

## Detection and Release Devices

F-12-0-001  
July 2019

### FEATURES

- Repeatable - self-restoring, nothing to replace, testable
- Versatile - various temperature settings available
- Durable - long lasting stainless steel shell
- Economical - wide spacings reduce installation costs
- Factory set
- Internal contact area hermetically sealed in stainless steel shell
- ROHS Compliant

### APPLICATIONS

- Protection of schools, factories, offices, libraries, etc.
- Power generation
- Gas station islands
- Paint spray booths
- Range hoods
- Engine compartments



### DESCRIPTION

DETECT-A-FIRE® (D-A-F) detectors are the "heart" of many fire protection systems. These highly reliable devices have been the standard for over 65 years. Thousands of these detectors are in systems controlling the release of extinguishants such as clean agents, CO<sub>2</sub>, water, or dry chemicals. In some systems the device is used as an alarm device, to sense overheat or fire and alert personnel.

D-A-F detectors are widely accepted, because they are designed with rate compensation. This provides a unique advantage over both fixed temperature and rate-of-rise types of detectors because the D-A-F detector accurately senses the surrounding air temperature regardless of the fire growth rate. At the pre-determined danger point, the system is activated.

Fixed temperature detectors must be completely heated to alarm temperature and therefore a lag in response time may occur with a fast rate fire. Rate-of-rise devices, on the other hand, are triggered by the rate of increase in ambient temperature and are subject to false alarms caused by harmless, transient thermal gradients such as the rush of warm air from process ovens.

The key to the detector's sensitivity is in the design (Figure 1). The outer shell is made of a rapidly expanding alloy which closely follows changes in surrounding air temperature. The inner struts are made of a slower expanding alloy. Designed to resist thermal energy absorption and sealed inside the shell, the struts follow temperature changes more slowly.

A slow rate fire (Figure 2) will heat the shell and struts together. At the "set point", the detector will trigger, actuating the alarm or releasing the extinguishant.

A transient rush of warm air up to 40°F/min. may expand the shell, but not enough to trigger the detector. By ignoring transient warm air excursions, the D-A-F detector virtually eliminates false alarms prevalent with rate-of-rise devices.

If a fast rate fire (Figure 3) starts, the shell will expand rapidly. The struts will close, actuating the alarm and/or releasing the agent. The faster the fire rate of growth, the sooner the D-A-F detector will react.

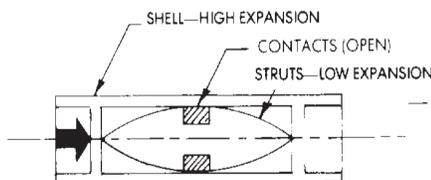


Figure 1. READY

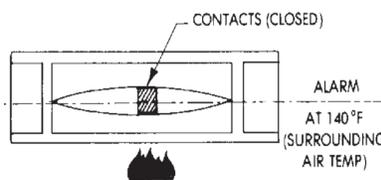


Figure 2. SLOW FIRE

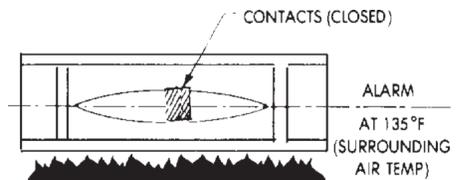


Figure 3. FAST FIRE

## VERTICAL DETECT-A-FIRE DETECTOR SPECIFICATIONS

Vertical D-A-F detectors are designed for use in both "ordinary" or "hazardous" locations. For "ordinary" use, they may be mounted to any approved junction box with 7/8" diameter opening by using 1/2-14 NPT mounting nuts. The device may be wired in or out of conduit, depending on local preferences and codes. To facilitate supervision of system wiring, four lead wires are provided on normally open vertical detectors (that close on temperature rise). When mounted in a suitable enclosure, detectors are Underwriters Laboratory and Underwriters Laboratory of Canada listed, and FM Approved for hazardous locations.

### VERTICAL MODELS

**TABLE 1: MODEL NUMBER 12-X27120\*, 12-X27121**

X	°F Setting	°F Tolerance	Spacings (in feet)			RTI	Color Coding
			UL	ULc	FM		
E	140	+7/-8	50	50	20	V-Fast	Black
	160	+7/-8	25	25	20	V-Fast	Black
	190	+7/-8	50	50	25	V-Fast	White
	210	+7/-8	25	50	25	V-Fast	White
	225	+7/-8	25	50	25	V-Fast	White
F	275	±10	25	50	25	V-Fast	Blue
	325	±10	50	50	25	V-Fast	Red
	360	±10	25	50	30	V-Fast	Red
G	450	±15	25	50	30	V-Fast	Green
	500	±15	50	50	30	V-Fast	Orange
H	600	±20	N/A	50	30	V-Fast	Orange
	725	±20	N/A	50	30	V-Fast	Orange

**Notes:**

- For clean agents and CO2 suppression systems, ceiling spacing is 20 ft. apart unless otherwise specified.
- 27120 is a 2-wire device and RTI is not applicable.
- 27120 is a normally closed device and does not meet the requirements of NFPA-72 for use as an initiating device.
- For NFPA Guidelines on ceiling height compensation, see Table 8 on page 4.

