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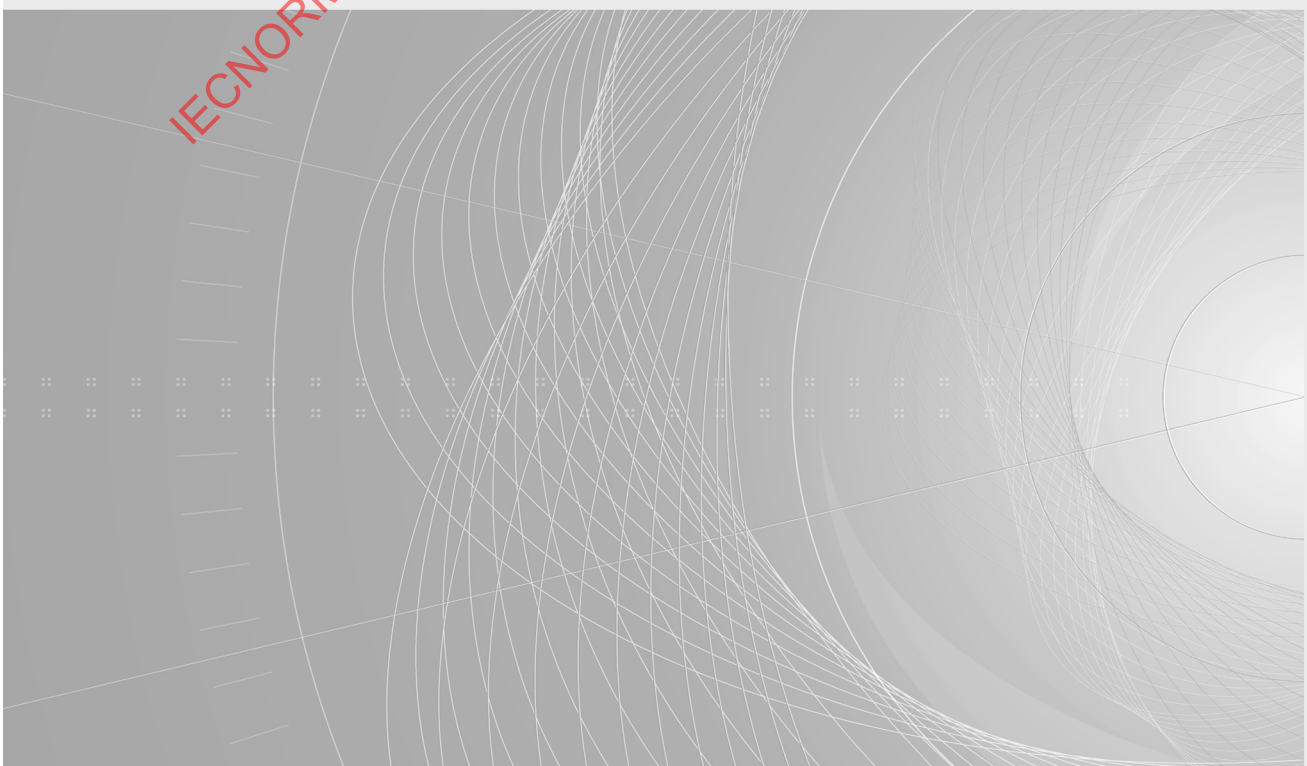
INTERNATIONAL STANDARD

Surface cleaning appliances – Part 5: High pressure cleaners and steam cleaners for household and commercial use – Methods for measuring performance



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INTERNATIONAL ELECTROTECHNICAL COMMISSION

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INTERNATIONAL ELECTROTECHNICAL COMMISSION

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SURFACE CLEANING APPLIANCES –

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FOREWORD

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International Standard IEC 62885-5 has been prepared by subcommittee SC 59F: Surface cleaning appliances, of IEC technical committee TC 59: Performance of household and similar electrical appliances.

The text of this International Standard is based on the following documents:

CDV	Report on voting
59F/340/CDV	59F/348/RVC

Full information on the voting for the approval of this International Standard can be found in the report on voting indicated in the above table.

This document has been drafted in accordance with the ISO/IEC Directives, Part 2.

