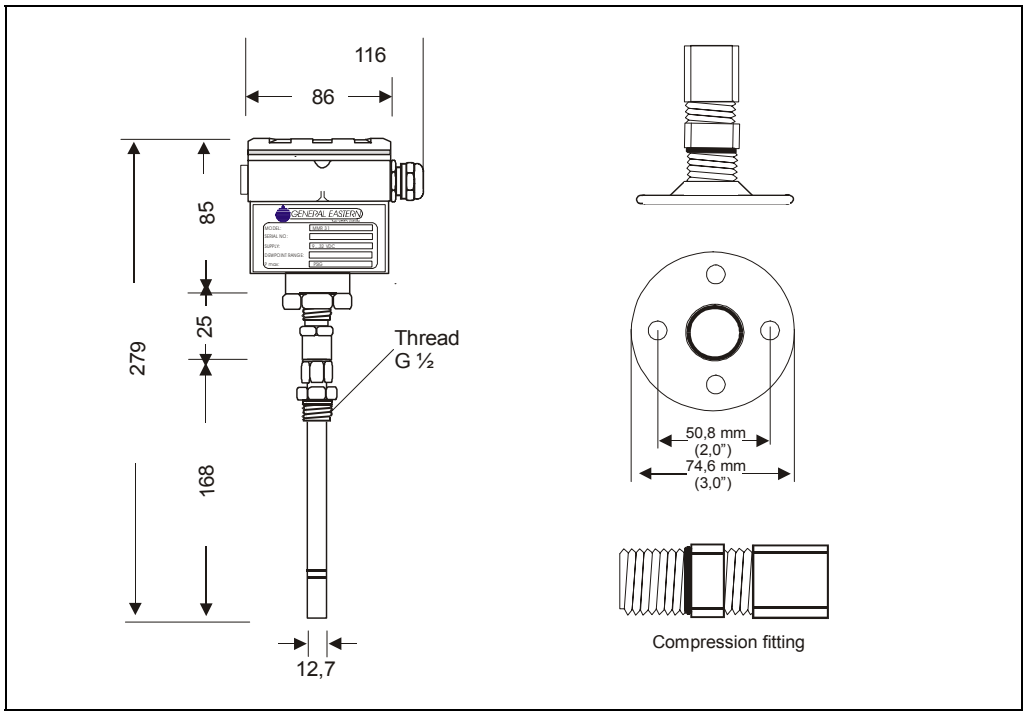


Fig. 2

1.3 Theory of Operation

First 4 to 20 mA Loop

The DewPro MMR 31 microprocessor controlled electronics operate with a voltage supply of 12 to 32 V DC. At the nominal 24 V DC supply, the maximum loop resistance is 600 Ohm. The signal is represented by the 4 to 20 mA loop current and is directly proportional to 0 to 100% relative humidity, or, if selected, the dewpoint temperature range of 15 oC to +85 oC (+5 oF to +185 oF), the absolute humidity in a range of 1 to 350 g/m3, or the mixing ratio in a range of 1 to 830 g/kg.

Second 4 to 20 mA Loop

The specifications for the first loop are also valid for the second loop except the 4 to 20 mA signal always corresponds to the temperature range of -15 oC to +85 oC.

Polymer Sensor

The sensing element in the MMR 31 is a silicon-based polymer that uses the capacitance principle for the moisture measurement. The IC chip includes the moisture sensor and appropriate integrated circuitry. A platinum RTD temperature sensor is built in to provide temperature compensation for maximum accuracy. The sensor element is protected from condensation using a hydrophobic sintered filter. An additional removable filter cap serves as a pre-filter.

Calibration

Each DewPro is factory calibrated against precise NIST certified moisture references. Field calibration is possible with the use of saturated salt solutions.

2.0 Installation Guidelines

2.1 Mounting the Probe

Preferably, mount the probe vertically such that the sensor tip points down. Mount the probe in a G 1/2 thread connection or with a flange. Be certain that the tip of the probe does not touch the inside wall of the pipe.

Adjust the ferrule (nylon or stainless steel*) for a probe insertion length of 1" (minimum) and tighten the compression fitting as follows:

- Hand-tighten the nut. Then, using a wrench, tighten the nut one and one-half turns.
- Now the fitting is tight and can withstand pressure to 17 bar (250 psi) (provided a stainless steel ferrule is used)

***A nylon ferrule is used in systems without pressure. However, a 1.4571 stainless steel ferrule is required for use in pressurized systems. Ensure that your probe has the appropriate fitting for your application.**

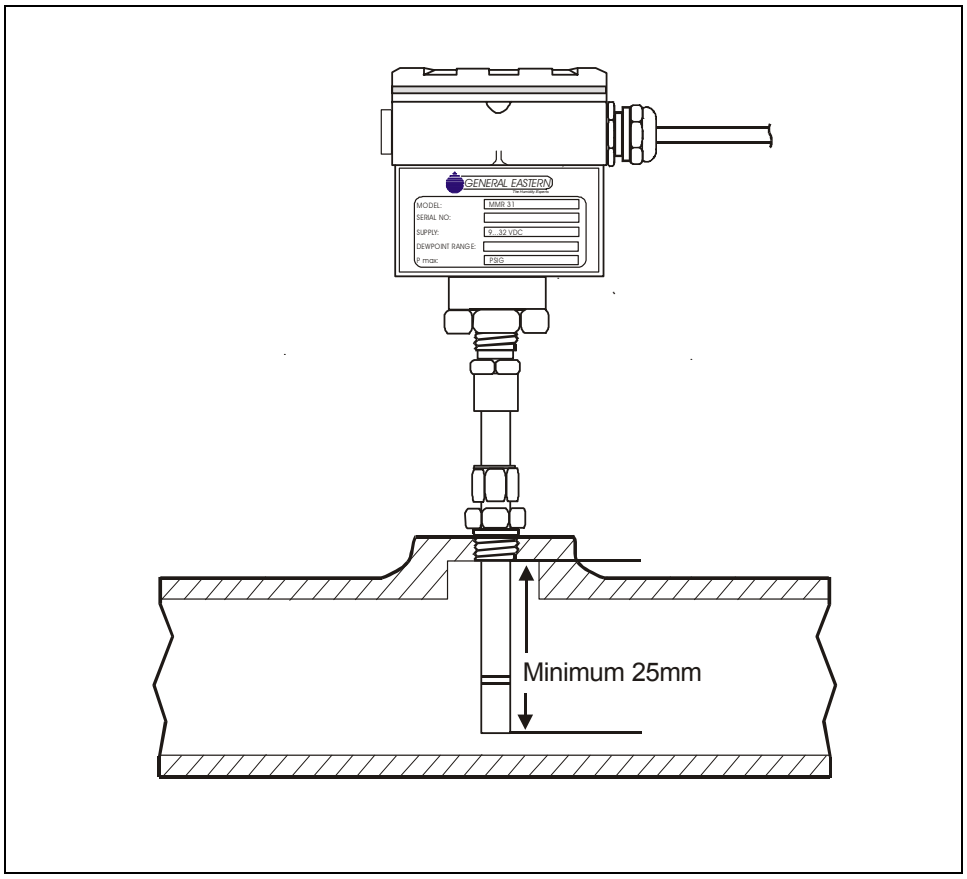


Fig. 3

3.0 Wiring for Configurations with One Loop

3.1 Wiring, General Guidelines

Caution! **Caution!**
The DewPro system contains electronic components that are susceptible to damage by static electricity. Proper handling procedures must be observed during the removal , installation, or other handling of internal boards.

