



*Stand-alone Solar Electrical Installations in
Hazardous Locations
What is the Class 1, Division 2
Classification?
A Quick Primer*



The Oil & Gas Industries have been major customers of the Off-Grid Solar Electric Industry for many years. At a recent training event—Choosing the Right Charge Controller for Off-Grid Solar Electric Systems—we learned that many of you want to learn more about “What the Hazardous Locations (Class 1, Division 2 Groups A-D) Classification means & Why you should look for this important certification classification” when you purchase and install charge controllers in a stand-alone solar powered industrial electrical systems. This Primer answers those questions and provides a quick, high-level overview of the Classification Standards ...

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Stand-alone Solar Electrical Installations in Hazardous Locations What is the Class 1, Division 2 Classification?

A Quick Primer

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Protecting electrical equipment in hazardous locations, like the one pictured below, requires special considerations to make sure that the electronics (and their enclosures) are designed and operate in a way that is ignition & explosion proof. Industrial solar electrification systems that operate in hazardous locations in and around the U.S. or Canada, (like those in the Oil & Gas Industries) must be explosion proof and their electrical specifications must comply with both the U.S. National Electrical Code (NEC) Division and Canadian Standards Association (CSA) hazardous locations classification systems—the NEC and CSA define hazardous locations by class and division.

Protecting electrical equipment in hazardous locations requires special considerations to make sure that the electronics (& their enclosures) are designed & operate in a way that is ignition & explosion proof.



In other parts of the world, areas containing potentially explosive atmospheres are dealt with using a “Zone System” classification scheme. Zones are based predominantly on the International Electro-technical Commission (IEC) and the European Committee for Electro-technical Standardization (CENELEC) standards. The most significant difference in the “Zone System” is that the level of hazard probability is divided into three Zones as opposed to two Divisions, as with the NEC and CSA standards. Here is a quick summary chart illustrating these Hazardous Location Basics:

What is the Class 1, Division 2 Classification?

Hazardous Materials	Class / Division System	Zone System ⁽¹⁾
Gasses or Vapors ⁽¹⁾	Class 1, Division 1	Zone 0, Zone 1
	Class 1, Division 2	Zone 2
Combustible Dusts ⁽²⁾	Class 2, Division 1	Zone 20, Zone 21
	Class 2, Division 2	Zone 22
Fibers or Flyings	Class 3, Division 1	No Equivalent
	Class 3, Division 2	

(1) The United States & Canada have adopted Zones for Gasses and Vapors.

(2) Zones for Dust are not yet developed for North America.

For the purposes of this special feature, we will highlight the North American Class 1, Division 2 classification system and why the charge controllers used in these stand-alone solar powered industrial electrical systems must be appropriately certified:

- **Class** considers the industrial ecosystem where flammable or explosive gases/ vapors, liquids or fibers/dusts may be present:

- Class 1** Locations are made hazardous by the presence of flammable gases, liquids or vapors.
- Class 2** Locations are described as hazardous because of the presence of combustible dusts.
- Class 3** Locations contain easily ignitable fibers or flyings.

- **Division** refers to the likelihood that ignitable concentrations of flammable materials are present:

Division 1 Designates an environment where ignitable concentrations of flammable gases, liquids, vapors or dusts can exist some of the time, or all of the time, under normal operating conditions or where easily ignitable fibers and flyings are manufactured, handled or used.

Division 2 An environment where ignitable concentrations are not likely to exist under normal operating conditions or where Class 3 materials are stored or handled.

- Hazardous classes are further defined by **Groups**. Combustible materials are grouped by their relevant physical properties. In fact, the Class 1 classification is divided into 4 Groups, determined by the specific gas or vapor involved—Groups A thru D (these groups include, but are not limited to):

- Group A** Acetylene
- Group B** Hydrogen
- Group C** Ethylene & Carbon Monoxide
- Group D** Propane, Gasoline, Naphtha, Benzene, Butane, Ethyl Alcohol, Acetone & Methane

Some typical Class I Division 2 Applications that lend themselves well to Off-Grid Solar Electrical Systems include, but are not limited to:

- SCADA (Supervisory Control & Data Acquisition)
- Remote Telemetry
- Gas Well Injection Pumps
- Cathodic Protection
- Gas Flow Meters
- Communication Hubs (Wellhead & Pipeline Monitoring)
- Off-Shore Platforms
- RTU (Remote Terminal Unit) Communications
- Central Station Monitoring
- HMI (Human Machine Interface) Sensors

Class I, Division 2 certification permits use of an electrical device in an environment where explosive gases are periodically present.

Morningstar is the world-leading supplier of Solar Charge Controllers to the Oil & Gas Industry – we have over 2 million units installed around the world, across a variety of industrial, commercial and consumer applications. Our [SunSaver™](#) and [SunKeeper™](#) controllers have undergone rigorous testing and received a myriad of safety certifications, including but not limited to: Hazardous Locations - Class 1, Div. 2 Groups A-D; ANSI/ISA-12.12.01-2007 (USA); and CSA C22.2 No. 213-M1987 (Reaffirmed 2004) (CANADA)—making them ideally suited for the Oil & Gas industry. In fact, our Class I, Division 2 certified controllers have been proven to reduce the overall cost and time of installation, as they do not require an explosion-proof (purged & pressurized) enclosure.



Our [SunSaver](#) and [SunKeeper](#) controllers are uniquely qualified for use in Oil & Gas Installations—the operating temperature of their internal circuitry is much lower than the auto-ignition temperature of most flammable gases and vapors. They are also well sealed and operate at low temperatures without the use of relays, thus preventing the high temperature arcing and sparking. Each product version has been certified and reaffirmed by an independent laboratory.

Stand-alone Solar Electrical Installations in Hazardous Locations

What is the Class 1, Division 2 Classification?

The [SunSaver](#) is:



- Manufactured in a Certified ISO 9001 Facility
- Available in 6A, 10A or 20A at 12Vdc or 24Vdc Versions.
- Environmentally Optimized for High Reliability & Increased Battery Life

- Hazardous Locations - Class 1, Div. 2 Groups A-D
- CE, RoHS and REACH Compliant
- UL 1604/ANSI/ISA 12.12.01-2000 (USA) and CSA C22.2 No. 213-M1987 (Reaffirmed 2004) (CANADA) Listed
- UL 1741 (with terminal cover) Listed*
- FCC Title 47 (CFR), Part 15 Subpart B for Class B Device

* Wire terminal cover included with every SunSaver.

The [SunKeeper](#) is:

- Manufactured in a Certified ISO 9001 Facility
- Available in 6A & 12A at 12Vdc Versions
- Environmentally Optimized & High Temperature Rated
- Hazardous Locations - Class 1, Div. 2 Groups A-D
- CE, RoHS and REACH Compliant
- UL 1604/ANSI/ISA 12.12.01-2000 and CSA C22.2 No. 213-M1987 Listed



To get the full facts on our [SunSaver](#) and [SunKeeper](#) Controllers or if you want to learn more about how Charge Controllers work in Off-Grid Solar Electrical Systems, check out our website at www.morningstarcorp.com

For more information about specific hazardous locations and their suitable ratings, check out the OSHA website: www.osha.gov/doc/outreachtraining/htmlfiles/hazloc.html

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