

# Four-wire Duct Smoke Detector

## ESD-4W

### Overview

EDWARDS *SuperDuct* smoke detectors are the most advanced and most reliable devices in their class. Designed for easy installation and superb reliability, *SuperDuct* represents the perfect balance of practical design and advanced technology.

**Reliability and stability** are two features built into every *SuperDuct* detector. *SuperDuct* features environmental compensation with patented differential sensing. This achieves a level of stability and reliability never before achieved for devices of this type. With differential sensing, *SuperDuct* sensors are immune from sensitivity drift – a common cause of false alarms. Every eight minutes the *SuperDuct* sensor checks its environment for dirt, humidity other conditions that normally interfere with sensor operation, and automatically adjusts its sensitivity to compensate. The result is unparalleled reliability and rock solid stability – two features essential to any duct smoke detection application.

**Sensitivity testing and diagnostics** reveal some of the most exciting innovations built into *SuperDuct*. With the ingenious *SuperDuct* remote test station, a sensitivity test can be performed at any time from the safety and comfort of a maintenance office or utility room. Operated either by key or by magnet, the one-gang station also performs alarm tests for detectors connected to a single controller. Detectors may also be tested at the controller via a test switch, or they can be tested individually in the field with a simple-to-operate magnetic test tool. Access to the magnetic reed switch does not require the detector cover to be removed, so testing can be performed quickly and easily.

A dedicated dirty/trouble LED on each unit offers immediate at-a-glance information even when the cover is closed.

### Standard Features

#### Detector assembly

- Less than 2" deep for easy installation
- PCB mounted photoelectric detector with on-board intelligence
- Environmental compensation with patented differential sensing
- -4°F to 158°F (-20°C to 70°C) operating range
- 100 ft/min. to 4,000 ft/min air velocity rating
- Standard RJ45 modular interconnection
- Status LEDs remain visible through clear assembly cover
- Cover tamper reed switch for added security
- Standard sampling tube and mounting holes
- Install in tandem with the controller assembly, or remotely from it
- Sampling tubes install from front-side or back-side of housing
- Magnet-activated test/dirty/reset switch
- No need to open the detector for installation

#### Controller

- One controller for up to two detectors
- Standard connections for easy migration from other detectors
- 24 Vac, 24 Vdc, 120 Vac or 230 Vac operation
- Status LEDs remain visible through clear assembly cover
- Knockouts located on the bottom
- Alarm contact, trouble contact, and two 10 amp auxiliary contacts
- No special tools required for easy access to field connections
- Interconnect up to 15 controllers for multiple fan shut-down

## Configuration 1

**SuperDuct detectors and controllers** feature a unique modular design that speeds installation and simplifies maintenance. Separate housings enable access to either the controller or detector without affecting the other.

Underside conduit knockouts, rubber cable glands, and optional water-resistant gaskets keep contaminants away from components, ensuring years of trouble-free service. When cleaning is required, the detector comes apart easily and snaps back together in seconds.

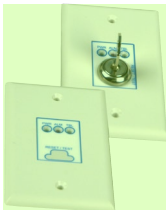
**The detector assembly** provides easy access to the smoke sensor, its wiring connections, sample and exhaust tube fittings, and the smoke chamber itself. Air enters the assembly by means of an air sampling tube (ordered separately), and exits by means of a six-inch exhaust tube (included). The sampling tube may be installed from either

the air duct side of the assembly or from inside the sensor compartment, as preferred by the installer. (The exhaust tube must be installed from the air duct side.) Sampling tubes may be rotated in 45-degree increments so that air-holes can be aligned to allow the unit to be mounted at virtually any angle relative to the air flow.

**The controller** can accommodate up to two detectors. One or both detectors may be installed remotely from the controller.

A Category 5 wiring harnesses (ordered separately) is used for interconnection when detectors are installed remotely from the controller. Harnesses are terminated with RJ45 connectors and come in lengths of up to 15 feet. Controllers and detectors may also be ordered with terminal blocks for interconnection wiring. All models come with terminal blocks for customer connection of the on-board relays to external equipment. High voltage power input terminals are suitable for #22 AWG to #12 AWG wire while all other terminals can handle #22 AWG to #14 AWG wires.

