BINMASTER

Dust Alarm
DD-3000

INSTALLATION & OPERATING MANUAL

T: (402) 434-9102 | 7201 N 98th Street, Lincoln, NE 68507 USA | www.binmaster.com

925-0357

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1 Notifications

1.1 Technical Support Contact

BinMaster provides industry leading engineering and technical support for all product lines. The technical support department is staffed with a team of engineering professionals. Areas of assistance provided by the technical support department include:

- Pre-Installation Site Analysis
- Product Installation
- General Operation
- Application-Specific Review
- Routine Maintenance

To assure the best and most efficient technical support, please be prepared with the following information prior to contacting BinMaster. If it is determined that the component must be returned for evaluation/repair, a Return Material Authorization (RMA) number will be issued. You must include the RMA number on the packing slip and mark the outside of the shipping container.

- Company Name_____
- Product Model Number_____
- Product Serial Number_____
- Date of Installation_____
- Reason for Return_____

BinMaster Technical Support may be reached by:

Phone: (402) 434-9102

Fax: (402) 434-9133

E-Mail: support@binmaster.com

Hours of Operation: 8:00AM – 5:00PM U.S. Central Time

- Any sensor that was exposed to hazardous materials in a process must be properly cleaned in accordance with OSHA standards and a Material Safety Data Sheet (MSDS) must be completed before it is returned to the factory.
- All shipments returned to the factory must be sent by prepaid transportation.
- All shipments will be returned F.O.B. factory.
- Returns will not be accepted without an RMA number.

1.2 Disclaimer

This document contains important information necessary for proper operation of the product. It is strongly urged that all users of the product read this manual in its entirety. All instructions should be followed properly and any questions that arise should be discussed with BinMaster (A Division of Garner Industries).

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In no event will BinMaster be liable for any mistake, including lost profits, lost savings, or other incidental or consequential damages or injury arising out of the use or inability to use this manual, even if advised of the possibility of such damages, or any claim by any other party. Terms and conditions supplied with each order contain additional liability limitations related to this product.

1.3 Symbols and Conventions

WARNING 	Identifies information about practices or circumstances that can lead to personal injury or death, property damage, or economic loss. Warning statements help you to: • Identify a hazard • Avoid a hazard • Recognize the consequences
IMPORTANT	Identifies information that is critical for successful application and understanding of the product.
	Identifies information, sections or statements in this manual that apply to approved hazardous area systems, regulations, or installation.

1.4 Safety

WARNING

AREA CLASSIFICATION

Before installing any device, confirm area classification requirements as specified on the product label. Do not install any device that is not tagged as suitable for the required area classification.

ENVIRONMENT

Before installing any device, confirm ambient temperature, process temperature, and process pressure requirements. Do not install any device that is not tagged as suitable for the required temperatures and pressures.

NOT A SAFETY RATED DEVICE

This model must not be used independently for safety or as a critical input signal to a safety system. This model is designated for general process control, diagnostics, and environmental monitoring.

GROUNDING

Before turning on the instrument, you must connect the protective earth terminal of the instrument to a proper earth ground. Grounding to the neutral conductor of a single-phase circuit is not sufficient protection.

INSTALLATION AND SERVICE PERSONNEL

Only appropriately licensed professionals should install this product. Always disconnect power before servicing.

Personnel must be familiar with operational hazards, such as those caused by hot, pressurized, or toxic gases, liquids, or particulates.

Service of individual electronics is limited to replacement of the electronics module. Do not attempt to disassemble electronics. Any components that are not operating properly should be returned to BinMaster for service.

2 Introduction

2.1 DD-3000 Overview

The DD-3000 is a single-point/basic functionality dust detector used to monitor particulate in stacks, ducts, and pipes and alert when dust levels exceed preset standards. Applications include baghouse filter leak detection and cyclone overflow. The DD-3000 is available in two versions.

DD-3000

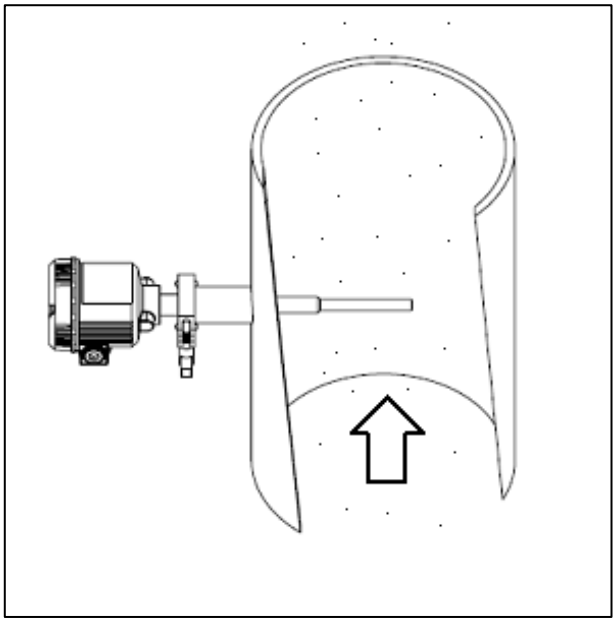
- DD-3000-A
    - Basic Particulate Monitor with Alarm Relay Outputs
    - Integral Electronics Only
- DD-3000-T
    - Basic Particulate 4-20mA Transmitter
    - Integral Electronics Only

Principle of Operation

As dust particles flow near or around the electrically isolated sensing probe, minute charge is continuously induced into the probe. The charge flows through a measurement circuit to ground.

The induced charge signal is digitally analyzed and processed to provide an output that is reasonably linear to mass. The unit of measure is picoamperes (pA).

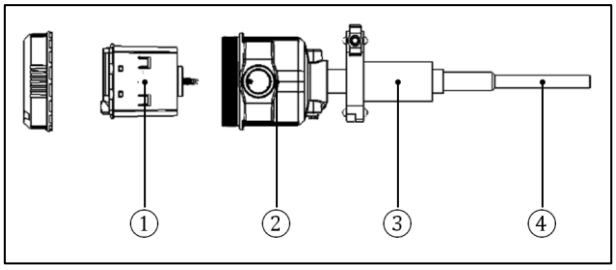
For best understanding of particulate levels, 4-20 mA analog outputs should be converted to pA at remote recording devices or remote displays. When dust exceeds preset levels an alarm status is triggered.



