



RAPID RESPONSE Series LFII Residential Sprinklers 4.9 K-factor Recessed Pendent, Dry Type Wet Pipe and Dry Pipe Systems

General Description

The TYCO RAPID RESPONSE Series LFII Dry Type Residential Recessed Pendent Sprinklers (TY2235) are dry type, decorative, fast response, frangible bulb sprinklers designed for use in residential occupancies such as homes, apartments, dormitories, and hotels.

The Series LFII Dry Type Residential Recessed Pendent Sprinklers (TY2235) are typically used for the following situations:

- where sprinklers are required on dry pipe systems that are exposed to freezing temperatures; for example, sprinkler drops from unheated portions of buildings
- where sprinklers and/or a portion of the connecting piping are exposed to freezing temperatures; for example, sprinkler drops from wet systems into unheated areas
- where sprinklers are used on systems that are seasonally drained to avoid freezing; for example, vacation areas

The Series LFII Dry Type Residential Recessed Pendent Sprinklers are intended for use in residential sprinkler systems for one- and two-family dwellings and mobile homes per NFPA 13D; residential sprinkler systems for residential occupancies up to and including four stories in height per NFPA 13R; or, sprinkler systems for the residential portions of any occupancy per NFPA 13.

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 Series LFII Dry Type Residential Recessed Pendent Sprinklers provide flexibility in adjusting sprinklers to the fixed pipe drops. The Recessed Escutcheon provides 1/4 inch (6,4 mm) of recessed adjustment or up to 1/2 inch (12,7 mm) of total adjustment from the flush mounting surface position.

The Series LFII Dry Type Residential Recessed Pendent Sprinklers are designed with heat sensitivity and water characteristics proven to help in controlling residential fires and improving the chance for occupants to escape or be evacuated.

Dry Pipe System Application

The Series LFII Residential Pendent and Recessed Pendent Sprinklers offers a laboratory approved option for designing dry pipe residential sprinkler systems, whereas, most residential sprinklers are laboratory approved for wet systems only.

Through extensive testing, it has been determined that the number of design sprinklers (hydraulic design area) for the Series LFII Residential Recessed Pendent Sprinklers (TY2235) need not be increased over the number of design sprinklers (hydraulic design area) as specified for wet pipe sprinkler systems, as is accustomed for density/area sprinkler systems designed per NFPA 13.

Consequently, the Series LFII Residential Sprinklers offer the features of non-water filled pipe in addition to not having to increase the number of design sprinklers (hydraulic design area) for systems designed to NFPA 13, 13D, or 13R. Non-water filled pipe will permit options for areas sensitive to freezing.

NOTICE

The Series LFII Dry Type Residential Recessed Pendent Sprinklers (TY2235) described herein must be installed and maintained in compliance with this document and the applicable standards of the National Fire Protection Association, in addition to the standards of any authorities having jurisdiction. Failure to do so may impair the performance of these devices.



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

Sprinkler Identification Number (SIN)

