

## Loss Prevention Standard

LPS<sup>®</sup> 1237 : Issue 2.0

Requirements for control panels for electric motor driven pumps used in automatic sprinkler installations



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## **PARTICIPATING ORGANISATIONS**

This standard has been developed in conjunction with Industry Stakeholders and was the subject of public consultation via the BRE Global website.

## **REVISION OF LOSS PREVENTION STANDARDS**

Loss Prevention Standards (LPSs) will be revised by issue of revised editions or amendments. Details will be posted on our website at [www.redbooklive.com](http://www.redbooklive.com).

Technical or other changes which affect the requirements for the 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.

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 LPSS SHOULD ENSURE THAT THEY POSSESS THE LATEST ISSUE AND ALL AMENDMENTS.**

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## FOREWORD

This Standard identifies the evaluation and / or testing practices undertaken by BRE Global for the purposes of LPCB certification and listing of products and services. LPCB certification and listing and of products and services is based on evidence acceptable to BRE Global:-

- 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

The responsibility for ensuring compliance with the technical and managerial process and requirements for the product or service lies with the manufacturer, service provider or supplier.

Suppliers of LPCB Approved pump controllers shall control and be responsible for the design, construction, testing, performance and provision of installation and commissioning instructions for their pump controller as well as compliance with all relevant regulatory requirements and standards.

The installer of the approved pump controller is responsible for the installation of the pump controller in strict accordance with the manufacturer's installation manuals and procedures.

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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 [BREGlobalEnquiries@bregroup.com](mailto:BREGlobalEnquiries@bregroup.com).

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Certified products and services appear in the LPCB “List of Approved Products and Services” which may be viewed on our website: [www.redbooklive.com](http://www.redbooklive.com)

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## 1 SCOPE

This standard specifies LPCB's requirements for the approval of control panels for electric driven 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 - 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 fire pump set. It should be read in conjunction with the other appropriate standards:

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

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

- Detailing electric 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

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## **2 DEFINITIONS**

In addition to the definitions of BS EN 12845 and “LPC Rules for automatic sprinkler systems” (incorporating EN 12845 - Fixed firefighting systems - Automatic sprinkler systems - Design, installation and maintenance), the following definitions are relied upon in this document.

### **2.1 Electric pump controller**

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

### **2.2 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.

### **2.3 Pump set supplier or pump set manufacturer**

The entity responsible for the design, construction, testing, performance, provision of installation instructions and commissioning of their fire pump sets

### **2.4 Pump set installer**

The entity responsible for the installation of the fire pump set, in accordance with the pump set suppliers’ instructions.

### **2.5 Electric pump controller supplier or electric pump controller manufacturer**

The entity responsible for the design, construction, testing, performance and provision of installation and commissioning instructions for their control panel for electric motor driven pumps.



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### **3 REQUIREMENTS**

#### **3.1 General**

Control panels for electric motor driven pumps 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 panels for electric motor driven pumps 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 shall be given to other factors affecting system performance.

#### **3.2 Enclosure**

##### **3.2.1 Environmental protection**

The control panel housing shall be of non-combustible material [EN 13501:1 – EuroClass A1] and provide a degree of protection at least equal to IP 54 (BS EN 60529 - 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.

##### **3.2.3 Location**

Control panels for electric motor driven pumps shall be located as close as practicable to the fire pump sets they control and shall be within sight of the fire 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. The switch shall be capable of being locked in the on position.

This switch shall be clearly labelled as follows:

“SPRINKLER PUMP MOTOR SUPPLY - NOT TO BE SWITCHED OFF IN THE EVENT OF FIRE.”

Lettering for the above shall be at least 10mm high and shall be white on a red background.

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

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

### **3.3.2 Main switching components**

Main electrical contactors shall be selected for utilization category AC3 according to IEC 60947 – Low voltage switchgear and control gear.

Isolators/Fuse switches shall be selected for utilization category AC23.

Starters employing the Autotransformer method of reduced voltage starting shall be rated for a minimum of 6 starts per hour.

### **3.3.3 Electric circuit protection devices**

High Rupturing Capacity (HRC) fuses complying with BS HD 60269-2, BS 88-2 or IEC 60269, DIN 43620 shall be fitted to the controller to protect the sprinkler pump circuits.

Fuses shall be capable of carrying the stalled motor current for a period of not less than 75% of the period needed for the motor windings to fail.

The fuse-ratings shall be clearly shown at a point near the fuses themselves.