2.2 Components

The DD-3000 consists of the following main elements:

① Electronics Module
② Electronics Enclosure
③ Process Mount
④ Sensing Probe



2.3 Technical Data

Electronics Module

Parameter	Specifications	Notes
Measurement Technology	Charge Induction	
Measurement Units	Picoamperes (pA)	1 x 10^{-12} A
Input Voltage	Universal 20-250 VAC/VDC, 47-63 Hz 18-60VDC Fuse: 1.0A, Slo-Blow 250V, Type 'T' 12-32 VDC Loop Power	
Input Power	3 Watts Max.	
Electronic Resolution, Range	0.5pA, Range 0 to 5,000pA 5.0pA, Range 0 to 5,000pA	
Minimum Detection Level	~1-5 mg/m^3 ~5-10 mg/m^3	
Minimum Particle Size	0.3 Micron	
Temperature Ambient	-13F to +160F (-25C to +71C) -40F to +185F (-40C to +85C)	Operating Storage
Relay Outputs	Form A (SPST) 250 VAC / 5A (Resistive), 2A (Inductive) 30 VDC / 5A (Resistive), 2A (Inductive)	Type Max Rating
4-20mA Output	500Ω Max. Loop Impedance @ 24 VDC Loop Power Adjustable via Keypad	Rating Span
Enclosure	NEMA 4/IP 66 Aluminum, Powder Coated	
Area Classification	Ordinary/General Purpose Only, CE Approved (CSA/UL Approval Pending)	

Sensor Probe

Parameter	Specifications	Notes
Mounting	NPT Male 0.5 in Quick Clamp, 1.5 in	
Wetted Materials	316L Stainless Steel Optional Fully Insulated Probe (Teflon Coating) 316L Stainless Steel, Teflon	Probe Nipple/Mount
Process Temperature Operating Range	-13F to +250F (-25C to +121C) Max. -13F to +450F (-25C to +232C) Max.	
Process Pressure Operating Range	Full Vacuum to 10PSI (0.69 Bar) Max.	

2.4 Model Configuration

DD-3000 Dust Alert	Order Code
Base Unit	
DD-3000: 2-Wire loop powered with 4-20mA output, in a NEMA 4/IP 66 Aluminum enclosure	DD310
DD-3000: 20 to 250 VAC/VDC dual relay output, in a NEMA 4/IP 66 Aluminum enclosure	DD305
DD-3000:18 to 60 VDC dual relay output, in a NEMA 4/1P 66 Aluminum enclosure	DD300
Ambient Temperature	
-13 °F to 158 °F (-25 °C to 70 °C)	S
-40 °F to 158 °F (-40 °C to 70 °C)	L
Resolution and Range	
Resolution: 0.5 pA, Range: 0 to 5,000 pA	1
Resolution: 5.0 pA, Range: 0 to 5,000 pA	2
Probe Length	
Length - 1.5 in (3.8 cm)	L02
Length - 3.0 in (7.6 cm)	L03
Length - 6.0 in (15.2 cm)	L06
Length - 12 in (30.5 cm)	L12
Length - 18 in (45.7 cm)	L18
Length - 24 in (60.9 cm)	L24
Length - 30 in (76.2 cm)	L30
Length - 36 in (91.4 cm)	L36
Process Mount	
NPT Male 0.5 in (1.3 cm) with Mounting Coupling	M1
Quick Clamp, 1.5 in (3.8 cm) with Mounting Kit (Z= Mount Extension Size in Inches)	M3
Process Temperature	
-13 °F to 250 °F (-25 °C to 121 °C) Max.	T1
-13 °F to 450 °F (-25 °C to 232 °C) Max.	T2
-13 °F to 500 °F (-25 °C to 260 °C) Max.	T3
Process Pressure	
Full Vacuum to 10 PSI (0.69 Bar) Max.	1
Additional	
Fully Insulated Probe (Teflon Coating)	C
Enclosure	
NEMA 4/IP 66 Aluminum, Powder Coated	N4
Area Classification	
Ordinary/General Purpose Only, (Approval Pending), CE Mark	G

3 Installation

WARNING

- Only trained professionals should install/maintain this product.
- Shutdown processes that include high temperatures, high pressures, toxic gases, hazardous particulate, or explosion risks prior to installing or removing equipment.

3.1 Location

Temperature, Pressure, and Area Classification

- Do not install any device that is not tagged as suitable for the required area classification.
- Confirm compatibility of sensor ratings with process and installation area.
- Check label for the following:
  - Process temperature rating
  - Process pressure rating
  - Wetted materials
  - Enclosure rating
  - Area classification
- Installation must be in grounded metal duct/pipe. Consult factory for non-metallic duct/pipe solutions.

Enclosure Label Example

BINMASTER

MODEL: **DD-3000**	S/N: **181410338**
INPUT:	**20-250VAC/VDC**
OUTPUT:	**(2) Relay 5A @ 250VAC/30VDC**
RANGE:	**05-5,000pA**
MOUNT:	**0.5in NPT**
LENGTH:	**6.0in (15.2cm)**
PROCESS TEMP:	**-13 to 250F (-25 to 121C)**
PROCESS PRESS:	**Full Vac. to 10PSI (0.7bar)**
WETTED MAT'L:	**Teflon, 316SS**
ENCLOSURE:	**NEMA4 (IP66)**
AREA:	**Ordinary Locations Only**

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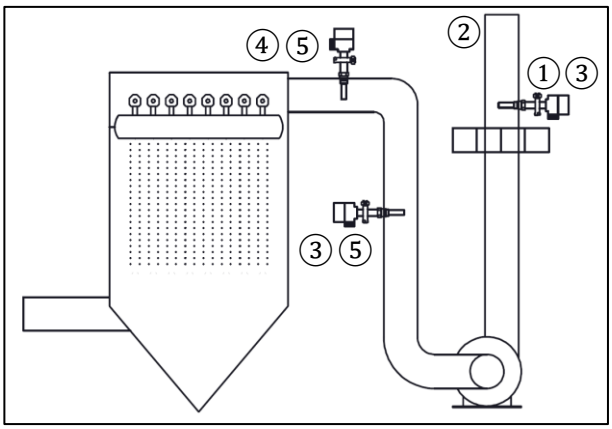
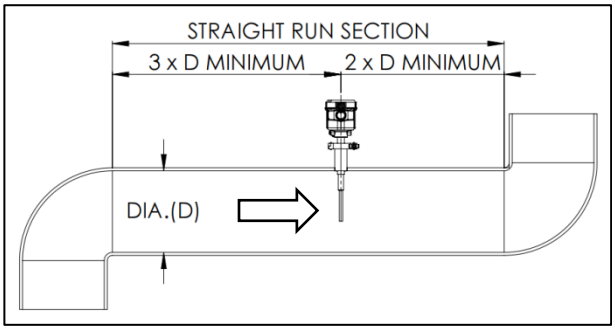
Filter Outlet Locations

① Ensure good access.
② Avoid locating too close to stack exit.
③ Straight runs and laminar flow best for measurement.
④ Short straight runs are acceptable for basic leak detection.
⑤ Accessible negative pressure locations may be preferred to prevent exposure to toxic gases and particulate.



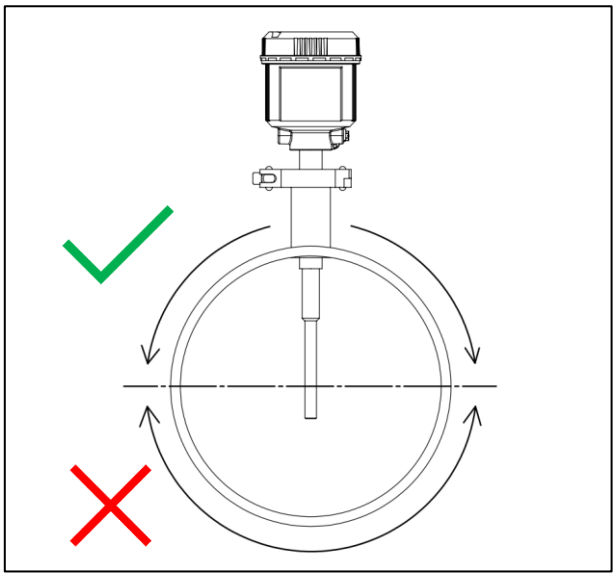
Straight Run Considerations

- Install in straight run if possible (not required).
- Three (3) duct diameters upstream.
- Two (2) duct diameters downstream.
- Straight run can be horizontal or vertical.