TY2235

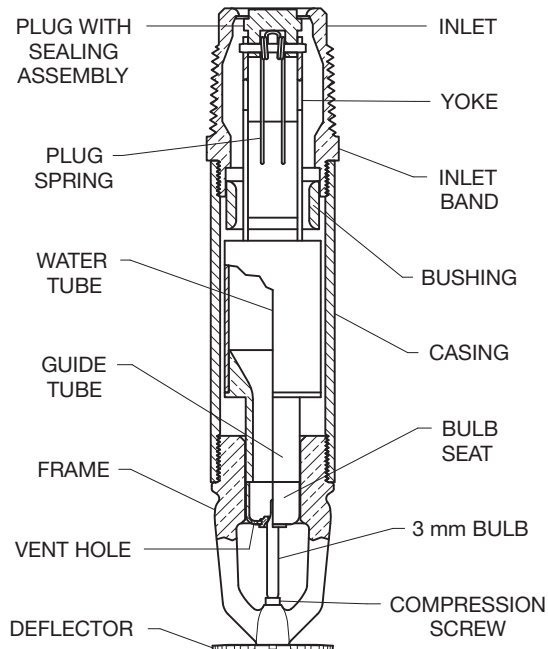


FIGURE 1
RAPID RESPONSE SERIES LFII DRY-TYPE RESIDENTIAL
PENDENT SPRINKLER ASSEMBLY

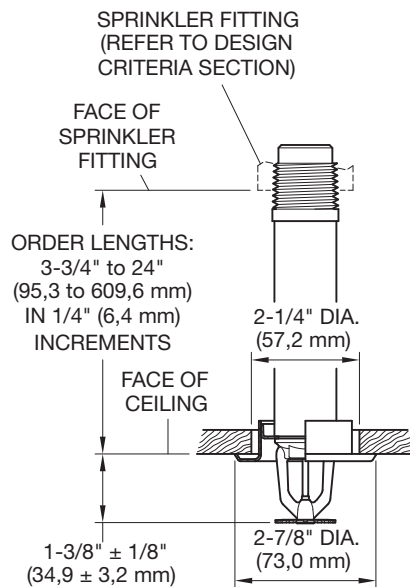


FIGURE 2
RAPID RESPONSE SERIES LFII DRY-TYPE RESIDENTIAL
PENDENT SPRINKLER (TY2235) WITH RECESSED ESCUTCHEON

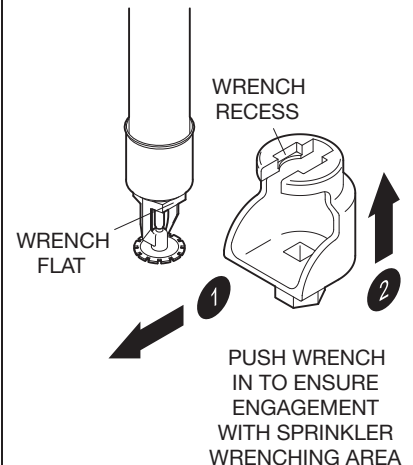


FIGURE 3
W-TYPE 7 RECESSED
SPRINKLER WRENCH

Technical Data

Approvals
 UL Listed

For details on approval, refer to the Design Criteria section.

Maximum Working Pressure
 175 psi (12,1 bar)

Discharge Coefficient
 $K = 4.9 \text{ GPM/psi}^{1/2}$ (70,6 LPM/bar^{1/2})

Inlet Thread Connections
 1 inch NPT
 ISO 7-R1

Sprinkler Temperature Ratings
 155°F (68°C)
 175°F (79°C) for wet pipe systems only

Finishes
 Natural Brass
 Signal White
 Chrome-Plated

Order Lengths
 Minimum: 3-3/4 inches (95,3 mm)
 Maximum: 24 inches (609,6 mm)

Physical Characteristics

Inlet.....	Brass
Plug.....	Brass
Yoke.....	Stainless Steel
Casing.....	Galvanized Steel
Insert.....	Bronze
Bulb Seat.....	Stainless Steel
Bulb.....	Glass
Compression Screw.....	Brass
Deflector.....	Brass
Frame.....	Brass
Guide Tube.....	Brass
Water Tube.....	Stainless Steel
Bushing.....	Brass
Plug Spring.....	Stainless Steel
Sealing Assembly.....	Beryllium
Escutcheon.....	Nickel w/TEFLON Carbon Steel

Operation

When the TYCO RAPID RESPONSE Series LFII Dry Type Residential Sprinkler (TY2235) is in service, water is prevented from entering the assembly by the Plug with Sealing Assembly (Figure 1) in the Inlet of the Sprinkler.

The glass Bulb contains a fluid that expands when exposed to heat. When the rated temperature is reached, the fluid expands sufficiently to shatter the glass Bulb to release the Bulb Seat. The system's water or air pressure is then able to unseat the Plug with Sealing Assembly. The Plug Spring turns the Plug with Sealing Assembly aside, allowing the sprinkler to activate and flow water.

