BRITISH STANDARD

BS EN
50186-1:1999

Live-line washing systems for power installations with nominal voltages above 1 kV —

Part 1: Common requirements

The European Standard EN 50186-1:1998 has the status of a British Standard

ICS 29.260.10

National foreword

This British Standard is the English language version of EN 50186-1:1998, incorporating Corrigendum January 1999.

The UK participation in its preparation was entrusted to Technical Committee PEL/78, Tools for live working, which has the responsibility to:

— aid enquirers to understand the text;

— present to the responsible European committee any enquiries on the interpretation, or proposals for change, and keep the UK interests informed;

— monitor related international and European developments and promulgate them in the UK.

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Summary of pages

This document comprises a front cover, an inside front cover, the EN title page, pages 2 to 5 and a back cover.

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Descriptors: electrical insulators, washing, cleaning, installation, electrical installation, utilization, safety, distance

English version

Live-line washing systems for power installations with nominal voltages above 1 kV — Part 1: Common requirements

Systèmes de lavage sous tension pour installations de puissance de tension nominale supérieure à 1 kV — Partie 1: Prescriptions générales

Abspritzeinrichtungen für Starkstromanlagen mit Nennspannungen über 1 kV — Teil 1: Allgemeine Anforderungen

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CENELEC

European Committee for Electrotechnical Standardization
Comité Européen de Normalisation Electrotechnique
Europäisches Komitee für Elektrotechnische Normung

Central Secretariat: rue de Stassart 35, B-1050 Brussels

Ref. No. EN 50186-1:1998 E

Foreword

This European Standard was prepared by the CENELEC BTTF 62-4, Live-line washing systems for power installations with rated voltages above 1 kV.

The text of the draft was submitted to the formal vote and was approved by CENELEC as EN 50186-1 on 1997-03-11.

The following dates were fixed:

- latest date by which the EN has to be implemented at national level by publication of an identical national standard or by endorsement (dop) 1999-03-01
- latest date by which the national standards conflicting with the EN have to be withdrawn (dow) 1999-03-01

Because of different national prescriptions and practices relating to protective distances, it was necessary to prepare a standard in two parts, i.e.:

— EN 50186-1, *Live-line washing systems for power installations with nominal voltages above 1 kV — Part 1: Common requirements*;

— EN 50186-2, *Live-line washing systems for power installations with nominal voltages above 1 kV — Part 2: National annexes*.

Where EN 50186-1 contains the common European requirements, EN 50186-2 collates the particular national provisions, mainly resulting from different practices relating to resistivity of the water, water pressure and spray nozzles. The provisions of EN 50186-2 therefore take precedence over EN 50186-1 in the concerned country.

It is the intention that these national provisions, which result from national laws, regulations and national standards, will gradually disappear, which should lead, at the end, to a future standard with only common European requirements.

Contents

1 Scope

This European Standard applies to the installation and operation of fixed and portable washing systems for the washing and cleaning of energized insulators on outdoor installations with voltages over 1 kV.

2 Normative references

This European Standard incorporates by dated or undated reference, provisions from other publications. These normative references are cited at the appropriate places in the text and the publications are listed hereafter. For dated references, subsequent amendments to or revisions of any of these publications apply to this European Standard only when incorporated in it by amendment or revision. For undated references, the latest edition of the publication referred to applies (including amendments).

EN 50186-2:1997, *Live-line washing systems for power installations with nominal voltages above 1 kV — Part 2: National annexes.*

EN 60071-2:1997, *Insulation co-ordination — Part 2: Application Guide.*
(IEC 60071-2:1996)

3 Definitions

3.1

fixed washing system

system in which the water supply pipes and nozzles are permanently installed close to the insulators to be cleaned, and which can be put into operation from a location outside the washing areas

3.2

portable live washing system

system in which parts of the water supply pipes and nozzle pipes with the nozzles are fully mobile and must be moved manually close to the insulators to be cleaned

3.3

washing area

zone within the range of the sprayed water

3.4

full jet

a jet of water which is closed on issuing from a nozzle and which breaks up into individual drops at a certain distance from the nozzle

A jet can be regarded as closed when it is as transparent as a glass rod when it issues from the nozzle.

3.5

spray jet

a jet of water which, on issuing from a nozzle, is formed from a close sequence of individual drops of water making no contact with one another

3.6

full-jet nozzle

a nozzle which produces a closed jet of water

3.7

spray nozzle

a nozzle which directly produces a broken-up jet of water

3.8

nozzle pipe

a nozzle carrier

3.9

multi-purpose nozzle pipe

a nozzle carrier which can produce either a spray or a full jet

4 General requirements for washing systems

4.1 A washing system shall be installed and designed such that it neither causes a hazard to operating personnel, nor impairs the operational effectiveness of the electrical installation, and effectively cleans the insulators.

4.2 It shall be possible to monitor and control washing systems from a location outside the washing areas.

4.3 The minimum monitoring equipment shall comprise:

a) a water pressure monitor;

b) a water conductivity monitor.

4.4 The minimum control equipment shall comprise:

a) a manual method of interrupting the washing process in the event of any irregularity, e.g. flashover;

b) a device to interrupt the washing process manually and/or automatically in the event of a rise of water conductivity above a specified value;

c) a device to interrupt the washing process manually and/or automatically in the event of a drop of water pressure below a specified value.

