

**masibus**  
A Sonepar Company

## User's Manual

### Filter DISPLAY UNIT **FDU**



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## 1. INTRODUCTION

### Foreword

Thank you for purchasing Filter Display Unit FDU.

This manual describes the basic functions and operation methods. Please read through this user's manual carefully before using the product.

### Notice

The contents of this manual are subject to change without notice as a result of continuous improvements to the instrument's performance and functions.

Every effort has been made to ensure accuracy in the preparation of this manual. Should any errors or omissions come to your attention, however, please inform MASIBUS Sales office or sales representative. Under no circumstances may the contents of this manual, in part or in whole, be transcribed or copied without our permission.

### Trademarks

Our product names or brand names mentioned in this manual are the trademarks or registered trademarks of Masibus Automation and Instrumentation (P) Ltd. (herein after referred to as MASIBUS).

Adobe, Acrobat, and Postscript are either registered trademarks or trademarks of Adobe Systems Incorporated. All other product names mentioned in this user's manual are trademarks or registered trademarks of their respective companies.

### Checking the Contents of the Package

Unpack the box and check the contents before using the product. If the product is different from which you have ordered, if any parts or accessories are missing, or if the product appears to be damaged, contact your sales representative.

### Product Overview

The masibus Filter Display Unit can measure Three Differential pressure using inbuilt sensors. Three individual displays to display PRE FILTER, FINE FILTER, HEPA FILTER.

The FDU has inbuilt buzzer for audible process value violation, Communication MODBUS-RTU protocol interfacing, two digital inputs to indicate AHU status OFF/TRIP.

FDU is the ideal digital instrument to take the place of analog mechanical pressure gages. FDU is designed to give fast, accurate indication of differential pressures.

FDU may be used as a readout device when measuring flowing fluids, pressure drop across filters, liquid levels in storage tanks and many other applications involving pressure, vacuum or differential pressure

The 4-digit seven segment Red LED display readings. Lab view based utility software for configuration and calibration.

FDU is available with bi-directional ranges. FDU is factory calibrated to specific ranges.

FDU has an added feature for filter applications where a set point can be input where the display will blink when the filter is dirty, alerting the user that a maintenance action needs to occur.

To measure differential pressure, connect higher pressure to the H-port and lower pressure to the L- port. Be sure the pressure rating of the tubing exceeds that of the operating ranges

### Applications



- Fluid flow
- Liquid storage tanks
- Filter pressure drops
- Vacuum or differential pressure
- Pharmaceutical industry
- HVAC (heating, Ventilation, Air conditioning, Cooling).

### Safety Precautions

The product and the instruction manual describe important information to prevent possible harm to users and damage to the property and to use the product safely.

Understand the following description (signs and symbols), read the text and Observe Descriptions.

### DESCRIPTION OF SIGN

 <b>WARNING</b>	<i>This indicates a danger that may result in death or serious injury if not avoided.</i>
 <b>CAUTION</b>	<i>This indicates a danger that may result in minor or moderate injury or only a physical damage if not avoided.</i>

