TECHNICAL SPECIFICATION

ISO/TS 8103-6

First edition
2017-09

Escalators and moving walks —

Part 6: Safety parameters meeting the GESRs

Escaliers mécaniques et trottoirs roulants —

Partie 6: Titre manque

Reference number
ISO/TS 8103-6:2017(E)

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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 (see www.iso.org/directives).

Attention is drawn to the possibility that some of the elements of this document may be the subject of patent rights. ISO shall not be held responsible for identifying any or all such patent rights. Details of any patent rights identified during the development of the document will be in the Introduction and/or on the ISO list of patent declarations received (see www.iso.org/patents).

Any trade name used in this document is information given for the convenience of users and does not constitute an endorsement.

For an explanation on the voluntary nature of standards, the meaning of ISO specific terms and expressions related to conformity assessment, as well as information about ISO's adherence to the World Trade Organization (WTO) principles in the Technical Barriers to Trade (TBT) see the following URL: www.iso.org/iso/foreword.html.

This document was prepared by Technical Committee ISO/TC 178, *Lifts, escalators and moving walks*..

A list of all parts in the ISO 8103 series can be found on the ISO website.

Introduction

This document was prepared under the old numbering of the ISO 25740 series. With the resolution of the plenary Meeting in Sydney 09/2016, the new number of this document will be ISO/TS 8103-6. When the renumbering of the standards to 810x-family is finished, this document is revised.

This document was prepared in response to the need to set global safety parameters for escalators and moving walks.

The objective of ISO/TS 25740-1 and this document is to:

a) define a common global level of safety for all people using, or associated with escalators and moving walks;

b) facilitate innovation of escalators and moving walks not designed according to existing local, national or regional safety standards, while maintaining equivalent levels of safety. If such innovations become state of the art, they can then be integrated into the detailed local safety standard, at a later date; and

c) help remove trade barriers.

ISO/TS 25740-1 establishes global essential safety requirements (GESRs) for escalators and moving walks by addressing hazards and risks that can be encountered on escalators and moving walks. The GESRs however, state only safety objectives of escalators and moving walks.

This document provides guidance and criteria for achieving conformance with safety requirements of GESRs by specifying global safety parameters (GSPs) for use and implementation, where applicable, in an escalator or moving walk to eliminate hazards or mitigate safety risks addressed in the GESRs. However, GSPs are not mandatory.

Clause 4 describes the approach and methodology used in the development of this document. Clause 5 gives instructions for the use and implementation of GSPs. The GSPs are presented in Clause 6 in the sequence of GESRs in ISO/TS 25740-1.

This document is a product safety standard in accordance with ISO/IEC Guide 51.

Escalators and moving walks —

Part 6:
Safety parameters meeting the GESRs

1 Scope

This document:

a) specifies global safety parameters (GSPs) for escalators and moving walks, their components and their functions;

b) complements the system and methods specified in ISO/TS 25740-1 for mitigating safety risks that can arise in the course of, the operation and use of, or work on, escalators and moving walks.

This document is applicable to escalators and moving walks that can:

a) be located in any permanent and fixed structure within or attached to a building;

b) have any

1) rated load, size of load carrying unit and speed, and

2) travel height;

c) be affected by fire and weather;

d) be foreseeably misused, but not vandalized.

This document does not specifically cover

— needs of users with disabilities, and

— risks arising from

— work on escalators and moving walks under construction or during alterations and dismantling;

— vandalism, and

— fire in the environment of the escalator or moving walk.

2 Normative references

The following documents are referred to in the text in such a way that some or all of their content constitutes requirements of this document. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

ISO 14798:2009, *Lifts (elevators), escalators and moving walks — Risk assessment and reduction methodology*

ISO/TS 25740-1:2011, *Safety requirements for escalators and moving walks — Part 1: Global essential safety requirements (GESR)*

3 Terms and definitions

For the purposes of this document, the following terms and definitions apply.