### SuperDuct Highlight: Remote Test/Reset Station 9



**SuperDuct's** ingenious labor-saving Remote Test/Reset stations not only provide remote alarm testing, they also annunciate detector dirt levels. Tests can be performed quickly and safely – without having to climb to the roof. Magnetically-operated and key-operated one-gang models are available.

## Application 12

**SuperDuct** smoke detection is ideally suited to HVAC applications where early indication of combustion is required within the confined space of ventilation ductwork.

Duct detectors are usually installed on the supply duct after the air filters, or in the return air stream prior to being diluted by outside air.

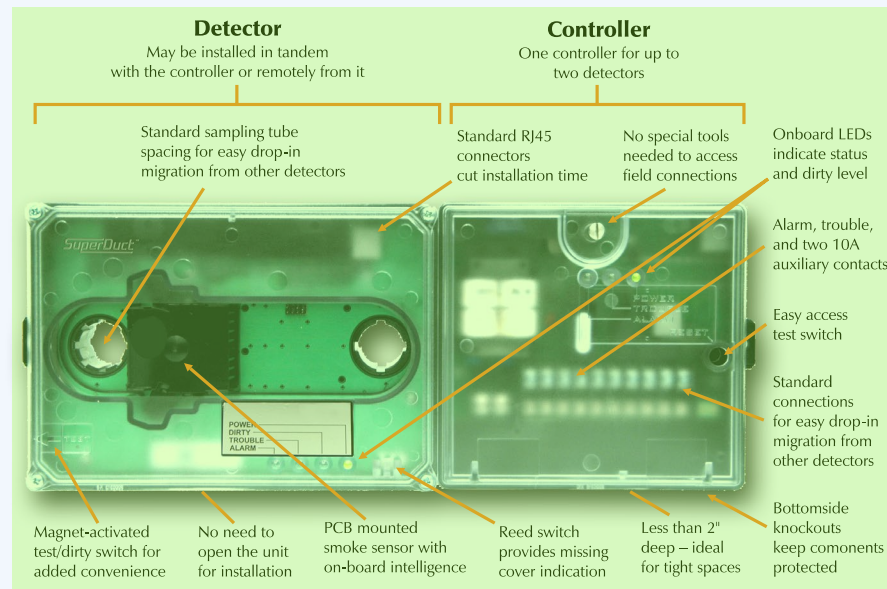
**SuperDuct** detectors continually sample air flow in the HVAC duct and initiate an alarm condition whenever smoke is detected. An alarm is activated when the quantity (percent obscuration) of combustion products in that air sample exceeds the detector's sensitivity setting.

Air velocity in the duct as low as 100 ft/min. maintains adequate air flow into the sensor smoke chamber through air-holes in the air sampling tube and discharges through the exhaust tube. *SuperDuct* air sampling tubes must be installed with the inlet holes

facing the airstream. Sampling tubes may be rotated in 45-degree increments so that air-holes can be aligned to allow the unit to be mounted in virtually any angle relative to the airflow.

**SuperDuct** detectors are engineered to operate optimally under the harsh environmental conditions frequently found in HVAC ductwork. Nonetheless, before installing the detector, test the duct air velocity, temperature, and humidity to verify that it is within the operating range of the **SuperDuct** detector. Consult the **SuperDuct**

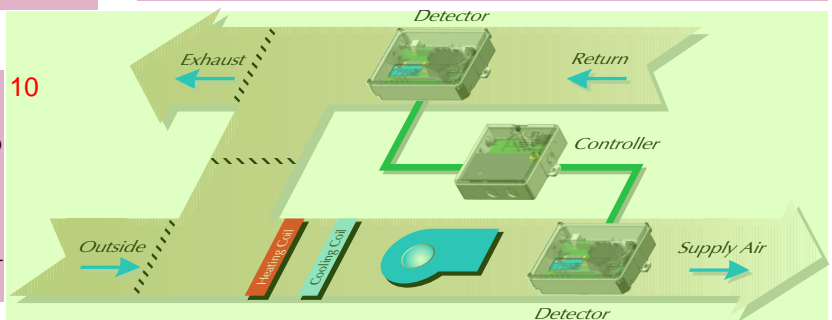
## SuperDuct Overview 18



installation sheet for details.

## Typical Layout 22

With **SuperDuct**, smoke detection for two airstreams can be monitored with just one set of field connections for fan shut-down, damper control, etc.



