



Fire Fighting for Railway Vehicles, Tunnels and Metro Stations

High-pressure water mist
fire protection

www.ultrafog.com

Ultra Fog Fire protection solutions are custom designed to meet worldwide fire safety regulations

ULTRA FOG is an international brand founded in Gothenburg, Sweden.

ULTRA FOG specializes in the development, design and application of high-pressure water mist sprinkler systems.

This high-performance product line results from a continuous program of research and development, extensive certification and type approvals, and quality controlled manufacturing. Ultra Fog's global reach, aftersales service and maintenance provision ensures that customers benefit from lifelong product assurance and protection.

The protection of rolling stock presents specific challenges for fire fighting. The fire must be rapidly brought under control to allow for the evacuation of passengers and crew, and the continuation of operation must be guaranteed, all within the spatial and weight confines of a railway vehicle moving at high speeds.

The lightweight design reduces water requirements, and the High-Pressure water mist provides a safe, efficient and flexible solution for the protection of rolling stock assets and passengers.



Ultra Fog Water Mist Suppression System Protects Railway Vehicles, Tunnels and Metro Stations

Tunnels are an essential part of travel infrastructure but possessing a dangerous feature: the incidence of fires is increasing. Within road tunnels, such unhappy events can occur as a result of vehicle collisions; overheating braking systems; overheating engines; and other accidental, deliberate, or negligent actions. Similarly, rail tunnels are at risk of fires within passenger or freight rolling stock. Due to the enclosed nature of a tunnel's structure, the control of heat and smoke is a priority. Assuring the safety of life, and the integrity of the tunnel's construction is our duty.

Life safety may be at further risk if the design of the tunnel has not made provision for adequate means of escape or refuge – which can be the case within older tunnels, constructed under old standards that may have put less emphasis on life safety than modern tunnel standards. Further to this, the emission and concentration of thick smoke and intense heat within the tunnel can present severe technical challenges to firefighters, during their rescue activities.



In response to this, Ultra Fog has developed a water-mist fire suppression system for tunnels. Designed to be simple, robust, reliable; the system efficiently cools the heat and smoke at the source of a fire, while consuming considerably less water than conventional deluge systems. Ultra Fog water mist is highly effective at blocking the radiant heat emanated, thereby creating a cooling barrier between the fire and the tunnel's walls, to preserve the structural integrity of the tunnel. Ultra Fog tunnels systems can be controlled instantly, from the safety of a control room located outside the tunnel, and they can be configured to operate manually or automatically in conjunction with 3rd party fire detection systems. As there is no need to wait for the firefighters to arrive – the Ultra Fog water mist can be activated as soon as a fire is detected while the flame remains relatively small, potentially enabling firefighters to perform search and rescue duties sooner.



Ultra Fog's tunnel systems are ultra reliable. Having built upon 30 years' of experience of the design and manufacture of water mist systems for the marine, land and offshore markets, Ultra Fog has developed a water mist system specifically to address the technical challenges posed by fires within tunnels. [This has been validated with full-scale fire tests at the Applus+ TST tunnel test facility, during which 30MW 50MW, 100MW, and 200MW fires were tested.] Furthermore, all the future testing will be performed at our brand new fire laboratory whose features are unique in the world.

Ultra Fog tunnel systems are designed to be as simple as possible – to ensure reliability, ease of maintenance, and to minimise the costs associated with the installation and through-life maintenance. Investment in an Ultra Fog tunnel system is primarily an investment in life safety, but secondary benefits include the protection of physical assets, lower insurance premiums, faster clean-up and repair after a fire; and less downtime, closure, and disruption.



Ultra Fog passed 30 MW fire test, which simulates a car within the tunnel

Throughout the tests, the tunnel's ventilation system ran continuously to create an airspeed. In real-world tunnel fires, ventilation is a double-edged sword. It is an essential tool for the control of smoke, to improve tenability and visibility within the tunnel, and to increase the window of opportunity for people to evacuate safely. On the other hand, ventilation provides the fire with supply oxygen which can intensify the fire, and the flow of air can dilute the water mist reducing its effectiveness. Accordingly, it was necessary to test the Ultra Fog system in conjunction with the tunnel's ventilation system.