3.2 System Configuration, Various

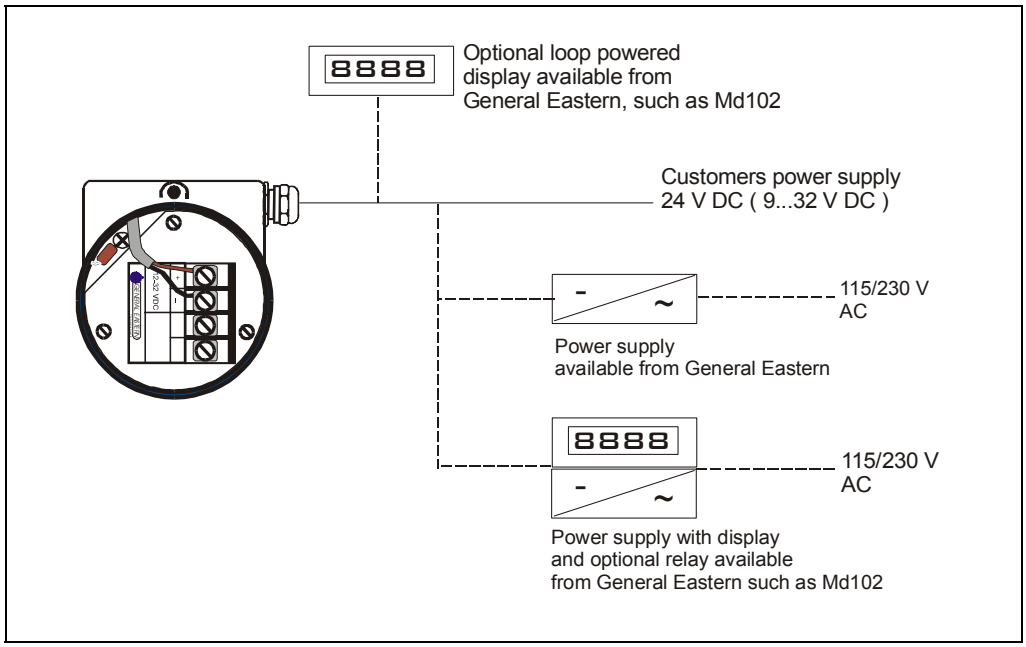


Fig. 4

NOTE: The voltage across the +/- terminal of the DewPro should not fall below 12 V DC. The maximum loop resistance is an important measure for selection of the supply voltage. Each device connected to the loop causes a voltage drop. For instance, using a loop-powered display with an input impedance of 50 Ohm will cause a voltage drop of 1 V DC at 20 mA following Ohm's law. Connecting the loop to a PLC will cause a voltage drop across its input.

When designing your loop, add up all voltage losses across the devices connected to the loop and add 12 V. The sum will be the minimum supply voltage required from the power supply. Calculate with a 20% safety factor.

If a display is used, configure it to the proper range: 0 to 100 for % RH, -15 oC to +85 oC (+5 oF to + 185 oF) for dewpoint, 1 to 350 g/m3 for absolute humidity, or
1 to 830 g/kg for mixing ratio or custom range corresponding to 4 to 20 mA.

3.3 Mounting in Normal Environment

Standard

- A standard two-wire, stranded cable can be used to interconnect the DewPro with the power source

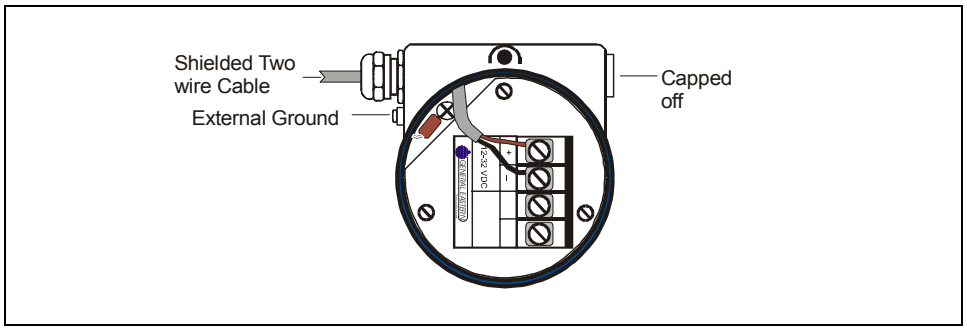


Fig. 5

3.4 Mounting in Environments with Severe Electrical Noise

EMI/RFI

- In areas where EMI/RFI interference is likely, a shielded signal cable is to be used for full protection. The DewPro MMR 31 meets requirements of IEC 801-1 through 6 (EN 50081-1, 50082-2) when properly shielded cable is used

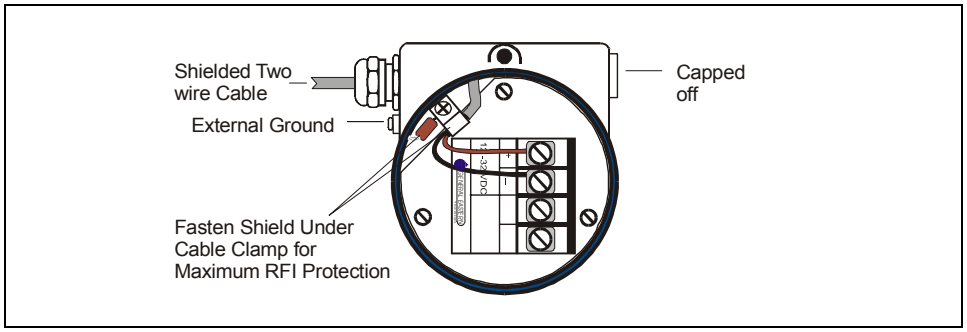


Fig. 6

3.5 Electrical Connection

Electrical Connection

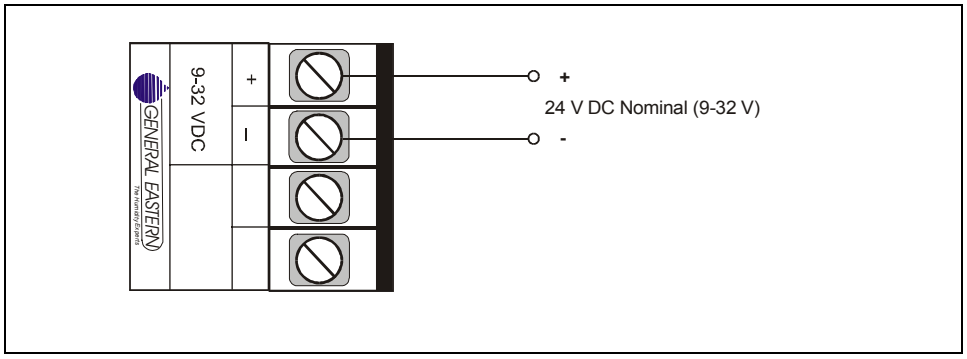


Fig. 7

3.6 General Wiring Instructions

1. Unscrew the cap on top of the unit.

2. Loosen the gray cable gland located on the side of the unit.

3. Feed the cable through the conduit opening.

   NOTE: Use a standard signal cable size.

4. Retighten the gray cable gland to meet IP 67 and to relieve any stress on the wire.

5. Verify that a value between 12 to 32 V DC is across the terminals marked + and

   NOTE: This is the voltage that appears ackm " DewPro@ terminals, not necessarily the power supply voltage due to voltage loss in wire length, displays, indicators, etc.

