Examination Standard for Programmable Logic Control (PLC) Based Burner Management Systems

Class Number 7605

May 2021

Foreword

This standard is intended to verify that the products and services described will meet stated conditions of performance, safety and quality useful to the ends of property conservation. The purpose of this standard is to present the criteria for examination of various types of products and services.

Examination in accordance with this standard shall demonstrate compliance and verify that quality control in manufacturing shall ensure a consistent and reliable product.

TABLE OF CONTENTS

1. INTRODUCTION

1.1 Purpose

1.1.1 This standard states testing and certification requirements for programmable logic control (PLC) based burner management systems.

1.1.2 Testing and certification criteria may include, but are not limited to, performance requirements, marking requirements, examination of manufacturing facility(ies), audit of quality assurance procedures, and a follow-up audit program.

1.2 Scope

1.2.1 This standard sets requirements for PLC based systems used in conjunction with safety controls for commercial and industrial heating equipment. These systems incorporate programmable electronic components. These electronic components use software and/or electronic hardware to set operating and safety parameters, and to implement the operating and safety logic.

1.2.2 The management system shall provide safe start, safe operation, and safe shutdown under normal or abnormal conditions.

1.2.3 The system may or may not be supplied with safety controls such as combustion safeguards, flame sensing devices, pressure and temperature limit controls, and combustion airflow interlocks. If safety controls are provided they shall be. If controls are not provided, the system input/output modules shall be compatible with certified controls.

Note: If the manufacturer desires to provide currently non-certified safety controls, such equipment shall be required to conform to certification requirements for that equipment. Certification of such equipment shall be handled as a separate project.

1.2.4 The requirements of this standard shall be used to measure and describe the performance of electronic hardware and software in response to exposure from heat, cold, abnormalities, electromagnetic interference, etc., under controlled laboratory conditions. The results of these controlled exposures shall not be used to describe or appraise actual exposure conditions since such conditions will vary widely.

1.3 Basis for Requirements

1.3.1 The requirements of this standard are based on experience, research and testing, or the standards of other organizations. The advice of manufacturers, users, trade associations, and loss control specialists was also considered.

1.3.2 The requirements of this standard reflect tests and practices used to examine characteristics of the subject equipment for the purpose of obtaining certification. Equipment having characteristics not anticipated by this standard may be certified if performance equal, or superior, to that required by this standard is demonstrated.

1.4 Basis for Certification

Certification is based upon satisfactory evaluation of the product and the manufacturer in the following major areas:

1.4.1 Examination and tests on production samples shall be performed to evaluate:

- the suitability of the product
- the performance of the product as specified by the manufacturer and required for certification; and as far as practical,
- the durability and reliability of the product.

1.4.2 Compliance of the hardware and software to the requirements of IEC 61508 Standard on Functional Safety of Programmable Electronic Systems

1.4.3 An examination of the manufacturing facilities and audit of quality control procedures may be made to evaluate the manufacturer's ability to consistently produce the product which is examined and tested, and the marking procedures used to identify the product. Subsequent surveillance may be required by the certification agency in accordance with the certification scheme to ensure ongoing compliance.

1.5 Basis for Continued Certification

The basis for continual certification may include, but is not limited to, the following based upon the certification scheme and requirements of the certification agency:

- production or availability of the product as currently certified;
- the continued use of acceptable quality assurance procedures;
- satisfactory field experience;
- compliance with the terms stipulated by the certification;
- satisfactory re-examination of production samples for continued conformity to requirements; and
- satisfactory surveillance audits conducted as part of the certification agencies product surveillance program.

1.6 Effective Date

The effective date of this certification standard mandates that all products tested for certification after the effective date shall satisfy the requirements of this standard.

The effective date of this standard is eighteen (18) months after the publication date of the standard for compliance with all requirements.

1.7 System of Units

Units of measurement used in this Standard are United States (U.S.) customary units. These are followed by their arithmetic equivalents in International System (SI) units, enclosed in parentheses. The first value stated shall be regarded as the requirement. The converted equivalent value may be approximate. Conversion of U.S. customary units is in accordance with ANSI/IEEE/ASTM SI 10.

1.8 Normative References

The following documents are referred to in the text in such a way that some or all of their content constitutes requirements of this document. For dated references, only the cited edition applies.

ANSI/IEEE/ASTM SI 10, *American National Standard for Metric Practice*

IEC 61508, *Functional Safety of Electrical/Electronic/Programmable Electronic Safety-related Systems*.