A list of all parts in the IEC 62885 series, published under the general title *Surface cleaning appliances*, can be found on the IEC website.

In this standard, the following print types are used:

- **terms defined in Clause 3 of IEC 60335-2-79:2016: Arial bold.**

The committee has decided that the contents of this document will remain unchanged until the stability date indicated on the IEC website under "http://webstore.iec.ch" in the data related to the specific document. At this date, the document will be

- reconfirmed,
- withdrawn,
- replaced by a revised edition, or
- amended.

A bilingual version of this publication may be issued at a later date.

SURFACE CLEANING APPLIANCES –

Part 5: High pressure cleaners and steam cleaners for household and commercial use – Methods for measuring performance

1 Scope

This part of IEC 62885 lists the characteristic performance parameters for high pressure cleaners and steam cleaners in accordance with IEC 60335-2-79.

The intent is to serve the manufacturers in describing parameters that fit in their manuals and in their literature. This can include all or some of the parameters listed in this definition document.

2 Normative references

The following documents are referred to in the text in such a way that some or all of their content constitutes requirements of this document. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

IEC 60335-2-79:2016, *Household and similar electrical appliances – Safety – Part 2-79: Particular requirements for high pressure cleaners and steam cleaners*

ISO 22968, *Forced draught oil burners*

3 Terms and definitions

For the purpose of this document, the terms and definitions given in IEC 60335-2-79 apply.

ISO and IEC maintain terminological databases for use in standardization at the following addresses:

- IEC Electropedia: available at http://www.electropedia.org/
- ISO Online browsing platform: available at http://www.iso.org/obp

4 General conditions for testing

4.1 Atmospheric conditions

Where required, the test procedures and measurements shall be carried out under the following conditions:

Standard atmosphere:	23/50
Temperature:	(23 ± 2) °C
Relative humidity:	(50 ± 5) %
Air pressure:	86 kPa to 106 kPa

NOTE Temperature and humidity conditions within the specified ranges are required for good repeatability and reproducibility. Care should be taken to avoid changes during a test.

4.2 Test equipment and materials

4.2.1 Cold and hot water high pressure cleaner

During testing, the machine shall be operated at **rated voltage**, and shall be used in accordance with **normal operation** as defined in IEC 60335-2-79 and with the manufacturer's specifications, unless otherwise specified in this clause. The operation shall be stable and smooth. In particular, the following conditions shall apply:

- The spraying device shall be held without tension, with a downwards angle of 45° ± 5°, spraying the water jet to the atmosphere without working towards any barrier. Gloves shall not be used unless required as PPE owing to the manufacturer's instructions.
- The hand position of the second hand shall be as displayed in Figure DD.5 of IEC 60335-2-79:2016.
- A pulsation dampener shall not be used, as far as possible. If a pulsation dampener is unchangeably fixed to the machine, this fact shall be reported.
- The length of the hose line shall be not more than 10 m. If the standard length according to the manufacturer's instructions is more than 10 m, the standard hose may be used; in this case the length shall be reported. The type of the hose line shall be reported.
- The nominal diameter shall be not more than DN 12. If the standard nominal diameter according to the manufacturer's instructions is more than DN 12, the standard hose may be used; in this case the nominal diameter shall be reported.

During measurement, the hose shall lie without interference and in particular without touching the **operator**.

4.3 Voltage and frequency

Unless otherwise stated, measurements shall be carried out at rated voltage with a tolerance of ± 1 % and, if applicable, at rated frequency.

High pressure cleaners designed for DC only shall be operated at DC. High pressure cleaners designed for both AC and DC shall be operated at AC. High pressure cleaners not marked with rated frequency shall be operated at either 50 Hz or 60 Hz, as is common in the country of use.

For high pressure cleaners with a rated voltage range, measurements shall be carried out at the mean value of the voltage range if the difference between the limits of the range does not exceed 10 % of the mean value. If the difference exceeds 10 % of the mean value, measurements shall be carried out both at the upper and lower limits of the voltage range.

If the rated voltage differs from the nominal system voltage of the country concerned, measurements carried out at rated voltage may give test results misleading for the consumer, and additional measurements may be required. If the test voltage differs from the rated voltage, this shall be reported.

