Non-Storage / Special Protection / Storage Sprinklers

General Information

Automatic sprinkler protection is recommended for industrial and other buildings having combustible construction or combustible occupancies.

When selecting a specific type of sprinkler, refer to the FM Global Property Loss Prevention Data Sheets to ensure that the sprinkler selected is capable of providing adequate fire protection for the intended occupancy. Projects that are specific to FM Global insured clients, working plans of proposed layouts, showing all details with respect to location of sprinklers and piping, description of the occupancy and details of construction, should be sent to the local FM Global engineering office for review and acceptance before the materials are fabricated. The plans will be accepted or changes will be recommended to assure that the work will be done according to the best practice and to avoid the possibility of later requests for changes.

Nominal thread sizes are expressed using American National Standard Taper Pipe Threads (NPT). Sprinklers intended for sale outside the United States shall have threads which are in compliance with other national or international standards as permitted at the sole discretion of FM Approvals.
Unless otherwise noted, automatic sprinklers have a rated working pressure of 175 psi (12.1 bar).

Sprinkler Categories

There are three categories of FM Approved automatic sprinklers: Storage, Non-Storage and Special Protection sprinklers based on the type of occupancy hazard they are intended to protect. Within these three categories are various different types of orientations (such as pendent, upright, horizontal sidewall, vertical sidewall, flush, recessed, concealed, dry pendent, dry upright, etc.), thermal response ratings (i.e. quick response or standard response), nominal temperature ratings (see table below), K-factors (see table below) and spacings (i.e. standard or extended coverage).

Nominal K-Factors of Sprinklers

The sprinkler nominal discharge coefficient (K-factor) is expressed in US customary units of gal/min/(psi)$^{0.5}$. See the table below for nominal K-factor values of currently Approved sprinklers.

Nominal K-Factors of Approved Sprinklers

Nominal K-Factor, gpm/(psi)$^{1/2}$	*Metric K-Factor, lpm/(bar)$^{1/2}$*
2.8	40
5.6	80
8.0	115
11.2	160
14.0	200
16.8	240
19.6	280
22.4	320
25.2	360

The following table provides the nominal K-factor values of currently Approved Special Protection (Residential) sprinklers.

Nominal K-Factors of Approved Special Protection (Residential) Sprinklers

Nominal K-Factor, gpm/(psi)$^{1/2}$	*Metric K-Factor, lpm/(bar)$^{1/2}$*
3.8	55
5.8	85
6.9	100

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Nominal Temperature Rating of Sprinklers

A sprinkler operates automatically when the heat-actuated element is heated to, or above, its thermal rating. Selection of the proper temperature rating for automatic sprinklers is important as it provides a factor of safety designed to prevent premature operation. See the table below as well as the occupancy-specific FM Global data sheet to ensure the proper nominal temperature rating for the sprinkler is chosen based on the hazard being protected as well as the expected ambient temperature conditions. Factory coated, plated and painted sprinklers rated above 165°F (74°C) have the standard temperature color code either on the frame arms or on the compression screws, except in the case of bulb type decorative coated sprinklers in which the bulb fluid color indicates the temperature rating per the following table:

Nominal Temperature Ratings of Sprinklers Based on Maximum Ambient Temperature at Sprinkler Level

