HYDRA®
Quality by Witzenmann

VdS

FM APPROVED

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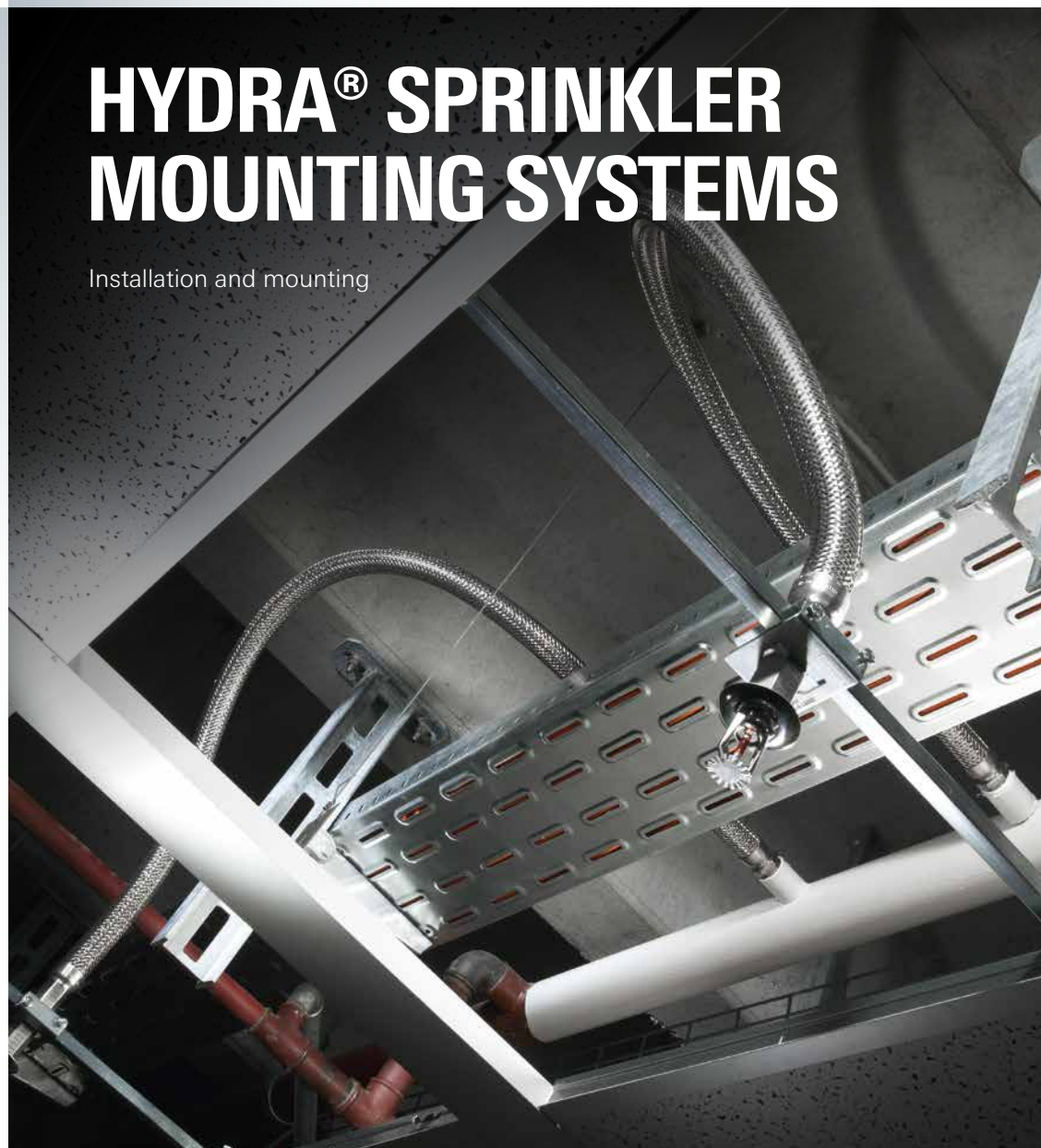
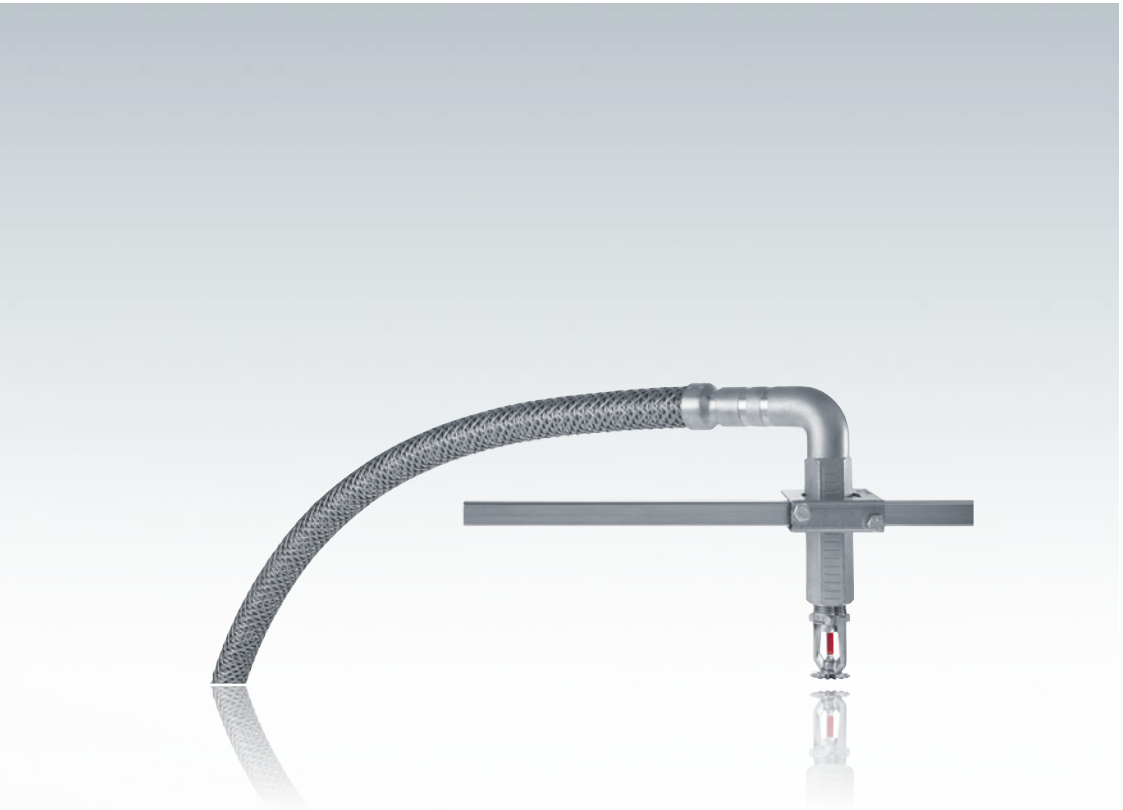
WITZENMANN
managing flexibility

HYDRA® SPRINKLER MOUNTING SYSTEMS

Installation and mounting



CONTENT



HYDRA

APPROVALS

Conventional installation of sprinklers in suspended ceiling systems with rigid piping is very complex. The flexibility of the stainless-steel hose enables the position of the sprinkler to be freely selected within the area defined by the length of the hose. The supplied mounting brackets allow reliable and secure attachment of the sprinkler tube to the substructure of the appropriate ceiling system.

