

## **Type D3S PROTECTOSPRAY Directional Spray Nozzles, Open, Medium Velocity**

### **General Description**

The Type D3S Protectospray Nozzles are open (non-automatic) directional spray nozzles and they are designed for use in water spray fixed systems for fire protection applications. They are external deflector type nozzles that discharge a uniformly filled cone of medium velocity water droplets.

The D3S Nozzles that are typically used in non-NFPA installations feature an integral strainer for use when the Authority Having Jurisdiction requires the use of individual strainers in addition to main pipeline strainers for nozzles having an orifice diameter of 3/8 inch (9,5 mm) or less.

**Note:** *Per the requirements of NFPA 15, the use of individual strainers in addition to main pipeline strainers is required for nozzles unable to pass an 1/8 inch (3,2 mm) particle. Therefore, the D3S is typically considered for use only in non-NFPA applications.*

The D3S Nozzles are effective in covering exposed vertical, horizontal, curved, and irregular shaped surfaces in a cooling spray to prevent excessive absorption of heat from an external fire and possible structural damage or spread of fire to the protected equipment. In some applications, depending on water design density requirements, the Type D3S Nozzles may also be used for fire control or extinguishment.

#### **IMPORTANT**

*Always refer to Technical Data Sheet TFP700 for the "INSTALLER WARNING" that provides cautions with respect to handling and installation of sprinkler systems and components. Improper handling and installation can permanently damage a sprinkler system or its components and cause the sprinkler to fail to operate in a fire situation or cause it to operate prematurely.*

The Type D3S Nozzles are available in a wide variety of orifice sizes and spray angles (included angle of discharge) to provide versatility in system design. Refer to Technical Data Sheet TFP890 for information on Blow-Off Plugs that can be used for applications where protection is required against insect infestation or accumulation of debris within the nozzle orifice.

It is recommended that the end user be consulted with respect to the suitability of the materials of construction and finish for any given corrosive environment. The effects of ambient temperature, concentration of chemicals, and gas/chemical velocity, should be considered, at a minimum, along with the corrosive nature to which the sprinklers may be exposed.

The Type D3S Protectospray Nozzle is a re-designation for the Gem Type D3S.

#### **NOTICE**

*The Type D3S Protectospray Nozzles described herein must be installed and maintained in compliance with this document, as well as with the applicable standards of the National Fire Protection Association, in addition to the standards of any other authorities having jurisdiction. Failure to do so may impair the performance of these devices.*

*The design of individual water spray fixed systems can vary considerably, depending on the characteristics and nature of the hazard, the basic purpose of the spraying system, the configuration of the hazard, and wind/draft conditions. Because of these variations as well as the wide range of available nozzle spray characteristics, the design of water spray fixed systems for fire protection must only be performed by experienced designers who thoroughly understand the limitations as well as capabilities of such systems.*

*The owner is responsible for maintaining their fire protection system and devices in proper operating condition. Contact the installing contractor or sprinkler manufacturer with any questions.*



# Technical Data

## Approvals

UL and C-UL Listed  
FM Approved.

## Maximum Working Pressure

175 psi (12,1 bar)  
Also refer to Figure 2, Note 2

## Discharge Coefficient

Refer to Table A

## Spray Angles

Refer to Table B

## Finish and Material

Refer to Table E

## Thread Connection

1/2 inch NPT

## Physical Characteristics (Bronze)

Frame .....	Bronze
Deflector .....	Bronze
Splitter .....	Bronze
Pin .....	Bronze
Strainer .....	Copper

