

Explosion Proof Apparatus Optional Fittings

Employment
Opportunities

Literature
& Manuals

All Parr reactors are normally equipped with open type, variable speed motors, electric heaters and controllers intended for use in non-hazardous environments. These standard units can be used in most laboratories without undue hazard, but there will be situations where the installed equipment must be considered explosion proof. Parr offers various optional stirrer drives and heating systems to meet these strict requirements. Monitoring and reporting in hazardous areas can be accomplished using Intrinsically Safe Technology. See the handbook [Understanding Hazardous Area Sensing](#) from TURCK Inc. for a definition and enhanced understanding of the technology.



Explosion Proof, Aluminum Block Heater on a Bench Top Reactor

USA and Canadian Codes

Designing electrical equipment to be operated in hazardous location is a complex subject, governed by extensive national electrical codes and supplemented by local regulations which require that all electrical equipment installed in a governed location must be approved for use with the specific gas, vapor or dust that will be present in that location. USA and Canadian electrical codes classify hazardous locations according to the nature and concentration of specific hazardous or flammable materials. These are divided into three classes:

Class I - Flammable liquids, gases or vapors.

Class II - Combustible or electrically conductive dusts.

Class III - Easily ignitable fibers or flying particles.

There are two divisions within each of these classes.

Division 1 - Where the flammable material exists in the atmosphere under normal operating conditions.

Division 2 - Where the hazardous material is confined within a closed system from which it may be released only under abnormal conditions, such as a leak in the system.

Class I locations are further subdivided into four groups, A, B, C and D which identify specific explosive gases and vapors. Explosive dusts and fibers in Class II are subdivided into Groups E, F and G. Most hazardous applications for Parr apparatus will occur in atmospheres identified by Class I, Group A for acetylene, Group B for hydrogen and Groups C and D for most other combustible gases and vapors. Class II, Group F covers coal dust. Most other combustible dusts, such as flour and grain, are in Group G. Minimum ignition temperatures and energy levels are established for specific materials in each group.

The European Community, International Electromechanical Commission (IEC) has corresponding classifications for hazardous locations. Parr will work with all users to provide equipment compatible with their own local codes. The components in Parr reactor systems which may be considered hazardous, and the steps that can be taken to reduce or eliminate the hazards they represent, are described below.

Explosion Proof Motors

Because of sparking from brush contacts, electric motors clearly represent the principal explosion hazard introduced by a stirred reactor. Electric motors approved for Class I, Groups C and D, and Class II, Groups F and G atmospheres are readily available in most sizes and voltages. These sealed motors are suitable for most hazardous applications, and they are sometimes used with hydrogen, but they are not approved for Class B atmospheres. To meet Class B requirements, a motor must be purged by building up a positive pressure of air within the motor to prevent explosive gases or vapors from reaching electrical ignition sources. This requires a special, air purged motor which can be provided when required.

An alternate method of dealing with the explosion hazard is to use an air driven motor. These are powered by compressed air and offer a convenient and satisfactory drive system for use in flammable atmospheres, including hydrogen. They are available in sizes suitable for most Parr reactors.

Explosion Proof Heaters

The easiest way to provide an explosion proof heater is to use a steam or hot oil jacket and ensure that the highest temperature that can be reached in the jacket is well below the minimum ignition temperature for the specific hazardous atmosphere in which it will be installed. An aluminum block heater can be considered explosion proof if it has explosion proof wiring, and if it is operated with an auxiliary controller that will hold the surface temperature below a safe maximum. Electric heaters purged with clean air can also be considered explosion proof, but it is doubtful that seals can be maintained in a purged heater to provide true protection over a long period of time. Please see our [Heaters page](#) for additional information on selection.

Explosion Proof Wiring

In an explosion proof system, all electric wiring with significant voltage or current carrying capability must be routed in approved sealed conduit or in specially sealed flexible cables. All terminations and switches must be contained in approved boxes or housing. The user must provide all local wiring and connections to a power supply, and must ensure that the installation meets all requirements of the local electrical code.

Certain sensors, such as thermocouples, pressure transducers and tachometer pickups carry such low electric loads that they are a potential ignition source only in the event of a most unusual failure. In many installations these low hazard components are not seen as a problem. They can, however, be protected with isolation barriers which will make them intrinsically safe even in an unusual failure. These energy limiting electronic barriers can be provided where required.

Explosion Proof Controllers

The most commonly used method for dealing with the ignition hazard introduced by a temperature or process controller is simply to locate the controller outside of the hazardous atmosphere. Another choice is to install the controller in a cabinet which can be purged with clean air within the hazardous location.

Special Systems

Parr can furnish systems approved for use in hazardous locations up through Class I, Division 1, Group B in which specific hazardous gases will be present. Each of these formally approved systems must be designed and built on a custom basis, with all current carrying wiring and fittings installed in accordance with the requirements discussed above.



Air Motor with Muffler, Oiler, and Valve