

**INSTRUCTIONS**

**&**

**OPERATING MANUAL**

**FOR**

**FULLY AUTOMATIC**

**LPG / CNG BURNER**

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# **INDEX**

<b>1.</b>	<b>LPG FACT SHEET -----</b>	<b>1</b>
<b>2.</b>	<b>PROPANE FACTS -----</b>	<b>2</b>
<b>3.</b>	<b>THE POINTS FOR ATTENDENT-----</b>	<b>3</b>
<b>4.</b>	<b>INSTALLATION PROCEDURE -----</b>	<b>3-4</b>
<b>5.</b>	<b>ELECTRICAL CONNECTIONS TO BE DONE -----</b>	<b>4</b>
<b>6.</b>	<b>PRECAUTIONS DURING INSTALLATION -----</b>	<b>5-6</b>
<b>7.</b>	<b>DO'S &amp; DONT'S-----</b>	<b>7</b>
<b>8.</b>	<b>FAULTS &amp; REMEDIES-----</b>	<b>8</b>
<b>9.</b>	<b>BURNER LAYOUT DRAWING-----</b>	<b>10</b>
<b>10.</b>	<b>TYPICAL LPG CYLINDER INSTALLATION -----</b>	<b>11</b>
<b>11.</b>	<b>BURNER WITH DILIGENT BSC W/O TC -----</b>	<b>12</b>
<b>12.</b>	<b>BURNER WITH DILIGENT BSC WITH TC-----</b>	<b>13</b>
<b>13.</b>	<b>BURNER WITH HEATGEN BSC W/O TC -----</b>	<b>14</b>
<b>14.</b>	<b>BURNER WITH HEATGEN BSC WITH TC -----</b>	<b>15</b>

# LPG FACT SHEET

Liquefied Petroleum Gas (LPG) is a generic name for commercial propane and butane and is made from crude oil and 'wet' gas.

LPG has the special property of becoming liquid at atmospheric temperature if moderately compressed and is stored and transported in containers as liquid but is generally drawn out and used as a gas by reducing the pressure.

LPG in gaseous state is nearly twice as heavy as air. Any leakage of LPG therefore tends to settle down at floor level.

Liquid LPG is almost half as heavy as water, thus when liquid LPG is converted to a gaseous state it expands by about 250 times. The leakage of liquid LPG is therefore very dangerous due to the volume of gas created.

LPG in a natural state is non-toxic and invisible but can displace the air necessary to sustain life.

Commercially available LPG by law has an odorant added to facilitate leak detection. Its smell is detectable in air at concentration down to one fifth of the lower explosive limit.

Escape of even small quantities of the liquefied gas can give rise to large volumes of vapour/air mixture, the mixture of LPG and air, in certain proportions, will explode if ignited. In its gaseous state LPG presents a fire and explosion hazard. The lower inflammability limit for LPG is 2% and the higher limit is around 10%. However over rich mixtures can also become hazardous when diluted with air.

The combustion of LPG produces carbon dioxide and water vapour but sufficient air must be available. Inadequate appliance flueing and/or ventilation or poor air/gas e.g. due to lack of servicing can result in the production of carbon monoxide, which is extremely hazardous.

LPG vapour is denser than air and consequently vapour may flow along the ground and into drains sinking to the lowest level of the surroundings and be ignited at a considerable distance from the source of leakage.

A naked flame should never be used to search for a leak.

A container that has held LPG and is 'empty' may still contain LPG in vapour form and is thus potentially dangerous. If a valve is leaking or left open air can diffuse into the container forming a flammable mixture and creating a risk of explosion, alternatively LPG can diffuse to the atmosphere.

**In the event of a gas leak :** Turn off the gas supply at the emergency gas control and turn off all appliances. Open doors and windows to disperse the gas. Extinguish all naked flames and isolate the other sources of ignition. Get further help by using the emergency telephone number provided by the supplier. Do not turn on the gas supply again until the installation has been inspected, repaired if necessary and passed safe for use by approved engineers.