## Physical Characteristics (Stainless Steel)

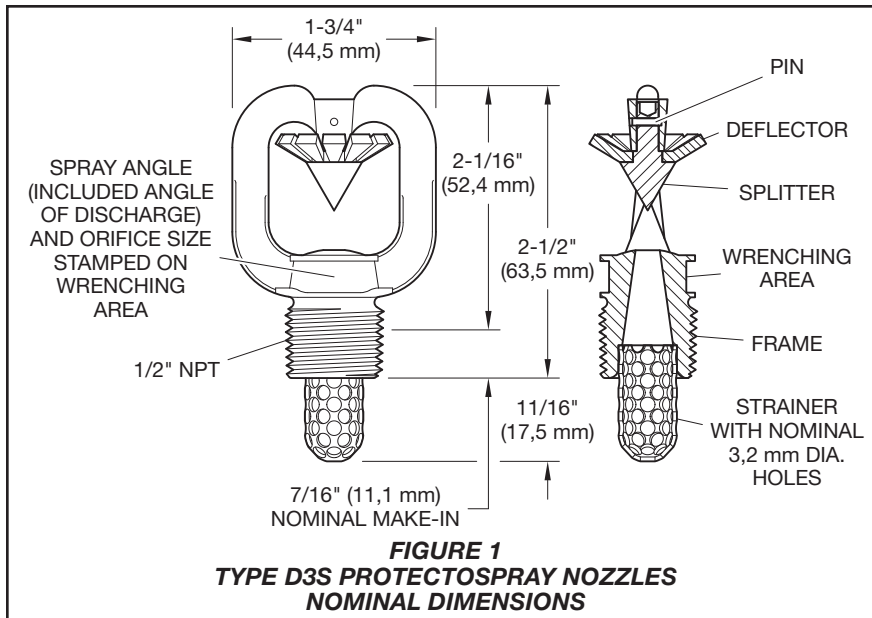
Frame .....	ASTMA-296, Grade CF-8M (equiv. Type 316 S.S.)
Deflector .....	Type 316 S.S.
Splitter .....	Type 316 S.S.
Pin .....	Type 316 S.S.
Strainer .....	Type 316 S.S.

# Design Criteria

## Nozzle Placement

Where direct impingement of water spray onto all of the protected surface is required by the authority having jurisdiction, the nozzles are to be spaced and directed so that their spray patterns will completely cover the plane-of-protection with the minimum required average density; however, it is recommended that indoor nozzle spacing be 12 feet (3,7 m) or less and that outdoor nozzle spacing be 10 feet (3,0 m) or less. Where rundown or slippage is planned, e.g., exposure protection of vessels per NFPA 15, the above recommended indoor and outdoor spacings also apply.

When used for protecting the surfaces of a vessel, for example, the nozzles are positioned normal to and approximately 2 feet (0,6 m) from the surface. This approach, in conjunction with a properly selected spray angle, will tend to make more effective use of the spray as well as help minimize the disturbance effects of wind/draft conditions on the water spray patterns.



**FIGURE 1**  
**TYPE D3S PROTECTOSPRAY NOZZLES**  
**NOMINAL DIMENSIONS**

ORIFICE SIZE	MINIMUM DIAMETER	K-FACTOR	
		GPM/psi <sup>1/2</sup>	LPM/bar <sup>1/2</sup>
NO. 16	0.203" (5,16 mm)	1.1	15,8
NO. 18	0.250" (6,35 mm)	1.6	23,0
NO. 21	0.281" (7,14 mm)	2.1	30,2
NO. 24	0.328" (8,33 mm)	2.8	40,3

