5-Digit Advanced Universal Process Indicator

UPI-5D Plus

Support for RTD Pt1000, E Type Thermocouple &
Bipolar Signals (±10 V, ±20 mA, ±80 mV, ±160 mV)
Higher Resolution (18 Bit) for DC mA/V Analog Inputs
1/8 DIN (48x96) Size

Process Precision Instruments
Vasai Road (E), Dist. Palghar - 401210,
Maharashtra, India

www.ppiindia.net

User Manual

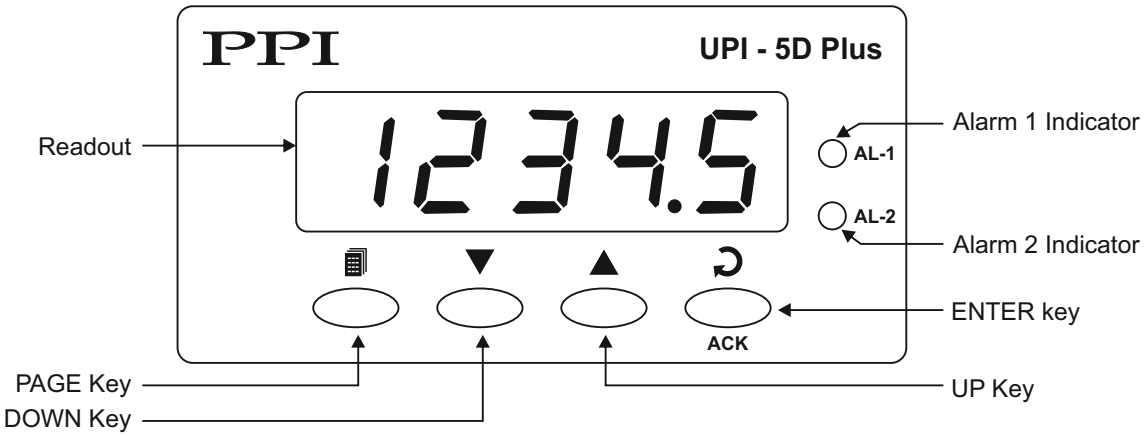
CONTENTS

Section 1

FRONT PANEL LAYOUT

The indicator front panel comprises of digital readouts, LED indicators and tactile keys as shown in Figure 1.1 below.

Figure 1.1



READOUTS

The Readout is a 5 digit, 7-segment bright red LED display and usually displays the PV (Process Value). In Set-up Mode, the Readout displays parameter prompts and values/options, alternatively.

INDICATORS

The front panel comprises 2 LED indicators that show Alarm status. Refer Table 1.1 below for details.

Table 1.1

LED	Status
AL1	Flashes while Alarm-1 is active.
AL2	Flashes while Alarm-2 is active.

KEYS

There are four tactile keys provided on the front panel for configuring the indicator, setting-up the parameter values. Refer Table 1.2 below.

Table 1.2

Symbol	Key	Function
	PAGE	Press to enter / exit Set-up mode.
	DOWN	Press to decrease the parameter value. Pressing once decreases the value by one count; holding the key pressed speeds up the change.
	UP	Press to increase the parameter value. Pressing once increases the value by one count; holding the key pressed speeds up the change.
ACK 	ENTER	If Readout is showing Parameter Name in the setup mode then upon pressing this key the Readout shows the value for the parameter. If Readout is showing Parameter Value in the setup mode then upon pressing this key the set parameter value is stored and the Readout shows the next Parameter Name. **Note** : While in Main mode, this key can be used to acknowledge any pending Alarm(s) to de-activate alarm relay(s).

Section 2

BASIC OPERATION

POWER UP

Upon switching on the power to the indicator, all displays are lit on for approximately 3 seconds. This is followed by the indication of the model name UP 15 and Version Number 02.10 for 1 second each.

MAIN DISPLAY

After the Power-up display sequence, the Indicator enters MAIN Display Mode. The Readout shows the measured PV (Process Value). For Flow Measurement function using Square-Root Extraction feature, refer to Appendix-C.

PV Error Indications

The process value is said to be in error if it exceeds the minimum / maximum range specified for the selected Input sensor type or if the sensor is disconnected (Open or Broken).The PV Error type, as shown in Table 2.1, is flashed on the Readout.

Table 2.1

Message	Error Type	Cause
Or	Over-range	PV above Max. Range
Ur	Under-range	PV below Min. Range
OPEn	Sensor Open	Thermocouple / RTD broken

ALARM STATUS UNDER PV ERROR CONDITIONS

For Alarm activation, the under-range condition is treated as minimum PV, whereas the over-range and open conditions are treated as maximum PV. Thus, Process High alarm activates under *Over-range / Open error*. Similarly, Process Low alarm activates under *Under-range error*.

Alarm Acknowledgment

While in Main mode, press ENTER Key to acknowledge any pending Alarm(s) to de-activate alarm relay(s).

OPERATOR PAGE AND PARAMETERS

The parameters that require frequent settings are organized on a separate page, called the Operator Page. The availability of operator parameters is controlled at supervisory level and the parameter setting cannot be locked by the Master Lock.

Accessing Operator Page & Adjusting Parameters

Step through the following sequence to open the operator page and to adjust the operator parameter values.

1. Press and release PAGE key. The Readout shows **PAGE**. Press and release ENTER key, the Readout shows page number **0.**
2. Press and release ENTER key. The Readout shows prompt for the first available operator parameter. Press and release ENTER key again. The Readout shows value for the first parameter.
3. Use UP / DOWN keys to adjust the value and then press ENTER key to store the set value and scroll to the next parameter.

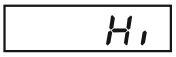
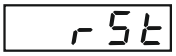
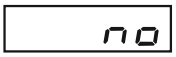
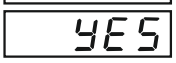
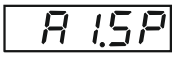
The indicator cycles through parameters; after the last operator parameter, it loops back to the first. Press PAGE to return to the MAIN Display Mode.

The operator parameters are described in Table 2.2. Note that the parameters presented on Operator Page depend upon the functions selected/enabled and supervisory level permissions. The operator parameter list mainly includes :

a) Min / Max Process Monitoring Parameters.

b) Setpoint Values for Alarm-1 and Alarm-2.

Table 2.2

Parameter Description	Settings (Default Value)
MAXIMUM PV  This indicates the highest value attained by the Process Value. This is a read only value and is available only if Min/Max monitoring is enabled.	View Only (Default :NA)
MINIMUM PV  This indicates the lowest value attained by the Process Value. This is a read only value and is available only if Min/Max monitoring is enabled.	View Only (Default :NA)
RESET COMMAND  Available only if Min/Max monitoring is enabled. This feature clears the current Min/Max values and starts afresh monitoring the **PV** for new highest and lowest values.	 No  Yes (Default :No)
RESET PASSWORD  For resetting the Min/Max values, set the reset command to 'Yes' and then enter the correct password.	0 to 250 (Default :0)
ALARM-1 SETPOINT  The setpoint for Alarm-1. This parameter is not available if the selected Alarm-1 type is 'None'.	Min to max Range specified for the selected Input Type (Default : Min or Max Range)
ALARM-2 SETPOINT  The setpoint for Alarm-2. This parameter is not available if the selected Alarm-2 type is 'None'.	Min to max Range specified for the selected Input Type (Default : Min or Max Range)

Section 3

SET-UP MODE : ACCESS AND OPERATION

The Indicator requires various user settings that determine how the indicator will function or operate. These settings are called Parameters.

For the convenience and ease of operation, the various parameters have been grouped separately depending upon the functions they define. Each such group is called a PAGE. Each PAGE is assigned a unique number, called PAGE NUMBER, for its access. The parameters contained in a PAGE are presented in a fixed sequence to the user for setting. The user can access a desired PAGE by entering its PAGE NUMBER and can select and set the desired parameter values.

PARAMETER NAMES

Each parameter has an identifying tag, called the Parameter Name. While setting parameter values in a PAGE, the Parameter Name precedes the Parameter Value.

While the readout shows Parameter Name, the UP / DOWN keys are non-functional. Upon pressing the ENTER key the readout shows the Parameter Value that can be adjusted using UP / DOWN keys.

ACCESSING A PAGE & ADJUSTING PARAMETER VALUES

Each PAGE is accessible only from the MAIN Display Mode. That is, from the current PAGE, the user must return to the MAIN Display Mode before the other PAGE can be accessed.

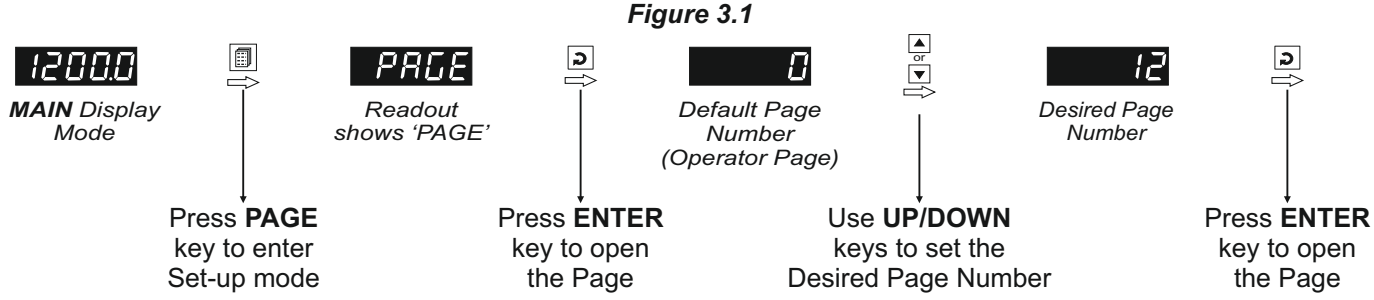
Step through the following sequence to open a desired PAGE and to adjust the parameter values.