**In the event of a fire :** Turn off the gas supply at the emergency gas control and turn off all appliances. Call the fire brigade. Evacuate the building. Get further help by using the emergency telephone number provided by the supplier.

## **PROPANE FACTS**

Propane is the liquid petroleum gas (LPG) used to fuel hot air balloons. When handled properly it is a safe and efficient fuel. It is sometimes supplied in a mixture with other gases such as butane, butylene and propylene.

### **General Properties of Propane**

1. Propane is a colourless, odourless and non-toxic gas. It is supplied commercially with an added odorant to assist detection by smell.
2. Propane boils at -42 degrees Celsius. At 15 degrees Celsius it has a storage pressure of 635 kPa.
3. Propane is stored as a liquid under pressure and will expand approximately 270 times to a vapour at normal temperatures and pressure when released.
4. When the propane changes to a vapour it is possible to see the initial leak by the cooling effect of the leak, which causes condensation, and even freezing of the water vapour in the air. Not being able to see the effects of the leak after a short distance does not mean that the gas is not present in a potentially explosive mixture.
5. Propane is heavier than air, and may flow along the ground or through drains and will sink to the lowest level of the surroundings.
6. The flammability range of the gas is 1.6% to 9.5% by volume in air. A small proportion of the gas can therefore give rise to a flammable mixture.
7. Propane and other LPG gases are excellent solvents of petroleum and rubber products.
8. Propane and other LPG gases are generally non-corrosive to steel and copper alloys. Precautions against corrosion may be necessary if aluminium or aluminium alloys are used.

## **I The points a service engineer/attendant must know**

1. Oven/furnace overall specifications and electrical rating.
2. Operating temperature, Maximum Temperature and details of air circulation arrangement.
3. Oven/furnace working space dimensions, details of baffle space and wall/insulation thickness. Specifications of installation and supporting material parts.
4. Specifications and type of temperature sensor.
5. Application of the oven/furnace to the customer.
6. Details of previous change carried out on the oven/furnace.

## **II Installation Procedure**

1. Check for all the installation instruments, including supporting parts and burner parts to be ready for the installation.
2. Before carrying out any modifications or rework, confirm the oven/furnace specifications (existing) and the modifications/renovations to be carried out.
3. Ensure the place of burner installation by taking in account the oven/furnace specifications as per the temperature requirement and uniformity of temperature.
4. Ensure the LPG pipeline and overall arrangement is done according to the standards burner installation point.
5. Ensure the place of temperature sensing arrangement to maintain the required temperature uniformity.
6. Fix up the position of burner control panel(s), according to the no. Of burner and controlling systems. Also fix up the perfect position of low pressure regulator and the hi-low system/solenoid valves.
7. Take the cutouts for burner flow tube insertion and combustion chamberfixing, strictly according to the required dimensions.

8. Fix-up the burner mounting bracket/support plate/flange to the oven/furnace body according to the requirement.
9. Once again check the inside parts of burner mounted properly at their required positions. (flame sensor rod, ignition rod, nozzle-diffuser plate arrangement)
10. Mount the burner on the flange/support plate/bracket and tight up the bolts firmly.
11. Mount the low pressure regulator and solenoid valve assembly in their prescribed horizontal position and arrange a LPG pigtail from burner to hi-low system.
12. Mount the control panel (s) in its predefined position, ensuring easy accessibility.
13. Mount the temperature sensor at its prefixed position and take out the termnal contact wires to the control panel.

Ensuring all the assembly and mounting work being completed, move towards the wiring/electrical connections for the oven and controlling system.

### **III Electrical connections to be done \***

First of all check the existing electrical and control system in the oven/furnace.

Following are the electrical connections at the particular points with LPG firing system.