**TABLE A**  
**SELECTION OF ORIFICE SIZES**

65°	80°	95°	110°	125°	140°	160°	180°
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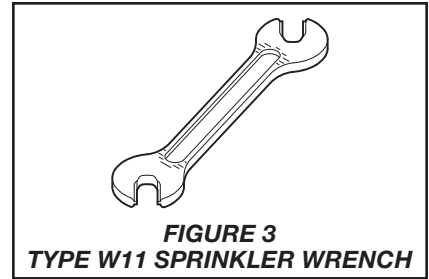
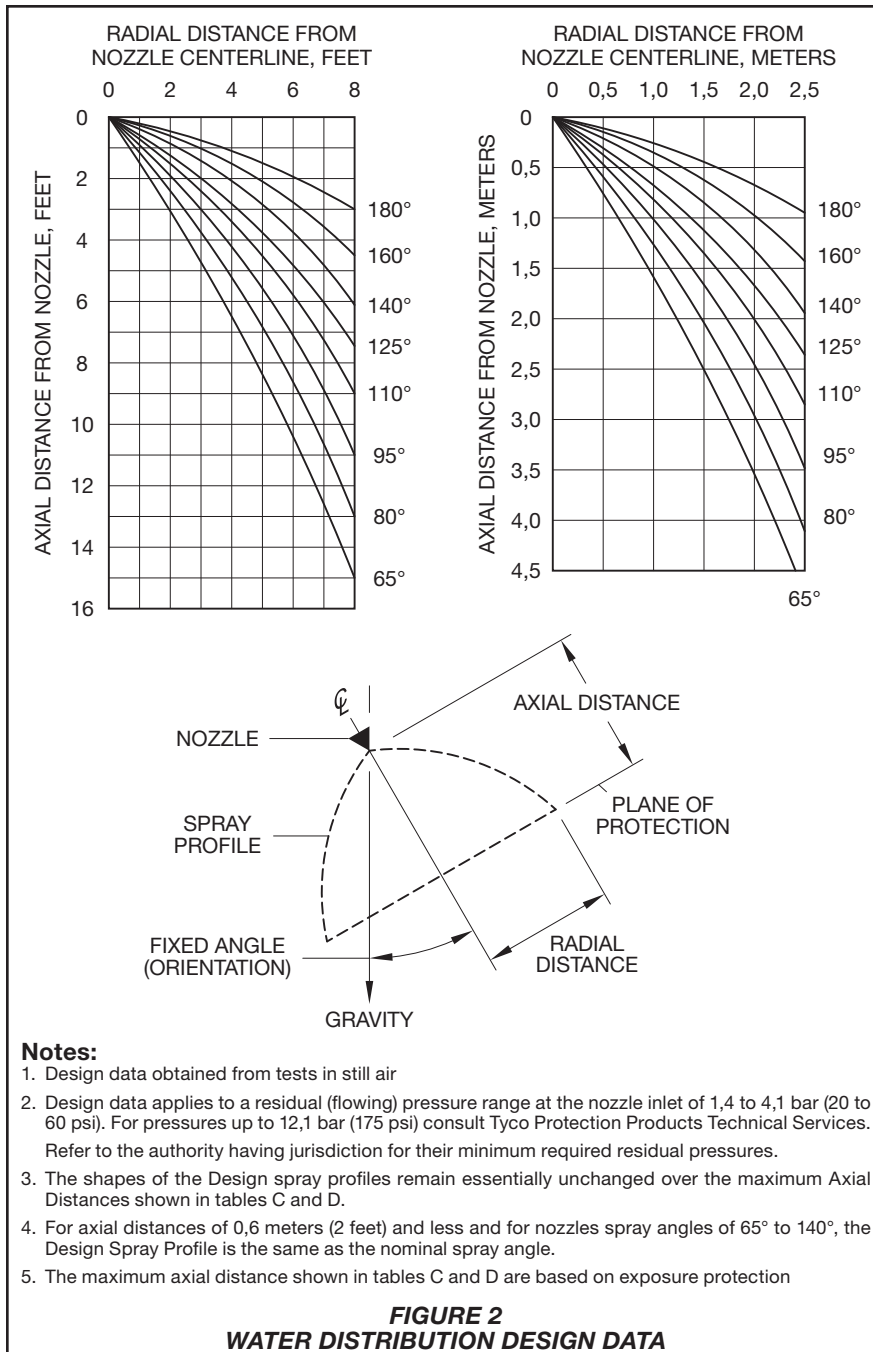
**TABLE B**  
**SELECTION OF SPRAY ANGLES**

## Spray Patterns

The Design Spray Profiles for the nozzle spray angles of 65 to 180 degrees are shown in Figure 2 and apply to discharge pressures of 20 to 60 psi (1,4 to 4,1 bar). Discharge pressures in excess of 60 psi (4,1 bar) will result in a decrease in coverage area since the spray patterns tend to draw inwards at higher pressures. Refer inquiries on higher discharge pressures to the Technical Services Department. The maximum axial distances between the nozzle tip and plane-of-protection, for exposure protection, are given in Table C and D. When the axial distance from the nozzle tip to the plane-of-protection is 2 feet (0,6 m) or less, the Design Spray Profile is the same as the nominal spray angles of 65 thru 140 degrees.

## Main Pipeline Strainers

Main pipeline strainers per NFPA 15 are required for systems utilizing nozzles with a flow path less than 3/8 inch (9,5 mm) diameter, i.e., No. 16 thru No. 24 (Ref. Table A and Figure 1), and for any system where the water is likely to contain obstructive material.



## Installation

Type D3S Protectospray Nozzles must be installed in accordance with the following instructions:

### General Instructions

A leak tight 1/2 inch NPT nozzle joint should be obtained with a torque of 7 to 14 ft.lbs. (9,5 to 19,0 Nm). A maximum of 21 ft. lbs. (28,5 Nm) of torque may be used to install nozzles with 1/2 NPT connections. Higher levels of torque may distort the nozzle inlet and cause leakage or impairment of the nozzle.

**Step 1.** With pipe thread sealant applied to the pipe threads, hand tighten the nozzle into the nozzle fitting.

**Step 2.** Tighten the nozzle into the nozzle fitting using only the W-Type 11 Sprinkler Wrench (Ref. Figure 3). With reference to Figure 1 the W-Type 11 Sprinkler Wrench is to be applied to the wrenching area.