1.9 Terms and definitions

ANSI - American National Standards Institute
ASTM - American Society for Testing and Materials
BMS - Burner Management System
DIN - German Industrial Standard
EEPROM - Electronically Erasable Programmable Read Only Memory
EN - European Norm
EPROM - Erasable Programmable Read Only Memory
IEC - International Electrotechnical Commission
IEEE - Institute of Electrical and Electronics Engineers
PLC - Programmable Logic Control
PrEN - Provisional European Norm
PROM - Programmable Read Only Memory

2. GENERAL INFORMATION

2.1 Product Information

Programmable Logic Control (PLC) Based Burner Management System equipment is comprised of electronic components that when combined in accordance with the manufacturer's instructions make up part of or a complete Combustion Safeguards and Flame Sensing System. They may be fabricated and shipped as complete assemblies or sub-assemblies.

2.2 Certification Application Requirements

The manufacturer shall provide the following preliminary information with any request for certification consideration:

- A complete list of all models, types, sizes, and options for the products or services being submitted for certification consideration;
- General assembly drawings, complete set of manufacturing drawings, materials list, anticipated marking format, piping and electrical schematics, nameplate format, brochures, sales literature, spec. sheets, installation, operation and maintenance procedures, and
- the number and location of manufacturing facilities.
- All documents shall identify the manufacturer's name, document number or other form of reference, title, date of last revision, and revision level. All documents shall be provided with English translation.

2.3 Requirements for Samples for Examination

2.3.1 Following authorization of a certification examination, the manufacturer shall submit samples for examination and testing based on the following:

- Sample requirements to be determined by the certification agency

2.3.2 Requirements for samples may vary depending on design features, results of prior or similar testing, and results of any foregoing tests.

2.3.3 The manufacturer shall submit samples representative of production. Any decision to use data generated using prototypes is at the discretion of the certification agency.

2.3.4 It is the manufacturer's responsibility to provide any necessary test fixtures, such as those which may be required to evaluate the PLC Burner Management Systems.

3. GENERAL REQUIREMENTS

3.1 Review of Documentation

3.1.1 The manufacturer shall provide assembly drawings, component drawings, evidence of functional safety, materials lists, brochures, sales literature, specification sheets, etc. for examination. In addition, drawings or samples of all labels and the certification agency's certification mark, including information as to their location, shall be provided. If certification is granted, all controlled documentation, listed in the documentation section of the certification report, shall state in bold print that any revisions require the certification agency's approval prior to implementation. The manufacturer's specification shall include an emergency stop pushbutton, and master fuel trip relay. A master fuel trip relay is defined as an electrical relay or group of relays whose purpose is to isolate power to critical boiler end devices, such as the fuel shutoff valves, pilot gas valves and spark igniters.

3.1.2 The control hardware and software of the burner management system shall be so designed and implemented that they are not affected by failures in the hardware or software of other systems (such as combustion control, auxiliaries, etc.). The evidence for functional safety must demonstrate this degree of independence.

3.2 Physical, Structural, and Operational Requirements

3.2.1 PLC based burner management systems shall be available as complete and identifiable assemblies. They shall perform in all respects to the manufacturer's specifications.

3.2.2 The system shall conform at a specified Safety Integrity Level (SIL) to IEC 61508, Part 1, General Requirements. The hardware architecture shall include self-checking firmware, external and internal watchdog systems, redundant processors, and dual I/O cards as required to achieve the specified SIL. Software architecture shall include communications drivers, fault handling, executive software, input/ output functions, and derived functions as required to achieve the specified SIL. Diverse design of hardware and/or software may be used as a means to achieve the specified SIL.

3.2.3 The operating temperature range shall be at least 32°F (0°C) to 140°F (60°C).

3.2.4 Electrical contacts, terminals, and other vulnerable components shall be adequately protected from damage and expected atmospheric conditions.

3.2.5 Redundant components shall be separated so as to reduce common cause failures.

3.2.6 Safety-related operating characteristics such as purge times, trial for ignition times, flame failure response times, etc., shall not be readily accessible by the operator. These characteristics shall not be adjustable when the safety system is online. These characteristics shall be located in a PROM, EPROM, EEPROM, or other non-volatile memory. Provision shall be made to warn the operator if programming changes will impact safety functions or add delays to scan rate timings.

3.2.7 Failure to satisfy, or loss of, permissives such as proof of purge air, combustion air, and closed fuel valve(s); proper fuel pressure; and absence of a flame signal at startup, prior to the ignition cycle, shall result in burner safety shutdown and burner lockout.

