



SUITABILITY OF MARATHON ELECTRIC MFG. CORP. SYNCHRONOUS AND INDUCTION (ASYNCHRONOUS) GENERATORS FOR CLASS I, MATERIAL GROUPS A, B, C, AND D, DIVISION 2, HAZARDOUS LOCATIONS

Reference: U. S. National Electric Code (NEC) NFPA 70-2008, NEC NFPA 70-2008 Handbook

Definitions – Per the above reference:

1. Class 1 Locations – Section 500.5(B) states:

“Class 1 locations are those in which flammable gasses, flammable liquid-produced vapors, or combustible liquid-produced vapors are or may be present in the air in quantities sufficient to produce explosive or ignitable mixtures. Class 1 locations shall include those specified in 500.5(B)(1) and (B)(2).”

2. Class I, Division 1 Locations – Section 500.5(B)(1) states in part:

“A Class I, Division 1 Location is a location

- (1) In which ignitable concentrations of flammable liquid-produced vapors, or combustible liquid-produced vapors can exist under normal operating conditions, or
- (2) In which ignitable concentrations of such gasses or flammable liquid-produced vapors, or combustible liquid-produced vapors may exist frequently because of repair or maintenance operations or because of leakage

Note: Section 501.125 (A) defines motors and generators suitable for use in Class I, Division 1 locations.

Marathon Electric Mfg. Corp. does not manufacture explosion proof synchronous or induction (asynchronous) AC generators suitable for these locations.

3. Class I, Division 2 Locations – Section 500.5(B)(2) states:

“A Class I, Division 2 Location is a location:

- (1) In which volatile flammable gases, flammable liquid-produced vapors, or combustible liquid-produced vapors are handled, processed or used, but in which the liquids, vapors or gases will normally be confined within closed containers or closed systems from which they can escape only in case of accidental rupture or breakdown of such containers or systems, or in case of abnormal operation of equipment, or
- (2) In which ignitable concentrations of flammable gases, flammable liquid-produced vapors, or combustible liquid-produced vapors are normally prevented by positive mechanical ventilation, and which might become hazardous through failure or abnormal operation of the ventilating equipment, or
- (3) That is adjacent to a Class I, Division 1 location, and to which ignitable concentrations of flammable gases, flammable liquid-produced vapors, or combustible liquid-produced vapors might occasionally be communicated unless such communication is prevented by adequate positive-pressure ventilation from a source of clean air and effective safeguards against ventilation failure are provided.”

Note:

Section 501.125 (B) defines motors and generators suitable for use in Class I, Division 2 Locations.

Marathon Electric Mfg. Corp. does manufacture synchronous and induction (asynchronous) AC generators suitable for use in these locations as will be discussed below.

4. Materials – Section 500.6 states:

“For purposes of testing, approval, and area classification, various air mixtures (not oxygen enriched) shall be grouped in accordance with 500.6(A) and 500.6(B).”

A. Group A Materials – Section 500.6 (A) (1) states:
“Acetylene [497:3.3.5.1.1]”

B. Group B Materials - Section 500.6 (A) (2) states:
“Group B. Flammable gas, flammable liquid-produced vapor, or combustible liquid-produced vapor mixed with air that may burn or explode, having either a maximum experimental safe gap (MESG) value less than or equal to 0.45 mm, or a minimum igniting current ratio (MIC ratio) less than or equal to 0.40. [497:3.3.5.1.2] A typical Class 1, Group B material is hydrogen.”

C. Group C Materials – Section 500.6(A)(3) states:
“Group C. Flammable gas, flammable liquid-produced vapor, or combustible liquid-produced vapor mixed with air that may burn or explode, having either a maximum experimental safe gap (MESG) value greater than 0.45 mm and less than or equal to 0.75 mm, or a minimum igniting current ratio (MIC ratio) greater than 0.40 and less than or equal to 0.80, [NFPS 497:3.3]. FPN: A typical Class 1, Group C material is ethylene.”

D. Group D Materials – Section 500.6(A)(4) states:
“Group D materials are flammable gas, flammable liquid-produced vapor or combustible liquid produced vapor mixed with air that may burn or explode, having either a maximum experimental safe gap (MESG) value greater than 0.75 mm, or a minimum igniting current ratio (MIC ratio) greater than 0.80. [NFPA 497:3.3] FPN No. 1: A typical Class 1, Group D material is propane.”

Note: Refer to Section 500.6 (A) (4), Table 5.1 of the U.S. National Electrical Code, NFPA 70-2008 Handbook which identifies the various gases and vapors by their NEC Group (A, B, C, D), and lists the Auto Ignition temperatures (AIT) in °C of the materials comprising these Groups. The internal or external temperature of the generator cannot exceed the AIT of these materials.

General.

Section 501.125(B) of NFPA 70-2008 states that an open motor or generator may be used in Class I, Division 2, Groups A, B, C and D Material locations providing that none of the following are present:

- a. Brushes and collector/slip rings.
- b. Sliding contacts that can produce an arc or spark, i.e.: a voltage adjust rheostats, or similar type devices.
- c. Switching mechanisms which can produce an arc, i.e.: a remote voltage adjust switch such as is used with our DVR2000E AVRs, rotary re-connection switches, transfer switches, protective devices such as circuit breakers, protective relays, thermostats with either NO or NC contacts, AVR On/Off switches etc.
- d. Any arc producing device.

