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Recommended Practice

Recommendations for the Preparation, Content, and Organization of Intrinsic Safety Control Drawings

ISA-RP12.2.02 — Recommendations for the Preparation, Content, and Organization of Intrinsic Safety Control Drawings

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1 Scope

1.1 This recommended practice provides guidance in the preparation of control drawings for intrinsically safe apparatus, associated apparatus, and intrinsically safe systems.

1.2 This recommended practice is intended to be used in conjunction with ANSI/UL 913-1988, “Standard for Safety, Intrinsically Safe Apparatus and Associated Apparatus for Use in Class I, II, and III, Division 1, Hazardous (Classified) Locations.”

1.3 This recommended practice is not intended to include guidance for the design or installation of intrinsically safe equipment or systems.

2 Purpose

2.1 This recommended practice has been formulated to provide guidance for and to promote the uniformity of manufacturers' control drawings for intrinsically safe apparatus, associated apparatus, and intrinsically safe systems.

2.2 Article 504 of the *National Electrical Code*® and Canadian Electrical Code, Part 1, Appendix F, requires that documentation for intrinsically safe apparatus and associated apparatus include a control drawing. This recommended practice is intended to provide guidance for the content of control drawings.

3 Definitions

3.1 control drawing: A drawing or other document provided by the manufacturer of the intrinsically safe or associated apparatus that details the allowed interconnections between the intrinsically safe and associated apparatus.

3.2 entity concept (also known as entity evaluation): A method used to determine acceptable combinations of intrinsically safe apparatus and connected associated apparatus that have not been previously investigated in such combination.

NOTE — ISA-TR12.2-1995 provides more information on the use of the entity concept.

3.3 entity parameters for intrinsically safe apparatus:

C_i: total equivalent internal capacitance that must be considered as appearing across the terminals of the intrinsically safe apparatus.

I_{max}: The maximum dc or peak ac current that can be safely applied to the terminals of the intrinsically safe apparatus. The maximum input current may be different for different terminals.

L_i: The total equivalent internal inductance that must be considered as appearing across the terminals of the intrinsically safe apparatus.

V_{max}: The maximum dc or peak ac voltage that can be safely applied to the terminals of the intrinsically safe apparatus. The maximum input voltage may be different for different terminals.

3.4 entity parameters for associated apparatus:

C_a: The maximum value of capacitance that can be connected to the intrinsically safe circuit of the associated apparatus.

I_{sc}: The maximum dc or peak ac current that can be drawn from the intrinsically safe connections of the associated apparatus.

L_a: The maximum value of inductance that can be connected to the intrinsically safe circuit of the associated apparatus.

V_{oc}: The maximum dc or peak ac open circuit voltage that can appear across the intrinsically safe connections of the associated apparatus.

Additional entity parameters for associated apparatus with multiple channels may include the following:

I_t: The maximum dc or peak ac current that can be drawn from any combination of terminals of a multiple-channel associated apparatus configuration.

V_t: The maximum dc or peak ac open circuit voltage that can appear across any combination of terminals of a multiple-channel associated apparatus configuration.

3.5 simple apparatus (as applied to intrinsic safety): A device that will not generate or store more than 1.2 V, 0.1 A, 25 mW, or 20 µJ. Examples are switches, thermocouples, light-emitting diodes, and resistance temperature detectors.

4 General considerations

4.1 Types of control drawings

There are three basic types of control drawings:

a) Control drawings in which intrinsically safe apparatus is identified by manufacturer and model number, for connection to associated apparatus that is specified only by entity parameters (see Figure 1).

b) Control drawings in which associated apparatus is identified by manufacturer and model number, for connection to simple apparatus or to intrinsically safe apparatus that is specified only by entity parameters (see Figure 2).

c) Control drawings of intrinsically safe systems in which both the intrinsically safe apparatus and the associated apparatus are identified by manufacturer and model number (see Figure 3).

4.2 Availability

Control drawings should be readily available from the manufacturer. The information in the document is critical to the safe design and installation of an intrinsically safe system. Before equipment is purchased, the compatibility of the intrinsically safe apparatus and the associated apparatus as a system should be determined. Typically, the first person to have need of the control drawing is the system designer. Without the control drawings, the system designer cannot accurately specify the required equipment.