ISO and IEC maintain terminological databases for use in standardization at the following addresses:

— ISO Online browsing platform: available at http://www.iso.org/obp

— IEC Electropedia: available at http://www.electropedia.org/

3.1
authorized person
person suitably trained with authorization to access restricted areas of *escalators* (3.9) and *moving walks* (3.25) (e.g. machinery spaces, separate machine rooms) and to work there, for the purpose of inspecting, testing and maintaining

[SOURCE: ISO/TS 25740-1:2011, 3.1]

3.2
cause
circumstance, condition, event or action that in a *hazardous situation* (3.16) contributes to the production of an *effect* (3.6)

[SOURCE: ISO 14798:2009, 2.1]

3.3
competent person
person in possession of the necessary technical knowledge, skills, qualification and experience to perform a work or task

3.4
control
system that governs the starting, acceleration, speed, deceleration and/or stopping of the *LCU* (3.20)

[SOURCE: ISO/TS 25740-1:2011, 3.3]

3.5
corrective action
action taken to reduce *risk* (3.30)

[SOURCE: ISO/TS 25740-1:2011, 3.4]

3.6
effect
result of a *cause* (3.2) in the presence of a *hazardous situation* (3.16)

[SOURCE: ISO 14798:2009, 2.2]

3.7
electromagnetic compatibility
EMC
degree of immunity to incident electromagnetic radiation and level of emitted electromagnetic radiation of electrical apparatus

3.8
enclosure of the travel path
structural elements which isolate the travel path from all other areas or space

[SOURCE: ISO/TS 25740-1:2011, 3.12]

3.9
escalator
power-driven, inclined, continuous moving stairway, including guards adjacent to the travel path, used for raising or lowering persons in which the user carrying surface of the LCU (e.g. steps) remains horizontal

[SOURCE: ISO/TS 25740-1:2011, 3.15]

3.10
essential safety requirement
ESR
requirement intended to eliminate or sufficiently mitigate the *risk* (3.30) of *harm* (3.13) to *users* (3.41), *non-users* (3.26), and *authorized persons* (3.1) using or associated with *escalators* (3.9) and *moving walks* (3.25)

3.11
global essential safety requirement
GESR
globally agreed upon essential safety requirement

Note 1 to entry: See 3.10.

3.12
global safety parameter
GSP
globally agreed upon *safety parameter* (3.34)

Note 1 to entry: See 3.34.

3.13
harm
physical injury or damage to the health of people, or damage to property or the environment

[SOURCE: ISO 14798:2009, 2.3]

3.14
harmful event
occurrence in which a *hazardous situation* (3.16) results in *harm* (3.13)

[SOURCE: ISO 14798:2009, 2.4]

3.15
hazard
potential source of *harm* (3.13)

[SOURCE: ISO 14798:2009, 2.5]

3.16
hazardous situation
circumstance in which people, property or the environment are exposed to one or more *hazards* (3.15)

[SOURCE: ISO 14798:2009, 2.6]

3.17
incident
effect
event or occurrence, which can, but does not necessarily create a *risk* (3.30) of *harm* (3.13), including risks possible due to, shearing, crushing, falling, impact, trapping, fire, electric shock, exposure to weather, etc.

[SOURCE: ISO/TS 25740-1:2011, 3.13]

3.18
landing
floor, balcony or platform used to receive and discharge persons from the *LCU* (3.20)

[SOURCE: ISO/TS 25740-1:2011, 3.14]

3.19
life cycle
period of usage of a component or the machinery

[SOURCE: ISO 14798:2009, 2.7]

3.20
load carrying unit
LCU
step/pallet/belt designed to carry persons for the purpose of transportation

[SOURCE: ISO/TS 25740-1:2011, 3.17]

3.21
LCU system
continuous connection of multiple *LCUs* (3.20) designed to carry persons for the purpose of transportation forming a transportation path

3.22
machinery
escalator (3.9) or *moving walks* (3.25) machine(s) mechanisms and associated equipment

[SOURCE: ISO/TS 25740-1:2011, 3.18]

3.23
machinery space
space(s) inside or outside of the supporting structure where the machinery as a whole or in parts is placed

3.24
maintenance
process of examination, lubrication, cleaning, adjustments, repair and replacement of parts of *escalators* (3.9) and *moving walks* (3.25) to ensure the safe and intended functioning of escalators and moving walks and its components after the completion of the installation and throughout its *life cycle* (3.19)

3.25
moving walk
power-driven installation for the conveyance of persons, including guards adjacent to the travel path, in which the user carrying surface of the *LCU* (3.20) remains parallel to its direction of motion and is uninterrupted (e.g. pallets, belt)

[SOURCE: ISO/TS 25740-1:2011, 3.16]

3.26
non-user
person in the vicinity of an *escalators* (3.9) or *moving walks* (3.25) but not intending to access or use it

[SOURCE: ISO/TS 25740-1:2011, 3.20]

3.27
protective measures
means used to reduce *risk* (3.30)

Note 1 to entry: Protective measures include risk reduction by inherently safe design, protective devices, personal protective equipment, information for use and installation, and training.