VdS

VdS-approved sprinkler mounting systems
VdS-approved sprinkler-mounting systems (VdS = Association of Damage Insurers of Germany) are approved for use in wet sprinkler systems with R 1/2“
(K 80) and R 3/4“ (K 115) sprinklers. DN 20 and DN 25 sprinkler hoses with a maximum length of 2000 mm are permitted. The threads are designed according to EN 10226-1. The pressure range for VdS-approved sprinkler mounting systems is PN16 bar.

FM
APPROVED

FM-approved sprinkler-mounting systems
(FM = Factory Mutual) may only be installed with R ½" (K 80) or R ¾" (K 115) sprinklers. The pressure range of FM-approved sprinkler mounting systems is PN12 bar (175 psi). In line with the approval, the maximum ambient temperature is limited to 190 °C = 375 °F. The maximum total length of the sprinkler hoses is 1800 mm.

The approvals only apply if HYDRA sprinkler hoses and HYDRA mounting brackets are used together in suspended ceilings.

MOUNTING

Sealing the sprinkler
The sprinkler head must be sealed at the hexagon socket on the sprinkler hose. A protective cap must be placed on the sprinkler after sealing to prevent damage. When using two-component rosettes the sprinkler clamp and the rosette spring washer must also be installed.

Installing the hose
The hose is connected to the water supply line by a threaded connection. The sprinkler hose outlets should be located on the side of the supply line, with the hose outlet parallel to the concrete ceiling. A clearance B of 100 mm or more but no less than 50 mm is recommended between the concrete ceiling and axis of the lateral sprinkler hose outlet.

In confined areas the hose can be installed in form of a loop or spiral (see drawing on page 6).

The sprinkler hose must be suspended freely between the concrete ceiling and the suspended ceiling, without being in contact with the concrete ceiling itself or other equipment. Do not exceed the minimum bending radius of the sprinkler hoses. The minimum distance H between the concrete ceiling and the suspended ceiling must be maintained.

In confined spaces sprinkler hoses with 90° bends are recommended: the minimum distance H min. is then only 140 mm (DN 20) or 150 mm (DN 25).

Installation of ceiling elements
The ceiling element required for sprinkler installation must be drilled at the installation location; the diameter of the hole depends on the sprinkler and rosette type. The drilled ceiling element must be installed in accordance with the instructions of the manufacturer of the ceiling system. The cover rosette is installed from the bottom of the suspended ceiling.

MOUNTING – INSTALLATION DISTANCES

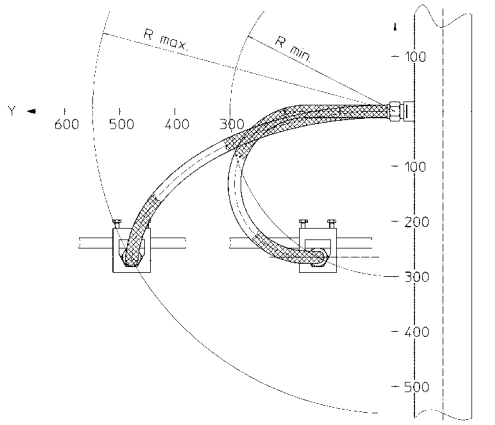
Installation distances and dimensions

The approved installation positions depend on the horizontal and vertical distance to the hose outlet on the supply line. The hose must not be kinked immediately behind the connection fitting. The hose should be as torsion-free as possible when installed.

Nominal diameter	Minimum bending radius with single bending	Minimum bending radius for frequent movements
DN 20	70 mm	170 mm
DN 25	85 mm	190 mm*

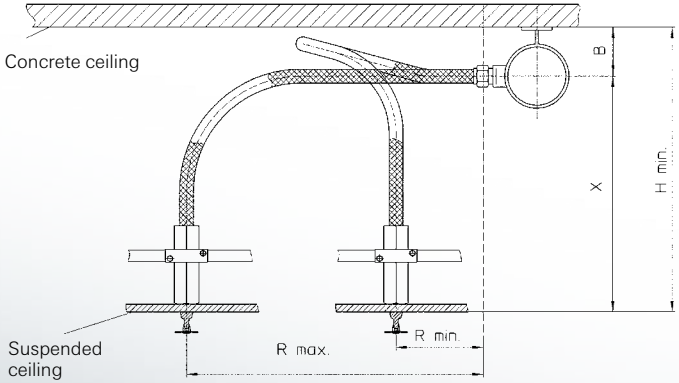
* Relevant minimum bending radius as per FM guidelines

Top view



Nominal diameter	Minimum distance H (min.)		
	Straight design		90° bend
	static	dynamic	
DN 20	240 mm	340 mm	140 mm
DN 25	265 mm	365 mm	150 mm

Lateral view



MOUNTING – INSTALLATION DIMENSIONS DN 20/25

X = Distance between hose outlet and suspended ceiling

NL	x		DN 20				DN 25			
			R min.		R max.		R min.		R max.	
	mm	inch	mm	inch	mm	inch	mm	inch	mm	inch
800	< 200	< 7.9"	not recommended				not recommended			
31.5"	300	11.8"	300	11,8"	500	19,7"	300	11.8"	500	19,7"
	400	15.7"	200	7,9"	450	17,7"	200	7,9"	450	17,7"
	500	19.7"	100	3,9"	400	15,7"	100	3,9"	400	15,7"
1000	< 200	< 7.9"	not recommended				not recommended			
39.4"	300	11,8"	300	11,8"	700	27,6"	300	11,8"	700	27,6"
	400	15,7"	200	7,9"	650	25,6"	300	11,8"	700	27,6"
	500	19,7"	100	3,9"	600	23,6"	200	7,9"	650	25,6"
	600	23,6"	0	0	550	21,7"	100	3,9"	600	23,6"
	700	27,6"	0	0	500	19,7"	0	0	500	19,7"
1200	< 300	11,8"	0	0	1000	39,4"	0	0	1000	39.4"
47.2"	400	15,7"	0	0	900	35,4"	0	0	900	35,4"
	500	19,7"	0	0	850	33,5"	0	0	850	33,5"
	600	23,6"	0	0	800	31,5"	0	0	800	31,5"
	700	27,6"	0	0	700	27,6"	0	0	700	27,6"
	800	31,5"	0	0	650	25,6"	0	0	600	23,6"
	900	35,4"	0	0	600	23,6"	0	0	500	19,7"
1500	< 300	11,8"	0	0	1200	47,2"	0	0	1200	47,2"
59.0"	400	15,7"	0	0	1150	45,3"	0	0	1150	45,3"
	500	19,7"	0	0	1150	45,3"	0	0	1150	45,3"
	600	23,6"	0	0	1100	43,3"	0	0	1100	43,3"
	700	27,6"	0	0	1000	39,4"	0	0	1000	39,4"
	800	31,5"	0	0	1000	39,4"	0	0	1000	39,4"
	900	35,4"	0	0	900	35,4"	0	0	900	35,4"
	1000	39,4"	0	0	900	35,4"	0	0	900	35,4"
1800	< 300	< 11.8"	0	0	1500	59,1"	0	0	1500	59,1"
70.9"	400	15.7"	0	0	1400	55,1"	0	0	1400	55,1"
	500	19.7"	0	0	1400	55,1"	0	0	1400	55,1"
	600	23.6"	0	0	1350	53,1"	0	0	1350	53,1"
	700	27.6"	0	0	1350	53,1"	0	0	1350	53,1"
	800	31.5"	0	0	1300	51,2"	0	0	1300	51,2"
	900	35.4"	0	0	1250	49,2"	0	0	1250	49,2"
	1000	39.4"	0	0	1200	47,2"	0	0	1200	47,2"
2000	< 300	11,8"	0	0	1750	68,9"	0	0	1750	68,9"
	400	15,7"	0	0	1700	66,9"	0	0	1700	66,9"
	500	19.7"	0	0	1700	66,9"	0	0	1700	66,9"
	600	23.6"	0	0	1650	65"	0	0	1650	65"
	700	27.6"	0	0	1650	65"	0	0	1650	65"
	800	31.5"	0	0	1600	63"	0	0	1600	63"
	900	35.4"	0	0	1550	61"	0	0	1550	61"
	1000	39.4"	0	0	1500	59,1"	0	0	1500	59,1"