Design Criteria

The TYCO RAPID RESPONSE Series LFII Dry Type Residential Recessed Pendent Sprinklers (TY2235) are UL Listed for installation in accordance with this section:

Residential Sprinkler Design Guide

When conditions exist that are outside the scope of the criteria provided in this section, refer to the technical data sheet entitled Residential Sprinkler Design Guide (TFP490) for the manufacturer's recommendations that may be acceptable to the local authority having jurisdiction.

System Types

Wet pipe and dry pipe systems may be utilized. Refer to Technical Data Sheet TFP485 for the use of residential sprinklers in residential dry pipe systems.

Ceiling Types

Smooth flat horizontal, or beamed, or sloped, in accordance with the 2013 Edition of NFPA 13D, 13R, or 13 as applicable.

Hydraulic Design (NFPA 13D and 13R)

For systems designed to NFPA 13D or NFPA 13R, the minimum required sprinkler flow rate are given in Tables A or B as a function of temperature rating and the maximum allowable coverage areas. The sprinkler flow rate is the minimum required discharge from each of the total number of "design sprinklers," as specified in NFPA 13D or NFPA 13R. The number of "design sprinklers" specified in NFPA 13D and 13R for wet pipe systems is to be applied when designing dry pipe systems.

Hydraulic Design (NFPA 13)

For systems designed to NFPA 13, the number of required design sprinklers is the four most hydraulically demanding sprinklers. The minimum required discharge from each of the four sprinklers is the greater of the following:

- flow rates listed in Table A or B as a function of temperature rating and the maximum allowable coverage area.
- minimum discharge of 0.1 gpm/ft² over the design area comprised of the four most hydraulically demanding sprinklers for the actual coverage areas protected by four sprinklers.

The number of "design sprinklers" specified in NFPA 13 for wet pipe systems is to be applied when designing dry pipe systems.

Dry Pipe System Water Delivery

When using the Series LFII Residential Sprinklers (TY2235) in dry pipe sprinkler systems, the time for water delivery must not exceed 15 seconds for the most remote operating sprinkler.

Obstruction to Water Distribution

Sprinklers are to be located in accordance with the obstruction rules of NFPA 13D, 13R, and 13 as applicable for residential sprinklers as well as with the obstruction criteria described within the TYCO Technical Data Sheet TFP490.

Operational Sensitivity

The sprinkler must be located relative to the mounting surface as shown in Figure 2.

Sprinkler Spacing

The minimum spacing between sprinklers is 8 feet (2,4 m). The maximum spacing between sprinklers cannot exceed the length of the coverage area (Table A) being hydraulically calculated (e.g., a maximum of 12 feet for a 12 ft. x 12 ft. coverage area or 20 feet for a 20 ft. x 20 ft. coverage area.)

Sprinkler Fittings

The following fittings may be used:

- The 1 inch NPT outlet or run of a malleable or ductile iron threaded tee fittings that meet the dimensional requirements of ANSI B16.3 (Class 150)
- The 1 inch NPT outlet or run of a cast iron threaded tee fittings that meet the dimensional requirements of ANSI B16.4 (Class 125).

For dry pipe systems, only use the side outlet of maximum 2-1/2 inch size reducing tees when locating the Series LFII Dry Type Residential Recessed Pendent Sprinklers directly below the branch line. Otherwise, use the configuration shown

in Figure 5 to assure complete drainage from above the Series LFII Sprinklers and the branch line.

Do not install the Series LFII Dry Type Residential Recessed Pendent Sprinklers into elbow fittings. The Inlet of the sprinkler can contact the interior of the elbow, potentially damaging the Inlet seal.

Only use the configuration in Figure 4 where the sprinkler fitting and water-filled pipe above the sprinkler fitting are not subject to freezing and where the length of the Series LFII Sprinkler has the minimum exposure length per Figure 6. Refer to the Exposure Length section and Table C.

