THE AN104
SPARK DETECTION
AND EXTINGUISHING SYSTEM

by
HANSENTEK
(Division of Neola Corp.)

INSTALLATION AND OPERATIONS MANUAL
IMA-1041SY2
# TABLE OF CONTENTS

1  **THE AN104 DETECTION SYSTEM** .............................................................................. 3  

2  **SYSTEM DESIGN** ........................................................................................................ 5  
   2.1  SYSTEM LAYOUT ............................................................................................................. 5  
   2.2  AIR VELOCITY ................................................................................................................. 6  
   2.3  DETECTOR LOCATION ........................................................................................................ 8  
   2.4  NUMBER OF DETECTORS ................................................................................................. 9  
   2.5  WATER SUPPLY ............................................................................................................... 10  
   2.6  NUMBER OF SPRAY ASSEMBLIES ................................................................................. 10  
   2.7  PLACEMENT OF SPRAY ASSEMBLIES ........................................................................... 11  

3  **EQUIPMENT INSTALLATION** ...................................................................................... 12  
   3.1  MAIN CONTROL UNIT ................................................................................................. 12  
      3.1.1  System Wiring ............................................................................................................ 13  
      3.1.2  Detectors Wiring ....................................................................................................... 13  
      3.1.3  Spray and Horn Output Connections ...................................................................... 15  
      3.1.4  Fan Shutdown Wiring ............................................................................................... 15  
      3.1.5  Abort Damper Wiring ............................................................................................... 16  
      3.1.6  Flow Wiring ............................................................................................................... 17  
      3.1.7  Heat Detector .......................................................................................................... 17  
      3.1.8  Auxiliary Wiring ....................................................................................................... 17  
      3.1.9  Alarm and Trouble Wiring ........................................................................................ 18  
   3.2  DETECTOR AND NOZZLE PLACEMENT ....................................................................... 18  
   3.3  VALVE AND NOZZLE SPRAY ASSEMBLY ..................................................................... 19  
   3.4  DETECTORS .................................................................................................................. 23  
      3.4.1  Model 120 Detector ................................................................................................. 24  
      3.4.2  Model 121 Fiber Optic Detectors ........................................................................... 27  

4  **SYSTEM PROGRAMMING** .......................................................................................... 31
4.1.1 SET TIME AND DATE

5 TESTING AND TROUBLESHOOTING

5.1 TEST

5.2 VIEW HISTORY

5.3 VIEW PROGRAM SWITCH SETTINGS

5.4 COMMISSIONING

6 MAINTENANCE PROCEDURES

6.1 GENERAL

6.2 WEEKLY CHECKS

6.3 SEMI-ANNUAL INSPECTIONS

6.4 ANNUAL INSPECTIONS

7 WARRANTY AND RETURN POLICY

OPERATIONS MANUAL
IMA-1041SY2
The AN104 is a single zone Spark Detection and Extinguishing System. It is designed to protect a single dust collector with either one or two main pneumatic lines. The basic function is to detect sparks or embers in the pneumatic air duct and spray water to extinguish the sparks or embers. The system provides other functions such as closing an abort damper, shutting down the dust collector system and controlling an auxiliary device such as an auxiliary baghouse deluge system.

The AN104 Spark Detection and Extinguishing System is a full featured, single zone system capable of protecting a single dust collector. The AN104 has either two or four spark detectors which may be set to test their sensitivity approximately every six hours. It also has the capability
to monitor a variety of other sensing devices such as heat detectors. The system provides a water spray in the duct on detection of sparks, as well as the capability to provide a deluge water spray in the dust collector on activation of the heat detectors. There are also capabilities to close an abort damper and shut down the dust collector system.

This single zone system is extremely flexible and provides all the features of the big multi zone systems but at a very low cost. It maintains a history of up to 2000 time stamped events and it can also monitor flow switches, heat detectors, shutoff valves, etc.

All input and output wiring is supervised for shorts or opens – even the return air abort damper wiring for solenoid controlled abort dampers.
2 SYSTEM DESIGN

2.1 SYSTEM LAYOUT

The AN104 can be laid out in three general configurations:

- Two detectors, spray, shutdown and abort

- Four detectors, spray, shutdown and abort

- Two detectors and spray; 2 detectors, shutdown and abort
An effective spark detection system must monitor all potential paths of a spark or ember through all branches of ducts and once a spark or ember is detected, it must establish a curtain of water through which the spark must pass.

The air in the ducts is traveling at a high velocity and therefore carries a spark or ember very rapidly. Air transport speeds are normally about 20 meters per second or 4000 feet per minute but speeds of 30m/s or 6000 ft/min. are possible, which means a spark can be carried 30 meters or 100 feet in one second. Detecting the spark; turning on the water and establishing a spray curtain across the entire duct, can take as much as 0.3 seconds or 0.005 minutes. If the spark is traveling at 30 m/s or 6000 ft/min, we will therefore require the detector to be placed at least 9 meters or 30 feet ahead of the water spray nozzle, since that is how far the spark will travel in 0.3 seconds. If there is insufficient length available on the main duct, detectors can be placed on the branch lines or the main duct must be extended.

NOTE: These are minimum distances.

NOTE: Ducts over 42 inches with multiple spray nozzles require even more distance.

