D355PL Duct Smoke Detector

**SPECIFICATIONS**

- **Operating Temperature:** -4° to 118°F (-20° to 70°C)
- **Storage Temperature:** -22° to 158°F (-30° to 70°C)
- **Humidity:** 0% to 95% Relative Humidity Non-condensing
- **Air Velocity:** 100 to 4000 ft./min. (0.5 to 20.3 m/sec.)
- **Rectangular Footprint Dimensions:** 14.38 in L × 5 in W × 2.5 in D (37 cm L × 12.7 cm W × 6.36 cm D)
- **Weight:** 1.8 pounds; 0.82 kg
- **Max. Alarm Current (LED on):** 6.5 mA @ 24 VDC
- **Air Velocity:** 100 to 4000 ft./min. (0.5 to 20.3 m/sec.)
- **Humidity:** 0% to 93% Relative Humidity Non-condensing
- **Square Footprint Dimensions:** 7.75 in L × 9 in W × 2.5 in D (19.7 cm L × 22.9 cm W × 6.35 cm D)
- **Rectangular Footprint Dimensions:** 14.38 in L × 5 in W × 2.5 in D (37 cm L × 12.7 cm W × 6.36 cm D)
- **Weight:** 1.8 pounds; 0.82 kg
- **Max. Alarm Current (LED on):** 6.5 mA @ 24 VDC

**NOTES:**
- The D355PL come with the sensor head factory installed, part number SD355R.
- The D355PL Air 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 and allows detection of a developing hazardous condition. When sufficient smoke is sensed, an alarm signal is initiated at the fire control panel monitoring the detector, 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.

**32° to 120°F (0° to 49°C) with module installed in the D355PL**

**ACCESSORY CURRENT LOADS AT 24 VDC**

<table>
<thead>
<tr>
<th>Device</th>
<th>Standby</th>
<th>Alarm</th>
</tr>
</thead>
<tbody>
<tr>
<td>RTS451/151</td>
<td>0mA 12mA Max.</td>
<td>12mA</td>
</tr>
<tr>
<td>RTS451KEY/RTS151KEY</td>
<td>12mA</td>
<td>12mA Max.</td>
</tr>
</tbody>
</table>
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 differential pressure and smoke entry tests described in the Measurement Tests section.

**FIGURE 2:** REMOVE SCREW AND PIVOT DETECTOR AS SHOWN BELOW. REPLACE SCREW TO SECURE DETECTOR IN PLACE.

**[4.3] 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.

**[4.3.1] 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 1.375 inch diameter holes using a 13⁄8-inch hole saw or punch. Drill 13⁄8 inch diameter holes using a 5⁄32 inch drill at target “B” centers.

**[4.3.2] 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 1.375 inch diameter holes using a 13⁄8-inch hole saw or punch. Drill 13⁄8 inch diameter holes using a 5⁄32 inch drill at target “C” centers. If desired, drill an additional 13⁄8 inch hole at the location of one of the mounting tabs on the lower housing.

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

<table>
<thead>
<tr>
<th>Outside Duct Width</th>
<th>Sampling Tube Recommended*</th>
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<tr>
<td>Up to 1 ft</td>
<td>DST1</td>
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<td>DST1.5</td>
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<tr>
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<td>DST3</td>
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<td>DST5</td>
</tr>
<tr>
<td>8 to 12 ft</td>
<td>DST10 (2-piece)</td>
</tr>
</tbody>
</table>

*Must extend a minimum of 2⁄3 the duct width

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

**[4.4] 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.

**[5] SAMPLING TUBE INSTALLATION**

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. The sampling tube length must extend at least 2⁄3 across the duct width for optimal performance.

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.

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

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*Must extend a minimum of 2⁄3 the duct width

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

**FL-300-000 2 I56-3255-003R**
[5.2] SAMPLING TUBE INSTALLATION

1. For tubes shorter than the width of the duct, slide the sampling tube, with installed end cap, into the housing connection that meets the airflow first. Position the tube so that the arrow points into the airflow as shown in Figure 3. Per NFPA sampling tubes over 3 feet long should be supported at the end opposite of the duct detector. In ducts wider than 4 feet, work must be performed inside the duct to couple the other section of the sampling tube to the section already installed using the ½-inch conduit fitting supplied. Make sure that the holes on both sections of the air inlet sampling tube are lined up and facing into the airflow.

