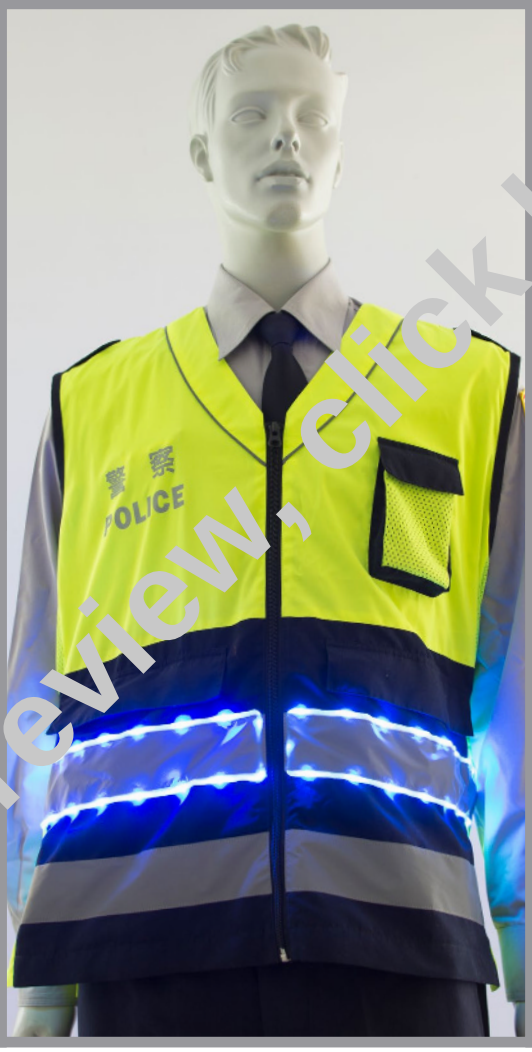
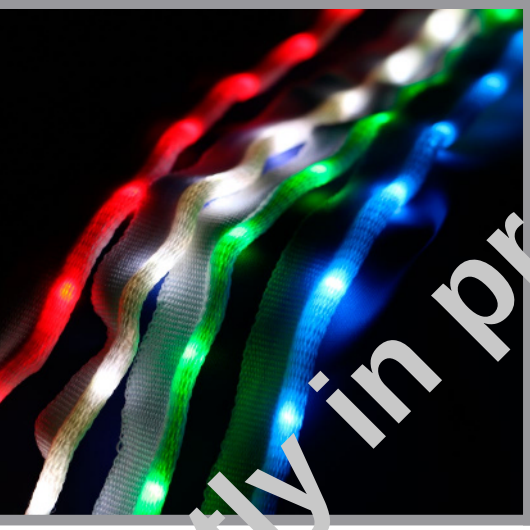
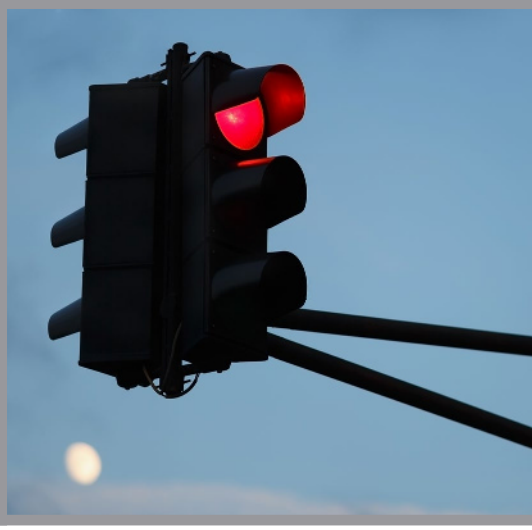
PAS 10412:2015

