



BS 799 : Part 4 : 1972

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Specification for
Oil burning
equipment

Part 4 . Atomizing burners over
36 litres per hour and
associated equipment for single burner
and multi burner installations

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The following BSI references relate to the work on this standard:

Committee references RHE/13 and RHE/13/4 Draft for comment 69/29012

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BS 799 : Part 4 : 1972

CONTENTS

	Page
Foreword	3

SPECIFICATION

1. Scope	4
2. Definitions	4
3. Burner operating sequences	6
4. Types of oil burner control	9
5. Purging, ignition and flame failure requirements	12
6. Materials and components	14
7. Painting and identification	23
8. Electrical equipment	23
9. Operating instructions	23
10. Marking	24
11. Classification of atomizing oil burners	24

APPENDIX

A. Recommendations for safety of plant to which oil burners are fitted	26
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TABLES

1. Summary of materials	15
2. Minimum storage and outflow temperatures for Classes C, D, E, F and G oil fuels and C.T.F. 50, 100, 200 and 250	19
3A. Recommended maximum degree of filtration for Classes C, D, E, F and G oil fuels	20
3B. Recommended maximum degree of filtration for C.T.F. 50, 100, 200 and 250	21
4. Maintenance of single non-mechanical filters. Minimum intervals between cleaning	21

FOREWORD

This British Standard, prepared under the authority of the Refrigeration, Heating and Air Conditioning Industry Standards Committee, deals with atomizing oil burners and associated equipment.

BS 799 : Part 1 : 1962 is in course of revision as follows:

Part 3 : 1970. Automatic and semi-automatic atomizing burners up to 36 litres per hour and associated equipment.

Part 4 : 1972. Atomizing burners over 36 litres per hour and associated equipment for single burner and multi-burner installations.

It is intended to prepare a further Part 5 to cover the existing sections of Part 1 not included in Parts 3 and 4. Until Part 5 is issued the relevant information given in Part 1 will continue to apply.

BS 799 : Part 2 : 1964 gives requirements for vaporizing burners and associated equipment.

This Part 4 of BS 799 provides a specification for burners having a burning rate in excess of 36 l/h (30 kg/h) for use in single burner and multi-burner installations for land and marine purposes and suitable for petroleum and coal tar liquid fuels as specified in BS 2869, 'Petroleum fuels for oil engines and burners' and BS 1469, 'Coal tar fuels'.

Attention is drawn to the alterations to safety requirements, particularly safety timings on ignition failure and on flame failure. These safety requirements are generally in accordance with proposed ISO Recommendations.

Recommendations on methods of installation are given in CP 3002, 'Oil firing'.

Particular attention is drawn to Appendix A, which gives recommendations for safety of plant to which oil burners are fitted.

BS 799 : Part 4 : 1972

BRITISH STANDARD SPECIFICATION FOR OIL BURNING EQUIPMENT

Part 4. Atomizing burners over 36 litres per hour and
associated equipment for single burner and multi-burner installations

1. SCOPE

This Part of this British Standard applies to single burner and multi-burner installations for land and marine purposes, each burner having a maximum burning rate of over 36 l/h and suitable for liquid fuels as specified in BS 2869 and BS 1469.

This standard does not apply to gas turbines and internal combustion engines.

NOTE 1. Where the equipment works in conjunction with a plant required to be certified under the Factories Act, or other legislation, the requirements of the certifying authorities should be complied with.

NOTE 2. The standards referred to in this British Standard are listed on pages 27 and 28.

2. DEFINITIONS

For the purposes of this British Standard the following definitions apply:

2.1 Oil. Petroleum fuel Classes C, D, E, F, G and H in accordance with the requirements of BS 2869 and coal tar liquid fuel (C.T.F. 50, 100, 200 and 250) in accordance with the requirements of BS 1469.

NOTE. Advice should be sought when changing from one grade of oil to another. Petroleum fuels and coal tar liquid fuels are in general totally incompatible.