Note 2 to entry: See also definition for “corrective actions” in 3.5.

[SOURCE: ISO 14798:2009, 2.8]

3.28
rated load
load that the *escalator* (3.9) or *moving walks* (3.25) is designed to move

[SOURCE: ISO/TS 25740-1:2011, 3.22]

3.29
relative movement
situation where a component of an *escalator* (3.9) or *moving walks* (3.25) moves in the vicinity of other components of escalators or moving walks that is stationary, or that moves at a different speed or in a different direction; also a situation where a component of an escalator or moving walk moves in the vicinity of a structure where persons may be present

EXAMPLE Building floor surrounding the escalator or moving walk.

3.30
risk
combination of the probability of occurrence of *harm* (3.13) and the *severity* (3.36) of that harm

[SOURCE: ISO 14798:2009, 2.10]

3.31
risk analysis
systematic use of available information to identify *hazards* (3.15) and to estimate the *risk* (3.30)

[SOURCE: ISO 14798:2009, 2.11]

Note 1 to entry: This method aims at systematically identifying and assessing hazards, evaluating risks and recommending risk reduction measures.

3.32
risk assessment
overall process comprising a *risk analysis* (3.31) and a *risk evaluation* (3.33)

[SOURCE: ISO 14798:2009, 2.12]

3.33
risk evaluation
consideration of the *risk analysis* (3.31) results to determine if the risk reduction is required

[SOURCE: ISO 14798:2009, 2.13]

3.34
safety parameter
SP
quantitative unit, the value of which, in the form of numerical values or references to ISO, IEC or other standards, provides a level of safety consistent with that provided by relevant standards in current use in the *escalator* (3.9) or *moving walks* (3.25) industry and sound engineering practices

3.35
scenario
sequence of a *hazardous situation* (3.16), *cause* (3.2) and *effect* (3.6)

[SOURCE: ISO 14798:2009, 2.14]

3.36
severity
qualitative measure of the worst possible *incident/effect* (3.17) that could be caused by a specific *hazard* (3.15)

[SOURCE: ISO 14798:2009, 2.15]

3.37
sound engineering practice
use of engineering or technical methods to design or evaluate a design or system by taking into account relevant factors that can influence its efficacy and operation

Note 1 to entry: This practice also involves the use of applicable standards, specifications, codes, regulatory and industrial guidelines, as well as accepted engineering and design methods and installation and maintenance practices.

3.38
transportation
process whereby persons step onto a moving *LCU* (3.20), which then travels from one *landing* (3.18) to another landing, where the person exits the LCU

[SOURCE: ISO/TS 25740-1:2011, 3.29]

3.39
travel path
path and related space within which *LCU* (3.20) travels between the *landing* (3.18)

[SOURCE: ISO/TS 25740-1:2011, 3.33]

3.40
uncontrolled movement
situation where

— *LCU* (3.20) moves when the *escalator* (3.9) or *moving walks* (3.25) was to remain stationary, or

— LCU travels at a speed that is out of control of the means designed and intended to control the LCU speed during operation.

EXAMPLE 1 LCU starts to move, due to failure of, or breakdown in, escalator or moving walk components, such as speed control, drive or brake system.

EXAMPLE 2 The LCU speed exceeds its designed speed or does not decelerate or stop as intended, due to failure of, or breakdown in, components of an escalator or moving walk, such as speed control, drive or brake system.

[SOURCE: ISO/TS 25740-1:2011, 3.31]

3.41
user
person using the *escalator* (3.9) or *moving walk* (3.25) for the purpose of transportation

[SOURCE: ISO/TS 25740-1:2011, 3.32]

3.42
vandalism
deliberate destruction of or damage to property for no obvious gain or reason

3.43
working area or space
area or space defined for use by *authorized persons* (3.1) to perform maintenance, inspection or testing of an *escalator* (3.9) or *moving walks* (3.25)

[SOURCE: ISO/TS 25740-1:2011, 3.33]

4 Development of global safety parameters (GSPs)

4.1 Purpose of GSPs

4.1.1 To enable verification that the escalator, or moving walk, and its selected components and functions have achieved safety objectives of applicable GESRs, global safety parameters (GSPs), such as strength, clearances, acceleration or deceleration values, are provided in this document in the form of numerical values or references to International Standards or other standards.