2.2 AIR VELOCITY

The air velocity must be greater than two m/s or 500 ft/min and less than 50 m/s or 10,000 ft/min to ensure proper operation and detection. The air velocity is generally known prior to installation, but Hansentek highly recommends that the air velocity be measured and confirmed prior to installation. If the air velocity is not known, you can simply calculate the velocity based on the dust collector capacity and the size of the duct (area of a cross section of the duct).

\[
\text{Velocity (ft/min)} = \frac{\text{Cubic Feet per Minute (CFM)}}{\text{Area of duct in Square Feet (SQ.FT)}}
\]

\[
\text{Velocity (m/s)} = \frac{\text{Cubic Meters per Hour}}{\text{Area of duct in Square Meters (SQ.M)}}
\]
The following table provides the duct cross section area in square feet or square meters:

<table>
<thead>
<tr>
<th>DUCT SIZE</th>
<th>AREA (SQ.FT)</th>
<th>DUCT SIZE</th>
<th>AREA (SQ.M)</th>
</tr>
</thead>
<tbody>
<tr>
<td>8 inch</td>
<td>0.3491 Square Feet</td>
<td>200mm</td>
<td>0.0314 m²</td>
</tr>
<tr>
<td>10 inch</td>
<td>0.5454 Square Feet</td>
<td>250mm</td>
<td>0.049 m²</td>
</tr>
<tr>
<td>12 inch</td>
<td>0.7854 Square Feet</td>
<td>300mm</td>
<td>0.071 m²</td>
</tr>
<tr>
<td>14 inch</td>
<td>1.069 Square Feet</td>
<td>350mm</td>
<td>0.096 m²</td>
</tr>
<tr>
<td>16 inch</td>
<td>1.396 Square Feet</td>
<td>400mm</td>
<td>0.126 m²</td>
</tr>
<tr>
<td>18 inch</td>
<td>1.767 Square Feet</td>
<td>450mm</td>
<td>0.159 m²</td>
</tr>
<tr>
<td>20 inch</td>
<td>2.182 Square Feet</td>
<td>500mm</td>
<td>0.196 m²</td>
</tr>
<tr>
<td>22 inch</td>
<td>2.640 Square Feet</td>
<td>550mm</td>
<td>0.238 m²</td>
</tr>
<tr>
<td>24 inch</td>
<td>3.142 Square Feet</td>
<td>600mm</td>
<td>0.283 m²</td>
</tr>
<tr>
<td>26 inch</td>
<td>3.687 Square Feet</td>
<td>650mm</td>
<td>0.332 m²</td>
</tr>
<tr>
<td>28 inch</td>
<td>4.276 Square Feet</td>
<td>700mm</td>
<td>0.385 m²</td>
</tr>
<tr>
<td>30 inch</td>
<td>4.909 Square Feet</td>
<td>750mm</td>
<td>0.442 m²</td>
</tr>
<tr>
<td>32 inch</td>
<td>5.585 Square Feet</td>
<td>800mm</td>
<td>0.503 m²</td>
</tr>
<tr>
<td>34 inch</td>
<td>6.305 Square Feet</td>
<td>850mm</td>
<td>0.567 m²</td>
</tr>
<tr>
<td>36 inch</td>
<td>7.069 Square Feet</td>
<td>900mm</td>
<td>0.636 m²</td>
</tr>
<tr>
<td>38 inch</td>
<td>7.876 Square Feet</td>
<td>950mm</td>
<td>0.709 m²</td>
</tr>
<tr>
<td>40 inch</td>
<td>8.727 Square Feet</td>
<td>1000mm</td>
<td>0.785 m²</td>
</tr>
<tr>
<td>42 inch</td>
<td>9.621 Square Feet</td>
<td>10050mm</td>
<td>0.866 m²</td>
</tr>
<tr>
<td>44 inch</td>
<td>10.56 Square Feet</td>
<td>1100mm</td>
<td>0.950 m²</td>
</tr>
<tr>
<td>46 inch</td>
<td>11.54 Square Feet</td>
<td>1150mm</td>
<td>1.04 m²</td>
</tr>
<tr>
<td>48 inch</td>
<td>12.57 Square Feet</td>
<td>1200mm</td>
<td>1.13 m²</td>
</tr>
</tbody>
</table>
2.3 DETECTOR LOCATION

**WARNING:** Connect detector only to a Hansentek Control Unit Initiating Device Circuit or the detector **Will Not Operate**. This Detector has a proprietary interface and will only work with a Hansentek Control Unit such as the AN104.

**NOTE:** The detectors are extremely sensitive to visible and near infrared light. The detector must be mounted on the pneumatic duct and be completely shielded from any light or modulated heat source or false alarms will occur. There can be no screw holes, open seams or cracks of any sort. Prior to operation, ensure any cracks or holes are sealed with metal foil tape. Duct tape is not acceptable as they may pass infrared light and cause false alarms.

**NOTE:** Due to the extreme sensitivity and the fast response of the detectors, it is possible that large voltage induced surge transients can cause false alarms.

The detectors are housed in an outdoor NEMA 4 rated aluminum enclosure. They are equipped with a press fit mounting flange and set screw. The mounting arrangements allow for easy periodic cleaning of the lens surface.

The Hansentek detectors react rapidly to sparks and embers and the water spray command is sent to the nozzle assembly very quickly but there are a number of factors which affect the time required. Since these factors are variable, we must allow the maximum time in our calculations to ensure the curtain of water is fully developed before the spark arrives.

The maximum delay factors involved yield a worst case Total System Reaction Time of 0.3 seconds or 0.005 minutes.

With a known velocity we simply calculate the distance ahead of the spray for placement of the detectors using the formula:
Distance = (Total System Reaction Time) \times (Velocity). For example, with a velocity of 5000 ft/min, we require the detectors to be placed 0.005(minutes) \times 5000 \text{ ft/min} = 25 \text{ feet} ahead of the water spray.

Distance = (Total System Reaction Time) \times (Velocity). For example, with a velocity of 20 m/s, we require the detectors to be placed 0.3(sec) \times 20 = six meters ahead of the water spray.