4.0 Wiring for Configurations with Two Loops

4.1 Wiring, General Guidelines

Caution! **Caution!**
The DewPro system contains electronic components that are suspectable to damage by electric electricity. Proper handling procedures must be observed during the removal, installation, or other handling of internal boards.

4.2 System Configuration with One 24 V DC Power Supply and Loop-Powered Displays

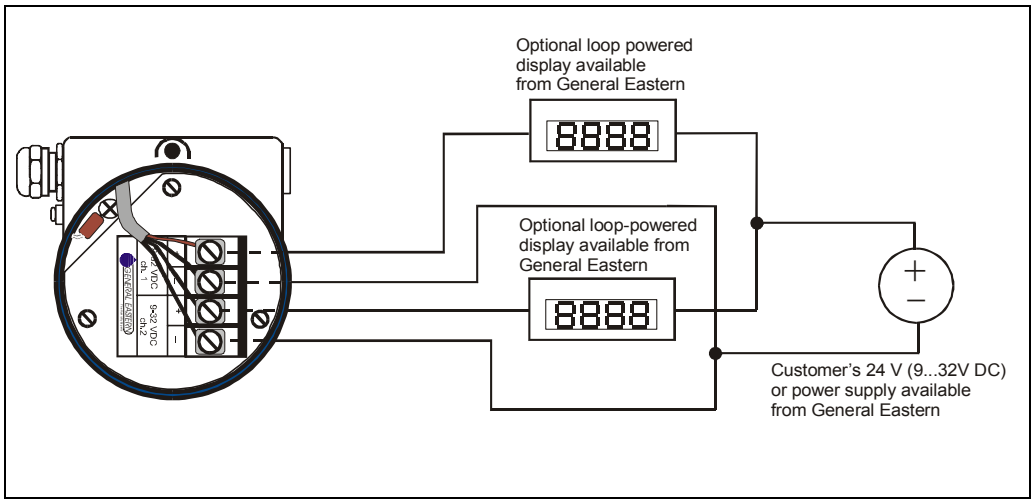


Fig. 8

NOTE: The voltage across the +/- terminal of the DewPro should not fall below 12 V DC. The maximum loop resistance is an important measure for selection of the supply voltage. Each device connected to the loop causes a voltage drop. For instance, using a loop-powered display with an input impedance of 50 Ohm will cause a voltage drop of 1 V DC at 20 mA following Ohm's law. Connecting the loop to a PLC will cause a voltage drop across its input.

When designing your loop, add up all voltage losses across the devices connected to the loop and add 12 V. The sum will be the minimum supply voltage required from the power supply. Calculate with a 20% safety factor.

If a display is used, configure it to the proper range: 0 to 100 for % RH, -15 oC to +85 oC (+5 oF to + 185 oF) for dewpoint, 1 to 350 g/m3 for absolute humidity, or 1 to 830 g/kg for mixing ratio or custom range corresponding to 4 to 20 mA.

The same specifications for the first loop also apply to the second loop. The range, however, is always -15 OC to +85 OC corresponding to temperature, unless a display/user interface is used allowing for a custom range. Be sure that both loops are independently connected (for example, not by jumper) to a power supply so that the loop currents from both loops are measured correctly.

4.3. System Configuration with Display Including Power Supply

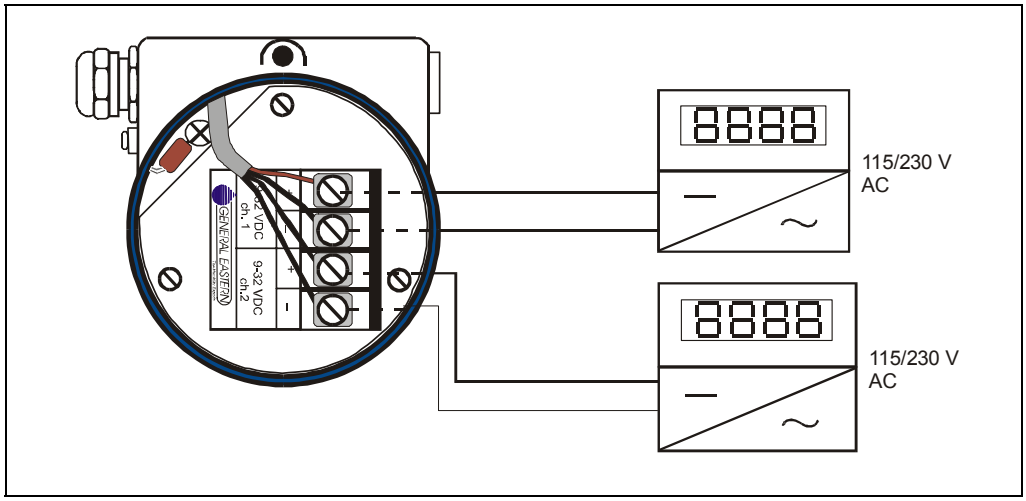


Fig.9

4.4 Mounting in Normal Environments

Standard

- A standard four-wire, stranded cable can be used to interconnect the DewPro with the power source.

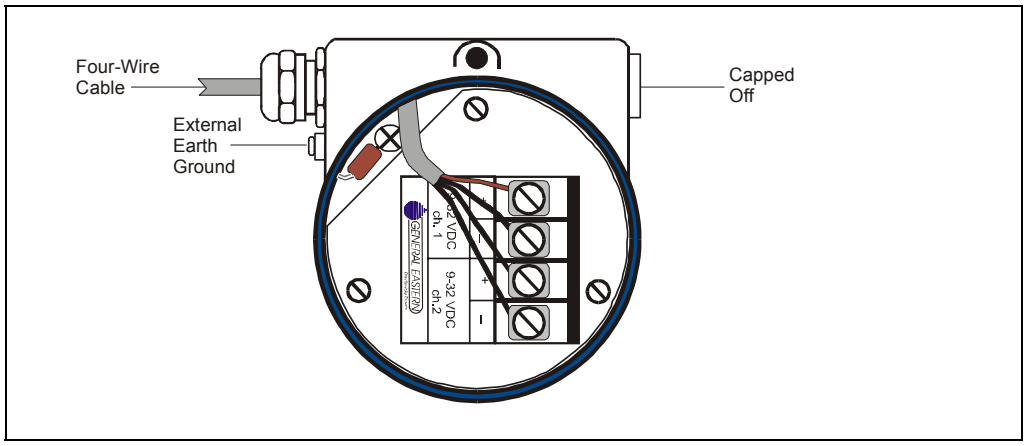


Fig.10

4.5 Mounting in Environments with Severe Electrical Noise

EMI/RFI

- In areas where EMI/RFI interference is likely a shielded signal cable is to be used for full protection. The DewPro MMR31 meets requirements of IEC 801-1 through 6 (EN 50081-1, 50082-2) when shielded cable is used.