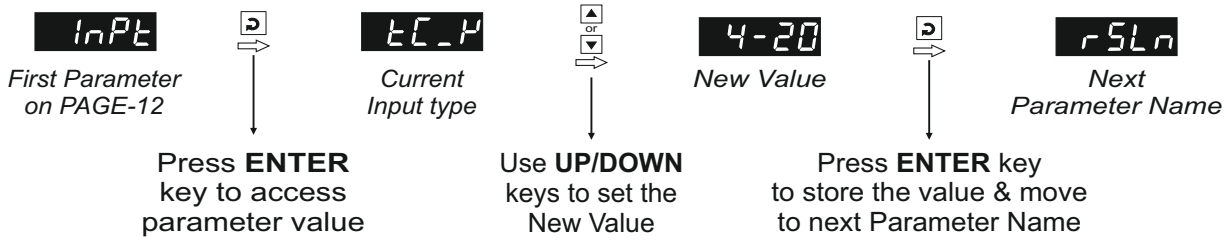
1. Press and release PAGE key. The Readout shows **PAGE**.
2. Press and release ENTER key. The Readout shows **0**, the default page value.
3. Use UP/DOWN keys to set the desired PAGE NUMBER.
4. Press and release ENTER key. The Readout shows Name for the first available parameter under the selected page number.
5. Press and release ENTER key. The Readout shows value for the first parameter.
6. Go to step 8 if the value for first parameter is to be edited.
7. Press & release Enter Key until the readout shows the name for the desired parameter.
8. Use UP / DOWN keys to adjust the value and then press ENTER key to store the set value and scroll to the next parameter.
9. Go to step 7.

The indicator cycles through parameters; after the last parameter, it loops back to the first. Press PAGE to return to the MAIN Display Mode.

Figure 3.1 illustrates the example of altering the value for the parameter 'Input Type' from Type K Thermocouple to 4-20 mA .

Figure 3.1





Notes

1. *Each page contains a fixed list of parameters that are presented in a pre-determined sequence. Note however that availability of a few parameters, called Conditional Parameters, depend upon the settings for some other parameters. For example, the parameter 'Alarm Setpoint' is* ***not available*** *if the corresponding 'Alarm type' is set to '****none****'.*
2. *To exit the set-up mode and return to the MAIN Display Mode, press and release PAGE key.*
3. *If no key is pressed for approximately 30 seconds, the set-up mode times out and the indicator reverts to the MAIN Display Mode.*

MASTER LOCKING

The indicator facilitates locking all the PAGES (except Operator PAGE) by applying Master Lock Code. Under Locking, the parameters are available for *view only* and cannot be adjusted. The Master Lock, however, does not lock the operator parameters. This feature allows protecting the rather less frequently used parameters against any inadvertent changes while making the frequently used operator parameters still available for any editing.

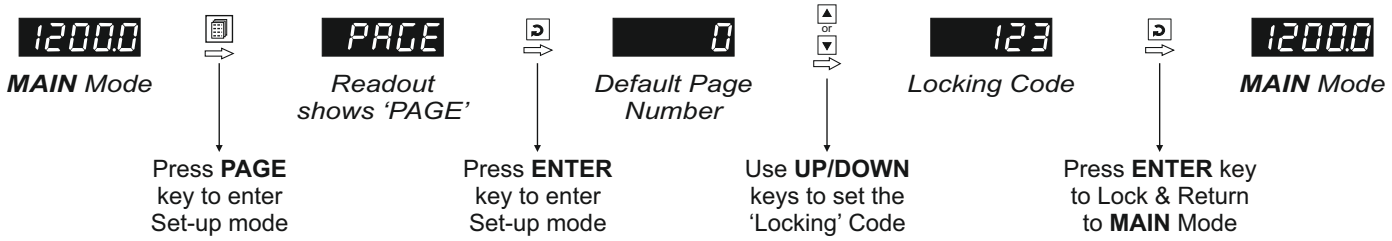
For enabling / disabling the Lock, step through the following sequence:

Locking

1. Press and release PAGE key while the indicator is in the MAIN Display Mode. The Readout shows **PAGE**.
2. Press and release ENTER key the Readout shows page number **0**
3. Use UP / DOWN keys to set the Page Number to 123 on the Readout.
4. Press and release ENTER key. The indicator returns to the MAIN Display Mode with the Lock enabled.

The Figure 3.2 below illustrates the Locking procedure.

Figure 3.2



UnLocking

Repeat the Locking procedure twice for unlocking.

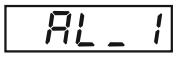
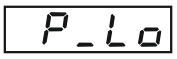
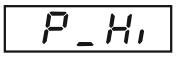
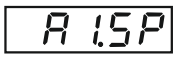
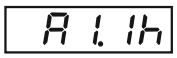
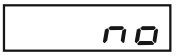
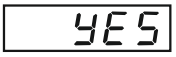
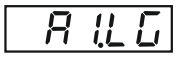
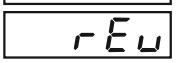
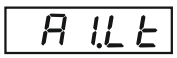
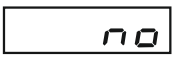
Section 4

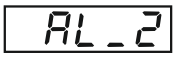
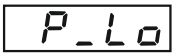
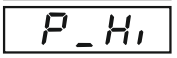
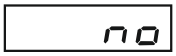
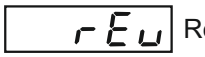
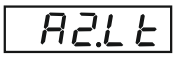
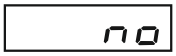
ALARM PARAMETERS : PAGE-10

Visit www.ppiindia.net for technical notes on ALARM for detailed understanding of the parameters / terminologies used for describing the Alarm parameters in this section.

The parameters required for configuring Alarms are grouped on PAGE-10. The configuration includes selecting the type of Alarm, setting the hysteresis value, enabling/disabling start-up Alarm suppression, etc. Refer Table 4.1 for parameter description & settings.

Table:4.1

Parameter Description	Settings (Default Value)
ALARM-1 TYPE  Select the Alarm-1 activation type. Selecting 'None' will disable the alarm and suppress all the related parameters for Alarm-1.	 None  Process Low  Process High (Default : None)
ALARM-1 SETPOINT  Sets the Process High or Process Low limit for Alarm-1.	Min. to Max. Range specified for the selected Input Type (Default : Min or Max Range)
ALARM-1 HYSTERESIS  Sets differential (dead) band between Alarm-1 ON and OFF states.	***For DC Lin. millivolts*** 1 to 30000 Counts ***For DC Lin. Volts/Current*** 1 to 99999 Counts ***For Thermocouple/RTD*** 1 to 1999 or 0.1 to 1999.9 (Default : 2.0)
ALARM-1 INHIBIT  Set to Yes to suppress Alarm-1 activation upon power-up (process start-up) condition.	 No  Yes (Default :No)
ALARM-1 LOGIC  Select 'Normal' if Alarm-1 relay is to activate an Audio / Visual alarm. Select 'Reverse' for Tripping (cut-off) the system.	 Normal  Reverse (Default : Normal)
ALARM-1 LATCH  No The Relay switches ON/OFF with Alarm switching. Yes The Relay Output switches (ON for Normal Logic / OFF for Reverse Logic) upon Alarm activation. However, Alarm de-activation does not affect the Relay status. The Relay status can only be regained by pressing 'Acknowledge-key' provided the Alarm has de-activated.	 No  Yes (Default :No)

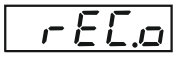
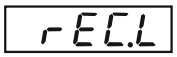
Parameter Description	Settings (Default Value)
ALARM-2 TYPE  Select the Alarm-2 activation type. Selecting 'None' will disable the alarm and suppress all the related parameters for Alarm-2.	 None  Process Low  Process High (Default : None)
ALARM-2 SETPOINT  Sets the Process High or Process Low limit for Alarm-2.	Min. to Max. Range specified for the selected Input Type (Default : Min/Max Range)
ALARM-2 HYSTERESIS  Sets differential (dead) band between Alarm-2 ON and OFF states.	***For DC Lin. millivolts*** 1 to 30000 Counts ***For DC Lin. Volts/Current*** 1 to 99999 Counts ***For Thermocouple/RTD*** 1 to 1999 or 0.1 to 1999.9 (Default : 2.0)
ALARM-2 INHIBIT  Set to Yes to suppress Alarm-2 activation upon power-up (process start-up) condition.	 No  Yes (Default :No)
ALARM-2 LOGIC  Select 'Normal' if Alarm-2 relay is to activate an Audio / Visual alarm. Select 'Reverse' for tripping (cut-off) the system.	 Normal  Reverse (Default : Normal)
ALARM-2 LATCH  *No* The Relay switches ON/OFF with Alarm switching. *Yes* The Relay Output switches (ON for Normal Logic / OFF for Reverse Logic) upon Alarm activation. However, Alarm de-activation does not affect the Relay status. The Relay status can only be regained by pressing 'Acknowledge-key' provided the Alarm has de-activated.	 No  Yes (Default :No)

Section 5

RETRANSMISSION PARAMETERS : PAGE-11

The parameters required for configuring *Retransmission* are grouped on PAGE-11. The configuration includes selecting the Output type, Recorder Low & High settings etc. Refer Table 5.1 for parameter description & settings.