NOTE: This is a minimum distance. A distance of 1.5 times this minimum is preferable.

The following table provides various calculated minimum values:

<table>
<thead>
<tr>
<th>Velocity</th>
<th>Distance (Ds)</th>
<th>Velocity</th>
<th>Distance (Ds)</th>
</tr>
</thead>
<tbody>
<tr>
<td>3000 ft/min</td>
<td>15 ft</td>
<td>15 m/s</td>
<td>4500 mm</td>
</tr>
<tr>
<td>3500 ft/min</td>
<td>17.5 ft</td>
<td>17.5 m/s</td>
<td>5250 mm</td>
</tr>
<tr>
<td>4000 ft/min</td>
<td>20 ft</td>
<td>20 m/s</td>
<td>6000 mm</td>
</tr>
<tr>
<td>4500 ft/min</td>
<td>22.5 ft</td>
<td>22.5 m/s</td>
<td>6750 mm</td>
</tr>
<tr>
<td>5000 ft/min</td>
<td>25 ft</td>
<td>25 m/s</td>
<td>7500 mm</td>
</tr>
<tr>
<td>5500 ft/min</td>
<td>27.5 ft</td>
<td>27.5 m/s</td>
<td>8250 mm</td>
</tr>
<tr>
<td>6000 ft/min</td>
<td>30 ft</td>
<td>30 m/s</td>
<td>9000 mm</td>
</tr>
<tr>
<td>6500 ft/min</td>
<td>32.5 ft</td>
<td>32.5 m/s</td>
<td>9750 mm</td>
</tr>
<tr>
<td>7000 ft/min</td>
<td>35 ft</td>
<td>35 m/s</td>
<td>10500 mm</td>
</tr>
</tbody>
</table>

Detectors should not be located close to branch lines or they may become obscured by dust due to turbulent air flow. Detectors must be placed 2.5 \times \text{last branch diameter} downstream from that branch.

### 2.4 NUMBER OF DETECTORS

Normally round ducts only require two detectors; one on each side of the duct. If the duct diameter is greater than 1200 mm or 48 inches, then four detectors are recommended and situated as shown in the installation section of the manual. The detectors must be mounted
opposite each other in the same vertical plane in order to perform their required sensitivity testing function. NEVER MOUNT A DETECTOR ON THE BOTTOM OF A DUCT.

NOTE: For Installations using detectors that are not opposite each other, Sensitivity Checking cannot be done.

2.5 WATER SUPPLY

The minimum water pressure for the Hansentek 901-1 Spray Assembly is a minimum of 340 kPa or 50 PSI and the maximum is 700 kPa or 100 PSI in order for proper operation to take place. A booster pump should be installed if pressure could fall below the minimum, and a pressure reducer should be installed if water pressure exceeds the maximum.

The absolute minimum water pressure required at entry to the Assembly is 310.0 kPa or 44.96 PSI. Water flow through the Assembly at 340 kPa or 50 PSI is 74 liters per minute or 19.5 gallons per minute.

Domestic water line supply is preferred over sprinkler lines, as sprinkler lines can have rust or scale that may foul the solenoid valve. This can cause the solenoid valve to fail to properly close and result in water leaking into the air duct.

2.6 NUMBER OF SPRAY ASSEMBLIES

The number of nozzles required is a function of both the duct size and air speed. Normally, only one spray nozzle is required but, for ducts larger than 38 inches, more nozzles are needed (for larger ducts and higher air speeds please consult Hansentek).
2.7 PLACEMENT OF SPRAY ASSEMBLIES

The Spray Assembly must be mounted on the top of the duct and a proper distance away from any elbows (Dc). If two spray assemblies are required, one should be mounted between 2 o’clock and 3 o’clock and the other between 9 o’clock and 10 o’clock in order to allow the nozzle to properly drain. All nozzles must be mounted in the same plane of vertical circumference.

The nozzles must have straight ducts (constant diameter) past their placement in order to guarantee a proper cone of spray. The distance that the Spray Assembly must be maintained from any elbow is a function of the air velocity. Minimum distance to the closest bend is calculated as (Dc) = 0.001 X velocity of air flow (in feet per minute) or (Dc) = 0.06 X velocity (in meters per second). Therefore if velocity is 5000 ft/min (25 m/s), the minimum distance to the nearest elbow after the spray assembly is .001 X 5000 = 5.0 feet or 0.06 x 25 = 1.5 meters.

Water pipes, strainers, valves and nozzles installed outside must be heat traced and insulated. Heat tracing and insulation must be adequate to withstand the temperature extremes and environmental conditions of the area where it is installed.

WARNING: Glycol loop must not be used.
3 EQUIPMENT INSTALLATION

3.1 MAIN CONTROL UNIT

The Main Control Unit is housed in an industrial NEMA 12/IP54 rated cabinet, 12 inches wide X 14 inches high X 5.5 inches deep. It consists of the Control Electronics, Backup Batteries and the Keypad/Display.

The Main Control Unit should be mounted on a wall, at least 1200 millimeters (48 inches) away from any high voltage sources (sources greater than 400 volts) with the four provided sealing washers to meet NEMA 12 requirements. The cabinet is dust resistant and can generally be installed directly in manufacturing areas, however we recommend that the cabinet be installed in a clean environment in an area free from vibration and extreme temperature swings. The control panel is designed to work indoors within a temperature range of 5C to 40C (do not mount the control panel near an outside door where it would be subject to temperatures beyond this range).

