

Loss Prevention Standard

LPS 1236: Issue 1.1

Requirements for control panels for diesel engine driven pumps used in automatic sprinkler installations

This Standard specifies the requirements for LPCB Approval of Control Panels for Diesel Engine Driven Pumps used in Automatic Sprinkler Installations. LPCB Approved Control Panels covered by this Standard are to be used in stationary fire sprinkler pump sets which conform to the LPC Rules for Automatic Sprinkler Installations.

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PARTICIPATING ORGANISATIONS

This standard was approved by the LPC Fire and Security Board and Expert Group C. The following organisations participated in the preparation of this standard:-

Association of British Insurers
 Association of Building Engineers
 Association of Chief Police Officers
 Association for Specialist Fire Protection
 British Automatic Fire Sprinkler Association
 British Security Industry Association
 BT Redcare
 Chief Fire Officers Association
 Door & Hardware Federation
 Electrical Contractors Association
 European Fire Sprinkler Network
 Fire Industry Association
 Health & Safety Executive
 International Fire Sprinkler Association
 Metronet
 Risk Engineering Data Exchange Group
 Royal and Sun Alliance
 Royal Institution of Chartered Surveyors

REVISION OF LOSS PREVENTION STANDARDS

Loss Prevention Standards will be revised by issue of revised editions or amendments. Details will be posted on our website at www.redbooklive.com.

Technical or other changes which affect the requirements for the approval or certification of the product or service will result in a new issue. Minor or administrative changes (e.g. corrections of spelling and typographical errors, changes to address and copyright details, the addition of notes for clarification etc.) may be made as amendments. (See amendments table on page 19)

The issue number will be given in decimal format with the integer part giving the issue number and the fractional part giving the number of amendments (e.g. Issue 3.2 indicates that the document is at Issue 3 with 2 amendments).

USERS OF LOSS PREVENTION STANDARDS SHOULD ENSURE THAT THEY POSSESS THE LATEST ISSUE AND ALL AMENDMENTS.

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FOREWORD

This standard specifies the requirements for LPCB certification of controllers for diesel driven fire pumps for use in automatic sprinkler systems to installation standards such as the "LPC Rules for Automatic Sprinkler Installations" incorporating BS EN 12845:2003 – "Fixed firefighting systems - Automatic sprinkler systems - Design, installation and maintenance". LPCB listing and approval of products and services is based on evidence acceptable to LPCB:-

- that the product or service meets the standard
- that the manufacturer or service provider has staff, processes and systems in place to ensure that the product or service delivered meets the standard

and on:-

- periodic audits of the manufacturer or service provider including testing as appropriate
- compliance with the contract for LPCB listing and approval including agreement to rectify faults as appropriate

This standard is part of a series relating to pump sets. It should be read in conjunction with LPCB Scheme Document SD139 "Certification requirements for Pump Sets"

The control panel shall comply with the essential health and safety requirements of the 'Machinery Directive', and conform with the relevant regulatory requirements and standards listed below:

Directives:

| | |
|-------------|---|
| 98/37/EC | Machinery Directive |
| 2006/95/EC | Low Voltage Directive |
| 2004/108/EC | Electromagnetic Compatibility Directive |

Harmonised Standards:

| | |
|--------------------|---|
| BS EN 292 Part 1 | Safety of Machinery - Basic Concepts and General Principles of Design |
| BS EN 292 Part 2 | Safety of Machinery |
| BS EN 809 | Pumps and Pump Units for Liquids - Safety Requirements |
| BS EN 60204-1 | Safety of Machinery - Electrical Equipment |
| BS EN 50081 Part 1 | EMC Generic Emission - Residential, commercial & light industrial |
| BS EN 50082 Part 2 | EMC Generic Immunity - Industrial |

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NOTES

Compliance with this LPS does not of itself confer immunity from legal obligations. Users of LPSs should ensure that they possess the latest issue and all amendments.

LPCB welcomes comments of a technical or editorial nature and these should be addressed to “the Technical Director” at enquiries@breglobal.co.uk.

