

Guidance on the Modification and Maintenance of Low Voltage Switchgear and Controlgear Assemblies



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Foreword

This technical guide has been written by Gambica's Controlgear Group Technical Committee in collaboration with Northumbrian Water and the Water Industry Mechanical and Electrical Specifications (WIMES) Electrical Working Group. It was born from the increasing necessity to modify and maintain motor control centres and other low voltage switchgear installed at water and wastewater facilities.

Disclaimer

This document is for guidance only and cannot act as a substitute for the regulations themselves. It is not an authoritative interpretation of the regulations, which is a matter for the courts. The reader should refer to the relevant regulations for a full statement of the legal requirements.

Included are examples of typical issues that need to be addressed when considering the modification and maintenance of low voltage switchgear and controlgear assemblies. The person responsible for the work shall satisfy themselves that the person(s) performing the work is competent to undertake the tasks required, has the appropriate risk assessment and method statement for the tasks at hand and follows the appropriate regulatory requirements.

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1. Purpose of this document

1.1. The purpose of this document is to provide guidance on the modification and maintenance of installed low voltage switchgear and controlgear assemblies. Technical knowledge and experience are essential for ensuring that assemblies are modified or maintained safely and in accordance with the requirements of the relevant legislation and standards.

1.2. All electrical equipment and installations must comply with the Electricity at Work Regulations (EAWR) and the Provision and Use of Work Equipment Regulations (PUWER). New equipment must comply with the Electrical Equipment (Safety) Regulations (EER) when it is placed on the market.

NOTE: The EAWR should not be confused with the EER, which applies to the supply of both new and second hand electrical equipment. Under the terms of the EER, all equipment owned and operated by the user is deemed to be 'second hand' i.e. it has passed from the manufacturer to the user and is not being sold for use. The EAWR and the PUWER both apply to electrical equipment that is being used in the work place.

1.3. This document specifically addresses the safety aspects associated with the modification and maintenance of low voltage switchgear and controlgear assemblies. Other aspects which must also be considered (e.g. EMC, functional safety of the machinery/equipment being controlled and chemical hazards, such as the presence of hazardous substances) are not specifically addressed.

2. Glossary

For an extensive list of definitions, including competence, refer to **BS 6423** and **BS EN 61439**.

GAMBICA - The UK Trade Association for Instrumentation, Control, Automation and Laboratory Technology.

NWL – Northumbrian Water Limited.

WIMES - Water Industry Mechanical and Electrical Specifications.

EAWR - Electricity at Work Regulations.

PUWER – Provision and Use of Work Equipment Regulations.

EER - Electrical Equipment (Safety) Regulations.

Low Voltage - Voltages from 50V to 1000V a.c. or from 75V to 1500V d.c.

CE marking – a marking by which the manufacturer indicates that the product is in conformity with the applicable requirements set out in Community harmonisation legislation providing for its affixing (*Source: Regulation (EC) 765/2008*).

Blue guide – The official European commission guidance to the implementation of EU product rules.

OEM – Original Equipment Manufacturer i.e. the manufacturer of the original switchgear and controlgear assembly.

Section – Constructional unit of an assembly between two successive vertical delineations (*Source: BS EN 61439-1*).

3. Modification or maintenance of installed assemblies - general

It is essential that the following aspects are carefully considered before embarking on any modification or maintenance of installed assemblies:

- 3.1. The risks associated with both the present condition and the use after modification or maintenance of the assembly shall be assessed and documented by a competent person prior to commencing work. Installed assemblies shall not be modified, unless a competent person has confirmed that the proposed modifications are compliant with the EAWR and PUWER.

If the risk assessment leads to the conclusion that the nature of the hazard has changed or the level of risk has increased (for example, there has been a significant increase in the watts-loss and/or load current or a change of functionality), then the modified assembly shall be considered as a new assembly and re-certified accordingly. Furthermore, if the conclusion is that it is a new assembly, the assembly shall undergo a full conformity assessment before it is put into service. For further information, please see the 'Blue Guide'.

- 3.2. A suitable and sufficient risk assessment and method statement for undertaking the work shall also be performed. Guidance for establishing a safe working environment is provided within BS 6423:2014 clause 4.2.

All modifications and maintenance shall be carried out by a competent person using a method statement and the guidance given in BS 6423 and with particular attention to clause 9.

- 3.3. The following is a non-exhaustive list of tasks that may be undertaken during the modification or maintenance of assemblies:

- Fault finding
- Component replacement
- Disconnection and reconnection of power and control of wiring
- Drilling new fixings on an existing mounting plate
- Cutting additional access holes in a compartment or mounting plate
- Filing within the compartment
- Punching holes in doors, mounting plates and covers
- Routing cables through cable ways
- Removal and replacement of covers and doors
- Replacing faulty equipment with new equipment
- Up-rating or down-rating of the compartment
- Alterations to the existing equipment configurations (e.g. combining two compartments into one)
- Extending the equipment by the installation of new sections.