The control panel must be mounted in an area of easy access for regular use of the Keypad/Display. The Keypad/Display is required to test detector sensitivity and easy access will encourage regular testing. For optimum viewing of the diagnostic LCD on the front, the middle of the control panel should be mounted between 160 to 170 centimeters above the floor (63 to 67 inches).

A clean source of single phase AC power (minimum 110 volts to a maximum 250 volts) is required. This should be provided from a dedicated, lockable 15 amp circuit breaker. The “LINE” wire connects to the “L” on the power supply, the “NEUTRAL” wire connects to the “N” on the power supply and the “GROUND” wire connects to the cabinet ground lug.
Connect the Red battery wire to the positive battery terminal and the Black wire to the negative battery terminal. After AC power has been connected, close the cabinet before energizing the dedicated circuit breaker. It is highly recommended that all field wiring be completed before power is turned on.

### 3.1.1 System Wiring

All wiring from the Main Control Unit should be installed in conduit. The terminal strip for the remote wiring is located on the top of the main control board.

![Terminal Strip Diagram]

**3.1.2 Detector Wiring**

Up to four Spark Detectors are wired to inputs DET 1 – DET 4 and are normally installed in pairs in order to “see” every possible path of a spark as well as to facilitate sensitivity testing of the detectors.

![Detector Wiring Diagram]

The Detector wiring must be three wire shielded of at least 18 AWG. At the control panel end, the red wire of the detector connects to the “+” terminal; the white wire connects to the “S” terminal; and the black wire connects to the “-” terminal.
At the detector end of the wiring, an electrical connector is pre-terminated and provided with a three meter (10 foot) cable stub to simplify local installation. This cable runs from the detector to a conduit junction box. Cable from the conduit junction box to the control panel must be three wire shielded 18 AWG and must be run in its own metallic conduit a minimum of one meter (36 inches) away from high voltage sources (greater than 400 volts). The cable stub should be connected to the control panel cable via a terminal block or mechanical crimping device (marrette type connectors are not recommended).

We recommend leaving one meter (three feet) of extra cable at the detector in case they need to be moved at a future date because of changes in air speed due to air handling equipment upgrades.

**Pin 1 is (+), Red Wire 24VDC**

**Pin 2 is SIG, White Wire signal**

**Pin 3 is (-), Black wire 0VDC**

**Pin 4 is Shield, Shield Wire**
3.1.3 Spray and Horn Output Connections

Two supervised outputs (SPRAY 1 and SPRAY 2) which are normally used for the 901-1 Water Spray Assembly are provided on the AN104 main control board. No end of line supervision device is required. An auxiliary device or flood nozzle for the dust collector may alternatively be connected to SPRAY 2. Program Switch 5 determines the function of SPRAY 2.

The Horn or Horn/Strobe is connected to the “HORN”. Polarity must be observed and a 3000 Ohm resistor must be fitted at the end of the line for End Of Line supervision (the EOL resistor is normally fitted on the Horn when shipped from the factory).

3.1.4 Fan Shutdown Wiring

A normally closed dry contact is provided to shut down the fan blower motor. This must be for control wiring only and can not be for direct motor wiring. This is a safety feature and the control wiring contact will open on detection of a spark or ember. Some authorities may prefer to keep the fans running, in which case this input is not used.
3.1.5 Abort Damper Wiring

An Abort Damper is intended to divert clean air from the dust collector away from inside, occupied spaces. When activated, the gate drops to the closed or diverting position. The Abort Damper is normally powered by single phase AC power. The AC power is connected to the ABORT VAC input.

The Abort Damper is connected to the ABORT terminals. There are two types of abort dampers: solenoid latched dampers and magnetic attached dampers. The more common solenoid latched damper is un-powered when idle and is energized to activate, while the magnet latched damper is powered when idle and de-energized when activated. The coil of the solenoid latched abort damper must be supervised to ensure it is available.

A jumper on JP2 is used to select normally open (SOLENOID) or normally closed (MAGNET) for the ABORT contacts. For magnetic latched dampers or no abort damper, a jumper must be added to JP3 to disable the supervision.
3.1.6 Flow Wiring

A supervised input marked FLOW is provided to monitor an optional Water Flow Switch. A 3000 Ohm End Of Line resistor must be fitted at the end of the last device. A trouble condition will be generated if there is water flow or contact closure when there is no spark detected or if a spark is detected, but there is no water flow. Program Switch 4 is set to indicate if the optional flow switch is fitted or not fitted.

3.1.7 Heat Detector Wiring

The HEAT input is used to monitor a Heat Detector. Activation of the Heat Detector will activate the Fan Shutdown Relay until cleared and the Abort Damper relay for 10 seconds. It may also activate output SPRAY 2 to control a baghouse deluge spray based on the setting of Program Switch 5. A 3000 Ohm End of Line resistor must be fitted at the end of the wires to ensure proper supervision on the circuit. A break, cut or ground on any wire will generate a trouble condition.

3.1.8 Auxiliary Wiring

A supervised input marked AUX is provided to monitor optional Auxiliary inputs such as a Supervised Shutoff Valve, Heat Tracing or a Water Pressure Switch. A 3000 Ohm End of Line resistor must be fitted at the end of the wires to ensure proper supervision on the circuit. A break, cut or ground on any wire will generate a trouble condition.
3.1.9 Alarm and Trouble Wiring

Dry contacts are provided to indicate alarm or trouble conditions to other monitoring facilities such as a Fire Alarm Control Panel or a Programmable Logic Controller. The connections are labeled “ALARM” and “TROUBLE”. Connect any wiring to normally open or normally closed contacts to accommodate the requirements of the monitoring facility.