Despite the ventilation, the Ultra Fog system excelled. Each of the 30 MW fire tests followed the same ignition sequence. The main fuel load (having a heat release rate of 30MW) was ignited, and the fire was allowed to develop for several minutes before the Ultra Fog system was manually activated. During this time, the average temperature 5m downstream of the fire peaked in excess of 600°C [\sim 1110°F]. Within 60 seconds of activation of the Ultra Fog system is reduced to 200°C [\sim 390°F]. Within 3 minutes this had fallen to 100°C [\sim 210°F], and within 6 minutes, the temperature had returned to \sim 20°C [\sim 68°F].



In addition to the rapid cooling, the Ultra Fog system also prevented the spread of fire to a flammable target which was placed near the main fuel load. The purpose of the target was to simulate another vehicle parked adjacent to the burning vehicle. The fire tests demonstrated the Ultra Fog system's ability to prevent the spread of fire from one vehicle to an adjacent vehicle.

Building upon the successful completion of the 30 MW fire tests, Ultra Fog will perform many other fire tests in September and October 2020. The size and arrangement of the fuel loads during these tests will be representative of light and heavy goods vehicles.

These tests are all part of Ultra Fog's ongoing commitment to invest in the research and development of robust fire suppression systems for the protection of lives and infrastructure, balancing the ever-growing need for efficiency and economy, without compromising performance.



Ultra Fog performance water mist fire suppression uses up to 90% less water than conventional sprinkler systems

High-pressure water mist is very effective in extinguishing fires. The Ultra Fog High-Pressure water mist fire protection system produces a great mist of micro water droplets by forcing clean water through a specially designed, patented high-pressure nozzle.

In a fire scenario, the resulting mist reduces the heat in the enclosure very quickly, the expansion of the mist from water to steam aids the suppression process by reducing the amount of oxygen feeding the fire. Clean water used in Ultra Fog systems, filtered by the pump station, is non-toxic, environmentally friendly and people safe.



Effective High Pressure / Performance Water Mist Solutions

Ultra Fog high-performance water mist fire suppression uses up to 90% less water than conventional sprinkler systems.

Ultra Fog Nozzles

The highly engineered nozzles are designed and assembled with few components to ensure high operational reliability, minimizing energy loss which translates to a very efficient nozzle that delivers excellent performance both ceiling and wall-mounted versions of the nozzles are available; installation is easy

