
**Lifts (elevators), escalators and
moving walks — Programmable
electronic systems in safety related
applications —**

**Part 3:
Life cycle guideline for programmable
electronic systems related to
PESSRAL and PESSRAE**

*Ascenseurs, escaliers mécaniques et trottoirs roulants — Conception
et mise au point des systèmes électroniques programmables dans les
applications liées à la sécurité —*

*Partie 3: Lignes directrices pour le cycle de vie des systèmes
électroniques programmables liés à PESSRAL et PESSRAE*



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Foreword

ISO (the International Organization for Standardization) is a worldwide federation of national standards bodies (ISO member bodies). The work of preparing International Standards is normally carried out through ISO technical committees. Each member body interested in a subject for which a technical committee has been established has the right to be represented on that committee. International organizations, governmental and non-governmental, in liaison with ISO, also take part in the work. ISO collaborates closely with the International Electrotechnical Commission (IEC) on all matters of electrotechnical standardization.

The procedures used to develop this document and those intended for its further maintenance are described in the ISO/IEC Directives, Part 1. In particular the different approval criteria needed for the different types of ISO documents should be noted. This document was drafted in accordance with the editorial rules of the ISO/IEC Directives, Part 2. www.iso.org/directives

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The committee responsible for this document is ISO/TC 178, *Lifts, escalators and moving walks*.

ISO 22201 consists of the following parts, under the general title *Lifts (elevators), escalators and moving walks — Programmable electronic systems in safety-related applications*:

- *Part 2: Escalators and moving walks (PESSRAE)*
- *Part 3: Life cycle guideline for programmable electronic systems related to PESSRAL and PESSRAE* [Technical Report]

When revised, ISO 22201:2009, *Lifts (elevators) — Design and development of programmable electronic systems in safety-related applications for lifts (PESSRAL)*, will become Part 1.

Introduction

This Technical Report addresses phases in the life cycle planning and actions for post-installation activities (e.g. maintenance, repair, and replacement and modification of interface) of PESSRAL and PESSRAE to help ensure the safety integrity level (SIL) over the life cycle of the system.

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Lifts (elevators), escalators and moving walks — Programmable electronic systems in safety related applications —

Part 3:

Life cycle guideline for programmable electronic systems related to PESSRAL and PESSRAE

1 Scope

This Technical Report provides additional information and process for the development of the instruction manual required by ISO 22201:2009 (PESSRAL) and ISO 22201-2 (PESSRAE) for programmable electronic systems (PES).

2 Normative references

ISO 22201:2009, *Lifts (elevators) — Design and development of programmable electronic systems in safety-related applications for lifts (PESSRAL)*

ISO 22201-2, *Lifts (elevators), escalators and moving walks — Programmable electronic systems in safety related applications — Part 2: Escalators and moving walks (PESSRAE)*

3 Terms and definitions

For the purposes of this document, the terms and definitions given in ISO 22201:2009, ISO 22201-2 and the following apply:

2.1

competent maintenance person

designated person, suitably trained, qualified by knowledge and practical experience, provided with necessary instructions and supported within their maintenance organization to enable the required maintenance operations to be safely carried out

Note 1 to entry: The competence of the maintenance person within the maintenance organization will be continuously updated

2.2

design equivalent

original equipment manufacturer, or third party certified product, which fulfils same SIL rated component/subsystem design specifications but has different specifications for the non-SIL rated portion of the PES

2.3

functional equivalent

product which fulfils same functional requirements with different SIL rated component/subsystem design specifications from that of the original certified product

2.4

maintenance organization

company or part of a company where competent maintenance person(s) carry out maintenance operations on behalf of the owner of the installation

2.5

manufacturer

natural or legal person who takes responsibility for the design, manufacture and placing on the market of safety components for lifts or of machinery (escalator, passenger conveyor, service lift and accessible goods only lift)

2.6

maintenance

post-installation life cycle activities, including preventative, replacement, repair, and alteration (modifications)

2.7

owner

natural or legal person who has the power or disposal of the installation and takes the responsibility for its operation and use