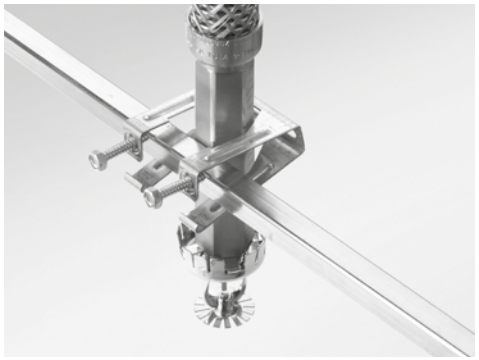
MOUNTING

Mounting the sprinkler hose on a square pipe

The sprinkler clamp is pushed onto the square pipe and brought to the final installation position. The installation position varies over the length of the square pipe. The hexagon socket of the hose is now slid onto the sprinkler clamp, if necessary with the sprinkler head, horizontally and vertically aligned, and fixed to the square pipe with AF 10 tapping screws (recommended torque 2 to 3.5 Nm). Follow the sprinkler manufacturer's installation instructions.

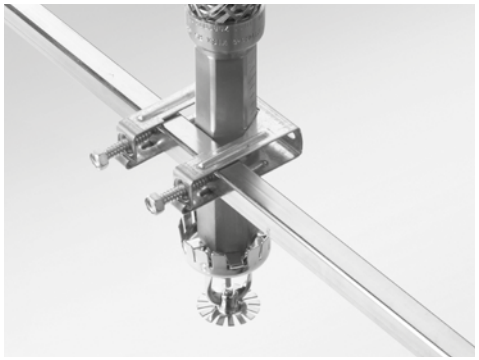
When using two-component rosettes or sprinklers with a large baffle plate,fold-away sprinkler clamps are recommended. Sprinklers and the internal spring washers on the rosette can be preinstalled on the sprinkler hose. The fold-away sprinkler clamp is supplied in "open condition" to allow the screw socket of the sprinkler hose to be inserted into the sprinkler clamp from the side.

Closed
sprinkler clamp
(standard delivery)



The open sprinkler clamp sheet metal webs are then pushed over the square pipe from the side and closed vertically one by one manually until the sheet metal tabs audibly click into position and are locked together.

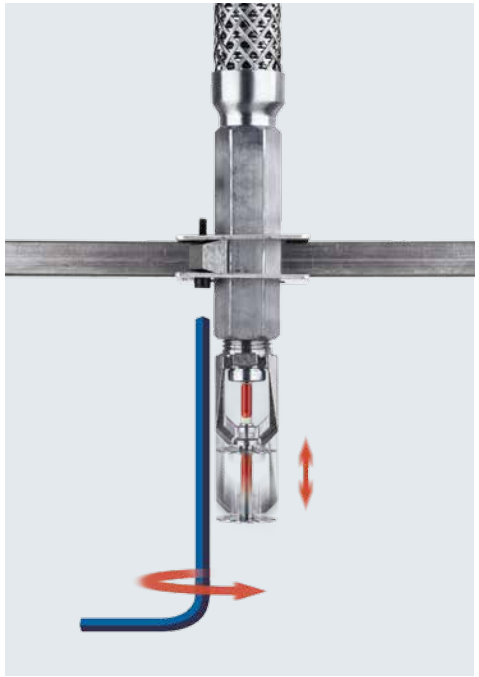
Now the sprinkler must be horizontally and vertically aligned; the installation position varies over the total length of the square pipe. The fold-away sprinkler clamp is screwed to the square pipe using the two AF 10 tapping screws (recommended torque 2 to 2.5 Nm).



Opened, fold-away
sprinkler clamp

MOUNTING

Subsequently detachable, closed clamp

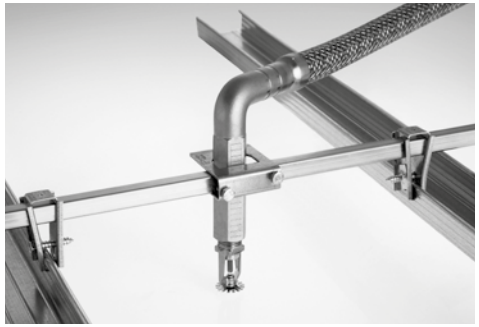


In individual cases, the sprinkler heads must be adjusted again after completely installing the sprinklers and closing the ceiling. The subsequently detachable, closed sprinkler clamp – material number 1213536 – enables this final adjustment, without having to open the ceiling once again.

The system consists of the closed clamp and a wedge, which is prestressed in the clamp with a screw (wedge compression) in the delivered state.
The sprinkler hose is installed in the usual manner of the HYDRA Standard mounting system. **Make sure that the screw head of the wedge compression is pointing downwards!**
Afterwards, the ceiling is closed.
For the subsequent adjustment use a long Allen key (size 3 for Allen screws M4) to loosen the wedge compression far enough so that the hexagon socket can be moved with the sprinkler head. After reaching the desired position, tighten the wedge compression once again until a tight fit is reached.
When doing so, do not exceed the maximum torque of 3 to 3.5 Nm.

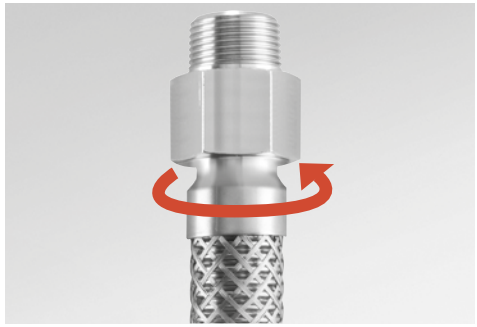
Information
The screw of the wedge compression should only be loosened a little bit so that it remains in the thread of the sprinkler clamp.
If it should fall out, mounting is no longer possible.

Hoses with 90° bends



When installing hoses with 90° bends it is important to ensure that the hoses are as torsion-free as possible. The hexagon socket must be installed in a vertical position by screwing the hose into the threaded socket of the main feed line. The hose must not be turned in its axis after installation. Risk of torsion!

Sprinkler hoses with swivelling pipe connection nipple



For confined spaces and/or when installing hoses with 90° bends, we recommend installing sprinkler hoses with swivelling threaded connections on the pipe end. This allows the hose – already under pressure and filled with water – to be rotated easily on its axis even after attachment to the water-supply pipe. This eliminates the possibility of excessive torsional strain.