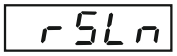
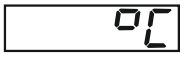
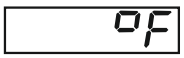
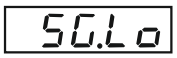
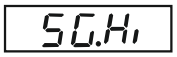
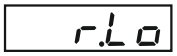
Table 5.1

Parameter Description	Settings (Default Value)
RETRANSMISSION (RECORDER) OUTPUT TYPE  Select Output Signal type in accordance with the hardware module fitted. Select 0-20 or 4-20 mA, if Current output module is fitted. Select 0-5 or 0-10 V, if Voltage output module is fitted.	 (Default : 0 to 20 mA)
RETRANSMISSION (RECORDER) LOW  Set the minimum Process Value (**PV**) that shall correspond to the minimum recorder output signal level (0mA or 4mA or 0V).	Min. to Max. Range specified for the selected Input Type (Default : -200.0)
RETRANSMISSION (RECORDER) HIGH  Set the maximum Process Value (**PV**) that shall correspond to the maximum recorder output signal level (20 mA or 10 V or 5 V).	Min. to Max. Range specified for the selected Input Type (Default : 1376.0)

Section 6

INPUT CONFIGURATION PARAMETERS : PAGE-12

Table 6.1

Parameter Description	Settings (Default Value)
INPUT TYPE  Select Input type in accordance with the type of Thermocouple or RTD sensor or transducer output connected for process value measurement.	Refer Table 6.2 (Default : Type K)
RESOLUTION  Set the process value indication resolution (decimal point). All the resolution based parameters (hysteresis, alarm setpoints etc.) then follow this resolution setting.	Refer Table 6.2 (Default : 1°C)
UNITS  (**Applicable for Thermocouple & RTD Pt100 Input only**) Select Temperature units in °C or °F.	 °C  °F (Default : °C)
DC SIGNAL LOW  ***(Available for DC Linear Input)*** This parameter is the transmitter output signal value that corresponds to the Range Low process value. Refer *Appendix-B : DC Linear Signal Interface* for details.	<table><tr><th>Input Type</th><th>Settings</th><th>Default</th></tr><tr><td>-20 to 20 mA</td><td>-20.00 to Signal High</td><td>-20.00</td></tr><tr><td>4 to 20 mA</td><td>4.00 to Signal High</td><td>4.00</td></tr><tr><td>-80 to 80 mV</td><td>-80.00 to Signal High</td><td>-80.00</td></tr><tr><td>-160 to 160 mV</td><td>-160.0 to Signal High</td><td>-160.0</td></tr><tr><td>-5 to 5 V</td><td>-5.000 to Signal High</td><td>-5.000</td></tr><tr><td>-10 to 10 V</td><td>-10.00 to Signal High</td><td>-10.00</td></tr><tr><td>1 to 5 V</td><td>1.000 to Signal High</td><td>1.000</td></tr></table>
DC SIGNAL HIGH  ***(Available for DC Linear Input)*** This parameter is the transmitter output signal value that corresponds to the Range High process value. Refer *Appendix-B : DC Linear Signal Interface* for details.	<table><tr><th>Input Type</th><th>Settings</th><th>Default</th></tr><tr><td>-20 to 20 mA</td><td>Signal Low to 20.00</td><td>20.00</td></tr><tr><td>4 to 20 mA</td><td>Signal Low to 20.00</td><td>20.00</td></tr><tr><td>-80 to 80 mV</td><td>Signal Low to 80.00</td><td>80.00</td></tr><tr><td>-160 to 160 mV</td><td>Signal Low to 160.0</td><td>160.0</td></tr><tr><td>-5 to 5 V</td><td>Signal Low to 5.000</td><td>5.000</td></tr><tr><td>-10 to 10 V</td><td>Signal Low to 10.00</td><td>10.00</td></tr><tr><td>1 to 5 V</td><td>Signal Low to 5.000</td><td>5.000</td></tr></table>
DC RANGE LOW  ***(Available for DC Linear Input)*** Sets process value corresponding to minimum DC Linear signal input (e.g., 0V, 0mA, 4mA, etc.). Refer *Appendix-B : DC Linear Signal Interface* for details.	***For DC Lin. mV*** -19999 to 30000 Counts ***For DC Lin. Volts/Current*** -19999 to 99999 Counts (Default : 0)

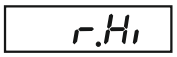
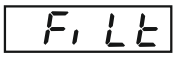
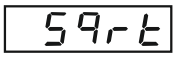
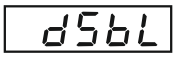
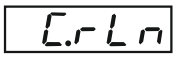
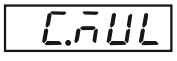
Parameter Description	Settings (Default Value)
DC RANGE HIGH  ***(Available for DC Linear Input)*** Sets process value corresponding to maximum DC Linear signal input (e.g., 5V, 10V, 20mA, etc.). Refer *Appendix-B : DC Linear Signal Interface* for details.	***For DC Lin. mV*** -19999 to 30000 Counts ***For DC Lin. Volts/Current*** -19999 to 99999 Counts (Default : 1000)
ZERO OFFSET  This value is algebraically added to the measured PV to derive the final PV that is displayed and used for Alarm / Retransmission. Final PV = Measured PV + Offset	***For DC Lin. mV*** -19999 to 30000 Counts ***For DC Lin. Volts/Current*** -19999 to 99999 Counts ***For Thermocouple/RTD*** -1999 to 3000 or -1999.9 to 3000.0 (Default : 0)
DIGITAL FILTER  Sets the time constant, in seconds, for the low-pass digital filter applied to the measured PV. The filter helps smoothing / averaging the signal input and removing the undesired noise. The higher the filter value the lower the indication response to the PV changes and vice-a-versa. ***Setting the value to 0.0 disables the filter.***	0.0 to 60.0 Seconds (Default : 2.0 sec.)
Parameters for measuring Flow Rate using Differential Pressure. Refer Appendix-C.	
SQUARE ROOT ENABLE/DISABLE  (**Available for mA/V DC Input Type only**) Set this parameter value to 'Enable' if the *Square Root Extraction* function is required for Flow Rate measurement.	 Disable  Enable (Default : Disable)
CONSTANT MULTIPLIER RESOLUTION  (**Available if Square root is set to 'Enable'**) This parameter sets the decimal position (resolution) for the parameter *Constant Multiplier*.	1 0.1 0.01 0.001 (Default : 1)
CONSTANT MULTIPLIER  (**Available if Square root is set to 'Enable'**) This parameter is multiplied with square root extracted value to derive the flow rate. The resolution for this parameter is set by the parameter *Constant Multiplier resolution*.	1 to 30000 (Default : 1000)

Table 6.2

Option	What it means	Range (Min. to Max.)	Resolution
tC_J	Type J Thermocouple	0.0 to +960.0°C / +32.0 to +1760.0°F	1 °C/°F or 0.1 °C/°F
tC_K	Type K Thermocouple	-200.0 to +1376.0°C / -328.0 to +2508.0°F	
tC_t	Type T Thermocouple	-200.0 to +387.0°C / -328.0 to +728.0°F	
tC_r	Type R Thermocouple	0.0 to +1771.0°C / +32.0 to +3219.0°F	
tC_S	Type S Thermocouple	0.0 to +1768.0°C / +32.0 to +3214.0°F	
tC_b	Type B Thermocouple	0.0 to +1826.0°C / +32.0 to +3318.0°F	
tC_n	Type N Thermocouple	0.0 to +1314.0°C / +32.0 to +2397.0°F	
tC_E	Type E Thermocouple	-200.0 to +1000.0°C / -328.0 to +1832.0°F	
r.100	3-wire, RTD Pt100	-199.9 to +600.0°C / -328.0 to +1112.0°F	
r.1000	3-wire, RTD Pt1000		
20	-20 to 20mA DC current	-19999 to 99999 units	1 0.1 0.01 0.001 units
4-20	4 to 20mA DC current		
0.080	-80 to 80mV DC voltage	-19999 to 30000 units	
0.160	-160 to 160mV DC voltage		
5.0	-5.0 to 5.0V DC voltage	-19999 to 99999 units	
10.0	-10.0 to 10.0V DC voltage		
1-5	1 to 5.0V DC voltage		

Section 7

SUPERVISORY PARAMETERS : PAGE-13

Table 7.1

Parameter Description	Settings (Default Value)
ALARM SP ADJUSTMENT ON OPERATOR PAGE AL.SP Supervisory permission for Alarm setpoint adjustments on Operator Page. Set to 'Enable' for permission.	dSbL Disable EnbL Enable (Default : Disable)
FRONT PANEL ALARM ACKNOWLEDGE FP.ACK This parameter determines whether the front panel ENTER key is used as Alarm Acknowledge.	dSbL Disable EnbL Enable (Default : Enable)
REMOTE ALARM ACKNOWLEDGE rA.ACK This parameter determines whether the rear panel terminals are used as Alarm Acknowledge.	dSbL Disable EnbL Enable (Default : Disable)
RECORDER rEC Supervisory permission for enabling recorder (retransmission) output.	dSbL Disable EnbL Enable (Default : Disable)
PROCESS VALUE HIGH-LOW MONITORING Hi Lo This parameter enables or disables the PV monitoring for Min / Max values. Set to 'Yes' for enabling the feature.	no No YES Yes (Default :No)
PASSWORD FOR RESETTING PV HIGH-LOW CODE This parameter allows protection against inadvertent resetting of Min / Max values. That is, the reset command is executed only if the operator sets the password that matches with this parameter value.	0 to 250 (Default : 0)
BAUD RATE bAUd Communication speed in 'Bits per Second'. Set the value to match with the host baud rate.	4.8 4800 9.6 9600 19.2 19200 (Default : 9.6)

Parameter Description	Settings (Default Value)
PARITY PAr1 One of the communication error trapping features. Select the data packet parity as implemented by the host protocol.	nonE None EuEn Even Odd Odd (Default : Even)
SERIAL ID NUMBER Id Unique numeric code assigned to the indicator for identification by the host. Set the value as required by the host.	1 to 127 (Default : 1)
SERIAL WRITE PERMISSION CoñE Setting to 'No' disallows the host to set / modify any parameter value. The host, however, can read the value.	no No YES Yes (Default :Yes)

Section 8

USER LINEARISATION PARAMETERS : PAGE-33

Visit www.ppiindia.net for technical notes on USER LINEARISATION for detailed understanding of the parameters / terminologies used for describing the parameters in this section.

