



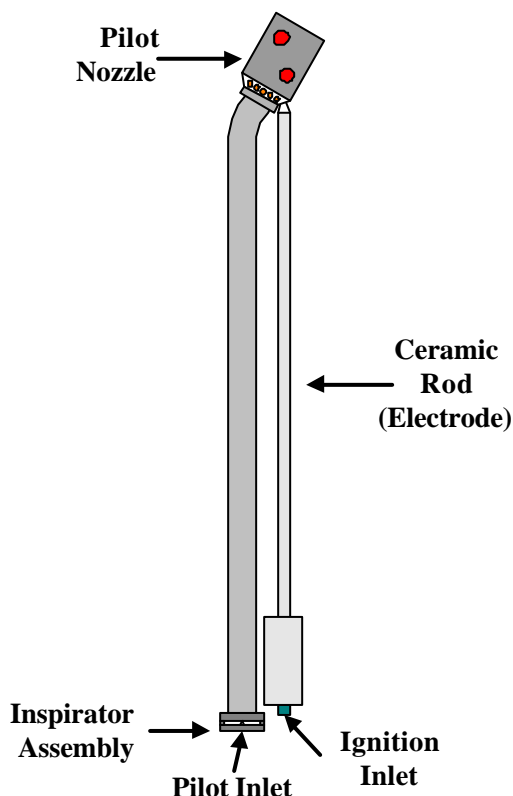
## ***KEP-100 Automatic Electronic Ignition Control System***

John Zink are committed to the principle of pilot ignition for flares. The use of a continuous pilot is the only reliable method to guarantee flare ignition and stability. It is proven that flare tips and pilots work as a system and pilotless flare tips have a tendency to instability.



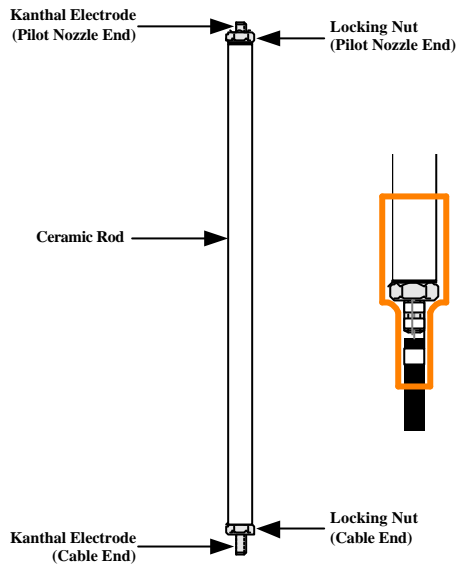
The Kaldair model KEP-100 automatic electronic pilot ignition control system is proprietary design providing many operational benefits over conventional flare pilot ignition control systems which use flame front generation for ignition or thermocouples to detect the flame. The KEP offers the following features

- Proven and reliable pilot monitoring technology
- Instantaneous recognition of pilot failure
- Fast, reliable pilot ignition / re-ignition
- Easy and flexible installation
- Simple hassle free operation
- Low capital cost



The KEP pilot draws in air with the fuel gas fed to the pilot to create a combustible mixture that is fed into the pilot burner nozzle. The burner nozzle includes a high voltage electrode that terminates directly in the burner nozzle. Upon energizing the electrode with a high AC voltage potential, a high-voltage arc is discharged creating a spark that ignites the fuel/air mixture in the burner nozzle.

The direct spark ignition achieved with the KEP-100 electronic pilot is far more reliable than conventional flame front generator ignition systems, which require a long purge of the flame front lines followed by the remote ignition of the flame front at the remote location.



The electrode used in the pilot nozzle is a rugged Kanthal rod design. The rod is insulated along the entire length of the pilot by a high temperature ceramic rod. The ceramic rod/electrode assembly is protected in a 1/2" 316 SS pipe. The electrical connection is made in a stainless steel connector box at the base of the pilot. The high voltage cable termination is made at this point using a spark plug boot-type connection to the Kanthal rod.