Additional information
Sprinkler installation systems are suitable for use with standard drinking water at ambient temperature. During installation and commissioning and also during use it is important to ensure that water constituents that could promote corrosion, such as chlorides, fluorides etc., do not exceed 50 ppm (corresponding to 50 mg/l) in the area of the sprinkler hoses. During installation, make sure that no foreign material such as dirt, rust particles or metal chips, gets into the sprinkler hose in order to prevent corrosion. The hoses must be protected from corrosion caused by foreign materials by suitable measures, such as flushing the pipe, installation of filters etc. Technical consultation is required if the installation and/or operating conditions vary from standard use.

HYDRA® SPRINKLER MOUNTING SYSTEM TYPE 1

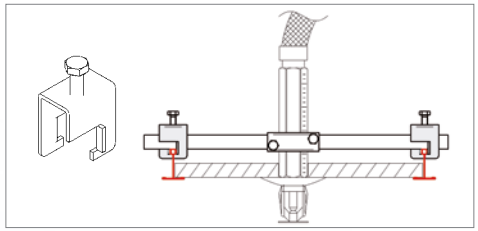
Areas of application

- Metal and mineral fibre grid ceiling systems with T-profile rails (main and ancillary supporting beam)
- Metal ceilings with clamping profiles
- Suspension-mounted standard sprinklers
- Mounting directly on the substructure. Recommended for confined installations with only small clearance between concrete ceiling and suspended ceiling
- Suitable for round and square profile contours, profile width min. 5 mm.

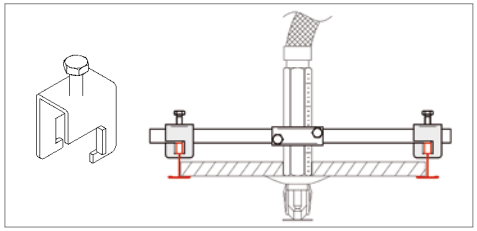
Installation type 1

The bracket must be installed on two parallel profile rails of the ceiling's substructure. In the first step the square pipe is positioned at an angle of about 70° on the ceiling rails (Fig. 1). The installation clamps are placed loosely onto the square pipe with the ceiling rail between the two tabs on the bottom of the clamps (Fig. 2). The square pipe is now aligned at right angles to the profile rails and is brought to its final installation position. The installation clamps are screwed to the ceiling rails (recommended torque 2 to 3.5 Nm) for a flush connection of the square pipe and ceiling rails (Fig. 3). During the final installation, ensure that the angle between the square pipe and ceiling rails is as close to 90° as possible (maximum approved deviation plus or minus 3°) (Fig. 4).

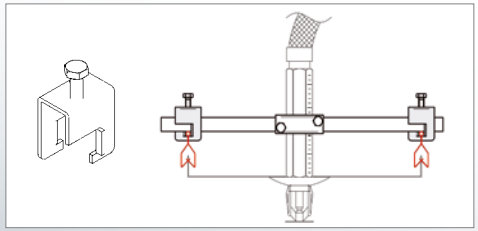
Installation situation



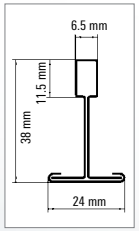
Grid ceiling profile with T-supports (main beam)



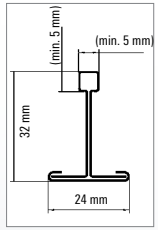
Grid ceiling profile with T-supports (main beam)



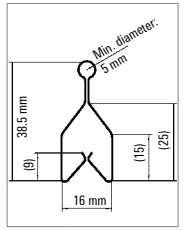
T-bar lay-in ceilings



Main supporting profile



Ancillary supporting profile



Clamping profile rail

Fig. 1

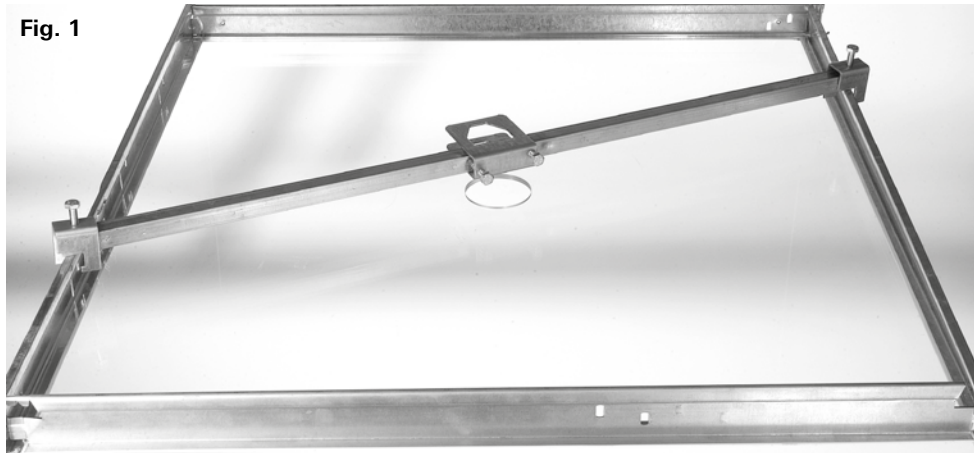


Fig. 2

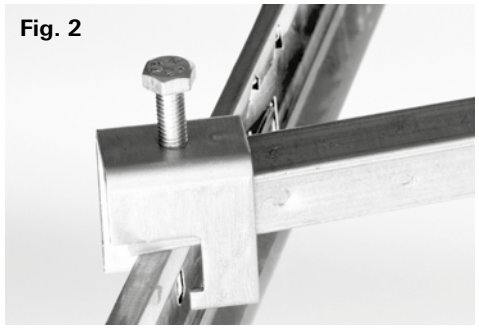


Fig. 3

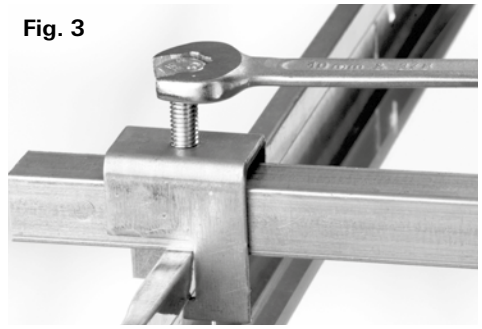


Fig. 4

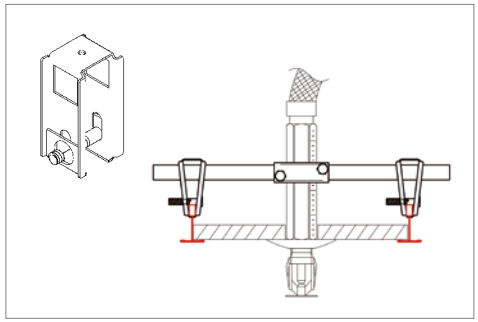
HYDRA® SPRINKLER MOUNTING SYSTEM TYPE 2

Areas of application

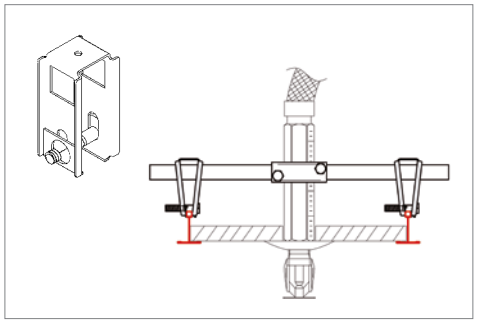
- Metal and mineral fibre grid ceiling systems with T-profile rails
- Metal ceilings with clamping profiles
- Plasterboard ceiling systems with U-shaped profile rails (60/27)
- Suspension-mounted standard sprinklers
- Hidden or recessed sprinklers

The universal solution for grid ceiling systems and plasterboard ceiling systems.
The mounting clips used (multiclips) are designed in such a way that the square pipe is mounted approximately 25 mm above the supporting beam of the ceiling substructure.
This provides sufficient space for installing hidden or recessed sprinklers.
It is also suitable for suspended standard sprinklers.

