

Railway applications — Fixed installations — D.C. switchgear —

Part 7-1: Measurement, control and protection devices for specific use in d.c. traction systems — Application guide

The European Standard EN 50123-7-1:2003 has the status of a
British Standard

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National foreword

This British Standard is the official English language version of EN 50123-7-1:2003. It supersedes DD ENV 50123-7-1:1999 which is withdrawn.

The UK participation in its preparation was entrusted by Technical Committee GEL/9, Railway electrotechnical applications, to Subcommittee GEL/9/3, Fixed equipment, which has the responsibility to:

- aid enquirers to understand the text;
- present to the responsible international/European committee any enquiries on the interpretation, or proposals for change, and keep the UK interests informed;
- monitor related international and European developments and promulgate them in the UK.

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**Railway applications –
Fixed installations – D.C. switchgear
Part 7-1: Measurement, control and protection devices
for specific use in d.c. traction systems –
Application guide**

Applications ferroviaires –
Installations fixes –
Appareillage à courant continu
Partie 7-1: Appareils de mesure,
de commande et de protection
pour usage spécifique dans
les systèmes de traction
à courant continu –
Guide d'application

Bahnanwendungen –
Ortsfeste Anlagen –
Gleichstrom-Schaltanlagen
Teil 7-1: Mess-, Steuer- und
Schutzeinrichtungen in Gleichstrom-
Bahnanlagen –
Anwendungsleitfaden

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CENELEC

European Committee for Electrotechnical Standardization
Comité Européen de Normalisation Electrotechnique
Europäisches Komitee für Elektrotechnische Normung

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Foreword

This European Standard was prepared by SC 9XC, Electric supply and earthing systems for public transport equipment and ancillary apparatus (fixed installations), of the Technical Committee CENELEC TC 9X, Electrical and electronic applications for railways.

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This European Standard supersedes ENV 50123-7-1:1998.

The following dates were fixed:

- latest date by which the EN has to be implemented
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with the EN have to be withdrawn (dow) 2005-09-01

This Part 7-1 is to be used in conjunction with EN 50123-1:2003.

Annexes designated “informative” are given for information only.
In this standard, annexes A, B and C are informative.

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1 Scope

This European Standard provides assistance, guidance and requirements for the design of protection, control and measuring systems in d.c. installations intended to provide a power supply to traction systems. This application guide identifies the characteristics and parameters of equipment used in the measurement, control and protection of d.c. traction systems.

Guidance is given concerning the appropriate application of electrical protection systems.

2 Normative references

This European Standard makes reference to other parts of the EN 50123 series.

3 Definitions

For the purposes of this European standard the terms and definitions given in EN 50123-1. apply.

4 Measurement

4.1 General

Two types of measurements are made on traction systems:

- a) measurements of current and voltage for connections to instruments and metering;
- b) current and voltage signals used for operating protection devices.

NOTE 1 It is necessary to take care that inductive circuits can alter the inherent di/dt response.

NOTE 2 In traction systems with trains supplying regenerative energy and in double end fed line sections, the current measurement device should be capable of measuring forward and reverse currents.

4.2 Current

4.2.1 d.c. shunt

A shunt is usually used for measurement purposes, but, when used for protection where accuracy of response is required, the device is preferably of the non-inductive type.

Use of an isolating transducer permits operation of secondary devices at lower voltage and with lower rated insulation. This is preferable to taking full mains voltage into what may otherwise be low voltage compartments.

It should be noted that shunts can run very hot when carrying their rated normal current, with one terminal hotter than the other, dependant on the direction of current flow. Where they are used inside switchgear assemblies, then temperature rise tests of the assemblies should take this fact into account.

4.2.2 Isolating transducer

See EN 50123-7-2 and EN 50123-7-3.

This device requires an auxiliary power supply which should be derived from a guaranteed source whose loss of supply should initiate an alarm.

The output signal is usually not of the same level as the input and is dependant on the requirements of the secondary device.