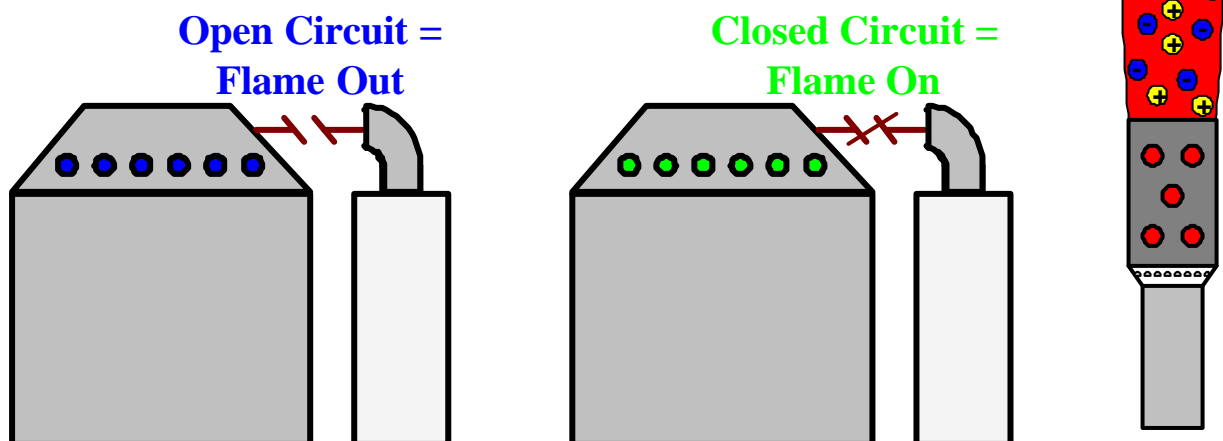
The specially developed KEP ignition cable has one core and a single cable is used for both ignition and monitoring.

### How does Ionization Detection Work ?

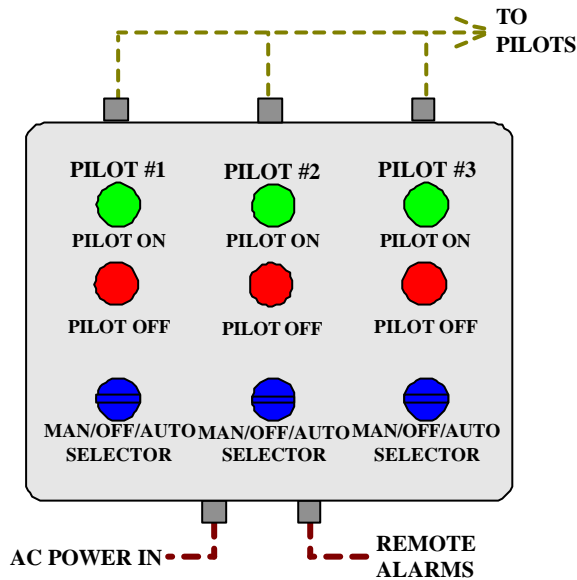
In the ignition monitoring mode, the electrode is energized with a small AC potential applied between the electrode and ground. The AC current flow between the electrode and ground is then monitored by the control system.



If no flame is present, there is no path for current flow between the electrode and ground (for example, an open circuit is detected). However, if a flame is present, the pilot nozzle will contain a cloud of ionized gases in the burning flame (referred to as "Flame Ionization"). These ionized gases create a path for current flow between the electrode and ground (for example, a closed circuit is detected).



The method of flame ionization monitoring is a very reliable pilot flame monitoring technique. The instant that the flame is lost, the loss is detected by the control system, allowing the control system to immediately switch to the re-ignition mode to attempt to re-ignite the pilot. Conventional pilot monitoring techniques rely on thermocouple measurements that create a considerable response time delay as the thermocouple sheath cools to the alarm set point. Thermocouples can take up to 15 minutes to recognize flame failure. Cold venting of hazardous flare gas for this period of time could be fatal.

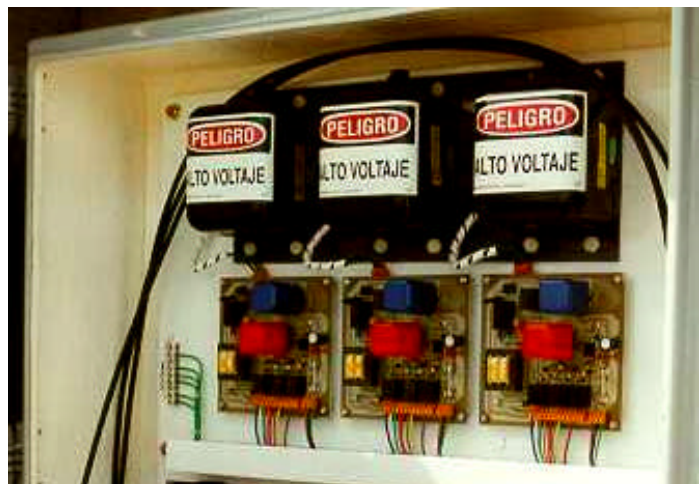


If the first attempt is unsuccessful than the purge delay cycle is started once again. These considerable response time delays with an FFG ignition system can often leave the pilots unlit for an unacceptable, dangerous time period. The KEP system, however, provides immediate indication of pilot flame loss and nearly instantaneous re-ignition via direct spark in the pilot nozzle.