Installation situation



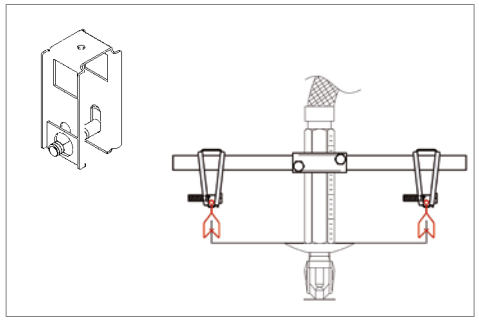
Grid ceiling profile with T-bars (main supporting beam)



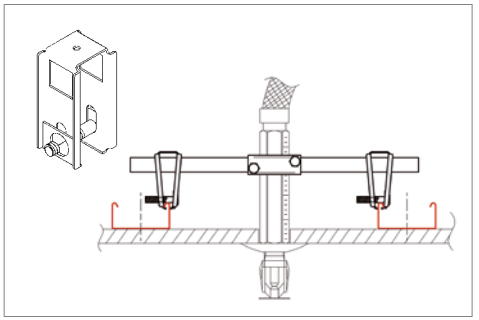
Grid ceiling profile with T-bars (ancillary supporting beam)

Installation type 2

The bracket has to be installed on to two parallel profile rails of the ceiling's substructure.
The mounting clamps (multiclips) must be loosely inserted into both ends of the square pipe.
The bracket system is positioned on the ceiling system substructure with the multiclips loosely around the ceiling rail profile (Fig. 1). The square pipe is now aligned at right angles to the profile rails and is brought to its final installation position. The multiclips come with SW 10 tapping screws, which are tightened to a recommended torque of 2 to 3.5 Nm. This firmly attaches the square pipe to the ceiling substructure (Fig. 2). The square pipe is held by the multiclips to prevent any axial displacement.



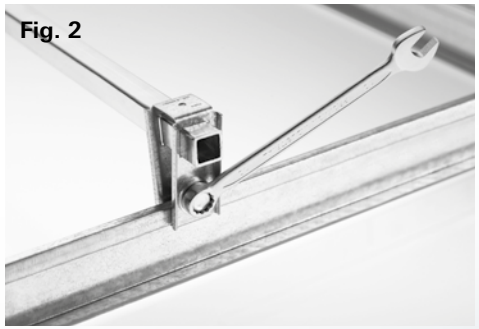
Metal ceilings with clamping profiles



Plasterboard ceiling with U-shaped profile rails

Fig. 1

Fig. 2



HYDRA® SPRINKLER MOUNTING SYSTEM TYPE 4

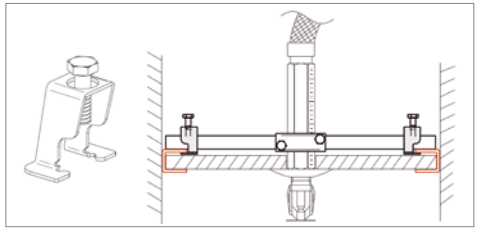
Areas of application

- Hall ceiling systems for mounting near walls using C, Z, or U-shaped profile rails
- Modular grid and panel ceiling systems with C, Z or U-shaped profile rails
- Suspension-mounted standard sprinklers
- In individual cases, it is also suitable for installing hidden or recessed sprinklers. The available installation height must be checked.

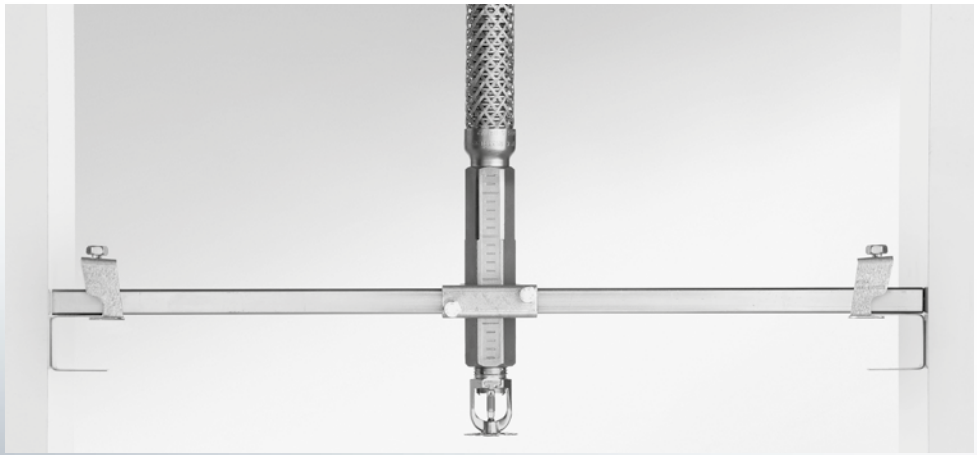
Installation type 4

Both ends of the square pipe are positioned on the ceiling or wall profile. The mounting clips are positioned on the square pipe and interlocked under the profile rails to form a positive connection (see installation drawing). The square pipe is firmly attached to the ceiling or wall profile with the type 4 mounting clamps (SW 10 tapping screws) (recommended torque 2 to 3.5 Nm).

Installation situation



Plasterboard ceiling with square pipe mounted on C-shaped profile rails near wall



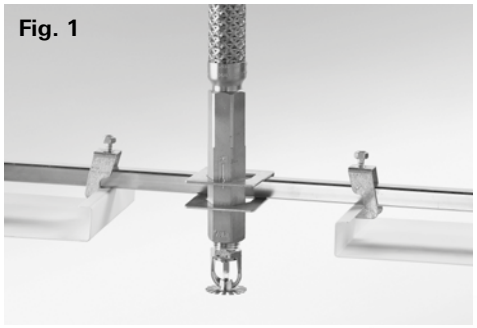
HYDRA® SPRINKLER MOUNTING SYSTEM TYPE 5

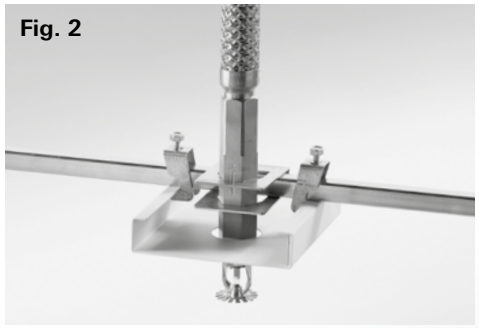
Areas of application

- Plasterboard ceiling systems with U-shaped profile rails (60/27)
- Suspension-mounted standard sprinklers
- Steel or stainless steel mounting rails/wide-span mounting profiles
- Modular grid and panel ceiling systems with C, Z or U-shaped profile rails
- In individual cases, it is also suitable for installing hidden or recessed sprinklers. The available installation height must be checked.
- Mounting directly on the ceiling substructure. Recommended for confined installations with only small clearance between concrete ceiling and suspended ceiling.