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Listed products and services appear in the LPCB “List of Approved Products and Services” which may be viewed on our website: www.redbooklive.com or by downloading the LPCB Red Book App from the App Store (for iPhone and iPad), from Google Play (for Android devices) or from the Windows Store (for Windows 8 Phones and Tablets from 2014).

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1 SCOPE

This standard specifies LPCB's requirements for the approval of Control Panels for Diesel Drivers for Fire Pump Sets for use in sprinkler systems conforming to sprinkler system installation standards, for example the "LPC Rules for automatic sprinkler systems" (incorporating EN 12845:2003 - Fixed firefighting systems - Automatic sprinkler systems - Design, installation and maintenance)

This standard is not intended to cover all aspects of the design and build of a control panel. It is limited to addressing certain critical areas, which are known to affect the ability of sprinkler systems to perform and comply with installation codes.

This standard is part of a series relating to several aspects of a pump set. It should be read in conjunction with the other appropriate standards:

| Standard | Status |
|---|---|
| LPS 1240 – Pump Sets | Publication pending |
| LPS 1239 – Diesel Drivers | Published – LPCB approved items available |
| LPS 1131 – Bare shaft pumps | Published – LPCB approved items available |
| LPS 1238 – Electric Drivers | No LPCB approved items available. Intended for future publication. |
| LPS 1236 – Control panels for Diesel drivers | This standard |
| LPS 1237 – Control panels for Electric drivers | Publication pending |

This standard specifies the diesel fire pump set controller requirements by:

- Detailing diesel pump set controller requirements which are not covered by other fire protection standards.
- The detailing requirements in this standard will take precedence (with the exception of regulatory requirements, which must always take precedence) over any other requirements.
- Referencing the relevant standards

Suppliers of LPCB Approved Fire Pump Sets shall control and be responsible for the design, construction, testing, performance, provision of installation instructions and commissioning of their fire pump sets.

The installer of the approved fire pump set is responsible for the installation of the pump set in strict accordance with the manufacturer's installation manuals and procedures. An LPCB approved sprinkler system installer, with sufficient knowledge and training in relation to the manufacturer's product, should always be used.

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2 DEFINITIONS

Fire pump set – An assembly comprising at least a pump, driver or motor, partial wiring loom, drive coupling and a mounting and/or base, which is intended to supply water to an automatic sprinkler installation.

Diesel pump controller – The control panel that monitors demand for sprinkler system water, controls the diesel engine start-up sequence when called upon, allows testing of pump set and monitors specified pump set system fault & alarm conditions.

ECM – Engine Control Module. Microprocessor controlled engine management systems including feedback, control and fault handling capabilities (Included in this standard for future use).

Note: Use of ECMs is not acceptable in LPCB fire protection applications until further work has been done.

3 REQUIREMENTS

3.1 General

Control panels shall be designed and manufactured to meet the requirements of this standard, referenced documents and the requirements of the applicable installation standard (typically LPC Rules for automatic sprinkler systems, incorporating BS EN 12845).

Control systems shall be designed to operate correctly at ambient temperatures from 0°C to 50°C. Where the designer proposes a system that has to operate at temperatures outside this range, successful tests shall be carried out at the relevant extreme temperatures and consideration given to other factors affecting system performance should be considered.

3.2 Enclosure

3.2.1 Environmental protection

The control panel housing shall be in non-flammable material and provide a degree of protection at least equal to IP 54 (BS EN 60529:1992 - Specification for degrees of protection provided by enclosures (IP code)), or be suited to its environment where the conditions are more demanding.

3.2.2 Access to control panel

The enclosure door shall be fitted with a suitable locking device, requiring the use of a key or special tool, in order to restrict access to authorised personnel only. It shall not be possible to open the panel door without having first isolated the AC main supply.

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3.2.3 Location

Controllers shall be located as close as practicable to the pump sets they control, and shall be within sight of the pump set. The controller must not be mounted directly on the pump set and must not be exposed to any undue sources of vibration.