#### **A). ON THE BURNER CONNECTOR (To the burner side)**

1. Ph and N wires for burner blower.
2. Ph and N wires for Ignition Transformer.
3. Earthing from Ignition Transformer connected to body.
4. Flame sensor rod cable going inside the burner to the flame sensor rod.
5. Ignition cable from ignition transformer going inside the burner to ignition rod.

**\*B]. WIRES COMING 'IN' TO THE CONTROL PANEL :**

1. Ph and N from main switch going inside connector for all further electrical connections.
2. Cable from flame sensing rod (via burner connector) going inside connector and then to sequence controller.
3. The thermocouple terminal extension wires going to the temperature controller.

**\*C]. WIRES COMING 'OUT' FROM THE CONTROL PANEL :**

1. The inter connecting wires, in case of more than one burner and control panels.
  2. Ph and N for burner blower going to burner connector.
  3. Ph for Ignition transformer going to burner connector.
  4. Signal wires for hooter/Alrm.
  5. Signal wires for Hi-low system/solenoid valves.
- \* Carry out all the electrical connections with above information considering the specific application and requirement of the system which differs from oven to oven (furnace to furnace)

**IV PRECAUTIONS TO BE TAKEN DURING INSTALLATION, ELECTRICAL CONNECTIONS & TRIALS\***

- 1 After making suitable arrangement go for checking & giving power supply
- 2 Check for all the specifications of the existing system and the burner system to be installed.
- 3 Ensure trouble-free operation of material handling system, material loading\system and door-openings.
- 4 Ensure easy accessibility of burner, control panel, LPG shut-off valve & Electrical switch.

5. Ensure easy accessibility of burner, supporting parts and control panel for the service engineer.
6. Ensure the correctness of cut-outs and fabrication work to be done.
7. Ensure the perfect mounting of burner bracket supporting plate/flange and tightening of all the nuts and bolts.
8. Ensure the mounting of combustion chamber being done carefully considering the bending / warping due to excess heat during the operation.
9. Ensure the position of the thermocouple to sense the overall temperature of the oven/furnace.
10. Ensure the mounting of low pressure regulator and solenoid valves of hi-low system in the horizontal position strictly.
11. Ensure proper venting of the oven/furnace in order to take out the excess heat/hot gases/fumes formed during oven/furnace operation.
12. Ensure the correctness of all electrical connections before the trials.
13. Ensure sheathing/Shielding of the electrical wires wherever required.
14. Ensure to carry the electrical wires separately in pipes wherever required for specific application.
15. Ensure the installation of LPG manifold and pipeline being done according to the standards and specific requirement.
16. Always carryout the leak test (soap test) on the LPG pipe line & upto the burner point.
17. Check all the parameters before switching 'ON' the burner for trials.
18. Set the parameters of the LPG firing system according to the application requirement.
19. Check the supply voltage whether it is  $230V \pm 5$ .
20. Switch 'ON' the system & necessary changes in the parameters (Air, Gas setting) according to the actual conditions.
21. Take vigorous trials to satisfy the process requirement (No-load, Half-load, Full-load Trials)
22. Take down all the data collected during trials for further reference.
23. Understand the process carefully and remove any problems faced during trials only.



# V

## **DO'S & DON'TS FOR THE OPERATORS/ATTENDANTS\***

1. The oven/furnace burner operating system should be operated by trained persons only.
2. The specified no. of LPG cylinders should be attached to the manifold.
3. The manifold and LPG cylinders should be kept open to atmosphere/ fresh air and away from electrical connections/cables.
4. Make sure to 'ON' all the control valves of the LPG pipeline.
5. Carry out the leak test (soap test) once in 15 days and make necessary repairs for the same.
6. The temperature setting on the temp. Controller should be done according to the process requirement only. Excess temperature setting may cause hazards.
7. In case of hazards switch 'OFF' the control system and LPG supply quickly or always shut off the LPG supply by the nearest valve to the burner
8. Do not change the setting of Main & low pressure regulator, solenoid control valves, air damper on the burner-blower etc. unnecessarily.
9. Keep the oven/furnace atmosphere free from heat, dust, high humidity, fumes etc.
10. Ensure good working of solenoid valves.
11. Observe the full indication of sequence controller on control panel.  
In case of burner failures, the trained person only should examine the system to find out the faults and should carry out the remedies for the same.

