

## Ultra Low Flow AQUAMIST Solution for Protecting Office Spaces, False Ceilings and False Floors - VdS Approval Criteria

### Approvals & Application Criteria

The TYCO Type ULF AM28 and Type ULF AM30 AQUAMIST Nozzles in a 57°C (135°F) temperature rating are VdS Approved when used as part of an engineered, wet pipe, low pressure water mist system. The VdS Approval testing of the AM28 Nozzle was performed in accordance with test protocol "Fire tests for 'Office, OH1 (Ordinary Hazard Class 1)' and similar" dated Dec. 6, 2007. The VdS Approval testing of the AM30 Nozzle was performed in accordance with VdS Test Protocol, "Fire tests for false floors and false ceilings as a completion of the fire tests 'Office, OH1' and similar".

The Type ULF AM28 and Type ULF AM30 AQUAMIST Nozzles are used in the following applications in accordance with VdS CEA 4001:

- AM28 Applications:  
Offices, banks, conference rooms, schools, universities, churches, restaurants, and comparable OH1 risks  
Train stations and service halls (without sales areas, shop passages, warehouses, etc.)
- AM30 Applications:  
False ceilings and false floors between 0,3 m (1.0 ft.) and 0,8 m (2.6 ft.)

Applications in question which are not listed are to be agreed upon with VdS Schadenverhütung.

#### NOTICE

*The Ultra Low Flow AQUAMIST System described herein must be installed and maintained in compliance with this document and with the applicable standards of VdS CEA 4001 in addition to the standards of any authorities having jurisdiction. Failure to do so may impair the performance of this system.*

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

### Protection Objectives

The TYCO Ultra Low Flow AQUAMIST Solution described herein offers an alternative to higher density automatic sprinkler systems for the protection of light and ordinary hazard class 1 occupancies when installed in accordance with the System Design Criteria section.

Copies of the fire test report are available upon request from the Technical Services department.

### System Components

- VdS approved pump skid for Ultra Low Flow AQUAMIST Systems
- TYCO Type ULF AM28 and/or Type ULF AM30 AQUAMIST Nozzle (Refer to Technical Data Sheets TFP2228 and TFP2201)

All hardware and components used must be VdS Approved (in accordance with VdS CEA 4001) and compatible (pressures, materials, design flow rate, etc.).

### System Design Criteria

Engineered water mist systems utilizing the TYCO Type ULF AM28 and/or Type ULF AM30 AQUAMIST Nozzle are to be installed in accordance with VdS CEA 4001 as well as the following system design criteria.

#### System Type

Wet-pipe

#### Compartmented Protection Area

Unlimited

#### Ceiling Height

- Type ULF AM28:  
Maximum 4,5 m (14.75 ft.)
- Type ULF AM30:  
Minimum 0,3 m (1.0 ft.)  
Maximum 0,8 m (2.6 ft.),

Type ULF AM30 Nozzles are intended for protection of false ceiling and false floor spaces where the height of the concealed space at the roof and floor is between 0,3 m (1.0 ft.) and 0,8 m (2.6 ft.), and where the space contains combustible material or is constructed of combustible materials. Per VdS CEA 4001 a false ceiling may be made of combustible materials, provided that this ceiling is separated from the intermediate space at least by a fire retardant separation.