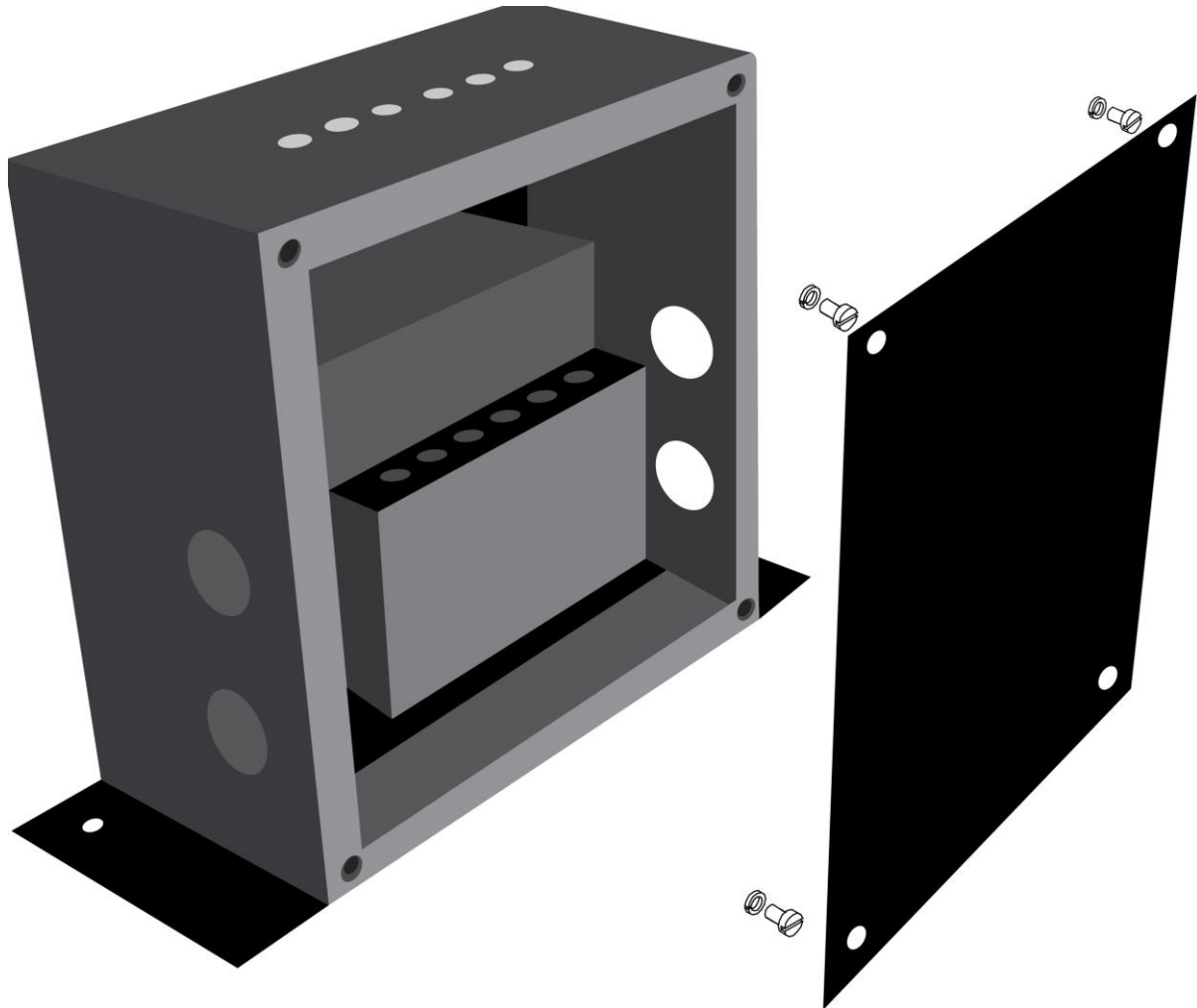
## 2. SPECIFICATIONS

<b>Input</b>	
No of channel	3 or 2 or 1
Input type	DP( Inbuilt Sensors)
Measurement Range	±1000, Pascal
Accuracy	± 2 % FS
Resolution	0.1 / 1
Response time	3 Sec
<b>Display &amp; Keys</b>	
Process Value 1,2,3	0.56" Four-digit 7 segment Red LED (P.F., F.F., H.F.)
Status Indication	10 Red LED's for alarm and Communication, AHU status
Keys	Enter, Increment, Decrement, Acknowledgement
<b>Output</b>	
Buzzer	In built Buzzer provided to beep in set values violated condition
<b>Communication O/P</b>	
Interface	RS485 (2 Wire)
Protocol	Modbus-RTU
Baud Rate	9600,19200,38400 bps
<b>Digital I/P(optional)</b>	
No of DI	2
Input Type	Non-Voltage Contact
Rating	24VDC at 5mA
Purpose	AHU status
<b>Power supply</b>	
Standard	85-265VAC/ 100-300VDC
Optional	18-36VDC
Power Consumption	<3VA
<b>Environmental Condition</b>	
Humidity	20% to 95% RH (Non-Condensing)
Ambient temperature	0 to 55°C
Storage Temperature	0 to 80°C
<b>Physical</b>	
Enclosure Dimension	210 x 160 x 80 (W x H x D) in mm
Enclosure material	M.S. Powder Coated Body with
Enclosure Mounting	Table Top
Enclosure Protection	IP 20

### Features

- Elegant Appearance, easy to operate and compact in size.
- Hi/Lo Alarms with LED status for all three channel.
- Remote programmable from master device.
- RS-485 communication available.
- Inbuilt buzzer to audible process value violation.
- Software based Calibration
- User selectable set limits for process value violation.
- Incorporates built-in DP sensors.
- Built in AHU OFF/TRIP status LED indications with digital inputs.

### 3. PHYSICAL SPECIFICATIONS & MOUNTING DETAILS



**Fig 3.1: Whole Assembly Drawing**

### 4. TERMINAL CONNECTIONS



**Fig 4.1: Terminal Connection Detail of FDU**

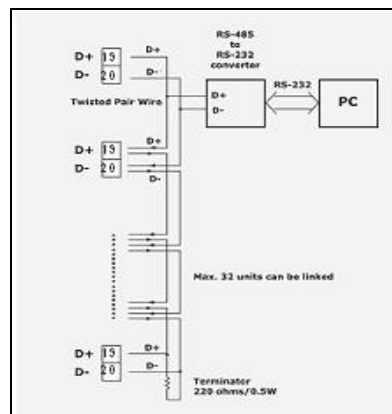
Terminal No.	Description
1 24VDC + 2 24VDC -	Power Supply Input
3 RS 485 + 4 RS 485 -	RS 485 Communication Output
5 DI - 1 6	Digital Input 1 for AHU off status
7 DI - 2 8	Digital Input 2 for AHU trip status

#### 4.1 How to connect wires?

Before carrying out wiring, turn off the power to the unit and check that the cables to be connected are not alive because there is a possibility of electric shock.