2.2 Oil burner. A means of mixing oil and air in order to promote controlled combustion. This normally consists of a device for delivering the oil in a controlled manner, and a method of introducing combustion air arranged so that the desired mixing rate is achieved.

2.3 Atomizing oil burner. Liquid fuel burners in which burning of the fuel is preceded by a preparatory phase during which the fuel is divided into small droplets.

The main types of burner in this category are defined as follows.

2.3.1 Pressure jet atomizers. Liquid fuel burners in which oil is supplied under pressure and at a suitable viscosity, to a nozzle in which some of the pressure is used to impart rotation (swirl) to the oil before it is discharged through the final orifice. On issuing from the final orifice, a film is produced which breaks up into oil droplets.

There are various types of pressure jet atomizers and these are classified in 11.1.

2.3.2 Two-fluid atomizers. Liquid fuel burners in which oil droplets are produced by promoting high rates of shear in the oil by the use of an additional fluid such as air or steam.

There are various types of two-fluid atomizers and these are classified in 11.2.

2.4 Safety and functioning times

2.4.1 *Ignition times*

2.4.1.1 *Pre-ignition time.* The period between initiation of the ignitor and release of the oil feed at the burner.

2.4.1.2 *Ignition time.* The period between release of the oil feed and the first appearance of the flame at the burner.

2.4.1.3 *Post-ignition time.* The period between the first appearance of the oil flame at the burner and the stopping of the ignition device.

2.4.2 *Safety time.* The maximum permitted period of time during which the control device is allowed to maintain the oil feed, when no flame is present.

2.4.3 *Waiting time.* The minimum period between the shutting down of the oil burner after extinction of the flames and restoration of the oil feed which accompanies restarting of the burner.

2.4.4 *Purge time.* The purge time is any period during which the furnace is forcibly ventilated without the ignitor fuel or main burner fuel being released into the furnace.

2.4.4.1 *Pre-firing purge time.* The period immediately preceding the release of fuel (ignitor or main burner) into the furnace.

2.4.4.2 *Post-firing purge time.* The period immediately following the signal to stop the fuel at the burners.

2.4.5 *State of operation.* The burner is considered to be in operation when the flame is present on expiry of the post-ignition time; the starting-up time ends at this point.

2.5 Regulators, controls and monitoring devices

2.5.1 *Regulator.* A device that keeps a quantity between pre-set values (e.g. pressure, temperature, time period). It may cause the burner to be started, shut-off, or to increase or decrease the fuel flow.

2.5.2 *Limiting device.* A limiting device is an on-off device that will prevent the oil flow should the monitored condition so demand.

2.5.3 *Flame monitor.* A device that gives signals indicating that the flame has failed to be established, is present or has been extinguished.

2.5.4 *Automatic firing controls.* Devices that start, regulate and stop the oil burner in accordance with a pre-set programme and in response to commands from regulators, limiting devices and flame monitors.

2.6 Types of shut-down

2.6.1 *Controlled shut-down.* A shut-down initiated by a regulator after which, once the condition is appropriate, an automatic restart can occur.

2.6.2 *Safety shut-down.* A safety shut-down is a shut-down initiated by a limiting device or plant interlock (see also 2.6.3). In this case a start-up can only occur after the limiting condition has been cleared and a manual reset device has been operated.

2.6.3 *Fault shut-down.* A fault shut-down is a shut-down initiated by the flame monitor (see 4.6.1 and 4.6.2).

2.7 Lockout. Lockout is the shut-down condition of the control system such that restart cannot be accomplished without manual reset (see 4.6.4).

2.8 Ignition equipment. The equipment by which the oil spray may be ignited electrically at the appropriate stage of the starting cycle of the oil burner, including the relevant switching device or relay, the ignition transformer, mains and high or low tension leads and connections, electrodes or ignition elements and their associated insulators; also the essential parts of any other means of ignition.

3. BURNER OPERATING SEQUENCES

3.1 Sequence of operation. The following sequence of operation shall be carried out when lighting-up and shutting down oil burners, regardless of the method of control (see Clause 4).