Horizontal Pipes/Ducts

- Side or top mount recommended.
- Bottom mount not recommended.
- Proper mount and installation location will prevent buildup.

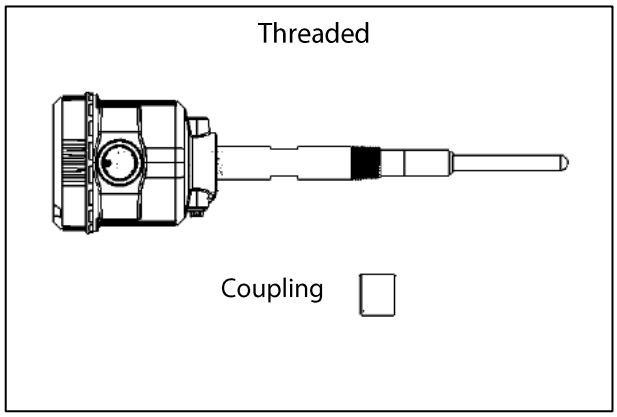


3.2 Process Mounts

The following types of process mounts are available:

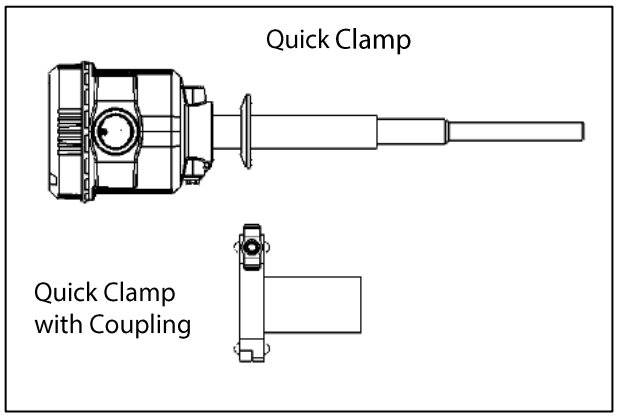
Threaded

- NPT Male 0.5 in (1.3 cm) with Mounting Coupling



Quick-Clamp

- Quick Clamp 1.5 in (3.8 cm) with Mounting Coupling
- Allows quick and easy removal from process
- Allows rotation to easily align

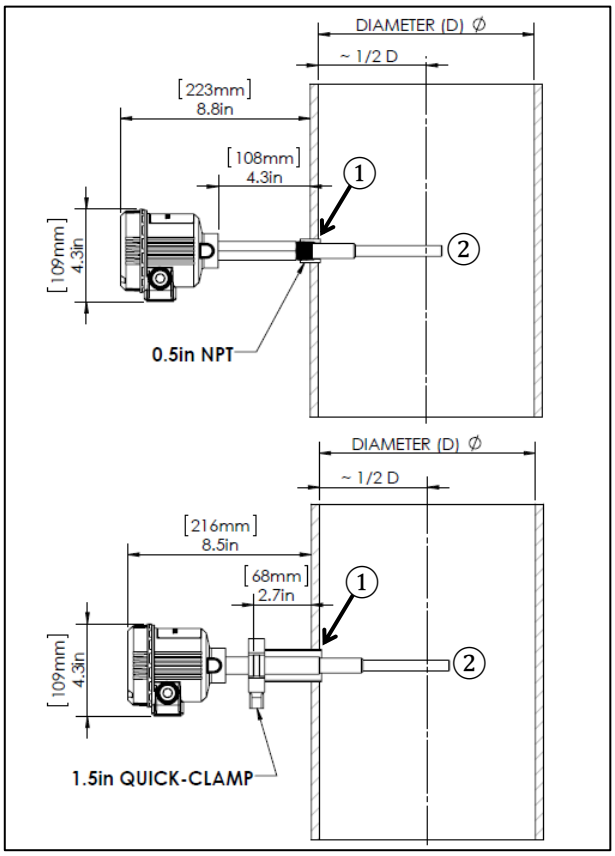


3.3 Mounting

Mounting Considerations

① Process mount should protrude into process 0.125 in (3.175 mm) to 0.5 in (12.7 mm).
② Sensor probe should extend approximately 1/2 of the duct diameter for filter outlet applications.

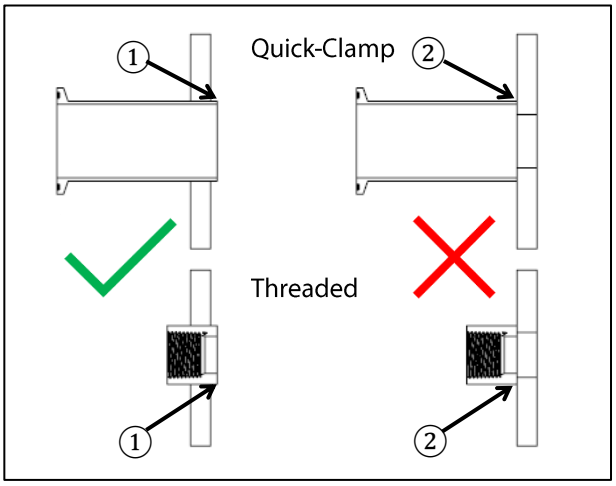
- In smaller pipes, the probe should be 1 in (25.4 mm) minimum from the opposing side.



Welding and Clearance

① "Through weld" half coupling or quick-clamp mount to ensure proper clearance and to prevent particulate buildup in mount. Process mount should protrude into process 0.125 in (3.175 mm) to 0.5 in (12.7 mm).
② Do not face weld.

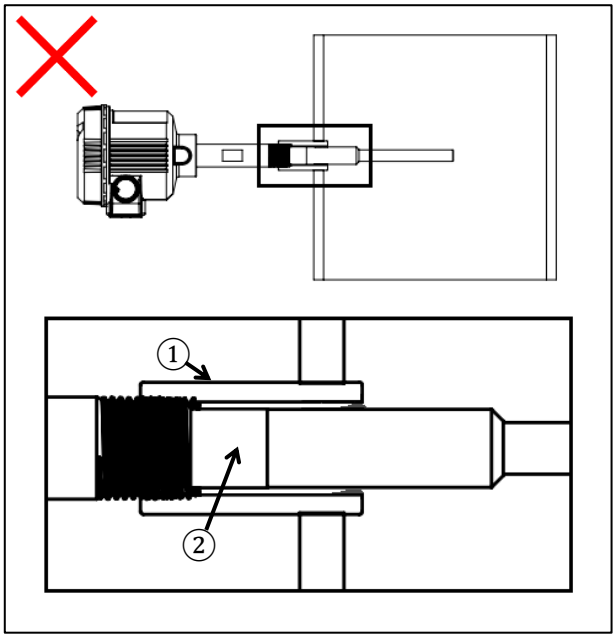
- Weld in center of the duct/pipe, perpendicular to the flow.
- Air and water tight seal.



