**D2E Duct Smoke Detector**

**SPECIFICATIONS**
- Operating Temperature: -20° to 60°C
- Storage Temperature: -20° to 60°C
- Humidity: 0% to 95% Relative Humidity Non-condensing
- Air Velocity: 1 to 20.3 m/sec
- Rectangular Footprint Dimensions: 37 cm L x 12.7 cm W x 6.34 cm D
- Square Footprint Dimensions: 19.7 cm L x 22.9 cm W x 6.35 cm D
- Weight: 0.73 kg
- Power supply voltage: 8.5 - 35 VDC
- Input capacitance: 0.1 µF max
- Reset Voltage: 2.5 VDC min
- Reset Time (with RTS451/RTS151): 0.3 to 0.3 sec
- Power Up Time: 3.5 sec max
- Alarm response time: 15 sec.
- Sensitivity Test: See detector label
- Current Requirements (Using No Accessories) - Sensitivity Test: See detector label
- Peak standby current: 130µA
- Average standby current: 49µA
- Max alarm current: 130mA

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**BEFORE INSTALLING**
Read the System Sensor Guide for Proper Use of Smoke Detectors in Duct Applications [A05-1004] which provides detailed information on detector spacing, placement zoning wiring and special applications. Copies of this manual are available online at www.systemsensor.com. Refer also to local standards and codes of practice.

**NOTICE:** This manual shall be left with the owner/user of this equipment.

**IMPORTANT:** This detector must be tested and maintained regularly. The detector should be cleaned at least once a year.

**[1] LIMITATIONS OF DUCT SMOKE DETECTORS**

**WARNING**

DUCT DETECTORS MUST NOT BE USED AS A SUBSTITUTE FOR OPEN AREA DETECTOR PROTECTION as a means of providing life safety. Nor are they a substitute for early warning in a building’s regular fire detection system.

This device will not operate without electrical power. Fire situations may cause an interruption of power. The system safeguards should be discussed with your local fire protection specialist.

This device will not sense smoke unless the ventilation system is operating and the cover is installed.

For this detector to function properly it MUST be installed according to the instructions in this manual. Furthermore, the detector MUST be operated within ALL electrical and environmental specifications listed in this manual. Failure to comply with these requirements may prevent the detector from activating when smoke is present in the air duct.

**[2] GENERAL DESCRIPTION**

Smoke introduced into the air duct system will be distributed throughout the entire building. Smoke detectors designed for use in air duct systems are used to sense the presence of smoke in the duct.

Model D2E Duct Smoke Detector utilizes photoelectric technology for the detection of smoke. This detection method when combined with an efficient housing design, samples air passing through the duct allowing detection of a developing hazardous condition. When sufficient smoke is sensed an alarm signal is initiated and appropriate action can be taken to shut off fans, blowers, change over air handling systems, etc. These actions can facilitate the management of toxic smoke and fire gases throughout the areas served by the duct system.

**[2.1] DETECTOR FEATURE SET**

- Uses 2351E, ECO1003 and 2020P Detector Heads
- Sampling tubes installed from front or rear
- Compatible with existing accessories

**[3] CONTENTS OF THE DUCT SMOKE DETECTOR KIT**

- Sensor/power board assembly and covers
- Three #10 sheet metal screws for mounting
- One test magnet
- Drilling template
- One sampling tube end cap
- One plastic exhaust tube

**NOTE:** A sampling tube must be ordered to complete the installation. It must be the correct length for the width of the duct where it will be installed. See Table 1 on page 3 to determine the inlet tube required for different duct widths.

**ACCESSORY CURRENT LOADS AT 24 VDC**

<table>
<thead>
<tr>
<th>DEVICE</th>
<th>STANDBY</th>
<th>ALARM</th>
</tr>
</thead>
<tbody>
<tr>
<td>RA400Z/RA100Z</td>
<td>0mA</td>
<td>12mA Max.</td>
</tr>
</tbody>
</table>
[5] DETECTOR INSTALLATION

[5.1] VERIFY DUCT AIR FLOW DIRECTION AND VELOCITY
Model D/E detectors are designed to be used in air handling systems having air velocities of 1.5 to 20.3 m/sec. Duct widths from 15.3 to 30.5 cm can be accommodated. Be sure to check engineering specifications to ensure that the air velocity in the duct falls within these parameters. If necessary, use a velocity meter (anemometer) to check the air velocity in the duct.

[5.2] DETERMINE MOUNTING LOCATION AND CONFIGURATION
On ducts wider than 45.7 cm it is recommended that the detector be mounted downstream of a bend obstruction in the duct or the supply or return air inlet.