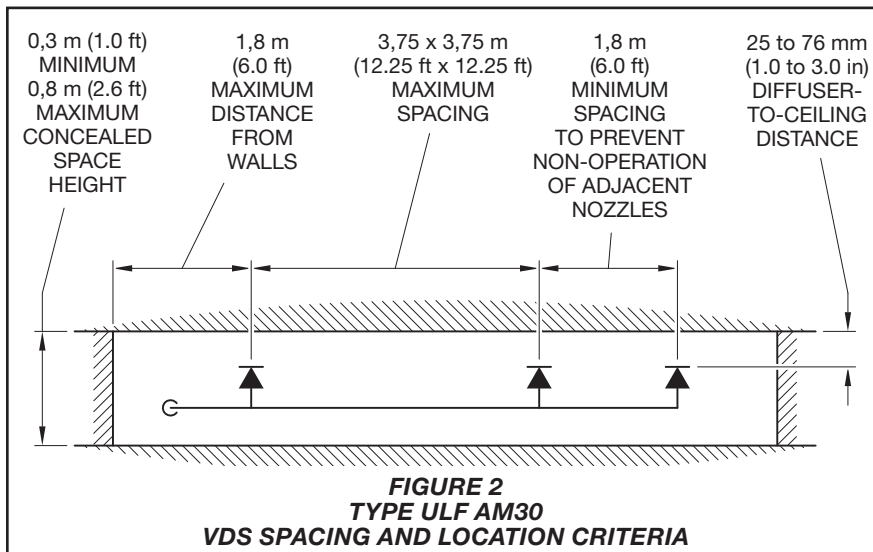
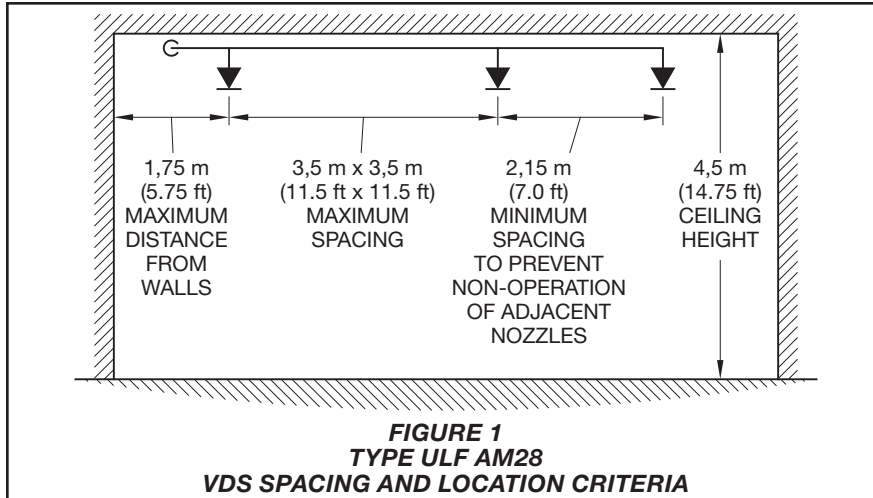
Within false ceiling or false floor spaces there shall be no contents of high flammability and contents of low flammability shall not have a fire load exceeding 12,6 MJ/m<sup>2</sup> (3,5 kWh/m<sup>2</sup>). In areas of high cable concentration the fire load per 4 m x 4 m shall not exceed 335 MJ (93,1 kWh).

#### Nozzle Spacing and Location

- Type ULF AM28:  
Type ULF AM28 Nozzles are to be installed at a maximum spacing of 3,5 m x 3,5 m (11.5 ft. x 11.5 ft.) with a maximum distance of 1,75 m (5.75 ft.) from walls. (Ref. Figure 1)  
The minimum spacing to prevent non-operation of adjacent nozzles is 2,15 m (7.0 ft.). (Ref. Figure 1)
- Type ULF AM30:  
Type ULF AM30 Nozzles are to be installed at a maximum spacing of 3,75 m x 3,75 m (12.25 ft. x 12.25 ft.), with a maximum distance of 1,8 m (6.0 ft.) from walls. (Ref. Figure 2)  
The minimum spacing to prevent non-operation of adjacent nozzles is 1,8 m (6.0 ft.). (Ref. Figure 2)  
The diffuser-to-ceiling distance must be 25 to 76 mm (1.0 to 3.0 in.). (Ref. Figure 2)

If the height of the concealed space at roof and floor is between 0,3 and 0,8 m, the spaces shall be nozzle protected if they contain combustible materials or are constructed with combustible materials.

In the case of voids the protection area shall be agreed upon with VdS.