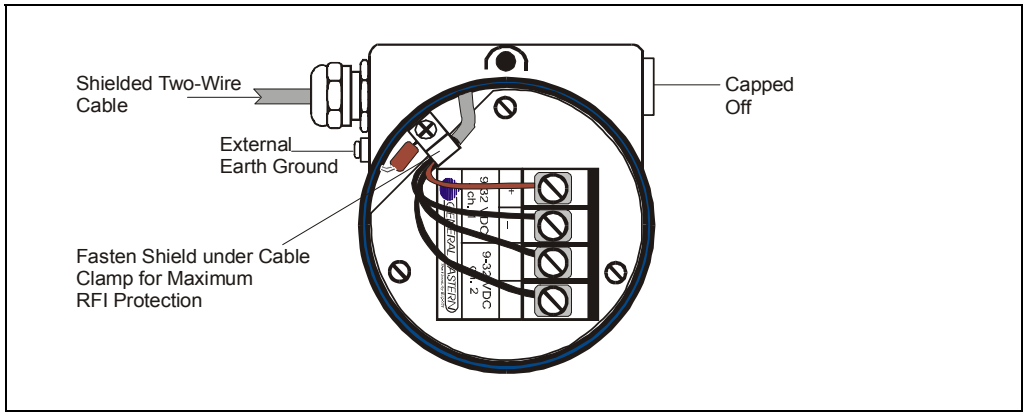


Fig.11

4.6 Electrical Connection

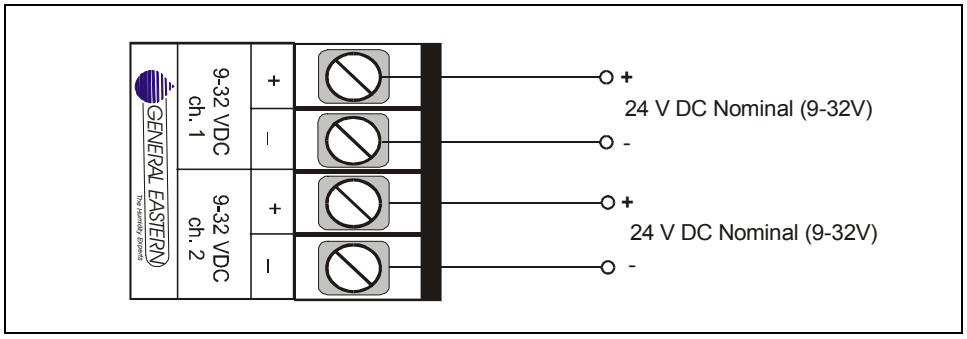


Fig. 12

4.7 General Wiring Instructions

1. Unscrew the cap on top of the unit.

2. Loosen the grey cable gland located on the side of the unit

3. Feed the cable through the conduit opening.

NOTE: Use a standard signal cable size.

4. Retighten the grey cable gland to meet IP 67 and to relieve any stress on the wire.

5. Verify that 12 to 32 V DC is across the terminals marked + and -.

NOTE: This is the voltage that appears across the DewPro terminals, not necessarily the power supply voltage due to voltage loss in wire length, displays, indicators, etc.

5.0 calibration

5.1 General Hints

Caution! **Caution!**
Be certain that the system is depressurized. The DewPro must be removed from the process prior to calibration.

5.2 Procedure for Calibration Using Two Saturated Salt Solutions

Utilizing saturated salt solutions is one of many methods available to calibrate a relative humidity sensor. Depending on the salt used (lithium chloride and sodium chloride are recommended), a defined relative humidity will occur above the solution at a given temperature. The accuracy of this method is dependent on the stability of the temperature during the calibration. It is important that the temperature of the salt solution and the temperature of the enclosed atmosphere above the solution are the same.

NOTE: To achieve optimum results, it is recommended that calibration be performed at 25.3 oC (77.5 oF) because the temperature compensation correction is zero at 25.3 oC (77.5 oF). Deviating from this value by app. 5 oC (app. 9 oF) will introduce an error of app. 1%.

For the following procedure, you will need two calibration bottles (11.3% and 75.4%) of the type available from General Eastern for RH field calibration.

For execution of the calibration, the following is needed:

- A screwdriver (4 mm wide)
- A screwdriver (2 mm wide)
- A mA meter or display ranged from 0 to 100 (see page 8)

5.3 Calibration Steps

NOTE: The following steps describe the use of a mA meter for calibration. If the loop already contains a display indicating the moisture values, there will be no need for installing a mA meter.

1 . Remove the lid of the DewPro enclosure.
2. Disconnect the (-) lead to connect the mA meter into the loop. Choose the 20 mA range on the meter.
3. Connect your meter as shown below in Figure 13.

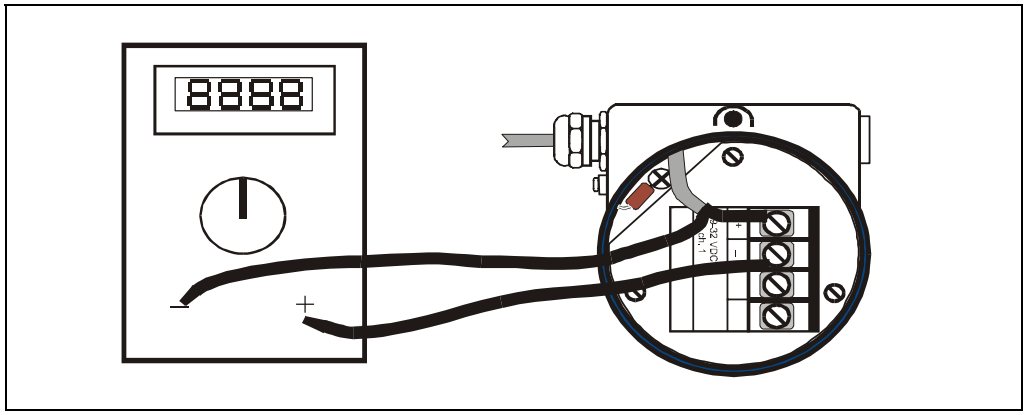


Fig.13

4. Loosen the screw indicated below and lift the blue cover to the vertical position.

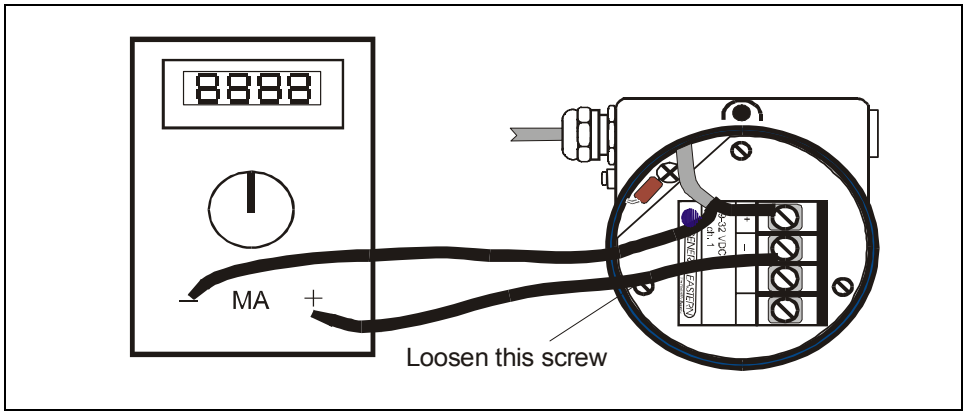


Fig. 14

5. After lifting the cover, two buttons and one rotary switch labeled SI, S2, and S3 on the circuit board are visible. Button SI is used for the calibration of the RH value 11.3% with a lithium chloride salt solution. Button S2 is for 75.4% with the sodium chloride solution. Rotary switch S3 selects the calibration mode when positioned to 9. Use a 2 mm screwdriver to turn the switch.