3.3 Power supply

3.3.1 Mains feed

The main AC supply switch operating handle shall be outside the housing of the equipment, and interlocked with the enclosure door. If mains power supply is turned off, the panel shall continue to run powered by its batteries. A switch accessible from inside the panel enclosure shall be provided to isolate the battery power when required for maintenance.

The fuse or circuit breaker ratings shall be clearly shown at a point near the devices.

The metal earth for the housing shall be connected directly to a terminal which provides for connection to an earthing point. This terminal shall be labelled.

3.3.2 Batteries

As per LPS 1240 (pump sets), two separate 12 or 24V DC battery power supplies shall be provided for engine starting and control panel backup. They shall be used for no other purpose. They shall be maintained on charge by two chargers connected to the mains.

Batteries shall be either:

- Open nickel – cadmium prismatic rechargeable cells complying with BS EN 60623 (Secondary cells and batteries containing alkaline or other non-acid electrolytes. Vented nickel-cadmium prismatic rechargeable single cells) (or BS 6260 (Specification for open nickel-cadmium prismatic rechargeable single cells – withdrawn), or:
- Lead-acid Plante positive batteries complying with BS EN 60896 part 1 Stationary lead-acid batteries. General requirements and methods of test. Vented types (or BS 6290 part 1 – Lead-acid stationary cells and batteries. Specification for general requirements (withdrawn) and BS 6290 Part 2 - Lead-acid stationary cells and batteries. Specification for the high-performance Plante positive type).

Each battery shall have the design capacity to rotate the engine at 0 °C and 760 mm mercury atmospheric pressure for not less than 10 cycles each of not less than 15 s cranking and not more than 10 s rest. At the end of the energized part of each cycle the engine cranking speed shall be not less than 120 r/min whilst power is applied.

3.3.3 Chargers

Two totally independent, constant, potential/current limited battery chargers are to be provided.

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The battery chargers shall be independently powered from the controller single phase A.C. supply via surge limiting fuses or circuit breakers. It shall be possible to remove either charger whilst leaving the other operational.

During standby conditions each battery charger must be continuously energised and permanently connected to its respective battery set. The charger outputs for normal float conditions should be set in accordance with the battery manufacturer's recommendations to allow the optimum trickle current to flow through the batteries, ensuring that they are maintained in a fully charged condition with minimum water loss. The controller circuits' and ECM standing load on the batteries should be automatically compensated for (ECMs included for future use). Chargers shall be rated to ensure batteries are restored to 90% of the batteries ampere hour rating within 24 hours.

During battery cranking the controller circuits shall automatically turn off both battery chargers.

3.3.4 Boost charge

A boost charge facility shall be provided for charging to a higher voltage again in accordance with battery manufacturers recommendations. The boost control (if the panel design requires one) should be accessible only from within the panel housing.

Operation of the chargers is to be monitored, and in the event that either charger output fails, or if either battery set becomes faulty or disconnected, then the 'charger fault' alarm should operate. Charger alarms are to be inhibited while the chargers are turned off during cranking.

3.4 Operational parameters

The control panel shall ensure the automatic and manual operation, control and monitoring of:-

- engines in the pump assembly
- additional equipment (starter, batteries etc.)
- its own logic and components

When powered up, normal operation must be ensured at temperatures between 0°C and 50°C or over a wider temperature range if specifically requested by the designer.

In addition, the panel shall be equipped with devices which will permit the transfer of information and data, as detailed in section 3.5.

3.4.1 Automatic starting system

Automatic start-up shall be by means of a contact which opens to initiate a start. This shall be triggered by a de-energised pressure switch signal.

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This sequence shall be initiated automatically on receipt of a signal indicating pressure drop in the fire protection system. The automatic start facility shall remain functional at all times, with only the following exceptions:

- The engine is already rotating under its own power
- After a “fail to start”
- When the Automatic start sequence isolating switch is activated. (This is to be an isolating switch at the control panel, protected from unauthorised use by a key-locked device)

The automatic starting sequence shall make six attempts to start the engine. The system shall switch over automatically to the other battery after each cranking attempt. Each attempt shall be of a minimum of 15 seconds duration. There shall be a maximum pause of 10 seconds between each attempt.