Exception: Installation of duct detectors can be on or within a commercial packaged rooftop heating and air-conditioning system fire/smoke dampers and economizers. They may be mounted in either the supply and/or return air section as determined by local code.

Once a suitable location is selected, determine if the detector is to be mounted in a side-by-side “rectangular” configuration or a top-over-bottom “square” configuration as shown in Figure 2. If mounting in the square configuration remove the rear attachment screw rotate the unit at hinge and replace the screw into the new attachment hole as shown in Figure 2. Do NOT remove the hinge screw during this process. Final installation approval shall be based upon passing section 10.4.2 and 10.4.4 tests.

[5.3] DRILL THE MOUNTING HOLES
Remove the paper backing from the mounting template supplied. Affix the template to the duct at the desired mounting location. Make sure the template lies flat and smooth on the duct.

[5.3.1] FOR RECTANGULAR SIDE-BY-SIDE MOUNTING CONFIGURATION:
Center punch at (4) target centers: (2) “A” for sampling tubes and (2) “B” for the rectangular configuration mounting tabs as shown on mounting template. Drill pilot holes at target “A” centers and cut two 3.5 cm diameter holes using a 3.5 cm hole saw or punch. Drill 4 mm diameter holes using a 4 mm drill at target “B” centers.

[5.3.2] FOR SQUARE TOP-OVER-BOTTOM MOUNTING CONFIGURATION:
Center punch at (4) target centers: (2) “A” for sampling tubes and (2) “C” for the square configuration mounting tabs as shown on mounting template. Drill pilot holes at target “A” centers and cut two 3.5 cm diameter holes using a 3.5 cm hole saw or punch. Drill 4 mm diameter holes using a 4 mm drill at target “C” centers. If desired, drill an additional 4 mm hole at the location of one of the mounting tabs on the lower housing.

[5.4] SECURE THE DUCT DETECTOR TO THE DUCT
Use two ‘rectangular configuration’ or three ‘square configuration’ of the provided sheet metal screws to screw the duct detector to the duct.

CAUTION: Do not overtighten the screws.
[6.1] SAMPLING TUBE SELECTION

The sampling tube must be purchased separately. Order the correct length as specified in Table 1 for width of the duct where it will be installed. It is recommended that the sampling tube length extend at least \( \frac{2}{3} \) across the duct width for optimal performance.

**TABLE 1. SAMPLING TUBES RECOMMENDED FOR DIFFERENT DUCT WIDTHS:**

<table>
<thead>
<tr>
<th>Outside Duct Width</th>
<th>Sampling Tube Recommended*</th>
</tr>
</thead>
<tbody>
<tr>
<td>Up to 30.5 cm</td>
<td>DST1</td>
</tr>
<tr>
<td>30.5 to 61 cm</td>
<td>DST1.5</td>
</tr>
<tr>
<td>61 to 122 cm</td>
<td>DST3</td>
</tr>
<tr>
<td>122 to 244 cm</td>
<td>DST5</td>
</tr>
<tr>
<td>244 to 366 cm</td>
<td>DST10 (2-piece)</td>
</tr>
</tbody>
</table>

*Must extend a minimum of \( \frac{2}{3} \) the duct width.

The sampling tube is always installed with the air inlet holes facing into the air flow. To assist proper installation, the tube’s connector is marked with an arrow. Make sure the sampling tube is mounted so that the arrow points into the airflow as shown in Figure 3. Mounting the detector housing in a vertical orientation is acceptable provided that the air flows directly into the sampling tube holes as indicated in Figure 3. The sampling tube and exhaust tube can be mounted in either housing connection as long as the exhaust tube is mounted downstream from the sampling tube.

**FIGURE 3. AIR DUCT DETECTOR SAMPLING TUBE:**

![Sampling Tube Diagram](image)

CAUTION: The sampling tube end cap included with the detector is critical to proper operation of the duct smoke detector. The end cap is needed to create proper airflow to the sensor and to seal the duct. The sampling tube end cap is installed by measuring the pressure difference between the inlet and outlet ports on the detector housing using a manometer as described in Section 10.4.4 of this manual.

Use a 4.9 mm drill and add the appropriate number of holes so that the total number of holes exposed to the air flow in the duct is 10 to 12. The holes should be evenly spaced as uniformly as possible across the width of the duct. If there are more than 2 holes in the section of the tube, extend out of the opposite side of the duct. Drill a 1.9 cm hole in the duct opposite the hole already cut for the sampling tube. Ensure that the sampling tube is angled downward from the duct smoke detector to allow for moisture drainage away from the detector. The sampling tube should be angled at least 45 cm downward for every 30.5 cm of duct width per Figure 4. There should be 10 to 12 holes spaced as evenly as possible across the width of the duct. If there are more than 2 holes in the section of the tube, extend out of the duct. Plug the end with the end cap and tape closed any holes in the protruding section of the tube. Be sure to seal the duct where the tube protrudes.