\* Not listed by FM with RTI.

**TABLE 2: MODEL NUMBER 12-X28020\*, 12-X28021**

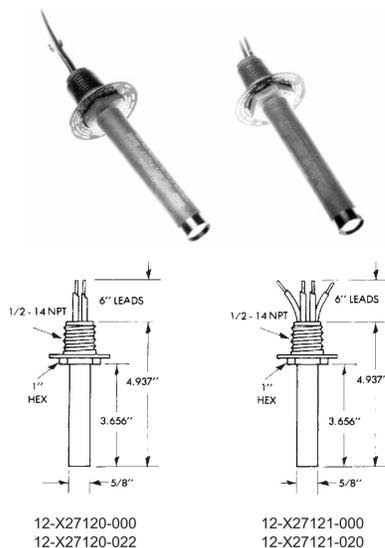
X	°F Setting	°F Tolerance	Spacings (in feet)			RTI	Color Coding
			UL	ULc	FM		
E	140	+7/-8	50	50	30	V-Fast	Black
	160	+7/-8	25	25	30	V-Fast	Black
	190	+7/-8	50	50	30	V-Fast	White
	210	+7/-8	25	50	30	V-Fast	White
	225	+7/-8	25	50	30	V-Fast	White
F	275	±10	25	50	30	V-Fast	Blue
	325	±10	50	50	30	V-Fast	Red
	360	±10	25	50	30	V-Fast	Red
G	450	±15	25	50	30	V-Fast	Green
	500	±15	50	50	30	V-Fast	Orange
H	600	±20	N/A	50	30	V-Fast	Orange
	725	±20	N/A	50	30	V-Fast	Orange

**Notes:**

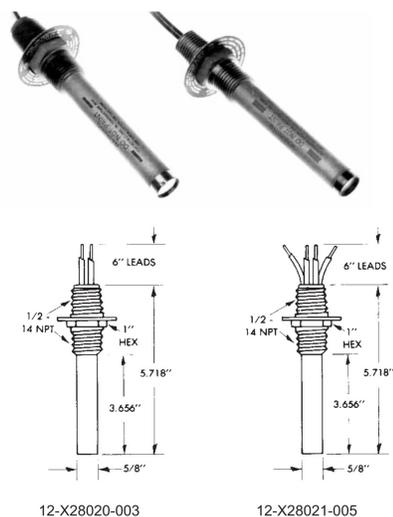
- For clean agents and CO2 suppression systems, ceiling spacing is 20 ft. apart unless otherwise specified.
- 28020 is a 2-wire device and RTI is not applicable.
- 28020 is a normally closed device and does not meet the requirements of NFPA-72 for use as an initiating device.
- For NFPA Guidelines on ceiling height compensation, see Table 8 on page 4.

\* Not listed by FM with RTI.

### VERTICAL DESIGNS (HEXAGONAL HEAD)



### VERTICAL DESIGNS (COUPLING HEAD)



## HORIZONTAL DETECT-A-FIRE DETECTOR SPECIFICATIONS

Horizontal D-A-F detectors are designed for locations where appearance is a factor. The low-profile, functional design lends physical protection of the detector while making it suitable for commercial, industrial, mercantile public buildings, institutions, and marine applications in non-hazardous locations (those classified as "ordinary" under the National Electric Code). Flush mounted detectors are designed to fit standard 4-inch octagonal electric boxes and surface mounting detectors are designed to mount directly on ceilings or on 4-inch electrical junction boxes. Canadian Electrical Codes requires mounting only to an electrical junction box.