*Nominal Temperature Rating of Sprinkler**	*Maximum Ambient Temperature at Sprinkler Level*	*Temperature Range of Nominal Rating***	*Temperature Classification of Sprinkler*	*Color of Sprinkler Frame*	*Color and Temperature of Sprinkler Glass Bulb*
135°F (55°C)	100°F (38°C)	135°F (57°C)	Ordinary	Unpainted	Orange, 135°F (57°C)
160°F (70°C)	100°F (38°C)	155°F - 165°F (68°C - 74°C)	Ordinary	Unpainted	Red, 155°F (68°C)
175°F (80°C)	150°F (66°C)	175°F (79°C)	Intermediate	White	Yellow, 175°F (79°C)
212°F (100°C)	150°F (66°C)	200°F - 220°F (93°C - 104°C)	Intermediate	White	Green, 200°F & 225°F (93°C & 107°C)
280°F (140°C)	225°F (107°C)	280°F - 286°F (138°C - 141°C)	High	Blue	Blue, 250°F & 286°F (121°C & 141°C)
350°F (175°C)	300°F (149°C)	325°F -375°F (163°C - 191°C)	Extra High	Red	Mauve, 325°F & 360°F (162°C & 182°C)
425°F (220°C)	375°F (191°C)	400°F -475°F (204°C - 246°C)	Very Extra High	Green	Black, 400°F - 650°F (204°C – 343°C)
525°F (275°C)	475°F (246°C)	500°F -575°F (260°C - 302°C)	Ultra High	Orange	Black, 400°F - 650°F (204°C – 343°C)
650°F (345°C)	625°F (329°C)	650°F (343°C)	Ultra High	Orange	Black, 400°F - 650°F (204°C – 343°C)

*The values indicated for nominal temperature ratings of sprinkler in this table are based on values indicated in FM Global data sheets

**The values indicated are based on the actual (marked or marked nominal) temperature ratings of currently Approved sprinklers

Sprinklers of "very extra high" and "ultra high" ratings are primarily used for internal protection of chambers such as ovens and dryers having working temperatures above 300°F (149°C). When the sprinklers are normally heated to the working temperature of the oven or dryer, under fire conditions they will operate fast enough for proper protection. However, when the sprinklers are initially at the same temperature as a cold oven or dryer, operation may be so severely retarded that the oven or dryer is virtually without internal sprinkler protection.

Nominal Response Rating of Sprinklers

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Approved sprinklers are listed in one of three ways for response ratings: fast response (FR), quick response (QR) or standard response (SR) and are reflective of the response of the entire sprinkler to thermal exposure, not just the thermal sensing element of the sprinkler. Note that fast response (FR) sprinklers are a subset of quick response sprinklers for listing purposes.

The thermal sensing elements of the sprinkler are identified as either Fusible or, in the case of bulb type elements, nominal bulb diameter in millimeters (e.g., 2.5 mm, 3 mm, etc.).

Finishes and Coatings of Sprinklers

Approved sprinklers are also available with factory-applied special coatings for resistance to corrosive environments; such sprinklers are listed under the Special Protection sprinkler category. For corrosion resistance, wax is satisfactory except in extreme atmospheres. Wax has too low a melting point for high temperate rated sprinklers, whereas a bituminous coating affords some protection. A lead coating protects against certain mild corrosive atmospheres. Wax-over-lead provides good sprinkler protection. Corrosion resistant sprinklers such as those manufactured from stainless steel or other corrosion resistant materials currently afford the best available protection. See the FM Global occupancy-specific data sheet to determine when a corrosion resistant sprinkler is needed and, if so, which type offers the best resistance for the environmental conditions.

FM Approved sprinklers are available with common decorative finishes such as factory-applied bright brass, chrome, paint, or polyester coating. Note that these finishes are for decorative purposes only and are not FM Approved specifically for corrosive environments.

Finishes of currently Approved Storage and Non-Storage sprinklers are included in the following table.

Factory-Applied Finishes of Approved Storage and Non-Storage Sprinklers

Finish	*Description*
Black Plated	*Black Plated*
Brass	*Unfinished, Plain Brass or Bronze*
Bright Brass	*Bright Brass Plated*
Chrome	*Chrome Plated*
Painted	*Painted (any color)*
Polyester	*Polyester Coated (any color)*
Zinc	*Zinc Plated*

Finishes of currently Approved Special Protection (Corrosive Environment) sprinklers are included in the following table. Note that FM Approved Special Protection (Corrosive Environment) sprinklers are also acceptable for use as Non-Storage sprinklers, unless indicated otherwise by the occupancy-specific FM Global data sheet.

