



Model S400/S400T
CONSTRUCTION HEATERS

MANUAL
No. 934-6638
PLEASE RETAIN FOR FUTURE REFERENCE

A DIVISION OF HAUL-ALL EQUIPMENT LTD.
LETHBRIDGE, ALBERTA

Model S400/S400T CONSTRUCTION HEATERS

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FOR YOUR SAFETY

**DO NOT USE THIS HEATER IN A SPACE WHERE
GASOLINE OR OTHER LIQUIDS HAVING
FLAMMABLE VAPORS ARE STORED OR USED.**

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SPECIFICATIONS

Model No. S400 & S400T Construction Heaters

C.G.A. Certified to CGA 2.14 Gas Fired Unvented Construction Heater

Gases:	Natural or Propane
Capacity:	400,000 Btu/h maximum
Orifice Size:	43 DMS (X18)
Blower:	2,000 cfm
Electrical Rating:	115 volts, 60 Hz, 5 amps, single phase

Gas Supply:

	<u>Inlet Pressure</u>		<u>Manifold Pressure</u>	
	Max W.C.	Min W.C.	Max W.C.	Min W.C. (S400T only)
Propane	14"	7"	1.8"	0.7"
Natural	14"	7"	4.5"	1.8"

(Minimum inlet pressure is for purpose of input adjustment)

INSTALLATION

The Sure Flame Models S400 & S400T are direct fired gas heaters intended to be used primarily for the temporary heating of buildings under construction, alteration, or repair. Since all the products of combustion are released into the area being heated, it is imperative that adequate ventilation is provided. The flow of supply air and combustion gases must not be obstructed in any way. Do not use the heater with ductwork as this will restrict the flow of supply air.

- 1) Install the heater in a horizontal position at least 6 feet from any LP-gas container, and allow the following clearances from any combustible materials:

Front Outlet:	12 feet (3.6 M)	Sides:	2 feet (.6 M)
Intake:	2 feet (.6 M)	Top:	4 feet (1.2 M)

Front Outlet must not be directed at any LP-gas container within 20 feet (6 M).

Also make sure that no flammable vapors are present in the space where the heater is being used.

- 2) When connecting the heater to a natural gas or propane supply line ensure that the pressure at the heater inlet is within the specified range. Excessive pressure (over 1/2" psi) will damage the controls and void the warranty.
- 3) Visually inspect the hose assembly and ensure that it is protected from traffic, building materials, and contact with hot surfaces. If it is evident that there is excessive abrasion or wear, or the hose is cut, it must be replaced.
- 4) After installation, check the hose assembly for gas leaks by applying a water and soap solution to each connection.
- 5) Connect the heater to an adequate 115 volt electrical supply as specified on the rating plate. For protection against shock hazard the supply cord must be plugged directly into a properly grounded three-prong receptacle.

- 6) In all applications, install the heater in such a manner that it is not directly exposed to water spray, rain and/or dripping water.

OPERATING INSTRUCTIONS

- 1) Set GAS SELECTOR VALVE to gas being used. The conversion shall be done by the owner or lessor of the equipment.

NOTE: When using Propane Gas the Selector Valve **must** be locked in position.

- 2) Ensure the MANUAL VALVE (valve nearest the burner) is in the "ON" position.
- 3) Connect power - 115 volt supply.
- 4) Open gas supply.
- 5) Push START Button.
- 6) Set heat selector switch to desired heating mode. (S400T only)
- 7) Set thermostat to desired temperature. (S400T only)
- 8) To stop, turn gas off.

The appliance area should be kept clear and free from combustible materials, gasoline, and other flammable vapors and liquids.

Ensure that the flow of supply air and combustion gases is not obstructed.

The installation and operation of the heater shall comply with the code requirements specified by the authorities having jurisdiction.

General criteria for the use of construction heaters may be found in the applicable sections of the National Standard of Canada Propane Installation Code CAN/CGA-B149.2.

**THE INSTALLATION AND MAINTENANCE OF THE HEATER MUST BE ACCOMPLISHED
BY A QUALIFIED SERVICE PERSON.**

SEQUENCE OF OPERATION

- 1) Push start button and release.
- 2) Control relay closes.
- 3) Motor starting relay closes.
- 4) Fan starts.
- 5) Fan reaches full speed and air switch closes.

- 6) Solenoid valve opens.
- 7) Spark is generated.
- 8) Flame rod senses flame, and then maintains flame.
(S400T only)
- 9) If selector switch is set on HI-LO, heater will cycle from lo to hi flame thermostatically.
- 10) If selector switch is set on ON-OFF, heater will cycle on and off thermostatically.