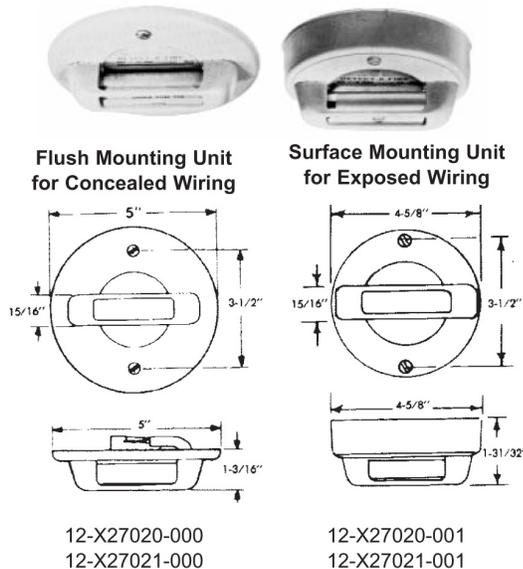
### HORIZONTAL MODELS ONLY

**TABLE 3:**

Model No. (See Table 4 for "X")	Contact Operation on Temperature Rise	Approx. Weight	Electrical Rating (Resistive Only)
12-X27020-000 12-X27020-001	Opens 325°F (Max)	10 oz	5.0 Amps 125 VAC 0.5 Amps 125 VDC
12-X27021-000 12-X27021-001	Closes 325°F (Max)	10 oz	5.0 Amps 125 VAC 0.5 amps 125 VDC 2.0 Amps 24 VDC 1.0 Amps 48 VDC

Model 12-X27020-00X is a normally closed device and does not meet the requirements of NFPA-72 for use as an initiating device.

### HORIZONTAL DESIGNS



**TABLE 4:**

X	°F Setting	°F Tolerance	Spacings (in feet)			RTI	Color Coding
			UL	ULc	FM		
A	140	+7/-8	50	50	20	Quick	Black
	160	+7/-8	25	25	20	Quick	Black
	190	+7/-8	50	50	25	Fast	White
	210	+7/-8	25	50	25	Fast	White
	225	+7/-8	25	50	25	Fast	White
B	275	10	25	50	25	Fast	Blue
	325	10	50	50	25	Fast	Red

### DETECT-A-FIRE MOUNTING (HORIZONTAL AND VERTICAL)

D-A-F detectors are not position sensitive. Horizontal and vertical detectors refer to the most common mounting configuration for that detector. However each type can be mounted either horizontally or vertically depending on the application and installation requirements.

**TABLE 5:**

Hazardous Locations	Detector Type	Fitting Required For UL & ULC Listing and FM Approval
Class I, Groups A, B, C and D; Class II, Groups E, F and G	12-X27120-002 12-X27121-020 12-X28020-003 12-X28021-005	Mount detector to a suitable listed fitting in accordance with National Electric Code and/or local authority having jurisdiction.
Class I, Groups B, C and D; Class II Groups E, F and G	12-X27120-000 12-X27121-000	

#### Notes:

- D-A-F detectors are temperature preset at the factory.
- For corrosive environments, care should be taken to protect the D-A-F detector to obtain optimal performance and maximum life. Consult factory for fluorocarbon coating option.
- For field wiring requirements to connect to D-A-F, please refer to the installation instructions.
- Per UL521 requirements - low temperature exposure test is -22°F (-30°C).
- D-A-F detectors are designed for long life expectancy, however due to various field conditions it is required that the detectors be tested annually per NFPA guidelines or local fire codes.
- Replace D-A-F detector after any fire or heat related event, any mechanical damage, or after 10 years of continuous service.
- UL of Canada labeling available upon request.
- D-A-F detectors are CE Listed. The product family has been evaluated in accordance with IEC 60947-1 and IEC 60947-5-1, and is documented under Intertek Report No. 102294754 BOX-001 as an overheat detector. Detectors have a rated insulation and impulse voltages of 1500 Vac.

## CONSTRUCTION

- Stainless steel shell sensing element. Cold rolled steel mounting facility. Off-White finish.
- #18 AWG Teflon™ insulated wire is used on detectors exposed to temperatures up to 375°F.
- #16 AWG TGGT insulated wire is used on detectors exposed to temperatures above 375°F.

## TEMPERATURE SETTING SELECTION

Fenwal Controls suggests selecting a D-A-F detector with a temperature setting a minimum of 100°F above the maximum ambient expected temperature.

Table 6 shows three categories of fire detection devices and their relative response levels for reaction to three different rate-of-rise conditions. Statistics indicate that 97% of all fires fall within these categories.

**TABLE 6:**

Devise Selection for Rate-Of-Rise Conditions			
Type of Device	Under 10°F/Min	Between 10-40°F/Min	Over 40°F/Min
D-A-F Rate Compensated Detector	FIRST	FIRST	SECOND but at selected protection level
Fixed Temp. Detector	SECOND	SECOND	THIRD
Rate-of-Rise Detector	Will not operate unless fixed temperature supplement at 165°F is provided, then it is THIRD in sequence	Will not operate unless fixed temperature supplement at 165°F is provided then it is THIRD in sequence	FIRST but may be a false alarm

## MODIFICATIONS

Fluorocarbon coating is available on 27120-22, 27121-20, 28020-3, 28021-5 models only for better corrosion resistance. The temperature setting is limited to 500°F maximum for this coating.

## AGENCY LISTINGS

D-A-F detectors are UL and ULC listed and FM Approved as fire detection thermostats (close on temperature rise) and as releasing devices (open on temperature rise).