Hazard Class	Area of Operation m <sup>2</sup> (ft <sup>2</sup> )
LH	84 (904)
OH1	72 (775)

**TABLE A**  
**TYPE ULF AM28 AND**  
**TYPE ULF AM30 WATER**  
**DEMAND REQUIREMENTS**

**Nozzle Pressure**

- Type ULF AM28: 7,0 to 16,0 bar (101.5 to 232 psi)
- Type ULF AM30: 7,6 to 16,0 bar (110 to 232 psi)

**Water Demand Requirements**

- Protection shall be to Light Hazard (LH) when main hazard class is LH and Ordinary Hazard Group 1 (OH1) in all other cases.
- The water supply shall be capable of supplying water to the greater of the most remote six nozzles or area prescribed in Table A.

**Water Supply**

Water supplies shall be capable of furnishing automatically at least the requisite pressure/flow conditions of the system. Except as specified in the case of pressure tanks, each water supply shall have a minimum water volume for the following minimum durations according to VdS CEA 4001:

- LH 30 minutes
- OH 60 minutes

A water supply shall not be affected by possible frost conditions or drought or flooding or any other conditions that could reduce the flow or effective capacity or render the supply inoperative.

The water shall be free from fibrous or other matter in suspension liable to cause accumulations in the system piping. Salt or brackish water shall not be retained in sprinkler installation pipework.

Water supplies shall be one or more of the following according to VdS CEA 4001:

- Public water mains
- Water storage tanks
- Inexhaustible sources
- Pressure tanks

**Nozzle Temperature Ratings**

The 57°C (135°F) temperature rated Type ULF AM28 and Type ULF AM30 may be used with a maximum ambient temperature of 38°C (100°F).

**Ceiling Construction**

Ceilings are to be of smooth, non-combustible construction with a maximum slope of 5° (1/12).

**Nozzle Orientation**

- Type ULF AM28: pendent position
- Type ULF AM30: upright position

**Obstructions**

The maximum allowable vertical and horizontal distance that the bottom of an obstruction can be from the Type ULF AM28 or Type ULF AM30 diffuser is provided in Graph A. Non-continuous obstructions on the ceiling such as open web beams (minimum 70% open) and light fixtures are not to be considered vertical obstructions.

**Note:** Refer to VdS CEA 4001 for installation guidelines around or in the vicinity of beams, joints, columns, and like structures.