If, after the 6 sequences, there is no information that start-up has occurred, the control panel shall:-

- give an audible and visual signal that the engine has failed to start.
- initiate an output signal 'Failed to start' - see paragraph 3.5.1 & 3.5.3.
- lock out the automatic start-up system

If either battery has insufficient power (determined by monitoring the rotation speed during cranking) to crank the engine during any stage of the cranking cycle, further cranks must automatically be made drawing power from the other battery to complete the six attempt sequence.

The control voltage shall be drawn from both batteries simultaneously. Once started the pump set must continue to run until shut down manually, by means of a shutdown push button located on the enclosure door and connected to the stop control.

After the fire pump has started an engine driven frequency generator, common magnetic pick-up or ECM shall provide a signal to the electronic speed sensor in the controller to cancel further cranking and automatically re-set the controller for future operation.

Pressure switches, for example on the engine lubricating system or pump discharge, shall not be used as a means of de-energising the starter motor.

The controller shall also provide an output signal to drive the engine mounted tachometer, the nature of the signal being determined by the type of instrument fitted.

3.4.2 Emergency manual starting system.

An **over-ride** emergency manual start facility shall be provided, protected by means of a frangible cover, or quick access front, and shall be operative at all times even with the automatic start switch in the OFF position. Starting shall be provided by both sets of batteries in parallel. **There shall be no delay in operation of the emergency manual start facility.**

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3.4.3 Test facility for manual starting.

A manual start test button and indicating lamp shall be provided to permit periodic testing of the manual electric start system without breaking the frangible cover over the emergency start button.

The indicating lamp shall be marked "Operate manual start test button if lit ".

The pushbutton and indicating lamp may be a combined device. The manual start test push button shall only be brought on line after an automatic engine start followed by a shut down or after six repeated unsuccessful attempts to start automatically. Either of the two conditions shall cause the indicator lamp to light and bring the manual start test button on line.

The power shall only be drawn from the battery which did not provide power for the last cranking attempt.

When a test manual start has been carried out, the circuit used for this purpose shall automatically become inoperable and the indicator lamp shall be extinguished. The automatic start facility shall be available, even when the manual start test button circuit is activated.

Note:- During test, after the engine is stopped there shall be a maximum period of 10 seconds before a start sequence can be initiated by the controller (either by a pressure drop or an emergency manual start).

3.5 Outputs

3.5.1 Indicators

Visual indication is to be provided by solid state indicators having clearly viable labels with relevant data as shown in table 1.

A common lamp test pushbutton shall be provided.

The principle of visual indication used for safety equipment is to be as follows:-

| | |
|-----------------|---|
| Green indicator | Healthy condition |
| Amber indicator | Fault - the device in question is defective and is not able to operate normally. Action required. |
| Red indicator | Alarm- Immediate action required. |

As an alternative, healthy, fault & alarm information may be given by an alphanumeric display, together with a Red, Amber and Green LED to identify status of current display.

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In addition, certain data must be capable of being transmitted over a given distance:

- (a) 'PUMP ON DEMAND' output signal, signifying:-
- That the system pressure switch requires the pump to start.
- (b) 'TROUBLE AT ENGINE OR CONTROLLER' output signal, which covers:-
- Starter motor lead disconnected
 - Low oil pressure
 - High engine temperature
 - Low engine temperature(failure of engine heater)
 - Battery / charger fault (System "A")
 - Battery / charger fault (System "B")
 - Electronic governor supply failed or ECM supply voltage for electronic engines (ECMs included for future use).
 - (Over speed deleted)
 - Fuel Injection fault (on ECM equipped electronic engines, included for future use)
- (c) 'PUMP FAILED TO START' output signal signifying:-
- The controller has performed 6 automatic crank attempts and failed to start the engine.
- (d) 'AUTOMATIC START UNAVAILABLE' output signal signifying:-
- Any switch or protective device which prevents the pump starting automatically is in "off" or "tripped" condition.
- (e) 'ENGINE RUNNING' output signal signifying the pump is operating

