DH200P Intelligent Air Duct Smoke Detector with Extended Air Speed Range

Before installing detectors, please thoroughly read the NEMA Guide for Proper Use of Smoke Detectors in Duct Applications, which provides detailed information on detector spacing, placement, zoning, wiring, and special applications. Copies of this manual are available from NEMA (National Electrical Manufacturers Association, 2101 L Street NW, Washington, DC 20037). NFPAS Standards 72 and 90A should also be referenced for detailed information.

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

IMPORTANT: This detector must be tested and maintained regularly following NFPAS 72 requirements. The detector should be cleaned at least once a year.

General Description

An HVAC system supplies conditioned air to virtually every area of a building. Smoke introduced into this air duct system is distributed to the entire building. Smoke detectors are designed for use in air duct systems are used to sense the presence of smoke in the duct.

The DH200P air duct smoke detector is a photoelectric detector. This smoke detection method combines with an efficient housing design that samples air passing through a 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 and change over air handling systems, etc. This can prevent the distribution of or can isolate toxic smoke and fire gases throughout the areas served by the duct system.

Two LEDs on each detector may illuminate, if programmed by the system control panel, to provide a local alarm indication. There is also a remote alarm output for use with auxiliary devices. The DH200P has remote test capability with the RTS451/RTS451KEY Remote Test Station.

Contents of the Duct Smoke Detector Housing Kit

The DH200P Duct Smoke Detector consists of the following items: (See Figure 1.)

Figure 1. Exploded View Of Duct Smoke Detector Components:

- Contents Of the Duct Smoke Detector
  1. Complete duct smoke detector assembly with sensor
  2. Two #10 x 1/4” sheet metal mounting screws
  3. Two sampling tube filters
  4. One test magnet
  5. Drilling template
  6. Two foam gaskets
  7. Four 46 self-tapping mounting screws for the sampling tube and optional exhaust tube extension
  8. One sampling tube end cap
  9. One plastic sampling tube
  10. One 48 self-tapping screw for plastic sampling tube

NOTE: A detector sensor board DOES NOT need to be ordered separately.

NOTE: For ducts over 1/2 feet (0.46m), longer sampling tubes must be ordered to complete the installation. They must be the correct length for the width of the duct where they will be installed. See Table 1 on page 3 to determine the sampling tube required for different duct widths.
[2.1] Sampling Tube Installation for Ducts Less Than 1/2 Feet (0.46m) Wide (see Figure 2)
1. Remove the front cover.
2. Slide the plastic sampling tube into the housing bushing.
3. Align the holes in the bushing with the holes in the sampling tube. Make sure there are 6 exposed holes on the plastic sampling tube. Secure with the #8 self-tapping screw into the bottom of the permanent tube (shown in Fig. 2).

[2.2.2] M02-04-00 Magnet Test
1. Place the painted surface of the magnet onto the TEST panel and the bottom of the detector housing (Figure 12).
2. Verify system control panel alarm status and control panel execution of all intended auxiliary functions (i.e. fan shutdown, damper control, etc.).
3. Connect the detector housing to the duct. The detector is self-restoring when the magnet is removed. Verify that the system control panel has reset.

Figure 12. Testing detector alarm:

[2.2] Alarm Tests

[9.2.2.1] M02-04-00 Magnet Test
1. Place the painted surface of the magnet onto the TEST panel and the bottom of the detector housing (Figure 12).
2. Verify system control panel alarm status and control panel execution of all intended auxiliary functions (i.e. fan shutdown, damper control, etc.).
3. The detector is self-restoring when the magnet is removed. Verify that the system control panel has reset.