Improper Extensions

① Do not use an extended or improper mount.
② Extended mounts can cause particulate buildup on the insulator and sensing probe.

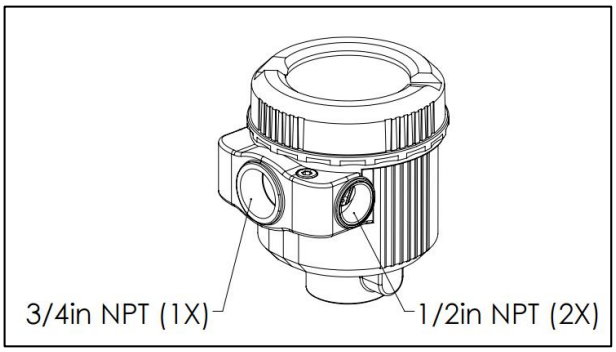
- Do not use non-stainless steel mounts that may corrode and cause corrosive residue to drip on the sensor.



4 Wiring

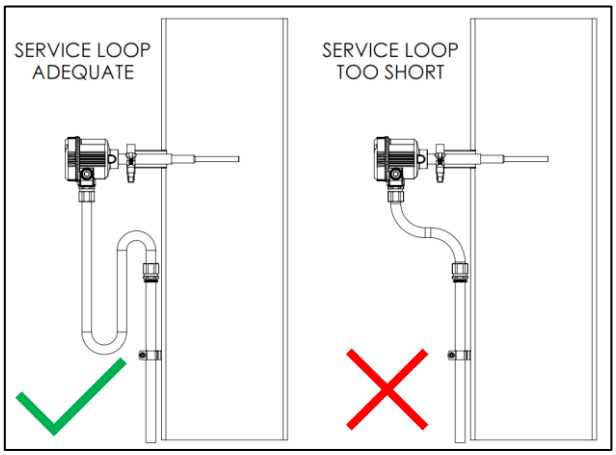
Conduit Entries

- One (1) ¾" and two (2) ½" NPT entries provided.
- Conduit fittings should be tight.
- Conduit should be routed downward to prevent moisture from entering enclosure.



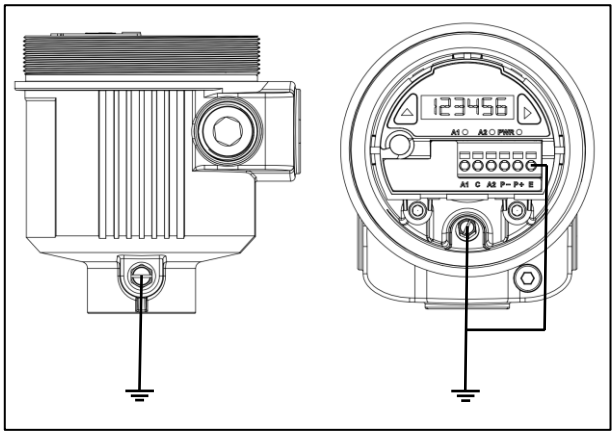
Recommended Service Loop

- Flex conduit and ground cable should be sufficient length to allow removal of the sensor.
- Recommended service loop is 1 to 2 times the sensor probe length.
- Service loop should extend downward to prevent moisture from entering enclosure.



Grounding

- Required for reliable operation and safety.
- DD-3000-T: Earth ground connection is made through the process mount. Grounding to the enclosure ground studs is not required.
- DD-3000-A: Earth ground connection should be made to one of the three ground locations:
    - External enclosure ground screw.
    - Internal enclosure ground screw.
    - Electronics module earth ground terminal.
- Analog wiring cable shield should be terminated to earth ground in PLC/DCS cabinet or at panel meter (terminate at one end only).
- Ground wire should not impede service loop.



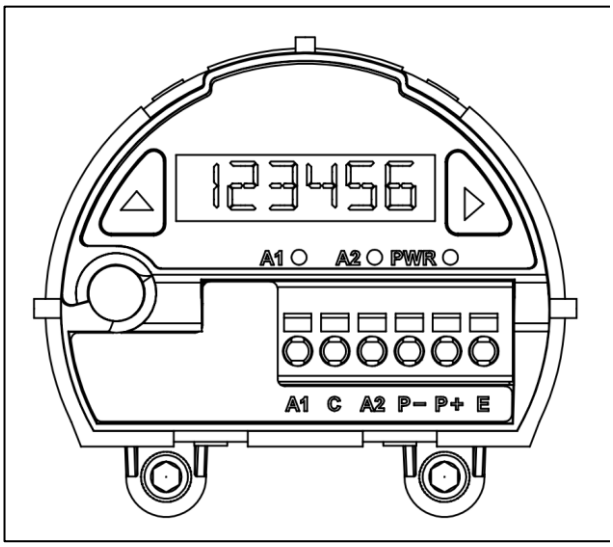
GROUNDING IN HAZARDOUS AREAS

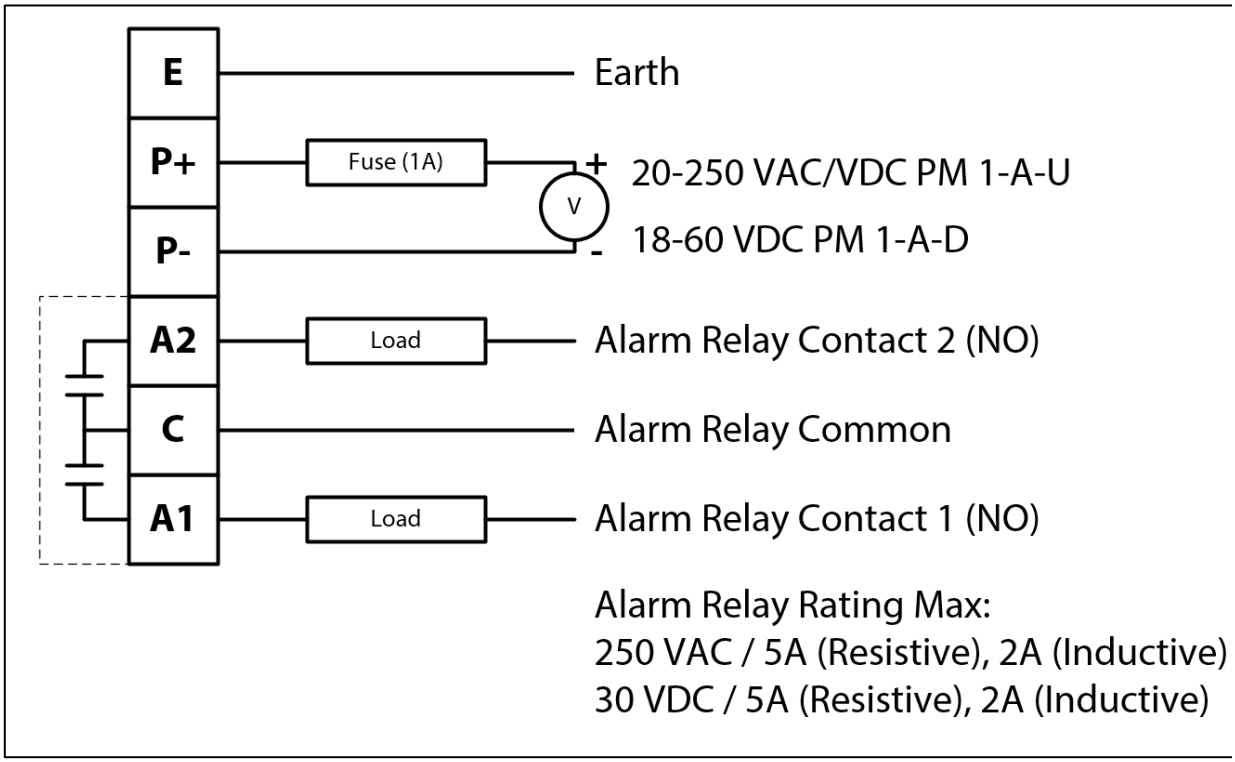
- For hazardous area applications, an external sensor earth ground cable is required to maintain sensor grounding during installation and maintenance.
- The ground cable must remain attached when the sensor is temporarily removed from the process. Do not disconnect the ground cable.

