



BOX OVEN

INSTALLATION & MAINTENANCE INSTRUCTIONS



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The Ovens manufactured by *Airflow*, which are covered by these instructions fall into two distinct categories, these being:

Airflow Box Ovens or Batch Ovens, which, as their name suggests, are an enclosed structure containing a heated environment. One or more pairs of double doors gain access to the Oven and work pieces would typically be loaded into the Oven on Frames, Racks or Trolleys. Once loaded, the doors would be closed and the Oven started to heat the product for the required period of time, after which, the doors would be opened and the work removed.

Airflow Conveyorised Ovens although similar in general construction to the Ovens described above, provide a zone of heated air through which products are conveyed by mechanical means at a speed suitable to provide the required period of time within the heated zone. As this type of continuous product movement precludes the use of conventional doors the heated air is contained within the Oven structure by means of air knives or product vestibules at the product entry and exit points.

(These Ovens may be constructed as single pass, double pass or multi pass configuration).

1 Type Designation and Identification

Model	Internal Dimensions (metres)	External Dimensions (metres)	Burner Depth	Door Swing	Circ. System (Amp/Phase)	225EC Gas Oven Burner Rating (kW)	225EC Elec. Oven Rating (kW)
	W H D	W H D	BD	DS			
2	1 x 1 x 1	1.7 x 2 x 1.2	0.26	1 x 1.5	6	35	16
4	1 x 1.5 x 1	1.7 x 2.5 x 1.2	0.26	1 x 1.5	6	35	20
6	1 x 2 x 1	1.7 x 3 x 1.2	0.26	1 x 1.5	6	35	27
8	1.5 x 2 x 1.5	2.2 x 3 x 1.7	0.26	2 x 0.95	6	45	43
10	2 x 2 x 2	2.7 x 3 x 2	0.26	2 x 1.2	6	60	62
12	2 x 2 x 2.5	2.7 x 3 x 2.7	0.35	2 x 1.2	7.5	75	73
14	2 x 2 x 3	2.7 x 3 x 3.2	0.35	2 x 1.2	7.5	90	85
16	2.5 x 2 x 2.5	3.2 x 3 x 2.7	0.5	2 x 1.45	7.5	95	87
18	2.5 x 2 x 3	3.2 x 3 x 3.2	0.5	2 x 1.45	7.5	110	100
20	2 x 2.5 x 2	2.7 x 3.5 x 2.2	0.5	2 x 1.2	7.5	76	74
22	2 x 2.5 x 2.5	2.7 x 3.5 x 2.7	0.5	2 x 1.2	7.5	95	88
24	2 x 2.5 x 3	2.7 x 3.5 x 3.2	0.7	2 x 1.2	7.5	110	101
26	2.5x 2.5 x 2.5	3.2 x 3.5 x 2.7	0.7	2 x 1.45	7.5	115	103
28	2.5x 2.5 x 3	3 x 3.5 x 3.2	0.7	2 x 1.45	7.5	135	119
30	2.5x 2.5 x 4	3.2 x 3.5 x 4.2	0.7	2 x 1.45	7.5	160	152
32	2.5x 3 x 3	3.2 x 4 x 3.2	0.7	2 x 1.7	7.5	150	138
34	2.5x 3 x 4	3.2 x 4 x 3.2	0.7	2 x 1.7	7.5	185	176
36	2.5x 3 x 6	3.2 x 4 x 6.2	0.7	2 x 1.7	11	260	252
38	3 x 3 x 3	3.7 x 4 x 3.2	0.7	2 x 1.7	7.5	167	159
40	3 x 3 x 4	3.7 x 4 x 4.2	0.7	2 x 1.7	11	213	204
42	3 x 3 x 6	3.7 x 4 x 6.2	0.7	2 x 1.7	11	300	291

Table 2.1, ‘Box Oven Specifications’

Airflow Box Ovens are identified by an alphanumeric code, (e.g.: Model 22LPG225).

The first number relates to the size of the Oven as shown in the table above. This is followed by the type of fuel used e.g. “NG” Natural Gas, “LPG” Liquid Petroleum Gas, “E” Electricity. The final number relates to the maximum permitted working temperature in degrees centigrade.