**TABLE 7:**

Agency	File Number	Location
UL	S492	Ordinary
UL	E19310	Hazardous
ULC	CS341-E	Ordinary and Hazardous
FM	J.I. OV2HO.AE	Hazardous
FM	17302	Ordinary
UL	S2410	Ordinary (600 & 725°F)
UL	E89599	Hazardous (600 & 725°F)
CE	IEC 60947-5-1	—

Table 8 outlines the redating factor required depending on ceiling height based on NFPA 72 guidelines for D-A-F detector installation.

**TABLE 8:**

Heat Detector Spacing Reduction Based on Ceiling Height				
Ceiling Height Above		Up to and Including		De-Rating Factor
m	ft	m	ft	
0	0	3.05	10	1.00
3.05	10	3.66	12	0.91
3.66	12	4.27	14	0.84
4.27	14	4.88	16	0.77
4.88	16	5.49	18	0.71
5.49	18	6.10	20	0.64
6.10	20	6.71	22	0.58
6.71	22	7.32	24	0.52
7.32	24	7.93	26	0.46
7.93	26	8.54	28	0.40
8.54	28	9.14	30	0.34

**TABLE 9:****PART SELECTION GUIDE for Vertical Detect-A-Fire Detectors**

Model Number	Mounting Head Material	Shell Material	Contact Operation on Temperature Rise	Electrical Rating (Resistive Only)	Approximate Weight
12-X27120-000 12-X27120-022	Brass Type 300 Stainless Steel	Type 300 Stainless Steel	Opens (450°F Max)	5.0 Amps 125 VAC 0.5 Amps 125 VDC	5 oz.
12-X27121-000 12-X27121-020	Brass Type 300 Stainless Steel		Closes	5.0 Amps 125 VAC 0.5 Amps 125 VDC 2.0 Amps 24 VDC 1.0 Amps 48 VDC	5 oz.
12X28020-003	Type 300 Stainless Steel		Opens (450°F Max)	5.0 Amps 125 VAC 0.5 Amps 125 VDC	5 oz.
12-X28021-005 12-200001-00X	Type 300 Stainless Steel		Closes	5.0 Amps 125 VAC 0.5 Amps 125 VDC 2.0 Amps 24 VDC 1.0 Amps 48 VDC	5 oz.

**TABLE 10:**

**STOCKED MODELS AND TEMPERATURE SETTINGS  
(SELECT A SETTING A MINIMUM OF 100°F ABOVE THE MAXIMUM EXPECTED AMBIENT)**

Model	Temperature Setting (°F)									
	140	160	190	225	275	325	360	450	600	725
12-X27020-000	X		X							
12-X27020-001	X									
12-X27021-000	X		X							
12-X27021-001	X		X							
12-X27120-000		X	X	X		X				
12-X27121-000	X	X	X	X	X	X	X	X	X	X
12-X28021-005				X				X		

X: Indicates a standard detector available from stock for quick delivery of a limited quantity.

**TABLE 11:****Detect-A-Fire DETECTOR - RESPONSE TIME INDEX (RTI)**

Model P/N*	Model Type	Contacts	Temperature (Set point)	Response Time Index (ft-s) <sup>1/2</sup>	RTI Classification	RTI Rated Spacing	Old Rated Spacing
12-X27021-0	Horizontal Flush Mount	N/O	140°F (60°C), 160°F (71°C)	110	QUICK	(20 X 20) ft (6 x 6) m	(25 x 25) ft (8 x 8) m
12-X27021-1	Horizontal Surface Mount	N/O					
12-X27021-0	Horizontal Flush Mount	N/O	140°F (60°C), 160°F (71°C), 190°F (88°C), 210°F (99°C), 225°F (107°C), 275°F (135°C), 325°F (163°C)	148	FAST	(25 x 25) ft (8 x 8) m	(25 x 25) ft (8 x 8) m
12-X27021-1	Horizontal Surface Mount	N/O					
12-X27121-0	Vertical Brass Head	N/O	140°F (60°C), 160°F (71°C), 190°F (88°C), 210°F (99°C), 225°F (107°C), 275°F (135°C), 325°F (163°C), 360°F (182°C), 450°F (232°C), 500°F (260°C), 600°F (316°C), 725°F (385°C)	99 (140°F, 160°F) 148 (190°F, 210°F, 225°F, 275°F, 325°F, 360°F, 450°F, 500°F, 600°F, 725°F)	V-FAST	(30 X 30) ft (9 x 9) m	(25 x 25) ft (8 x 8) m
12-X27121-20	Vertical Stainless Head	N/O					
12-X28021-5	Vertical Stainless Coupling Head	N/O					

**Note:** Spaces shown are distances between detectors on smooth ceilings, the distances from partitions or walls would be half that shown. Authority having LOCAL jurisdiction should be consulted before installation.

\*For complete P/N, refer to "How To Order" on page 6.