## Installation 1

Up to two detectors may be connected to a single controller. Typically, the detector comes attached to the controller, connected by means of an integral cable (provided).

Alternatively, one or both detectors may be installed remotely from the controller and connected by means of either a cable with RJ45 connectors, or terminal blocks (see ordering information for details).

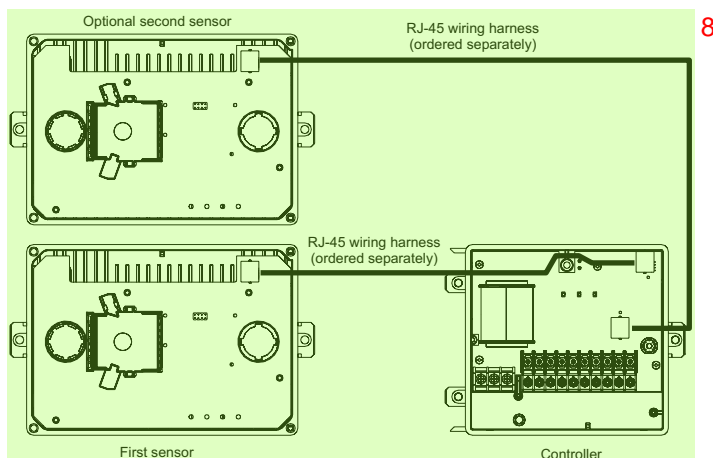
Wiring between detector and controller, along with wiring between controller and fire alarm panel (if used) is supervised.

## Assembly 5

Controllers and detectors come pre-assembled for easy installation for the RJ-45 models. They are sold separately for the terminal versions.