As will be noted from the table below all Ovens within the standard *Airflow* range are given an even model number i.e. 2, 4, 6 & 8 etc. If however, the Customer has ordered an Oven to an odd dimension outside our standard range, that Oven would be given an odd number designation. For example, an Oven constructed to an odd size between a model 6 and a model 8 would be given the identification number 7. This method enables customers to gain information relating to power consumption and running costs by referring to the two adjacent even numbers in the following table.

Due to the fact that all Conveyorised Ovens are manufactured to Customers specific requirements and, as such, do not fall into a standard range, these Ovens are all given an individual serial number. The type of fuel used and the maximum working temperature as described in the example above will again suffix this serial number.

Note: Burner and element ratings are calculated on a loading of 50kg of steel per m³ of internal Oven volume and a temperature rise of 200°C. To calculate running cost, assume 70% of burner or element kW rating, once Oven at set temperature. Please refer to *Airflow* for ratings of 325°C models.

Steam Heated/Drum Heating Ovens are individually sized.

2 Usages of the Machine

The *Airflow* industrial Oven is a machine used to provide an internal environment of heated air into which is placed an item or component which requires to be heated. Typical applications where an *Airflow* Oven would be used include the stove enamelling of painted products, the curing powder coated items, curing electric motor windings, the force drying of damp products, the curing of rubber and other synthetic items, etc. etc.

Typical temperatures obtained within the Ovens range from 50°C-325°C.

The *Airflow* industrial Oven is to be used in an indoor industrial environment with ambient temperatures between +5°C and 30°C a relative humidity of 60% or lower, sited in a clean, dry pollutant free environment.

3 Identification of Working Areas

In all instances, operators must limit their movements to the external floor area surrounding the industrial Oven. Under no circumstances must operators or maintenance staff access the roof of the Oven whilst the Oven is either in use or still at a temperature above ambient.

Caution. It is not permitted for operators to enter the interior of the Oven whilst the Oven is operating. Please see Section 13 Hot Surfaces and Section 15 Operation for further details on removing work from a hot Oven.

4 Delivery and Handling Data

All standard Ovens are delivered to site as one complete pre-assembled unit, and are provided with lifting eyes on the four corners to facilitate off-loading and positioning by mobile crane.

In the case of exceptionally large industrial Ovens the complete unit may be subdivided into two or more separate units, in this case each separate unit would be provided with lifting eyes to facilitate movement as described above. The industrial Ovens rest on the factory floor and are bolted to the floor if required. Both Box and Conveyorised Ovens are designed to be stable and require no additional support. Under normal operation there are no additional components that require handling by the operator.

Please refer to the following table that gives weights for the standard range of Box Ovens. As described in Section 1, Conveyorised Ovens are manufactured as individual items and reference should be made to the control panel information label that gives the weight of the Oven in kilograms.



Model	225°C Oven Weight (kg)	325°C Oven Weight (kg)
2	770	818
4	883	949
6	990	1065
8	1225	1363
10	1530	1623
12	1672	1776
14	1817	1933
16	1898	1999
18	2096	2122
20	1770	1972
22	1803	2005
24	1991	2188
26	2000	2172
28	2131	2325
30	2185	2571
32	2469	2533
34	2732	2899
36	3424	3661
38	2577	2804
40	2934	3170
42	3690	3992

Table 2.2, 'Box Oven Weights'

5 Inspection

Each Oven should be inspected upon delivery and any damage must be reported to *Airflow* in writing within 7 days. It is important that these Installation and Operating instructions are studied carefully before any installation takes place. The Installation and Operation should also be in accordance with local regulations and accepted codes of practice. Under no circumstances should any part of the Oven be operated until a competent and qualified commissioning engineer has commissioned the complete machine.

6 Warranty

The *Airflow* warranty covers all defects on the equipment originating from faulty workmanship or materials, for a period of 12 months from the date of despatch. This period will be reduced if the anticipated operating times are exceeded. The warranty covers the replacement of any parts and associated carriage costs. It does not cover the labour to fit these parts or the cost of removing refitting or any secondary losses.