4. Work not requiring the assembly to be extended (no additional section(s))

4.1. Modifications

4.1.1. All modifications should be carried out in accordance with the guidance given in BS 6423.

4.1.2. Wherever possible, the OEM should be approached to carry out a suitable risk assessment, accept the responsibility for the changes and provide confirmation that the work has been carried out in accordance with BS 6423. If this proves to be impractical, the following options should be considered:

4.1.2.1. Ask the OEM to provide the necessary design parameters for the proposed modification (e.g. watts-loss, full load current, short circuit capability) to enable a third party to satisfactorily carry out the modifications. These parameters must be based on the actual or extrapolated OEM's type-test data and provide a sound basis for a competent third party to modify the assembly.

If the necessary design parameters cannot be obtained from the OEM, then replacement or the provision of an additional assembly must be considered (see section 5).

4.1.2.2. Have the assembly assessed by a competent manufacturer and obtain a statement describing the fitness for purpose of the existing assembly and the acceptability or otherwise of the proposed modifications. Clause 8 of BS 6423 provides assistance in conducting a fitness for purpose review.

Another manufacturer cannot certify the modified assembly, but based on their own experience and knowledge with regard to the manufacture and testing of certified assemblies, may be able to advise whether or not, in their opinion, the modification will be safe in operation.

The responsibility for continuing to use the assembly remains with the user.

The responsibility for modifications remains with the assembly manufacturer undertaking the design and implementing the modifications.

4.2. Maintenance

4.2.1. All maintenance shall be carried out in accordance with OEM's recommendations and the guidance given in BS 6423.

4.2.2. The user may have a number of assemblies that are not certified to current standards and regulations. In cases where such equipment has performed satisfactorily in all respects for several years (i.e. where there is an adequate and auditable history of safe and proper operation as part of the company's planned maintenance regime), there is an increased likelihood that identical component replacement will no longer be viable (e.g. through component obsolescence). If this is the case, it is possible that components with the same functionality can be used. A competent person has to make sure that any component substitution is safe and must ensure that the changes have been properly documented (including drawings) and must endorse the maintenance record appropriately.

Guidance on the selection and installation of replacement and alternative components is given in clause 9 of BS 6423.

5. Work requiring the assembly to be extended (additional section(s))

5.1. The following options are permissible:

5.1.1. Extend the existing assembly either by:

a) the OEM using the same fundamental design of busbar system (e.g. material, cross section, phase centres and support centres) and enclosure,

or

b) a competent third party assembly manufacturer using the OEM's same design of busbar system (e.g. material, cross section, phase centres and support centres) and enclosure as the original assembly.

5.1.2. Install a separately certified and physically separate additional assembly using either:

a) a feeder from the existing assembly,

or

b) if no feeder exists or a supply cannot be derived from the existing assembly, split the supply before the existing assembly.

5.1.3. Replace the existing assembly completely.

5.2. All new equipment supplied (i.e. the extension(s)) shall meet all applicable regulations. The new assembly including the transition must conform to the Low Voltage Directive, preferably by using BS EN 61439.

6. Competencies

Throughout this guide reference is made to competent persons (individuals and/or companies).

Examples of criteria that might be used to determine the competence of an individual or company to perform specific tasks include:

6.1. Design competencies (assembly manufacturer or user)

- Detailed understanding of BS EN 61439-1 & 2.
- Detailed understanding of BS 6423.
- Creation of risk assessments in the context of modifying and maintaining low voltage switchgear and controlgear assemblies.
- Working knowledge of the Low Voltage Directive.
- Understanding of the applicable requirements of the EAWR, PUWER, and the wider Health and Safety regulations.
- Familiarity with the GAMBICA Technical Guide "LOW-VOLTAGE POWER SWITCHGEAR AND CONTROLGEAR ASSEMBLIES - A guide to the requirements of BS EN 61439-1:2011 and BS EN 61439-2:2011.
- Experience in design of modifications to assemblies.
- Technical / design capability to review the design and verify the manufacture of the parts necessary to undertake the modification work.

6.2. Craftsperson / technician competencies (assembly manufacturer or user)

- Time served panel builder / assembler / wireman (depending on the terminology used by the various panel builders) or maintenance technician.
- 7 years' experience in building / modifying / maintaining / testing / inspecting low voltage switchgear and controlgear assemblies (based on a 4 year apprenticeship and 3 years field experience performing similar work).
- Understanding of the applicable requirements of the EAWR, PUWER, and the wider Health and Safety regulations.

7. References

BS EN 61439-1:2011 Low-voltage switchgear and controlgear assemblies. General rules

BS EN 61439-2:2011 Low-voltage switchgear and controlgear assemblies. Power switchgear and controlgear assemblies

BS 6423:2014 Code of practice for maintenance of low-voltage switchgear and controlgear

The 'Blue Guide' to the implementation of EU product rules – 2014

GAMBICA Technical Guide "LOW-VOLTAGE POWER SWITCHGEAR AND CONTROLGEAR ASSEMBLIES - A guide to the requirements of BS EN 61439-1:2011 and BS EN 61439-2:2011

Low Voltage Directive 2006/95/EC

Electricity at Work Regulations (EAWR)

Provision and Use of Work Equipment Regulations (PUWER)

The Electrical Equipment (Safety) Regulations

IET Wiring Regulations 17th Edition

H&S (signs and signals) regulations 1996

For high voltage switchgear >1kV:

HSE's "Keeping electrical switchgear safe" HSG230 (2nd edition) 2015

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