Finishes of Approved Special Protection (Corrosive Environment) Sprinklers

Finish	*Description*
Lead	*Lead Coated (for extra corrosion protection in some atmospheres)*
NICOTEF	*Nickel-Teflon Coating (for extra corrosion protection in some atmospheres)*
Stainless Steel	*Stainless Steel Alloy (for extra corrosion protection in some atmospheres)*
Wax	*Wax Coated (for extra corrosion protection in some atmospheres)*
Wax Over Brass	*Wax Over Brass Coated (for extra corrosion protection in some atmospheres)*
Wax Over Lead	*Wax Over Lead Coated (for extra corrosion protection in some atmospheres)*
Wax Over Polyester	*Wax Over Polyester Coated (for extra corrosion protection in some atmospheres)*

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Only sprinklers supplied by the listed manufacturers are FM Approved. Any change in the device after it leaves the manufacturer voids the Approval.

Note that Approved Special Protection (Corrosive Environment) sprinklers can also be installed in applications acceptable for both Approved Non-Storage and Storage sprinklers having the same K-factor, orientation, RTI, nominal temperature rating and sprinkler spacing.

Non-Storage Sprinklers and Storage Sprinklers

Orientation

Adjustable Concealed Pendent

Adjustable concealed pendent sprinklers incorporate a cover plate which is heat activated and can be manually removed to prevent over-painting of the cover plate. They are intended for use with concealed sprinkler piping where attractive appearance under a ceiling is desired; such occupancies may include offices, hotel lobbies, dining rooms, clubs and similar properties. FM Approved adjustable concealed pendent sprinklers are limited to a maximum temperature rating of 225°F (107°C) and to protection of hazard occupancies as outlined in the occupancy-specific FM Global Property Loss Prevention Data Sheet. Unless indicated otherwise by the occupancy-specific FM Global Property Loss Prevention Data Sheet, these sprinklers are FM Approved only for use in wet systems as well as pre-action systems that qualify as a wet system.

Dry Adjustable Horizontal Sidewall

A dry-type sprinkler consists of a sprinkler permanently attached to an extension nipple which has a closure at the inlet end to prevent system water from entering the nipple until the sprinkler operates.

Adjustable dry horizontal sidewall sprinklers are dry-type sprinklers in which the sprinklers attached to the nipple extension are of the horizontal sidewall orientation. They are intended for installation near a wall/ceiling interface and are equipped with a special deflector which discharges most of the water in a horizontal plane so that the water is directed onto adjacent walls as well as the protected area. These types of sprinklers are typically used to protect areas subject to freezing and are connected to water-filled sprinkler piping located adjacent to the protected area in a location not susceptible to freezing. They are also sometimes used on dry type sprinkler systems where the installed sprinkler must be of the sidewall orientation. The sprinklers are generally intended for locations such as offices, hotel lobbies and dining rooms, where the installation of Non-Storage pendent or upright sprinklers with the usual ceiling spacing and pipe location may be objectionable because of appearance. They are also installed for special circumstances where their directional properties are desirable.

Dry Adjustable Pendent

A dry-type sprinkler consists of a sprinkler permanently attached to an extension nipple which has a closure at the inlet end to prevent system water from entering the nipple until the sprinkler operates.

Adjustable dry pendent sprinklers are dry-type sprinklers in which the sprinkler attached to the nipple extension is of the pendent orientation. These types of sprinklers are typically used to protect areas subject to freezing and are connected to water-filled sprinkler piping located above the protected area in a location not susceptible to freezing. They are also sometimes used on dry type sprinkler systems where the installed sprinkler must be of the pendent orientation.