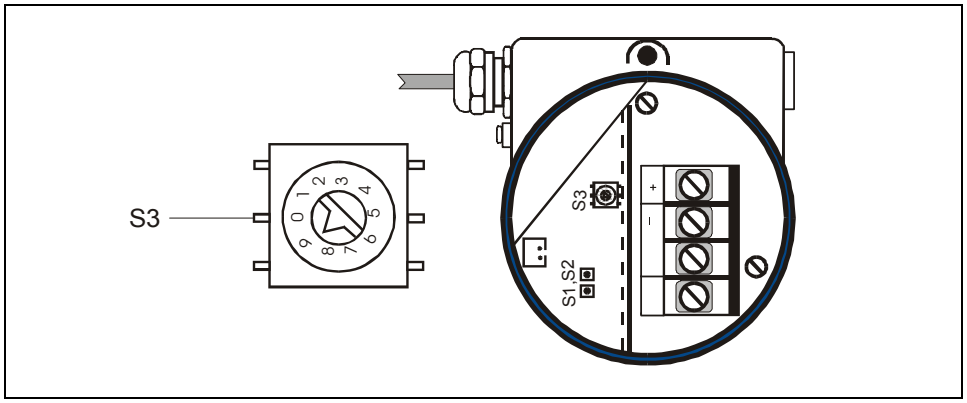


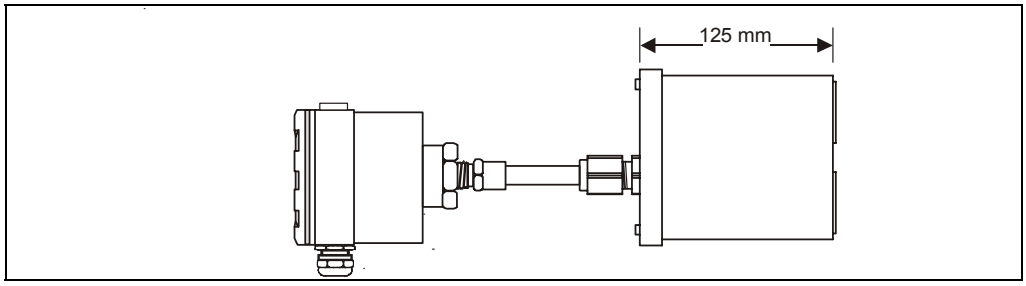
Fig. 15

For the low RH reading, a saturated salt solution of lithium chloride is used, providing 11.3% relative humidity. Insert the probe into the calibration bottle, keeping the tip of the probe above the salt solution. Ensure that the environment inside the bottle is air-tight by carefully securing the bottle cap and tube compression fitting to the bottle.
Observe the mA meter. The reading will change toward 5.8 mA (or 11.3% on a display) after insertion of the probe. For successful calibration, it is important that the temperature in the salt solution and in the enclosed atmosphere above the solution is the same (at equilibrium).

After waiting for approximately two hours, the mA meter reading should stabilize. If the meter reading is stable, press SI inside the DewPro for a minimum of one second. This will assign the 11.3% RH value. Return S3 to position 0 if only the low RH calibration will be performed, otherwise continue with the 75.4% calibration. The mA meter then should read 5.80 mA (or 11.3% on a display).

For the high RH reading, repeat the same procedure described above using a saturated salt solution of sodium chloride. This provides a relative humidity of 75.4%. Set S3 to position 9. Observing the mA meter, it should approach a reading of 16 mA (or 75.4% on a display). When the meter reading is stable, press S2 inside the DewPro for a minimum of one second. This will assign the 75.4% value. The mA meter should now read 16.06 mA (or 75.4% on a display). Be certain to return the rotary switch to position 0.

Fig. 16



6. After successful calibration, remove the mA meter, replace the lead, tighten the blue plastic cover, and replace the lid. The DewPro is now performing to the new calibration data.

NOTE: When calibrating, for example, 11.3% and accidentally pressing S2 (75.4%) instead of S1, please note that the value will not be accepted due to a plausibility check. This is valid vice versa.

5.4 Selecting the Unit of Measure

1 . The DewPro is shipped ranged from 0 to 100% relative humidity as a standard if it is not ordered differently
2. To select scaling in dewpoint:
   - Unscrew the lid
   - Unscrew the screw located on the blue flap (see Figure 14)
3. After lifting the cover S3 will be visible. Use a 2 mm screw driver to turn the switch. Selections possible are shown in the following table:

BCD Position	Mode	Range
0	% RH	0 to 100%
1	Dewpoint	-15 oC to +85 oC
2	Mixing Ratio	1 to 830 g/kg
3	Absolute Humidity	1 to 350 g/m3
8	Dewpoint	Custom
9	% RH Calibration with Salt Bottles (75.4 and 11.3%)	0 to 100%

EXAMPLE: Current output represents -15 oC to +85 oC dewpoint temperature when dewpoint mode is selected. Attached indicators need to be rescaled from their RH (0 ... 100%) scaling.

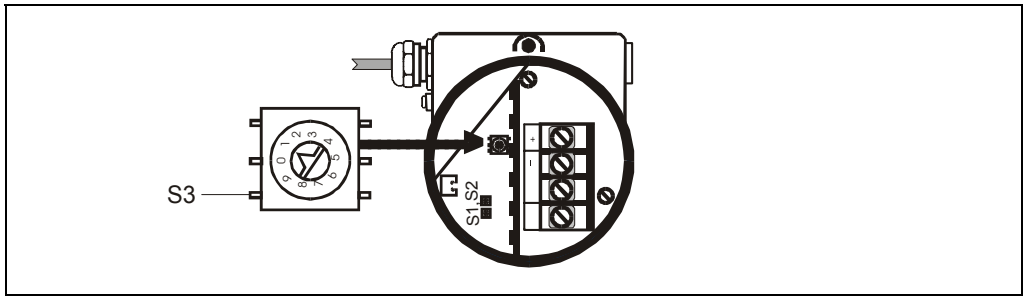


Fig. 17

6.0 Optional Display/User Interface

6.1 Installation

If the DewPro is equipped with an optional display / user interface follow the procedure below to access the terminals prior to applying power. Please use Figure 18 below as a reference when removing any parts from the DewPro.