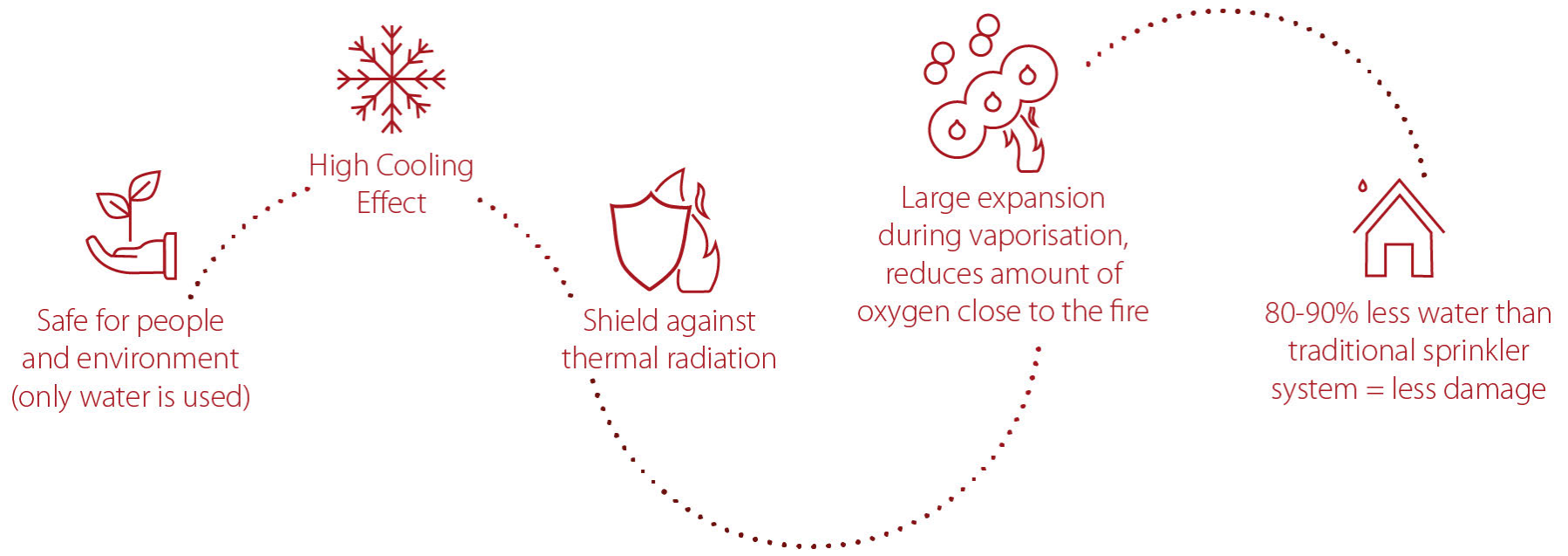
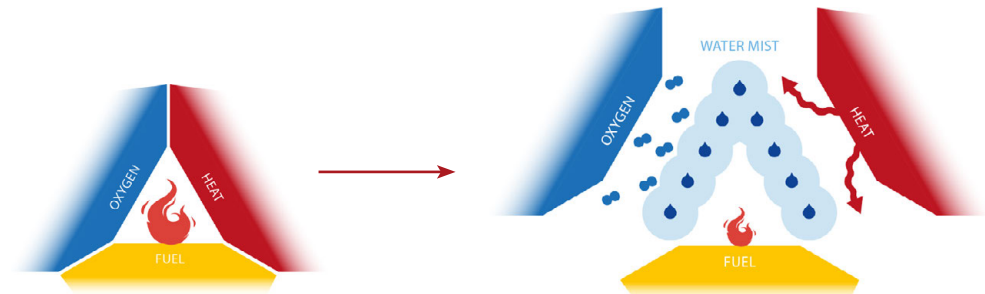
Energy Consumption

Temperature increase for 1 litre with 1 degree Celsius 4.19 kJ
Transforming 1 litre 100 °C) water to vapour 100 °C) 2256 kJ

Droplet size	No. of droplets	Covering Area/m ²
10	1900	0.6
1	1900000	6
0.1	1.9x10 ⁹	60
0.01	1.9x10 ¹²	600

Water Mist Performances in a Brief

When the water droplets evaporate, they expand in the air further depriving the fire of oxygen, effectively creating a double extinguishing attack on the fire.



Features and Benefits

01 Custom-designed, engineered, quality manufactured fire suppression solutions.

02 Fast response Ultra Fog fire systems are highly effective, quick and easy to put back into service.

03 The rapid expansion of water droplets displaces oxygen in the fire zone reducing the risk of flare-up.

04 Environmentally friendly and safe for people.

05 Aesthetically pleasing nozzles.

06 Risk of flashover is substantially reduced or reduced to zero.

07 Using less water than conventional sprinklers radically reduces storage space requirements, less space, less weight.

08 Small stainless steel pipe dimensions result in less weight, ease of installation, and pipe networks that are easy to conceal.

09 Reduced downtime and clean up costs following the fire event.

Ultra Fog Rail Classification Testing and Approvals



Standard UNI 11565 2016

Railway Vehicles Design, Installation, Validation And Maintenance

Of Fire Detection And Extinguishing Systems To Be Utilized In Rail Vehicles General Principles

Ultra Fog Land Classification Testing and Approvals

Our systems are designed according to CEN/TS 14972 NFPA 750 and retested according to standards from FM (SP (Sintef (This is in addition to being component tested by FM (Factory Mutual) and full scale retested according to the following standards

- FM5560 Non-Storage Occupancies, HC-1, Part 4 EN14972
- FM5560 Turbine and Machinery in Enclosures, Part 14 and 15 EN14972
- Part 3 EN14972 OH1
- Part 10 EN14972 Annex A OH4
- Part 2 EN14972 Annex A OH3
- Part 5 EN14972 Annex A OH2
- Part 7 & 17 EN14972 Annex A, Residential Water Mist Systems
 - BS 8458 – Domestic and Residential Water Mist Systems
 - BS 8489 – Commercial and Industrial Water Mist Systems
 - NFPA 750
- Archive / Library CEN TS 14972 Annex B, ref. fire report BFL2020/TP02/001 and BFL2020/TP02/009
- Part 12 EN14972, Fat Fryer & Galley Hood
- Component testing by the laboratory of UL and FM
- Tunnel: Uptun, Aplus guideline full scale fire test.
- Vehicle / Diesel Train: Regulation No. 107, Revision 7, Annex 13; Train test specification ALn663