3.2 DETECTOR AND NOZZLE PLACEMENT

The spray assembly must have a straight pipe after it (downstream) to develop a proper water spray pattern. The required distance is determined as follows:
• (Dc) is defined as the minimum distance that a spray nozzle may be located to a bend. In feet 
  \( (Dc) = 0.001 \times \text{velocity of air flow (in feet per minute)} \); in meters \( (Dc) = 0.06 \times \text{velocity of air flow in meters per second} \).

• The distance between the detector and the spray nozzle does not need to be a straight pipe. 
  \( (Ds) \) is defined as the minimum between the detector and the spray nozzle. In feet, 
  \( (Ds) = 0.005 \times \text{velocity of airflow (in feet per minute)} \); in meters, \( (Ds) = 0.3 \times \text{velocity in meters per second} \).

• Detectors should not be located close to branch lines or they may become obscured by dust 
  due to turbulent air flow.

• (Db) is defined as the distance between the last branch and the detector. \( (Db) = 2.5 \times \text{last branch diameter} \)

• Detectors should not be mounted in bends; they must be mounted in a straight portion of the 
  duct work.

3.3 VALVE AND NOZZLE SPRAY ASSEMBLY

A water supply capable of supplying 74 l/m (19.5 g/min) at minimum pressure of 340 kPa (50 
PSI) must be maintained at each nozzle spray. A booster pump should be installed if pressure 
could fall below the minimum and a pressure reducer should be installed if water pressure exceeds 
the maximum.

The absolute minimum water pressure required at entry to the assembly is 310.0 kPa or 44.96 
PSI. Water flow through the Assembly at 340 kPa or 50 PSI is 74 l/min or 19 gal/min.
A strainer with a maximum of a 20 mesh stainless steel screen must be installed immediately in front of the valve and nozzle spray assembly. The strainer is installed as shown above. The valve should connect directly to the nozzle or within 75 mm (three inches).

Water pipes, strainers, valves and nozzles installed outside must be heat traced and insulated. Heat tracing and insulation must be adequate to withstand extreme temperature and environmental conditions of the area where it is installed.

Install the nozzle all the way into the mounting flange.
All nozzles must be mounted in the same plane of vertical circumference. Single nozzles should be mounted at the top of the duct. If two nozzles are required, they should be mounted 15 degrees above the center of the ducts to ensure drainage after spray.

Locate the nozzle positions and drill the duct to accept the mounting flange.

If you have access to the inside of the duct, you can drill a 38 mm (1.5 inches) diameter hole in the duct, push the flange and the split washer through the hole from the inside and then fasten the washer and nut on the outside of the duct.
If you do not have access to the inside of the duct, you will need to use an insertion tool to mount the detector mounting flange through a blind hole in the duct. The duct hole in this case must be 40 mm (1 9/16 inches) diameter as you will need to pass the flange through the hole from the outside.

First, slip the nut, washer, split washer and then the flange onto the mounting tool. Turn the wing nut on the insertion tool until the tool fits tightly to the flange - the nut and washers should be loose on the shaft of the tool.

Secondly, push the mounting flange completely through the hole in the duct and insert the split washer by rotating it into the inside of the duct.

Thirdly, gently pull the flange back through the hole with the insertion tool so it rests against the split washer inside the duct. Make sure the flange is centered in the oversized hole and tighten the washer and nut onto the flange. It is very important that no light can get between the flange and the duct, or it will cause false alarms. Remove the insertion tool by loosening the wing nut and pulling straight back and twisting if required.
The nozzle screws all the way into the flange.

A two conductor, 14 AWG cable is required to connect Spray One to the valve and nozzle spray assembly. 14 AWG is adequate for distances up to 1000 feet - for greater distances, consult with Hansentek. The valve and nozzle spray assembly is not polarity sensitive.

### 3.4 DETECTORS

**NOTE:** The detectors are extremely sensitive to visible and near infrared light. The detector must be mounted on the pneumatic duct and be completely shielded from any light or modulated heat source or false alarms will occur. There can be no screw holes, open seams or cracks of any sort. Prior to operation, ensure any cracks or holes are sealed with a metal foil tape. Duct tapes are not acceptable as they may pass infrared light and cause false alarms.

**NOTE:** Due to the extreme sensitivity and the fast response of the detectors, it is possible that large voltage induced surge transients can cause false alarms.

The detectors are housed in an outdoor NEMA 4 rated aluminum enclosure. They are equipped with a quick-release mounting bracket for mounting onto the surface of a duct or a press fit mounting flange. The mounting arrangement allows for easy periodic cleaning of the lens surface.

Each detector is equipped with an infrared light source located behind the protective lens. This light source is used to test the opposing detector when more than one detector is used in a duct. In this way each detector can verify the sensitivity of the opposing detector.
The specifications of the Hansentek detectors are:

<table>
<thead>
<tr>
<th></th>
<th><strong>120 Detector</strong></th>
<th><strong>121 Detector</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Sensitivity:</strong></td>
<td>100 nW/cm²</td>
<td>150 nW/cm²</td>
</tr>
<tr>
<td><strong>Response Time:</strong></td>
<td>.5msec</td>
<td>.5msec</td>
</tr>
<tr>
<td><strong>Cone of Vision:</strong></td>
<td>100 degrees</td>
<td>70 degrees</td>
</tr>
<tr>
<td><strong>Spectral Response:</strong></td>
<td>0.4 - 1.1 µm</td>
<td>0.4 - 1.1 µm</td>
</tr>
<tr>
<td><strong>Response Peak:</strong></td>
<td>1.0 µm</td>
<td>1.0 µm</td>
</tr>
<tr>
<td><strong>Temperature Range:</strong></td>
<td>-40°C to 60°C</td>
<td>-40°C to 60°C</td>
</tr>
<tr>
<td></td>
<td>(-40°F to 140°F)</td>
<td>(-40°F to 140°F)</td>
</tr>
<tr>
<td><strong>Max Probe Temperature:</strong></td>
<td>N/A</td>
<td>260°C (500°F)</td>
</tr>
<tr>
<td><strong>Current:</strong></td>
<td>15 mA</td>
<td>15 mA</td>
</tr>
</tbody>
</table>

### 3.4.1 Model 120 Detector

Locate the detector positions and drill the duct to accept the mounting flange.