2.8

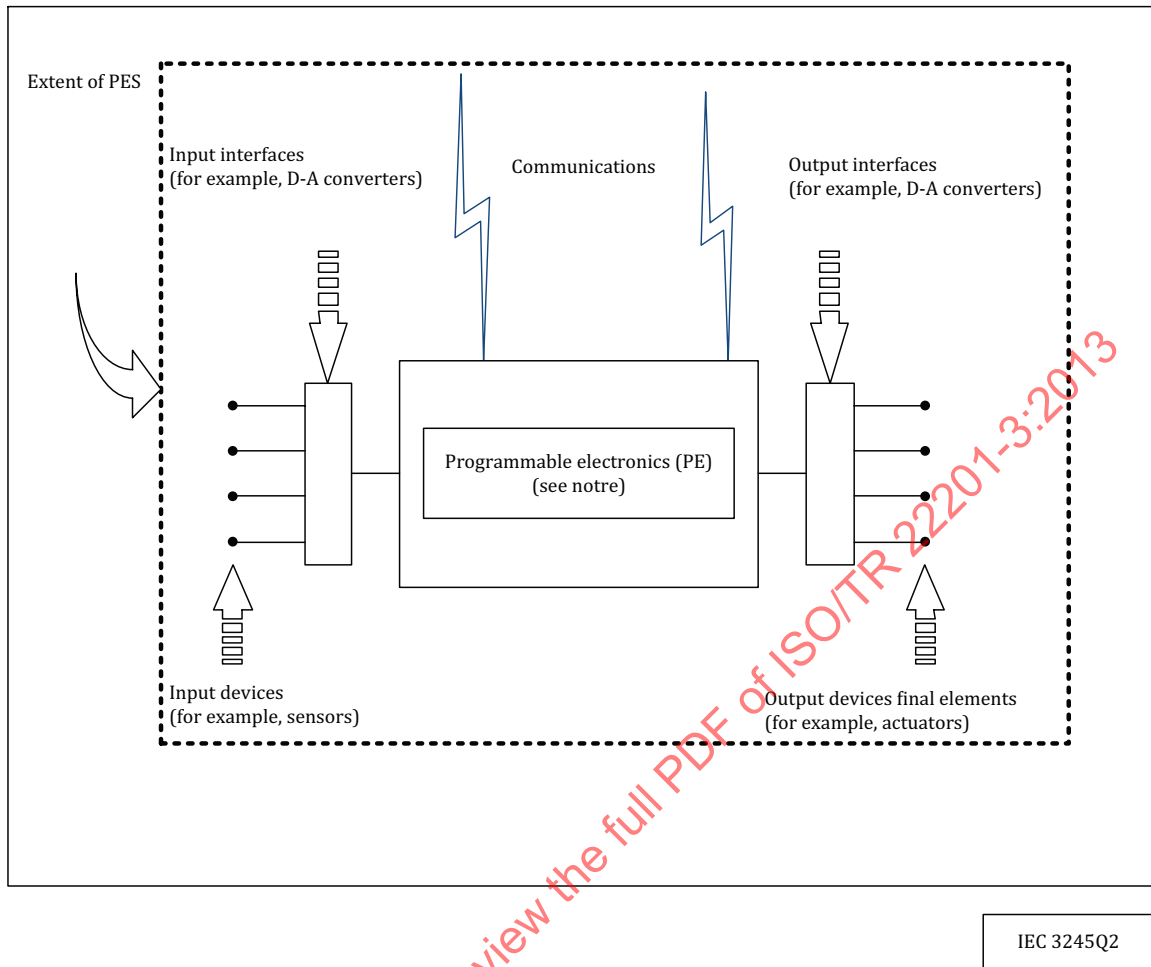
programmable electronic system

PES

system for control, protection or monitoring based on one or more programmable electronic devices, including all elements of the system such as power supplies, sensors and other input devices, data highways and other communication paths, and actuators and other output devices

Note 1 to entry: See [Figure 1](#).

Note 2 to entry: A PES may perform functions that fulfil requirements for SIL rated and non-SIL rated function(s). The SIL rating of a function is only required to consider that portion of the PES that perform the SIL relevant functional requirements.



NOTE The programmable electronics are shown centrally located but could exist at several places in the PES.

Figure 1 — Basic PES structure

2.9

product equivalent

original equipment manufacturer or third party certified product that is a direct replacement in design, make, model, and version (built to the same production drawings) of the original certified product

4 Instruction manual content

This clause addresses special considerations for process and additional content of instruction manuals applied to PES as described in ISO 22201:2009 and ISO 22201-2.