Typical Rolling Stock Layout & Water Mist Application

Ultra Fog Nozzle

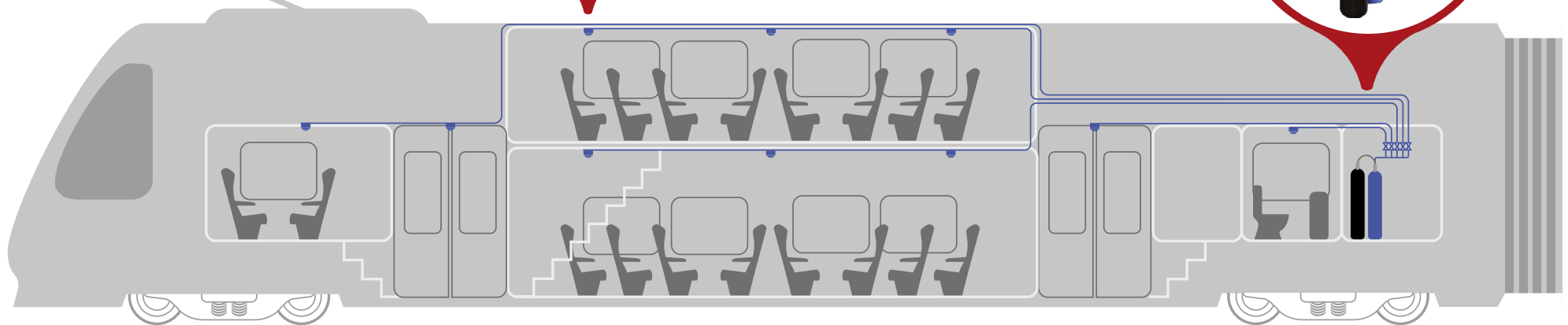
Double Deck Train:
Flow 7 L/min at 60 Bar
Spacing 4m

Single Deck Train:
Flow 5,8 L/min at 40 Bar
Spacing 2m - 4.25m

Compartment:
Decaying pressure system
Flow 2,7 L/min at 100 Bar
Spacing 2.5m



Accumulator Unit



Major Clients

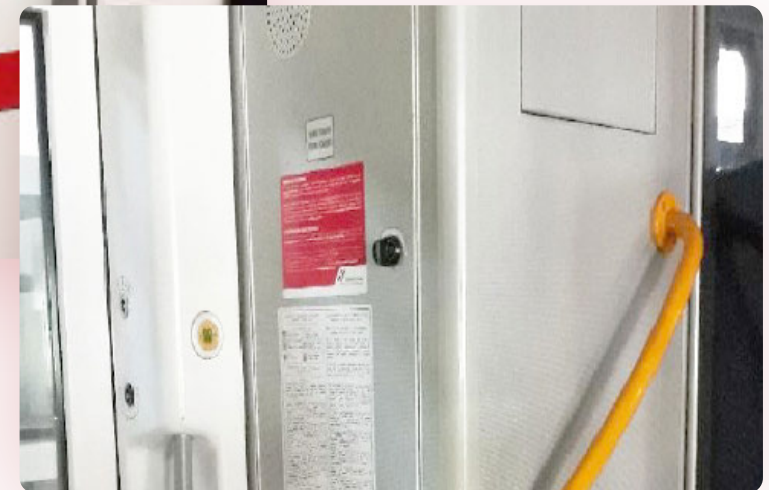
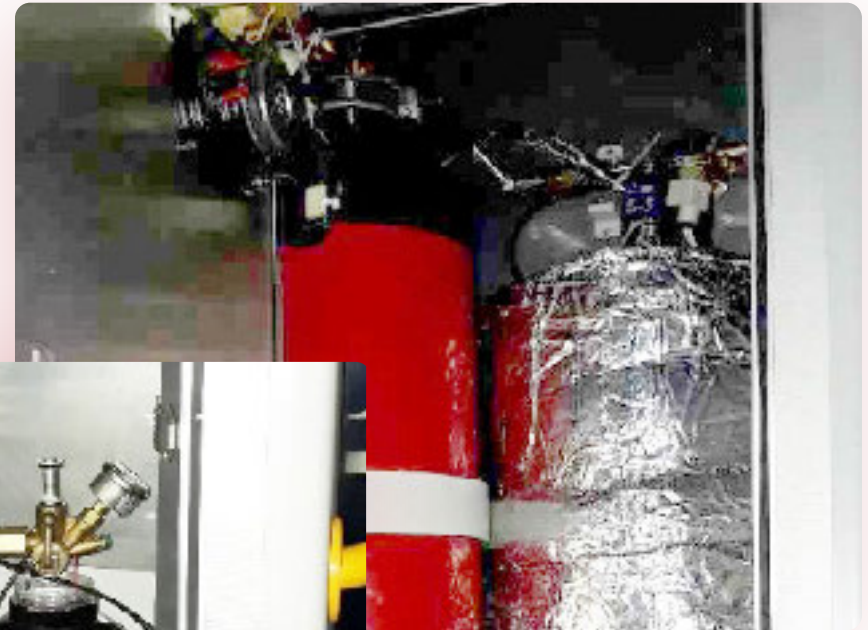