MAXIMUM AXIAL DISTANCE FOR 65° SPRAY ANGLE IN FEET AND INCHES				
FIXED ANGLE	ORIFICE SIZE			
	16	18	21	24
0°	10-6	12-6	13-0	13-3
30°	8-3	10-9	10-9	11-9
45°	7-3	10-0	10-0	11-3
60°	6-6	9-3	9-6	10-9
90°	6-0	8-6	9-0	10-3
120°	5-9	7-6	7-6	7-6
135°	5-6	6-0	6-3	6-6
150°	5-3	5-6	5-6	5-9
180°	5-0	5-0	5-0	5-6

MAXIMUM AXIAL DISTANCE FOR 80° SPRAY ANGLE IN FEET AND INCHES				
FIXED ANGLE	ORIFICE SIZE			
	16	18	21	24
0°	9-0	10-6	11-0	12-0
30°	7-3	8-3	8-9	10-6
45°	6-3	7-6	8-0	10-3
60°	5-6	7-0	7-6	10-0
90°	5-0	6-0	7-0	9-3
120°	4-6	4-9	5-9	6-6
135°	4-3	4-6	5-0	5-6
150°	4-0	4-0	4-6	5-0
180°	3-9	3-9	4-0	4-6

MAXIMUM AXIAL DISTANCE FOR 95° SPRAY ANGLE IN FEET AND INCHES				
FIXED ANGLE	ORIFICE SIZE			
	16	18	21	24
0°	7-0	7-9	9-6	10-6
30°	5-9	6-6	7-9	9-9
45°	5-3	6-3	7-0	9-6
60°	4-9	6-0	6-9	9-3
90°	4-0	5-0	6-6	8-3
120°	3-6	3-9	5-0	5-3
135°	3-3	3-6	4-0	4-6
150°	3-0	3-0	3-6	4-0
180°	3-0	3-0	3-3	3-9

MAXIMUM AXIAL DISTANCE FOR 110° SPRAY ANGLE IN FEET AND INCHES				
FIXED ANGLE	ORIFICE SIZE			
	16	18	21	24
0°	6-0	7-0	9-0	9-6
30°	5-3	6-3	7-3	8-9
45°	4-9	5-9	6-6	8-6
60°	4-3	5-6	6-3	8-3
90°	3-6	4-6	5-9	7-6
120°	2-9	3-3	4-6	4-6
135°	2-6	2-9	3-6	3-6
150°	2-3	2-6	3-0	3-3
180°	2-3	2-3	2-9	3-0

MAXIMUM AXIAL DISTANCE FOR 125° SPRAY ANGLE IN FEET AND INCHES				
FIXED ANGLE	ORIFICE SIZE			
	16	18	21	24
0°	4-6	5-0	6-6	7-9
30°	3-9	3-9	6-3	6-9
45°	3-0	3-6	5-9	6-0
60°	2-6	3-0	5-6	5-9
90°	2-0	2-9	4-9	5-0
120°	1-9	2-3	3-3	3-3
135°	1-6	1-9	2-6	2-6
150°	1-6	1-6	2-0	2-3
180°	1-3	1-3	1-9	2-0

MAXIMUM AXIAL DISTANCE FOR 140° SPRAY ANGLE IN FEET AND INCHES				
FIXED ANGLE	ORIFICE SIZE			
	16	18	21	24
0°	4-0	4-6	6-0	6-6
30°	3-3	3-6	5-6	5-6
45°	2-9	2-9	5-0	5-0
60°	2-3	2-6	4-6	4-6
90°	1-9	2-3	4-0	4-0
120°	1-6	1-9	2-3	2-6
135°	1-3	1-6	1-6	1-9
150°	1-3	1-3	1-6	1-6
180°	1-0	1-0	1-3	1-3

MAXIMUM AXIAL DISTANCE FOR 160° SPRAY ANGLE IN FEET AND INCHES				
FIXED ANGLE	ORIFICE SIZE			
	16	18	21	24
0°	3-6	3-9	4-9	5-0
30°	2-9	3-0	4-3	4-6
45°	2-3	2-6	3-9	4-0
60°	1-9	2-3	3-6	3-9
90°	1-3	1-9	3-0	3-3
120°	1-0	1-3	1-6	2-0
135°	1-0	1-0	1-3	1-3
150°	0-9	0-9	1-0	1-0
180°	0-9	0-9	0-9	0-9