4.4 Equipment of the high pressure cleaner

The measurements shall be conducted with the primary **trigger gun** delivered with the high pressure cleaner.

4.5 Operation of the high pressure cleaner

The high pressure cleaner and its attachments shall be used and adjusted in accordance with the manufacturer's instructions for normal operation for the test to be carried out.

4.6 Number of samples

All measurements of performance shall be carried out on the same sample(s) of the high pressure cleaner with its attachments, when any. A minimum of three samples of a high pressure cleaner shall be tested.

Durability tests carried out on the high pressure cleaner may require additional samples. Any durability tests shall be carried out at the end of the whole test programme.

5 High pressure cleaner efficiency tests

5.1 Cleaning efficiency of cold-water high pressure cleaners

Under consideration.

5.2 Cleaning efficiency of hot-water high pressure cleaners

Under consideration.

5.3 Efficiency tests of oil-heated high pressure cleaners

5.3.1 General

Oil-heated stationary or quasi-stationary high pressure cleaners are special variants of oil furnaces and, for that reason, have to meet special values for thermal exhaust loss q_A, CO emissions, and dust emissions.

5.3.2 Thermal exhaust loss of oil fired high pressure cleaner

Compliance is checked by the following test.

The fuel tank is filled to its maximum level. Detergent tanks are filled to ½ of their maximum content. The machine has to operate at normal load for 15 min, 30 min, and 45 min, with the burner at the maximum temperature setting, but the water temperature at the boiler outlet not exceeding 100 °C. No measurement shall exceed the limits.

The thermal loss q_A is calculated from the oxygen content in the flue gas, and the temperature difference between the burner inlet air and the flue gas. The oxygen content and the flue gas temperature shall be measured simultaneously at the same location. Instead of the oxygen content, it is also possible to use the carbon dioxide content of the flue gas. The fuel used shall have a gross calorific value of between 42 500 kJ/kg and 44 800 kJ/kg.

CO_2 sensors shall be of the NDIR (non-dispersive infrared) type, or of the electrochemical type, with a range of 0 % to 20 % and a measurement uncertainty of maximum 1 %. Oxygen sensors shall be of the electrochemical or equivalent type, with a range of 0 % to 21 % and a measurement uncertainty of maximum 1 %.

Using the oxygen measurement, the calculation is as follows:

$$q_A = (t_A - t_L) \cdot \left(\frac{0{,}68}{21 - O_2} + 0{,}007 \right)$$

or using the carbon dioxide content:

$$q_A = (t_A - t_L) \cdot \left(\frac{0{,}50}{CO_2} + 0{,}007 \right)$$

where

q_A is the thermal exhaust loss in %;

t_A is the flue gas temperature in °C, measured in the centre of the exhaust;

t_L is the combustion air inlet temperature in °C, measured at the air intake of the burner;

CO_2 is the volumetric carbon dioxide content in dry flue gas in %;

O_2 is the volumetric oxygen content in dry flue gas in %.

In the case where more than one exhaust exists, temperatures and concentrations shall be averaged.

5.3.3 Determination CO emissions of oil-heated high pressure cleaner

The content of CO shall be determined by a continuous measuring apparatus. In Table 1 gives the measurement tolerances for the measuring device. Table 2 reflects the measurement tolerances during the measurement.

Table 1 – Measurement tolerances for the measuring device

Pressure sensing equipment	± 1 % from full scale
Temperature measuring equipment	± 1 K
Mass flow measuring device	± 0,5 % from full scale
Length measuring device	± 1 % from full scale
Measuring devices for	
CO_2 content	± 0,1 % volume from full scale
O_2 content	± 0,1 % volume from full scale
CO content	± 5 ml/m^3

Table 2 – Measurement tolerances during the measurement

Length of combustion chamber l_1	± 3 %
Temperature of air at burner inlet	± 2 K
Combustion chamber pressure during operation	± 5 % or 0,1 mbar
Combustion chamber pressure during start-up	± 10 % or 0,3 mbar
Fuel temperature	± 2,5 K
Fuel throughput	± 2,5 %
Smoke number	± 0,2
CO_2 content	± 0,3 % volume
O_2 content	± 0,3 % volume
CO content	± 10 ml/m^3