Burner shutdown is defined as the normal operating shutdown procedure for a burner or boiler to be taken out of service by an operator. Burner safety shutdown is defined as the automatic emergency shutdown of all fuel shutoff valves, pilot gas valves, and spark igniters. Burner lockout is defined to mean that the system must be reset by an operator before the burner is permitted to restart automatically.

3.2.8 Failure to establish a pilot or main flame within the trial-for-ignition period shall result in burner safety shutdown and burner lockout.

3.2.9 A single, automatic retrial for ignition is allowable if flame failure occurs during the normal firing cycle. Automatic recycle is not allowed for gas burners with a fuel input greater than 2,500,000 Btu/hr (730

kW) or oil burners with a fuel input greater than 2,800,000 Btu/hr (820 kW).

3.2.10 Flame sensing and combustion safeguard systems shall be immediately operable when the main power to the burner management system is turned on. A combustion safeguard system is defined as a system required by boiler drum level and combustion control systems to maintain stable burner flame and operating conditions.

3.2.11 The control system, in conjunction with its flame sensor, shall react to flame failure within 4 seconds or less.

3.2.12 The available trial-for-ignition period, for pilot flames, shall not exceed 10 seconds.

3.2.13 The available trial-for-ignition period, for main flames, shall not exceed the following:

A. Gas burners
   1. 2,500,000 Btu/hr (730 kW) or less: 15 sec. (4 sec for direct electric ignition)
   2. Greater than 2,500,000 Btu/hr (730 kW): 10 sec.

B. Oil burners
   1. Less than 2,800,000 Btu/hr (820 kW): 15 sec.
   2. 2,800,000 Btu/hr (820 kW) or more — No. 1 - No. 4 oil: 10 sec.
   3. 2,800,000 Btu/hr (820 kW) or more — No. 5, 6 oil: 15 sec.

3.2.14 The equipment shall be capable, as a minimum, of operation at 85 and 110 percent of nominal rated input voltage.

3.3 Markings

3.3.1 Marking on the product or, if not possible due to size, on its packaging or label accompanying the product, shall include the following information:

- name and address of the manufacturer or marking traceable to the manufacturer;
- date of manufacture or code traceable to date of manufacture or lot identification;
- model number, size, rating, capacity, etc., as appropriate.

When hazard warnings are needed, the markings should be universally recognizable.

3.3.2 The certification agency's mark of conformity shall be displayed visibly and permanently on the product and/or packaging as appropriate and in accordance with the requirements of the certification agency. The manufacturer shall exercise control of this mark as specified by the certification agency and the certification scheme.

3.3.3 All hardware markings shall be legible and durable.

3.3.4 The software shall contain the following text: "Certified for compliance to IEC 61508". The software shall also contain a means of verifying its identity in order to ascertain that the software is the same as that certified. The software shall contain text describing the boiler and burner particulars including the manufacturer(s), model numbers, site location, unit identification, design pressure and temperature.

3.4 Manufacturer's Installation and Operation Instructions

3.4.1 The manufacturer shall

- prepare instructions for the installation, maintenance, and operation of the product;
- provide facilities for repair of the product and supply replacement parts, if applicable,
- provide services to ensure proper installation, inspection, or maintenance for products of such nature that it would not be reasonable to expect the average user to be able to provide such installation, inspection, or maintenance,
- provide detailed operating and upgrade procedures for this equipment,
- provide a parts/repair list with required maintenance instructions,
- make the BMS logic program available in a fully documented format as part of the BMS package, and
- the owner shall be able to view the BMS logic program either off-line in read only mode, or on-line via communication link.

3.5 Calibration

3.5.1 Each piece of equipment used to verify the test parameters shall be calibrated within an interval determined on the basis of stability, purpose, and usage. A copy of the calibration certificate for each piece of test equipment is required. The certificate shall indicate that the calibration was performed against working standards whose calibration is certified and traceable to an acceptable reference standard and certified by an ISO/IEC 17025 accredited calibration laboratory. The test equipment shall be clearly identified by label or sticker showing the last date of the calibration and the next due date. A copy of the service provider's accreditation certificate as an ISO/IEC 17025 accredited calibration laboratory should be available.

3.5.2 When the inspection equipment and/or environment is not suitable for labels or stickers, other methods such as etching of control numbers on the measuring device are allowed, provided documentation is maintained on the calibration status of thus equipment.