4.3 Drawing format

Control drawings should be of a size that easily can be distributed. The preferred sizes for control drawings are 8 1/2 x 11 (approximately A4) or 11 x 17 inches (approximately A3). Text size and figures should be legible when reduced to 64 percent of original size. Several small sheets are preferable to one large sheet.

5 Drawing content

5.1 Wiring diagram

The control drawing should contain a wiring diagram showing interconnections of the intrinsically safe apparatus and the associated apparatus. It is not necessary to show internal circuitry of the apparatus; however, information showing the operation of the apparatus can be very useful to the system designer.

5.2 Equipment identification

The following minimum information should be provided:

5.2.1 Control drawings provided by the manufacturers of intrinsically safe apparatus (as shown in Figure 1) should identify the model number(s) and entity parameters of the intrinsically safe apparatus, and should specify the entity parameters for acceptable associated apparatus.

5.2.2 Control drawings provided by the manufacturers of associated apparatus (as shown in Figure 2) should identify the model number(s) and entity parameters of the associated apparatus,

and should specify the entity parameters for acceptable intrinsically safe apparatus, or specify connection to simple apparatus.

5.2.3 Control drawings that specify the entire intrinsically safe system (as shown in Figure 3) should identify the model number(s) of both the associated apparatus and the intrinsically safe apparatus, and should specify the interconnection of the intrinsically safe apparatus and associated apparatus. Control drawings of this type may be provided by either the manufacturer of the associated apparatus or the manufacturer of the intrinsically safe apparatus.

5.3 Entity parameters

When entity parameters are provided, they should be supplied in a table or other suitable form, showing allowable values for each applicable class and group. When multi-channel associated apparatus is involved, the terminals to which the entity parameters apply should be clearly identified. It may be necessary to have more than one set of parameters for multiple terminals.

It is possible to have both system configuration and entity configuration shown on the same control drawing. In such cases, it is possible for the identified associated apparatus to have entity parameters that exceed the allowed entity parameters for the intrinsically safe apparatus. Evaluation using the entity concept results in the application of more than two faults. When equipment is evaluated as a system, only two faults are applied. The entity concept provides a great deal of flexibility for configuring a system, but at the expense of excluding some equipment that would be acceptable under the system configuration.

5.4 Hazardous location identification

The control drawing should include a demarcation line between the hazardous (classified) and the nonhazardous (unclassified) locations, and should identify equipment that may be installed in each location. The hazardous locations should be identified by class, group(s), and division(s).

5.5 Control drawing identification

The control drawing should be identified by manufacturer, identification number, sheet or page number of total, and some form of revision control (e.g., date or revision level).

5.6 Maximum voltage

Control drawings for associated apparatus should show the maximum nonhazardous location voltage that may be used with the associated apparatus.

5.7 Installation information

The control drawing should contain a reference to ANSI/ISA-RP12.6, and a reference to the *National Electrical Code*®, NFPA 70 Article 504 or CEC Part 1, Appendix F.

5.8 Other information

At the discretion of the manufacturer, other useful information may be provided on the control drawing to further aid proper installation.