Adjustable Recessed Pendent

Adjustable recessed pendent sprinklers consist of a pendent sprinkler installed in a decorative recessed cup which reduces the protrusion of the sprinkler from the ceiling. They are intended for use with concealed sprinkler piping where attractive appearance under a ceiling is desired; such occupancies may include offices, hotel lobbies, dining rooms, clubs and similar properties. FM Approved adjustable recessed pendent sprinklers are limited to a maximum temperature rating of 225°F (107°C) and to protection of hazard occupancies as outlined in the occupancy-specific FM Global Property Loss Prevention Data Sheet. Unless indicated otherwise by the occupancy-specific FM Global Property Loss Prevention Data Sheet, these sprinklers are FM Approved only for use in wet systems as well as pre-action systems that qualify as a wet system.

Concealed Pendent

Concealed pendent sprinklers incorporate a cover plate which is heat activated and can be manually removed to prevent over-painting of the cover plate. They are intended for use with concealed sprinkler piping where attractive appearance under a ceiling is desired; such occupancies may include offices, hotel lobbies, dining rooms, clubs and similar properties. FM Approved concealed pendent sprinklers are limited to a maximum temperature rating of 225°F (107°C) and to protection of hazard occupancies as outlined in the occupancy-specific FM Global Property Loss Prevention Data Sheet. Unless indicated otherwise by the occupancy-specific FM Global Property Loss Prevention Data Sheet, these sprinklers are FM Approved only for use in wet systems as well as pre-action systems that qualify as a wet system.

Dry Concealed Pendent

A dry-type sprinkler consists of a sprinkler permanently attached to an extension nipple which has a closure at the inlet end to prevent system water from entering the nipple until the sprinkler operates.

Dry concealed pendent sprinklers are dry-type sprinklers in which the sprinklers attached to the nipple extension are of the pendent orientation. Dry concealed pendent sprinklers incorporate a cover plate which is heat activated and can be manually removed to prevent over-painting of the cover plate. These types of sprinklers are typically used to protect areas subject to freezing and are connected to water-filled sprinkler piping located adjacent to the protected area in a location not susceptible to freezing. They are also sometimes used on dry type sprinkler systems where the installed sprinkler must be of the pendent orientation. The sprinklers are generally intended for use with concealed sprinkler piping where attractive appearance under a ceiling is desired; such occupancies

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may include offices, hotel lobbies, dining rooms, clubs and similar properties. FM Approved dry concealed pendent sprinklers are limited to a maximum temperature rating of 225°F (107°C) and to protection of hazard occupancies as outlined in the occupancy-specific FM Global Property Loss Prevention Data Sheet.

Dry Horizontal Sidewall

A dry-type sprinkler consists of a sprinkler permanently attached to an extension nipple which has a closure at the inlet end to prevent system water from entering the nipple until the sprinkler operates.

Dry horizontal sidewall sprinklers are dry-type sprinklers in which the sprinklers attached to the nipple extension are of the horizontal sidewall orientation. They are intended for installation near a wall/ceiling interface and are equipped with a special deflector which discharges most of the water in a horizontal plane so that the water is directed onto adjacent walls as well as the protected area. These types of sprinklers are typically used to protect areas subject to freezing and are connected to water-filled sprinkler piping located adjacent to the protected area in a location not susceptible to freezing. They are also sometimes used on dry type sprinkler systems where the installed sprinkler must be of the sidewall orientation. The sprinklers are generally intended for locations such as offices, hotel lobbies and dining rooms, where the installation of Non-Storage pendent or upright sprinklers with the usual ceiling spacing and pipe location may be objectionable because of appearance. They are also installed for special circumstances where their directional properties are desirable.

Dry Pendent

A dry-type sprinkler consists of a sprinkler permanently attached to an extension nipple which has a closure at the inlet end to prevent system water from entering the nipple until the sprinkler operates.

Dry pendent sprinklers are dry-type sprinklers in which the sprinkler attached to the nipple extension is of the pendent orientation. These types of sprinklers are typically used to protect areas subject to freezing and are connected to water-filled sprinkler piping located above the protected area in a location not susceptible to freezing. They are also sometimes used on dry type sprinkler systems where the installed sprinkler must be of the pendent orientation.