4. PERFORMANCE REQUIREMENTS

Note: Unless otherwise specified the examinations and tests noted below shall be conducted at the manufacturer's facility or other mutually agreed upon site.

4.1 Examination and Tests of Systems

Reference Appendix A for Industry Specific Requirements per IEC 61508.

4.2 Examination and Tests of Hardware

Reference Appendix A for Industry Specific Requirements per IEC 61508.

4.3 Examination and Assessment of Software

Reference Appendix A for Industry Specific Requirements per IEC 61508.

5. OPERATIONS REQUIREMENTS

5.1 Demonstrated Quality Control Program

5.1.1 A quality assurance program is required to assure that subsequent products produced by the manufacturer shall present the same quality and reliability as the specific products examined. Design quality, conformance to design, and performance are the areas of primary concern.

- Design quality is determined during the examination and tests and may be documented in the certification report.
- Continued conformance to this standard is verified by the certifier's surveillance program.
- Quality of performance is determined by field performance and by periodic re-examination and testing.

5.1.2 The manufacturer shall demonstrate a quality assurance program which specifies controls for at least the following areas:

- existence of corporate quality assurance guidelines
- incoming quality assurance, including testing
- in-process quality assurance, including testing
- final inspection and tests
- equipment calibration
- drawing and change control
- packaging and shipping
- handling and disposition of discrepant materials.

5.1.3 Documentation/Manual

There should be an authoritative collection of procedures/policies. It should provide an accurate description of the quality management system while serving as a permanent reference for implementation and maintenance of that system. The system should require that sufficient records are maintained to demonstrate achievement of the required quality and verify operation of the quality system.

5.1.4 Records

To assure adequate traceability of materials and products, the manufacturer shall maintain a record of all quality assurance tests performed, for a minimum period of two years from the date of manufacture.

5.1.5 Drawing and Change Control

- The manufacturer shall establish a system of product configuration control that shall allow no unauthorized changes to the product. Changes to critical documents, identified in the certification report, may be required to be reported to, and authorized by the certification agency prior to implementation for production.
- Records of all revisions to all certified products shall be maintained.

5.2 Surveillance Audit

5.2.1 An audit of the manufacturing facility may be part of the certification agencies surveillance requirements to verify implementation of the quality assurance program. Its purpose is to determine that the manufacturer's equipment, procedures, and quality program are maintained to ensure a uniform product consistent with that which was tested and certified.

5.2.2 Certified products or services shall be produced or provided at, or provided from, location(s) disclosed as part of the certification examination. Manufacture of products bearing a certification mark is not permitted at any other location prior to disclosure to the certification agency.

5.3 Manufacturer's Responsibilities

5.3.1 The manufacturer shall notify the certification agency of changes in product construction, components, raw materials, physical characteristics, coatings, component formulation or quality assurance procedures prior to implementation.

6. BIBLIOGRAPHY

ISO/IEC 17025, *General Requirements for the Competence of Testing and Calibration Laboratories.*

FM Approvals Class 7610, *Combustion Safeguards and Flame Sensing Systems*.

APPENDIX A

APPLICATION SPECIFIC REFERENCES TO IEC 61508

The following are some Burner Management Applications Specific Safety Functions that the certification agency will review during the assessment of a PLC based Burner Management System.

Ref.		*Requirement*	*Test Method*
IEC 61508	Part 1	All clauses of this part apply	Review of the documentation for: (1.) Definition of EUC and environment. (2.) Overall safety requirements, (3.) Safety Requirements Allocation and Safety Integrity Level (SIL) for each Safety Function (4.) Operation and Maintenance Plan (5.) Installation Plan. (6.) Review of Quality Management
IEC 61508	Part 2	Clause 7.2.2	Review of documentation for E/E/PES safety requirements and software safety requirements
		Clause 7.3.2	Review of documentation for the safety validation plan
		Clause 7.4.2 to 7.4.9	Review of the hardware design of the E/E/PES Review of the FMEDA Review of the Markov Model Review of the PFD calculations for SIL determination
		Clause 7.7.2	**Combustion Safeguards**: 1) Testing of the Combustion Safeguard in conjunction with a flame sensing system 2) Testing for shut down and lock out if flame is detected prior to the ignition cycle or upon failure to establish flame during the ignition cycle. 3) Proper response to loss of flame signal by opening the safety shutoff valve circuit and, if so configured, shall attempt only one automatic retrial for ignition 4) If applicable, the PLC shall shut down and lock out if safety interlocks for airflow, pressure, temperature, and valve position are not in the proper state either upon startup or during the burner operating cycle
IEC 61508	Part 2	Clause 7.7.2	**Flame Sensing System**: Requirement: The flame detector (scanner) in a flame sensing system shall be activated immediately upon application of power to the system. Test: The detector shall be aimed at an actual or simulated flame. Power shall then be applied to the system. The system shall immediately indicate presence of flame by a signal light, meter indication, lockout, and/or activation of the flame relay output circuit. Requirement: The system shall operate properly in accordance with the manufacturer's specifications for methods of flame detection (infra-red, rectification, ultra-violet) and flame signal strength Test: The detector shall be subjected to an actual or simulated flame that can be varied in intensity, wavelength, or flicker frequency as applicable to the particular detection method. The detector shall not indicate presence of flame or activate the flame relay when subjected to signals outside of its specified wavelength or frequency bandwidth or at a signal level below the specified threshold value. Requirement: Systems equipped with a self-checking provision shall lock out and open the flame relay output circuit upon detection of an abnormal condition. Self-checking is normally accomplished by periodically interrupting the flame signal for a specified amount of time, either mechanically or electronically Test: The system shall lock out and open the flame relay output circuit when the self-check feature is disabled.