Any warranty claim must be immediately notified to *Airflow* and no repair work is to be conducted without prior agreement.

Any claim or defect arising from incorrect installation of parts, inadequate maintenance or abuse of the equipment how-so-ever caused is not covered by this warranty. Any modifications or alterations made to the equipment by a third party subsequent to the issue of CE certification, renders certification and warranty void. The 12 month warranty detailed above assumes a maximum 10 hours of operation per working day and is subject to a 6 months (chargeable) *Airflow* service visit.

7 Installation

The *Airflow* Oven should be installed on a perfectly flat and sound factory floor, suitable for both the load and heat involved. If the area in which you intend to site the Oven has a floor of potentially unsuitable material, please consult the *Airflow* Sales Department for further advice on its suitability. The Oven should be carefully lifted into position by use of overhead crane utilising the four lifting lugs provided on the top corners of the Oven. Care must be taken to ensure that a four leg chain set of sufficient length is used and under no circumstances must the included angle between any two chain legs be greater than 90°, otherwise serious damage to the structure of the Oven will result from the crushing forces exerted.

Once in position, visually inspect the seating of the Oven frame to the floor, there should be no gaps through which heat can escape and the Oven should be checked using an accurate spirit level in all directions. Please ensure that the Oven is not twisted due to an uneven floor.

Check the operation of the door mechanism and check that the doors can swing through their complete arc of movement freely without binding on high spots on the concrete floor.

If it is found necessary to shim the Oven level, this must be done at the four corners of the steel framework and along the sides of the Oven at a maximum of 1 metre apart. Following this shimming or in the case of any unevenness in the concrete floor, the Oven must be grouted into position to provide an effective air tight seal with a suitable proprietary fireproof grouting mixture.

8 Exhaust Ducting

All *Airflow* Ovens are provided with a means of exhaust ventilation via an adjustable Exhaust Damper. Note: In all circumstances without exception, the industrial Oven must be vented to the external atmosphere. Under no circumstances must the internal contents of the Oven be vented into the factory environment.

Exhaust Ducting venting the *Airflow* Oven to atmosphere should be designed and installed by a competent ventilation engineer. In order to ensure the correct operation of the *Airflow* Oven and also to ensure that the correct volume of air is extracted, the complete Ducting system should be sized and designed so as to achieve a maximum pressure drop of 80Pa.

Generally speaking all ductwork should allow the air an uninterrupted and smooth passage from the Exhaust Damper to the point of discharge. All bends or transition sections should be designed so as to maintain the cross sectional area of the duct discharge diameter and performance checks should be carried out on completion of the installation. Please note: Certain Customers whose use of solvents puts them within the threshold of the guidelines contained within the Environmental Protection Act must pay particular attention to the design criteria of such duct work. These criteria will necessitate the use of special ductwork specifically designed to comply with the E.P.A.

9 Electrical Data

Before removing the terminal box cover from any electric motor, or before any removal or dismantling of the fan units, please ensure that the electricity supply has been suitably isolated and cannot be switched on.

All electrical connections should be carried out by a qualified and authorised electrician in accordance with local site regulations and also in accordance with the latest issue of the IEE regulations.

The metal body of the fan unit, motor and switch gear control panel must all be earthed.

All *Airflow* Ovens are designed to operate on 415v +/- 6% 50Hz 3-phase and neutral supply unless stated otherwise within the control panel. If your supply deviates from the above, please contact the *Airflow* Sales Department prior to connection of your Oven.

10 Electrical Connections

All electrical connections should be carried out by a qualified and authorised electrician in accordance with local site regulations and also in accordance with the latest issue of the IEE regulations.

In the interests of electrical safety, a local means of isolating the electrical supply should be located as close as practically possible to the *Airflow* Oven, and must be of a type capable of being fitted with a lock to prevent the supply being inadvertently turned on during maintenance operations. The operation voltage and other electrical data are clearly marked on the inside of the Oven control panel. Please make sure that the Oven is suitable for the electrical supply on which it will be used.

