B16 M.O.T. 3.7.2.1.4—AUTOMATIC BURNER IGNITION SYSTEMS FOR ATMOSPHERIC BURNERS

B16.1 Scope

This test applies to automatic burner ignition systems for atmospheric burners with re-ignition attempts. Systems with failsafe interlocking mechanical purging that, before a re-ignition attempt, have a pre-ignition purge sufficient to ensure that the volume of the purging medium is at least five times the volume of the heat exchanger are not required to be tested to this M.O.T.

B16.2 Principle

The ignition cycles are successively simulated up to the maximum allowable of five and the ignition is monitored.

B16.3 Apparatus

Equipment as specified in Clause 3.2.6. Tests are to be performed in a coolroom. It is the manufacturer's responsibility to provide a system that allows the test authority to enable/disable the igniter as described below.

B16.4 Materials

Supply of appropriate test gas (See Clause 3.1.1) at nominal test gas pressure.

B16.5 Preparation of apparatus

Set up the apparatus and appliance in accordance with Clause 3.2.

B16.6 Procedure

The procedure shall be as follows:

(a) Turn off the gas and activate the appliance. Count the number of ignition attempts. Ensure it does not exceed the maximum stated by the manufacturer up to a limit of six (five re-ignition attempts) and that at least a 5 min delay occurs between attempts.

(b) Re-apply gas to the appliance.

(c) Reset the appliance, and deactivate the ignition source. Activate the appliance and allow it to attempt ignition. During the second ignition attempt, reactivate the ignition source at the igniter test activation time. Observe the operation of the appliance to ensure ignition occurs immediately and is safe and without undue noise.

(d) Allow the heat exchanger to cool to a maximum of 5°C.

(e) Repeat (b) enabling the ignition source during the third ignition attempt for systems with more than two ignition attempts, otherwise terminate the test.

(f) Repeat (b) enabling the ignition source during the fourth ignition attempt for systems with more than three ignition attempts, otherwise terminate the test.

(g) Repeat (b) enabling the ignition source during the fifth ignition attempt for systems with more than four ignition attempts, otherwise terminate the test.

(h) Repeat (b) enabling the ignition source during the sixth ignition attempt for systems with six ignition attempts, otherwise terminate the test.'

$$I_{ta} = F_{ep} + F_{pp} - I_{wp} - 5$$

where

I_{ta} Ignition test activation time

F_{ep} = Flame establishment period

F_{pp} = Flame proving period

I_{wp} = Igniter warm-up period

B16.7 Result

The appliance complies with this requirement provided the ignition at each attempt is safe and without undue noise.

B17 M.O.T. 4.2—DETERMINATION OF CO/CO_2 RATIO OF COMBUSTION PRODUCTS—SURFACE COMBUSTION BURNERS—UNDERLOAD

B17.1 Scope

This test applies to all appliances incorporating surface combustion burners.

B17.2 Principle

The combustion products are sampled by means of an appropriate hood and analysed for CO and CO_2.

B17.3 Apparatus

(a) Equipment as specified in Clause 3.2.6.

(b) Flue gas sampling hood of stainless steel or aluminium (see Figures A3 and A4).

(c) Carbon monoxide analyser, calibrated to give accurate and reproducible results.

(d) Carbon dioxide analyser, calibrated to give accurate and reproducible results.

B17.4 Materials

Appropriate limit gases as listed in Table B5.

TABLE B5

LIMITING CONDITIONS—INDEPENDENT SURFACE COMBUSTION BURNER

	Limit gas	Appliance inlet pressure	Limiting condition
Natural gas	Nc, S	0.75 kPa	The lowest operating setting to which the burner control can be set
Propane	X	2.00 kPa	
Butane	Y	2.00 kPa	
Universal LPG	X	2.00 kPa	
TLP gas	Tb	0.50 kPa	
Town gas	C	0.50 kPa	

B17.5 Preparation of apparatus

(a) Set up the appliance in an accessible draught-free position in accordance with Clause 3.2.

(b) Open flued appliances that may utilize a masonry chimney for removal of flue products shall be tested without a flue fitted. (Refer Figure A4.)

(c) Connect the appropriate limit gas.

(d) Place appropriate sampling hood above flue outlet.

B17.6 Procedure

The procedure shall be as follows:

(a) Adjust the aeration setting, where fitted, to the minimum setting for burners intended for luminous flame effect.

(b) Light the burner(s).

(c) Immediately adjust the appliance inlet pressure to as specified in Table B5

(d) After 5 min operation at the reduced inlet pressure, reduce the burner control to the lowest operating setting.

(e) Five minutes after reducing the burner on an indoor flueless appliance, or 10 min on any other type of appliance, determine the CO and CO_2 by the use of the specified apparatus.

(f) For a natural gas appliance repeat the test using the alternative test gas.