IEC 61508	Part 2	Clause 7.7.2	**Flame Failure Response Time (FFRT):** Requirement: A combination safeguard and/or flame sensing system shall react to loss of flame, within 4 seconds or less, by deactivating the flame relay output circuit and/or opening the safety shutoff valve circuit. Test: FFRT shall be measured for at least ten operational cycles. The average of the ten measurements plus three standard deviations shall not exceed 4 seconds.
IEC 61508	Part 2	Clause 7.7.2	**Trial for ignition (TFI)**: Requirement: The trial for ignition period shall not exceed the limits specified in Sections 3.2.11 and 3.2.12 Test: Trial for ignition shall be measured for at least ten operational cycles. The average of the ten measurements plus three standard deviations shall not exceed the aforementioned limits or 110 percent of the manufacturer's specified trial for ignition, whichever is less.
IEC 61508	Part 2	Clause 7.7.2	**Purge Cycle**: Requirement: The actual purge cycle time, whether fixed or selectable, shall not be less than the manufacturer's specified value. Test: Purge time shall be measured for at least ten operational cycles. The average of the ten measurements, minus three standard deviations, shall not be less than the specified value.
IEC 61508	Part 2	Clause 7.7.2	**Durability**: Requirement: Output devices in the flame detection and/or safety shutoff valve circuits shall be capable of enduring 100,000 operational cycles without undue wear or failure. Test: The output device(s) shall be subjected to a minimum of 100,000 operational cycles at rated voltage and maximum specified electrical load {the above does not apply to equipment that uses solid state relays (switches) in the flame and valve circuits}.
IEC 61508	Part 2	Clause 7.7.2	**Voltage Variation**: Requirement: The combustion safeguard and/or flame sensing system shall operate properly over a range of 85 to 110 percent of rated input voltage. Test: Input voltage shall be varied from 85 to 110 percent of rated voltage. There shall be no change in operating characteristics or any significant change in FFRT, TFI, and purge times.
IEC 61508	Part 2	Clause 7.7.2	**Electrical Insulation**: Requirement: All electrical components of this equipment shall be capable of withstanding the high potential between input terminals and ground for 1 minute without arcing or breakdown. Test: For an operating voltage of 60V or less, the potential of 500VAC shall be applied between input terminals and the enclosure ground for 1 minute. For an operating voltage greater than 60 V, the potential shall be 1000VAC plus twice the rated voltage. No arcing or breakdown shall occur. Leakage current shall not exceed 0.5 ma. CAUTION: Some combustion safeguards may be equipped with voltage surge protection or suppression. Application of a high potential may result in disablement or a false indication of breakdown.
IEC 61508 IEC 68	Part 2 Parts 1, 2, 3, 14, 26, 30	Clause 7.7.2	**Ambient Temp. Effects**: Requirement: The equipment shall be capable of operating reliably and consistently at temperatures ranging from 32°F (0°C) to 140°F (60°C). Test: The combustion safeguard and/or flame sensing system shall be conditioned, for a minimum of 4 hours at 32°F (0°C) to 140°F (60°C). The equipment shall operate properly at these temperatures and upon return to room temperature. FFRT at these temperatures shall not increase more than 10 percent beyond the actual value recorded previously and shall not exceed 4 seconds.