- The 1 inch NPT outlet of a GRINNELL Figure 730 Mechanical Tee in wet pipe systems only
- The 1 inch NPT CPVC outlet of a 1" x 1" x 1" NPT Sprinkler Head Adapter Tee (P/N 80249) in wet pipe systems only
- The 1 inch NPT CPVC outlet of a 1" x 1" NPT Female Adapter (P/N 80145) in wet pipe systems only
- The 1 inch NPT outlet of a 1" x 1" x 1" NPT CPVC Sprinkler Head Adapter Tee (P/N 80259) in either wet or dry pipe systems

NOTICE

Do not install the Series LFII Dry Type Residential Recessed Pendent Sprinklers into any other type fitting without first consulting the Technical Services Department. Failure to use the appropriate fitting may result in the following:

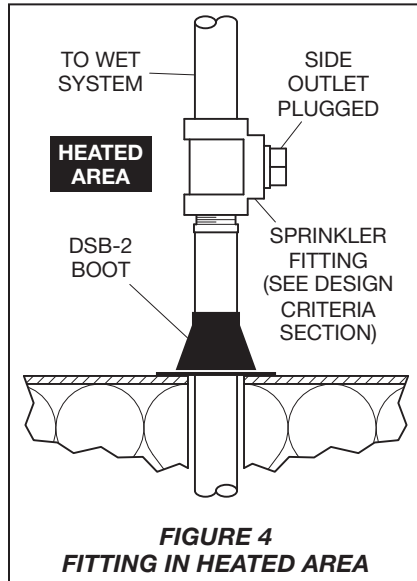
- *failure of the sprinkler to operate properly due to formation of ice over the Inlet Plug or binding of the Inlet Plug.*
- *insufficient engagement of the inlet pipe threads with consequent leakage.*

Drainage

Branch, cross, and feed-main piping connected to Series LFII Dry Type Residential Recessed Pendent Sprinklers and subject to freezing temperatures must be pitched to allow proper drainage, in accordance with the minimum requirements of the National Fire Protection Association for dry pipe sprinkler systems.

Exposure Length

When using Series LFII Dry Type Residential Recessed Pendent Sprinklers in wet pipe sprinkler systems to protect areas subject to freezing temperatures, use Table C to determine a sprinkler's appropriate exposed barrel length to prevent water from freezing in the connecting pipes due to conduction. The exposed barrel length measurement

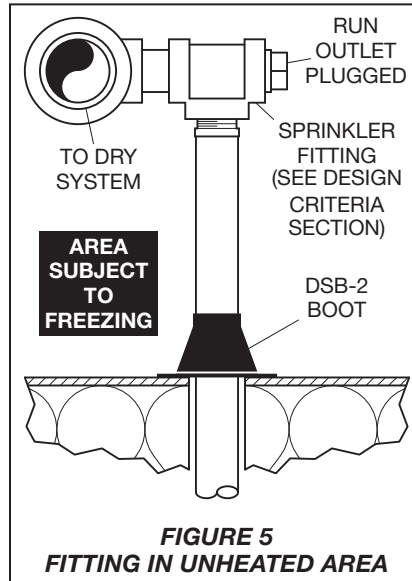


must be taken from the face of the sprinkler fitting to the surface of the structure or insulation that is exposed to the heated area. Refer to Figure 6 for an example.

Clearance Space

When connecting an area subject to freezing and an area containing a wet pipe sprinkler system, the clearance space around the sprinkler barrel of Dry Type Residential Recessed Pendent Sprinklers must be sealed, in accordance with the National Fire Protection Association. Due to temperature differences between two areas, the potential for the formation of condensation in the sprinkler and subsequent ice build-up is increased. If this condensation is not controlled, ice build-up can occur that might damage the dry type sprinkler and/or prevent proper operation in a fire situation.

Use of the Model DSB-2 Dry Sprinkler Boot, described in Technical Data Sheet TFP591 and shown in Figures 4 through 6, can provide the recommended seal.