**Corrosion Resistance**

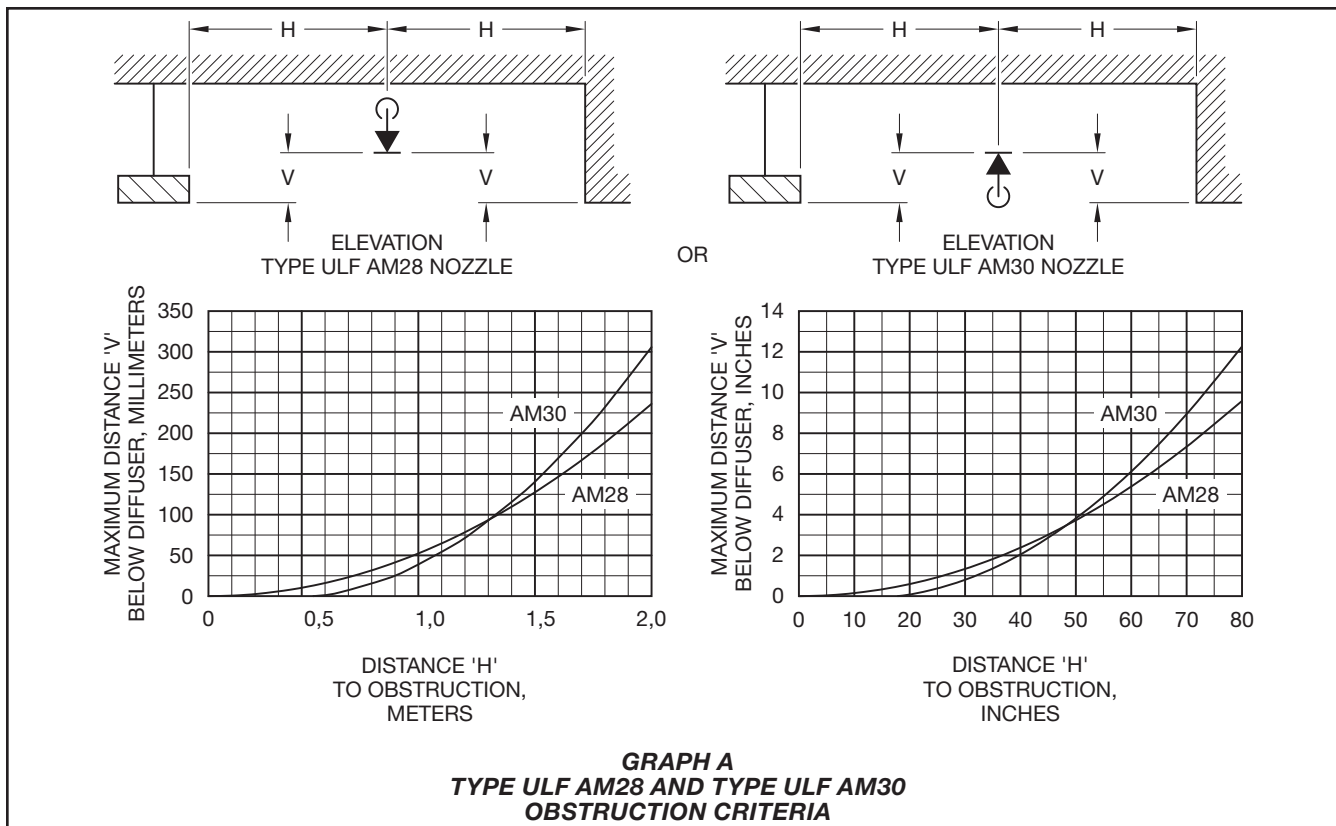
The Type ULF AM28 and Type ULF AM30 Nozzles are only to be used in environments for which the materials of construction specified in Technical Data Sheets TFP2228 and TFP2201, respectively, will provide acceptable corrosion resistance. Direct any questions to TFPP Technical Services.

The pipe (tube), fittings, hangers, and hanger components must be suitable for use in the application environment.

**Hydraulic Calculations**

Hydraulic calculations for the water mist system are to be made as part of the design of the piping system to verify that the minimum required flowing pressure is available at each nozzle in the design area.

- Where the water flow velocity does not exceed 7,6 m/s (25 ft./sec.), hydraulic calculations may be made using the Hazen-Williams formula using a C=150 value for CPVC, brass, copper, or stainless steel pipe or tube.
- Where the water flow velocity exceeds 7,6 m/s (25 ft./sec.), the hydraulic calculations are to be made using the Darcy-Weisbach formula.



**Sizes for System Pipe (Tube) and Fittings**

Pipe sizes shall be determined in accordance with VdS CEA 4001.

All pipe sizes shall be determined by hydraulic calculation using the method shown in VdS CEA 4001.

**Material for System Pipe (Tube) and Fittings**

Pipes and fittings shall be installed in accordance with the manufacturer's instructions and shall be protected against corrosion. All materials and dimensions of pipes and fittings shall be in accordance with VdS CEA 4001.

Only the following pipes shall be used for underground piping:

- Ductile cast iron pipes in accordance with DIN EN 545
- Steel pipes in accordance with DIN 2460
- Pressure pipes made of polyethylene PE-HD in accordance with DIN 8075 and R 14.3.1 with quality mark by Gütegemeinschaft Kunststoffe e.V. (Quality Association for Plastic Products)
- Stainless steel pipes in accordance with DIN 17455 with plastic coating and welded pipe joints.

Steel pipes in accordance with DIN 2460 shall be welded by butt or slip-in weld socket joints or joined by connecting sleeves. The steel pipes shall have a factory-made cement mortar lining in accordance with DIN EN 10298. For exterior corrosion protection the pipes shall have a protective enclosure. The soil shall be classified in accordance with DVGW worksheet GW 9 resp. DIN 50929 in order to determine the enclosure type in accordance with DIN 30675-1.

All above ground piping shall be steel or copper or VdS tested and approved pipe systems.