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Table 1 – Indicator lamps

| TITLE | LAMP COLOUR | FUNCTION | AUDIBLE |
|-----------------------------------|-------------|---|--|
| Battery healthy | Green | Indicates that the batteries are connected and providing power to the control circuits. (two indicators, one for each battery). | No |
| Battery/charger fault | Amber | Indicates failure of either battery, or any failure of either battery charger while they are switched on (two indicators, one for each circuit). | Yes |
| Automatic start unavailable | Red | Indicates that one or more of the switches or protective devices which prevent the pump starting automatically are in the "off" or "tripped" condition. | Yes This alarm shall be Non-Mutable |
| Pump on demand | Green | Indicates that an initiation signal is present, and the engine should be either running, or attempting to start. | No |
| Failed to start | Red | Pump has not started automatically. | Yes |
| High engine temperature | Amber | Excessive engine temperature, all cooled engines. | Yes |
| Low oil pressure | Amber | Insufficient oil pressure | Yes |
| Operate manual test Start | Amber | Illuminated when the engine has stopped, following an automatic start, or after a 'failed to start' condition. | Yes |
| Low engine temperature. | Amber | Engine temperature below 5°C | Yes |
| Electronic governor supply failed | Amber | Electrical supply to governor unavailable. | Yes |
| Running | Green | Engine Running. | No |
| Fuel injection fault | Amber | Problem indicated by ECM or problem with ECM (included for future use) | Yes |
| Starter motor disconnect | Red | Starter motor leads disconnected. Motor will not start. | Yes |

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3.5.2 Meters – measurement indication

The following parameters must be measured independently to an accuracy of $\pm 5\%$ with the actual measurements being displayed:-

- The charging level of the chargers, by means of ammeters (one per charger) permitting readings with maximum increment scale of 0.5A.
- For all the measuring equipment, the normal functional ranges and units must be stated, preferably by direct display on the dial.

3.5.3 Terminal numbering

In order to maintain compatibility between engine sets and controllers supplied by different manufacturers, a numbering system has been introduced which shall be adhered to. See table 2

Table 2 Terminal numbering for LPCB Diesel controllers for use with engines approved to LPS 1239

| Controller & Engine terminal No. | Engine, Pump Set or System Mounted Device |
|----------------------------------|--|
| 1 | Electronic governor +VE Supply hours run counter |
| 2 | Magnetic pickup |
| 3 | Magnetic pickup (0 Volt) |
| 4 | Oil pressure switch close at low pressure (earth return) |
| 5 | Engine temperature switch close at high temperature (earth return) |
| 6 | Battery A positive supply |
| 7 | Not used |
| 8 | Battery B positive supply |
| 9 | Start solenoid from battery A |
| 10 | Start solenoid from battery B |
| 11 | Common negative / earth. Both terminals linked |
| 12 | Stop control |
| 13 | Not used |
| 14 | Diagnostics / fault with ECM (included for future use) |
| 15 | Low engine temp switch |
| 16 | Low engine temp switch (insulated return) |
| 17 | Fuel injection fault (ECM engines only-included for future use) |
| 18 | Governor supply failure monitor (positive) |
| 19 | Governor supply failure monitor (negative) |
| 20 | Signal to engine mounted tachometer / hours run indicator. |
| 21 | Remote start / low water start |
| 22 | Remote start / low water start |
| 23 | Pressure switch start (open to start) |
| 24 | Pressure switch start (open to start) |

Numbering for fans, louvers and alarm contacts as per individual manufacturer's standard.

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3.6 Auxiliary and Supplementary Functions

Any device or function of a supplementary nature provided in the equipment and not covered by this present specification shall not interfere with the functional requirements set out by the specification and referenced documents; they shall further comply with the data relating to them.