Intelligent clothing – LED active high visibility clothing – Specification







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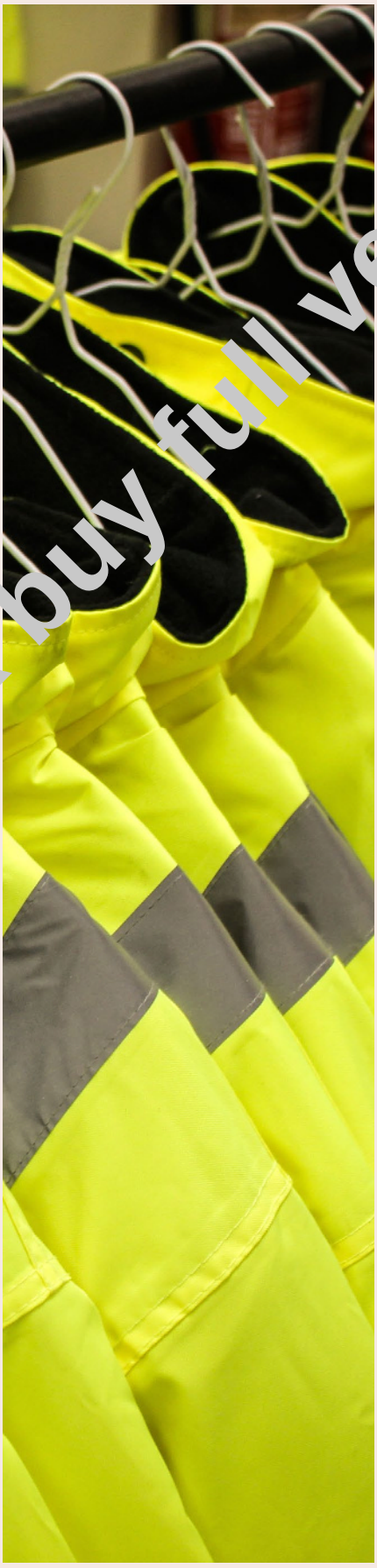


Foreword

This PAS was sponsored by the Taiwan Textile Research Institute (TTRI). Its development was facilitated by BSI Standards Limited and it was published under licence from The British Standards Institution. It came into effect on 30 November 2015.

Acknowledgement is given to the following organizations that were involved in the development of this PAS as members of the steering group:

- Taiwan Textile Research Institute (TTRI)
- AiQ Smart Clothing Incorporated, Taiwan
- CENTEXBEL, the Belgian Textile Research Centre
- Chinese Culture University, Taiwan
- Committee for Conformity Assessment of Accreditation and Certification on Functional and Technical Textiles (FTTS), Taiwan
- Co-opted technical expert
- Co-opted technical expert
- Dankook University, Personal Protective Equipment Centre, Korea
- Electronics Testing Centre (ETC), Taiwan
- Fabric King Textile Company Limited, Taiwan
- Finnish Institute of Occupational Health (FIOH), Finland
- Harvatek Corporation, Taiwan
- National Taipei University of Technology, Taiwan
- Polytechnic University, Textile Bioengineering Research Centre, Hong Kong
- SATRA Technology Centre, UK
- Shinshu University, Japan
- Transport Research Institute (TRL) Ltd.

Acknowledgement is also given to the members of a wider review panel who were consulted in the development of this PAS.

This PAS is not to be regarded as a British Standard. It will be withdrawn upon publication of its content in, or as, a British Standard.

The PAS process enables a specification to be rapidly developed in order to fulfil an immediate need in industry. A PAS can be considered for further development as a British Standard, or to institute part of the UK input into the development of a European or International Standard.

Relationship with other publications

This PAS specifies requirements for high visibility clothing conforming to EN ISO 20471 incorporating active lighting via Light Emitting Diodes (LEDs).

It is envisaged that further standards for clothing incorporating active lighting will be developed in the future. These might include other types of technology or other forms of clothing.

Product certification/testing. Users of this PAS are advised to consider the desirability of third-party certification/testing of product conformity with this PAS. Users seeking assistance in identifying appropriate conformity assessment bodies or schemes may ask BSI to forward their enquiries to the relevant association.

Test laboratory accreditation. Users of this PAS are advised to consider the desirability of selecting test laboratories that are accredited to EN ISO/IEC 17025 by a national or international accreditation body.

Assessed capability. Users of this PAS are advised to consider the desirability of quality system assessment and registration against the appropriate standard in the EN ISO 9000 series by an accredited third-party certification body.

Use of this document

It has been assumed in the preparation of this PAS that the execution of its provisions will be entrusted to appropriately qualified and experienced people, for whose use it has been produced.

Presentational conventions

The provisions of this PAS are presented in roman (i.e. upright) type. Its requirements are expressed in sentences in which the principal auxiliary verb is "shall".

Commentary, explanation and general informative material is presented in italic type, and does not constitute a normative element.