Figure 12. Testing detector alarm:

Accessory Current Loads at 24VDC

<table>
<thead>
<tr>
<th>DEVICE</th>
<th>STANDBY</th>
<th>ALARM</th>
</tr>
</thead>
<tbody>
<tr>
<td>RA400Z</td>
<td>0mA</td>
<td>10 mA Max.</td>
</tr>
<tr>
<td>RTS451/RTS451KEY</td>
<td>0mA</td>
<td>7.5 mA Max.</td>
</tr>
</tbody>
</table>

[9.3] Maintenance of Duct Smoke Detectors

[9.3.1] Air Filters
1. Turn off power to the system.
2. Remove and inspect sampling tube filters.
3. If filters are heavily coated with dirt, replace them with new filters (p/n F36-09-11). If they are not heavily coated, use a vacuum cleaner or compressed air nozzle to remove dust, then reinstall the filters.

[9.3.2] Photo Detector Boards
1. Remove the screen by gently grasping on each side and pulling straight off.
2. Lift the photo chamber in the same fashion. Vacuum the screen and cover. Use clean, compressed air to loosen and blow out any remaining debris. Replacement screens (p/n 308-39-01) are available from System Sensor.
3. Vacuum photo chamber, then use clean compressed air to blow area clean.
4. Replace the chamber by pressing it onto the base. Press the screen into place. It should fit tightly on the chamber.

[10] Board Replacement

[10.1] Sensor Board Replacement
1. Remove the two sensor board mounting screws.
2. Pull gently on the board to remove it.
3. To replace the board, align the board mounting features, holes, and the interconnect terminals. Push the board into place.
4. Secure board with the two mounting screws.

[10.2] Power Board Replacement
1. Disconnect wiring from the terminal block.
2. Remove the two power board mounting screws.
3. Pull gently on the board to remove it.
4. To replace the board, align the board mounting features, holes, and the interconnect terminals. Push the board into place.
5. Secure board with the two mounting screws.
6. Re-connect wiring to terminal block.
The filters do not substantially affect smoke performance even when up to 90% of the filter is clogged. Quarterly visual inspection usually suffices to determine whether the contamination affects performance. If further testing is required, compare differential pressure readings with and without the filters installed. If the difference exceeds 10% replace the filters. In no case should the pressure differential fall below 0.0015 inches of water.

Figure 8. Procedure for verifying air flow:

[Diagram showing procedure for verifying air flow]

[9.2] Standby, Alarm, And Sensitivity Tests

[9.2.1] Standby And Trouble

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

Trouble — If the detector LEDs do not flash, then the detector lacks power (check wiring, panel programming, or power supply), the detector board is missing (replace), or the unit is defective (return for repair).

Test — The trouble condition can be caused intentionally to verify correct operation of the system. Remove the detector board to cause a trouble condition locally and at the system control panel.

Figure 9. Wiring Diagram for DH200PL Duct Smoke Detector using a UL listed control panel:

[Diagram showing wiring diagram]

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>1 to 2 ft. (0.3 to 0.6 m)</td>
<td>ST-1.5</td>
</tr>
<tr>
<td>2 to 4 ft. (0.6 to 1.2 m)</td>
<td>ST-3</td>
</tr>
<tr>
<td>4 to 8 ft. (1.2 to 2.4 m)</td>
<td>ST-5</td>
</tr>
<tr>
<td>8 to 12 ft. (2.4 to 3.7 m)</td>
<td>ST-10</td>
</tr>
</tbody>
</table>

*Must extend a minimum of ¼ the duct width

Figure 10. Tube mounting configurations with varying air flow direction:

[Diagram showing tube mounting configurations]

[4.2] Installation For Ducts More Than 8 Feet (2.4m) Wide

To install sampling tubes in ducts more than 8 feet (2.4m) wide, work must be performed inside the air duct. Sampling of air in ducts wider than 8 feet (2.4m) is accomplished by using the ST-10 sampling tube. If the tube is shorter than the width of the air duct, install the end cap into the sampling tube as shown in Figure 4 and support the end opposite the duct smoke detector.