Any no-volt release mechanism shall be of the automatic resetting type so that on restoration of the supply, the motor can be restarted automatically if the trunk main pressure falls.

NOTE: MAGNETIC AND THERMAL TRIPS SHALL NOT BE USED.

### **3.3.4 Electrical design criteria**

All electrical and electronic components shall be suitably designed and rated to ensure reliable operation of the sprinkler pump in all scenarios foreseen by BS EN 12845 (e.g. start condition, normal operation and stalled rotor conditions).

Electric pump controller manufacturers shall provide the information required by Table 2 (Annex A) for all ratings of their design which are to be considered for LPCB approval. The table shall be accompanied by justification of the design decisions taken and supporting evidence (e.g. calculations and component data sheets). The data shall be provided to BRE Global for review.

The data shall be verified for the electric pump controller manufacturer by a competent person such as a chartered engineer with at least 5 years' experience of designing electrical and electronic systems. The CV and evidence of professional standing shall be included with the submission.

BRE Global reserve the right appoint an independent expert to review the data submitted.

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### 3.4 Operational parameters

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

- Motors in the pump assembly
- Its own logic and components

Normal operation must be ensured at temperatures between 0°C and 50°C or over a wider temperature range if specifically requested by the end user of the electric pump controller, which is to be within the scope of the LPCB approval.

The electric pump controller shall be provided with a stop pushbutton. When pressed and released, if a low pressure or emergency manual start demand condition is present, the fire pump set shall not stop, or shall immediately restart.

#### 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.

The electric pump controller shall start the fire pump set automatically on receipt of a signal indicating pressure drop in the fire protection system and the pump set shall continue to run until shut down manually.

#### 3.4.2 Manual starting system.

A manual start facility shall be provided. The manual start push button shall be clearly labeled:

‘MANUAL START’

Alternatively, the purpose of the start button should be easily and readily recognisable following international conventions.

#### 3.4.3 Stopping the pump

Consistent with BS EN 12845 10.7.5.2, once the pump has started, it shall continue to run until stopped manually. It shall only be possible to stop the pump by manual intervention.

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### 3.5 Outputs

#### 3.5.1 Indication

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

A common lamp test push button shall be provided.

The principle of visual indication used for fire pump sets is to be as follows:-

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

Lamps, LCD or LED type display panels may be used, except for the following critical functions which shall be indicated by a lamp or LED:

- AC supply healthy
- Fail to start
- Pump on demand
- Pump running

These conditions may additionally be displayed on LCD or LED type displays. For other conditions (e.g. see Table 1), healthy, fault & alarm information may be given by an alphanumeric display, and/or by Red, Amber and Green LEDs.

**Table 1 - Condition status indicators**

<b>Title</b>	<b>Lamp /LCD colour</b>	<b>Function</b>	<b>Audible</b>
AC supply healthy	Green	Indicates that the main supply is available on all three phases. Shall also indicate control supply healthy.	No
Pump on demand	Red	Indicates that an initiation signal is present, and the pump should be running.	No
Pump running	Red	Indicates that the pump is running (pressure switch, upstream of the pump check valve)	No
Start failure, or; Low discharge pressure	Red	Pump has not started automatically or the pump discharge pressure has not been reached.	Yes

NOTE where graphical symbols are used, an accompanying key shall be affixed to the front of the control panel, clearly relating the functions required by table 1.

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In addition, the following data shall 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) 'SUPPLY FAILURE' output signal, signifying a phase failure
- c) 'PUMP RUNNING' output signal, signifying the operation of the pump.
- d) 'START FAILURE' output signal, signifying low discharge pressure.

### 3.5.2 Meters – measurement indication

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

- The full load running current of the motor, by means of an ammeter having an overload scale of 6 times full load current.
- For all the measuring equipment, the units shall be stated. The normal functional ranges and units should be stated, preferably by direct display on the device. Where it is not reasonably practical to present normal functional ranges on the device, this information shall be provided in the manual.

### 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.

### 3.7 Documentation

General requirements:

- 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). BRE Global 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 shall be in the English language.

The following shall be provided:

1. Design details:
  - 1.1. A technical operating sheet
  - 1.2. Detailed explanation of the operation of each of the circuits (monitoring, surveillance, start-up, etc.)
  - 1.3. Description of electrical characteristics: mains power voltage, breaking capacity of contacts available to the user, power consumption, etc)
  - 1.4. Description of possible external connections (indicators, inputs, etc)
  - 1.5. Description of how to start the electric pump
2. Commissioning instructions
3. Operating instructions (explanation of indicator lamps, trouble-shooting instructions, in the event of an alarm or malfunction)
4. Instructions covering checks, maintenance and storage
5. Electrical and key component schematics

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- 5.1. Manufacturers' recommended functional test procedures
6. Manufacturing drawings. 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)
  - 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)
  - 6.3. Drawing showing the positions of the terminal blocks and cabling, labelled with cross reference to the schematics.
7. Means to safely disable motor & panel for service and maintenance activities.
8. Test certificates, where applicable, showing compliance with directives.