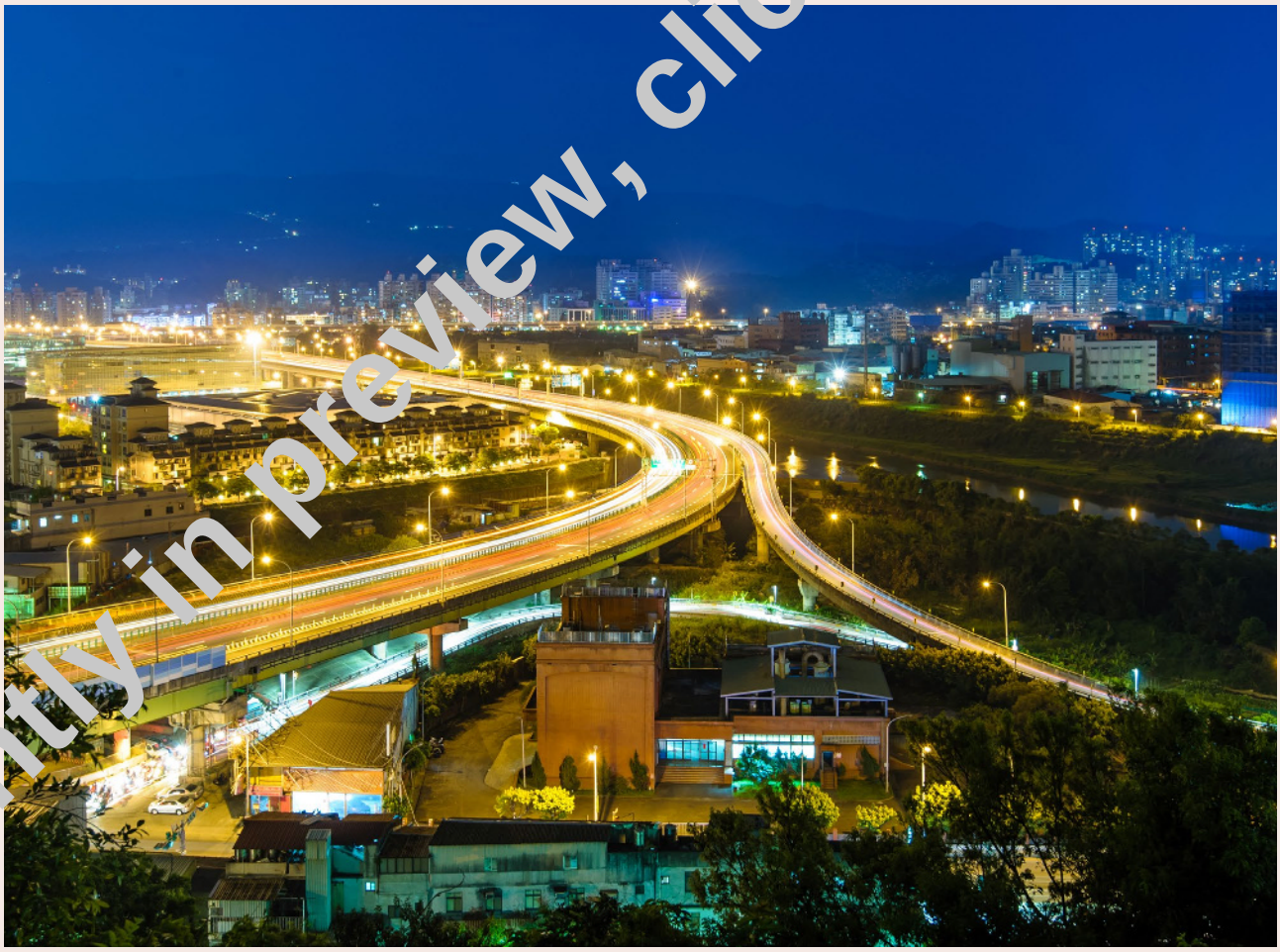
Requirements in this PAS are drafted in accordance with *Rules for the structure and drafting of UK standards*, subclause **J.1.1**, which states, "Requirements should be expressed using wording such as: 'When tested as described in Annex A, the product shall ...'". This means that only those products that are capable of passing the specified test will be deemed to conform to this PAS.

Contractual and legal considerations

This publication does not purport to include all the necessary provisions of a contract. Users are responsible for its correct application.

Compliance with a PAS cannot confer immunity from legal obligations

Particular attention is drawn to the need to be aware of regulations and legal obligations that might be applicable to the scope covered by the PAS or compliance with it. Regulations and legal obligations might vary from one country and jurisdiction to another. Particular attention is drawn to those regulations and legal obligations that address Personal Protective Equipment (PPE), where applicable, though it is important to note that the scope of this PAS is not limited to PPE.