Installation type 5

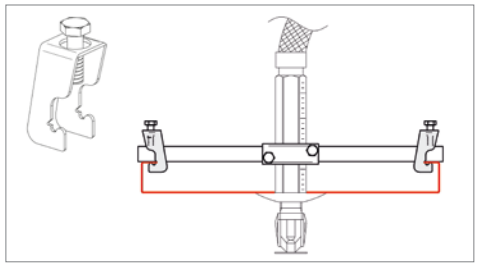
The bracket is installed on two parallel profile rails. First the square pipe is placed loosely onto the profile rails and roughly aligned. Then the type 5 mounting clamps are placed on the square pipe and interlocked into the folded edge of the profile rails to form a positive connection (see installation drawings). The square pipe is screwed to the profile rails of the ceiling system with the tapping screws of the type 5 mounting clamp (recommended torque 2 to 3.5 Nm) (Fig. 1). A profile clearance of at least 100 mm (C-profile) or 125 mm (U-profile) is required for ceiling openings in the linear grid profile rails (Fig. 2).



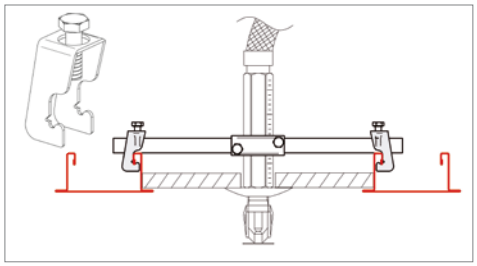


HYDRA® SPRINKLER MOUNTING SYSTEM TYPE 5

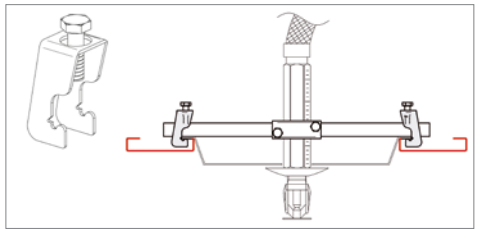
Installation situation



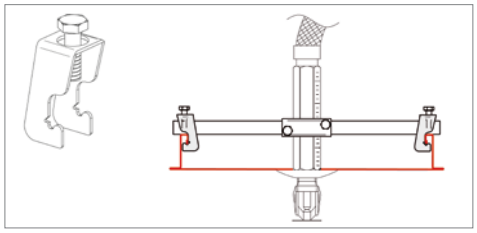
Modular grid ceiling – installation in C-shaped profile rails (Minimum width 100 mm)



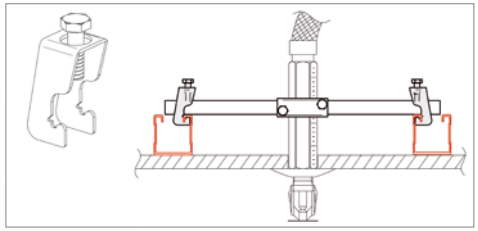
Modular grid ceiling – installation between two U-shaped profile rails



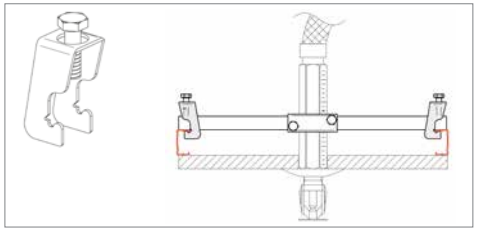
Modular grid ceiling – installation between two C-shaped profile rails



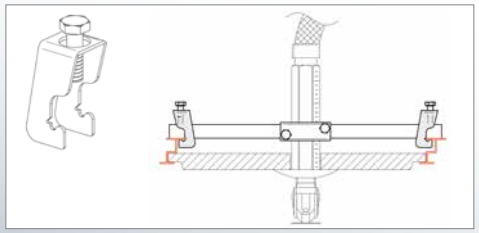
Modular grid ceiling – installation in U-shaped profile rails (Minimum width 125 mm)



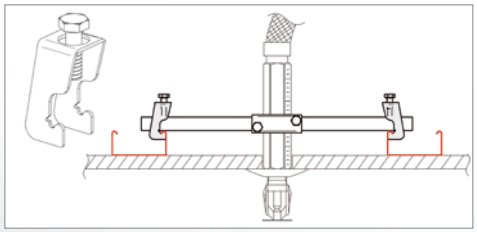
Plasterboard ceiling with mounting clips



Plasterboard ceiling with U-shaped profile rails (vertical)



Grid ceiling system with Z-shaped profile rails



Plasterboard ceiling with U-shaped profile rails (horizontal)

HYDRA® SPRINKLER MOUNTING SYSTEM TYPE 6

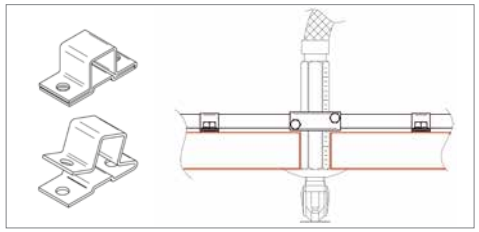
Areas of application

- For attaching by means of tapping screws on appropriate level surfaces

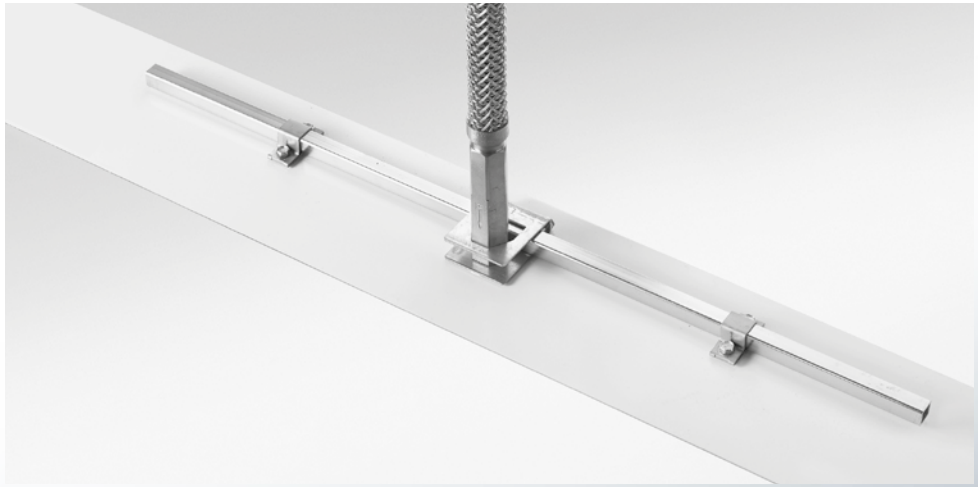
Installation type 6

System type 6 is suitable for mounting on appropriate level surfaces of metal ceiling substructures. It can be mounted in any position using conventional sheet metal screws. The mounting clips are first placed loosely onto the square pipe in an opened state. After that, they are closed manually and screwed to the substructure of the suspended ceiling with tapping screws (recommended torque 2 to 3.5 Nm). This tightens the square pipe with the mounting clips to prevent axial displacement.