• **Steel**

When steel pipes with a nominal diameter equal to or less than 150 mm are threaded, cut-grooved or otherwise machined, they shall have a minimum wall thickness in accordance with ISO 65M. Steel pipe ends formed without significantly reducing the wall thickness, e.g. by roll-grooving, shall have a minimum wall thickness in accordance with ISO 4200 range D, in any case at least 2,6 mm. GRINNELL G-Press Press Fit Galvanized Steel Tube and Fittings are VdS approved when used in wet pipe systems up to a maximum operating pressure of 16 bar (230 psi) and a maximum ambient service temperature of 66° C (150° F).

• **Copper**

Copper pipes shall be used in wet pipe systems only, installed in the direction of flow downstream of the alarm valve. Pipes up to DN50 shall be in accordance with EN 1057. Pipes between DN50 and DN100 shall be in accordance with DIN EN 12449. Copper pipes shall bear the quality mark by Gütegemeinschaft Kupferrohre e.V. (Quality Association for Copper Pipes) and the DVGW quality mark (German Technical and Scientific Association for Gas and Water). Pipes in accordance with DIN EN 1057 with DVGW quality mark and VdS Approval may be used.

**NOTICE**

*Pipe and fitting welding procedures are to be in accordance with the applicable requirements of an installation standard which is approved by the authority having jurisdiction.*

**Pipework in Concealed Spaces**

- False ceilings above OH occupancies

Nozzles above the ceiling may be fed from the same branch pipes as the nozzles below the ceiling.

- All other cases

The nozzles in false ceilings and false floors shall be fed from separate branch pipes.

### **Flexible Hoses**

The TYCO FASTFLEX Flexible Hose is VdS Approved when used in wet-pipe systems at a service pressure not to exceed 16 bar (230 psi), and can be installed in false ceilings without cutting and threading pipes associated with installing a drop, arm-over, and elbows. To maintain proper hose functionality the maximum ambient temperature is not to exceed 107° C (225° F). The length of the hose shall be limited to the minimum necessary taking into account the installation guidelines and restrictions of the hose manufacturer. TYCO FASTFLEX Flexible Hose is VdS Approved for use in the following suspended ceilings:

- Odenwald Systems – S3 & S15
- Richter Systems – 11.1 – 11.5
- Armstrong Systems – Board and Tegular with panel type “Prima Sahara”
- API Systems – 15/38, 24/38, 24/60, 35/38, and 35/60 with panel type of a.m.

Refer to TFP720 for hose length information and installation criteria.

### **Hangers**

Pipe hangers shall be fixed directly to the building or, if necessary, to machines, storage racks or other structures. They shall not be used to support any other installations. They shall be of the adjustable type in order to secure an even load bearing capability. Hangers shall completely surround the pipe and shall not be welded to the pipe or fittings.

No part of any hanger shall be made of combustible material. Nails shall not be used.

Hangers for copper pipes shall be provided with a suitable lining with sufficient electrical resistance, in order to prevent contact corrosion. Suitable linings are, for example, powder saponified ethylene-vinyl acetate copolymers applied with the whirl sintering method, or a bracket lining with PTFE foil. If other materials are used, their appropriateness shall be verified.

Hanger spacing and design shall be in compliance with VdS CEA 4001.

### **Valves And Pressure Gauges**

Valves, valve identification, and pressure gauges must conform to the applicable requirements of VdS CEA 4001.

### **Waterflow Alarms**

A test facility for water flow alarm switches shall be fitted downstream of each switch to simulate the operation of a single nozzle. The pressure/flow characteristic of the fully opened test valve and draw-off pipe shall be equal to that of the smallest nominal bore nozzle installed downstream of the water flow alarm switch. The water flow alarm shall operate at 22,7 lpm (6 gpm). i.e. with the operation of one nozzle at a minimum operating pressure. The water flow alarm valve shall be VdS Approved and shall be installed and maintained in accordance with VdS CEA 4001. The test facility for water flow alarm switches shall be fitted with a drain. Any orifice plate shall be at the pipe outlet and shall be either stainless steel or non-ferrous material. The draw-off pipe shall be galvanized steel or copper. The draw-off pipe of the water flow alarm switch shall be positioned in such a way that the flow of water can be clearly seen during tests.