INSTALLATION USING A PROPANE SUPPLY TANK

- 1) When installing the heater for use with propane gas, set the gas selector valve to "Propane" and lock in position.
- 2) Arrange the propane supply system to provide for vapor withdrawal from the operating container. Supplying liquid propane to the heater is dangerous and will damage the components.
- 3) Ensure that for the surrounding temperature the size and capacity of the propane supply container is adequate to provide the rated Btu/h input to the heater. Refer to Appendix A.
- 4) Turn off the propane supply valve at the container when the heater is not in use.
- 5) The installation must conform with local codes, or in the absence of local codes, with CAN/CGA-B149.2 Propane Installation Code.
- 6) When the heater is to be stored indoors the propane container must be disconnected from the heater and the container moved away and stored in accordance with the above National Standard.

COMMON INSTALLATION AND OPERATIONAL PROBLEMS

1) LOW VOLTAGE

This is one of the most common problems and is usually the result of the supply cord having too small a wire gauge for its length. Low voltage results in the motor overheating, burnt relay contacts, or a relay that will not maintain contact.

2) SUPPLY LINE TOO SMALL

3) INSUFFICIENT VAPORIZATION AT SUPPLY

Normally caused by too small size of supply tank.

4) IMPROPER GAS SUPPLY PRESSURE

Usually a result of supply pressure being too high because of improper or lack of regulation.

5) **DIRTY GAS SUPPLY**

Dirty gas can cause strainers to plug or form a build-up in the burner orifice.

6) **LACK OF PREVENTATIVE MAINTENANCE**

Heaters must be cleaned as required, especially when used in a dirty environment.

7) **IMPROPER SUPPLY OF FRESH AIR**

It is normally recommended that the intake air of the heater be taken from outside the enclosed area. This provides a slight pressurization and prevents any problems associated with recirculation.

SAFETY FEATURES

Servicing of Sure Flame Construction Heaters normally involves one of several built-in safety features. The Models S400 & S400T incorporate devices to detect the following:

- | | |
|------------------------------|---|
| 1) LOSS OF FLAME | Gas supply is shut off if flame is lost to prevent raw gas from leaving the heater. |
| 2) OVERHEATING | (a) Thermal overload protection in the motor.
(b) High temperature limit switch in the combustion chamber. |
| 3) LOSS OF POWER | Total shutdown with manual reset required. Any one of the safety devices will create a loss of power situation. |
| 4) BLOCKED AIR SUPPLY | A switch detects the differential pressure in the combustion chamber and shuts down when insufficient . |

DESIGN RELATED ADDITIONAL SAFETY FEATURES:

1) **LOCKING POSITION FOR LPG ON GAS SELECTOR LEVER**

Units used with LPG while the gas selector valve is positioned for Natural Gas will throw significantly more heat than the rated Btu/h. This is definitely a safety hazard.

2) **LOW SKIN TEMPERATURE**

Sure Flame Heaters are designed to have a low skin temperature. This provides added safety in the workplace.

3) DURABLE CONSTRUCTION

The Models S400 & S400T use a stainless steel burner for long life and consistent performance.

In order to maintain the highly efficient combustion of the Sure Flame Heater, the combustion chamber must remain as manufactured. Any change or distortion could alter the fuel/air mixture and create unwanted gases.

ON-SITE SAFETY PROBLEMS

1) SHORTING OUT OF DEFECTIVE COMPONENTS

This common problem saves short term expense at the risk of a large future cost. Any heaters found in this condition should be removed immediately.

2) IMPROPER ENCLOSURES

When heaters are installed partially to the outside for fresh air intake, strict adherence must be made to the minimum clearance to combustibles given on the instruction plate. Wood framing around a heater is a request for trouble.

3) SUPPLYING LIQUID PROPANE TO HEATER

This problem has occurred from time to time. To minimize the damage, and possible personal injury, shut off the gas supply and let the heater run until all of the liquid in the lines has been vaporized..

PREVENTIVE MAINTENANCE

Sure Flame Construction Heaters are built to withstand the rigors of operating on construction sites, for mining applications, and a multitude of other locations where heaters are used. To maintain the reliable performance required it is necessary to do a certain amount of regular maintenance.

A) VISUAL CHECKS

The following items should be checked for excessive wear or damage:

- 1) Wheels (if installed)
- 2) Cords and Connectors
- 3) Wiring and Conduit
- 4) Heater Shell (including heat shield) and Control Box

It is recommended that units purchased as spares be rotated periodically, so that each unit will be placed in operation at least once every 90 days.

B) BURNER

Flame Rod and Insulator - Clean with soap and water or solvent on a routine basis. Any build up on burner should also be removed at this time.

Ground Wire - Ensure that the ground wire is secured to the burner. This is necessary for the flame detection system to operate.

Spark Plug - Clean with solvent and check spark gap.

C) CONTROL BOX

The inside of the control box should be cleaned using a dry cloth or by blowing compressed air. Do not use any liquid or aerosol spray cleaners. Also check that all electrical connections are snug and tight.

D) MOTOR - The electric motor on the S400 & S400T Heaters is fitted with sealed bearings and no oiling is required. Keep the motor clean by blowing or wiping off dust or dirt in order to prevent it from over heating.

E) FAN - Check for dust or dirt build up on fan blades. Check the tightness of the set screw and run the heater to check for fan vibration.