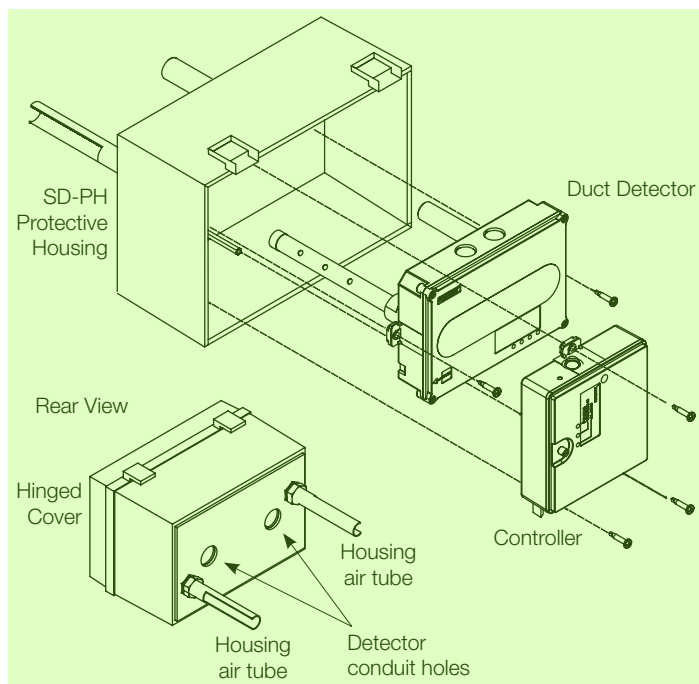
## Interconnection 7

### RJ-45 Model 9



## High-humidity environments 10

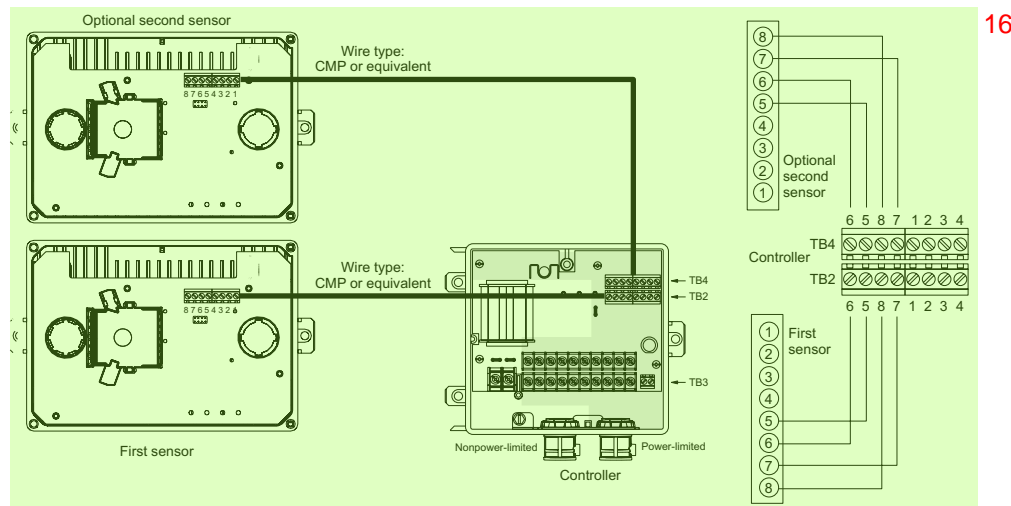
Use the SD-PH Protective Housing when installing SuperDuct detectors in high-humidity environments. The SD-PH is a weatherized housing that prevents condensation on the device by insulating the detectors and providing circulated air from the monitored HVAC duct. The SD-PH also adds a layer of protection against physical damage to the unit.



The SD-PH is easy to install and service. The hinged and transparent cover provides ready access to the detector, while keeping its status indicators visible at all times.

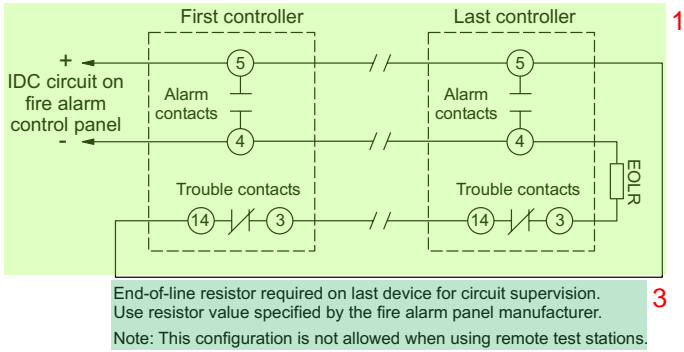
**Note:** The SD-PH Protective Housing is weatherized against outdoor air, but it is not intended for direct outdoor exposure.

### Terminal Model 15

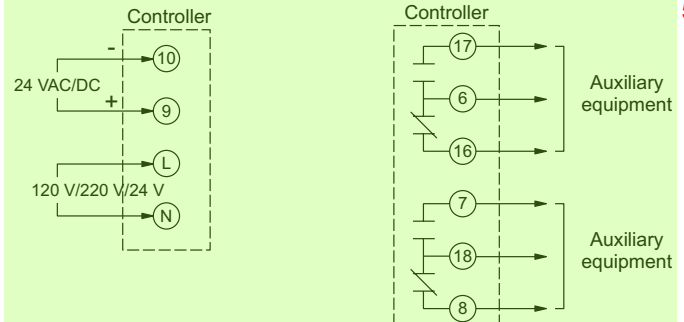


# Typical Wiring

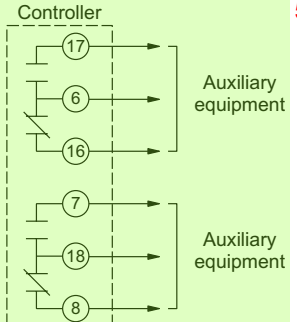
## Fire alarm initiating circuit wiring 2