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#### **4 TYPE TESTING**

The electric pump controller manufacturer shall submit a complete panel to the BRE Global, including:-

- A test harness and associated equipment wired to the control panel to enable:
  - All inputs to be simulated
  - All volt free contacts to be monitored
  - A test motor (which may be a reduced power version for test purposes)

The electric pump controller manufacturer shall also provide a technical dossier covering the items listed in 3.7.

##### **4.1 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.

While carrying out the functional test, the controller shall be connected to a test motor, in order to prove phase rotation is correct.

Finally, with the motor disconnected, a functional test shall be carried out at 85% of rated voltage.

##### **4.2 Simulation of power failure**

The controller shall be connected to a test motor. The power to the panel shall be isolated for a minimum of 5 minutes. The power shall be restored.

Required results: Control panel shows mains supply healthy  
The motor shall not start or activate momentarily.  
Mains healthy volt free contacts show healthy condition

Test to be repeated 5 times.

A mains phase shall be disconnected to simulate a phase failure.

Required results: Control panel shows Mains failure  
Mains healthy volt free contacts shows a failure  
Control panel will still 'attempt' to start both manually & automatically

##### **4.3 Manual Start**

The manual start push button is activated to start the motor

Required results: Motor starts (and the controller changes from star to delta state) within 15s [by observation of the contactors and motor running speed]  
Close pump running simulated pressure switch input  
Control panel shows pump running indication  
Pump running volt free contacts activate.  
Ammeter shows running current

The manual stop push button is pressed

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Required results: Motor stops  
Open pump running simulated pressure switch input  
Control panel shows pump stopped indication (or absence of pump running indication)  
Pump running volt free contacts show stopped

The manual start push button is activated to start the motor

Required results: Motor starts (and the controller changes from star to delta state) within 15s [by observation of the contactors and motor running speed]

Do not close pump running pressure switch. Start the pump using the manual start button. After a maximum of 15s:

Required results: Control panel shows pump failure indication  
Start failure volt free contacts activate.

#### 4.4 Automatic Start

The start pressure switch input is opened to start the motor;

Required results: Motor starts (and the controller changes from star to delta state) within 15s  
Pump on demand indication  
Pump on demand volt free contacts operate  
Close pump running simulated pressure switch input  
Control panel shows pump running indication  
Pump running volt free contacts activate.  
Ammeter shows running current

Close the start pressure switch input and the manual stop push button is pressed

Required results: Motor stops  
Pump on demand volt free and indication condition is removed  
Open pump running simulated pressure switch input  
Control panel shows pump stopped indication (or absence of pump running indication)  
Pump running volt free contacts show stopped  
Pump on demand volt free contacts show no demand

The pressure switch start input is opened to start the motor and then close the pump running pressure switch input.

Required results: Motor starts (and the controller changes from star to delta state) within 15s  
Pump running indication and volt free contacts are present

Press the stop push button.

Required results: The motor does not stop or stops only while the button is pressed, and then restarts due to the pump on demand being present.



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#### 4.5 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 AC supply connected.

A complete functional check (tests as specified in clauses 4.1 to 4.4 of this standard) 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, the oven shall be switched off. The oven shall be allowed to return to ambient temperature. Then, the equipment must:-

- not reveal any defect or change which might affect operation in the course of time.
- satisfy the functional tests (clauses 4.1 through to 4.4), which should be carried out at 85% & 110% of nominal voltage.

#### 4.6 Electrical safety checks (AC Circuits)

Perform an insulation resistance test at 1000 volts DC, between the incoming terminals and Earth.

**THE INSULATION RESISTANCE SHALL EXCEED 10 MEGOHM**

Using Dielectric high voltage test equipment, apply a voltage of 2500 volts AC between the incoming terminals and Earth, for a period of one minute.

**NO BREAKDOWN SHALL OCCUR**

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

**THE INSULATION RESISTANCE SHALL EXCEED 10 MEGOHM**

Using Dielectric high voltage test equipment, apply a voltage of 2500 volts AC between the outgoing terminals and Earth, for a period of one minute.