Railway vehicles	Train subject to refurbishment	Railway operator / owner
646	MD	TRENITALIA
290	NCDP-Vivalto	TRENITALIA
204	Minuetto	TRENITALIA
140	MD	TRENORD
64	TAF	TRENITALIA
34	ETR 485/600/610 high velocity	TRENITALIA
9	ETR 460/463 high velocity	TRENITALIA



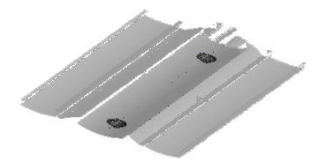
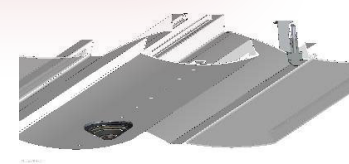
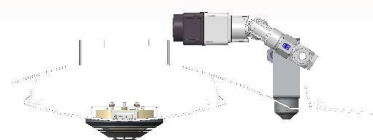
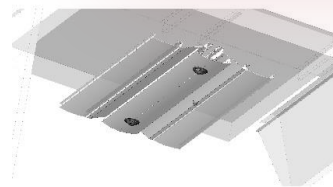
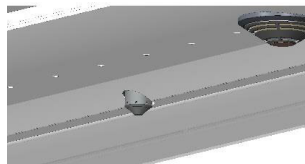
Minuetto EMU/DMU

Ultra Fog
installations
in the train cabin



Minuetto EMU/DMU

Ultra Fog
installations
in the train cabin



MD - Medium Distance Trains

Ongoing project

Ultra Fog
installations
in the train cabin





ETR - High Velocity Trains

Ongoing project

Ultra Fog
installations
in the train cabin





Do you have the questions? Contact us:

Global Sales:
info@ultrafog.com

Service:
+377 9990 1481
service@ultrafog.com



High-pressure water mist
fire protection

Ultra Fog | Sweden

Faktorvagen 17Q
434 37 Kungsbacka

Tel.: +46 (0)31 979 870

Ultra Fog | Italy

Via Grecale 33
55049 Viareggio

Tel.: +39 05 84390609

Ultra Fog | Italy

Via V. Monti 52,
20017 Rho (Milano)

Tel.: +39 02 09943101

Ultra Fog | Monaco

57 rue Grimaldi Block C/D
98000 Monte Carlo

Tel.: +377 99901481

Ultra Fog | United States

3380 SW 11th Avenue
Fort Lauderdale FL 33315

E-mail: salesusa@ultrafog.com
Tel.: +1 (954) 581-6996

Ultra Fog | United Kingdom

Office No. 113
1010 Cambourne Business Centre
Cambourne, Cambridgeshire CB23 6DP

Tel.: +44 (0) 1223 499180



info@ultrafog.com



www.ultrafog.com



www.linkedin.com/company/ultra-fog