The conductors of electrical supply cables should be connected securely to the appropriate terminals within the control panel and in accordance with the diagrams contained within the control panel. All cables must be of adequate size to prevent any drop in the supply voltage. Appropriate cable glands must be fitted to control panel connection points and tightened and secured against the ingress of dust, dampness or dirt. The terminal box covers must be fitted correctly, ensuring that their gasket seals the terminal box effectively.

On direct on-line Starters, the overload unit should be adjusted to trip out at the motors full load current. Under no circumstances should the overload be set to a higher value than the full load current shown on the motor rating plate.

The direction of rotation of the fan units is marked on the outside of the fan casing with a yellow label. On plug type air circulation fans, which can be identified by a square recessed frame set into the roof of the Oven, the direction of rotation is clockwise when viewed from above. To reverse the direction of rotation, switch off and isolate the electrical supply and interchange any two of the incoming supply wires. Please Note: As the Oven will have been pre-commissioned and tested at our works prior to despatch, all motors will be rotating in the same direction. i.e: If one motor is rotating the wrong way, all motors will be rotating the wrong way and vice versa, therefore, it is considerably more practical to interchange two of the main incoming supply wires and therefore, correct all motor rotation directions at one go.

11 Gas Connection

On gas-fired Ovens, either LPG or Natural Gas, the supply to the gas burner valve block must be made by a competent and qualified gas engineer. A local means of isolation must be provided as close as practically possible to the industrial Oven and at a position convenient to be reached by an operator.

All pipe work must be sized so as to deliver an adequate volume of gas to the burner/s so as to maintain the recommended working pressure even when the burner is firing at its maximum output.

The gas supply should be regulated to provide a running pressure of 17.5mbar in the case of Natural Gas Burners and 35mbar in the case of LPG Burners. This pressure should be checked using a suitable manometer. Following the commissioning of the Oven, particular attention should be made to any other gas-fired equipment within the immediate vicinity which may effect the continuity of the supplied pressure. This precaution is especially relevant when installing an Oven in the summer months when the heating of the factory is switched off. It is not until winter arrives and all local factory heaters are put into service that problems with the Ovens gas supply are encountered.

Any operating problems attribute to gas supply fluctuations are not covered by warranty, and rectification will be at the Customers expense.

11a Steam Connection

As per Heat Exchanger Literature.

12 Noise Emissions

Please refer to the following table to obtain information on the test results obtained from typical *Airflow* Oven installations. Please note specific individual noise levels should be obtained following installation of your *Airflow*

Oven, as it is impossible for *Airflow* to predict the properties of the acoustic environment into which your Oven is to be sited.

Model No	dB (A) @1m Doors Open	dB (A) @ 1m Doors Closed
2 ! 10	81	72
11 ! 34 and 38	87	78
36, 40 and 42	91	84

Table 2.3, 'Noise Emission Data'

Please Note: *Airflow* will be pleased to advise on suitable induct silences for use with their range of Ovens, please contact our Sales Department for further advise.

13 Hot Surfaces

Due to the specific nature of an industrial Oven, the internal surfaces will reach a temperature unacceptably high to be brought into contact with human skin. If your process demands that the product must be inspected or removed from the interior of the Oven whilst the temperature is still at an elevated level, all operators must be equipped with suitable personal protective equipment to protect themselves from these extremes of temperature.

Each industrial Oven is clearly labelled around the area of the access doors with signs warning of high surface temperatures. Although it is not anticipated that the external surfaces of the industrial Oven will become elevated to such a temperature as to present a danger, it is a sound precautionary measure to wear suitable personal protective equipment before touching door handles, door surrounds or other exposed surfaces. Especially if the Oven has been operated continuously for some considerable period of time.

14 Commissioning

On gas-fired Ovens a competent and qualified gas engineer must only undertake the commissioning of the gas burner. We would strongly recommend that a trained *Airflow* service engineer is employed for this function as all our engineers have the necessary experience to set gas burners to a level suitable to achieve the optimum operating characteristics whilst maintaining maximum fuel efficiency.