Dry Recessed Horizontal Sidewall

A dry-type sprinkler consists of a sprinkler permanently attached to an extension nipple which has a closure at the inlet end to prevent system water from entering the nipple until the sprinkler operates.

Dry recessed horizontal sidewall sprinklers are dry-type sprinklers in which the sprinklers attached to the nipple extension are of the horizontal sidewall orientation and are installed in a decorative recessed cup which reduces the protrusion of the sprinkler from the wall. These types of sprinklers are typically used to protect areas subject to freezing and are connected to water-filled sprinkler piping located adjacent to the protected area in a location not susceptible to freezing. They are also sometimes used on dry type sprinkler systems where the installed sprinkler must be of the sidewall orientation.

Dry Recessed Pendent

A dry-type sprinkler consists of a sprinkler permanently attached to an extension nipple which has a closure at the inlet end to prevent system water from entering the nipple until the sprinkler operates.

Dry recessed pendent sprinklers are dry-type sprinklers in which the sprinklers attached to the nipple extension are of the pendent orientation and are installed in a decorative recessed cup which reduces the protrusion of the sprinkler from the ceiling. These types of sprinklers are typically used to protect areas subject to freezing and are connected to water-filled sprinkler piping located above the protected area in a location not susceptible to freezing. They are also sometimes used on dry type sprinkler systems where the installed sprinkler must be of the pendent orientation.

Dry Upright

A dry-type sprinkler consists of a sprinkler permanently attached to an extension nipple which has a closure at the inlet end to prevent system water from entering the nipple until the sprinkler operates.

Dry upright sprinklers are dry-type sprinklers in which the sprinklers attached to the nipple extension are of the upright orientation. These types of sprinklers are typically used to protect areas subject to freezing and are connected to water-filled sprinkler piping located below the protected area in a location not susceptible to freezing.

Flush Pendent

Flush pendent sprinklers are constructed with an operating element which extends a short distance below the ceiling. Upon actuation, the sprinkler deflector drops below the ceiling level to provide a proper water distribution. They are intended for use with concealed sprinkler piping where attractive appearance under a ceiling is desired; such occupancies may include offices, hotel lobbies, dining rooms, clubs and similar properties. FM Approved flush pendent sprinklers are limited to a maximum temperature rating of 225°F (107°C) and to protection of hazard occupancies as outlined in the occupancy-specific FM Global Property Loss Prevention Data Sheet. Unless indicated otherwise by the occupancy-specific FM Global Property Loss Prevention Data Sheet, these sprinklers are FM Approved only for use in wet systems as well as pre-action systems that qualify as a wet system.

Horizontal Sidewall

Sidewall sprinklers are sprinklers that are intended for installation near a wall/ceiling interface. They are equipped with a special deflector which discharges most of the water in a horizontal plane so that the water is directed onto adjacent walls as well as the protected area. The sprinklers are generally intended for locations such as offices, hotel lobbies and dining rooms, where the installation of Non-Storage pendent or upright sprinklers with the usual ceiling spacing and pipe location may be objectionable because of appearance. They are also installed for special circumstances where their directional properties are desirable.

Horizontal sidewall automatic sprinklers are sidewall-type sprinklers in which the axis of the sprinkler orifice is oriented horizontally.

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Pendent

Pendent automatic sprinklers are sprinklers designed such that the water discharge from the sprinkler orifice is directed downward towards the deflector which in turn directs the water downward toward the protected area. The sprinkler is designed such that the deflector is located below the pipe to which the sprinkler is connected.