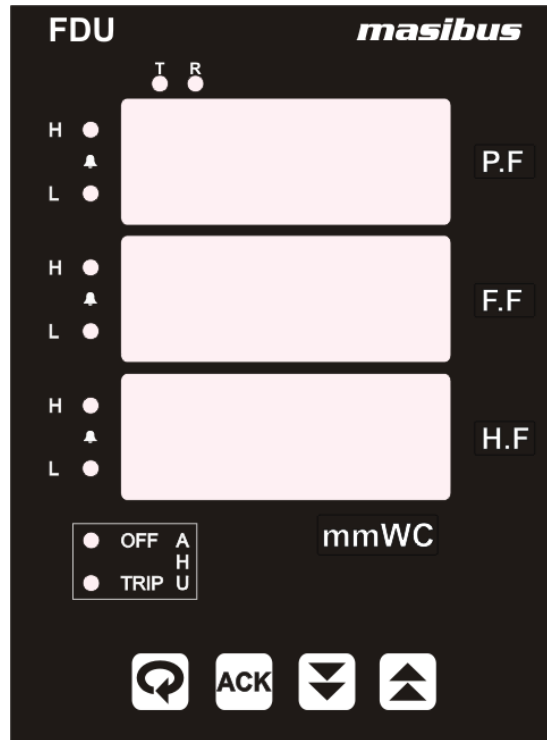
**NOTE:**

- ✓ All wiring must confirm to appropriate standards of good practice and local codes and regulations. Wiring must be suitable for Voltage, Current and temperature rating of the system.
- ✓ Provide power from a single-phase instrument power supply. If there is a lot of noise in the power line, insert an insulating transformer into the primary side of the line and use a line filter on the secondary side. Do not place the primary and secondary power cables close to each other.
- ✓ Use repeater after each set of 32 instruments connected in RS-485 Communication.
- ✓ Unused terminals should not be used as jumper points as they may be internally connected, which may cause damage to the unit.
- ✓ Unused control terminals should not be used as jumper points as they may be internally connected, which may cause damage to the unit.
- ✓ Use >250V-1Amp Cable for Power Supply.
- ✓ Supply voltage must be below maximum voltage rating specified on the label
- ✓ If cable has two parallel wires inside then isolation between them must be 2.5 KV.