3.7 Documentation

General Requirement for guidance:

- All schematics and drawings shall be numbered and indexed.
- Any modification carried out to the equipment, to the schematics and/or to the drawings must be covered by a change to the revision level (letter or number). LPCB must be notified of all changes which may affect the approval)
- A list of all the drawing and schematic numbers must be provided.
- All documents must be in the English language.

The following shall be provided:

- 1 A technical operating sheet.
 - 1.1 Detailed explanation of the operation of each of the circuits (charger, battery switching, monitoring, surveillance, start-up etc.).
 - 1.2 Description of electrical characteristics: mains power voltage and battery voltage tolerances (type, capacity, voltage, manufacturer, breaking capacity of contracts available to the user, power consumption etc.).
 - 1.3 Description of possible external connections (indicators, inputs etc.)
 - 1.4 Description of ways and means of controlling battery chargers.
 - 1.5 Description of how to start the diesel engine.
- 2 Commissioning instructions.
- 3 Operating instructions (explanation of indicator lamps, trouble-shooting instructions, in the event of an alarm or malfunction). These instructions shall in particular include a clearly visible statement, prohibiting the use of the batteries for any purpose other than for motor start-up.
- 4 Instructions covering checks, maintenance and storage.
- 5 Electrical and key component schematics.
 - 5.1 Manufacturers recommended functional test procedures (routine).
- 6 Manufacturing drawings.
 - 6.1 Drawings showing views of the panel from the front, from above and from the side, showing the indicator lamps, pushbuttons and inscriptions (a photograph shall also be provided of the front face).
 - 6.2 Sectionalised drawing of the panel, showing the positions of the various items and devices (these shall be labelled).

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6.3 Drawing showing the positions of the terminal blocks and cabling, labelled with cross-reference to the schematics.

Each drawing shall have the dimensions marked on and be accompanied by a listing of all the items making up the equipment and protection, where this is appropriate (paint, varnish, etc.).

7 Means to safely disable engine for service and maintenance activities.

8 Test certificates, where applicable, showing compliance with Directives listed on page three.

4 MARKING, LABELLING AND PACKAGING

The housing shall have a data plate, positioned visibly and showing:-

- manufacturer's name or trademark
- manufacturers address
- model designation
- serial number
- year of manufacture
- LPCB approval mark
- the nominal voltage for the main power supply source
- the voltage of the 2 secondary sources (batteries)
- battery type Nicad / Planté (lead acid)

A label shall be affixed to the front of the controller providing clear and concise instructions regarding the weekly test procedure.

WEEKLY TEST PROCEDURE

1. Open test line (in the pump house) to start engine by creating a pressure drop in the fire protection system.
2. Allow engine to run for 30 minutes.
3. Close test line.
4. Stop engine (manual operation).
5. Operate Manual Test Start push button.
6. Allow engine to start and attain full speed.
7. Stop engine (manual operation).

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5 TYPE TESTING

The manufacturer shall submit a complete panel to the LPCB, including:-

- Connecting cabling between the panel and the batteries;
- Two batteries of the same voltage as those used in the installation but of a lower capacity, so as to ensure merely the operation of the devices included within the panel.
- The device which will indicate the start-up or failure to start of the motor. The input and output characteristics of this device must be specified in the technical data sheets.

The designer shall also provide a technical dossier, covering the items listed in Appendix 3.

5.1 Function tests

Verification tests shall be carried out to confirm that all the functionality required by this standard and referenced documents is provided by the controller.

5.2 Battery chargers

The batter charges shall be checked for correct operation at 85% and then 110% of nominal AC line voltage.

A functional test is to be carried out at 85% of nominal battery voltage.

5.3 Vibration testing

PURPOSE

The purpose of this test is to evaluate the ability of the components of a controller to withstand mechanically and to function formally when they are subjected to vibrations, which may occur under normal operating conditions in the installation, or during transportation.