4.1 Safety precautions

In creating an instruction manual, the developer will carry out a risk assessment to identify and address possible hazards for this phase of the life cycle of PES. (See ISO 14798 for possible hazard assessment methodology).

4.2 Markings, signs, pictograms and written warnings

If the risk assessment indicates that additional specific warnings are required for the purpose of maintenance, these will be affixed directly on the installation/component or, when this is not possible, in the close vicinity. Markings, signs, pictograms and written warnings will be readily understandable

and unambiguous. Where possible, readily understandable signs and pictograms taken from ISO 3864 will be used. Signs or written warnings carrying only "DANGER" will not be used. Information affixed directly on the installation/component will be permanent and legible.

4.3 Elements to consider for content of the instruction manual

Listed below are elements to consider for contents of the instruction manual. See also A.1 for additional elements of consideration.

- a) All the necessary operations to ensure the safe and intended functioning of the installation and its components after the completion of the installation and throughout its life cycle.
- b) Repair or changing of components which may occur due to wear or tear and do not affect the characteristics of the installation.
- c) Modernization of the installation, including the changing of any characteristic of the installation (speed, load, etc.).
- d) Rescue operations carried out by Fire Brigades and emergency personnel.
- e) The specifications and the intended use of the installation (type of installation, performance, type of goods to be transported, type of users, etc.).
- f) The environment in which the installation and its components are installed (weather conditions, vandalism, etc.).
- g) Any restriction of use.
- h) The result of the risk assessment (see 4.1) for every working area and for every task to be undertaken.
- i) The specific maintenance instructions provided by the manufacturer of the safety components.

5 Procedure

The instructions for maintenance of PES will be provided by the manufacturer when placed on the market and be the result of a risk assessment. When preparing the content of the maintenance instructions, the following elements will be taken into account in the manual:

- a) Control Documents – Control documents will be identified and maintained for the life of a PES that includes SIL rated hardware or software. These documents include:
 - 1) Functional requirements:
 - i) design specifications (system and component/subsystem);
 - ii) production specification;
 - iii) version identification and version control.
- b) Maintenance activity and record keeping of maintenance activity – The following maintenance activities, date and explanation of reason for the activity of PES will be recorded and retained by the owner for the life of the PES installation:
 - 1) preventative maintenance of the safety device (scheduled safety function actuation, proof test, etc.);
 - 2) failure event of the safety device;
 - 3) modification in the PES device (obsolescence, upgrade, reliability improvement, etc.);

- 4) modification of the interfaces to the safety device or its environment.
- c) Validation of replacement or modification process – Replacements or modifications that result from the maintenance activities in (b) will be made according to the process outlined in A.2. Where SIL relevant and non-SIL relevant functions (those indicated in ISO 22201:2009 and ISO 22201-2 and non-SIL relevant circuits driven by or communicating with SIL rated parts) are included in the SIL rating of a PES, changes made to software or hardware of the non-SIL relevant functions need to be treated in the same manner as a change to the SIL relevant portion of the PES.

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Annex A (informative)

Elements of instruction manual and validation process

A.1 Additional elements for creating instruction manual

See [Table A.1](#).

Table A.1 — Additional elements for creating instruction manual

ID	Element to consider
1	Consideration of diagnostics and failure modes identified
2	Clarity in how to perform the proof check
3	Clarity in gaining access to PES components
4	Clarity in replacing PES components
5	Identification of the physical components including software
6	Identification of PES components in documentation
7	Version and configuration management of PES devices and related software
8	Version and Configuration management of system interfaces with PES devices
9	Precautions concerning sensitivity to changes in external environmental condition of the installation (e.g. air pressure, temperature, humidity, ESD, EMI, and grounding)
10	Frequency for maintenance action including proof check
11	Precautions related to introduction of unintended faults due to test simulation setup/parameters
12	Precautions related to unintended faults due to test conditions
13	Precautions related to unintended faults due to testing tools or incompatibility of testing tools
14	Precautions related to misleading results due to misuse of testing tools or incompatibility of testing tools

A.2 Process for validating PES device replacement or modification

See [Figure A.1](#).