**Fig 4.2: RS485 Connection Details**

## 5. FRONT PANEL DETAILS

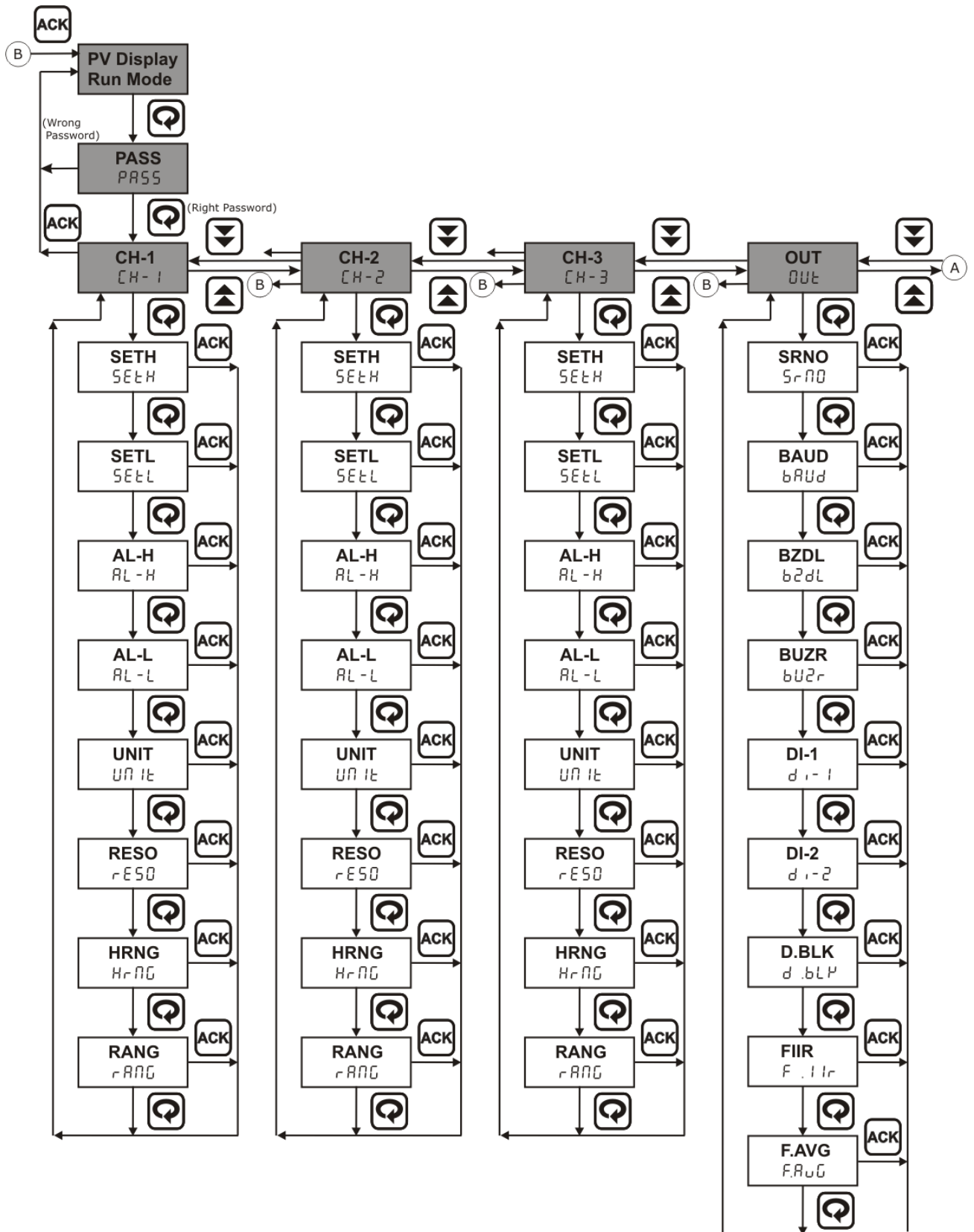


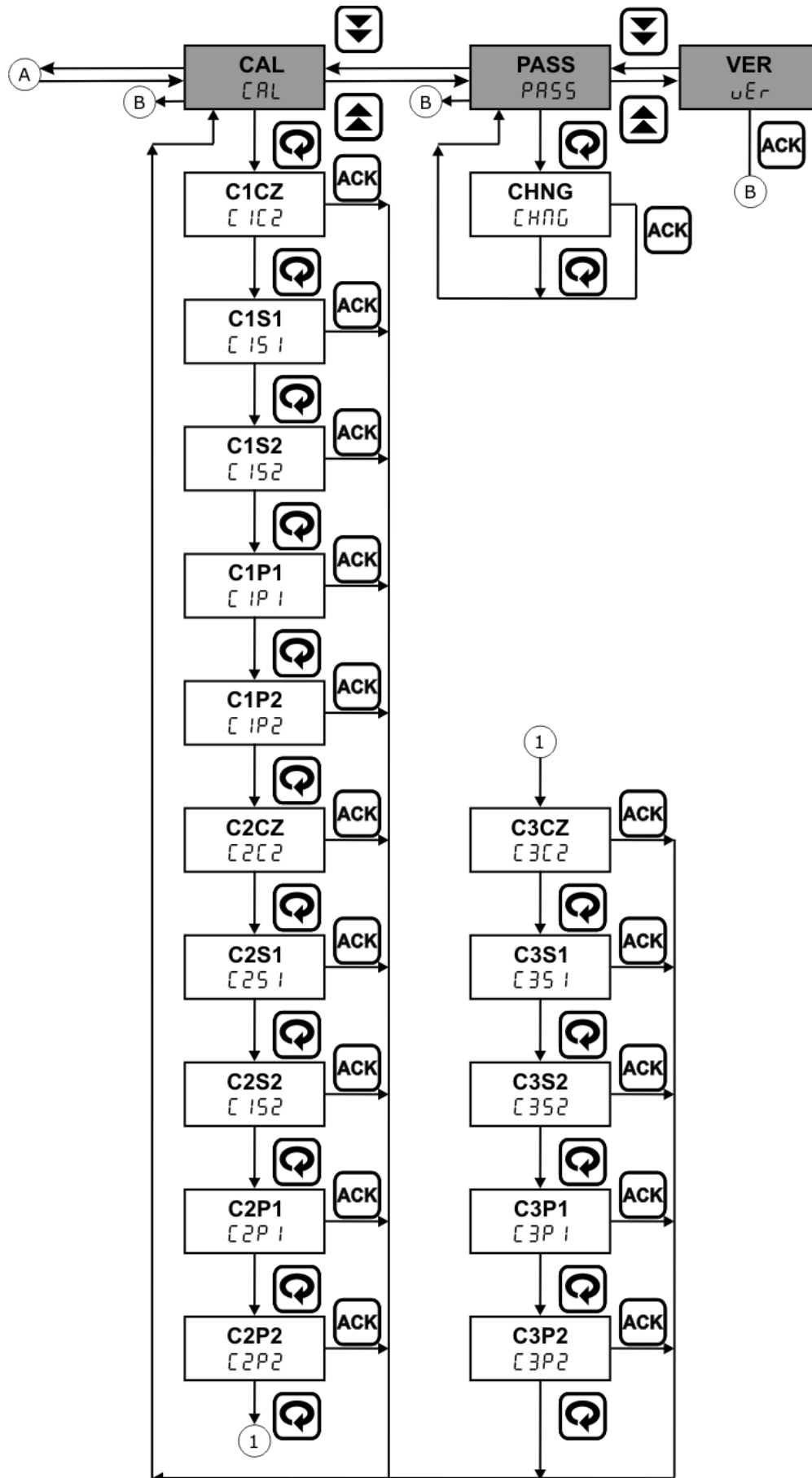
### 5.1 Front Panel Description

Symbol	Function
	Increment the Value of any Parameter in menu mode.
	Decrement the Value of any Parameter in menu mode.
	In Sub Menu it can be used to get to the next Parameter. It is also used to save the parameters to nonvolatile memory, when user setting a proper data by Increment and decrement key for parameter configuration.
	Used to acknowledge the buzzer in Run mode.
<b>P.F.</b>	4 digit 0.56" inch RED Display Display process value of PRE FILTER. Display Serial number and baud Rate of device.
<b>F.F.</b>	4 digit 0.56" inch RED Display Display process value of FINE FILTER.
<b>H.F.</b>	4 digit 0.56" inch RED Display Display process value of HEPA FILTER.
<b>T</b>	LED ON when device is transmitting some Data (RS-485).
<b>R</b>	LED ON when device is receiving some Data (RS-485).
<b>H</b>	LED ON when setH process value violation
<b>L</b>	LED ON when setL process value violation
<b>OFF</b>	Monitoring the AHU (air handling unit) Status
<b>TRIP</b>	



## 6. MENU LAYOUT





**6.1 Run Time Indication/Function.**

- To Acknowledge Buzzer, Press Acknowledgment Key.
- While Display blink is on, for particular alarm generation respective PV Display will blink.

**6.2 Channel-1 Pressure**

Parameter (PV display)			Setting Name & Description	Default Value
Symbol	Modbus Absolute Addresses	Name		
<b>SETH (SETH)</b>	40001	Set Point High	Adjust SET POINT High value -100.0 to 100.0 For mmwc- 0.1 degree Resolution -1000.0 to 1000.0 For Pa - 0.1 degree Resolution,	20.0
<b>SETL (SETL)</b>	40002	Set Point Low	Adjust SET POINT Low value -100.0 to 100.0 For mmwc- 0.1 degree Resolution -1000.0 to 1000.0 For Pa - 0.1 degree Resolution,	10.0
<b>AL-H (AL-H)</b>	40003	Alarm High	Set Alarm Type for Alarm HIGH 0 : HI(High) 1 : LOW(Low) 2: DIS(Disable)	HIGH