The parameters listed on this page are used to implement the linearisation curve on the process value represented by the DC linear output of a transmitter. The parameters affect the measured PV only if the 'User Linearisation' feature is 'Enabled' and if the input type is DC Linear. That is, the PV measured using Thermocouple or RTD is not affected by the linearisation parameters. The Table 8.1 below lists the user linearisation parameters.

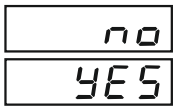
Table 8.1

Parameter Description	Settings (Default Value)
USER LINEARIZATION SETTING CODE [CodE] Protection password for access to the linearisation related parameters. Set to **333** as valid password.	0 to 9999 (Default : 0)
USER LINEARIZATION [U.Lin] Enable / Disable user linearisation feature.	[no] No [YES] Yes (Default :No)
TOTAL BREAK POINTS [PntS] Select number of segments for the purpose of input **PV** curve linearisation by setting the number of total break points.	2 to 32 (Default : 2)
BREAK POINT NUMBER [Co.Or] Select the break point for which the X, Y co-ordinates are to be set.	1 to 32 (Default : 1)
ACTUAL VALUE FOR BREAK POINT (X CO-ORD) [A.Pnt] Set the actual measured (X co-ordinate) value for the selected break point number.	-19999 to 30000 (Default : Undefined)
DERIVED VALUE FOR BREAK POINT (Y CO-ORD) [d.Pnt] Set the computed or derived (Y co-ordinate) value for the selected break point number.	-19999 to 30000 (Default : Undefined)

Section 9

ALARM ACK PARAMETER : PAGE-2

Table 9.1

Parameter Description	Settings (Default Value)
ALARM ACKNOWLEDGE  Set to Yes to acknowledge one or more active alarms. Acknowledging the alarm de-activates (mutes) the associated relay output (buzzer), however, the front panel LED indication is unaffected.	 No Yes (Default :No)

Section 10

MECHANICAL INSTALLATION

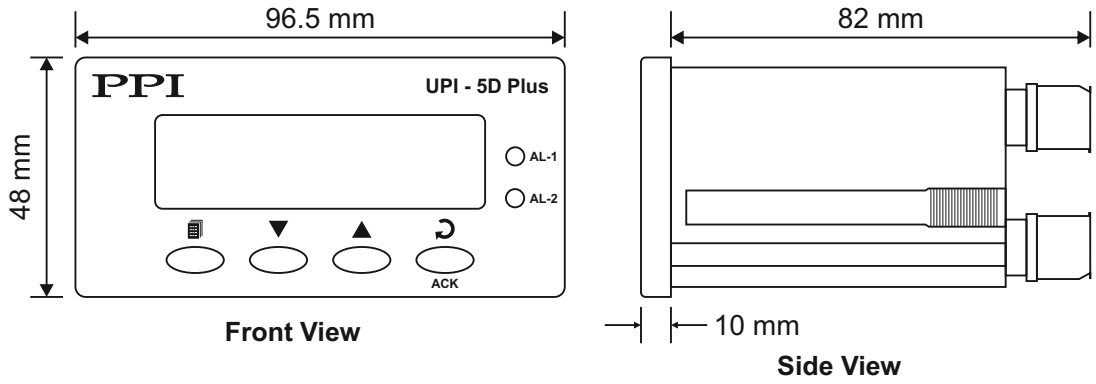
The following precautions should be strictly observed while installing the indicator:

1. The place of installation should be free of corrosive/combustible gases and electrically conductive pollution.
2. Ensure that the place of installation is not subject to rapid ambient changes that can cause condensation. Also the Ambient Temperature and Relative Humidity surrounding the indicator should not exceed the maximum specified for the proper operation of the Indicator.
3. The place of installation should be adequately protected against excessive electrostatic or electromagnetic interference.
4. The Indicator should not be subject to direct vibration or shock.
5. The Indicator should not be exposed to dust, salt air, direct sunlight or radiant heat.

OUTER DIMENSIONS

The Figure 10.1 show the outer dimensions, respectively.

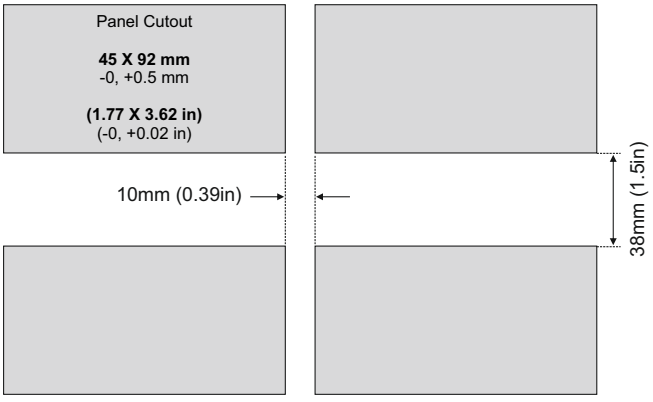
Figure 10.1



PANEL CUTOUT AND RECOMMENDED MINIMUM SPACING

The Figure 10.2 shows panel cutout requirements for a single Indicator and also the minimum spacing recommended if several Indicators are required to be mounted on a single panel.

Figure 10.2

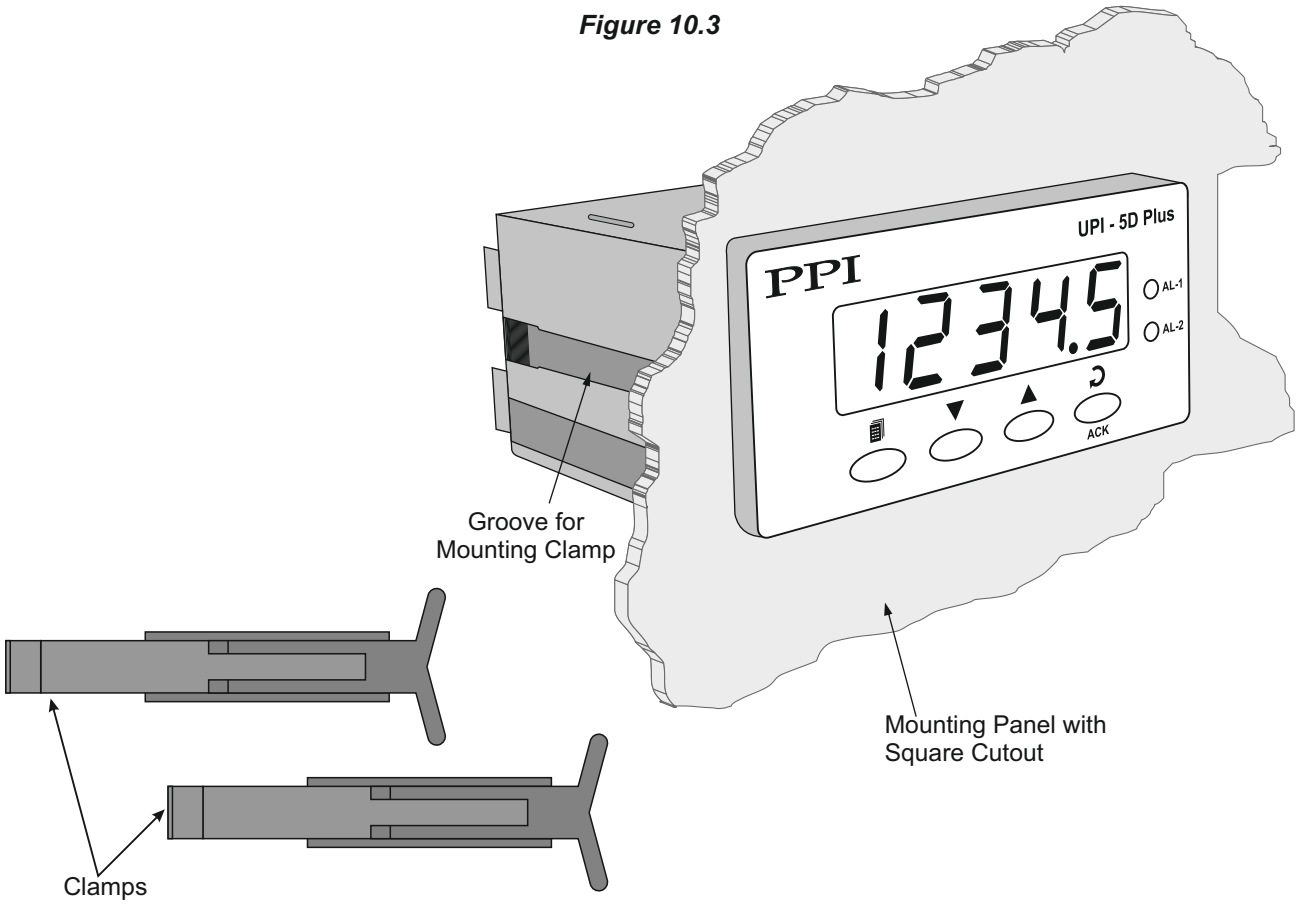


PANEL MOUNTING

Follow the steps below for mounting the Indicator on panel:

1. Prepare a rectangular cutout to the size shown in Figure 10.2.
2. Remove the Panel Mounting Clamp from the Indicator Enclosure.
3. Insert the rear of the Indicator housing through the panel cutout from the front of the mounting panel.
4. Hold the Indicator gently against the mounting panel such that it positions correctly against the panel wall, see Figure 10.3. Apply pressure only on the bezel and not on the front label.
5. Insert the clamps on either side of the enclosure in the grooves provided and slide them forward until this are firmly in contact with the rear face of the mounting panel. Refer Figure 10.3 below.