### **Flushing Connection**

Systems with underground water supply connections are to be provided with a suitable flushing connection at the inlet to the automatic water control valve for the system. The flushing connection is to be of sufficient size to establish a flow rate not less than the water demand rate of the system.

### **NOTICE**

*Suitable provision is to be made for the disposal of flushing water. Flushing water must be directed such that it will not cause accidental damage to property or danger to persons.*

## **Operation**

The mechanisms by which the TYCO Type ULF AM28 and Type ULF AM30 AQUAMIST Nozzles spray act to control Class A fires can be a combination of the following factors:

- Heat extraction from the fire as water is converted into vapor and the fuel is cooled;
- Reduced oxygen levels as the water vapor displaces oxygen near the fire;
- Direct impingement wetting and cooling of the combustibles; and
- Enveloping of the protected area to pre-wet adjacent combustibles, cool gases and other fuels in the area, as well as to block the transfer of radiant heat to adjacent combustibles.

## **Installation**

All materials and devices are to be installed in accordance with VdS CEA 4001.

### **NOTICE**

*Pipe, tube, and nipples are to have the burrs and fins removed after cutting. Apply pipe-thread sealant to male threads only. When using TEFLON tape, do not start the tape any closer than one thread from the inlet of any pipe connection or the Ultra Low Flow AQUAMIST Nozzles (strainer end).*

In order to remove foreign materials that have entered underground mains during the course of the installation, underground mains and lead-in connections to system risers are to be thoroughly flushed, as required by VdS CEA 4001, before connection is made to the system piping. Refer to the Flushing Connection requirements under the System Design Criteria section.

During installation all pipework shall be inspected for cleanliness on the inside. Moreover, after installation the entire pipework shall be thoroughly flushed via its flushing connections.

All installation pipework shall be hydrostatically tested for not less than 24 hours, to a pressure of not less than 15 bar, or 1,5 times the maximum pressure to which the system will be subjected, (both measured at the alarm valves), whichever is the greater.

### **Replacement Nozzles**

A stock of spare nozzles shall be kept on the premises as replacements for operated or damaged nozzles. Spare nozzles, together with sprinkler spanners as supplied by the manufacturer, shall be housed in a cabinet or cabinets located in a prominent and easily accessible position where the ambient temperature does not exceed 38° C (100° F).

The number of spare nozzles shall be not less than:

- 6 for LH installations
- 24 for OH installations

## **Care and Maintenance**

Before closing a fire protection system control valve for inspection or 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.

After placing a fire protection system in service, notify the proper authorities and advise those responsible for monitoring proprietary and/or central station alarms.

Exercise care to avoid damage to the TYCO Ultra Low Flow AQUAMIST Nozzles both before and after installation. Replace nozzles damaged by dropping, striking, wrench twisting, wrench slippage, or the like.

Water mist systems for the fire protection service require regularly scheduled care and maintenance by trained personnel. It is recommended that the Ultra Low Flow AQUAMIST Nozzles be periodically inspected for loading/obstructions, improper orientation, or other evidence or impaired protection. The inspections should be scheduled at least annually but more frequently if found to be necessary and corrective action taken immediately to ensure that the Ultra Low Flow AQUAMIST Nozzles will perform as intended in the event of a fire.

Fixed water mist systems for fire protection should be inspected, tested, and maintained by a qualified Inspection Service in accordance with local requirements and/or national codes.

Underground lead-in connections to the system riser are to be flushed at least annually, at a flow rate not less than the water demand rate of the system. The flushing operation is to be continued for a sufficient time to ensure thorough cleaning.

The owner is responsible for the inspection, testing, and maintenance of their fire protection system and devices in accordance with this document and VdS CEA 4001, in addition to the standards of the authority having jurisdiction. Contact the installing contractor or product manufacturer with any questions.

### **NOTICE**

*The installing contractor shall be VdS Approved for the installation of ULF components and sprinkler systems.*

## **Limited Warranty**

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