Installation situation



Installation on aluminium hollow profiles



HYDRA® SPRINKLER MOUNTING SYSTEM TYPE 7

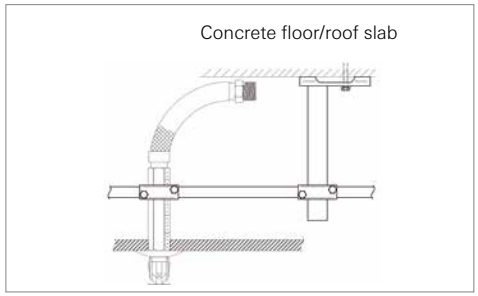
Areas of application

- For direct attachment to concrete ceilings

Installation type 7

The HYDRA sprinkler hose is attached using this bracket, regardless of the construction and geometry of the suspended intermediate ceiling. The base supporting beam is anchored directly on the concrete ceiling. The sprinkler can be positioned as required in a radius of 600 mm around the mounting position of the base supporting beam. The lateral offset can be implemented with the square pipe (max. 700 mm), which is securely screwed to the pipe of the base supporting beam by means of a sprinkler clamp.

Installation situation



HYDRA® SPRINKLER MOUNTING SYSTEM L TYPE 11

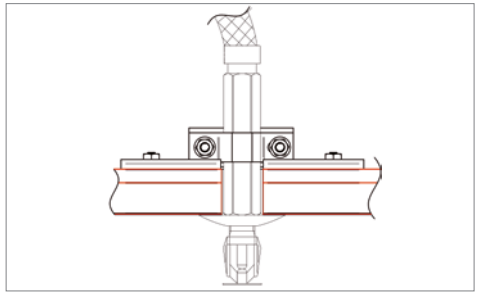
Areas of application

- For attaching by means of t-bolts/nuts in the profile rails of department store ceiling and aluminium profile rails of meshed metal baffle ceilings or clean room ceilings

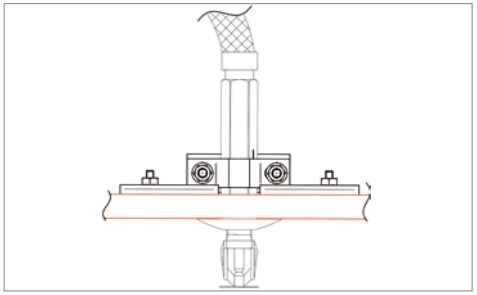
Installation L-type 11

HYDRA sprinkler bracket L-type no. 11 is screwed directly to the profile rails of the suspended ceiling with t-bolts/nuts (see installation drawing). The sprinkler hose is inserted through the bracket clamp, vertically aligned in the ceiling and then tightly screwed to the bracket with AF 13 union nuts.

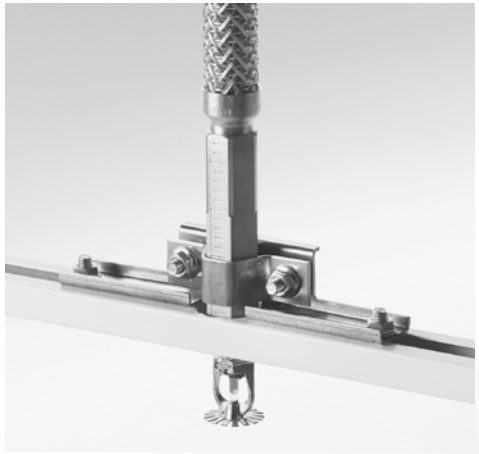
Installation situation



Mounting on aluminium meshed metal baffle ceiling system



Mounting on department store ceiling system



HYDRA® SPRINKLER MOUNTING SYSTEM L TYPE 12

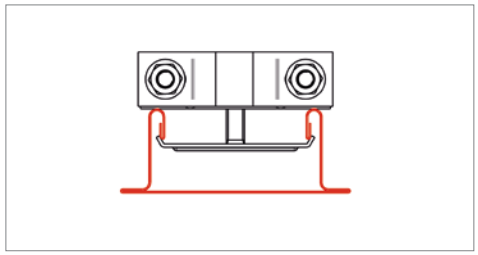
Areas of application

- For force-fit mounting inside the narrow U-shaped profile rails of modular grid and panel ceiling systems.

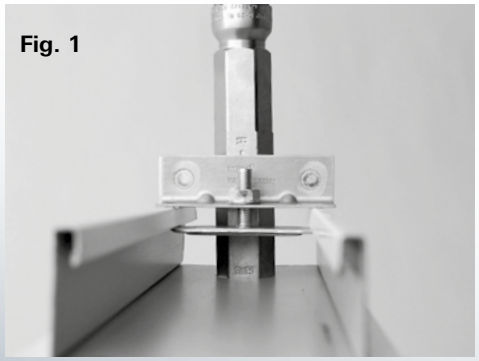
Installation L-type 12

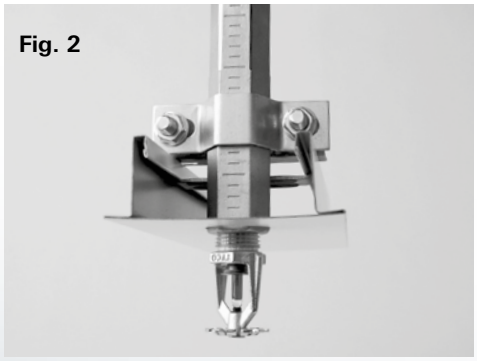
HYDRA sprinkler bracket L-type no. 12 is designed for installation inside the profile rails of modular grid ceilings. The bracket is positioned on the modular grid profiles and aligned at right angles (Fig. 1). The clamp is positioned so that the slanting ends encompass the folded ends of the profile from below. The bracket is then tensioned on the profile by tightening the AF 13 nut using the clamp. The sprinkler hose is then inserted through the bracket clamp, vertically aligned and screwed to the bracket with AF 13 nuts (Fig. 2).

Installation situation



Modular grid ceiling system (U-shaped profile rail)
for narrow profiles (< 125 mm)





HYDRA® SPRINKLER MOUNTING SYSTEM L TYPE 13

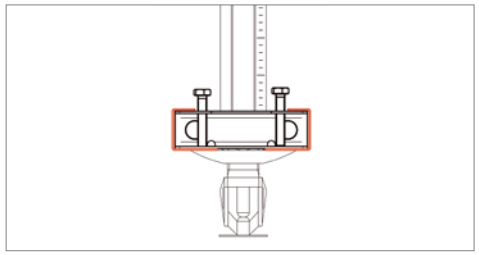
Areas of application

- For form and force-fit mounting inside the C or U-shaped profile rails of modular grid and panel ceiling systems.

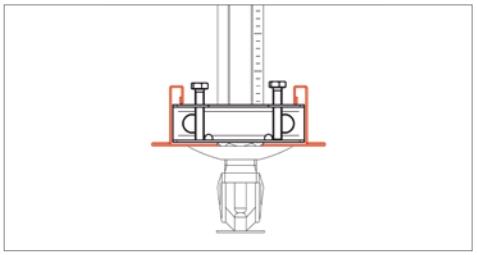
Installation L-type 13

HYDRA sprinkler bracket L-type no. 13 is designed for installation inside the profile rails of modular grid ceilings. The bracket is inserted into the modular grid profiles and aligned at right angles (Fig. 1). Then, it is tensioned flush in the modular grid profile with the two vertically positioned AF 10 screws (Fig. 2). The minimum width of the profile rail is 100 mm (C-profiles) or 125 mm (U-profiles). The sprinkler hose is then inserted through the bracket clamp, vertically aligned and screwed to the bracket with AF 13 nuts.