2. For tubes longer than the width of the air duct, the tube should extend out of the opposite side of the duct. Drill a ½-inch 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 ½° downward for every 12” 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 extending out of the duct, select a shorter tube using Table 1. Otherwise, trim the tube to leave approximately 1 to 2 inches extending outside the duct. Drill a ¾-inch hole in the duct opposite these holes and tape open any holes in the protruding section of the tube. Be sure to seal the duct where the tube penetrates.

NOTE: Air currents inside the duct may cause excessive vibration, especially when the longer sampling tubes are used. In these cases, a 3-inch 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 1 to 1½-inch hole where the flange will be used.

[5.3] MODIFICATIONS OF SAMPLING TUBES

There may be applications where duct widths are not what is specified for the installation. In such cases, it is permissible to modify a sampling tube that is longer than necessary to span the width of the duct.

Use a 0.193-inch diameter (30 gauge) drill and add the appropriate number of holes so that the total number of holes expressed 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.

CAUTION: 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/or exhaust tube. In this case both the detector, sampling tube and exhaust tube (if included) should be rigged 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. Pressure differential across the sampling and exhaust ports in the detector housing shall be verified to be between 0.1 and 0.11 inches of water. Do be measure the pressure difference between the inlet and outlet ports on the detector housing using a manometer as described in the Measurement Tests section of this manual.

[6.5] MEASUREMENT TESTS

[6.5.1] JAR FLOW

The D530FL is designed to operate over an extended air speed range of 100 to 4000 FPM. 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 0.06 inches of water and no more than 1.1 inches of water. Because most commercially available manometers cannot accurately measure very low pressure differentials, applications with less than 500 FPM of duct air speed may require one of the following: 1) the use of a current-sensing pressure transmitter (Dwyer Series 607) or 2) the use of aerosol smoke, see below for test descriptions.

[6.5.2] LOW FLOW AIR FLOW TEST USING DRYER SERIES 607

Differential Pressure Transmitter

Verify the air speed of the duct using an anemometer. Air speed must be at least 100 FPM. Wire the Dwyer transmitter as shown in Figure 5. Connect the leads of the meter to either side of the 100Ω 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 100Ω resistor (measurement 1), 4.00 volts is typical. Using flexible tubing and rubber stoppers, connect the HO163-01 to the sampling tube to the exhaust tube of the duct smoke detector housing, and the LOW side of the transmitter to the exhaust tube of the duct smoke detector housing. Measure and record the voltage drop across the 100Ω resistor (measurement 2). Subtract the voltage recorded in measurement 1 from the voltage recorded in measurement 2. If the difference is greater than 0.11 volts, there is enough air flow through the duct smoke detector for proper operation.

[7] FIELD WIRING; INSTALLATION GUIDELINES

All wiring must be installed in compliance with the National Electrical Code and the local codes having jurisdiction. Proper wire gauges should be used. The conductors used to 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 detectors or from detector to auxiliary devices), it is usually recommended that, select conductor wire be no smaller than 18 gauge. The duct smoke detector terminals accommodate wire sizes up to 12 gauge. Flexible conduit is required for the last foot of conduit, solid conduit connections may be used if desired. Dust smoke detectors and alarm system control panels have specifications for Signaling Line Circuit (SLC) wiring. Consult the control panel manufacturer’s specifications for wiring requirements before wiring the detector loop.
Connect the power source from the communication line before installing the D355PL duct smoke detector.

The D355PL detectors are designed for easy wiring. The housing provides a terminal strip with clipping plates. Wiring connections are made by sliding the base end under the plate, and tightening the clamping plate screw. See Figure 6 below for system wiring.

**Figure 6. SYSTEM WIRED DIAGRAM FOR D355PL:**

**8.1.** **INSTALL THE COVER**

- Set the desired address on the sensor head code wheel switches. On the back of the sensor head:
  - The seven screws that are captured in the covers. Note that the cover must be properly installed for proper operation of the sensor.
  
**8.2.** **POWER THE UNIT**

Activate the communication line on terminals COM+ and COM–.

**8.3.** **DETECTOR CHECK**

Standby - If programmed by the system control panel, look for the presence of the flashing LEDs through the transparent housing cover. The LED will flash with each communication.

Trouble - If programmed by the system control panel and the detector LEDs do not flash, then the detector lacks power (watch wiring, missing or improperly placed cover, panel programming, or power supply), the sensor head is missing (replace), or the unit is defective (return for repair).