The measurement shall be conducted as stated in ISO 22968. The CO content for an oil burning installation has to be given in mg/kWh. For the conversion, the definitions in Table 3 and the following equations shall be used:

$$CO = CO_{meas} \cdot 1{,}25 \cdot \left(\frac{21}{21 - O_{2meas}} \right) \cdot \left(\frac{V_{A,th,tr,min}}{H_i} \right) \text{ in mg/kWh}$$

$$CO = CO_{meas} \cdot 1{,}25 \cdot \left(\frac{21 - O_{2ref}}{21 - O_{2meas}} \right) \text{ in mg/m}^3 \text{ at } O_{2ref}$$

Table 3 – Definition of the different figures

O_{2meas}	is O_2 – measured O_2 – concentration in the gaseous combustion products
O_{2ref}	is O_2 – reference gas conditions (e.g.: 3 % – O_2)
1.25	is the density of CO in kilograms per cubic metre (kg/m^3)
H_i	is the net calorific value
$V_{A,th,tr,min}$	is the theoretical reference volume, dry
reference values:	
H_i	11,86 kWh/kg
$V_{A,th,tr,min}$	10,46 m^3/kg

For calculation, the reference values or the real values of the fuel oil can be used.

5.3.4 Determination dust emissions of oil-heated high pressure cleaners

5.3.4.1 General

The test method described in 5.3.4.2.1 to 5.3.4.2.4 can be applied by means of an electronic sampling device, provided that the test index, which is being compared by the person performing the test with the comparison scale, or which is shown as a value by the appliance, corresponds to the method described in 5.3.4.2.1.

Loosen the paper fixing device, insert the filter paper in the slot provided in the pump and tighten the device. Place the sampling probe perpendicularly to the flow direction of the combustion gases. Leak-tightness shall be assured between the probe and the wall of the pipe in which the sample is taken. Samples may be taken either with a hand pump, or with the aid of an electromechanical pump.

If a hand pump (as specified in 5.3.4.2.1) is used, carry out ten suction actions; each suction action shall be regular and last between 2 s and 3 s. Withdraw the tube from the gas duct, unscrew the fixing device and carefully take out the filter paper.

5.3.4.2 Apparatus

5.3.4.2.1 Pump

Pump (manual), capable of drawing a volume of 160 (1 ± 5 %) cm^3 through an effective filtering surface of 6 mm in diameter in a single action of the pump (i.e. approximately 570 (1 ± 5 %) cm^3 per cm^2 of effective filtering surface); the piston stroke of the pump shall be approximately 200 mm. The tightening of the paper fixing device, carried out with the paper placed in the recess provided, shall give sufficient water-tightness to prevent the formation of condensate and heating during the first operation of the pump.

The distance travelled by the gases from the sampling point to the filtering surface shall not exceed 40 cm, except in the case of special flue gas duct conditions, to be indicated in the test report.

5.3.4.2.2 Sampling tube

Sampling tube, with an internal diameter of 6 mm.

5.3.4.2.3 Filter paper

Filter paper, with a reflection factor of (85 ± 2,5) % determined photometrically. For this, the filter paper shall be placed on a white surface of reflection factor 75 % or more.

The passage of air through the filter paper, at a rate of 3 $dm^3/cm^2/min$, shall give a pressure drop of between 2 kPa and 10 kPa (20 mbar and 100 mbar).

5.3.4.2.4 Smoke number scale

Smoke number scale, comprising ten printed grades spaced at regular intervals from white to dark grey, consisting of a white material with a reflection factor of (85 ± 2,5) %. The reflection of the first sample corresponds to that of the background paper and refers to smoke number 0. The identification number of each of the following grades is equal to a tenth of the reduction rate, expressed in a percentage of the reflection of incident light on the corresponding sample. Number 6, for example, corresponds to a reduction rate of 60 %. The tolerance for the deviations in reflection factor for each of the points of the scale shall not exceed 3 % of its value.

6 Productivity

Under consideration.