B17.7 Result

The appliance complies with this requirement provided the CO/CO_2 ratio of the combustion products does not exceed 0.007 after 5 min for indoor flueless appliances or 0.02 after 10 min for any other type of appliance.

B18 M.O.T. 4.3—DETERMINATION OF CO/CO_2 RATIO OF COMBUSTION PRODUCTS—INDEPENDENT BURNER—OVERLOAD

B18.1 Scope

This test applies to all appliances.

B18.2 Principle

The combustion products are sampled by means of an appropriate hood and analysed for CO and CO_2.

B18.3 Apparatus

(a) Equipment as specified in Clause 3.2.6.

(b) Flue gas sampling hood of stainless steel or aluminium (see Figures A3 and A4).

(c) Carbon monoxide analyser, calibrated to give accurate and reproducible results.

(d) Carbon dioxide analyser, calibrated to give accurate and reproducible results.

B18.4 Materials

Appropriate limit gases as listed in Table B6.

TABLE B6

LIMITING CONDITIONS—INDEPENDENT BURNER

	Limit gas	Actual gas consumption (% of nominal gas consumption)
Natural gas	Na	115%
Propane	X	113%
Butane	Y	113%
Universal LPG	Y	125%
TLP gas	Ta	113%
Town gas	A	115%

B18.5 Preparation of apparatus

(a) Set up the appliance in an accessible draught-free position in accordance with Clause 3.2.

All open flued appliances, including those that may utilize a masonry chimney for removal of flue products, shall be tested without a flue fitted. (See Figure A4.)

(b) Connect the appropriate limit gas.

(c) Ensure that any thermostat or other temperature control device is rendered inoperative, e.g. by immersing the sensing element in cold water.

(d) Light the burner(s) and operate the appliance for 15 min.

(e) Adjust the overload gas rate as specified in Table B6 and corrected as in Appendix C.

(f) The specified overload conditions shall be obtained by adjusting the inlet pressure with the appliance regulator at its nominal setting. If the overload condition cannot be obtained with a maximum inlet pressure of 3.0 kPa then the appliance regulator shall be rendered inoperative or bypassed.

(g) Turn off the burner and allow appliance to cool.

(h) Place the appropriate sampling hood above the flueway outlet.

B18.6 Procedure

The procedure shall be as follows:

(a) Adjust the aeration setting, where fitted, to the minimum setting for burners intended for luminous flame effect.

(b) Light the burner.

(c) Five minutes after ignition of an indoor flueless appliance, or 10 min after ignition of any other type of appliance, determine CO and CO_2 by the use of the specified apparatus.

B18.7 Result

The appliance complies with this requirement provided the CO/CO_2 ratio of the combustion products does not exceed 0.007 after 5 min for indoor flueless appliances and 0.02 after 10 min for any other type of appliance.

B19 M.O.T. 4.4—DETERMINATION OF CO/CO_2 RATIO OF COMBUSTION PRODUCTS—PERMANENT PILOTS—OVERLOAD

B19.1 Scope

This test applies to all appliances with permanent pilots.

B19.2 Principle

The combustion products are sampled by means of an appropriate hood and analysed for CO and CO_2.

B19.3 Apparatus

(a) Equipment as specified in Clause 3.2.6.

(b) Flue gas sampling hood of stainless steel or aluminium (see Figures A3 and A4).

(c) Carbon monoxide analyser, calibrated to give accurate and reproducible results.

(d) Carbon dioxide analyser, calibrated to give accurate and reproducible results.

B19.4 Materials

Appropriate limit gases as listed in Table B7.

TABLE B7

LIMITING CONDITIONS—PILOT BURNER

	Limit gas	Appliance inlet pressure
Natural gas	Na	3.0 kPa
Propane	X	3.5 kPa
Butane	Y	3.5 kPa
Universal LPG	Y	3.5 kPa
TLP gas	Ta	2.5 kPa
Town gas	A	2.5 kPa

B19.5 Preparation of apparatus

(a) Set up the appliance in an accessible draught-free position in accordance with Clause 3.2.

(b) Connect the appropriate limit gas.

(c) Light the pilot burner.

(d) Adjust the appliance inlet pressure as specified in Table B7.

(e) Turn off the pilot burner and allow to cool.

(f) Place appropriate sampling hood above flue outlet or burner.

B19.6 Procedure

The procedure shall be as follows:

(a) Light the pilot burner.

(b) Five minutes after ignition of an indoor flueless appliance, or 10 min after ignition of any other type of appliance, determine CO and CO_2 by the use of the specified apparatus.

B19.7 Result

The appliance pilot complies with this requirement provided the CO/CO_2 ratio of the combustion products does not exceed 0.007 after 5 min for indoor flueless appliances and 0.02 after 10 min for any other type of appliance.