**NO BREAKDOWN SHALL OCCUR**

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On completion of electrical safety testing, ensure any shorting links fitted in order to do so are removed.

#### **4.7 Other tests**

Where special designs or new manufacturing methods make it necessary to conduct additional testing, this shall be carried out after consultation with the electric pump controller manufacturer.

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## **5 CLASSIFICATION AND DESIGNATION**

LPCB certificated products will be listed in the Red Book of approved products and services and published on the product certificate.

Accompanying the listings & certificates will be any key supporting information relevant to the LPCB approval. Any special limitation to the approval will also be set out in the listing and on the certificate.

## **6 MARKING, LABELLING AND PACKAGING**

For details of acceptable use of the mark, see LPCB publication PN103 “Use of the certification marks”

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

- Electric pump controller manufacturers’ name or trademark
- Electric pump controller manufacturers’ address
- model designation
- serial number
- year of manufacture
- LPCB approval mark [see PN103]
- the nominal voltage for the main power supply source
- rating (kW) of starter

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## 7 ADDITIONAL GUIDANCE DOCUMENTATION

This standard is part of a series relating to fire pump sets. It should be read in conjunction with LPCB Scheme Document SD247 "*Certification requirements for control panels for electric engine driven pumps used in automatic sprinkler installations*"

## 8 PUBLICATIONS REFERRED TO:

BS EN ISO 12100	Safety of machinery. General principles for design. Risk assessment and risk reduction
BS EN 809	Pumps and Pump Units for Liquids – Safety Requirements
BS EN 12845	Fixed firefighting systems - Automatic sprinkler systems - Design, installation and maintenance
BS EN 60529	Specification for degrees of protection provided by enclosures (IP code)
BS EN 60204-1	Safety of Machinery - Electrical Equipment
BS EN IEC 61000-6-2	Electromagnetic compatibility (EMC). Generic standards. Immunity standard for industrial environments
BS EN IEC 61000-6-3	Electromagnetic compatibility (EMC). Generic standards. Emission standard for equipment in residential environments
IEC 60947	Low-voltage switchgear and control gear
BS HD 60269-2:2013, BS 88-2:2013	Low-voltage fuses. Supplementary requirements for fuses for use by authorized persons (fuses mainly for industrial application). Examples of standardized systems of fuses A to K
DIN 43620	Low-voltage high-rupturing-capacity fuses with blade contacts
IEC 60269-2	Low-voltage fuses – Part 2: Supplementary requirements for fuses for use by authorized persons (fuses mainly for industrial application) – Examples of standardized systems of fuses A to I

For undated references please refer to the latest published issue.

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**Annex A – Electrical design parameters:**

See clause 3.3.4. The following table (Table 2) is to be completed by electric pump controller manufacturers in support of their application for LPCB approval. Continuation sheets shall be used as necessary.

Note: the values indicated in the column “*typical full load current*” are indicative only; designers’ are expected to ensure appropriate values for their equipment and implementation are used.

**Table 2 - electrical design parameters**

motor kW	Typical full load current	Fuse isolator rating	Fuse type	Main contactor rating	Star contactor rating	Isolator to contactor cable size	star contactor cable size	Justification provided (yes/no and refer to continuation sheet)
5.5	12							
7.5	14							
11	20							
15	28							
18.5	34							
22	38							
30	54							
37	66							
45	80							
55	95							
75	130							
90	155							
110	188							
132	229							
150	247							
160	275							
185	304							
200	336							
220	385							
250	425							
280	460							
315	535							
355	580							
Other (state)	Other (state)							

<b>Issue: 2.0</b>	<b>LOSS PREVENTION STANDARD</b>	<b>LPS® 1237</b>
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#### AMENDMENTS ISSUED SINCE PUBLICATION

DOCUMENT NO.	AMENDMENT DETAILS	SIGNATURE	DATE
LPS 1237-1.1	<ol style="list-style-type: none"> <li>1. New front cover</li> <li>2. Title added to header</li> <li>3. Notes amended on Page 4</li> <li>4. Repagination</li> <li>5. Update to copyright information</li> </ol>	DC	Jan 2014
LPS 1237-2.0	<ol style="list-style-type: none"> <li>1. Removal of vibration test</li> <li>2. Clarification of lamp requirements</li> <li>3. Clarification of function test requirements</li> <li>4. Scheme Document (SD) number updated</li> <li>5. Further editorial and technical changes in response to consultation</li> </ol>	SNB	Oct 2022
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