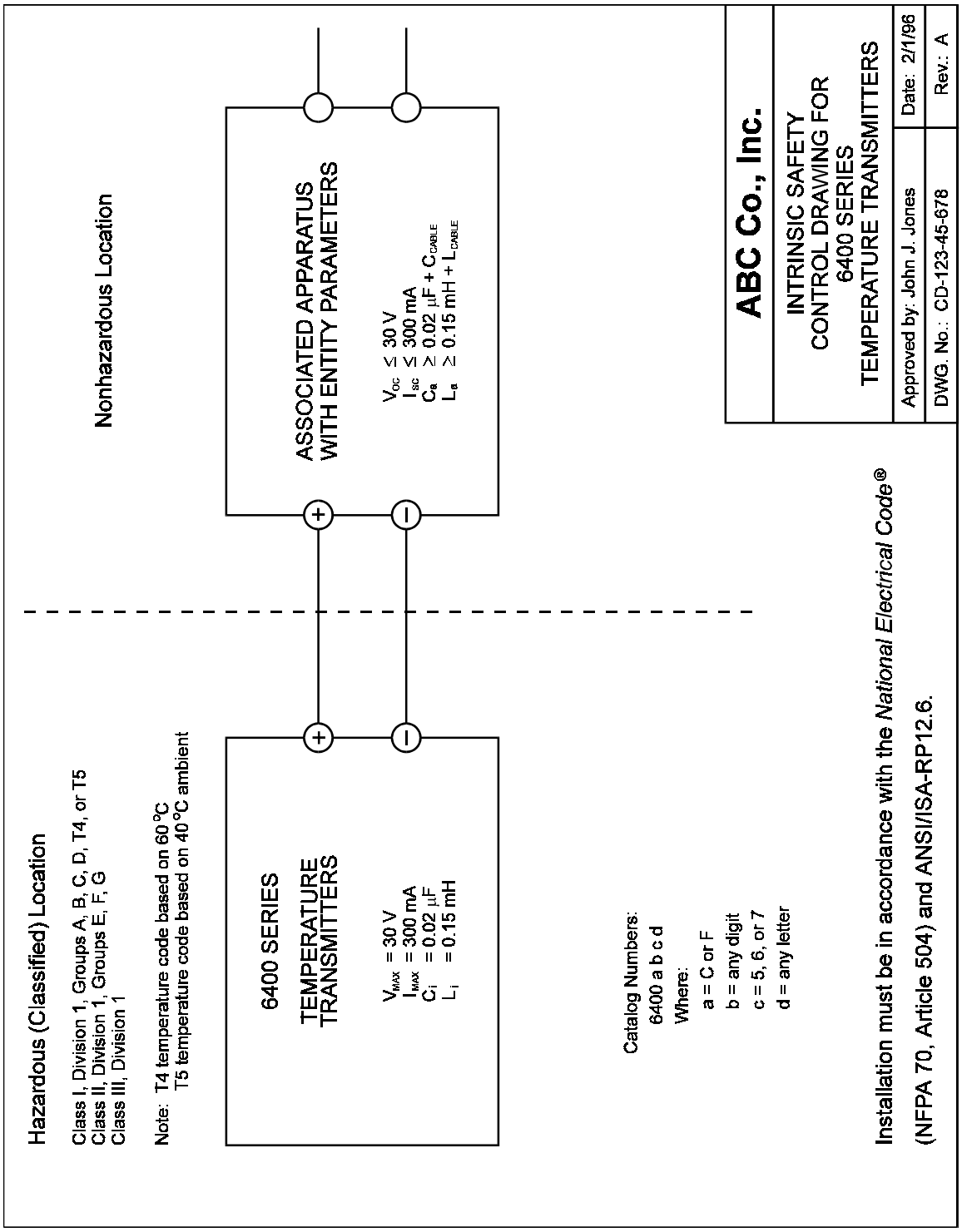