Conventional pilot monitoring systems use a thermocouple mounted in the pilot nozzle. The extreme temperature of the pilot flame makes the long-term reliability of this technique very poor. In fact it is common to burn up the thermocouple junctions upon initial startup of the pilots. When designs are modified to protect the thermocouple, response time upon loss of flame becomes very slow.

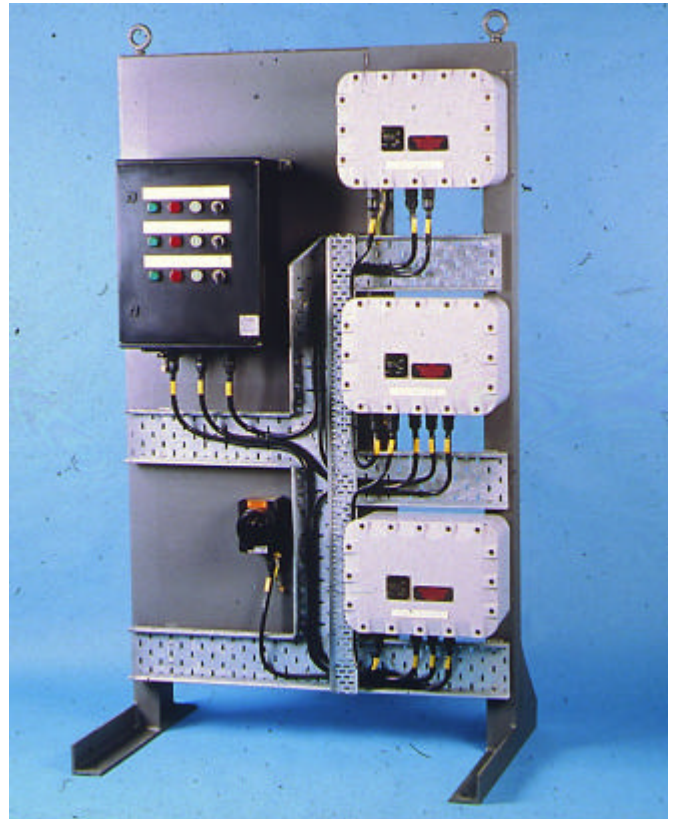
With the KEP-100 pilot ignition system all of the electronics to control the ignition and flame monitoring are housed in a remote control panel. A single high voltage cable connection is made between the control panel and each of the pilots. The standard control panel can be easily installed up to 300m from the pilots and as far as 1000 m with special modifications.

The control panel includes the high voltage transformer (6 kVA) used for pilot ignition and all of the monitoring and control electronics. The panel includes automatic mode selector, manual ignite pushbutton, flame on & flame off indicator lights for each of the pilots. Each pilot has its own dedicated monitoring and control circuits and ignition transformer for truly independent operation of each of the pilots.



The Kaldair KEP-100 ignition control system has been in use for many years and has proven highly successful in hundreds of flaring applications from the rugged Arctic conditions of the North Slope of Alaska to the extremely high winds of the North Sea in the Atlantic. The direct spark ignition coupled with the unique flame ionization monitoring technique provides a system far more reliable than conventional flame front ignition or thermocouple monitoring systems.

Through continuous improvement and experience the KEP system has evolved over the years. Many improvements have been made to the pilot to improve its reliability and operational life. The latest pilots include high integrity systems to eliminate heat damage to the KEP cables.



The latest KEP pilot incorporates the unique technology of the KEP ignition and monitoring system into the advanced John Zink Windproof pilot which, not only reduces gas consumption by up to 50%, but also operates in winds of 160 mph and rainfall equivalent to 20 inches per hour, and will also reliably reignite in these conditions.

The KEP system can be supplied for both safe and hazardous areas. The system is certified to most international standards including ATEX. The individual requirements of most Oil and Gas Operators and Contractors specifications can be accommodated.

**JOHN ZINK ♦ TODD COMBUSTION ♦ BROWN FINTUBE ♦ KALDAIR**

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