

Compliance with the EN 14972 water mist standard...

How to apply it in practice today

Background

The publication of the European standards for water mist fire protection systems is intended to unify the reference framework for how water mist systems will be applied in the European countries belonging to the European Committee for Standardisation, CEN. There are two series of water mist standards with the following principal structure:

EN 14972 Fixed firefighting systems. Water mist systems.

- Part 1 is the standard for Design, installation, inspection, and maintenance
- Parts 2 and onward are performance standards that contain fire test protocols for different occupancies and applications

EN 17450 Fixed firefighting systems

- Water mist components.
- All Parts are component standards that contain dedicated component test protocols.

The core standard is EN 14972-1, i.e., the Design and Installation part of the series, but it is not an independent all-inclusive standard: it is linked to application-specific performance standards (fire test protocols) and component standards (component test protocols).

Currently, there is a missing link between the fire test protocols and real installations, but there is work in process for an Amendment with a set of dedicated Annexes that will define the limits of applicability for each of the test protocols of EN 14972 Parts 2 to 17.

While most Parts of EN 14972 and one of EN 17450 have been published, several have not yet completed the CEN process. It will also be a never-ending story with respect to fire test protocols, as new applications may be added to increase the coverage of water mist protection in different areas for building protection and industrial applications.

This article describes best practice for claiming compliance with EN 14972 in the current situation where the standard series are incomplete. Red flags are also raised on potentially false or misleading claims presented about compliance.

Status of the EN 14972 and EN 17450 series

Table 1 shows the status of the EN 14972 and EN 17450 series to the extent that applications and component

categories have been specified so far. Most of the current fire test protocols in EN 14972 series are directly based on existing test protocols from VdS, FM Approvals and BS, as indicated in the table, and existing component test protocols primarily by VdS and BS have been and are being used as the basis for the EN 17450 series.

Compliance with EN 14972 – principle

Full compliance with EN 14972 can be claimed when all the following conditions are met:

- (i) The system is designed, installed, inspected, and maintained according to EN 14972-1.
- (ii) The system design has been verified in full-scale fire tests according to EN 14972-X, i.e., the Part relevant to the application.
- (iii) The system components have passed the tests of EN 17450-X, i.e., the relevant component Parts, or "other appropriate standard" where EN 17450 is still incomplete.
- (iv) A system specific Design, Installation, Operation, and Maintenance (DIOM) manual exists with all the required information, together with a well-defined scope of application.

None of the water mist standards are harmonized and, therefore, it is not possible to CE mark water mist systems or system components under the CPR (Construction Products Regulation). The alternative way to prove compliance with the CPR and CE mark a product is to follow a European Technical Assessment through a Technical Assessment Body (TAB).

There are still gaps and ambiguities in the process: Although the core design standard EN 14972-1 has been published, not all the currently listed fire test protocols have been published, and only a single component test protocol exists as a published standard so far. Also, for the time being, the scope of application of the test protocols is missing altogether, and there is no established Technical Assessment procedure for water mist systems.

How to demonstrate compliance in practice today?

The factors that contribute to the success of any fire-fighting systems are the same. The EFSN has summarised these factors for sprinkler systems, but they are equally valid for water mist systems:

Publication		Status	
EN 14972 / GENERAL DESIGN & INSTALLATION			
EN 14972-1 (2020)	Design, installation, inspection, and maintenance	Published (*)	
EN 14972 / FIRE TEST PROTOCOLS			
	Test protocol for ...	Base protocol	
N/A (Part 2)	... shopping areas	VdS	Preliminary Stage
EN 14972-3 (2021)	... office, school classrooms and hotel	VdS	Published
prEN 14972-4	... non-storage occupancies	FM Approvals	Passed Enquiry
prEN 14972-5	... car garages	VdS	Passed Enquiry
EN 14972-6 (2023)	... false floors and false ceilings	VdS	Published
EN 14972-7 (2023)	... commercial low hazard occupancies	BS	Published
EN 14972-8 (2020)	... machinery in enclosures exceeding 260 m³	FM Approvals	Published
EN 14972-9 (2020)	... machinery in enclosures not exceeding 260 m³	FM Approvals	Published
EN 14972-10 (2022)	... atrium protection with sidewall nozzles	N/A	Published
EN 14972-11 (2023)	... cable tunnels	VdS	Published
prEN 14972-12	... commercial deep fat cooking fryers	UL/ISO	Passed Enquiry
N/A (Part 13)	... wet benches and other similar processing equipment	FM Approvals	Preliminary Stage
EN 14972-14 (2021)	... combustion turbines in enclosures exceeding 260 m³	FM Approvals	Published
EN 14972-15 (2021)	... combustion turbines in enclosures not exceeding 260 m³	FM Approvals	Published
EN 14972-16 (2019)	... industrial oil cookers	FM Approvals	Published
prEN 14972-17	... residential occupancies	BS	Passed Enquiry
EN 17450 / COMPONENT TEST PROTOCOLS			
	Requirements and test methods for...	Base protocol	
EN 17450-1 (2021)	... strainer and wire mesh filter	VdS & BS	Published
prEN 17450-2	... nozzles		Passed Enquiry
N/A (Part 3)	... check valves		Preliminary Stage
N/A (Part 4)	... control deluge valves and actuators		Preliminary Stage
N/A (Part 5)	... pressure switches		Preliminary Stage