## VI FALULTS AND REMEDIES\*

Following are the faults occurring in the burner system and their causes & remedies mentioned below them.

### \*A]. BURNER DO NOT START AFTER SWITCHING 'ON'

NO.	CAUSE	REMEDIAL ACTION
1	No Electrical supply	Check for surety.
2	Main switch shut-off	Check and make it ON.
3	LPG toggle switch shut-off	Check and make it ON.
4	Burner 'ON' switch failure	Check and repair/replace.
5	Temperature is set to 'ZERO' or less than atmospheric (oven)	Check and reset to the required process temp.
6	Loose electrical connections	Check and correct the connection to burner or control panel

### \*B]. BURNER START AND GOES TO LOCKOUT IMMEDIATELY

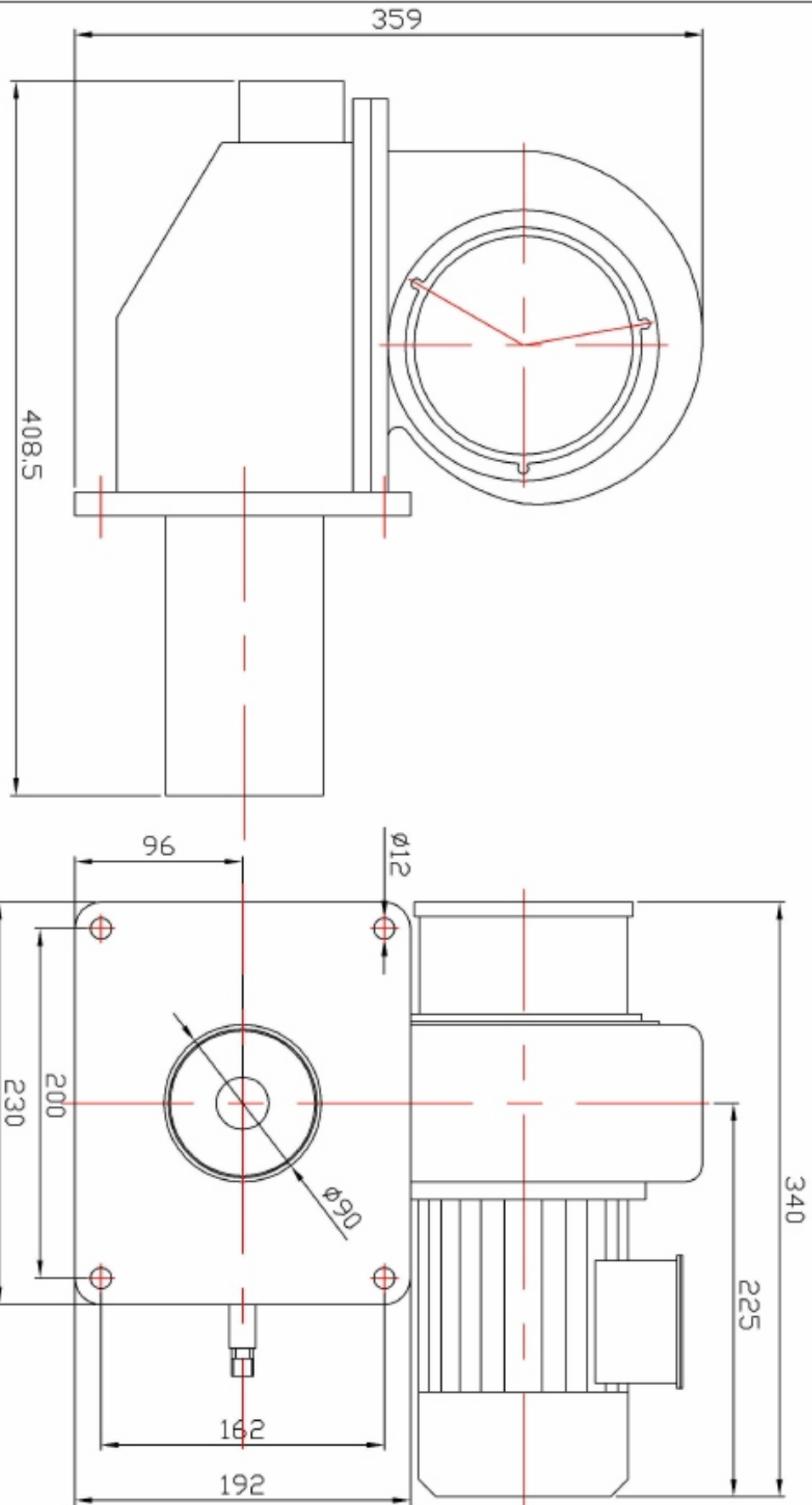
NO.	CAUSE	REMEDIAL ACTION
1	No Supply of LPG	Check all control valves and assure LPG supply to the burner.
2	Low pressure of LPG	Check and add cylinders if needed.
3	Flame not establishing.	Check Air and gas ratio and correct by trial & error . No ignition on rod-check for it.
4	No Ignition on Ignition Rod.	Check for sequencing of sequence controller & replace if needed. Check connections to Ignition transformer & ignition rod and correct if needed. Ignition rod touching to diffuser plate/ burner body check and correct the gap . Excess carbon on ignition rod-check and clean it . Broken ignition rod-check and replace if needed.
5	Failure of seq. Controller.	Check and replace if needed.
6	No Activation of relays of Temp. Controller/and	Check relay operation (by indicators) and replace temp. controller if needed. No Relay signal to solenoid valves.
7	Solenoid stucked up.	Check & repair.