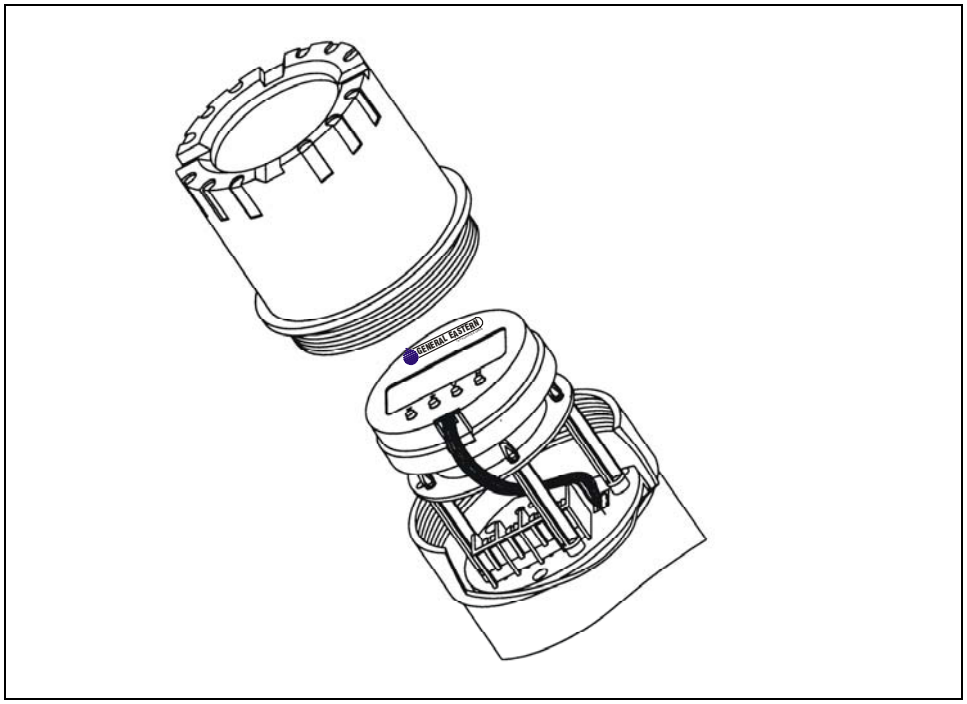


Fig. 18

1. Unscrew and remove the protective lid from the top of the DewPro, exposing the display module below
2. Unplug the display from the lower terminal board.
3. Carefully grasp the display bracket and pull straight up.
4. Follow the procedure outlined in Section 3.0, pages 8-10.
5. To replace the display module, locate the six holes on the underside of the display bracket. The MMR 31 uses the holes with the additional markings next to them.
6. Align the display bracket with the standoffs and snap the display bracket onto the three standoffs.
7. Carefully rotate the display module on the display bracket until properly aligned for readability.
8. Reconnect the display to the lower terminal board observing the key on the plug and socket.

NOTE: When the display module is installed it takes over control, superseding the rotary switch functions illustrated under Section 5.4 on page 16. Only the calibration buttons on the printed circuit board remain active.

6.2 Description of the DewPro MMR31 Programming Matrix

In the DewPro mid-range moisture transmitter with display option, a matrix-style input is used for programming the unit of measure, measuring range, error status of output, and output adjustment. For users of other General Eastern equipment, this 'GEI matrix" format is familiar. The following describes the features and usage of the various matrix location as they apply to the MMR 31.

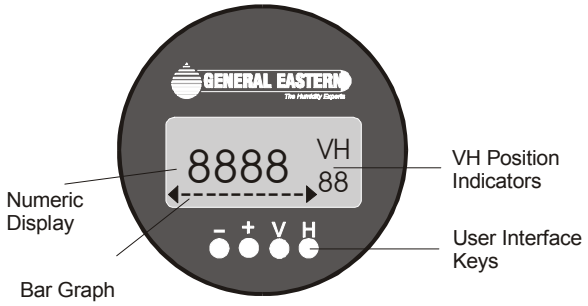


Fig. 19

The display of the DewPro MMR 31 continuously shows the current matrix location using the vertical (V) and horizontal (H) coordinates to designate the row and column, respectively. The bar graph represents the output current in an analogue fashion (refer to Figure 19). See the Appendix for an enlarged overview of the matrix.

MMR31		H0	H1	H2	H3	H4	H5	H6	H7	H8	H9
Moisture Unit	**V0**	Display Moisture Value	Select Moisture Unit *)						Loop 1 at Fault 0= -10%, 1=110%, 2=Hold	Loop 1 Raw Reading	
Loop Range	**V1**	% RH 4 mA	% RH 20 mA	Dewpoint °C 4 mA	Dewpoint °C 20 mA	Dewpoint °F 4 mA	Dewpoint °F 20 mA	g/m^3 4 mA	g/m^3 20 mA	g/kg 4 mA	g/kg 20 mA
	V2										
Constant; Loop Hardware Calibration	**V3**	Pressure Constant in mmHg								Loop 1 D/A Calibration Low	Loop 1 D/A Calibration High
Temperature Unit; Loop 1 Hardware Calibration	**V4**	Display Temperature Value	Select Unit of Temperature 0 = °C; 1 = °F				Temperature 4 mA	Temperature 20 mA	Loop 2 at Fault 0= -10%, 1=110%, 2=Hold	Loop 2 Raw Reading	
	V5										
RH Calibration	**V6**								Enable Calibration; enter digit other than 0	Enter Low RH [%]	Enter High RH [%]
Loop 2 Hardware Calibration	**V7**									Loop 2 D/A Calibration Low	Loop 2 D/A Calibration High
Access Key	**V8**										Input Locking 50 = Unlock
Misc. Setup	**V9**	Display Present Error	Previous Error	Unit ID	Software Version		Reset To Defaults 50 = Reset				System Reset 50 = Reset

Matrix *)	Moisture Unit
0	% RH
1	Td °C
2	Td °F
3	g/m3
4	g/kg

Fig. 20

Movement through the matrix is accomplished by using the "V" and "H" buttons to move to another row or column. For example, beginning at VH 00 and successively pressing "V", leads the user to VH 10, VH 20, VH 30, VH 40, VH 50, VH 60, VH 70, VH 80, VH 90 and back to VH 00. At any location where a value may be changed by the user, the desired value is programmed using the "+" and "-" buttons.

6.3 Special Functions of the Push buttons

1. Reset to "Normal" Display: Pressing the 'V' and “H” buttons simultaneously returns the user to VH 00 (normal display).
2. Display Only: Note that eight (8) matrix locations me for display only and may not be changed by the user (refer to Figure 20 or Appendix). The 'display only' fields are as follows:

   VH 00 = normal display (in dewpoint %RH, mixing ratio or absolute humidity as selected in VH 01)

   VH 08 = indicates digitized moisture signal

   VH 40 = display of temperature

   VH 48 = indicates digitized temperature signal

   VH 90 = during a system alarm, displays the error code for the fault encountered

   VH 91 = during normal operation, the previous error code is displayed for reference

   VH 92 = displays the factory issued identification number

   VH 93 = displays the factory issued reference number designating the device type and software version

3. Default Values
   A default value is assigned to each programmable matrix field. The values are present after a reset to factory programmed data has been executed (see VH 95).

6.4 Functions of the Matrix (Refer to Figure 20 or Appendix

This section describes the functions available to the user through the matrix. grouped by common function areas. The function is accessed by positioning to the specified location within the matrix

SYSTEM ADMINISTRATION FUNCTIONS

1. Unlocking/Locking the Matrix

Location in Matrix	Description of Function
VH 89	This location allows the user to lock and unlock the matrix input functions. When the matrix is locked, “V” and “H” keys are still functional but the “+" and “-“ keys are disabled. This prevents unauthorized modification of any of the user input functions, such as output ranging or unit selection. Entering the value “50" in this location unlocks the matrix. Any other value locks the matrix. Default: 0

2. System Reset

Location in Matrix	Description of Function
VH 99	This location allows the user to a reset of the system electronics, similar to removing and re-applying power to the instrument. No system parameter settings are modified. Entering the value “50” in this location initiates the reset, and after approximately five (5) seconds the reset is executed. After the reset, normal operation is resumed at location VH 00.

3. Transmitter Identification

Location in Matrix	Description of Function
VH 92	This location displays the identification number of the transmitter. The display should read “200”

4. Software Version

Location in Matrix	Description of Function
VH 93	This location displays the version number (3.00) of the instrument software

5. Two Point Calibration Using Any Low and High RH Value

Location in Matrix	Description of Function
VH 67	In this field, the calibration using VH 68 and VH 69 is enabled entering a digit other than “0” NOTE: Follow the steps described in Chapter 5.0. Enter “11.3” % in VH 68 and “75.4” in VH 69. If a different moisture source is being used, for example, from a variable moisture generator or other saturated salt solutions, any low value can be entered in VH 68 and any high value in VH 69. Ensure that there is at least a delta of 20% between the high and low value. NOTE: The hardware buttons on the printed circuit board are still active, performing a 11.3 and 75.4 calibration. As described in Chapter 5.0, field VH 68 would reset to 11.3% and field VH 69 to 75.4%.