Installation

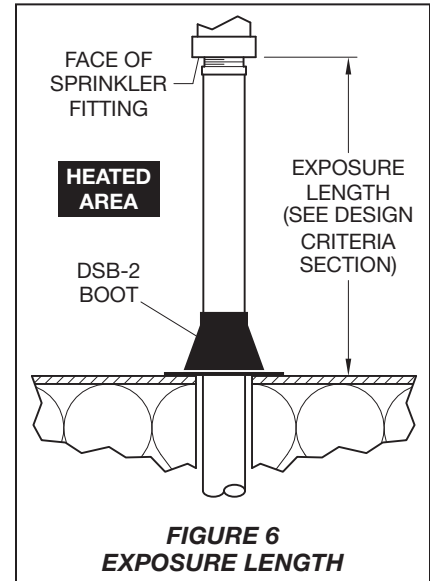
The TYCO RAPID RESPONSE Series LFII Dry Type Residential Recessed Pendent Sprinklers must be installed in accordance with this section:

General Instructions

The Series LFII Dry Type Residential Recessed Pendent Sprinklers must only be installed in fittings that meet the requirements of the Design Criteria section. For other important requirements regarding piping design and sealing of the clearance space around the Sprinkler Casing, refer to the Design Criteria section.

Do not install any bulb type sprinkler if the Bulb is cracked or there is a loss of liquid from the Bulb. With the sprinkler held horizontally, a small air bubble should be present. The diameter of the air bubble is approximately 1/16 inch (1,6 mm).

A leak-tight 1 inch NPT sprinkler joint should be obtained by applying a minimum-to-maximum torque of 20 to 30 ft.-lbs. (26,8 to 40,2 Nm). Higher levels of torque can distort the sprinkler Inlet or Frame with consequent leakage or impairment of the sprinkler.



Do not attempt to compensate for insufficient adjustment in an Escutcheon Plate or Cover-Retainer Assembly by under- or over-tightening the Sprinkler. Re-adjust the position of the sprinkler fitting to suit.

Step 1. Install pendent sprinklers only in the pendent position with the deflector parallel to the ceiling.

Step 2. With a non-hardening pipe-thread sealant such as Teflon tape applied to the inlet threads, hand-tighten the sprinkler into the sprinkler fitting.

Step 3. Wrench-tighten the sprinkler using a pipe wrench on the Inlet Band or the Casing (Figure 1) or using the W-Type 7 Sprinkler Wrench on the Wrench Flat (Figure 3). Apply the Wrench Recess of the W-Type 7 Sprinkler Wrench to the Wrench Flat.

If sprinkler removal is necessary, remove the sprinkler using the same wrenching method noted above. Sprinkler removal is easier when a non-hardening sealant was used and torque guidelines were followed. After removal, inspect the sprinkler for damage.

Maximum Coverage Area ^(a) Ft. x Ft. (m x m)	Maximum Spacing Ft. (m)	WET PIPE SYSTEM Minimum Flow and Residual Pressure ^(b, c)						
		Ordinary Temp Rating 155°F (68°C)		Intermediate Temp Rating 175°F (79°C)		Deflector to Ceiling	Installation Type	Minimum Spacing Ft.
		Flow GPM (L/min)	Pressure PSI (bar)	Flow GPM (L/min)	Pressure PSI (bar)			
12 x 12 (3,7 x 3,7)	12 (3,7)	13 (49,2)	7.0 (0,48)	13 (49,2)	7.0 (0,48)	Smooth Ceiling 1-1/4 to 1-1/2 inches	Recessed	8 (2,4)
14 x 14 (4,3 x 4,3)	14 (4,3)	14 (52,9)	8.2 (0,57)	14 (52,9)	8.2 (0,57)			
16 x 16 (4,9 x 4,9)	16 (4,9)	15 (56,8)	9.4 (0,65)	15 (56,8)	9.4 (0,65)	Beamed Ceiling per NFPA 13D or 13R Installed in Beam 1-1/4 to 1-1/2 inches below bottom of beam		
18 x 18 (5,5 x 5,5)	18 (5,5)	18 (68,1)	13.5 (0,93)	18 (68,1)	13.5 (0,93)			
20 x 20 (6,1 x 6,1)	20 (6,1)	21 (79,5)	18.4 (1,3)	21 (79,5)	18.4 (1,3)			