Turn on the electrical isolator both on the supply cable and on the front of the Oven control panel.

Briefly operate the circulation (and exhaust fan if fitted) to ensure the correct direction of rotation (see Section 10 Electrical Connections).

Please Note: We would strongly recommend that at this stage of the commissioning process a trained *Airflow* service engineer is engaged to set up the Oven to give maximum operating efficiency, please contact our Sales Department to arrange for a commissioning engineers visit.

If however, your organisation is of such a size and nature that your own engineers are equipped with the necessary analytical equipment please proceed to commission the Oven as follows:-

Start by setting all air outlet dampers to 50% open. On the majority of Ovens this will be a setting of 50mm.

Start the Oven circulation fan/s.

With the aid of a calibrated digital anemometer measure the air velocity entering the Oven from each outlet.

By calculating the open area of each outlet and multiplying this figure by the air velocity establish the air volume exiting from each outlet.

Adjust the outlet dampers by small increments reducing the ones with a higher volume and increasing the ones with a lower volume. Once all dampers have been set repeat the air volume calculation. Bearing in mind that it is not simply possible to measure the air velocity exiting from each damper but as the damper orifice is changed, the calculation relating to open area needs to be reworked.

Repeat this procedure until by calculation you have as near as possible an identical volume of air (not velocity) exiting from each inlet damper.

With the aid of a multipoint digital thermometer (or preferably a PC based laptop data logger) set up a minimum of four thermocouples on thermocouple stands at the height of your intended produce.

Lead the thermocouple cables outside the Oven and close the Oven doors.

Set the temperature on the temperature controller to the temperature most commonly required by your product.

Start the Oven to warm up to operating temperature and allow the temperature then to stabilise within the Oven for a 10-15 minute period.

The type of controller used on this Oven is of the P.I.D. type and as such is able to learn the individual characteristics of your Oven and control the heating accordingly. The Oven must be run for a period of at least 30 minutes to allow the instruments to set its internal parameters.

Allow the Oven to cool and repeat the warm-up sequence this time logging the data from the four internal thermocouples.

Using the data logged make any final adjustments to the air distribution outlets to ensure an even distribution of heat within the entire Oven volume.

Check the operation of the door mechanism when the Oven is at operating temperature to ensure that thermal expansion has not affected the working clearances.

Check any stainless steel door seals to ensure that there is no escape of heated air from inside the Oven.

The Oven exhaust rate should now be set and to some degree this is dependant upon the use to which the Oven is being put e.g. evaporating solvents, excessive moisture etc. etc. As a general rule the exhaust rate should be set to 20% of the Ovens internal volume. Begin by calculating the Ovens internal volume in cubic metres, this volume should include the space within the internal ducting and not just the clear internal dimensions of the Oven as described in Section 1. To obtain a volume equal to 20% of the Ovens internal volume should now divide this figure.

With the aid of a digital anemometer suitable to withstand the maximum operating temperature of the Oven, measure the exhaust rate velocity at the exit point of the Oven duct. By calculation, with regard to the duct diameter, establish the volume of exhausted air and adjust the exhaust damper until the volume of exhausted air matches the 20% figure obtained by calculation.

Finally, using a currently calibrated and certificated accurate digital thermometer and thermocouple check the reading of the Ovens temperature controller at minimum 50°C increments. If deviation exists and is predominantly in either a positive or negative quantity program the necessary offset into the temperature controller. Having compensated for any variation as far as possible by means of the offset produce a deviation card for any remaining deviation and hand to the Oven operator.

If you do not feel able to complete the Commissioning procedure using your own resources, please contact the *Airflow* Sales Department for advice.

15 Operation (Tecnologic TLK32/TLK35 Controllers)

The range of *Airflow* Ovens are designed to be as easy to operate as practically possible. All necessary controls are located on the front face of the Oven control panel and are clearly and indelibly labelled.

Open the Oven doors.

Start Circulation Fan.

Set temperature to required level on Temperature Controller.

*Set soak time on the Temperature Controller.
Switch heat switch to “on” position.

The Burner will light after pre-purge time.

Close Door.