6. Low RH Point Calibration

Location in Matrix	Description of Function
VH 68	Enter the low RH value in % when reading is stable. VH 67 has to be other than “0". Ensure that there is at least a delta of 20% between the high and low value.

7. High RH Point Calibration

Location in Matrix	Description of Function
VH 69	Enter the high RH value in % when reading is stable. VH 67 has to be other than "0". Ensure that there is at least a delta of 20% between the high and low value.

MOISTURE MEASUREMENT FUNCTIONS

8. Display Present Process Value

Location in Matrix	Description of Function
VH 00	This location displays the present process humidity value measured by the instrument. The unit of measure for the displayed value (i.e., % RH, dewpoint or unit selected under VH 01) is selected in position VH 01. The bar graph beneath the numeric display represents the position of the present value within the range programmed for the selected unit of measure.

9. Select Unit of Measure for Display

Location in Matrix	Description of Function
VH 01	This location selects the unit of measure to be used for the humidity value display when the active matrix location is The possible selections are as follows: 0 = %relative humidity 1 = oC dewpoint 2 = oF dewpoint 3 = grams/m3 4 = grams/kg dry air Default: 0

10. Loop #1 at Fault

Location in Matrix	Description of Function
VH 07	This location specifies the state of current output # 1 corresponding to the detection of a fault with either the humidity sensor or the measurement circuitry The possible selections are 0 = -10% (3.6 mA) 1 = 110% (22 mA) 2 = Hold at previous level Default: 1

11. Displaying the Moisture Frequency

Location in Matrix	Description of Function
VH 08	When this location is selected, the A/D counts from the moisture measurement circuit are displayed.

SETTING THE OUTPUT RANGES FOR THE HUMIDITY 4-20 mA OUTPUT

12. Range of Humidity Values

Assign any value to 4 and 20 mA to establish desired output range.

Location in Matrix	Description of Function	Default values
VH 10	% RH 4 mA	0
VH 11	% RH 20 mA	100
VH 12	oC dewpoint 4 mA	-15
VH 13	oC dewpoint 20 mA	+85
VH 14	oF dewpoint 4 mA	5
VH 15	oF dewpoint 20 mA	185
VH 16	grams/m3 4 mA	1
VH 17	grams/m3 20 mA	350
VH 18	grams/kg dry air 4 mA	1
VH 19	grams/kg dry air 20 mA	830

13. Pressure Constant Adjustment

Location in Matrix	Description of Function
VH 30	This location allows the user to enter a value for the process pressure. The value is entered in mmHg. This value is only used for the calculation of the unit grams/kg dry air. Default: 760

14. Calibrating the Current Output

Location in Matrix	Description of Function
VH 38 VH 39	These locations are used to calibrate the 4 mA and 20 mA settings of the humidity output current loop. This output comes calibrated from the factory and should not normally need adjustment. To check the setting, connect a current meter in series with the power terminals for loop #1 (see section 3). Move to Matrix location VH 38. The output will automatically change to the 4 mA setting. Adjust as necessary using the "+" and "-" keys. Move to location VH 39. The output will automatically change to the 20 mA setting. Again, adjust as necessary. Move to any other matrix location to return the output to normal operation. NOTE: If the matrix input is locked (VH 89), the calibration values are displayed but the current output is unaffected.

TEMPERATURE MEASUREMENT FUNCTIONS

15. Displaying the Measured Temperature

Location in Matrix	Description of Function
VH 40	Selecting this location displays the present process temperature. The unit of measure (oC/oF) is the unit selected in location VH41 (see table below). The bar grah displays the percentage of output for the programmed output range.

16. Selecting the Temperature Unit

Location in Matrix	Description of Function
VH 41	This location allows the user to select either oC or oF as the temperature measurement unit to be displayed in location VH 40. Setting this location to "0" selects oC, and setting to "1" selects oF. Default: 0

17. Setting the Temperature Output Range

Location in Matrix	Description of Function
VH 45 VH 46	These locations specify the range of temperatures corresponding to the 4 mA to 20 mA range of current output #2. The range of values for both locations is between "-15" and "+85". The output range is always specified in oC, regardless of the display units selected.

18. Loop #2 at Fault

Location in Matrix	Description of Function
VH 47	This location specifies the condition for current output #2 when a fault is detected in the temperature measurement circuitry. The possible selections are: 0 = -10% (3.6 mA) 1 = 110% (22 mA) 2 = Hold at previous level Default: 1

19. Calibrating the Current Output

Location in Matrix	Description of Function
VH 78 VH 79	These locations are used to calibrate the 4 mA and 20 mA settings of the temperature output current loop. This output comes calibrated from the factory and should not normally need adjustment. To check the setting, connect a current meter in series with the power terminals for loop #2 (see section 3). Move to Matrix location VH 78. The output will automatically change to the 4 mA setting. Adjust as necessary using the "+" and "-" keys. Move to location VH 79. The output will automatically change to the 20 mA setting. Again, adjust as necessary. Move to any other matrix location to return the output to normal operation. NOTE: If the matrix input is locked (VH 89), the calibration values are displayed but the current output is unaffected.

ERROR CODES

20. Display the Present Error Code

Location in Matrix	Description of Function
	This field displays a number associated with an error code. If no error condition exists, the location displays "0". During normal operation, it is possible for the RH channel to be in error, yet have a temperature channel read correctly. It is also possible for the temperature to be in error, but have the RH read correctly. If a moisture unit is selected that needs both RH and temperature (such as dewpoint) in order to be properly calculated, the error conditions for RH <0% and RH >100% will be set. Follow the instructions on pages 24 – 25 to properly detect the correct error code.

Directions for Detecting the Correct Error Code

STEP 1: Take the error code displayed at the matrix location VH 90 and divide it by 16. The digit(s) before the decimal point represent the error code associated with the temperature channel.

Temperature Error	
Bit: 0010 xxxx	Temperature < - 15 C Temperature > + 40 C Output on CH.2 less than 4 mA. Output on CH.2 greater than 20 mA.

STEP 2: To calculate the moisture error code, take the remainder of the previous division (the digit(s) after the decimal point) and multiply it by 16.

Moisture Error	
Bit: 0111 xxxx	RH < 0 % RH > 100% Output on CH. 1 less than 4 mA Output on CH. 1 greater than 20 mA

STEP 3: Use the "Error Code Conversion Table" in step 3 below to convert both numbers into their respective bit codes.

NOTE: Every "1"corresponds to an error. See the example at the bottom of the 'Error Code Conversion Chart" for help when calculating. Please refer to 'Troubleshooting" Chapter 7.0, page 27, for further information.