4.1 Terminal Connections

DD-3000-A

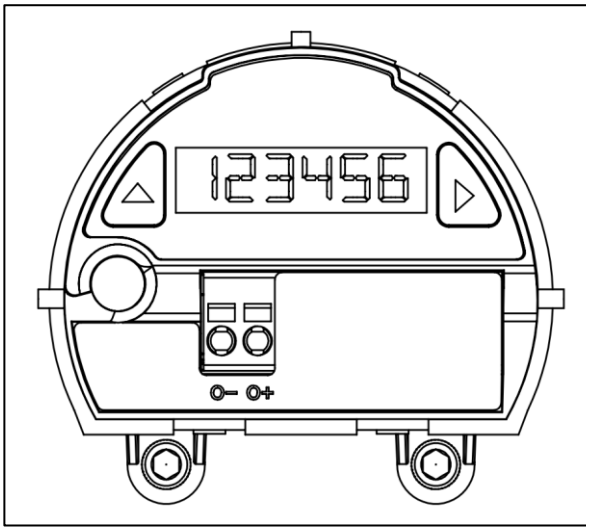
- Terminal connections for power and two alarm relays.
- All wiring must be rated for 250V minimum.
- Always disconnect power before connecting/ removing wiring from the terminal connectors.

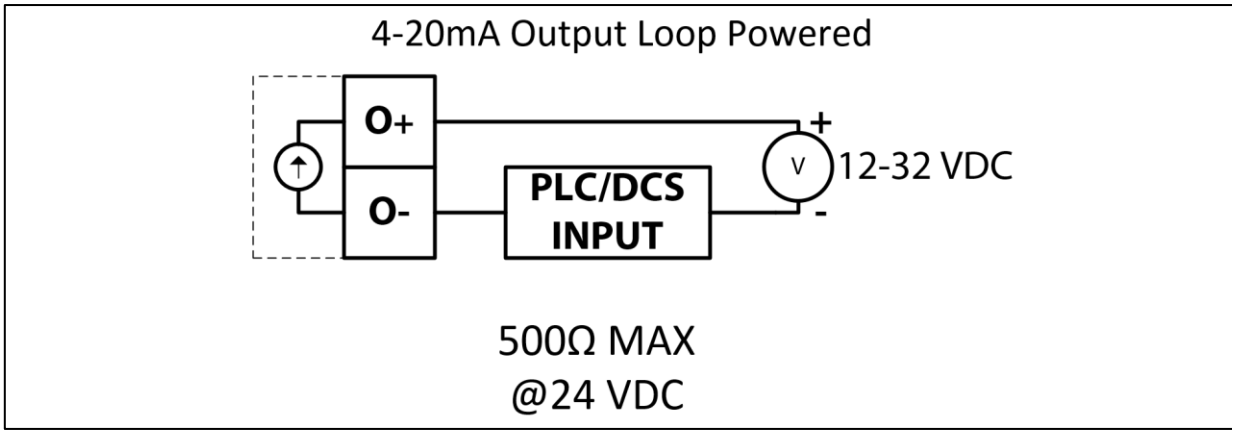




DD-3000-T

- Terminal connection for loop powered analog output.
- All wiring must be rated for 250V minimum.
- Always disconnect power before connecting/ removing wiring from the terminal connectors.
- Analog 4-20mA wire should be 22 AWG stranded shielded twisted pair, Belden 88761 or equivalent.
- Analog wiring cable shield should be terminated to earth ground in PLC/DCS panel/cabinet (terminate one end only).





5 Operation

5.1 User Interface

The user interface consists of two navigation keys and a digital readout. The DD-3000-A also includes status LEDs for power and alarms. Upon power up, the particulate measurement is shown, from which the user can view live values or choose to access the **Settings**.

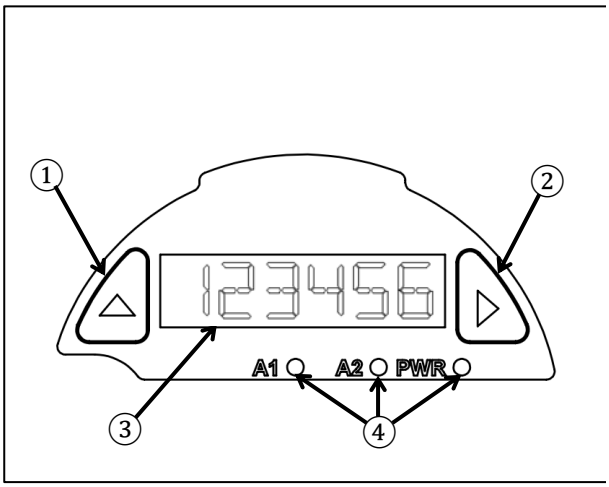
Keypad

Key	Description
① Up/Next 	• Next reading or setting • Increment value
② Right/Enter 	• Enter setting • Move cursor right • Accept value

Display and LEDs

Key	Description
③ Digital Readout	• 6-Character display with decimals
④ Status LEDs	• DD-3000-A only • Alarms and power indications

User Interface



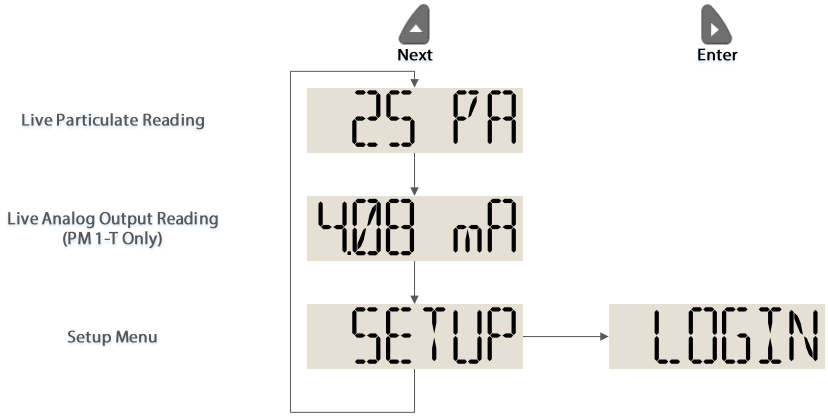
Status LEDs (DD-3000-A Only)

LED	State	Meaning
A1	Red Off	• Alarm 1 active • Alarm 1 inactive
A2	Red Off	• Alarm 2 active • Alarm 2 inactive
PWR	Green Off	• Power • No power

5.2 Settings

Live Particulate Reading

Upon power up, the **Live Particulate Reading** is shown in picoamps (pA) (the actual measured value from particulate charge). Pressing the NEXT key will cycle from the **Live Particulate Reading (pA),** to the corresponding **Live 4-20mA Reading** (DD-3000-T only), and the **Setup** display. Pressing the ENTER key on **Setup** will enter the **Login** display.