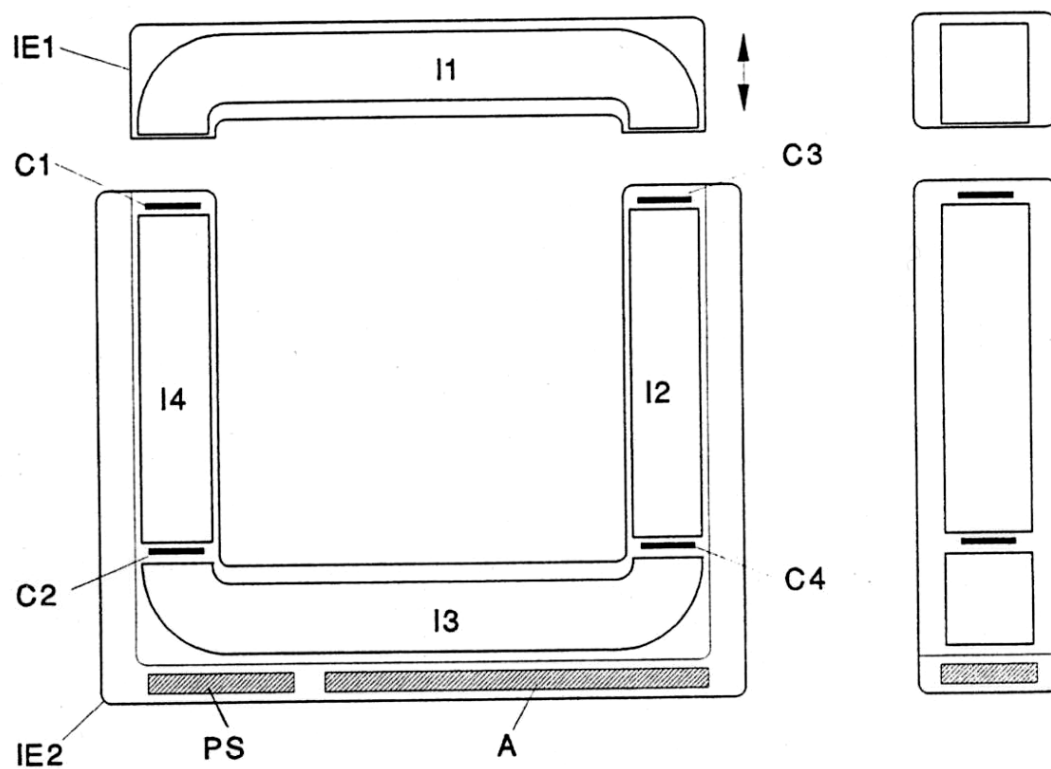
4.2.3 Hall effect sensor

This device requires an auxiliary power supply which should be derived from a guaranteed source whose loss of supply should initiate an alarm.

This device provides an isolated output. The primary insulation is generally provided by encapsulation of the iron circuit and sensors. The device is sometimes constructed in a split form for ease of fitting to a main conductor. See Figure 1 for typical example of a split form of Hall effect sensor.

The output signal from the device is proportional to the current in the main conductor. This signal is very low in magnitude and usually requires amplification to provide a suitable input to the secondary device. Thus an auxiliary power supply is required.

Reliability and overall accuracy can be improved by using an average value obtained from multiple devices. Placing devices at different locations around a conductor can reduce proximity effects.



C1....Cn	Hall effect cells
A	Amplifier
PS	Internal Power Supply
I1....In	Iron Circuits
IE1 , IE2	Insulated Encapsulation

Figure 1 – Example of a split form hall effect sensor

4.3 Voltage dividers

Dividers have the same insulation voltage requirements as the main circuit. Isolating transducers should be employed if the secondary device can not withstand the main circuit insulation level.

NOTE Failure to open circuit of the footing resistor will result in approximately full mains voltage appearing on the output side of the divider. A voltage limiter connected in parallel to the footing resistor may be employed for protection against overvoltages

5 Control systems

5.1 General

Control systems are usually only those which involve the electrical closing of switchgear devices. Their effect is to permit or inhibit a closure depending on the status of the system and the compliance with specified requirements.

5.2 Anti-pumping

This system permits the closing device to effect a single attempt while the signal to close is maintained. If the device fails to complete a satisfactory close operation whilst the close signal is maintained, then attempts at further reclosing (pumping) are inhibited.

Anti-pumping can be achieved in the closing control circuit in various ways, either by using mechanism auxiliary switches or a timing relay. It only allows a single closing pulse to the closing device, which resets when the initial closing signal is released.

Anti-pumping should be explicitly requested by the purchaser and may be applied to all types of switchgear closing device.

5.3 Auto-reclose with variable reclose time and final lock out

Auto-reclose is only applied to the line circuit breaker L. Its purpose is to reclose the line circuit breaker automatically after an overcurrent release operation.

On traction systems especially light-rail or trolleybus systems, overcurrent release operations of line circuit breakers are often due to overcurrents at simultaneous accelerations of vehicles or due to temporary short circuits. An auto-reclose system can enhance the reliability of the system.

Auto-reclose is usually associated with a timing device which initiates several attempts at reclosing with varying adjustable intervals of circuit dead time. After a prescribed number of unsuccessful recloses, then a lock out of the reclosing circuit is instigated. This lock out is either electrically or manually resettable.