If you have access to the inside of the duct, you can drill a 32 mm (1.25 inch) diameter hole in the duct, push the flange and the split washer through the hole from the inside and then fasten the washer and nut on the outside of the duct.

If you do not have access to the inside of the duct, you will need to use an insertion tool to mount the detector mounting flange through a blind hole in the duct. The duct hole in this case must be
(1.5 inches) 38 mm diameter as you will need to pass the flange through the hole from the outside.

First, slip the nut, washer, split washer and then the flange onto the mounting tool. Turn the wing nut on the insertion tool until the tool fits tightly to the flange - the nut and washers should be loose on the shaft of the tool.

Secondly, push the mounting flange completely through the hole in the duct and insert the split washer by rotating it into the inside of the duct.
Thirdly, gently pull the flange back through the hole with the insertion tool so it rests against the split washer inside the duct. Make sure the flange is centered in the oversized hole and tighten the washer and nut onto the flange. It is very important that no light can get between the flange and the duct or it will cause false alarms. Remove the insertion tool by loosening the wing nut and pulling straight back and twisting if required.
The 120 detector lens assembly slides snugly into the flange. A set screw is provided to hold the detector in place.

### 3.4.2 Model 121 Fiber Optic Detectors

The Model 121 has two lenses and there are normally two detectors installed at each location. The four lenses of the two detectors should be mounted at 90 degree intervals or at approximately 1:30 o’clock, 4:30 o’clock, 7:30 o’clock and 10:30 o’clock. For square or rectangular ducts, we recommend one lens on the top and one on the side for each detector as shown. The larger fiber probe of each detector must be mounted on the sides, opposite each other.

The Model 121-3 has three lenses which should be mounted at 120 degree intervals or at approximately 12:00 o’clock, 4 o’clock and 8 o’clock.

The detector itself is mounted away from the duct and the lenses are attached to the duct through steel clad fiber optic cables. The mounting hole spacing for the detector is shown below.
Locate the detector lens positions and drill the duct to accept the mounting flange.

If you have access to the inside of the duct, you can drill two 20 mm (0.75 inch) diameter holes in the duct for each detector. Push the flanges and the split washers through each hole from the inside and then fasten the washers and nuts on the outside of the duct.

If you do not have access to the inside of the duct, you will need to use an insertion tool to mount the detector mounting flanges through blind holes in the duct. The duct holes in this case must be 25 mm (one inch) diameter as you will need to pass the flanges through the holes from the outside.

First, slip the nut, washer, split washer and then the flange onto the mounting tool. Turn the wing nut on the insertion tool until the tool fits tightly to the flange - the nut and washers should be loose on the shaft of the tool.
Secondly, push the mounting flange completely through the hole in the duct and insert the split washer by rotating it into the inside of the duct.

Thirdly, gently pull the flange back through the hole with the insertion tool so it rests against the split washer inside the duct. Make sure the flange is centered in the oversized hole and tighten the washer and nut onto the flange. It is very important that no light can get between the flange and the duct or it will cause false alarms. Remove the insertion tool by loosening the wing nut and pulling straight back and twisting if required.
The Model 121 detector lens assembly slides snugly into the flange. A set screw is provided to hold the lens in place.

**NOTE:** Sensitivity Checking cannot be done when using the 121-3 detector.
4 SYSTEM PROGRAMMING

4.1.1 SET TIME AND DATE

The TEST key together with the VIEW HISTORY key are used to set the time and date on a 24 hour clock.

NOTE: The system will not adjust for daylight savings time and this must be adjusted manually using the following procedure. Procedure: Press the TEST key and VIEW HISTORY key together at the same time. The display will respond:

SET TIME
HHMMSS: 13:24:05
Press the NEXT key to advance the number above the cursor and the LAST arrow key to decrement the number. Press the EXECUTE key to save this number and move the cursor to the next position. When you press EXECUTE from the last digit position, the display will change to the following:

<table>
<thead>
<tr>
<th>SET DATE</th>
</tr>
</thead>
<tbody>
<tr>
<td>MMDDYY: 01/05/13</td>
</tr>
</tbody>
</table>

NOTE: The system clock operates on a 24 hour basis. Therefore 1 o’clock in the afternoon is entered as 13:00:00 and 10 o’clock in the evening is entered as 22:00:00. Press the NEXT key to advance the number above the cursor and the LAST arrow key to decrement the number. Press the EXECUTE key to save this number and move the cursor to the next position. When you press EXECUTE from the last digit position, the display will return to the normal mode.
5 TESTING AND TROUBLESHOOTING

5.1 TEST

The Hansentek Spark Detectors have a unique built-in test system. This test checks the sensitivity of the detector across the complete full width of the duct and through the lenses. The detector mounted opposite the one under test flashes an Infra Red light. The test procedure starts at Detector One. Press the EXECUTE key to perform the test. The display will indicate a PASS or FAIL. Use the NEXT arrow to increment through all the detectors.

NOTE: It is recommended that these tests be performed when the dust collector is off as particles in the air stream can affect the accuracy of the test results.