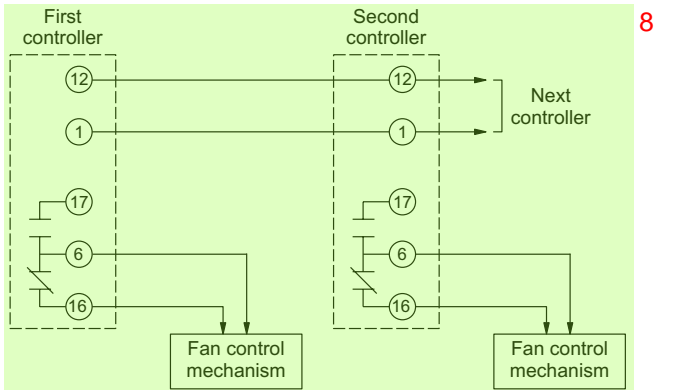
## Power input wiring 4



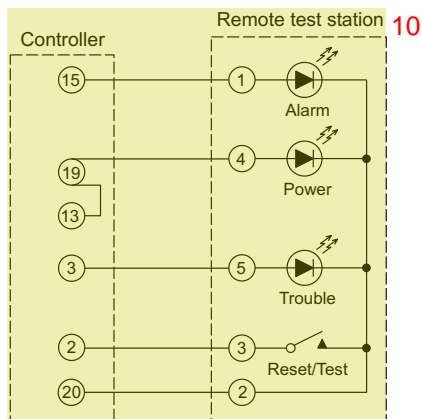
## Auxiliary relay wiring 6



## Multiple fan shutdown interconnect wiring 7



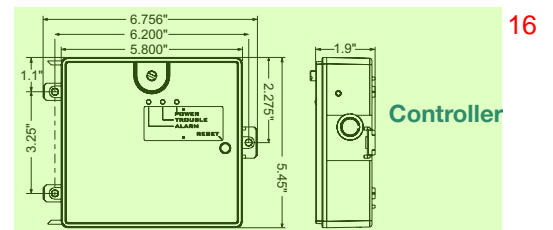
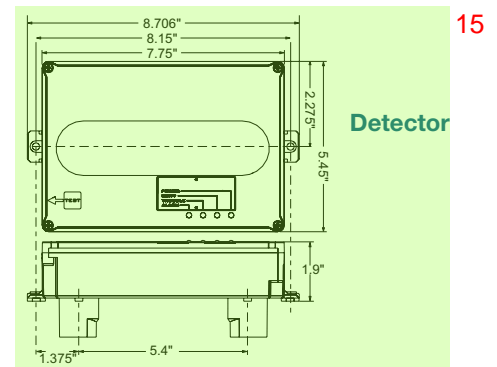
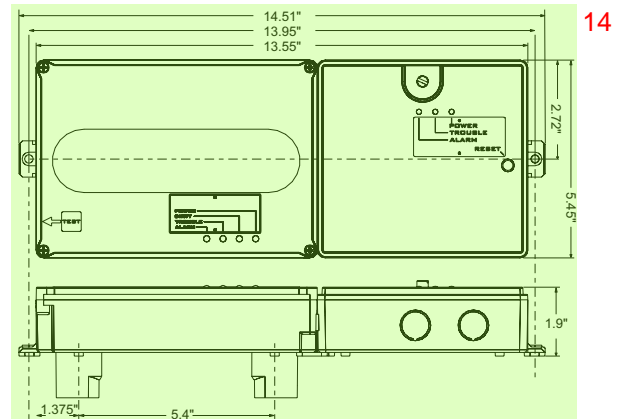
## Remote test station wiring 9



Note: For applications where only the Alarm LED and Reset/Test switch is required, wiring the Power LED and Trouble LED is optional.

# Dimensions 12

## Controller and Detector (mounted in tandem) 13



## Specifications

Dimensions	Controller: 6.75" x 5.45" x 1.90" inches (17.15 cm x 13.84 cm x 4.83 cm) Sensor: 8.70" x 5.45" x 1.90" (22.10 cm x 13.84 cm x 4.83 cm) Controller with sensor: 14.51" x 5.45" x 1.90" (36.86 cm x 13.84 cm x 4.83 cm)
Wire size	High voltage power input terminals (L&N): #12 to #22 AWG All others: #14 to #22 AWG
Wiring distance	Detector to Controller: 100 feet max for each detector Test Station to Controller: 10 ohms max. per wire (i.e. 621 feet with 22 AWG, 3,952 feet with 14 AWG) Controller Interconnect: 5 ohms max between first and last controller (i.e. 310 feet with 22 AWG, 1,976 feet with 14 AWG)
RJ-45 wiring harness	Cable type: CMP
Smoke detection method	Photoelectric
Air velocity rating	100 to 4,000 ft/min and meets the required minimum air pressure differential
Air pressure differential	0.005 to 1.00 inches of water
Sensitivity	0.67 to 2.46 %obscuration/ft
Reset time	2 seconds, max.
Power up time	8 seconds, max.
Alarm test response time	5 to 7 seconds
Controller LED indicators	Alarm (red), Trouble (yellow), Power (green)
Sensor LED indicators	Alarm (red), Trouble (yellow), Dirty (yellow), Power (green)
Alarm initiation relay	Quantity: 1 Style: Normally open Ratings: 2.0 A at 30 Vdc (resistive)
Auxiliary relay	Quantity: 2 Style: Form C Ratings: 10 A at 30 Vdc, 10 A at 250 Vac (contacts must switch a minimum of 100 mA at 5 Vdc)
Supervision (trouble) relay	Quantity: 1 Style: Form C Ratings: 2.0 A at 30 Vdc (resistive)
Auxiliary output	18 Vdc, nom., 30 mA, max.
Operating environment	Temperature (UL): -4 to 158 °F (-29 to 70 °C). Temperature (ULC): -4 to 120 °F (-29 to 49 °C) Relative humidity: 10 to 93%, noncondensing
Operating voltages	24 Vdc, 24 V at 50/60 Hz, 120 V at 50/60 Hz, 220/240 V at 50/60 Hz
Agency Approvals	UL, ULC, CSFM, FM, MEA