Figure 10.3



Section 11

ELECTRICAL CONNECTIONS

WARNING
MISHANDLING / NEGLIGENCE CAN RESULT IN PERSONAL DEATH OR SERIOUS INJURY.

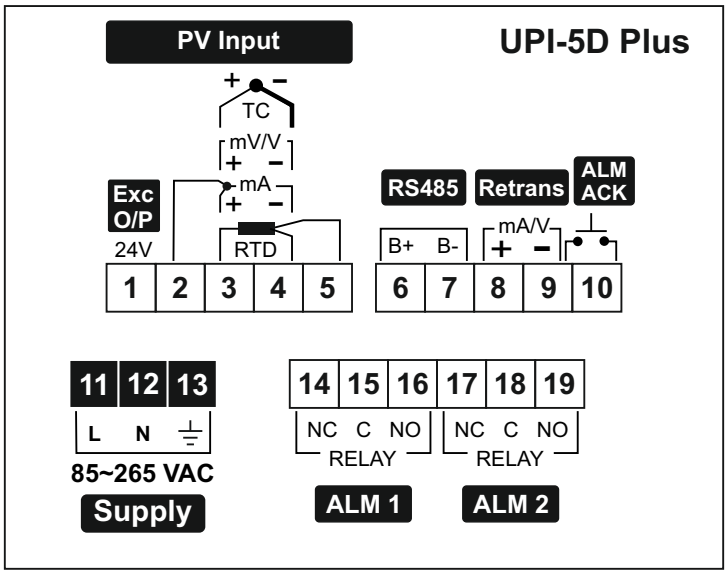
1. The user must rigidly observe the Local Electrical Regulations.
2. Do not make any connections to the unused terminals for making a tie-point for other wires (or for any other reasons) as they may have some internal connections. Failing to observe this may result in permanent damage to the indicator.
3. Run power supply cables separated from the low-level signal cables (like Thermocouple, RTD, DC Linear Current/Voltage, etc.). If the cables are run through conduits, use separate conduits for power supply cable and low-level signal cables.
4. Use appropriate fuses and switches, wherever necessary, for driving the high voltage loads to protect the indicator from any possible damage due to high voltage surges of extended duration or short-circuits on loads.
5. Take care not to over-tighten the terminal screws while making connections.
6. Make sure that the Indicator supply is switched-off while making/removing any connections or removing the Indicator from its enclosure.

CONNECTION DIAGRAM

The Electrical Connection Diagram is shown on the top side of the Indicator enclosure. The diagram shows the terminals viewed from the REAR SIDE with the Indicator label upright. Refer the label provided on the Rear Side for terminal numbers. Note that a few connections are functional / applicable only if the respective plug-in modules are fitted.

The rear panel electrical wiring connection diagram is shown in Figure11.1 below.

Figure 11.1

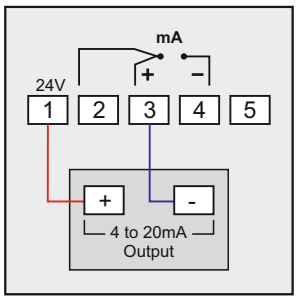


DESCRIPTIONS

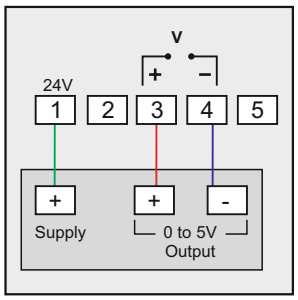
The back panel connections are described as under:

EXC O/P (24 V Excitation Voltage)

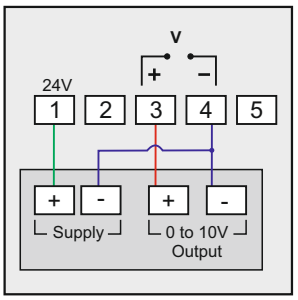
As standard the indicator is supplied with 24 VDC @ 30 mA power source. This is primarily meant for exciting 2-wire or 4-wire current output transmitters. Only Single terminal (1) is provided for 24V DC excitation supply. The following figures illustrate a few connection examples.



2-wire Current Transmitter

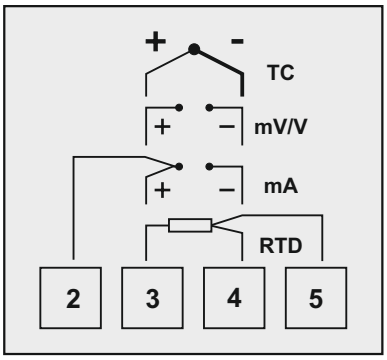


3-wire Voltage Transmitter



4-wire Voltage Transmitter

Figure 11.2



PV INPUT

The Indicator accepts Thermocouples (J, K, T, R, S, B, N, E), 3-wire RTD Pt100 / RTD Pt1000 and DC Linear Current/Voltage (mA/mV/V) as input. Refer Figures 10.2 below.

Thermocouple

Connect Thermocouple Positive (+) to terminal 3 and Negative (-) to terminal 4 as shown in Figure 11.2. Use the correct type of Thermocouple extension lead wires or compensating cable for the entire distance ensuring the correct polarity throughout. Avoid joints in the cable.

RTD Pt100 / RTD Pt1000, 3-wire

Connect single leaded end of RTD bulb to terminal 3 and the double leaded ends to terminal 4 and 5 (interchangeable) as shown in Figure 11.2. Use copper conductor leads of very low resistance ensuring that all 3 leads are of the same gauge and length. Avoid joints in the cable.

DC Linear MilliVolts (mV) / Volts (V)

Use a shielded twisted pair with the shield grounded at the signal source for connecting mV source. Connect signal (+) to terminal 3 & common (-) to terminal 4, as shown in Figure 11.2.

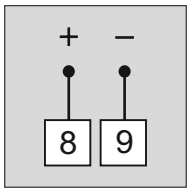
DC Linear Current (mA)

Use a shielded twisted pair with the shield grounded at the signal source for connecting mA source. Connect signal (+) to terminal 3 & common (-) to terminal 4 and also *short terminals 2 & 3*, as shown in Figure 11.2.

RETRANSMISSION OUTPUT

The retransmission output is either DC Current (0/4-20 mA) or DC Voltage (0-5/10 V) depending on the module fitted. The terminal labeled '+' & '-' are the Current/Voltage source output and return, respectively.

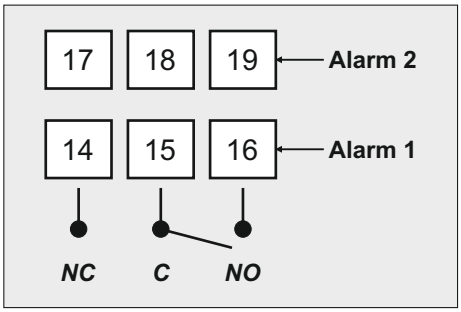
Figure 11.3 : mA / V Output



ALARM-1
ALARM-2

The Alarm-1 & Alarm-2 are available in the form of Relay outputs as standard. The connection descriptions are shown in figures 11.4.

Figure 11.4



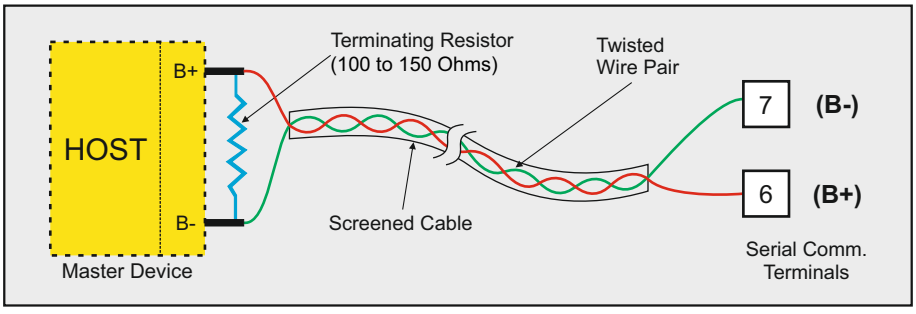
Relay

Potential-free Relay changeover contacts N/O (Normally Open) and C (Common) rated 2A/240 VAC (resistive load) are provided as Relay output. Use external auxiliary device like contactor with appropriate contact rating for driving the actual load.

SERIAL COMMUNICATION PORT

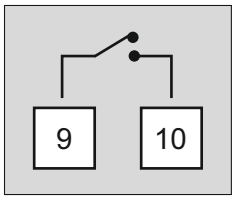
(Applicable if the Option plug-in module for RS485 Serial Port is fitted)

Figure 11.5



If the Optional plug-in communication board is fitted, connect terminals B+ and B- of the Indicator to the respective terminals of the Master device (PC/HMI). For reliable noise free communication, use a pair of twisted wires inside screened cable as shown in Figure 11.5. The wire should have less than 100 ohms/km nominal DC resistance (Typically 24 AWG or thicker). Connect the terminating resistor (Typically 100 to 150 ohm) at one end to improve noise immunity.