Heating will now commence and temperature will rise to set point.

Heat up Oven to set point, then run at set point for the allotted soak time.

*At the end of soak period, heating will automatically switch off and flashing Xenon Beacon OTC Audible Alarm will operate.

Press Circulation Fan stop button to re-set Temperature Controller for next operation.

Set Temperature Controller.

To set required temperature, - press the ‘P’ button, - Display will show ‘SP1’; then press the up/down buttons to the required maximum Oven temperature.

Press ‘P’ button twice to return to main display.

To set required soak time, - press ‘P’ button twice, - Display will show ‘TP’; use up/down buttons to adjust time value in minutes, (standard setting 20 mins.).

Press ‘P’ button once to return to main display.

*These instructions apply to Ovens fitted with the optional Process Timer only.

The Ovens manufactured by *Airflow* which are covered by these instructions fall into two distinct categories, these being:

16 Maintenance

Airflow Ovens have been designed to be as maintenance free as possible and provide the maximum period of working life. However, in order to ensure a consistently high quality of finished product, cleanliness within the Oven cannot be over stressed and we would recommend that the following procedure is conducted on a weekly basis.

Clean out the interior of the Oven and wipe the internal surfaces with a soft brush to dislodge any airborne particles adhered to the Oven lining. After marking the position of all air outlet dampers, remove and vacuum the inside of the ducts, replace the dampers and lastly vacuum out the Oven floor.

With the power to the Oven isolated and locked in the “off” position, carefully examine the air inlet to the gas burner (if fitted). With the aid of a soft paint brush carefully clean any dust or powder adhering to the burner and burner outlet.

17 Servicing

Airflow provide a national network of trained service engineers. Each service vehicle is equipped with a considerable range of genuine spare parts. Please Note: It is a condition of your 12 months warranty that your Oven is serviced every six months. This service will include:



- Full Burner Service (Gas Ovens)
- Full Element Service / Load Test (Electric Ovens)
- Circulation Fan Load Test
- Circulation Fan Air Flow Measurement
- Air Circulation Damper Balance
- Temperature Controller Test
- Exhaust Fan Load Test (if fitted)
- Exhaust Air Damper Setting
- Control Panel Motor Overload Test and Adjustment

In addition to the above, *Airflow* engineers are also trained and able to provide a full temperature mapping and calibration service, including the production of print-outs to satisfy the requirements of BS 5750 / ISO 9000 as well as many government and aerospace standards.

Please Note: Under no circumstances must the repair or service of equipment used for the combustion of gas (either Natural Gas or LPG) be conducted by untrained personnel. Any variation in the recorded burner settings taken at the time of commissioning will automatically invalidate your warranty.

18 Ordering Spare Parts

Please quote the following information when ordering spare parts.

Your Company Name	e.g.	A. Smith Limited
Model Number	e.g.	Model 30LPG225
Serial Number	e.g.	1694
Inspection / Despatch Date	e.g.	11/10/95

Airflow carry large stocks of all spare parts and can arrange same day despatch for orders received before 3pm Monday to Friday. Please Note: The performance of your *Airflow* Oven is dependant upon the correct fitment of genuine spare parts. Please do not attempt to fit locally sourced substitutes.

CE EC DECLARATION OF CONFORMITY CE

In accordance with the supply of machinery (Safety) Regulations 1992, and the supply of machinery (Safety) (Amendment) Regulations 1994.

This declaration relates to the range of *Airflow* Industrial Ovens. A full listing of which appear in the relevant technical file. (See Section 1 of this Publication for type designation).

We, *Airflow* Products Ltd declare under our sole responsibility that the Industrial Ovens referred to in these instructions, taking into account the state of the art, comply with, or are designed and constructed so far as is possible, to comply with the relevant essential Health and Safety requirements as indicated in the technical file, and contained within EEC Directives:

Machinery (98/37/EC)

Electromagnetic Compatibility (89/336/EEC)

Electric Equipment designed for use within certain voltage limits (73/23/EEC)

1st January 1996
Airflow Products Ltd
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Serial Number:

Officer of the Company:

Date: