

# Industrial Boiler and Burner Limit Control Switches

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## INDUSTRIAL BOILER AND BURNER LIMIT CONTROL SWITCHES

### Introduction:

Designers and manufacturers of industrial boilers are focused on meeting regulatory and safety requirements when developing highly efficient burner management systems (BMS). BMS are responsible for startup, operation and shutdown of a burner boiler systems. BMS monitor temperature, pressure and flow and employs safety shutoffs to shut down the burner boiler if an unsafe condition occurs.

### Safety Standards for Boilers and Burners

Both customers and insurers impose a list of safety standards on designers and manufacturers. Three primary UL safety standards that are commonly applied are:

1. UL 726 Standard for Safety Oil-Fired Boiler Assemblies
2. UL 795 Standard for Safety Commercial-Industrial Gas Heating Equipment
3. UL 834 Standard for Safety Heating, Water Supply, and Power Boilers - Electric

These three standards define the use of limit control switches and establish the requirement that they are built to meet UL 353 requirements.

### UL 353 Limit Controls

UL 353 requirements cover limit control switches and other interlocks which are switches responding to changes in liquid level, temperature or pressure. These safety controls are intended to safeguard heating, processing, air-conditioning and ventilating systems.

These limit control switches must meet several criteria:

- Enclosures must be designed to protect the operators from any electrical hazards
- The set point shall be indicated in a recognizable and legible manner
- A field adjustable switch shall have stops to prevent set points above the range of the control
- Automatic reset controls shall not reset or be resettable manually. The control can only be reset when safe operating conditions return.
- Manual reset controls shall not reset automatically. The control can only be reset when safe operating conditions return.
- Controls must undergo general performance and temperature tests
- Controls must undergo endurance testing
  - 100,000 cycles at full rated current load for automatic reset switches
  - 1,000 cycles at full rated current load and 5,000 cycles without current for manual reset switches

### Medium Pressure Gas and Oil Limit Control (Option XG6)

The Ashcroft Medium Pressure Gas and Oil Limit Control Switch is designed for use with air, LP Gas, natural gas, numbers #1 & #2 fuel oil and No. #6 oil preheated to 240°F. This limit control is an adjustable pressure operated switch with a secondary chamber to prevent fuel from entering the switch enclosure in the unlikely event that the diaphragm develops a leak. The control shuts down a fuel pump in high or low pressure conditions.

U.L. requires the control to be furnished with a set point indicating scale, an adjusting nut stop and a means of venting process fluid in the event of a diaphragm leak. Additionally, a pilot light can be added to fulfill Factory Mutual (FM) requirements.