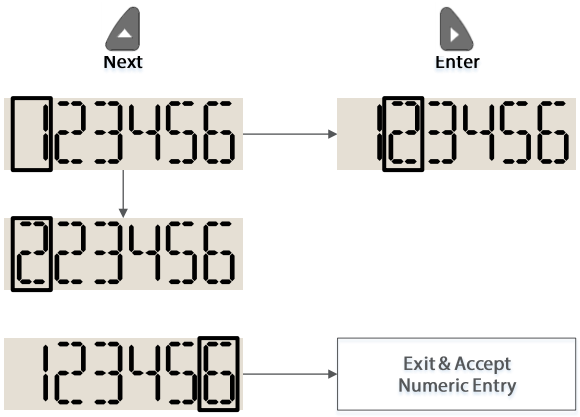


User Login

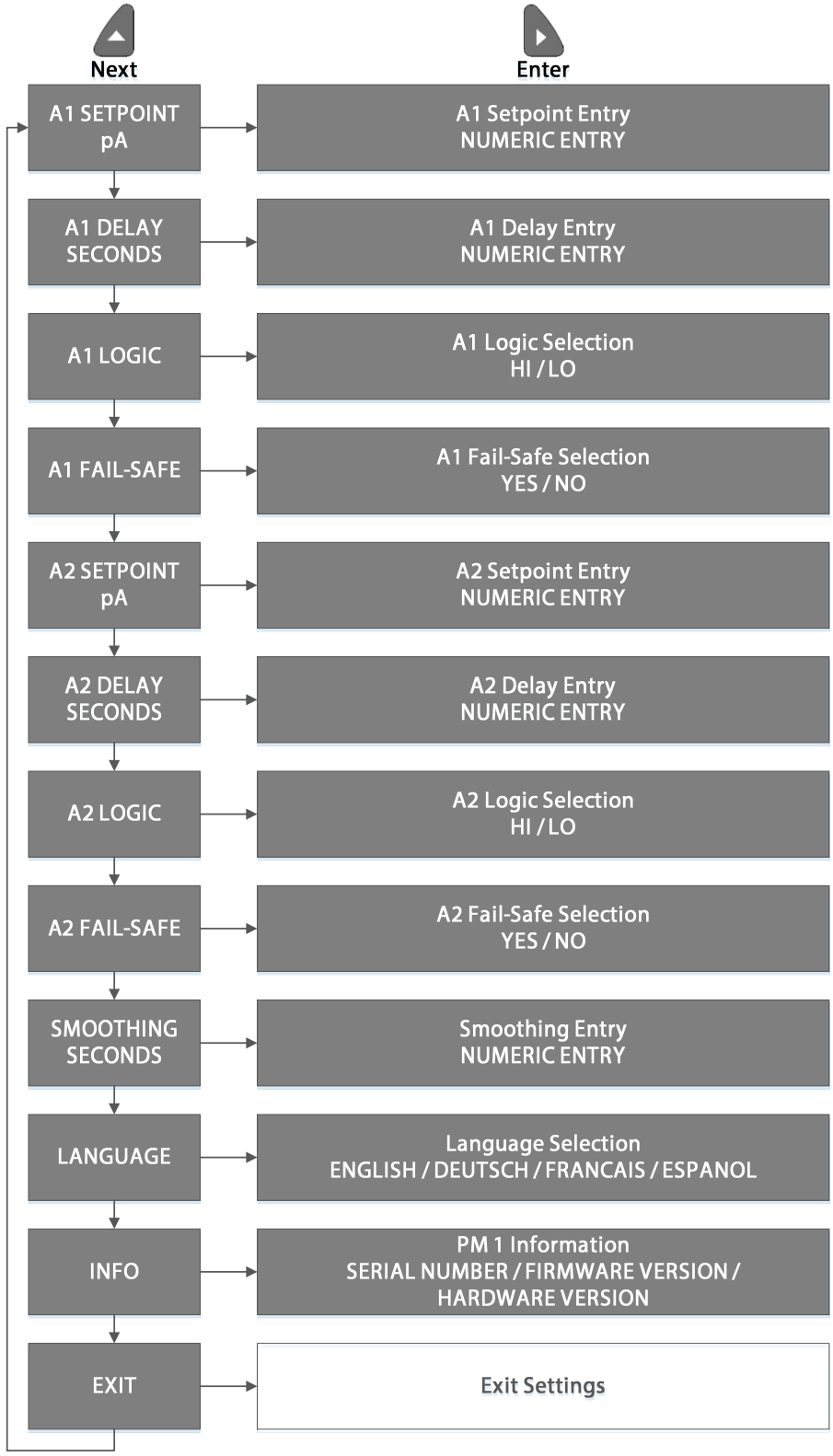
Login is required to access the **Settings** and is valid until power is removed, or after 5 minutes without keypad activity. Default passwords cannot be changed.

User Level	Password	Permissions
Operator	0	View live process readings and all settings, no changes allowed.
Engineer	55	View and change all settings.

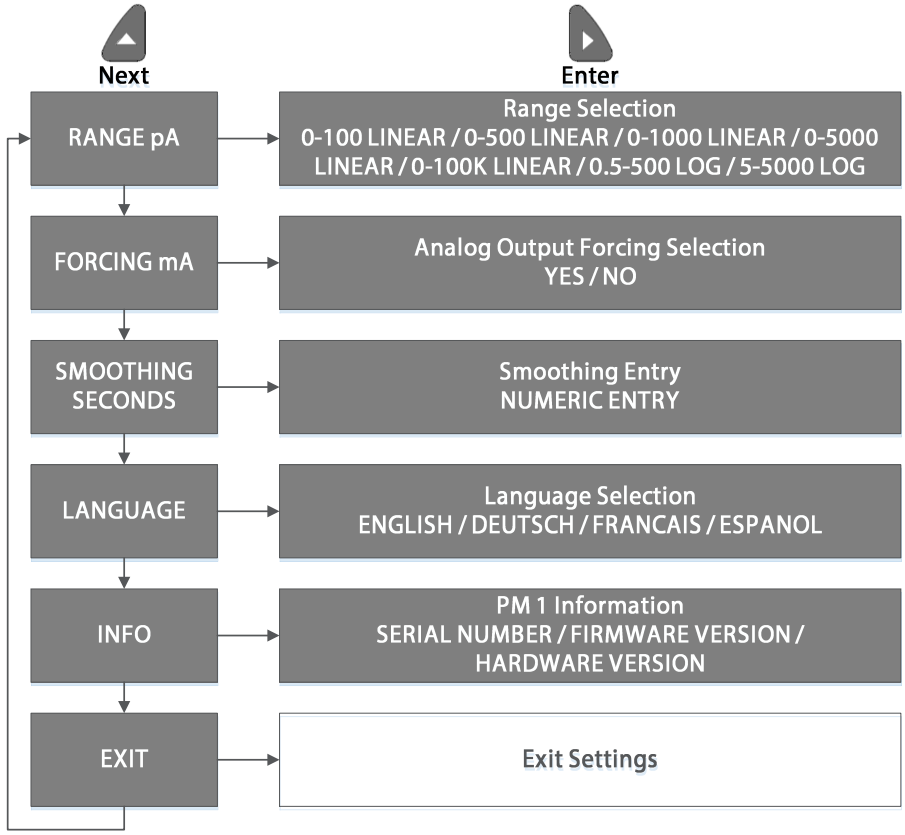
Numeric Entry



Settings (DD-3000-A)