Variations in this sequence are permitted, within those specified in

3.1.1, 3.1.2 and 3.1.3.

The sequence of operation specified assumes that the plant is in a safe condition to start and applies to normal operation. In the case of lighting-up of new plant, shut-down or after a fault, additional checks may be required.

Checking that the plant is ready to start shall, in the case of manually operated burners, be carried out by the operator in accordance with the operating instructions (see Clause 9).

In the case of automatic burners, the system shall be so designed to carry out a series of checks automatically to ensure that, in the event of a fault, all the safety features are maintained.

3.1.1 Light up sequence (normal operation)

Operation No.	Operation	Sequence	Requirements
1	Ensure correct condition for atomization. For example, that the fuel and, where applicable, the atomizing media are at the correct temperature and pressure.	To precede operations 5 to 9.	(1) The correct oil temperatures are those that provide the viscosity range specified by the manufacturer. (2) The correct pressures are those specified by the manufacturer for the lighting-up process. (3) To obtain the correct fuel temperature, it will generally be necessary to circulate oil through the system to provide hot oil at the burner shut-off valve. (4) Unavoidable fuel line 'deadlegs' should be suitably traced and provision made for the removal of condensate in steam or air lines.

Operation No.	Operation	Sequence	Requirements
2	Purge the furnace or check for the presence of combustibles, or both.	To precede operations 5 to 9.	Any ignition attempt shall be preceded by purging of the complete furnace volume sufficiently to ensure a minimum of five air changes (see also 5.1). Steps shall be taken to check that the furnace purge is taking place. Listed below, in order of preference, are three methods commonly employed; other methods may be used where appropriate. (1) Detection of air flow by measurement of the differential pressure set up across burner restrictions or boiler restrictions, or both. (2) Check position of relevant dampers and presence of satisfactory windbox pressure. (3) Check that the fan is running. N.B. This will normally be the combustion air fan. Operation No. 2 is not required if one or more burners are already firing in the furnace.
3	Set air-flow for selected firing rate.	To precede operations 5 to 9.	-
4	Start means of ignition and prove when called for.	To precede operations 5 to 9.	See 5.2.1 and 5.2.2.
5	Turn on atomizing medium where necessary and turn on and set oil flow to start-up rate.	-	For any burner with a variable firing rate this is normally 'low fire'.
6	Ensure that oil flame has been established.	-	Either by direct viewing or by means of a flame monitor (see 5.2).

BS 799 : Part 4 : 1972

Operation No.	Operation	Sequence	Requirements
7	Stop ignitor.	To precede operation 6, where there is no discrimination between main flame and the ignition source.	The ignitor is to be stopped within 30 s after the main flame has been established. NOTE. If, following operation No. 5, the presence of the flame is not confirmed within the safety time set out in 5.2, the source of the ignition shall be removed or stopped immediately.
8	Continue to monitor oil flame.	-	When the operations through to normal running have been completed the oil flame shall be continuously monitored either by visual observation or by flame-monitoring devices. In either case, if the flame fails the oil is to be shut off within the times given in 5.3.
3.1.2 Running conditions			
9	Adjust oil, air and atomizing medium to meet load demand.	-	-
10	Continue to monitor oil flame and presence of combustion air.	-	The oil flame is to be continuously monitored either by visual observation or by flame-monitoring devices. In either case, if the flame fails the oil is to be shut off within the times given in 5.3. Failure of the combustion air supply shall cause the burner to shut down (see 4.6.5).
3.1.3 Shut-down sequence (see 6.10.5)			
11	Shut off oil supply to burner.	-	If shut-down is caused by flame failure, the oil shut-off valve to be closed within the times given in 5.3.
12	Purge the burner (where applicable).	Operation 12 to follow immediately after operation 11.	When there is a possibility of the oil in the burner carbonizing, vaporizing or leaking, the oil should be purged from the burner. The burner will not normally be purged except in a multi-burner application, where other burners are still firing.