Figure 11.6



REMOTE ALARM ACKNOWLEDGMENT INPUTS

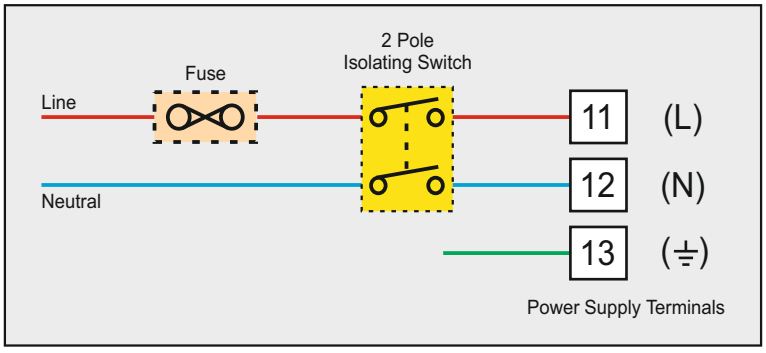
(Applicable if the Option plug-in module for Remote Alarm Acknowledge is fitted).

Use potential-free push button switch with normally Open contacts for the purpose of Alarm Acknowledgment. Connect the switch across the terminals 9 & 10 as shown in figure 11.6.

POWER SUPPLY

Caution The indicator is designed for installation in an enclosure which provides adequate protection against electric shock. Local regulations regarding electrical installation should be rigidly observed. Consideration should be given to prevention of access to the Power Supply terminals by unauthorized personnel.

Figure 11.7



As standard, the indicator is supplied with power connections suited for 85 to 264 VAC. Use well-insulated copper conductor wire of the size not smaller than 0.5mm^2 for power supply connections ensuring proper polarity as shown in Figure 11.7. The indicator is not provided with fuse and power switch. If necessary, mount them separately. Use a time lag fuse rated 1A @ 240 VAC.

Section 12

MODBUS MAPPING

Table 1 : Read Only Parameters

<table>
<tr><th>Parameter</th><th>Data Type</th><th>Address</th><th>Remark</th></tr>
<tr><td>Process Value (PV) as 32-bit Long Integer</td><td>32 bit signed integer (Long)</td><td>2, 3</td><td rowspan="2">Resolution Based Parameter : Refer Appendix-A

The following constant counts indicate PV Errors.
<table><tr><th>Value</th><th>PV Error Type</th></tr><tr><td>-131072</td><td>Under Range</td></tr><tr><td>+130000</td><td>Over Range</td></tr><tr><td>+131071</td><td>Sensor Open</td></tr></table>
Note :
For Square Root Extraction feature, the PV represents the measured Differential Pressure. The Computed Flow Rate can be read as a Long Value using register pair 13 & 14 and as a Float Value using register pair 2003 & 2004.</td></tr>
<tr><td>Process Value (PV) as 32-bit Single Precision Float</td><td>32 bit Single Precision Float</td><td>2001, 2002</td></tr>
<tr><td>Minimum Process Value</td><td>32 bit signed integer (Long)</td><td>4, 5</td><td rowspan="2">Resolution Based Parameter : Refer Appendix-A</td></tr>
<tr><td>Maximum Process Value</td><td>32 bit signed integer (Long)</td><td>6, 7</td></tr>
<tr><td>Ambient Temperature</td><td>16 bit signed integer</td><td>8</td><td>Resolution Based Parameter : Refer Appendix-A

The measured Ambient Temperature used for thermocouple cold junction compensation.

The value is always in °C with 0.1°C resolution.</td></tr>
<tr><td>Alarm 1 Status</td><td>16 bit signed integer</td><td>9</td><td rowspan="2"><table><tr><th>Value</th><th>Status</th></tr><tr><td>0</td><td>Alarm OFF (Inactive)</td></tr><tr><td>1</td><td>Alarm ON (Active)</td></tr></table></td></tr>
<tr><td>Alarm 2 Status</td><td>16 bit signed integer</td><td>10</td></tr>
<tr><td>Resolution for calculated Flow Rate (DP based) as a Long Value</td><td>16 bit signed integer</td><td>12</td><td rowspan="3">Refer Appendix-C : Differential Pressure Based Flow Rate Measurement.</td></tr>
<tr><td>Calculated Flow Rate (DP based) as a 32-bit Long Value</td><td>32 bit signed integer (Long)</td><td>13, 14</td></tr>
<tr><td>Calculated Flow Rate (DP based) as a 32-bit Single Precision Float Value</td><td>32 bit Single Precision Float</td><td>2003, 2004</td></tr>
</table>

Table 2 : Read / Write Parameters

<table>
<tr><th>Parameter</th><th>Data Type</th><th>Address</th><th>Remark</th></tr>
<tr><td>Input Type</td><td>16 bit signed integer</td><td>46</td><td>
<table>
<tr><th>Value</th><th>Type</th></tr>
<tr><td>0</td><td>Type J Thermocouple</td></tr>
<tr><td>1</td><td>Type K Thermocouple</td></tr>
<tr><td>2</td><td>Type T Thermocouple</td></tr>
<tr><td>3</td><td>Type R Thermocouple</td></tr>
<tr><td>4</td><td>Type S Thermocouple</td></tr>
<tr><td>5</td><td>Type B Thermocouple</td></tr>
<tr><td>6</td><td>Type N Thermocouple</td></tr>
<tr><td>7</td><td>Type E Thermocouple</td></tr>
<tr><td>8</td><td>RTD Pt100, 3-wire</td></tr>
<tr><td>21</td><td>RTD Pt1000, 3-wire</td></tr>
<tr><td>9</td><td>0 to 20 mA</td></tr>
<tr><td>10</td><td>4 to 20 mA</td></tr>
<tr><td>12</td><td>0 to 80 mV</td></tr>
<tr><td>17</td><td>0 to 160 mV</td></tr>
<tr><td>14</td><td>0 to 5 V</td></tr>
<tr><td>15</td><td>0 to 10 V</td></tr>
<tr><td>16</td><td>1 to 5 V</td></tr>
</table>
</td></tr>
<tr><td>PV Units</td><td>16 bit signed integer</td><td>47</td><td>
<table>
<tr><th>Value</th><th>Unit</th></tr>
<tr><td>0</td><td>°C</td></tr>
<tr><td>1</td><td>°F</td></tr>
</table>
</td></tr>
<tr><td>PV Resolution</td><td>16 bit signed integer</td><td>48</td><td>
<table>
<tr><th colspan="2">For TC & RTDs Input</th></tr>
<tr><th>Value</th><th>Resolution</th></tr>
<tr><td>0</td><td>1</td></tr>
<tr><td>1</td><td>0.1</td></tr>
<tr><th colspan="2">For mV/V/mA Input</th></tr>
<tr><th>Value</th><th>Resolution</th></tr>
<tr><td>0</td><td>1</td></tr>
<tr><td>1</td><td>0.1</td></tr>
<tr><td>2</td><td>0.01</td></tr>
<tr><td>3</td><td>0.001</td></tr>
</table>
</td></tr>
</table>

<table>
<tr><th>Parameter</th><th>Data Type</th><th>Address</th><th>Remark</th></tr>
<tr><td>Signal Low</td><td>16 bit signed integer</td><td>49</td><td rowspan="5">Resolution Based Parameter : Refer Appendix-A</td></tr>
<tr><td>Signal High</td><td>16 bit signed integer</td><td>50</td></tr>
<tr><td>PV Range Low</td><td>32 bit signed integer (Long)</td><td>51, 52</td></tr>
<tr><td>PV Range High</td><td>32 bit signed integer (Long)</td><td>53, 54</td></tr>
<tr><td>Offset for PV</td><td>32 bit signed integer (Long)</td><td>55, 56</td></tr>
<tr><td>Digital Filter Time Constant</td><td>16 bit signed integer</td><td>57</td><td>Resolution Based Parameter : Refer Appendix-A

Settable in multiples of 0.5 Seconds. Non-multiples of 0.5 are automatically converted to the nearest multiple of 5.</td></tr>
<tr><td>Alarm-1 Type</td><td>16 bit signed integer</td><td>61</td><td rowspan="2"><table><tr><th>Value</th><th>Type</th></tr><tr><td>0</td><td>None</td></tr><tr><td>1</td><td>Process Low</td></tr><tr><td>2</td><td>Process High</td></tr></table></td></tr>
<tr><td>Alarm-2 Type</td><td>16 bit signed integer</td><td>67</td></tr>
<tr><td>Alarm-1 SP</td><td>32 bit signed integer (Long)</td><td>42, 43</td><td rowspan="4">Resolution Based Parameter : Refer Appendix-A</td></tr>
<tr><td>Alarm-1 Hysteresis</td><td>32 bit signed integer (Long)</td><td>62, 63</td></tr>
<tr><td>Alarm-2 SP</td><td>32 bit signed integer (Long)</td><td>44, 45</td></tr>
<tr><td>Alarm-2 Hysteresis</td><td>32 bit signed integer (Long)</td><td>68, 69</td></tr>
<tr><td>Alarm-1 Inhibit</td><td>16 bit signed integer</td><td>64</td><td rowspan="2"><table><tr><th>Value</th><th>Inhibit</th></tr><tr><td>0</td><td>No</td></tr><tr><td>1</td><td>Yes</td></tr></table></td></tr>
<tr><td>Alarm-2 Inhibit</td><td>16 bit signed integer</td><td>70</td></tr>
<tr><td>Alarm-1 Logic</td><td>16 bit signed integer</td><td>65</td><td rowspan="2"><table><tr><th>Value</th><th>Logic</th></tr><tr><td>0</td><td>Normal</td></tr><tr><td>1</td><td>Reverse</td></tr></table></td></tr>
<tr><td>Alarm-2 Logic</td><td>16 bit signed integer</td><td>71</td></tr>
<tr><td>Alarm-1 Latch</td><td>16 bit signed integer</td><td>66</td><td rowspan="2"><table><tr><th>Value</th><th>Latch</th></tr><tr><td>0</td><td>No</td></tr><tr><td>1</td><td>Yes</td></tr></table></td></tr>
<tr><td>Alarm-2 Latch</td><td>16 bit signed integer</td><td>72</td></tr>
</table>