To test all other functions of the system, the SERVICE Switch on the main control circuit board must be set to SERVICE. Under individual control, you can also test and verify the Spray Assemblies as well as the Horn, the Alarm Relay, the Trouble Relay, the Shutdown Relay and the Abort Damper Relay by stepping though with the NEXT and LAST arrow keys. Press the EXECUTE key to perform any of these tests. These outputs and relays are activated for only one second during this test in order to minimize water flow or system interruptions. The SERVICE Switch must be returned to the NORMAL position after all the testing of these functions.

5.2 VIEW HISTORY

The AN104 records a history in chronological order of the last 2000+ alarm and trouble conditions that have occurred, complete with the time and date of the occurrence.

Press the VIEW HISTORY key. The display will respond with the last alarm or trouble activity with a description as well as a time and date (the time and date are displayed on a second screen).
You may use the \textit{NEXT} and \textit{LAST} arrow keys to step through the 2000+ most recent occurrences. To clear History, press the \textit{CLEAR} and \textit{HISTORY} keys at the same time. The Display will ask you to “PRESS EXECUTE TO CLEAR HISTORY” and you must press \textit{EXECUTE} to clear History.

5.3 VIEW PROGRAM SWITCH SETTINGS

![TEST ACKNOWLEDGE] The \textit{TEST} key together with the \textit{ACKNOWLEDGE} key is used to read 12 program switch settings of the AN104. Procedure: Press the \textit{TEST} key and \textit{ACKNOWLEDGE} key together at the same time. The display will respond with “SWITCH SETTINGS: such as “010110011101”, which indicates the settings of the 12 program switches.

There are a total of 12 programming switches located on the main control circuit board.

The table following the list of options provides details on how to set the switches.

- \textbf{Spray Time}: Switch 1 and 2 set the water spray time. The Water Spray Assembly sends a curtain of water across the duct that any detected sparks must pass through. The spray time is normally set at 5 seconds but may be set longer.
- \textbf{Number of Detectors}: Switch 3 sets how many detectors are fitted on the zone. Detectors are fitted in pairs of either 2 or four.
- \textbf{Water Flow Monitoring}: Switch 4 is used to monitor a Water Flow Switch when a flow switch is installed in the water line to the spray assembly. With Switch 4 set as “0”, a trouble condition will be generated if there is a spark and no flow. Set the switch to “1” if no Flow Switch is fitted.
- \textbf{Second Water Spray}: Switch 5 selects whether Output S2 is used for a second Water Spray Assembly or used as a deluge spray in the dust collector controlled by the Heat Detector.
- \textbf{Deluge Spray Time}: If Output 2 is set as a deluge spray as above, Switch 6 determines the spray time which may be set at 10 minutes or continuous until the “Clear” button is pressed.
• **Shutdown**: Switch 7 determines whether the air conveyance system is shutdown when a spark is detected or whether only multiple sparks (four in a five minute period) will shut the system down (switch shutdown contacts).

• **Second Detection**: Switch 8 can be set to provide a second detection point on the air conveyance. This allows you to detect with detectors one and two and then detect again with detector 3 and 4 after the spray to confirm extinguishment. If detector three or four sees the spark, it activates the shutdown and abort functions.

• **Auto Self Test**: Switch 9 enables or disables the Auto Self Test feature. When enabled, the detectors will self test at approximately six hour intervals. A trouble condition is reported if any detector pair fails the self test.

• **Language**: Switch 10 allows for the selection of language to be displayed. Either English or French (or another substituted language can be selected).

• **Spray One Disable**: Output S1 (SPRAY 1) can be disabled with Switch 11.

• **Spray Two Disable**: Output S2 (SPRAY2) can be disabled with Switch 12.
<table>
<thead>
<tr>
<th>SWITCH</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
<th>6</th>
<th>7</th>
<th>8</th>
<th>9</th>
<th>10</th>
<th>11</th>
<th>12</th>
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</thead>
<tbody>
<tr>
<td>Spray 2 Seconds</td>
<td>0</td>
<td>0</td>
<td></td>
<td></td>
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<td></td>
<td></td>
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<tr>
<td>Spray 5 Seconds</td>
<td>0</td>
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<tr>
<td>Spray 10 Seconds</td>
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<tr>
<td>Spray 30 Seconds</td>
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<tr>
<td>Two Detectors</td>
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<tr>
<td>Four Detectors</td>
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<tr>
<td>Output 2 (S2) is Second Spray</td>
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<tr>
<td>Output 2 (S2) is Deluge</td>
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<td>Deluge 10 Minutes</td>
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<tr>
<td>Deluge Continuous until reset</td>
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<td>1</td>
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<tr>
<td>Shutdown on 1 spray</td>
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<tr>
<td>Shutdown on 4 sprays in 5 minutes</td>
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<td>0</td>
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<tr>
<td>Shutdown/Abort on D3, D4 only</td>
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<tr>
<td>Shutdown/Abort on D1, D2, D3 or D4</td>
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<td>Auto Self Test On</td>
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<tr>
<td>Auto Self Test Off</td>
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<tr>
<td>Language - English</td>
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<tr>
<td>Language - French (other)</td>
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<td>Enable Spray 1</td>
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<tr>
<td>Disable Spray 1</td>
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<td>1</td>
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<tr>
<td>Enable Spray 2</td>
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<td>0</td>
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<tr>
<td>Disable Spray 2</td>
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<td>1</td>
</tr>
</tbody>
</table>
5.4 COMMISSIONING

Commissioning of the AN104 spark detection system should be done by a factory trained representative of Hansentek or one of its authorized distributors. When the system is placed in service, the representative will completely test the spark detection and extinguishing system to demonstrate that it is properly installed and functional.