**\*C].BURNER GOES TO LOCKOUT CONTINUOUSLY DURING CYCLE**

<b>NO.</b>	<b>CAUSE</b>	<b>REMEDIAL ACTION</b>
1.00	Less pressure of LPG	Check and attach cylinders.
2.00	No supply of LPG	Check and attach new cylinders.
3.00	Flame not establishing.	Check Air and gas ratio and adjust it.
4.00	Air to Gas ratio altered.	Adjust by trial and error.
5.00	No Flame sensing.	Flame sensor rod failed-change Connection loose-correct it. Flame sensor rod not touching to the flame - check & correct. Flame sensor rod cable burnt- check & replace.
6.00	Ignition not taking place during ON-OFFs.	Check for ignition rod, loose connections, Ignition gap, carbon, sequencing and correct needed.
7.00	Solenoid valve not operating.	Check for the valve lifting & releasing- clean if needed by opening the valve assembly.

**\*D]. INSTANT TEMPERATURE RISE IN ACTUAL TEMPERATURE  
(Act Temp. Exceeding set temp. But burner is still on)**

<b>NO.</b>	<b>CAUSE</b>	<b>REMEDIAL ACTION</b>
1.00	Failure of temp. controller.	Check for set temperature, relay operation and correct if needed/replace if needed.
2.00	Temp. Controller not calibrated properly.	Check for the temperature records and change controller if needed/ repair.
3.00	Solenoid coil not releasing the valve stem.	Check for its operation and clean by opening if needed.
4.00	Solenoid valve stem jammed in 'ON' position.	Check for its operation and clean by opening if needed.



**GENERAL NOTES :-**

(1) ALL DIMENSIONS ARE IN MILLIMETERS UNLESS OTHERWISE SPECIFIED.

(2) ALL TOLERANCES WILL BE AS PER CODE/SPECIFICATION

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