Notes:

1. Section 501.115 of NFPA 70-2008 states that fuses must be in an approved enclosure, or of an approved type, such as hermetically sealed, or oil immersed. These approved types of fuses are not available from Marathon Electric.
2. Section 501.125(B) of NFPA 70-2008 states in part: “The exposed surface of space heaters used to prevent condensation of moisture during shutdown periods shall not exceed 80 percent of the ignition temperature in degrees Celsius of the gas or vapor involved when operating at rated voltage and the maximum surface temperature [based on a 40° C (104° F) ambient] shall be permanently marked on a visible name plate mounted on the machine.” Should anti-condensation space heaters be required, please consult with the Factory for availability of heaters that comply with this Section.

GENERATOR MARKING

Generator Marking - Section 500.8(C) Equipment Marking 6 (a) Special Allowances states:

“(a) General Purpose Equipment. Fixed general-purpose equipment in Class I locations, other than fixed luminaries (lighting fixtures) that is acceptable for use in Class I, Division 2 locations shall not be required to be marked with the class, division, group, temperature class or ambient temperature range.” In accordance with this Section, Marathon Electric Mfg. Corp. does not mark their generators acceptable for use in these locations with the class, division, group, temperature class or ambient temperature range.

GENERATOR TYPES

THREE PHASE SELF VOLTAGE REGULATED TYPE LIMA[®]MAC AC GENERATORS

All three phase LIMA[®]MAC AC generators (alternators) are brushless, synchronous, self excited, and are self-voltage regulated, meaning they have no automatic voltage regulator with sliding contacts, fuses, etc. Therefore, these generators comply with all of the criteria listed by Section 501.125 (B) for Class I, Material Groups A, B, C , and D Division 2 locations, and therefore, are acceptable for use in these locations.

Marathon Electric’s Engineering Department has determined that the lowest acceptable site temperature code to be temperature code T3 (Minimum ignition temperature of 200°C per table 500.8 (B)). Engineering has also limited the acceptable full load temperature rise of any generator we furnish for this type environment to 80°C as measured by the resistance method of measurement over a maximum ambient temperature of 40°C. All standard three phase LIMA[®]MAC generators are nameplate rated at 80°C temperature rise by the resistance method of measurement.

Any required additional accessories such as circuit breakers, instrument panels, etc. are to be furnished loose by Marathon, or others, for installation by others in an enclosure identified for Class I, Division 2 locations in accordance with Section 501.105 (B). Or, alternatively, in a location outside of the hazardous area.

SINGLE AND THREE PHASE EXTERNALLY VOLTAGE REGULATED TYPE MAGNAMAX^{DVR®}, MAGNAPLUS[®] AND PANCAKE AC GENERATORS

All standard type MAGNAMAX^{DVR®}, MAGNAPLUS[®], and PANCAKE AC single and three phase AC generators (alternators) are brushless, synchronous, self-excited, externally voltage regulated AC generators. As with the LIMA[®]MAC generators, when nameplate rated at their 80°C temperature rise rating, these units are suitable for operation in Class I, Material Groups A, B, C, and D, Division 2 Temperature Code T3 (Minimum ignition temperature of 200°C per table 500.8 (B)) locations, and therefore, are acceptable for use in these locations.

The exception here is that their automatic voltage regulators are not necessarily suited for these locations, so Marathon Electric Mfg. Corp. has determined that automatic voltage regulators, and any associated accessories used with these regulators, and/or additional generator accessories such as circuit breakers, instrument panels, etc. shall be furnished loose by Marathon, or others, for installation by others in an enclosure identified for Class I, Division 2 locations in accordance with Section 501.105 (B). Or, alternatively, in a location outside of the hazardous area.

THREE PHASE INDUCTION (ASYNCHRONOUS) TYPE PRIMELINE[®] GENERATORS

All standard three phase PRIMELINE[®] induction (asynchronous) generators are essentially induction motors being driven above synchronous speed. As such, they are similar to the LIMA[®]MAC in that they are brushless, and have no external automatic voltage regulators with sliding contacts, fuses, etc. Therefore, these generators comply with all of the criteria listed by Section 501.125 (B) for Class I, Material Groups A, B, C, and D, Division 2 Temperature Code T3 (Minimum ignition temperature of 200°C per table 500.8 (B)) locations, and therefore, are acceptable for use in these locations.

All standard PRIMELINE[®] three phase generators are nameplate rated at 80°C temperature rise by the resistance method of measurement over a maximum ambient temperature of 40°C. Any required additional accessories such as circuit breakers, instrument panels, etc. are to be furnished loose by others, for installation

in an enclosure identified for Class I, Division 2 locations in accordance with Section 501.105 (B). Or, alternatively, in a location outside of the hazardous area.

Note: The National Electrical Code also states that the local authority having jurisdiction over the installation site must make the final determination as to what type of generator is required. The application and operation of the generator is beyond the control of the generator manufacturer.

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