B20 M.O.T. 4.5—FLAME ABNORMALITY

B20.1 Scope

This test applies to all burners in appliances.

B20.2 Principle

The appliance is tested at maximum and minimum limiting conditions both hot and cold (5ºC) with all appropriate limit gases, and burner flames are observed for any abnormalities.

B20.3 Apparatus

(a) Equipment as specified in Clause 3.2.6.

(b) An adequately sized enclosure capable of being cooled to 5ºC ±3ºC.

(c) Means of observing the burner flames (mirror or glass panel) if necessary.

(d) For open flued appliances, updraught and downdraught apparatus.

B20.4 Materials

Specified limit gases at pressures to satisfy the limiting conditions.

B20.5 Preparation of apparatus

(a) Set up the apparatus and appliance in accordance with Clause 3.2 in the enclosure to be cooled.

(b) Connect to the specified gas.

(c) Operate the appliance and adjust to the appropriate limiting conditions.

(d) Shut off the gas supply and allow the appliance to stand at 5ºC until temperature equilibrium is reached.

(e) Shut down cooling apparatus.

B20.6 Procedure

The procedure shall be as follows:

(a) Light the burner and check that the test point pressure is at the appropriate proportions of nominal test point pressure as shown under limiting conditions.

The limiting conditions shall be as specified in Table B8.

TABLE B8

LIMITING CONDITIONS—FLAME ABNORMALITY

	Maximum condition		Minimum condition	
	Limit gas	Test point pressure	Limit gas	Test point pressure
Natural gas	Na	1.10 × Pt	Nb, Nc, S	0.75 × Pt
Propane	X, Z	1.25 × Pt	X, Z	0.75 × Pt
Butane	Y	1.25 × Pt	Y	0.75 × Pt
Universal LPG	Y, Z	1.25 × Pt	X, Z	0.75 × Pt
TLP gas	Ta	1.10 × Pt	Tb	0.75 × Pt
Town gas	A	1.10 × Pt	B, C	0.75 × Pt

where Pt = nominal test point pressure

(b) Remove the appliance from the cold enclosure and set up at normal room temperature with the test point pressure at the appropriate proportion of nominal test point pressure as shown under limiting conditions in (a).

B20.6.1 *Appliances with draught diverters*

The appliances shall be as follows:

(a) Block flue outlet.

(b) Observe the burner flames for any abnormality.

(c) Unblock flue and connect draught apparatus.

(d) Apply downdraught of up to 7.5 Pa to the flue connection.

(e) Observe the burner flames for any abnormality.

(f) Apply updraught of up to 7.5 Pa to the flue connection.

(g) Observe the burner flames for any abnormality.

B20.6.2 *Appliances without draught diverters*

(a) Block flue outlet.

(b) Observe the burner flames for any abnormality or safety shutdown.

(c) Unblock flue and apply back-pressure of 140 Pa to the flue outlet.

(d) Observe the burner flames for any abnormality.

B20.7 Result

The appliance complies with this requirement if flame abnormality does not occur or the appliance shuts down safely under the limiting conditions applied.

B21 M.O.T. 4.6—IGNITION TESTS

B21.6 Scope

This test applies to all burners.

B21.7 Principle

The normal lighting procedure is carried out and the burner is observed for completeness of ignition whether hot or cold (5ºC) with all gases and the ignition time recorded. Ignition shall take place within the specified time.

B21.8 Apparatus

(a) Equipment as specified in Clause 3.2.6.

(b) Suitable timing device.

(c) An adequately sized enclosure capable of being cooled to 5ºC ±3ºC.

(d) Means of observing the burner flames (mirror or glass panel) if necessary.

B21.9 Materials

Specified limit gases.

B21.10 Preparation of apparatus

(a) Set up the apparatus and appliance in accordance with Clause 3.2 in the enclosure to be cooled.

(b) Connect to the specified gas.

(c) Ensure that the ignition system is complete and is installed according to the manufacturer's instructions.

(d) In the case of mains ignition systems a voltage equivalent to both 85% and 110% of the nominal supply voltage is applied to the appliance.

(e) For battery-operated ignition systems remove batteries and apply a power source equivalent to 80% of the nominal voltage to the supply contacts of the battery holder.

(f) Operate the appliance and adjust to the appropriate limiting condition.

(g) Shut off the gas and allow the appliance to stand at 5ºC until temperature equilibrium is reached.

(h) Shut down cooling apparatus.

B21.11 Procedure

The procedure shall be as follows:

(a) Purge the gas line to the control valve.

(b) Turn on gas control valve and start the timing device at the same time.

(c) Operate the ignition system in accordance with the manufacturer's instructions.

(d) Test five times allowing 1 min between tests.

(e) Test when the appliance is both hot and cold.

The limiting conditions shall be as specified in Table B9.