MAXIMUM AXIAL DISTANCE FOR 180° SPRAY ANGLE IN FEET AND INCHES				
FIXED ANGLE	ORIFICE SIZE			
	16	18	21	24
0°	2-9	3-0	3-6	3-6
30°	2-3	2-3	3-6	3-6
45°	1-9	2-0	3-3	3-3
60°	1-6	1-9	2-9	2-9
90°	1-0	1-6	2-0	2-0
120°	0-9	1-0	1-0	1-0
135°	0-6	0-9	0-9	0-9
150°	0-6	0-6	0-6	0-6
180°	0-6	0-6	0-6	0-6

**TABLE C**  
**MAXIMUM AXIAL DISTANCE BETWEEN**  
**NOZZLE TIP AND PLANE-OF-PROTECTION FOR EXPOSURE PROTECTION**  
**FEET AND INCHES**

MAXIMUM AXIAL DISTANCE FOR 65° SPRAY ANGLE IN METERS					MAXIMUM AXIAL DISTANCE FOR 80° SPRAY ANGLE IN METERS					MAXIMUM AXIAL DISTANCE FOR 95° SPRAY ANGLE IN METERS				
FIXED ANGLE	ORIFICE SIZE				FIXED ANGLE	ORIFICE SIZE				FIXED ANGLE	ORIFICE SIZE			
	16	18	21	24		16	18	21	24		16	18	21	24
0°	3,2	3,8	4,0	4,0	0°	2,7	3,2	3,4	3,7	0°	2,1	2,4	2,9	3,2
30°	2,5	3,3	3,3	3,6	30°	2,2	2,5	2,7	3,2	30°	1,8	2,0	2,4	3,0
45°	2,2	3,0	3,0	3,4	45°	1,9	2,3	2,4	3,1	45°	1,6	1,9	2,1	2,9
60°	2,0	2,8	2,9	3,3	60°	1,7	2,1	2,3	3,0	60°	1,4	1,8	2,1	2,8
90°	1,8	2,6	2,7	3,1	90°	1,5	1,8	2,1	2,8	90°	1,2	1,5	2,0	2,5
120°	1,8	2,3	2,3	2,3	120°	1,4	1,4	1,8	2,0	120°	1,1	1,1	1,5	1,6
135°	1,7	1,8	1,9	2,0	135°	1,3	1,4	1,5	1,7	135°	1,0	1,1	1,2	1,4
150°	1,6	1,7	1,7	1,9	150°	1,2	1,2	1,4	1,5	150°	0,9	0,9	1,1	1,2
180°	1,5	1,5	1,5	1,7	180°	1,1	1,1	1,2	1,4	180°	0,9	0,9	1,1	1,1

MAXIMUM AXIAL DISTANCE FOR 110° SPRAY ANGLE IN METERS					MAXIMUM AXIAL DISTANCE FOR 125° SPRAY ANGLE IN METERS					MAXIMUM AXIAL DISTANCE FOR 140° SPRAY ANGLE IN METERS				
FIXED ANGLE	ORIFICE SIZE				FIXED ANGLE	ORIFICE SIZE				FIXED ANGLE	ORIFICE SIZE			
	16	18	21	24		16	18	21	24		16	18	21	24
0°	1,8	2,1	2,7	2,9	0°	1,4	1,5	2,0	2,4	0°	1,2	1,4	1,8	2,0
30°	1,6	1,9	2,2	2,7	30°	1,1	1,1	1,9	2,1	30°	1,0	1,1	1,7	1,7
45°	1,4	1,8	2,0	2,6	45°	0,9	1,1	1,8	1,8	45°	0,8	0,8	1,5	1,5
60°	1,3	1,7	1,9	2,5	60°	0,8	0,9	1,7	1,8	60°	0,7	0,8	1,4	1,4
90°	1,1	1,4	1,8	2,3	90°	0,6	0,8	1,4	1,5	90°	0,5	0,7	1,2	1,2
120°	0,8	1,0	1,4	1,4	120°	0,5	0,7	1,0	1,0	120°	0,5	0,5	0,7	0,8
135°	0,8	0,8	1,1	1,1	135°	0,5	0,5	0,8	0,8	135°	0,4	0,5	0,5	0,5
150°	0,7	0,8	0,9	1,0	150°	0,5	0,5	0,6	0,7	150°	0,4	0,4	0,5	0,5
180°	0,7	0,7	0,8	0,9	180°	0,4	0,4	0,5	0,6	180°	0,3	0,3	0,4	0,4