Recessed Horizontal Sidewall

Sidewall sprinklers are sprinklers that are intended for installation near a wall/ceiling interface. They are equipped with a special deflector which discharges most of the water in a horizontal plane so that the water is directed onto adjacent walls as well as the protected area. The sprinklers are generally intended for locations such as offices, hotel lobbies and dining rooms, where the installation of Non-Storage pendent or upright sprinklers with the usual ceiling spacing and pipe location may be objectionable because of appearance. They are also installed for special circumstances where their directional properties are desirable.

Recessed horizontal sidewall sprinklers consist of a horizontal sidewall sprinkler installed in a decorative recessed cup which reduces the protrusion of the sprinkler from the wall. They are intended for use with concealed sprinkler piping where attractive appearance is desired; such occupancies may include offices, hotel lobbies, dining rooms, clubs and similar properties.

Recessed Pendent

Recessed pendent sprinklers consist of a pendent sprinkler installed in a decorative recessed cup which reduces the protrusion of the sprinkler from the ceiling. They are intended for use with concealed sprinkler piping where attractive appearance under a ceiling is desired; such occupancies may include offices, hotel lobbies, dining rooms, clubs and similar properties. FM Approved recessed pendent sprinklers are limited to a maximum temperature rating of 225°F (107°C) and to protection of hazard occupancies as outlined in the occupancy-specific FM Global Property Loss Prevention Data Sheet. Unless indicated otherwise by the occupancy-specific FM Global Property Loss Prevention Data Sheet, these sprinklers are FM Approved only for use in wet systems as well as pre-action systems that qualify as a wet system.

Upright

Upright automatic sprinklers are sprinklers designed such that the water discharge from the sprinkler orifice is directed upward towards the deflector which in turn redirects the water downward toward the protected area. The sprinkler is designed such that the deflector is located above the pipe to which the sprinkler is connected.

Vertical Sidewall

Sidewall sprinklers are sprinklers that are intended for installation near a wall/ceiling interface. They are equipped with a special deflector which discharges most of the water in a horizontal plane so that the water is directed onto adjacent walls as well as the protected area. The sprinklers are generally intended for locations such as office, hotel lobbies, and dining rooms, where the installation of Non-Storage pendent or upright sprinklers with the usual ceiling spacing and pipe location may be objectionable because of appearance. They are also installed for special circumstances where their directional properties are desirable.

Vertical sidewall automatic sprinklers are sidewall-type sprinklers in which the axis of the sprinkler orifice is oriented vertically. They are FM Approved for use in both the upright and pendent positions, except where noted otherwise.

Non-Storage Sprinklers

A Non-Storage automatic sprinkler is a sprinkler that has been categorized by FM Global as acceptable for protecting non-storage-type occupancies and/or other occupancy hazards characterized by low to moderate heat-release rate fires as permitted in a FM Global occupancy-specific Property Loss Prevention Data Sheet.

K5.6 (K80 metric)

Non-Storage automatic sprinklers having a K-factor value of 5.6 (80 metric) are similar to Non-Storage automatic sprinklers having a K-factor value of 2.8 (40 metric), except that they discharge 100% more water at the same discharge pressure and typically do not require the use of individual or system strainers. Pendent sprinklers of this K-factor would, however, require the installation of a return bend if the water supply is fed from an open-body type source. See FM Global Property Loss Prevention Data Sheet 2-0, *Installation Guidelines for Automatic Sprinklers*, for additional details and requirements regarding these sprinklers.

K5.6 (K80 metric) Pendent

PS002

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Company Website:	http://www.protectorsprinkler.com.tw
New/Updated Product Listing:	No

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Primary Class of Work:	2017-AS, Control Mode, Pendent
Listing Country:	Taiwan
Sprinkler Category:	Non Storage
K:	5.6
Type:	Pendent
Response:	SR - Standard Response
Element:	5 mm
NPT (in.):	1/2
Finish:	Brass, Chrome, Polyester
Temp. Rating (°F):	135, 155, 175, 200
Temp. Rating (°C):	57, 68, 79, 93
Certification Type:	FM Approved

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