<b>AL-L (AL-L)</b>	40004	Alarm Low	Set Alarm Type for Alarm LOW 0 : HI(High) 1 : LOW(Low) 2: DIS(Disable)	LOW
<b>UNIT (UNIT)</b>	40009	Pressure UNIT	Display Pressure UNIT	mmwc
<b>RESO (RESO)</b>	40010	Display Resolution	Set Resolution For Pressure Output 0 : 1 1 : 0.1	0
<b>HRNG (HRNG)</b>	40011	Pressure High range	It is a pressure High range for display. -100.0 to 100.0 For mmwc- 0.1 degree Resolution -100 to 100 For mmwc - 1 degree Resolution, -1000.0 to 1000.0 For Pa - 0.1 degree Resolution, -1000 to 1000 For Pa - 1 degree Resolution	25.0
<b>RANG (RANG)</b>	40012	Pressure Display Range	Set Display Range For Pressure Input Unidirectional/Bidirectional 0: UN.DR	UN.DR

			1: BI.DR	
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### 6.3 Channel-2 Pressure

<b>SETH</b> (SETH)	40021	Set Point High	Adjust SET POINT High value -100.0 to 100.0 For mmwc- 0.1 degree Resolution -1000.0 to 1000.0 For Pa - 0.1 degree Resolution	40.0
<b>SETL</b> (SETL)	40022	Set Point Low	Adjust SET POINT Low value -100.0 to 100.0 For mmwc- 0.1 degree Resolution -1000.0 to 1000.0 For Pa - 0.1 degree Resolution	10.0
<b>AL-H</b> (AL-H)	40023	Alarm High	Set Alarm Type for Alarm HIGH 0 : HI(High) 1 : LOW(Low) 2: DIS(Disable)	HIGH
<b>AL-L</b> (AL-L)	40024	Alarm Low	Set Alarm Type for Alarm LOW 0 : HI(High) 1 : LOW(Low) 2: DIS(Disable)	LOW
<b>UNIT</b> (UNIT)	40029	Pressure UNIT	Display Pressure UNIT	mmwc
<b>RESO</b> (RESO)	40030	Display Resolution	Set Resolution For Pressure Output 0: 1 1: 0.1	0
<b>HRNG</b> (HRNG)	40031	Pressure High range	It is a pressure High range for display. -100.0 to 100.0 For mmwc- 0.1 degree Resolution -100 to 100 For mmwc - 1 degree Resolution, -1000.0 to 1000.0 For Pa - 0.1 degree Resolution, -1000 to 1000 For Pa - 1 degree Resolution	50.0
<b>RANG</b> (RANG)	40032	Pressure Display Range	Set Display Range For Pressure Input Unidirectional/Bidirectional 0: UN.DR 1: BI.DR	UN.DR