Table 1. Status of the EN 14972 and EN 17450 series. (* Work for an Amendment on-going.

1. the existence of appropriate design standards / DIOM manuals
2. the use of appropriate components
3. their application by qualified, trained personnel
4. installation by competent, adequately supervised staff
5. inspection of the new system by a competent person
6. regular system maintenance by trained staff
7. periodic inspections of the system by a competent person

The first two requirements relate primarily to the technical requirements of the system as given in the relevant standards and guidelines, whereas the five other requirements relate to quality assurance of real installations.

Technical requirements

For sprinklers, there is a prescriptive design standard applying to all sprinkler systems, and harmonized

component standards allowing for products with CE marking. In most cases the sprinklers are also type approved by VdS, LPCB, UL, and/or FM Approvals. The process for assessing compliance with the technical requirements is a well-established process.

For water mist systems the primary difference and challenge relate to the fact that the systems are manufacturer specific with dedicated design guidelines and components for each system. With sprinkler systems the prescriptive design guidelines do not need any assessment, whereas the DIOM manuals for water mist systems do. Very fundamental issues affect the reliability and credibility of the DIOM manual:

- 1) Is the test lab that conducted the fire tests competent enough for full-scale fire testing with water mist systems?

Challenge: It is a very specific area of fire testing, and even the common requirement for "accredited labs" is no guarantee of the quality of all testing.

water mist

- 2) Is the organisation that has issued a “certificate” or “acceptance” for compliance with EN 14972 competent enough to evaluate (i) the fire tests, (ii) the component tests and (iii) the scope & contents of the DIOM manual?

Challenge: Assessing a full system is not a straightforward process as there are still a range of open issues within the EN framework for compliance evaluation.

Fundamental issues related to the components, are:

- 1) Have any component tests been conducted?
- 2) What tests have been conducted?

Challenge: most EN 17450 component test protocols are not yet available.

Currently VdS is the only authority in Europe with a well-established process for testing and evaluating water mist systems, including (i) witnessed fire testing, (ii) in-house component testing, (iii) DIOM manual assessment, and consequent (iv) type approvals for full systems. VdS guidelines, EN 14972 & EN 17450 are also largely aligned and therefore a VdS type approval indicates close compliance with EN 14972, and any deviations there may be are likely to be insignificant.

BRE/LPCB in the UK does have a limited scope for water mist approvals, but currently the scope is not linked to EN standards but to BS and LPS water mist standards.

In the USA, FM Approvals has a well-established process leading to type approvals. Many FM Approvals and EN 14972 fire test protocols are aligned but component test protocols differ. Therefore, systems with FM type approvals for applications covered by EN 14972 comply with the relevant Part in EN 14972. For components, EN 14972-1 currently refers to EN 17450 or “other appropriate standard”, and where FM 5560

is considered an appropriate standard, also FM type approval indicates close compliance with EN 14972.

UL has a limited process with respect to components: UL Listing covers the system design and nozzles only. UL fire test protocols are different to those of EN 14972, although the basis for many of them is the same. For the nozzles, UL component tests may be considered to qualify as appropriate, as intended by EN 14972. This applies to nozzle tests according to IMO.Res.A.800 as well.

Apart from formal type approvals by VdS and FM Approvals, there are various certifications about EN 14972 compliance, the credibility of which is to be assessed by potential AHJs, consultants, and clients.

Table 2 summarises the assessment of technical requirements for sprinklers and water mist systems.