**FIGURE 4:**

![Diagram of Sampling Tube](image)

CAUTION: Air currents inside the duct may cause excessive vibration especially when the longer sampling tubes are used. In these cases, a 74 cm flange available at most plumbing supply stores may be used to fasten the sampling tube to the other side of the duct. When using the flange connector mounting technique, drill a 2.3 to 2.5 cm hole where the flange will be used. In ducts wider than 91.4 cm, use a 4.9 mm drill and add the appropriate number of holes so that the total number of holes exposed to the air flow in the duct is 10 to 12. Space the additional holes as evenly as possible over the length of the tube.

NOTE: This procedure should only be used as a temporary fix. It is not intended as a permanent substitute for ordering the correct length tubes.

[6.4] REMOTE SAMPLING TUBE INSTALLATION

The detector arrangement can also incorporate the remote mounting of the sampling tube and exhaust tube. In this case, both the detector sampling tube and exhaust tube if included should be rigidly mounted to withstand the pressure and vibrations caused by the air velocity. The location of the detector’s sampling tube should be such that there is uniform airflow in the cross section area of the duct.

The pressure differential across the sampling and exhaust ports in the detector housing shall be verified to be between 25 and 25.2 mm of water. Do so by measuring the pressure difference between the inlet and outlet ports on the detector housing using a manometer as described in Section 10.4 of this manual.

[7.3] AIR FLOW

The D2E is designed to operate over an extended air speed range of 15 to 30.3 m/sec. To verify sufficient sampling of ducted air, turn the air handler on and use a manometer to measure the differential pressure between the two sampling tubes. The differential pressure should measure at least 20 mm of water and no more than 28.4 mm of water. Because most commercially available manometers cannot accurately measure very low pressure differentials, a pressure higher than 356 m/sec of duct air speed may require one of the following: 8 the use of a current-sourcing pressure transmitter (per Section 7.1, or 19 the use of aerosol smoke per section 7.1.4.4.
[7.2] LOW FLOW AIR FLOW TEST USING DYER SERIES 607 DIFFERENTIAL PRESSURE TRANSMITTER

Verify the air speed of the duct using an anemometer. Air speed must be at least 1.5 m/s. Wire the transmitter as shown in Figure 5. Connect the leads of the meter to either side of the 1000Ω resistor. Allow unit to warm up for 15 seconds. With both HIGH and LOW pressure ports open to ambient air, measure and record the voltage drop across the 1000Ω resistor. Subtract the voltage recorded in measurement 1 from the voltage recorded in measurement 2. If the difference is greater than 0.15 volts, there is enough air flow through the duct smoke detector for proper operation.

FIGURE 5. PROCEDURE FOR VERIFYING AIR FLOW:

[Diagram showing connections and measurements]

[8] FIELD WIRING; INSTALLATION GUIDELINES

All wiring must be installed in compliance with local wiring regulations and codes of practice. Proper wire gauges should be used. Connect smoke detectors to control panels and accessory devices should be color-coded to prevent wiring mistakes. Improper connections can prevent a system from responding properly in the event of a fire.

For signal wiring, the wiring between interconnected detectors or from detectors to auxiliary devices, it is recommended that single conductor wire be no smaller than 18 gauge. The duct smoke detector terminals accommodate wire sizes up to 12 gauge.

Smoke detectors and alarm system control panels have specifications for allowable loop resistance. Consult the control panel manufacturer’s specifications for the total loop resistance allowed for the particular model control panel being used before wiring the detector loop.

[8.1] WIRING INSTRUCTIONS

The D2E detectors are designed for easy wiring. The housing provides a terminal strip with clamping plates. Wiring connections are made by sliding the bare end of the wire under the plate, and tightening the clamping plate screw. See Figure 6A for negative supply (-) supervision or Figure 6B for positive supply (+) supervision.

[9] DETECTOR STATUS INDICATION

Detector status is indicated by the LED’s on the sensor. Refer to relevant detector installation manual for more details.

FIGURE 6A. SYSTEM WIRING DIAGRAM FOR D2E 2-WIRE DUCT SMOKE DETECTORS WITH NEGATIVE SUPPLY (-) SUPERVISION (DETECTORS POWERED FROM INITIATING CIRCUIT):

NOTE: FOR POSITIVE SUPPLY (+) SUPERVISION SEE FIGURE 6B.