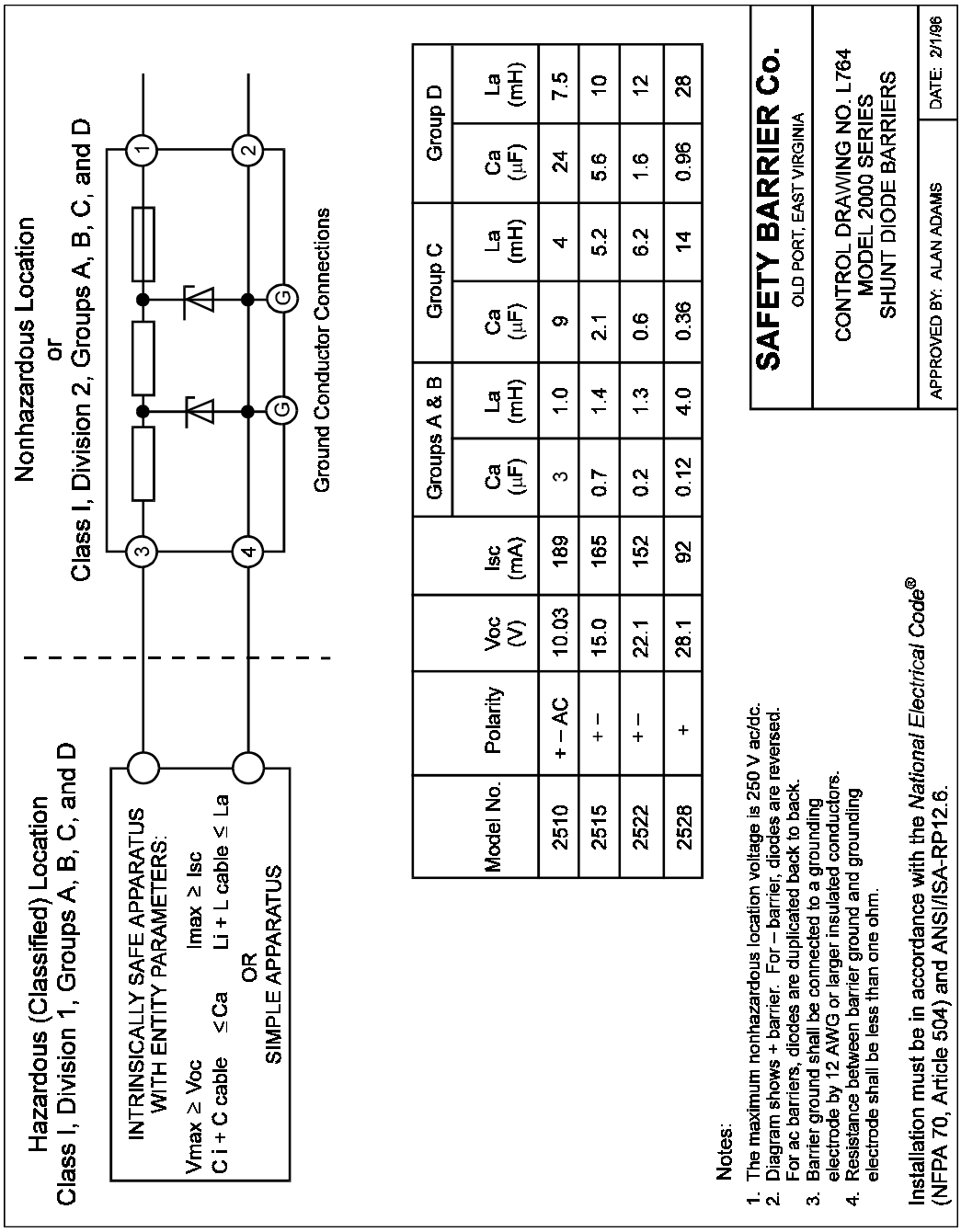