Install the sampling tube as follows:

1. Drill a ¼-inch (19mm) hole in the duct directly opposite the hole already drilled for the sampling tube. Make sure the hole is 1” to 2” (25 to 50mm) below the inlet hole on the opposite side of the duct to allow moisture drainage away from the detector. If the tube is shorter than the width of the air duct, install the end cap into the sampling tube as shown in Figure 4. Sampling tubes over 3 ft. (0.91m) long must be supported at the end opposite the duct smoke detector.

2. Slide the tube into the housing bushing that meets the air flow first. Position the tube so that the arrow points into the air flow, as shown in Figure 4.

3. Secure the tube flange to the housing bushing with two #6 self-tapping screws.

4. For tubes longer than the width of the air duct, the tube should extend out of the opposite side of the duct. If there are more than 2 holes in the section of the tube extending out of the duct, select a different length using Table 1. Otherwise, trim the end of the tube protruding through the duct so that 1” to 2” (25 to 50mm) of the tube extend outside the duct. Plug this 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.

NOTE: Only metal sampling tubes can be installed in orientations C and D.
3. From inside the duct, couple the other sections of the sampling tube to the section already installed using the ¼-inch (12mm) conduit fittings supplied. Make sure that the gasket on both of the sampling tubes are lined up and facing into the air flow.

4. Trim the end of the tube protruding through the duct so that 1” to 2” (25 to 50mm) of the tube extend outside the duct. Plug this end with the end plug and tape closed any holes in the protruding section of the tube. Be sure to seal the duct where the tube protrudes.

NOTE: An alternate method to using the ST-10 is to use two ST-5 inlet tubes. Remove the flange from one of the tubes and install as described above. After the installation, use electrical tape to close off some of the sampling holes so that there are a total of 10 to 12 holes spaced as evenly as possible across the width of the duct.

NOTE: Air currents inside the duct may cause excessive vibration, especially when the longer sampling tubes are used. In these cases a 3 inch (75mm) floor 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-inch to 1¼-inch (25 to 32mm) hole where the flange will be used.

[5] Install The Filters

To install the sampling tube filters, simply push the filters into the sampling and exhaust tube holes, as shown in Figure 6. If a metal sampling tube is used, install the filters into the tube end.

Figure 6. Sampling tube filter installation:

Filters require periodic cleaning or replacement, depending on the amount of dust and dirt accumulated. Visually inspect the filters at least quarterly; inspect them more often if the dust accumulation warrants it. See Section [9.1.2] for more information. Replacement filters can be ordered (filter P/N F36-09-11).


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 detectors to auxiliary devices), it is usually recommended that single conductor wire be no smaller than 18 gauge. The duct smoke detector terminals accommodate wire sizes up to 12 gauge. The last foot (0.3m) of conduit should be flexible conduit (available in electrical supply houses), which facilitates easier installation and puts less strain on the conduit holes in the housing. Solid conduit connections may be used if desired.

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 for the particular model control panel being used before wiring the detector loop.

The DH200PL detector is designed for ease of wiring. The housing provides a terminal strip with clamping plates. Wiring connections are made by stripping about ½ inch (9mm) of insulation from the end of the wire, sliding the bare end under the plate, and tightening the clamping plate screw.

Two LEDs on each duct smoke detector may light, if programmed by the system control panel, to provide a local, visible indication. Remote LED annunciator capability is available as an option. Each duct smoke detector can only be wired to one remote annunciator.

Different panel manufacturers offer different feature sets across their different panel models. As a result, certain features of the DH200PL may be available on some control panels, but not on others. The possible features available in the DH200PL, if supported by the control panel are:

1. Panel controls the LED operation on sensor. Operational modes are RED blink, RED continuous, and off.
2. The remote output of the RA400Z follows the condition of the duct smoke detector LED.

Please refer to the operation manual for the UL listed control panel for specific operation of the DH200PL.

Wiring Instructions

Disconnect power from the communication line before installing the DH200PL duct smoke detector.

Wire the DH200PL duct smoke detector per the Control Panel Installation Manual and Figures 9, 10 or 11. Set the desired address on the sensor board address code wheel switches (see Figure 7).