Settings (DD-3000-T)

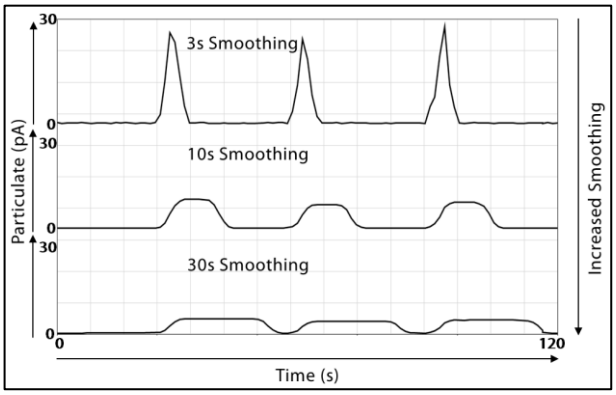


6 Commissioning

6.1 Signal Smoothing

IMPORTANT Alarms and ranges should be adjusted **after** changes are made to **Smoothing Seconds**.

- A signal smoothing adjustment is provided to fine tune the real-time output.
- Adjust for reasonably stable baseline readings, while response to peaks remains dynamic and fast.
- Adjusting too high may limit setting an alarm based on peaks.
- Adjusting too low may result in an output that is too dynamic to easily interpret.



Smoothing Seconds example. Actual response is application dependent.

Setting	Default	Notes
Smoothing Seconds	3	Signal smoothing. Increase for smoother reading, decrease for more dynamic.

6.2 Alarms (DD-3000-A)

Two alarms are available in the DD-3000-A. An alarm will be activated when the particulate measurement increases above (HI **Alarm Logic**) or decreases below (LO **Alarm Logic**) the **Alarm Setpoint** continuously for a period longer than the **Alarm Delay** setting. The LED status will correspond with the associated alarm. The default alarm configuration is listed below.

IMPORTANT **ALARM LEVELS**

Appropriate alarm levels will vary by process and user needs. Default alarm levels should not be relied on without careful review of each process.

Alarm Settings

Setting	Default	Notes
A1 Setpoint pA	30	Limit for alarm 1 activation
A1 Delay Seconds	10	Amount of time reading must be in alarm condition to activate alarm 1
A1 Logic	HI	Activation logic (HI or LO)
A1 Fail-Safe	No	Determines relay state of alarm 1 output (closed/open)
A2 Setpoint pA	100	Limit for alarm 2 activation
A2 Delay Seconds	5	Amount of time reading must be in alarm condition to activate alarm 2
A2 Logic	HI	Activation logic (HI or LO)
A2 Fail-Safe	No	Determines relay state of alarm 2 output (closed/open)

Alarm Logic

Alarm Logic defines how the particulate alarms are activated. When the **Alarm Logic** setting is set to **HI**, the alarm is activated when the input rises above the **Alarm Setpoint** continuously for a period longer than the **Alarm Delay**. When **Alarm Logic** is set to **LO**, the alarm is activated when the input falls below the **Alarm Setpoint** continuously for a period longer than the **Alarm Delay**. **LO Alarm Logic** is used for loss of flow applications.

Fail-Safe Relay State

Fail-Safe Mode	Power Off/Removed	Normal Operation	Active Alarm
Normal (No)	Open	Open	Closed
Fail-Safe (Yes)	Open	Closed	Open

6.3 Analog Output (DD-3000-T)

The DD-3000-T is a 4-20mA transmitter, which can be used for trending live particulate readings in external devices. The selectable **Range** can be set to one of five linear ranges or two logarithmic ranges. After selecting the desired **Range**, the output can be forced to verify proper wiring and scaling in the connected device.

Analog Output Settings

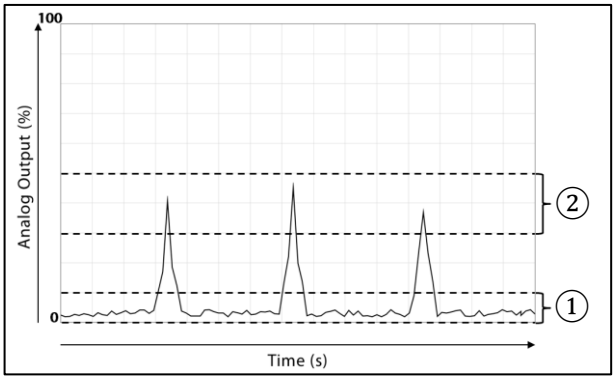
Setting	Default	Notes
Range pA	0-1000 Linear	Range selection for the analog output. Available ranges include 0-100 Linear, 0-500 Linear, 0-1000 Linear, 0-5000 Linear, 0-100K Linear, 0.5-500 Log, 5-5000 Log.
Forcing mA	No	Stepwise simulation of analog output (YES or NO)

Analog Output Range Selection

- Range selection recommendations:

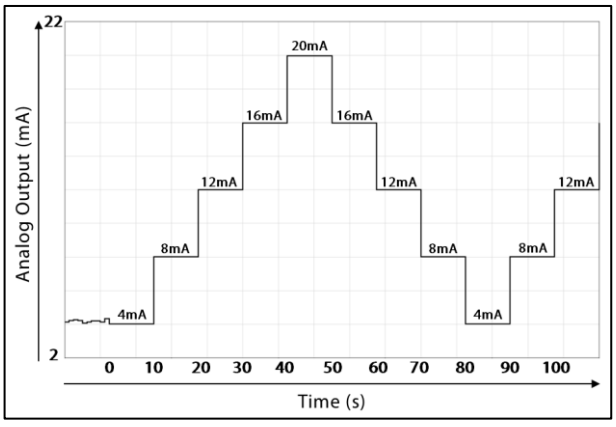
① Baseline is 0-10% of range.

② Peaks are 30-50% of range.



Analog Output Forcing

- Set **Forcing mA** to **Yes** to force a step-change output for testing the analog output in a stepwise manner.
- Output will follow the pattern shown.
- Each step will last for 10 seconds from 4mA to 20mA and back down in a cyclic pattern.
- Forcing cycles will either end automatically after four (4) cycles (5 minutes 30 seconds) or can be stopped before completion by setting **Forcing mA** to **No**.
- Once simulation has ended, the analog output will continue with normal operation.