Figure 1 — Intrinsically safe apparatus for connection to associated apparatus specified by entity parameters



Model No.	Polarity	Voc (V)	Isc (mA)	Groups A & B		Group C		Group D	
				Ca (µF)	La (mH)	Ca (µF)	La (mH)	Ca (µF)	La (mH)
2510	+ – AC	10.03	189	3	1.0	9	4	24	7.5
2515	+ –	15.0	165	0.7	1.4	2.1	5.2	5.6	10
2522	+ –	22.1	152	0.2	1.3	0.6	6.2	1.6	12
2528	+	28.1	92	0.12	4.0	0.36	14	0.96	28

Notes:
1. The maximum nonhazardous location voltage is 250 V ac/dc.
2. Diagram shows + barrier. For – barrier, diodes are reversed. For ac barriers, diodes are duplicated back to back.
3. Barrier ground shall be connected to a grounding electrode by 12 AWG or larger insulated conductors.
4. Resistance between barrier ground and grounding electrode shall be less than one ohm.

Installation must be in accordance with the *National Electrical Code®* (NFPA 70, Article 504) and ANSI/ISA-RP12.6.

SAFETY BARRIER Co.
OLD PORT, EAST VIRGINIA

CONTROL DRAWING NO. L764
MODEL 2000 SERIES
SHUNT DIODE BARRIERS

APPROVED BY: ALAN ADAMS | DATE: 2/1/96

Figure 2 — Associated apparatus identified by manufacturer and model number for connection to intrinsically safe apparatus specified by entity parameters

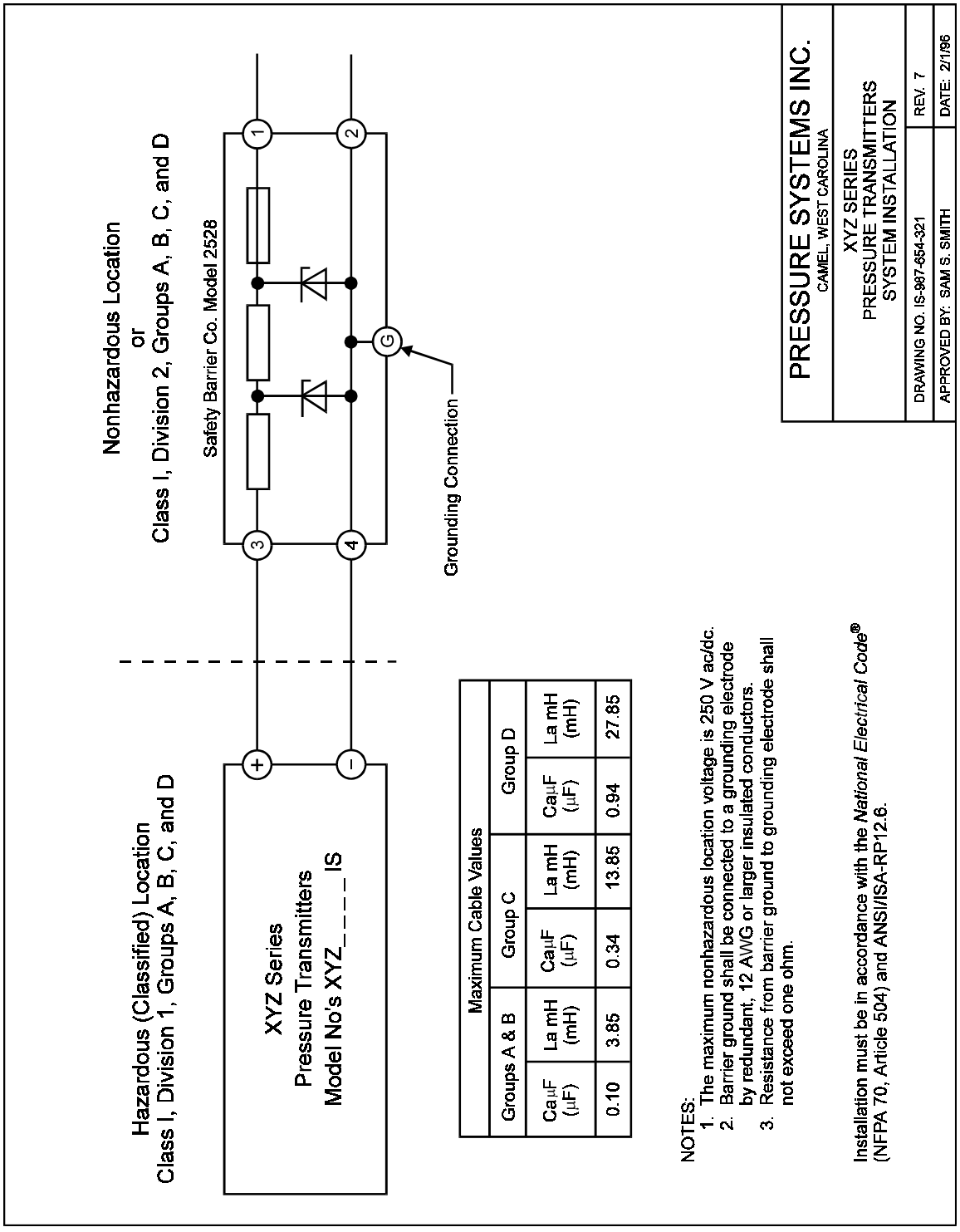


Figure 3 — Intrinsically safe apparatus and associated apparatus specified by manufacturer and model number

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