- (a) For coverage area dimensions less than or between those indicated, use the minimum required flow for the next highest coverage area for which hydraulic design criteria are stated.
- (b) Requirement is based on minimum flow in GPM (LPM) from each sprinkler. The associated residual pressures are calculated using the nominal K-factor. Refer to Hydraulic Design under the Design Criteria section.
- (c) For NFPA 13 residential applications, the greater of 0.1 gpm/ft² over the design area or the flow in accordance with the criteria in Table A must be used.

TABLE A
WET PIPE SYSTEM
SERIES LFII RESIDENTIAL DRY-TYPE RECESSED PENDENT SPRINKLERS (TY2235)
NFPA 13D, 13R, AND 13 HYDRAULIC DESIGN CRITERIA
UL LISTED

	Maximum Coverage Area ^(a) Ft. x Ft. (m x m)	Maximum Spacing Ft. (m)	DRY PIPE SYSTEM Minimum Flow and Residual Pressure ^(b, c)					
			Ordinary Temp Rating 155°F (68°C)		Deflector to Ceiling	Installation Type	Minimum Spacing Ft.	
			Flow GPM (L/min)	Pressure PSI (bar)				
	12 x 12 (3,7 x 3,7)	12 (3,7)	13 (49,2)	7.0 (0,48)	Smooth Ceiling 1-1/4 to 1-1/2 inches Beamed Ceiling per NFPA 13D or 13R Installed in Beam 1-1/4 to 1-1/2 inches below bottom of beam	Recessed	8 (2,4)	
	14 x 14 (4,3 x 4,3)	14 (4,3)	14 (52,9)	8.2 (0,57)				
	16 x 16 (4,9 x 4,9)	16 (4,9)	15 (56,8)	9.4 (0,65)				
	18 x 18 (5,5 x 5,5)	18 (5,5)	18 (68,1)	13.5 (0,93)				
	20 x 20 (6,1 x 6,1)	20 (6,1)	21 (79,5)	18.3 (1,3)				

- (a) For coverage area dimensions less than or between those indicated, use the minimum required flow for the next highest coverage area for which hydraulic design criteria are stated.
- (b) Requirement is based on minimum flow in GPM (LPM) from each sprinkler. The associated residual pressures are calculated using the nominal K-factor. Refer to Hydraulic Design under the Design Criteria section.
- (c) For NFPA 13 residential applications, the greater of 0.1 gpm/ft² over the design area or the flow in accordance with the criteria in Table B must be used.

TABLE B
DRY PIPE SYSTEM
SERIES LFII RESIDENTIAL DRY-TYPE RECESSED PENDENT SPRINKLERS (TY2235)
NFPA 13D, 13R, AND 13 HYDRAULIC DESIGN CRITERIA
UL LISTED

Ambient Temperature Exposed to Discharge End of Sprinkler	Temperatures for Heated Area ^(a)		
	40°F (4°C)	50°F (10°C)	60°F (16°C)
	Minimum Exposed Barrel Length, Inches (mm) ^(b)		
40°F (4°C)	0	0	0
30°F (-1°C)	0	0	0
20°F (-7°C)	4 (100)	0	0
10°F (-12°C)	8 (200)	1 (25)	0
0°F (-18°C)	12 (305)	3 (75)	0
-10°F (-23°C)	14 (355)	4 (100)	1 (25)
-20°F (-29°C)	14 (355)	6 (150)	3 (75)
-30°F (-34°C)	16 (405)	8 (200)	4 (100)
-40°F (-40°C)	18 (455)	8 (200)	4 (100)
-50°F (-46°C)	20 (510)	10 (255)	6 (150)
-60°F (-51°C)	20 (510)	10 (255)	6 (150)
Notes: (a) For protected area temperatures that occur between values listed above, use the next cooler temperature. (b) These lengths are inclusive of wind velocities up to 30 mph (18,6 kph).			
TABLE C MINIMUM RECOMMENDED LENGTHS OF EXPOSED SPRINKLER BARRELS IN WET PIPE SYSTEMS			

Care and Maintenance

The TYCO RAPID RESPONSE Series LFII Dry Type Residential Recessed Pendent Sprinklers (TY2235) must be maintained and serviced in accordance with this section:

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 systems from the proper authorities and notify all personnel who may be affected by this action.