Quality assurance of real installations

Provided that the DIOM manual and the components applied in the water mist system can be considered to provide at least the same performance level against fires as that by the sprinkler design standard and components in the respective occupancy/application, then the design basis is equally acceptable for sprinklers and water mist. The next task is to assure that an actual installation is as it should be, and that it is operational for its entire expected lifetime.

For sprinkler systems practices differ in European countries. In most countries there are quality assurance schemes in place to comply with building regulations and in all countries systems installed for insurance reasons are inspected, often by the insurer. Many countries have also national installer accreditation schemes.

For water mist systems the practices – in countries where they exist – differ even more and can be quite vague. Only VdS and FM Approvals have comprehensive

		Standard or guidelines		Design basis	Compliance assessment to the standard requirements
Europe	Sprinkler	Design & Installation	EN 12845 CEA 4001	Prescriptive requirements	The requirements are given in the prescriptive standard --> straightforward assessment
		Components	EN 12259	Same design criteria for all sprinkler systems	CE marking / Type approvals by VdS & LPCB Type approvals by UL & FM Approvals according to their own standards
	Water mist	Design & Installation	EN 14972 - 1 VdS 3188	Performance based requirements	VdS guidelines and EN 14972 & EN 17450 are largely aligned. VdS type approval indicates a close compliance with EN 14972 for the specific application.
		Fire test protocols	EN 14972 - 2 ... VdS 3883		
Components		EN 17450 - 1 ... VdS 3100			
USA	Water mist	Design & Installation	NFPA 750 FM Global DS 4-2	System specific DIOM manual	FM 5560 and EN 14972 fire test protocols are fully aligned, and the FM component test protocols may be considered to fall under the definition “other appropriate standards” by EN 14972. FM type approval indicates a close compliance with EN 14972 for the specific application.
		Fire and component test protocols	FM 5560 UL 2167		The credibility and contents of certifications by other organizations about EN 14972 compliance is to be assessed by AHJs, consultants, and clients.

Table 2. Assessment of technical requirements.

quality assurance schemes for full water mist systems, including regular audits of the manufacturing sites for quality control.

Some European countries have national schemes often based on VdS and/or FM schemes, and many insurance companies have published their own guidelines and best practices. A process of defining a dedicated national scheme for water mist systems is on-going at least in the UK and in the Netherlands.

In general, the work has only just started for developing acknowledged and appropriate quality assurance schemes for water mist systems, but – as always – trained and competent people are the key in all assessments, installations, inspections, and maintenance actions. With water mist systems they must be trained in the specific manufacturer's systems and today manufacturers have their own training programmes for system design, installation, service, and commissioning, and consequent certifications for designers and installers.

Red flag: potentially misleading compliance claims

In the current situation with incomplete standards and evolving practices, one should be cautious with compliance claims. For example, it may well be that the system design has been defined and verified in fire tests complying with EN 14972 Parts 2 – 17, but full compliance with EN 14972 cannot be claimed based on plain fire testing.

As another example, many misunderstandings relate to Annex A of EN 14972-1. It is an informative annex providing guidelines for developing new test protocols for the EN 14972 series, but it is useful also in defining representative project-specific fire tests. Annex A does not give any "acceptance criteria" for a test protocol nor to a system tested based on the test protocol. A water mist system cannot be "according to Annex A" even if it has been tested against a protocol defined following the guidelines of Annex A. There is no quality control or standard practices for tests "according to Annex A", and the tests would not qualify as equivalent to Parts 2 – 17 in any compliance assessment.

Summary

European water mist system standardization has been progressing quite effectively in recent years. The design standard together with a set of fire test protocols have already been published, but work remains to be done, especially with component test protocols. Also, new fire test protocols will be included in the future for a more comprehensive coverage of different areas in building protection and industrial applications.

Close compliance with the technical requirements of EN 14972 is already built into the VdS and FM type approvals for water mist systems in applications covered by EN 14972. A more detailed compliance assessment by competent third-party assessment bodies is needed for systems without formal VdS or FM type approvals. For the quality assurance of real installations, the practices differ in European countries from non-existent to national schemes often based on VdS and/or FM schemes, and many insurance companies have published their own guidelines.

For full compliance assessment, the principles are the same as with sprinkler systems but today in practice interested parties like AHJs, consultants, and clients should go deeper in assessing the credibility and contents of the submitted documentation when dealing with water mist systems.