### 6.4 Channel-3 Pressure

<b>SETH</b> (SETH)	40041	Set Point High	Adjust SET POINT High value -100.0 to 100.0 For mmwc- 0.1 degree Resolution -1000.0 to 1000.0 For Pa - 0.1 degree Resolution,	80.0
<b>SETL</b> (SETL)	40042	Set Point Low	Adjust SET POINT Low value -100.0 to 100.0 For mmwc- 0.1 degree Resolution -1000.0 to 1000.0 For Pa - 0.1 degree	10.0

			Resolution, Set Alarm Type for Alarm HIGH	
<b>AL-H</b> (AL-H)	40043	Alarm High	0 : HI(High) 1 : LOW(Low) 2: DIS(Disable)	HIGH
<b>AL-L</b> (AL-L)	40044	Alarm Low	Set Alarm Type for Alarm LOW 0 : HI(High) 1 : LOW(Low) 2: DIS(Disable)	LOW
<b>UNIT</b> (UNIT)	40049	Pressure UNIT	Display Pressure UNIT	mmwc
<b>RESO</b> (RESO)	40050	Display Resolution	Set Resolution For Pressure Output 0: 1 1: 0.1	0
<b>HRNG</b> (HRNG)	40051	Pressure High range	It is a pressure High range for display. -100.0 to 100.0 For mmwc- 0.1 degree Resolution -100 to 100 For mmwc - 1 degree Resolution, -1000.0 to 1000.0 For Pa - 0.1 degree Resolution, -1000 to 1000 For Pa - 1 degree Resolution	100.0
<b>RANG</b> (RANG)	40052	Pressure Display Range	Set Display Range For Pressure Input Unidirectional/Bidirectional 0: UN.DR 1: BI.DR	UN.DR

**6.5 OUT**

<b>SRNO</b> (SRNO)	40071	Sr. no.	Sr.no for Communication 1 to 247	1
<b>BAUD</b> (BAUD)	40072	Baud Rate	Set Serial Communication Baud Rate 0 : 9.6K (9600 bps) 1 : 19.2K (19200 bps) 2 : 38.4K (38400 bps)	96K
<b>BZDL</b> (BZDL)	40073	Buzzer on Delay	It is a delay time to Buzzer ON. 0 to 3600 Sec	10
<b>BUZR</b> (BUZR)	40074	Buzzer Status	Set Enable or Disable For Audible Process value violation 0: DIS 1: EN	EN
<b>DI-1</b> (DI-1)	40075	*DI-1	For LED status of AHU Off 0:Active High –When Switch is Close LED ON 1:Active Low –When Switch is Close LED OFF	0
<b>DI-2</b> (DI-2)	40076	*DI-2	For LED status of AHU Trip 0:Active High –When Switch is Close LED ON 1:Active Low –When Switch is Close LED	0

			OFF	
<b>D.BLK</b> (D.BLK)	40077	Display Blink	For Alarm generation Display Blinking option 0: Flash Off 1: Flash On	1
<b>F.IIR</b> (F.IIR)	40079	Filter Rate	It is a filter rate for IIR filter, 0 value will disable the Filter. Set value from 0-100sec	10
<b>F.AVG</b> (F.AVG)	40080	Moving Average Filter Option	For enable or disable Moving Average Filter. 0: Off 1: On	1

\*Refer table For AHU off/trip

Status of DI - AHU Off	DI-1	LED Status	RS 485 Status
CLOSE	Active High	ON	1
	Active low	OFF	0
OPEN	Active High	OFF	0
	Active low	ON	1
Status of DI - AHU Trip	DI-2		
CLOSE	Active High	ON	1
	Active low	OFF	0
OPEN	Active High	OFF	0
	Active low	ON	1

## 6.6 CAL

<b>C1CZ</b> (C1Cz)	40091	Channel 1 calibration zero point	Calibration Zero for channel-1 (channel-1 Display : Current PV) 1: Zero calibration Note: Above value is for Modbus calibration.	-
<b>C1S1</b> (C1S1)	40091	Channel 1 calibration span1 point	Calibration Span for channel-1 (channel-1 Display : Current PV) 2: Span1 Calibration Note: Above value is for Modbus calibration.	-
<b>C1S2</b> (C1S2)	40091	Channel 1 calibration span2 point	Calibration Span for channel-1 (channel-1 Display : Current PV) 3: Span2 Calibration Note: Above value is for Modbus calibration.	-
<b>C1P1</b> (C1P1)	40092	Calibration Span Point 1 for channel-1	Calibration Point-1 for channel-1	200
<b>C1P2</b> (C1P2)	40093	Calibration Span Point 2 for channel-1	Calibration Point-2 for channel-1	250
<b>C2CZ</b> (C2Cz)	40094	Channel 2 Calibration zero point	Calibration Zero and Span for channel-2 (channel-2 Display : Current PV) 1: Zero calibration Note: Above value is for Modbus calibration.	-
<b>C2S1</b> (C2S1)	40094	Channel 2 Calibration span1 point	Calibration Zero and Span for channel-2 (channel-2 Display : Current PV) 2: Span1 Calibration Note: Above value is for Modbus calibration.	-