Absence of a Recessed Escutcheon Plate to cover a clearance hole can delay sprinkler operation in a fire situation.

The owner must assure that the sprinklers are not used for hanging any objects and that the sprinklers are only cleaned by means of gently dusting with a feather duster; otherwise, non-operation in the event of a fire or inadvertent operation may result.

A Vent Hole is provided in the Bulb Seat (Figure 1) to indicate if the Series LFII Dry Type Residential Sprinkler is remaining dry. Evidence of leakage from the Vent Hole indicates potential leakage past the Plug with Sealing Assembly and the need to remove the sprinkler to determine the cause of leakage (for example, an improper installation or an ice plug). Close the fire protection system control valve and drain the system before removing the sprinkler.

Sprinklers which are found to be leaking or exhibiting visible signs of corrosion must be replaced.

Automatic sprinklers must never be painted, plated, coated, or otherwise altered after leaving the factory. Modified sprinklers must be replaced. Sprinklers that have been exposed to corrosive products of combustion, but have not operated, should be replaced if they cannot be completely cleaned by wiping the sprinkler with a cloth or by brushing it with a soft bristle brush.

Care must be exercised to avoid damage to the sprinklers - before, during, and after installation. Sprinklers damaged by dropping, striking, wrench twist/slippage, or the like, must be replaced. Also, replace any sprinkler that has a cracked bulb or that has lost liquid from its bulb. (Ref. Installation Section.)

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 (e.g., NFPA 25), in addition to the standards of any authorities having jurisdiction. Contact the installing contractor or sprinkler manufacturer regarding any questions.

Automatic sprinkler systems are recommended to be inspected, tested, and maintained by a qualified Inspection Service in accordance with local requirements and/or national codes.

P/N* 63 – XXX – X – XXX			ORDER LENGTH (EXAMPLES)	
10	Pendent w/ Recessed Escutcheon	SIN TY2235 (Figure 2)	055	5.50"
			082	8.25"
			180	18.00"
			187	18.75"
			240	24.00"

TEMPERATURE RATING	
1	155°F (68°C)
2	175°F (79°C) Wet Pipe Systems Only

SPRINKLER		RECESSED ESCUTCHEON	
2	Natural Brass	Brass Plated	
4	Signal White (RAL9003)	Signal White (RAL9003)	
9	Chrome Plated	Chrome	

Note
* Use Prefix "I" for ISO 7-R1 Inlet Thread Connection;
for example, I-63-101-9-180.

TABLE D
RAPID RESPONSE SERIES LFII DRY-TYPE RESIDENTIAL RECESSED PENDENT SPRINKLERS (TY2235)
PART NUMBER SELECTION

Ordering Procedure

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

Pendent Sprinkler with Recessed Escutcheon

Specify the following information:

- Series LFII Dry Type Residential Sprinkler (TY2235),
- with Recessed Escutcheon,
- 4.9 K-factor,
- Temperature Rating of: 155°F (68°C) or 175°F (79°C),
- Sprinkler Finish (value from Table C),
- Recessed Escutcheon Finish (value from Table C),
- Order Length (value from Figure 2), and
- Inlet Thread Connection (1 inch NPT or ISO 7-R1).
- P/N (from Table D).

Separately Ordered Sprinkler Wrench

Specify: W-Type 7 Sprinkler Wrench (Figure 2), P/N 56-850-4-001.

Separately Ordered Escutcheon

Specify: Style 20 Recessed Escutcheon with (specify*) finish, P/N (specify*).

*Refer to Technical Data Sheet TFP770.