## Accessories

### RJ45 wiring harnesses

These 8-conductor cables are used to interconnect detectors with controllers. Harnesses are available in 5 ft., 10 ft., and 15 ft. lengths. They include RJ45 connectors with rubber glands to provide a watertight seal at each end.

### Air Sampling Tubes

Rigid metal sampling tubes are available in several lengths. They can be installed without the need to open the detector.

### Remote Test/Reset Station

The Remote Test/Reset Station provides alarm test or dirty test capability from a remote location. It includes a one-gang plate, momentary SPST switch, red alarm LED, yellow trouble LED, green power LED, and terminal block. Magnetically-operated or key-operated models are available.

Current Load @ 24 Vdc:  
standby = 5 mA  
alarm = 15 mA max.

### Air Velocity Test Kit

With this kit, and a suitable manometer, testing can be carried out with the duct detector fully installed and wired.

### Test Magnet

Used to activate test routine from either a SD-TRM4 Remote Test/Reset Station, or the detector.

## Ordering Information

Catalog Number	Description	Ship Wt. lb. (kg)
<b>Controllers and Detectors</b>		
ESD-CJ	Controller (RJ45)	2.4 (1.1)
ESD-SJ	Sensor (RJ45)	2.4 (1.1)
ESD-4WJ	Controller w/sensor (RJ45)	3.7 (3.4)
ESD-CT	Controller (terminals)	2.4 (1.1)
ESD-ST	Sensor (terminals)	2.4 (1.1)

<b>Accessories</b>		
SD-T8	Air sample tube, 8 inch	0.5 (0.2)
SD-T18	Air sample tube, 18 inch	1.5 (0.7)
SD-T24	Air sample tube, 24 inch	1.1 (0.5)
SD-T36	Air sample tube, 36 inch	3.0 (1.4)
SD-T42	Air sample tube, 42 inch	3.5 (1.6)
SD-T60	Air sample tube, 60 inch	5.8 (2.6)
SD-T78	Air sample tube, 78 inch	4.1 (1.9)
SD-T120	Air sample tube, 120 inch	11.5 (5.2)
SD-RJ15	RJ45 wiring harness kit -- 15 ft.	1.5 (0.7)
SD-RJ10	RJ45 wiring harness kit -- 10 ft.	1.5 (0.7)
SD-RJ5	RJ45 wiring harness kit -- 5 ft.	0.6 (0.3)
SD-TRM4	Remote test/reset station, magnetic	1.0 (0.5)
SD-TRK4	Remote test/reset station, keyed	1.0 (0.5)
5956A	Remote LED Alarm Indicator	1.0 (0.5)
SD-PH	Protective housing for high humidity areas	5.5 (2.5)
SD-VTK	Air velocity test kit (stoppers, etc)	1.0 (0.5)
SD-GSK	Cover gasket kit	0.5 (0.2)
SD-MAG	Test magnet kit	0.5 (0.2)
SD-4WPCBT	Replacement PCB/sensor kit (terminals)	1.0 (0.5)
SD-4WPCBJ	Replacement PCB/sensor kit (RJ45)	1.0 (0.5)
7140126-01	Replacement RJ45 interconnect cable	0.5 (0.2)