**8.4.** **DUCT SMOKE DETECTOR TEST & MAINTENANCE PROCEDURES**

Test and maintain duct smoke detectors as recommended in NFPA 72. 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.

**8.4.1.** **TEST THE UNIT**

1. MB-12-00 Magnet Test - This sensor can be functionally tested with a test magnet.
2. Remove Test Accessory - The use of a remote accessory for visible indication of power on/off is recommended.
3. Verify system control panel alarm status and control panel execution of all intended auxiliary functions (i.e., fan shutters, damper control, etc.).

Two LEDs on the sensor are controlled by the panel to indicate sensor status. Coded signals, transmitted from the panel, can cause the LEDs to blink, latch on, or latch off. Refer to the manufacturer’s published technical documentation for sensor LED operation and expected delay to alarm.

**8.4.2.** **THE DETECTOR MUST BE RESET BY THE SYSTEM CONTROL PANEL**

- Before conducting these tests, notify the proper authorities that the smoke detector system is undergoing verification of proper detector operation.

**8.5.** **NOTE:**

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

**8.6.** **VERIFICATION OF OPERATION**

**8.6.1.** **UNINSTALL 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 that the cover must be properly seated for proper operation of the sensor.

**10.** **SENSOR REPLACEMENT**

1. Remove the sensor head by rotating counterclockwise.
2. Pull gently to remove it.
3. To replace the sensor head, align the mounting features and rotate clockwise into place.

**11.** **OPTIONAL ACCESSORIES**

Optional accessories include RA400Z/RA100Z, RTS451/RTS151, and RTS451KEY/RTS151KEY.

**NOTE:** Ensure blue wire always remains connected to RA+ on the field connector side of the terminal block.

**Figure 8. Wiring Diagram for D355PL to RA400Z/RA100Z:**

**Figure 9. RTS451/RTS151, RTS451KEY/RTS151KEY USING SENSOR WITH REMOTE TEST CAPABILITY:**

The RTS451/RTS151, RTS451KEY/RTS151KEY Remote Test Station facilitates test of the alarm capability of the duct smoke detector. These accessories provide the stimulus to initiate an alarm condition at the detector. The D355PL duct smoke detector must be reset by the system control panel.

**11.1.** **OPTION 1:**

**REMOTE TEST USING SENSOR WITH REMOTE TEST CAPABILITY (WITHOUT A TEST COIL):**

A sensor with suffix “R” is available for use inside the D355PL. Suffix “R” represents a head with Remote Test Capability. Using this head inside the D355PL eliminates the need for a test coil when wired to a RTS451/RTS151/ RTS451KEY/RTS151KEY Remote Test Station.

To install the RTS451/RTS151/RTS451KEY/RTS151KEY, using the sensor with remote test capability connect the device as shown in Figure 3. Wire runs must be limited to 100 ft or less per interconnected wiring. NOTE: Resistor assembly must be in place between RA+ and OUt+ inside the D355PL for Remote Test function to operate.

**Figure 8. Wiring Diagram for D355PL to RA400Z/RA100Z:**

**Figure 9. RTS451/RTS151, RTS451KEY/RTS151KEY USING SENSOR WITH REMOTE TEST CAPABILITY:**

**11.2.** **OPTION 2:**

**REMOTE TEST USING A TEST COIL:**

The use of a remote test station requires the installation of an accessory coil, part number DCOIL, sold separately.

1. Install DCOIL in housing pocket insuring that it is pointing toward detector.
2. Install DCOIL mounting screw.
3. Connect each DCOIL lead to a Test Coil Terminal. See Figure 10 below for reference.

**Figure 10. D355PL USING A TEST COIL:**

**11.3.** **ADDITIONAL MODULE OPTION**

The D355PL can also accommodate a relay or control module (sold separately) within the power board side of the housing. The relay or control module must be listed as compatible to the fire alarm control panel.

**Physical Module Mounting:**

1. Remove the breakaway tabs at the four corners of the module.
2. Locate the module at right most corner of the power board. The upper left corner mounting hole of the module will align with a screw boss in the housing.
3. Install a #8 × ⅝” Phillips screw at the screw boss location.

**NOTE:** See the corresponding module installation instructions for general description, control panel compatibility, wiring and ratings.