<b>C2S2</b> (C2S2)	40094	Channel 2 Calibration span2 point	Calibration Zero and Span for channel-2 (channel-2 Display : Current PV) 3: Span2 Calibration Note: Above value is for Modbus calibration.	-
<b>C2P1</b> (C2P1)	40095	Calibration Span Point 1 for channel-2	Calibration Point-1 for channel-2	400
<b>C2P2</b> (C2P2)	40096	Calibration Span Point 2 for channel-2	Calibration Point-2 for channel-2	450
<b>C3CZ</b> (C3Cz)	40097	Channel 3 Calibration zero point	Calibration Zero and Span for channel-3 (channel-3 Display : Current PV) 1: Zero calibration Note: Above value is for Modbus calibration.	-
<b>C3S1</b> (C3S1)	40097	Channel 3 Calibration span1 point	Calibration Zero and Span for channel-3 (channel-3 Display : Current PV) 2: Span1 Calibration Note: Above value is for Modbus calibration.	-
<b>C3S2</b> (C3S2)	40097	Channel 3 Calibration span2 point	Calibration Zero and Span for channel-3 (channel-3 Display : Current PV) 3: Span2 Calibration Note: Above value is for Modbus calibration.	-
<b>C3P1</b> (C3P1)	40098	Calibration Span Point 1 for channel-3	Calibration Point-1 for channel-3	900
<b>C3P2</b> (C3P2)	40099	Calibration Span Point 2 for channel-3	Calibration Point-2 for channel-3	950

**6.7 PASS**

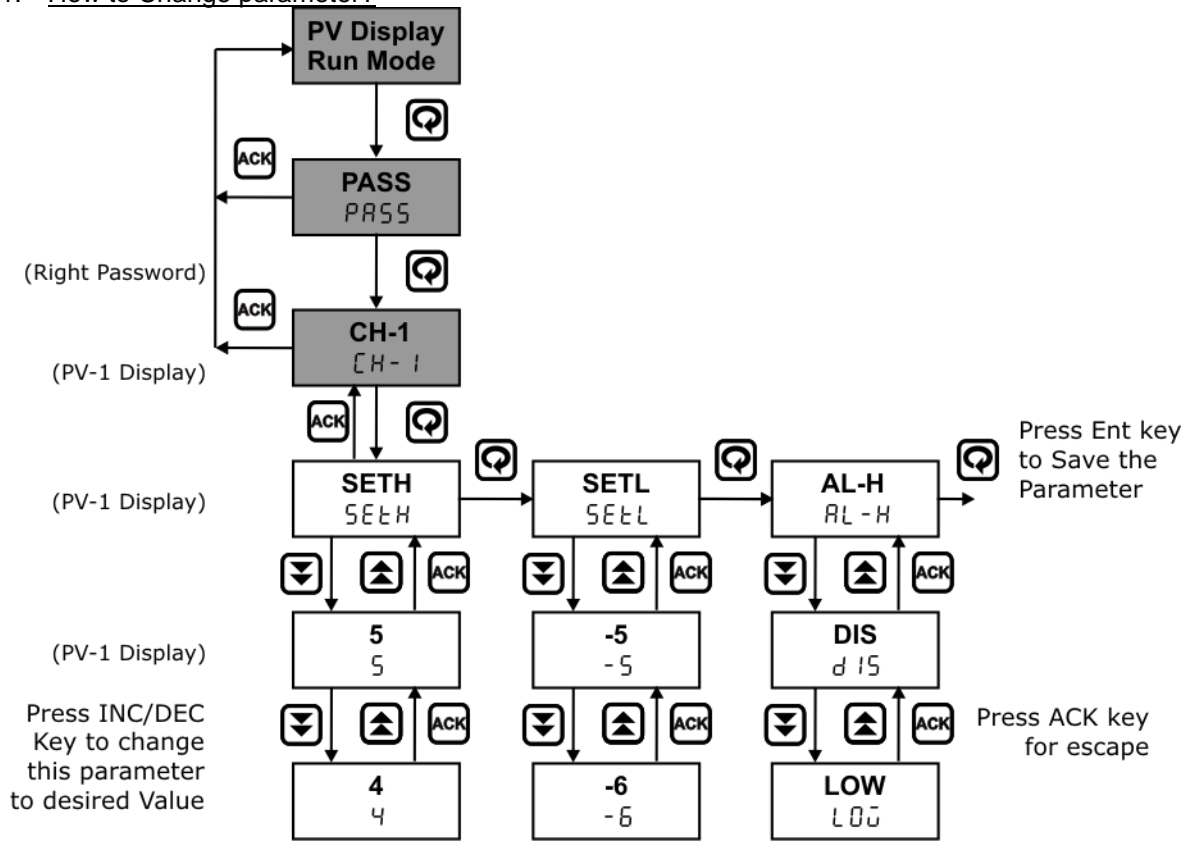
<b>40081</b>	Change Password	Set Device Password 1 to 9999	1
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**6.8 VER**

<b>40082</b>	Version No.	Shows the Version of the Current Firmware	1.00
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**Examples For FDU:**

1. How to Change parameter?





## 7. CALIBRATION PROCEDURE

### 7.1 Procedure for calibration zero and span

The instrument is factory calibrated for the specified range of Differential pressure input (PV), but due to long term drift of components, re-calibration may be necessary in some cases. For calibrating the instrument a reliable source is required. This source should be at least ten times accurate compared to the range of the instrument. The unit can be calibrated without opening it and without trim pots.