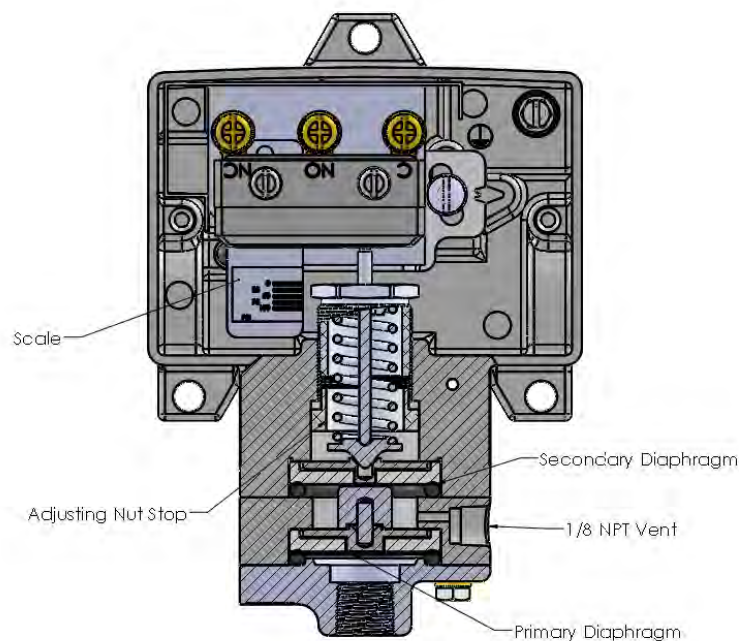


Figure 1 B400 Pressure Switch with option XG6

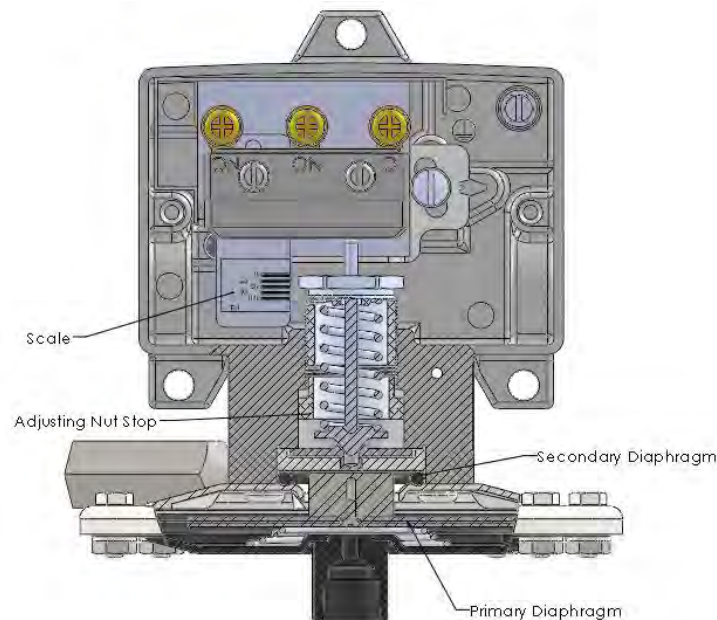
The operation of the limit control is similar to that of a standard pressure switch. If the primary diaphragm were to develop a leak, the oil or gas would be prevented from entering the electrical enclosure by the secondary diaphragm. The leaking oil or gas will then be vented to a safe area.

Option XG6 is available on B4, B7 and LPS series pressure switches. Pressure ranges available are 15 PSI to 600 PSI.

### Low Pressure Gas and Oil Limit Control (Option XG5)

The Ashcroft Low Pressure Gas and Oil Limit Control Switch is designed for use with air, LP Gas, natural gas and numbers #1 & #2 fuel oil at room temperatures. This limit control is an adjustable pressure operated switch with a secondary chamber to prevent fuel from entering the switch enclosure in the unlikely event that the diaphragm develops a leak. The control shuts down a fuel pump in high or low pressure conditions.

U.L. requires the control to be furnished with a set point indicating scale, an adjusting nut stop and a means of venting process fluid in the event of a diaphragm leak. Additionally, a pilot light can be added to fulfill Factory Mutual (FM) requirements.



*Figure 2 D400 Pressure Switch with Option XG5*

The operation of the limit control is similar to that of a standard differential pressure switch, except the limit control is used as a pressure switch. The high port is used as the pressure inlet while the low port is used as the vent. If the primary diaphragm were to develop a leak, the oil or gas would be prevented from entering the electrical enclosure by the secondary diaphragm. The leaking oil or gas will then be vented to a safe area.

Option XG5 is available on D4, D7 and LDS series pressure switches. Pressure ranges available are 30 IW to 150 IW.

### Steam Limit Control (Option XG8)

The Ashcroft Steam Limit Control Switch is designed for use on boilers. This limit control is an adjustable pressure operated switch set to stop burner operation when the recommended safe boiler working pressure is exceeded. This switch includes a single pole, double throw (S.P.D.T.) snap action switch element for normally open (N.O.) or normally closed (N.C.) operation

U.L. requires the control to be furnished with a set point indicating scale and an adjusting nut stop. The scale shows the approximate switch set point. The adjusting nut stop prevents the switch from being set beyond its range. During operation pressure may increase and exceed the recommended safe boiler working pressure. The limit control switch will shut down the burner at the control point. Burner operation is restored automatically once the boiler pressure falls below the control point. The Limit Control Switch should be separated from the boiler by means of a “pigtail” siphon (at least 7.5 inches long) or a coiled line assembly.

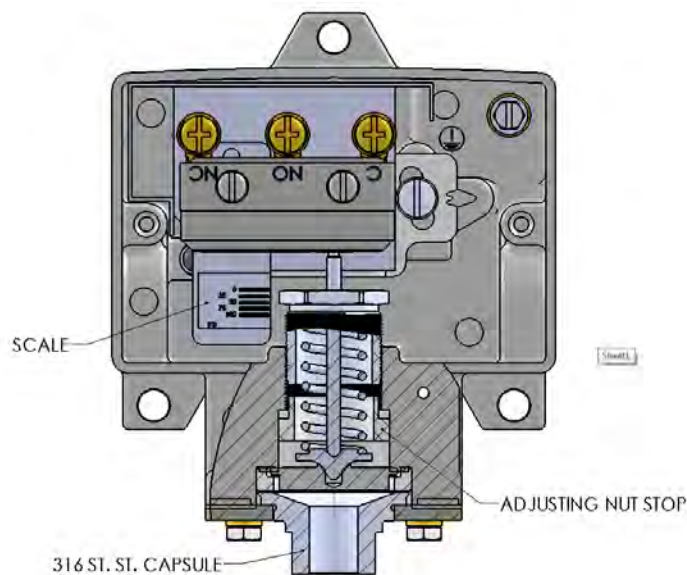


Figure 3 B400 Pressure Switch with Option XG8

Option XG8 is available on B4, B7 and LPS series pressure switches. Pressure ranges available are 15 PSI to 300 PSI.

### Summary

The Medium Pressure Gas and Oil Limit Control Switch, Low Pressure Gas and Oil Limit Control Switch and Steam Limit Control Switch are designed to meet the demanding requirements of UL 353 for endurance and safety. Having the UL 353 approval allows the switches to be used in the BMS of burners and boilers to act as limit controls or safety shutdowns.