Error Code Conversion Chart

0	**0000**
1	**0001**
2	**0010**
3	**0011**
4	**0100**
5	**0101**
6	**0110**
7	**0111**
8	**1000**
9	**1001**
10	**1010**
11	**1011**
12	**1100**
13	**1101**
14	**1110**
15	**1111**

EXAMPLE1:

Error Code: 1

STEP 1: 1 / 16 = **0.0625** No temperature error

STEP 2: 0.0625 x 16 = **1** Moisture error code = **1**

STEP 3: Error Code Bit Map **(0) (1)**
0000 0001

+ >> RH < 0% (gas too dry)

EXAMPLE 2:

Error Code: 39

STEP 1: 39 / 16 = **2.4375** Temperature error code = **2**

STEP 2: 0.4375 x 16 = **7** Moisture error code = **7**

STEP 3:
Error Code Bit Map **(2) (7)**
0010 0111

++ >> Moisture unit selected depends on temperature

+ >> Output 1 < 4mA
+ >> Temperature > + 85 oC

7.0 Troubleshooting

7.1 General Problems

1. The loop current is outside the range of 4-20 mA, as shown on display or current meter.

   A. If the unit of measure is RH

   NOTE: 0% and 100% relative humidity are absolute limits. A defective sensor or a malfunction of the sensor electronics could generate sensor signal values which are out of the 0% to 100% range. If above 100% or below 0%, the current will go to the fault current specified on the order or in the matrix field VH 07.

   SOLUTION: Expose the sensor to ambient air which normally possesses a relative humidity well away from 0% and 100% (i.e. between 10% and 90%). If the current comes back into the 4 to 20 mA range, check the calibration (i.e. with salt solutions). If the current remains in error mode consult the factory.

   B. If the unit of measure is dewpoint:

   SOLUTION: The process dewpoint is out of range. If the dewpoint is above +85 oC (+ 185 oF), the current will go to the fault current specified on the order or in the matrix field VH 07. Apply dry air for a few minutes. If the dewpoint doesn't decrease, consult factory.

   SOLUTION: If the dewpoint is below -15 oC (+5 oF), the current will go to the fault current specified on the order or in the matrix field VH 07. Move the sensor into a wetter environment for a few minutes. If the dewpoint doesn't increase. the cause may be a defective sensor assembly or an electronics malfunction. Consult factory.

   The same approach is valid for the other available units of measure and for the second loop (temperature).

2. There is no current.

   SOLUTION: Check voltage and polarity across +/- terminals with a DC voltmeter If the voltage is within 12-32 V DC, consult the factory.

3. The response time is very slow.

   SOLUTION: Remove protective filter cap by turning it counter-clockwise and clean it with air flow or solvent. If the sensor filter is contaminated, clean with a brush using hot water.

4. The current output is frozen.

   SOLUTION: Check S3, which should be in position 0, 1, 2, 3, 8 or 9.

8.0 Technical Specifications

Sensing element: Silicon-based polymer, capacitance principle, IC electronics

Dewpoint range: -15 oC to + 85 oC (+5 oF to +185 oF)

RH range: 0-100%

RH accuracy: app. 2%

Absolute humidity range: 1 to 350 g/m3

Mixing ratio range: 1 to 830 g/kg

Temperature range: - 15 oC to + 85 oC (+5 oF to +185 oF); signal available with second loop

Repeatability: app. 1 oC (app. 2 oF)

Standard operating temperature: -15 oC to +85 oC (+5oF to +185oF)

Maximum operating pressure: 17 bar (250 psig)

Outputs: Loop current 4 to 20 mA; 16 mA resolution

Electronics: Microprocessor controlled

EM I/RFI Protection: Meets 1 EC 801 -1 through 6

Moisture unit: Dew point temperature in oC or oF, RH%, absolute humidity, or mixing ratio hardware selectable

Supply power: 24 V DC nominal, range 12 to 32 V DC

Protection: IP 66

Weight: 2 kg (4.4 lbs.)

9.0 Accessories

9.1 Available Accessories

Accessory Description

Single power supply

Panel mount display, power supply, no relays

Panel mount display, power supply, two alarms

Panel mount display, power supply, two alarms. 4 to 20 repeating output

Consult GE General Eastern

Example **Example**

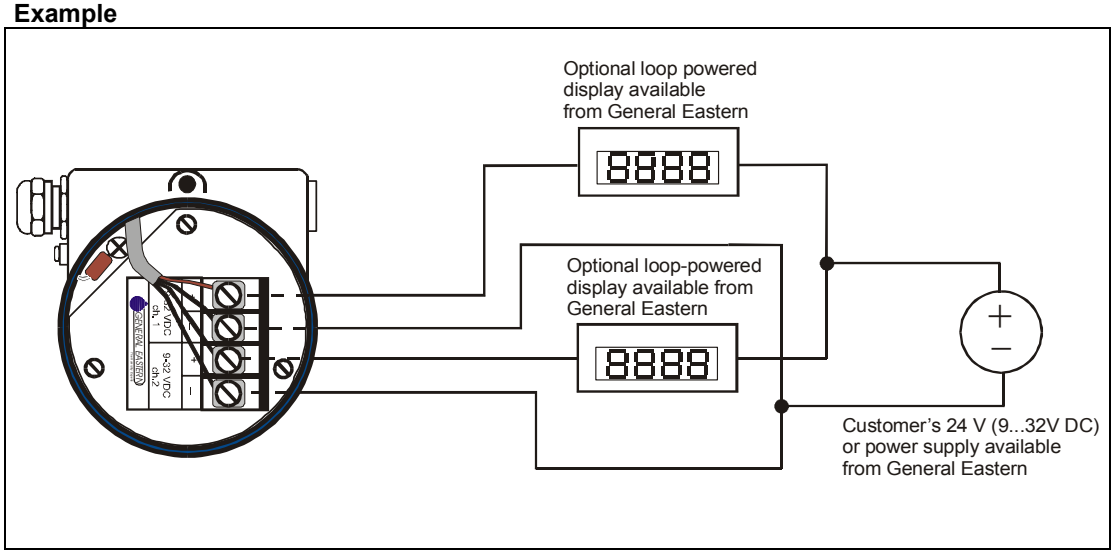


Fig. 22

APPENDIX

MMR31		H0	H1	H2	H3	H4	H5	H6	H7	H8	H9
Moisture Unit	**V0**	Display Moisture Value	Select Moisture Unit *)						Loop 1 at Fault 0= -10%, 1=110%, 2=Hold	Loop 1 Raw Reading	
Loop Range	**V1**	% RH 4 mA	% RH 20 mA	Dewpoint °C 4 mA	Dewpoint °C 20 mA	Dewpoint °F 4 mA	Dewpoint °F 20 mA	g/m^3 4 mA	g/m^3 20 mA	g/kg 4 mA	g/kg 20 mA
	V2										
Constant; Loop Hardware Calibration	**V3**	Pressure Constant in mmHg								Loop 1 D/A Calibration Low	Loop 1 D/A Calibration High
Temperature Unit; Loop 1 Hardware Calibration	**V4**	Display Temperature Value	Select Unit of Temperature 0 = °C; 1 = °F				Temperature 4 mA	Temperature 20 mA	Loop 2 at Fault 0= -10%, 1=110%, 2=Hold	Loop 2 Raw Reading	
	V5										
RH Calibration	**V6**								Enable Calibration; enter digit other than 0	Enter Low RH [%]	Enter High RH [%]
Loop 2 Hardware Calibration	**V7**									Loop 2 D/A Calibration Low	Loop 2 D/A Calibration High
Access Key	**V8**										Input Locking 50 = Unlock
Misc. Setup	**V9**	Display Present Error	Previous Error	Unit ID	Software Version		Reset To Defaults 50 = Reset				System Reset 50 = Reset

Matrix *)	Moisture Unit
0	% RH
1	Td °C
2	Td °F
3	g/m3
4	g/kg