The instrument is factory calibrated for the specified range of Differential pressure input (PV), but due to long term drift of components, re-calibration may be necessary in some cases. For calibrating the instrument a reliable source is required. This source should be at least ten times accurate compared to the range of the instrument. The unit can be calibrated without opening it and without trim pots.

To calibrate PRE Filter of FDU or FINE Filter of FDU or HEPA Filter of FDU, zero calibration, span point 1 calibration and span point 2 calibrations are required.

Zero calibration: The value should be calibrated to zero only.

**Example:** if process value is 0.4, then calibrate that value to 0.0

Span Point 1 Calibration: It can be done either at positive side or negative side.

**Example:**

- 0 to 150 mmwc. 0 means zero calibration and 150 means span point 1 calibration.
- 0 to -150 mmwc. 0 means zero calibration and -150 means span point 1 calibration.

Span Point 2 Calibration: It can be done at positive side only.

**Example:**

0 to 200 Pa. 0 means zero calibration and 200 means span point 2 calibration.

Calibration using utility software.

Apply appropriate Input from the source, and press buttons for Zero, Span Point-1, and Span Point-2 for Individual Filter Display.

Calibration using key menu.

To enter into the Calibration Mode, enter correct password and go to CAL mode and enter into C1CZ menu, press increment or decrement key.

Apply appropriate Input from the source, and press 'DECREMENT KEY' until decimal point of digit 4 of PV-1 starts to blink. It indicates calibration is done.

Same will be applicable for span point 1 and span point 2.

## 8. COMMUNICATION PROTOCOL– MODBUS RTU

### 8.1 Introduction

The unit can be connected in RS-485 communication data link either in multi drop or repeat mode. Each unit must have unique Serial Number. Entire range of addresses (1 to 247) may be used. Before starting any communication, choose a baud rate compatible to the host computer. The serial protocol used is MODBUS RTU.

### 8.2 Function Code for Modbus

CODE	NAME	Function
01	Read Coil Status	Use to Read Coil status, Battery status, Wireless Communication break status, Sensor open status etc.
03	Read Holding registers	Use to read PV, Alarm status, Battery status etc.
04	Read input registers	Use to read programmable registers
06	Preset Single register	Use to write programmable register

The error checking field contains a 16-bit value implemented as two eight-bit bytes. The error check value is the result of a Cyclical Redundancy Check (CRC) calculation performed on the message contents.

### 8.3 Parameter Address Details

Sr. No.	Parameters	Absolute Address	Type	Access Type
1.	channel-1 AL1 H	1	Bit	Read Only
2.	channel-1 AL2 L	2	Bit	Read Only
3.	channel-2 AL1 H	3	Bit	Read Only
4.	channel-2 AL2 L	4	Bit	Read Only
5.	channel-3 AL1 H	5	Bit	Read Only
6.	channel-3 AL2 L	6	Bit	Read Only
7.	Buzzer status	7	Bit	Read Only
8.	AHU OFF	8	Bit	Read Only
9.	AHU TRIP	9	Bit	Read Only

Sr. No.	Parameters	Absolute Address	Type	Access Type
1	Process Value of channel-1	30001	int16_t	Read Only
2	Process Value of channel-2	30002	uint16_t	Read Only
3	Process Value of channel-3	30003	uint16_t	Read Only
4	Alarm Status*	30004	uint16_t	Read Only

Parameter	Alarm Status*															
Bit No.	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0
Description	Future Use							AHU TRIP	AHU OFF	Buzzer status	channel-3 AL2 L	channel-3 AL1 H	channel-2 AL2 L	channel-2 AL1 H	channel-1 AL2 L	channel-1 AL1 H

**NOTE:**

1. Process Value (PV) Error Condition value For Sensor damaged it displays "OPEN" message on display.  
 P.F. : 32767  
 F.F. : 32767  
 H.F. : 32767
2. Process Value (PV) Error Condition value for display range, it displays "OVER" message on display.  
 P.F. : 32766  
 F.F. : 32766  
 H.F. : 32766

**8.4 Exceptional Response**

**TABLE- 8**

CODE	MEANING
01	Function code Invalid. It must be 03, 04, 06 or 16.The function code received in the query is not allowable action for the slave.
02	Illegal address value. The data address received in the query is not an allowable address for the slave.
03	Illegal data value. A value contained in the query data field is not an allowable value for the slave.

## 9. APPENDIX

### 9.1 Troubleshooting

If the operating display does not appear after turning on the unit's power, follow the measures in the procedure below.

If a problem appears complicated, contact our sales representative.

#### **IMPORTANT**

Take note of the parameter settings when asking the vendor for repair.