APPARATUS AND METHOD OF OPERATION

This test is carried out with a vibrating device, used at a frequency of 20 Hz with a peak-to-peak amplitude of 0.8mm - that is, an acceleration equivalent to 0.64g.

The equipment, positioned in its normal operating plane, is subjected to vibrations for a period of 30 minutes, perpendicular to its plane of attachment and then for thirty minutes in two orthogonal directions parallel to this plane.

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REQUIREMENTS

In the course of this test, the equipment must remain stable. At the end of the test, the equipment must:-

- satisfy the necessary functional tests.
- reveal no defect or change which might, in time, affect its performance.

5.4 Temperature tests

PURPOSE

The temperature test is intended to verify operability of the controller at extremes of specified operating temperature range.

METHOD OF OPERATION

The equipment shall be placed in an environmental test chamber, with both AC and DC supplies connected.

A complete functional check should then be performed.

The chamber shall then be brought up to a temperature of 50°C, which must be maintained for a period of 24 hours continuously.

REQUIREMENTS

During the course of the test the equipment must continue to operate as specified.

At the end of the test, when brought back to ambient temperature, the equipment must:-

- not reveal any defect or change which might affect operation in the course of time.
- satisfy the necessary functional tests, which should be carried out at 85% & 110% of nominal battery voltage.

5.5 Electrical safety checks (AC Circuits)

In addition to statutory electrical safety design and test requirements applicable to the region of use:

Perform an insulation resistance test at 1000 Volts DC, between the circuit and Earth.

THE INSULATION RESISTANCE MUST EXCEED 10 MEGOHM

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Using Dielectric high voltage test equipment, apply a voltage of 2000 volts AC between the circuit and Earth, for a period of one minute.

NO BREAKDOWN SHALL OCCUR

Remove any links fitted in the above tests.

6 CLASSIFICATION AND DESIGNATION

LPCB approved products will be listed in the RedBook of approved products and services and published on the product approval certificate supplied to the owner of the approval. Accompanying the listings & certificates will be any key supporting information in relation to the LPCB approval. Any special limitation to the approval will also be set out in the listing and on the certificate. For details of acceptable use of the mark, see LPCB publication PN103 "Use of the certification marks"

PUBLICATIONS REFERRED TO:

| | |
|--------------------|---|
| BS EN 292 Part 1 | Safety of Machinery - Basic Concepts and General Principles of Design |
| BS EN 292 Part 2 | Safety of Machinery |
| BS EN 809 | Pumps and Pump Units for Liquids - Safety Requirements |
| BS EN 12845:2003 | Fixed firefighting systems - Automatic sprinkler systems - Design, installation and maintenance |
| BS EN 60529:1992 | Specification for degrees of protection provided by enclosures (IP code) |
| BS EN 60204-1 | Safety of Machinery - Electrical Equipment |
| BS EN 50081 Part 1 | EMC Generic Emission - Residential, commercial & light industrial |
| BS EN 50082 Part 2 | EMC Generic Immunity – Industrial |
| BS EN 60623 | Secondary cells and batteries containing alkaline or other non-acid electrolytes. Vented nickel-cadmium prismatic rechargeable single cells |
| BS 6260 | Specification for open nickel-cadmium prismatic rechargeable single cells – withdrawn |
| BS EN 60896 Part 1 | Stationary lead-acid batteries. General requirements and methods of test. Vented types |
| BS 6290 Part 1 | Lead-acid stationary cells and batteries. Specification for general requirements (withdrawn) |
| BS 6290 Part 2 | Lead-acid stationary cells and batteries. Specification for the high-performance Plante positive type) |

For undated references please refer to the latest published issue.

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Amendments Issued Since Publication

| DOCUMENT NO. | AMENDMENT DETAILS | SIGNATURE | DATE |
|--------------|---|-----------|----------|
| LPS 1236-1.1 | <ol style="list-style-type: none"> 1. New front cover 2. Title added to header 3. Notes amended on Page 4 4. Repagination 5. Update to copyright information | DC | Jan.2014 |