Introduction

This specification has been sponsored by the Taiwan Textile Research Institute and developed in conjunction with BSI to cover requirements for high visibility clothing which incorporate active lighting in the form of LED lighting fixtures. Such clothing can be used for visually signalling the presence of the person wearing the clothing to others, especially in situations where there is no, or only limited, external sources of light.

There are many benefits to incorporating LED active lighting in high visibility clothing. The low energy requirements of LEDs mean that they remain an energy effective and cost efficient form of lighting. The low voltage used by the LEDs also pose a low risk to those wearing the LED active high visibility clothing. Their size, relatively light mass and durability allow for flexible and innovative designs that might be used for clothing falling within the category of PPE, or other clothing categories (such as for sport or recreational use) in which visibility is desirable or of key importance. Where clothing does fall within the category of PPE, it is critical to stress that such clothing might fall within the remit of legislation or country-specific regulations which could place certain requirements or restrictions on the design and placement of the LED lighting fixtures. Such requirements fall outside of the remit of this PAS. The intention behind the creation of PAS 10412 is for LED active lighting to enhance and not reduce or restrict the performance of the high visibility clothing within which it is featured.

LED active high visibility clothing is beginning to be used by the traffic police within Taiwan, and a number of other countries. There also exists the potential for such clothing to be used within other situations in which the usability of high visibility clothing could be improved by the addition of active lighting through LEDs.

Intelligent clothing is a new and rapidly developing area within the industries of textiles and technology. In order to establish acceptable levels of the quality and safety of LED active high visibility clothing for the end users of such products, and also to maintain the integrity of manufacturers working in this area, it is necessary to develop standards that can be used to provide an international benchmark against which products can be measured. PAS 10412 has been developed specifically for the purpose of creating requirements and establishing a baseline standard for LED active high visibility clothing.

It is envisaged that further standards for clothing incorporating active lighting will be developed in the future.

1 Scope

This PAS specifies requirements for high visibility clothing conforming to EN ISO 20471 incorporating active lighting via Light Emitting Diodes (LEDs). It covers LED modules that are permanently attached to high visibility clothing. It is applicable to an LED lighting fixture having a removable battery-controller set and LEDs measuring between 2 mm and 20 mm in diameter.

This PAS covers high visibility clothing that is designed to be subjected to temperatures falling between -30°C and 50°C and is applicable to high visibility clothing used in professional or civil situations. It covers requirements for the luminous intensity of the LED lighting set only, when not including luminous intensity obtained from other lighting or visibility systems that also appear on the high visibility clothing, such as fluorescent material and retroreflective material.

This PAS does not cover the requirements of the wiring, e.g. electrically conductive material that is woven into the fabric itself, or fabric made of electrically conductive material. The PAS makes no provision for requirements for LED active high visibility clothing designed for use in fire-fighting, or for protecting against chemical, bio-nuclear, or radioactive situations. It does not cover requirements for the placement or configuration of LED lighting sets on high visibility clothing.

Annex A covers requirements for test specimens and test conditions and Annex B covers a test method for an LED lighting fixture photometric measurement.

NOTE 1 *The temperatures to which the clothing is designed to be subjected includes temperatures expected for cleaning and maintenance of the clothing.*

NOTE 2 *Requirements for fluorescent material and retroreflective material can be found in EN ISO 20471.*

NOTE 3 *Factors related to risk level are given in EN ISO 20471:2013, Table A.1.*

2 Normative references

The following documents, in whole or in part, are normatively referenced in this document and are indispensable for its application. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

EN 60086-5 (IEC 60086-5), *Primary batteries – Part 5: Safety of batteries with aqueous electrolyte*

EN 60529:1992+A2:2013 (IEC 60529:2011), *Degree of protection provided by enclosures (IP Code)*

EN 60598-1:2015 (IEC 60598-1:2014), *Luminaires – Part 1: General requirements and tests*

EN 60598-2-20 (IEC 60598-2-20), *Luminaires – Part 2-20: Particular requirements – Lighting chains*

EN ISO 6330:2012, *Textiles – Domestic washing and drying procedures for textile testing*

EN ISO 13688:2013, *Protective clothing – General requirements (ISO 13688:2013)*

EN ISO 15797, *Textiles – Industrial washing and finishing procedures for testing of workwear*

EN ISO 20471:2013, *High visibility clothing – Test methods and requirements (ISO 20471:2013)*