IEC 61508	Part 2	Clause 7.7.2	**Safety Related Operating Characteristics**: Requirement: Safety related operating characteristics such as purge times, FFRT, TFI time, pressure limits, temperature limits, etc., shall not be readily accessible or alterable by an operator. Test: A programmable combustion safeguard shall be examined to determine whether an operator can readily alter safety characteristics. Alteration by manipulation of external adjustments or a keyboard is not acceptable. Adjustments that require special tools, removal of external housing, or a special program access code are generally considered acceptable.
IEC 61508	Part 3	Clause 6.2	Review functional safety planning with respect to software procurement, development, integration, verification, validation, and modification. Review software configuration management scheme.
IEC 61508	Part 3	Clause 7.1.2	Review safety life cycle, quality and safety assurance procedures satisfy figure 3 and table 1.
IEC 61508	Part 3	Clause 7.2.2	Review software safety requirements specification, if used.
IEC 61508	Part 3	Clause 7.3.2	Review software safety validation planning wrt modes of operation, technical strategy, environment, and pass/ fail criteria.
IEC 61508	Part 3	Clause 7.4.2 to 7.4.8	Review software architecture Review tools, languages, and coding standards Review software design and development documentation Review results of module testing
IEC 61508	Part 3	Clause 7.5.2	Review integration of software and hardware
IEC 61508	Part 3	Clause 7.6.2, and 7.8.2	Review procedures for modification of software, and Review any modifications that have been done
IEC 61508	Part 3	Clause 7.7.2	Review results of software safety validation
IEC 61508	Part 3	Clause 7.9.2	Review results of software verification
IEC 801	Parts 3, 4, 5, 6	EMC for Industrial Process Measurement and control	Review Documentation relating to the EMC testing and test results
IEC 61000	Parts 4-4, and 4-6	EMC	Review Documentation relating to the EMC testing and test results
EN 50081		EMC Emission Std.	Review Documentation of test results
EN 55011		EMC Emission Power Line	Review Documentation of test results
ANSI/ IEEE C62.41		Immunity, Power Line Surge	Review Documentation of test results
ANSI/ IEEE C37.90		Immunity, Elect. Fast Transients	Review Documentation of test results
ANSI/ ISA S71.04		Corrosives	Review Documentation of test results
EMC Directive 89/336/ EEC		EMC European std.	Review Documentation of test results
EN 50082-1		EMC — Immunity	Review Documentation of test results
72/23/ EWG		Low Voltage Directive	Review Documentation of test results

EN 61010 Part 1		Safety Requirements for Electrical Equipment for measurement, control and laboratory use; General Requirements	Review Documentation of test results
ANSI/ISA S82		National Version EN 61010 Part 1	If used, then Review Documentation of test results
NFPA 8502		Boiler Standard	Review Documentation of test results
IEC 61131	Part 1, 2, 3	PLC Design Standards	Documentation referencing recommended design practices outlined in this spec.

General National (German) Standards Relevant to Certification of BMS with programmable elements

Identification of Standard	*Description of Standard*
DIN 31000 Part 2	Concepts of safety technology; Basic concepts
DIN V 19250	Control technology, fundamental safety aspects to be considered for measurement and control equipment
DIN V VDE 0801 Inc. Amendment A1	Principles for computers in safety related systems
DIN V 19251	Process control technology — MC protection equipment — requirements and measures for safeguarded function

Application Specific International and National Standards Relevant to Certification BMS with programmable elements

Identification of Standard	*Description of Standard*
90/ 396/ EEC	Gas Directive
DIN VDE 0116	Electrical equipment for furnaces
EN 230	Monobloc oil burner Safety, control, and regulation devices, and safety times
EN 298	Automatic gas burner control systems for gas burners and gas burning appliances with or without fans
EN 60730 -1, -2, -5	Automatic electronic controls for household and similar use
PrEN 50156-1	Electrical equipment for furnaces; Requirements for design and installation
PrEN 676	Automatic forced draft burners for gaseous fuels
PrEN 746-2	Industrial thermoprocessing equipment Safety requirements for combustion and fuel handling systems
PrEN 1954	Internal and external fault behavior of safety related electronic parts of gas appliances

Note: There is some duplication and overlap among these standards. The usual history is to write Standards A, B, C, etc., with a mixture of very specific requirements and quite general requirements. Then the general requirements are consolidated into Standard X. Eventually, Standard A will be revised to contain only the specific requirements and will refer to Standard X for the general requirements. However, Standard A may not be revised for some time. In the meanwhile, there is duplication among standards.