MAXIMUM AXIAL DISTANCE FOR 160° SPRAY ANGLE IN METERS					MAXIMUM AXIAL DISTANCE FOR 180° SPRAY ANGLE IN METERS				
FIXED ANGLE	ORIFICE SIZE				FIXED ANGLE	ORIFICE SIZE			
	16	18	21	24		16	18	21	24
0°	1,1	1,1	1,4	1,5	0°	0,8	0,9	1,1	1,1
30°	0,8	0,9	1,3	1,4	30°	0,7	0,7	1,1	1,1
45°	0,7	0,8	1,1	1,2	45°	0,5	0,6	1,0	1,0
60°	0,5	0,7	1,1	1,1	60°	0,5	0,5	0,8	0,8
90°	0,4	0,5	0,9	1,0	90°	0,3	0,5	0,6	0,6
120°	0,3	0,4	0,5	0,6	120°	0,2	0,3	0,3	0,3
135°	0,3	0,3	0,4	0,4	135°	0,2	0,2	0,2	0,2
150°	0,2	0,2	0,3	0,3	150°	0,2	0,2	0,2	0,2
180°	0,2	0,2	0,2	0,2	180°	0,2	0,2	0,2	0,2

**TABLE D**  
**MAXIMUM AXIAL DISTANCE BETWEEN**  
**NOZZLE TIP AND PLANE-OF-PROTECTION FOR EXPOSURE PROTECTION**  
**METERS**

P/N 49 - 5XX - X - XXX

ORIFICE SIZE		FINISH & MATERIAL		SPRAY ANGLE	
16	NO. 16	1	NATURAL FINISH BRONZE	065	65°
18	NO. 18	9	CHROME PLATED BRONZE	080	80°
21	NO. 21	0	NATURAL FINISH STAINLESS STEEL	095	95°
24	NO. 24			110	110°
				125	125°
				140	140°
				160	160°
				180	180°

**TABLE E**  
**D3S PROTECTOSPRAY NOZZLES**  
**PART NUMBER SELECTION**

## Care and Maintenance

The TYCO Type D3S Protectospray Nozzles must be maintained and serviced in accordance with the following instructions.

Before closing a fire protection system main control valve for maintenance work on the fire protection system that it controls, obtain permission to shut down the affected fire protection system from the proper authorities and notify all personnel who may be affected by this action.

The owner is responsible for the inspection, testing, and maintenance of their fire protection system and devices in compliance with this document, as well as with the applicable standards of the National Fire Protection Association (for example, NFPA 25), in addition to the standards of any other authorities having jurisdiction. Contact the installing contractor or sprinkler manufacturer regarding any questions.

Water spray fixed systems should be inspected, tested, and maintained by a qualified Inspection Service in accordance with local requirements and/or national code.

Frequent visual inspections are recommended to be initially performed for nozzles installed in potentially corrosive atmospheres to verify the integrity of the materials of construction and finish as they may be affected by the corrosive conditions present for a given installation. Thereafter, annual inspections per NFPA 25 are required.

Water spray fixed systems for fire protection service require regularly scheduled care and maintenance by trained personnel. In addition to inspecting nozzles for proper spray performance during water flow trip tests of the system, it is recommended that nozzles be periodically inspected for broken or missing parts (including blow-off plugs where applicable), loading/obstructions, or other evidence of impaired protection. The inspections should be scheduled weekly or as frequently as may be necessary, and corrective action must be taken to ensure that the nozzles will perform as intended in the event of a fire.

For installations subject to freezing and where blow-off plugs have been installed, a periodic inspection must be performed for evidence of ice build-up from trapped condensate which could affect the proper release of the blow off plugs.

## Limited Warranty

For warranty terms and conditions, visit [www.tyco-fire.com](http://www.tyco-fire.com).

## Ordering Procedure

Contact your local distributor for availability. When placing an order, indicate the full product name and Part Number (P/N).

**D3S PROTECTOSPRAY Nozzles**  
Specify: No. (orifice), Type D3S PROTECTOSPRAY Nozzle with (finish/coating and material) with (number) degree spray angle, P/N (from table E)

**Sprinkler Wrench**  
Specify: Type W11 Sprinkler Wrench, P/N 56-452-1-001

**Optional Blow-Off Plugs**  
Specify: Blow-Off Plug Style (letter), P/N

- (No. 16) Style A . . . . . P/N 56-320-1-001
- (No. 18) Style K . . . . . P/N 56-320-1-009
- (No. 21) Style J . . . . . P/N 56-320-1-008
- (No. 24) Style I . . . . . P/N 56-320-1-007