To conduct the test and start up procedure, the representative will need:

- The assistance of one plant employee (preferably the person who will be responsible for the operation and maintenance of the system).

- Access to the control panel, horn, detectors, nozzles and abort gates. The representative will probably require ladders or a lift to get access to the equipment.

During testing, all equipment will be demonstrated to work properly. Generally, this means spraying water, sounding horns and shut down of the dust collection system. Every effort will be made to minimize production interruptions, however all test system functions must be demonstrated for acceptance of the system.
6 MAINTENANCE PROCEDURES

6.1 GENERAL

In order to ensure that your spark detection system is in a fully operational condition at all times it must be inspected and tested on a regular basis by a trained, competent, service personnel. It is recommended that a Service & Maintenance contract be established with a manufacturer trained Service Company or with an approved Hansentek Representative.

6.2 WEEKLY CHECKS

A) Visually check all pipe work and detectors to ensure no damage has occurred.
B) Check the control panel to ensure the system is displaying the current time and date.
C) Check sensitivity of detectors at the control panel by doing the following:

Press the TEST key to test the detectors. The test procedure starts at Detector One. Press the EXECUTE key to perform the test. The display will indicate a “PASS” or “FAIL”. Use the NEXT arrow key to increment through all the detectors. Press the EXIT key after testing the last detector. If any detectors fail the test, all detector lenses must be cleaned and the test repeated.

NOTE: Set the toggle switch on the printed circuit board to SERVICE position when cleaning the lenses in order to avoid discharge of water or system shutdown or abort. This test is best performed when the air conveyance system is off and there is no obscuration of the light path due to heavy particle counts in the airstream. Water does not flow and all outputs are inhibited during this test.
6.3 SEMI-ANNUAL INSPECTIONS

- Check system components for mechanical damage and tampering. All systems lead and wire seals should be intact.
- Ensure that there are no obstructions that would prevent system operation.
- Check water supply to spray assembly and ensure that the strainer is clear of any debris to allow a clean flow of water.
- Keep records of all test procedures for the authority having jurisdiction.
- Testing is best accomplished during non-production periods.
- If applicable, manually activate and reset your abort damper when the exhaust system has been turned off.

6.4 ANNUAL INSPECTIONS

(By Authorized Representative)

- Complete testing of the control panel, detectors, spray assembly and all other functions such as the abort dampers, shut-down, and fire alarm connections.
- Operation of input/output circuits.
- Sensitivity testing of each detector.
- Inspect and clean all control equipment.
- Issue report as per NFPA 72 code.

UPON COMPLETION OF ALL TESTING, ENSURE ALL EQUIPMENT IS RESET AND THAT ALL COMPONENTS ARE LEFT IN A NORMAL "STANDBY" CONDITION. KEEP DOCUMENTS AND RECORDS OF ALL TEST PROCEDURES THAT MAY BE REQUIRED BY THE AUTHORITY HAVING JURISDICTION.
7 WARRANTY AND RETURN POLICY

WARRANTY ON SPARK DETECTION & EXTINGUISHING SYSTEMS:

Hansentek (Division of Neola Corporation) warrants that equipment will perform in accordance with Hansentek’s specifications and will be free from defects in materials and workmanship under normal use for a period of one year from the date of shipment.

Hansentek’s warranty is valid only on the following conditions: The equipment is installed in accordance with approved installation drawings and manual and in accordance with all applicable codes, regulations, and safety requirements.

Hansentek’s sole obligation and customer’s sole remedy under this warranty is the replacement or repair, (at Hansentek’s option), of the defective components. Such obligation and remedy are conditional upon the equipment not having been altered, mishandled, misused, repaired or damaged. Defective components shall be shipped, freight prepaid, to Hansentek’s offices. Customer shall pay inbound and outbound freight and insurance on all components returned to Hansentek for repair or replacement.

THIS WARRANTY IS EXCLUSIVE AND IN LIEU OF ALL OTHER WARRANTIES OR CONDITIONS, EXPRESS OR IMPLIED, INCLUDING BUT NOT LIMITED TO THE IMPLIED WARRANTIES OR CONDITIONS OF MERCHANTABILITY, MERCHANTABILITY QUALITY, FITNESS FOR A PARTICULAR PURPOSE AND THOSE ARISING BY STATUE OR OTHERWISE IN LAW OR FROM THE COURSE OF DEALING WITH USAGE OR TRADE. CUSTOMER ACKNOWLEDGES THAT THE SYSTEM DOES NOT PRECLUDE THE POSSIBILITY OF FIRE OR EXPLOSION. INSTEAD, THE PURPOSE OF THE SYSTEM IS TO DETECT AND ATTEMPT TO EXTINGUISH AT THE SOURCE OF DETECTION. ITS USE IN CONJUNCTION WITH OTHER EXPLOSION SUPPRESSION SYSTEMS, FLAME BARRIERS OR EXPLOSION VENTING MAY REDUCE THE DEGREE OF DAMAGE.
Reasonable efforts have been made to ensure reliability of the system to the extent possible under accessible current technology. Customer acknowledges however, that the technology is of such complexity that it may have inherent or latent defects. In addition, machine and operator variables will influence performance of the system. Hansentek cannot and will not warrant 100 percent detection or elimination of sparks.

Customer releases Hansentek from, and agrees that, in no event, shall Hansentek be liable for any direct, indirect, special, incidental or consequential damages, including loss of profits, death or personal injury, or loss of use of other economic loss, arising in tort, contract or otherwise. For any cause of action whatsoever and regardless of the form of action, shall be limited to customer’s actual direct, provable damages in an amount not to exceed the total amount paid to Hansentek in respect of the Spark Detection and Extinguishing System.