4.5 It shall be possible to confirm the calibration of the conductivity monitoring device by means of suitable test equipment.

4.6 Pipelines, pumps, containers and fittings shall be manufactured from materials from which particles cannot become detached and block the nozzles (e.g. rust, lining).

4.7 Nominal diameters of the pipes and nozzles shall be selected so that the insulator to be cleaned can receive and be cleaned with a sufficient amount of water.

4.8 The water pressure at the pump shall be selected according to the types of nozzle used, the distance of the nozzles from the insulator to be cleaned, and the diameter and length of the pipes.

4.9 Storage tanks or water supply networks shall be designed to provide the required amount of water for a specified number of cleaning operations.

5 Installation of fixed washing systems

5.1 All parts of washing equipment shall be arranged so that the distance between them and the energized parts of the installation is not less than the minimum distances specified in EN 60071-2.

5.2 For fixed washing systems it shall be possible to simultaneously wash groups of insulators in close proximity.

5.3 Nozzles and nozzle arrangements

5.3.1 Only spray nozzles shall be used.

5.3.2 The quantity, nominal diameter and arrangement of nozzles shall be selected such that every insulator can be completely and quickly cleaned. If particular wind forces and directions are to be taken into account, this shall be agreed between supplier and client when designing the installation.

5.4 Pipelines and valves

5.4.1 Metallic or electrically non-conductive (plastic) pipes may be used.

5.4.2 Prior to initial operation of the washing system or after repair work, it shall be possible to flush every section in order to avoid blockages of the nozzles. This shall be done with the substation equipment de-energized. Additionally, the tightness and correct arrangement of spray nozzles shall be checked by trial spraying.

5.4.3 The pipes shall be filled up to the nozzle prior to washing, and the washing process started by means of quick action valves to ensure that a spray jet is formed by the nozzles immediately.

5.4.4 It shall be possible to drain the complete system for maintenance and frost protection purposes by means of suitable drain valves.

5.5 Water supply

5.5.1 The pump suction pipe shall be provided with a filter if necessary.

5.5.2 For larger live-line washing installations, it is recommended that the washing system be divided into groups.

5.6 Earthing

If metal pipes are used for the pipelines, electrically conducting or non-conducting nozzles may be used. These pipelines shall be provided with a low-resistance connection to the earthing system of the electrical equipment. If electrically non-conducting pipes are used, electrically conducting nozzles shall be used, and these, together with the fittings in the pipeline, shall be connected to the earthing system.

6 Installation of portable washing systems

6.1 Nozzle pipes and nozzles

Nozzle pipes with spray or full-jet nozzles may be used for washing. Multi-purpose nozzle pipes are allowed.

6.2 Nozzle pipe operating stand

6.2.1 If the nozzle pipe cannot be held securely by hand, a platform with a stand shall be provided on which the nozzle pipe can be secured while being freely manoeuvrable.

6.2.2 The nozzle pipe, stand and platform shall be bonded together and connected to the substation earthing system.

6.2.3 If the nozzle pipe is on a vehicle, a platform shall be provided on this vehicle for the nozzle pipe operator, and procedures adopted according to **6.2.1**.

7 Operation of live-line washing systems

7.1 At temperatures of about or below 0 °C, washing systems may only be operated when freezing of the water in the pipelines and on the insulators is prevented. It shall be taken into account that spraying of the water will produce evaporation and thus a lowering of temperature.

7.2 Only waterproof equipment may be washed.

Especially, due to the risk of explosion, only waterproof lightning arresters may be washed while energized.

7.3 Pipelines shall be filled and operated such that pressure surges are reduced to acceptable limits.

7.4 On commencement of the washing process, the insulators to be cleaned shall be sprayed quickly with a sufficient quantity of water. Wherever possible, the underlying parts shall be cleaned first.

7.5 In windy conditions, washing of the installation shall be initiated against the wind direction, so that neighbouring sections are not endangered by an insufficient admission of water.

7.6 Large washing systems should be divided into electrically adjacent groups. Once commenced, the washing of each of these groups should be completed as far as practicable.

7.7 Depending on the type and degree of contamination of the insulators, the conductivity of the water and cleaning intervals shall be selected so that flashovers at the insulators are avoided.

7.8 Automatically initiated fixed washing systems require no supervision. Manually initiated fixed washing systems need to be supervised by at least one person.

7.9 When using water in mobile washing systems with a conductivity of <10 μS/cm (condensate), protective distances shall be maintained according to Table 1, column 2.

7.10 When using water with a permissible conductivity of >10 μS/cm up to 1 000 μS/cm (drinking water), protective distances shall be maintained between the manually operated nozzle pipe and energized parts according to Table 1, column 3 or 4.

7.11 Values of protective distances, prescribed in different countries through national laws, regulations and standards, and diverging from the values of Table 1, can be found in EN 50186-2.

Table 1 — Protective distances when washing with nozzle pipes (m)

	Protective distance m		
1	**2**	**3**	**4**
Nominal voltage up to	**Nozzle pipe full-jet nozzle**		**Nozzle pipe with spray nozzle**
	Conductivity of the water μS/cm		**Conductivity of the water** μS/cm
kV	**≤10**	**≤1 000**	**<1 000**
30	3	5	3
110	4	6	3
220	5	7	4
380	6	8	5
NOTE The distances in this table are based upon a water pressure of around 5 bar.			

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