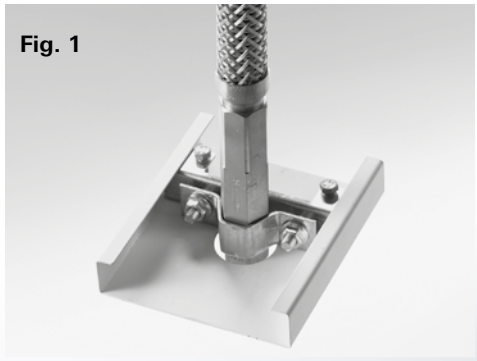
Installation situation

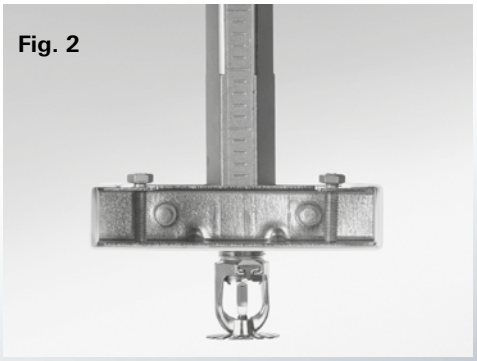


Modular grid ceiling system (C-shaped profile rail)
Minimum width 100 mm



Modular grid ceiling system (U-shaped profile rail)
Minimum width 125 mm





HYDRA® SPRINKLER MOUNTING SYSTEM L TYPE 10/15

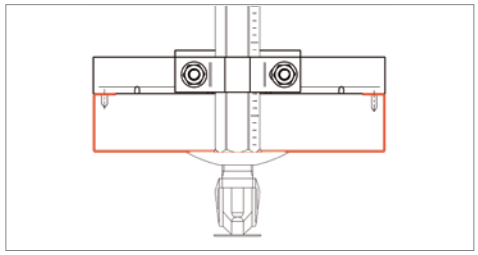
Areas of application

- For mounting directly on top of C-shaped profile rails of modular grid and panel ceiling systems using sheet metal screws and on appropriate level surfaces in accordance with the minimum requirements for fire protection. The ceiling system must be water-resistant so that no deformations such as swelling, sagging or other deformations occur, which restrict the sprinkler functions.

Installation L-type 10/15

HYDRA sprinkler bracket L-type no. 10 and 15 is designed for installation on top of the profile rails of modular grid and panel ceiling systems or on level surfaces. The bracket is positioned on the profile rails, aligned at right angles and fastened with two tapping screws. The sprinkler hose is inserted through the bracket clamp, vertically aligned in the ceiling and then screwed to the bracket with AF 13 nuts.

Installation situation



Modular grid ceiling system (C-shaped profile rail)

PRESSURE LOSSES / EQUIVALENT PIPE LENGTHS

VdS Equivalent smooth pipe lengths according to VdS specifications – **DN 20/25**

Nominal length	DN 20	
	Δ p	L (eq.)
500 mm	0.8 bar	5 m
1000 mm	0.9 bar	8 m
1200 mm	1.0 bar	12 m
1500 mm	1.3 bar	12 m
2000 mm	1.7 bar	14 m

Nominal length	DN 25	
	Δ p	L (eq.)
500 mm	0.5 bar	4 m
1000 mm	0.5 bar	8 m
1200 mm	0.6 bar	11 m
1500 mm	0.8 bar	11 m
2000 mm	1.0 bar	12 m

The VdS values are based on measurements taken with a flow velocity of 5 m/sec.

FM APPROVED Equivalent smooth pipe lengths according to FM 1637 – **DN 25**

Sprinkler hose nominal length	Pipe outlet x sprinkler outlet thread	Sprinkler hose design	Equivalent pipe length (FM measured values)
800 mm	R1" x Rp ½"	Straight	6.8 m
1000 mm	R1" x Rp ½"	Straight	9.3 m
1200 mm	R1" x Rp ½"	Straight	10.0 m
1500 mm	R1" x Rp ½"	Straight	12.2 m
1800 mm	R1" x Rp ½"	Straight	13.8 m
800 mm	R1" x Rp ¾"	Straight	4.6 m
1000 mm	R1" x Rp ¾"	Straight	6.8 m
1200 mm	R1" x Rp ¾"	Straight	8.1 m
1500 mm	R1" x Rp ¾"	Straight	10.1 m
1800 mm	R1" x Rp ¾"	Straight	11.7 m
800 mm	R1" x Rp ½"	90° bend	12.5 m
1000 mm	R1" x Rp ½"	90° bend	13.6 m
1200 mm	R1" x Rp ½"	90° bend	17.2 m
1500 mm	R1" x Rp ½"	90° bend	17.9 m
1800 mm	R1" x Rp ½"	90° bend	21.4 m

EQUIVALENT PIPE LENGTHS

FM APPROVED

Equivalent smooth pipe lengths according to FM 1637 – **DN 20**

Sprinkler hose nominal length	Pipe outlet x sprinkler outlet thread	Sprinkler hose design	Equivalent pipe length (FM measured values)
600 mm	R ¾" x Rp ½"	Straight	11.6 m
700 mm	R ¾" x Rp ½"	Straight	14.6 m
800 mm	R ¾" x Rp ½"	Straight	16.1 m
1000 mm	R ¾" x Rp ½"	Straight	21.9 m
1200 mm	R ¾" x Rp ½"	Straight	25.7 m
1500 mm	R ¾" x Rp ½"	Straight	31.9 m
1800 mm	R ¾" x Rp ½"	Straight	38.3 m
600 mm	R 1" x Rp ½"	Straight	9.9 m
700 mm	R 1" x Rp ½"	Straight	13.0 m
800 mm	R 1" x Rp ½"	Straight	14.6 m
1000 mm	R 1" x Rp ½"	Straight	20.3 m
1200 mm	R 1" x Rp ½"	Straight	24.1 m
1500 mm	R 1" x Rp ½"	Straight	30.3 m
1800 mm	R 1" x Rp ½"	Straight	36.7 m
600 mm	R ¾" x Rp ½"	90° bend	21.6 m
700 mm	R ¾" x Rp ½"	90° bend	22.6 m
800 mm	R ¾" x Rp ½"	90° bend	27.0 m
1000 mm	R ¾" x Rp ½"	90° bend	28.3 m
1200 mm	R ¾" x Rp ½"	90° bend	32.1 m
1500 mm	R ¾" x Rp ½"	90° bend	34.9 m
1800 mm	R ¾" x Rp ½"	90° bend	40.7 m
600 mm	R 1" x Rp ½"	90° bend	20.0 m
700 mm	R 1" x Rp ½"	90° bend	21.0 m
800 mm	R 1" x Rp ½"	90° bend	25.5 m
1000 mm	R 1" x Rp ½"	90° bend	26.7 m
1200 mm	R 1" x Rp ½"	90° bend	30.5 m
1500 mm	R 1" x Rp ½"	90° bend	33.3 m
1800 mm	R 1" x Rp ½"	90° bend	39.7 m