7 Alarm Setpoint Guidance

Alarms should be set based on observing the output over the full range of normal operating conditions. For fabric filter applications, monitor the readings when the filter media is in good non-leaking condition and with cleaning both disabled and enabled. For filter applications, baseline and peak particulate readings following cleaning cycles should be noted.

Once a good set of readings is observed, alarms should be set based on the alarming objective. In all cases recall the output of a DD-3000 dust detector is reasonably linear/proportional to mass. This means that if the readings increase by a factor of 3, for example, the amount of particulate will have increased by a factor of 3. If during normal operation the baseline is always 0pA, contact the factory for a model with lower detection capabilities.

The following are the main approaches to setting the alarms.

Leak Alarming (focus is on detecting leaks in filter media)

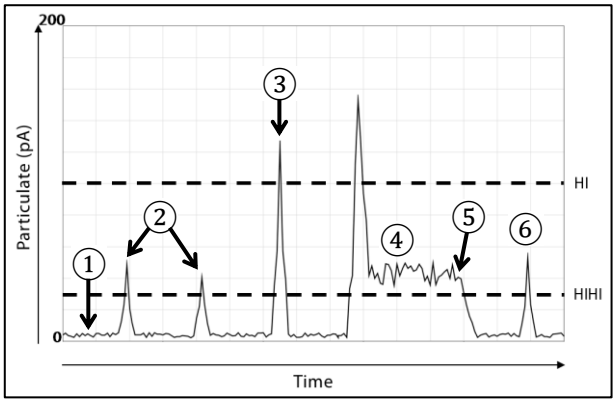
- Adjust **Smoothing Seconds** for good response to cleaning cycles while keeping the baseline fairly stable.
- Set a **HI** (peak) alarm to capture increasing cleaning cycle peak readings at 1.5x to 5x typical peak height with a 1- to 5-second delay. This provides an early warning alarm.
- Set a **HIHI** (baseline) alarm to capture increasing baseline readings at 2x to 10x average baseline reading with a 30- to 180-second delay.

Proportional Alarming (focus is on detecting a relative change in the mass concentration)

- Adjust **Smoothing Seconds** for relatively stable particulate readings.
- Set a **HI** (peak) alarm at a desired multiple over the average baseline reading with a 1- to 60-second delay.
- Set a **HIHI** (baseline) alarm at a desired multiple over the average baseline reading with a 30- to 360-second delay.

Example of Typical Baghouse/Dust Collector Readings

① Normal baseline.
② Normal peaks from cleaning cycles.
③ Filter wear causes an increase in the cleaning peak. Early warning alarm of filter leak-through (HI alarm).
④ Filter leak increases, causing a baseline shift. HIHI alarm triggered.
⑤ Filter replaced.
⑥ Baseline and cleaning peaks return to normal levels.



Typical Readings for Modern Efficient Fabric Filters

Average Baseline	Peaks (After Cleaning Cycles)	Filter Condition
1 to 10pA	Less than 50pA	No significant leaks
10 to 100pA	50 to 500pA	Onset of leaks
100 to 1000pA	500 to 5000pA	Significant leaks present

8 Functional Verification

To verify operation after commissioning or otherwise as needed, the following 3 checks should be performed:

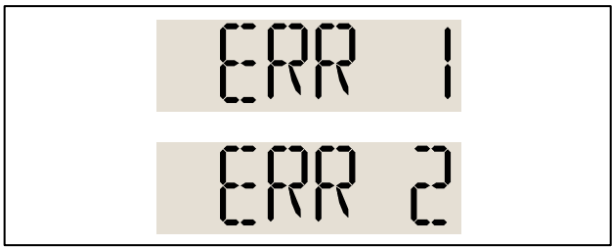
1. Power-Up Check
2. System-Zero Check

8.1 Power-Up Check

A **Power-Up Check** can be initiated to check the general functionality of the particulate monitor. The check occurs each time the instrument is powered up. A failed status result will remain until power is cycled and the error has cleared. Follow the steps below to run a **Power-Up Check**:

Power-Up Check Procedure

1. Cycle power to the DD-3000.
2. If ERR 1 or ERR 2 is displayed on the digital readout, follow the steps outlined in the Troubleshooting section of this manual.



8.2 System-Zero Check

A **System-Zero Check** is an in situ (fully installed) test of the entire system when there is no airflow. A **System-Zero Check** confirms proper installation and zeroing of the electronics and sensing probe when fully installed.

System-Zero Procedure

1. Shut down the process and fan. Ensure process flow has completely stopped. The slightest amount of flowing particles can create a signal.
2. Monitor the particulate reading for a system zero.

9 Troubleshooting

Issue	Action
Display reads ERR 1	• Replace electronics module. • Return faulty electronics module to factory for evaluation/repair.

Display reads ERR 2	• Inspect the electronics enclosure to check that water has not entered the enclosure.
	  ○ If water is found, contact Technical Support.
	• Inspect the particulate sensor and process mount for particulate buildup, moisture, and/or damage.
	  ○ Clean the sensor of all particulate and moisture.
	  ○ If damage is found, contact Technical Support.
	• After performing the above inspections, cycle power to the particulate monitor. If the issue remains, contact Technical Support.

Elevated Flat-Lined Reading (with process running)	• Perform a **Power-Up Check** to verify the electronics module. • Confirm correct scaling between 4-20mA output and PLC. • Inspect the electronics enclosure to check that water has not entered the enclosure. ○ If water is found, contact Technical Support.
High Dynamic Reading (with process running)	• Check to make sure the particulate has not increased. Leaking filters and filter cleaning cycles can cause high dynamic readings. The particulate sensor detects very low levels of particulate. Small leaks can cause alarms. • Verify DD-3000 is grounded to earth with less than 1Ω of impedance per the specifications in the **Grounding** section. • Check the **Signal Smoothing** adjustment. • Confirm correct scaling between 4-20mA output and PLC. • If nothing is found, perform a **System-Zero Check**.
Relay Not Responding	• Verify alarm LED status. Remove all wiring from the output and connect the output to an ohmmeter. Check continuity across relay output circuit.
Analog Output Not Responding	• Use a multimeter in series to verify that the milliamps match the milliamp measurement on the digital readout. • Force the analog output.

10 Maintenance

- Only trained professionals should install/maintain this product.
- Shutdown processes that include high temperatures, high pressures, toxic gases, hazardous particulate, or explosion risks prior to installing or removing equipment.

Electronics Module

DD-3000 electronics are normally drift free and require no periodic maintenance or electronics calibration by the user.

Particulate Sensor

DD-3000 particulate sensors properly configured for the application generally do not require periodic maintenance other than an annual inspection. This should be verified by conducting functional verification checks of the electronics and manually inspecting the sensor after one and six months of operation. After these two initial checks, if no need for sensor maintenance is observed, an annual inspection is recommended.

Dust Alert Inspection

Each inspection should consist of the following:

- Visually inspect inside the sensor enclosure.
- Remove the sensor from the process and inspect the probe and insulator for buildup and/or moisture.
    - The sensor probe and insulator may be wiped down with a damp rag.
    - Fully insulated probes are recommended for processes with moisture and most conductive particulates.
- Inspect the inside of the process mount for buildup and/or moisture.
- Check the outputs.
- Perform **Functional Verification** checks.