FIGURE 6B. SYSTEM WIRING DIAGRAM FOR D2E 2-WIRE DUCT SMOKE DETECTORS WITH POSITIVE SUPPLY (+) SUPERVISION (DETECTORS POWERED FROM INITIATING CIRCUIT):

NOTE: WIRING CARD MUST BE REMOVED FOR POSITIVE SUPPLY (+) SUPERVISION SEE FIGURE 7.

Do not loop wire under terminals when wiring detectors. Break wire runs to provide system supervision of connections.
[10] VERIFICATION OF OPERATION

[10.1] POWER THE UNIT
Apply 12 VDC or 24 VDC to terminals marked as (+) and (–)IN, see Figure 4, and electrical specs for details.

[10.2] PERFORM DETECTOR CHECK
VERIFY STANDBY per Section 9 on page 4. The use of a remote accessory is recommended.

10.2.1 COVER TAMPER
Removal of the cover on the sensor side of the housing will result in a trouble condition. The unit with cover removed will remain powered while any units between this unit and the eol resistor will loose power.

[10.3] DUCT SMOKE DETECTOR TEST AND MAINTENANCE PROCEDURES
Test and maintain duct smoke detectors in accordance with local regulations and codes of practice. The tests contained in this manual were devised to assist maintenance personnel in verification of proper detector operation.

Before conducting these tests notify the proper authorities that the smoke detection system will be temporarily out of service. Disable the zone or system under test to prevent unwanted alarms.

[10.4] VERIFY AIRFLOW TEST PER SECTION 7 HAS BEEN PERFORMED.

10.4.1 SMOKE ENTRY USING AEROSOL SMOKE
This test is intended for low-flow systems <2.54 m/sec if the air speed is greater than 2.54 m/sec use a conventional manometer to measure differential pressure between the sampling tubes as described in 7.1.

Drill a 0.63 cm hole 91.4 cm upstream from the duct smoke detector. With the air handler on, measure the air velocity with an anemometer. Air speed must be at least 1.5 m/sec. Spray aerosol smoke into the duct through the 0.63 cm hole for five seconds. Wait two minutes for the duct smoke detector to alarm. If the duct smoke detector alarms air is flowing through the detector. Remove the duct smoke detector and blow out the residual aerosol smoke from the chamber and reset the duct smoke detector. Use duct tape to seal the aerosol smoke entry hole.

CAUTION
Canned aerosol simulated smoke ‘canned smoke agent’ formulas will vary by manufacturer. Misuse or overuse to these products may have long term adverse effects on the smoke detector. Consult the canned smoke agent manufacturer’s published instructions for any further warnings or caution statements.

[10.5] INSTALL THE COVER
Install the covers making sure that the cover fits into the base groove. Tighten the seven screws that are captured in the covers.

NOTE: Verify sensor cover gasket is properly seated on cover prior to cover installation.

Notify the proper authorities that the smoke detector system is undergoing maintenance and that the system will temporarily be out of service. Disable the zone or system undergoing maintenance to prevent unwanted alarms and possible dispatch of the fire department.

11.1 DETECTOR SENSOR
1. Remove the sensor to be cleaned from the system.
2. Refer to the relevant detector installation manual for cleaning instructions.
3. Reinstall the detector.

[11.2] REINSTALLATION
1. Reinstall the detector in its housing.
2. Restore system power.
3. Perform Detector Check Section 10.2.
4. Notify the proper authorities testing has been completed and the smoke detector system is back in operation.

[11.3] OPTIONAL ACCESSORIES
The D2E duct smoke detector can be used with the RA400Z or RA100Z.

FIGURE 7. POWER BOARD WITH REMOVABLE CARD:

![Power Board Diagram]
System Sensor warrants its enclosed product to be free from defects in materials and workmanship under normal use and service for a period of three years from date of manufacture. System Sensor makes no other express warranty for the enclosed product. No agent, representative, dealer, or employee of the Company has the authority to increase or alter the obligations or limitations of this Warranty. The Company's obligation under this Warranty shall be limited to the replacement of any part of the product which is found to be defective in materials or workmanship under normal use and service during the three year period commencing with the date of manufacture. After obtaining a Return Authorization number, send defective units to: Returns Department, RA #__________, Pittway Tecnologica Srl Via Caboto 154, 34147 Trieste Italy. Please include a note describing the malfunction and suspected cause of failure. The Company shall not be obligated to replace units which are found to be defective because of damage, unreasonable use, modifications, or alterations occurring after the date of manufacture. In no case shall the Company be liable for any consequential or incidental damages for breach of this or any other Warranty, expressed or implied whatsoever, even if the loss or damage is caused by the Company's negligence or fault. Some states do not allow the exclusion or limitation of incidental or consequential damages so the above limitation or exclusion may not apply to you. This Warranty gives you specific legal rights and you may also have other rights which vary from state to state.