<table>
<tr><th>Parameter</th><th>Data Type</th><th>Address</th><th>Remark</th></tr>
<tr><td>Retransmission (Recorder) Enable</td><td>16 bit signed integer</td><td>73</td><td><table><tr><th>Value</th><th>Command</th></tr><tr><td>0</td><td>Disable</td></tr><tr><td>1</td><td>Enable</td></tr></table></td></tr>
<tr><td>Retransmission (Recorder) Signal Type (Output-1)</td><td>16 bit signed integer</td><td>74</td><td><table><tr><th>Value</th><th>Signal Type</th></tr><tr><td>0</td><td>0 to 20 mA</td></tr><tr><td>1</td><td>4 to 20 mA</td></tr><tr><td>2</td><td>0 to 5 V</td></tr><tr><td>3</td><td>0 to 10 V</td></tr></table></td></tr>
<tr><td>Retransmission (Recorder) Low</td><td>32 bit signed integer (Long)</td><td>75, 76</td><td rowspan="2">Resolution Based Parameter : Refer Appendix-A</td></tr>
<tr><td>Retransmission (Recorder) High</td><td>32 bit signed integer (Long)</td><td>77, 78</td></tr>
<tr><td>Min / Max Process Value Reset Command</td><td>16 bit signed integer</td><td>40</td><td><table><tr><th>Value</th><th>Command</th></tr><tr><td>0</td><td>—</td></tr><tr><td>1</td><td>Reset</td></tr></table></td></tr>
<tr><td>Alarm Latch Acknowledge Command</td><td>16 bit signed integer</td><td>41</td><td><table><tr><th>Value</th><th>Command</th></tr><tr><td>0</td><td>—</td></tr><tr><td>1</td><td>ACK</td></tr></table></td></tr>
<tr><td>Linearization</td><td>16 bit signed integer</td><td>201</td><td><table><tr><th>Value</th><th>Feature</th></tr><tr><td>0</td><td>Disable</td></tr><tr><td>1</td><td>Enable</td></tr></table></td></tr>
<tr><td>Linearization No. of Ponits</td><td>16 bit signed integer</td><td>202</td><td>—</td></tr>
<tr><td>X-Co-ordinates</td><td>16 bit signed integer</td><td>203 to 234 (X1 to X32)</td><td rowspan="2">Resolution Based Parameter : Refer Appendix-A</td></tr>
<tr><td>Y-Co-ordinates</td><td>16 bit signed integer</td><td>235 to 266 (Y1 to Y32)</td></tr>
<tr><td>Square Root Selection</td><td>16 bit signed integer</td><td>58</td><td><table><tr><th>Value</th><th>Command</th></tr><tr><td>0</td><td>Disable</td></tr><tr><td>1</td><td>Enable</td></tr></table></td></tr>
</table>

<table>
<tr><th>Parameter</th><th>Data Type</th><th>Address</th><th>Remark</th></tr>
<tr><td>Const Multiplier Resolution</td><td>16 bit signed integer</td><td>59</td><td><table><tr><th>Value</th><th>Resolution</th></tr><tr><td>0</td><td>1</td></tr><tr><td>1</td><td>0.1</td></tr><tr><td>2</td><td>0.01</td></tr><tr><td>3</td><td>0.001</td></tr></table></td></tr>
<tr><td>Const Multiplier</td><td>16 bit signed integer</td><td>60</td><td>Resolution Based Parameter : Refer Appendix-A</td></tr>
</table>

APPENDIX - A

HANDLING DECIMAL VALUES IN MODBUS REGISTERS

Overview

MODBUS protocol utilizes 16-bit signed integer registers (Input and Holding Registers) to store data. These registers accommodate values within the range -32,767 to 32,768. However, many process parameters require values with decimal precision. Since MODBUS registers inherently do not support floating-point values, decimal handling is achieved through scaling techniques.

This section describes how **Fixed** and **Programmable** decimal point parameters are stored and retrieved using MODBUS registers.

Note : The description below also applies to 32-bit Long Integer values that are stored using two 16-bit registers with consecutive MODBUS addresses.

Handling Fixed Decimal Point Values

For parameters with a fixed decimal resolution, the integer values written to the MODBUS register are automatically converted by the device. However, when reading values, users must convert the retrieved integer values back to their corresponding decimal representations by dividing them by the appropriate power of 10.

Example: Fixed Decimal Resolution of 0.01

- Parameter Range: -12.34 to 20.00
- Scaling Factor: 100 (since 0.01 = 10^(-2))
- Writing a Value: To set a parameter to 34.82, write 34.82 × 100 = 3482 into the register.
- Reading a Value: If the register contains 3482, the actual value is 3482 ÷ 100 = 34.82.

This method ensures consistency in handling values with fixed decimal precision across MODBUS communication.

Handling Programmable Decimal Point Values

For parameters with a programmable decimal resolution, the number of decimal places is stored in a separate parameter named Resolution (or PV Resolution). The resolution value determines the scaling factor applied when storing and retrieving values in MODBUS registers.

Resolution Parameter Definition

The resolution parameter is stored as an integer value corresponding to the decimal precision:

Resolution Value	Decimal Precision	Scaling Factor
0	1 (No Decimals)	10^0=1
1	0.1	10^1=10
2	0.01	10^2=100
3	0.001	10^3=1000

Example: Programmable Decimal Resolution

- Resolution Parameter Value: 3 (corresponding to 0.001 resolution)
- Writing a Value: To set the parameter to 27.651, use Scaling Factor 1000 (corresponding to Resolution value 3) to convert the decimal value to integer value : 27.651 × 1000 = 27651 and write to the MODBUS register.
- Reading a Value: If the register contains 27651, divide by 1000 (10^3) to get 27.651.

Using this method, MODBUS allows flexible handling of parameters where decimal precision may need to be adjusted dynamically.

APPENDIX - B

DC LINEAR SIGNAL INTERFACE

Overview

Various transmitters generate different signal types, such as mV, V, or mA, with distinct signal ranges. To ensure compatibility with a wide range of transmitters, PPI products offer configurable Signal Type and Range settings.

Common industry-standard signal ranges include:

- 0 to 80 mV, 0 to 160 mV
- 0 to 5 V, 1 to 5 V, 0 to 10 V
- 0 to 20 mA, 4 to 20 mA

Additionally, since transmitters output different signal ranges corresponding to specific process values (e.g., a 1 to 4.5 V signal may represent 5% to 95% RH), PPI products allow users to configure the process value range and resolution.

Required Parameters for Linear Transmitter Interface

For interfacing linear transmitters, the following six parameters must be configured:

Parameter	Definition	Example
Input Type	Defines the standard DC signal type in which the transmitter signal range falls.	4 to 20 mA
Signal Low	The minimum signal value corresponding to the lowest process value.	4.00 mA
Signal High	The maximum signal value corresponding to the highest process value.	20.00 mA
PV Resolution	Defines the smallest measurable unit for the process value.	0.01 psi
Range Low	The process value corresponding to Signal Low.	0.00 psi
Range High	The process value corresponding to Signal High.	5.00 psi

Mathematical Representation

The relationship between transmitter signal values and the corresponding process values follows a straight-line equation:

$$Y = mX + C$$

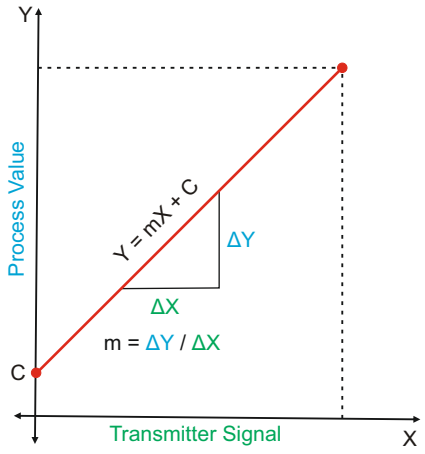
Where;

X : Signal Value from Transmitter

Y : Process Value Corresponding to X

C : Process Value Corresponding to X = 0 (Y-intercept)

m : Slope (Change in Process Value per unit Change in Signal Value)

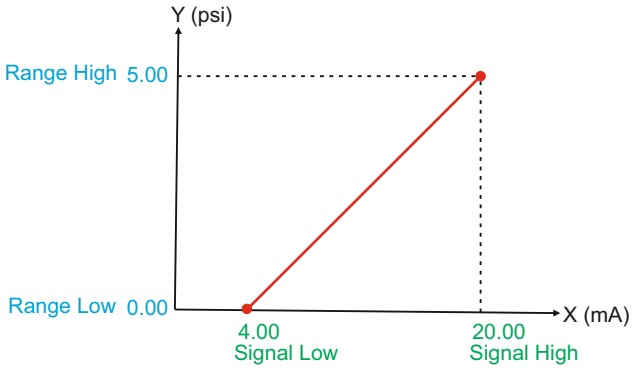


Examples of Transmitter Configurations

Example 1:

Pressure Transmitter (**4 to 20 mA** corresponding to **0 to 5 psi**)

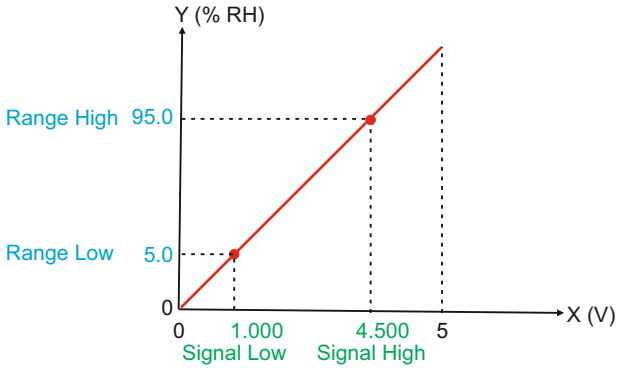
Input Type	:	4-20 mA
Signal Low	:	4.00 mA
Signal High	:	20.00 mA
PV Resolution	:	0.01
Range Low	:	0.00
Range High	:	5.00



Example 2

Humidity Transmitter (**1 to 4.5 V** corresponding to **5 to 95 %RH**)

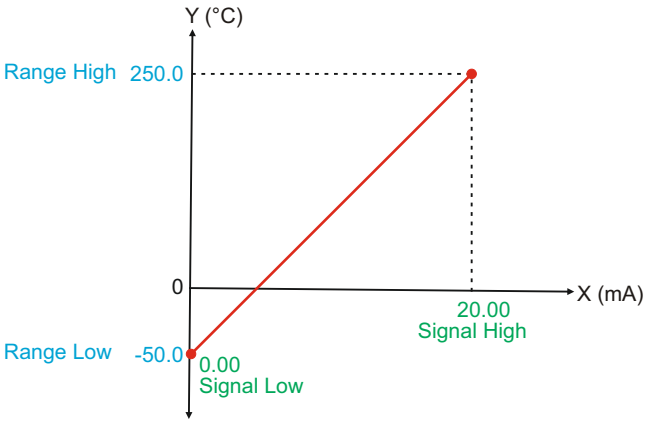
Input Type	:	0-5 V
Signal Low	:	1.000 V
Signal High	:	4.500 V
PV Resolution	:	0.1
Range Low	:	5.0
Range High	:	95.0



Example 3

Temperature Transmitter (**0 to 20 mA** corresponding to **-50 to 250 °C**)

Input Type	:	0-20 mA
Signal Low	:	0.00 mA
Signal High	:	20.00 mA
PV Resolution	:	0.1
Range Low	:	-50.0
Range High	:	250.0



APPENDIX - C

DIFFERENTIAL PRESSURE (DP) BASED FLOW RATE MEASUREMENT

FLOW MEASUREMENT USING DP

In many industrial applications, flow rate is derived by measuring the differential pressure (DP) across a primary flow element such as an orifice plate, venturi, or flow nozzle.

The fundamental relationship is :

$$Q \propto \sqrt{P}$$

Q = Flow Rate
P = Differential Pressure

This implies that flow is proportional to the square root of the measured differential pressure.

PARAMETER SETTINGS FOR DP-BASED FLOW MEASUREMENT

To enable flow computation using square root extraction, the *UPI-5D Plus* must be configured in two stages:

Parameters for Measuring Differential Pressure (DP)

These parameters define how the input signal is interpreted and scaled into pressure.

- *Input Type*
  Select the appropriate input signal type : -20 to +20 mA, 4 to 20 mA, -5 to +5 VDC, -10 to +10 VDC.

- *Signal Low & Signal High*
  Define the electrical input range corresponding to the DP measurement.
  Example: Signal Low = 1 V & Signal High = 3 V (for a -5 to +5 V input type).

- *Range Low & Range High*
  Define the measured DP corresponding to the input signal.
  Example: Range Low = 0.0 bar (corresponding to 1V) & Range High = 100.0 bar (corresponding to 3V).

The instrument converts the input signal into a linearly scaled differential pressure (P).

Parameters for Square Root Extraction (Flow Computation)

These parameters enable conversion of DP into flow rate.

- *Square Root Function Enable / Disable*
  Must be Enabled for flow measurement.

- *Resolution for Constant (K)*
  Define the Resolution (Decimal Point) for the scaling constant ‘K’ (see below parameter).

- *Constant (K)*
  User-defined flow scaling factor.
  Used to calibrate the flow rate based on system characteristics. This value depends on :
  - Type of primary element (orifice, venturi, etc.)
  - Pipe size
  - Desired engineering units (LPH, m³/hr, etc.).

Once enabled, the instrument computes:

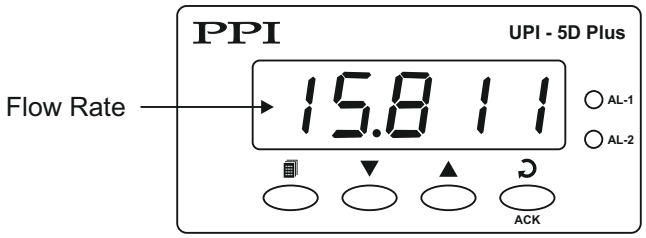
$$Q = K \times \sqrt{P}$$

Q = Flow Rate
K = Flow Scaling Factor
P = Differential Pressure

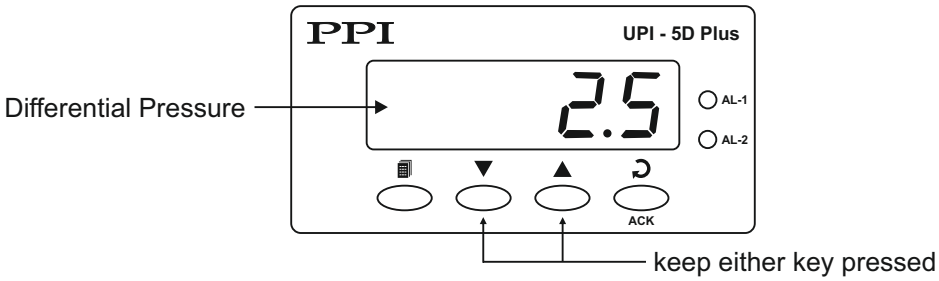
FLOW VALUE DISPLAY

The computed flow rate is shown on the 5 digit 7 segment indicator display.

The example display below shows the computed flow rate for a measured DP = 2.5 & the Flow Scaling Factor = 10.



The measured differential pressure (DP) can be viewed by holding the front panel UP or DOWN key pressed. Refer the figure below.



FLOW VALUE REPRESENTATION OVER MODBUS

The computed flow rate is available via MODBUS as a 32-bit Long Integer or a 32-bit Single Precision Float.

Flow Value as 32-bit Long Integer

The computed flow value can be retrieved using two registers.

- *32-bit Signed Integer (Flow Value)*
  Contains the numerical value of flow. Register Address 13 & 14.

- *16-bit Signed Integer (Resolution)*
  Contains the number of decimal places. Register Address 12.

How to Interpret the Flow Value

The actual flow value is obtained as:

$$\text{Flow} = \frac{\text{32-Bit Integer Value}}{\text{10 raised to the power of Resolution (10\^Resolution)}}$$

Where:

- Resolution = 0 → No decimal
- Resolution = 1 → 1 decimal place
- Resolution = 2 → 2 decimal places
- Resolution = 3 → 3 decimal places

Example

- 32-bit Flow Register Value = 15811
- Resolution Register Value = 3

$$\text{Flow} = \frac{15811}{10\text{\^}3}$$

Actual Flow Rate = 15.811 Units (e.g., LPH, m³/hr)

Flow Value as 32-bit Single Precision Float

The computed flow value can be retrieved using two registers.

- *32-bit Signed Integer (Flow Value)*
- Contains the numerical value of flow in Single Precision Float. Register Address 2003 & 2004.

FLOW VALUE AS SIGNED LONG OR FLOAT32 DATA TYPE

Data Representation

The Signed Long & Single Precision Float data occupies two consecutive 16-bit MODBUS registers, with the high-order register at an odd address.

Example :

The MODBUS address for the flow value in 32-bit Signed Long format is 13 and it occupies two registers; 13 (high register) & 14 (low register). Similarly, the MODBUS address for the flow value in 32-bit Float format is 2003 and it occupies two registers; 2003 (high register) & 2004 (low register).

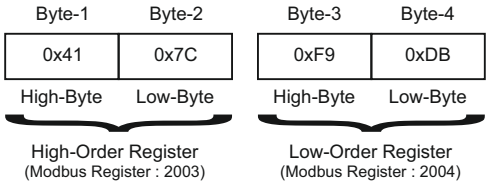
The byte order follows standard MODBUS RTU convention:

High-order byte first, followed by low-order byte within each 16-bit register.

Byte and Register Sequence Example for Float Representation

- Flow Rate Value: 15.811
- Hexadecimal FLOAT32 Representation: 0x417CF9DB

Register allocation and byte order:



VERSION HISTORY

Version	Release Date	Remark
01.10	10/11/2025	First Release
02.10	11/04/2026	Added MODBUS Registers for reading PV and DP based computed Flow Rate as 32-bit Single Precision Float.

Process Precision Instruments (An ISO 9001 : 2008 Company)

101, Diamond Industrial Estate, Navghar, Vasai Road (E), Dist. Palghar - 401210, Maharashtra, India

Sales : 8208199048 / 8208141446 Support : 07498799226 / 08767395333

sales@ppiindia.net **www.ppiindia.net**