4.1.2 According to ISO/TS 25740-1:2011, 5.1.5, a GESR states only the safety objective, or "what" shall be done or accomplished but not "how" to accomplish the objective. Therefore, in order to achieve the safety objective of a GESR, appropriate designs of escalators and moving walks components and functions shall be selected and their compliance with the GESR shall be verified. ISO 14798 describes a risk assessment process that can help to establish that the GESRs have been fulfilled with a specific design. In order to mitigate specific risks identified in the risk assessment process, specific components, functions or GSPs may be used.

4.1.3 ISO/TS 25740-1 and this document do not mandate the use of specific designs of components and functions (such as, specific designs of "steps", "machines", or "supporting elements") as they are commonly specified and required in prescriptive standards for escalators and moving walks. Mandating such components and functions in this document would inhibit design innovations.

4.1.4 All applicable GESRs shall be fulfilled in accordance with ISO/TS 25740-1, irrespective of whether or not there is a GSP specified in this document.

4.2 Approach

4.2.1 As was the case with development of ISO/TS 25740-1, the development of this document also involved experts from various parts of the world.

4.2.2 Individual experts derived safety parameters from independent research of existing standards, anthropometric data, clearances, forces, etc., and a comparison of major codes. GSPs which were determined to provide sufficient mitigation of risks related to relevant GESRs have been included in this document (see Annex A).

5 Understanding and implementing GSPs

5.1 Overall objective

5.1.1 Consistent with the purpose described in 4.1, global safety parameters in relation to individual GESRs are specified in Clause 6.

5.1.2 The objective of the global safety parameters in Clause 6 is to

a) introduce parameters that provide universal means to demonstrate compliance with GESRs, and

b) stimulate the harmonization of safety parameters in existing national and regional standards.

5.1.3 To accomplish the safety objective of a GESR, a GSP, although not mandatory, can be an adequate means of achieving compliance. The list of GSPs in Table 2 is not exhaustive.

Table 2 specifies fixed minimum or maximum values. Where the GSP gives a possible range of values in the referenced International Standards, dependent on the circumstance in which it is used, justification that the correct value has been chosen can be required to suit the particular hazardous situation(s).

5.1.4 Listed GSPs should not be interpreted as the only measure of conformity with a GESR. Conformance with a GESR may be achieved by deviating from the listed GSPs, provided that the risk is mitigated using other equally effective protective measures. Parameters consistent with sound engineering practices or selected from applicable codes or standards may be used. In such cases, it is necessary to demonstrate that the type of parameters chosen:

a) sufficiently mitigate the risk addressed in the GESR, and

b) ensure that any new risks created by implementation of the parameter(s) are sufficiently mitigated.

NOTE See also ISO 14798.

5.2 Properties and use of GSPs

5.2.1 GSPs

5.2.1.1 The GSPs are listed in Table 2.

NOTE 1 International Standards and other standards have been used wherever applicable for developing GSPs as they represent long-standing history in escalator and moving walk safety, or scientifically developed data which has been applied for some time in safety-related applications. The other standards include escalator and moving walk safety codes, electrical codes, anthropometric standards and various materials standards. In all cases, the use of the relevant standard is to assist the user of this document.

NOTE 2 This document recognizes that slightly different or non-identical values for safety-related criteria have been used around the world in order to ensure the safe operation of escalators and moving walks. Examples of these are safety factors, space sizes to prevent body part entry, space, forces, deceleration and acceleration rates and illumination levels. In many cases, the values vary only slightly (e.g. as a result of conversions of imperial to SI units of measure, or due to different origins of the units). Nevertheless, these slightly differing values have proven to result in safe escalator and moving walk operation over many years.

5.2.1.2 Safety factors should be considered relative to the material being used and its application, based on sound engineering practice considering all applicable codes and standards.

5.2.1.3 It is recognized that electronic safety devices and programmable electronic systems in safety-related applications (i.e. PESSRAE) are extensively used in many industries. Where used in escalator and moving walk safety applications, guidance on safety integrity levels (SILs) is provided in ISO 22201-2.

For devices using electro-mechanical or non-programmable electronic devices, methods such as Failure Modes and Effects Analysis (FMEA) should be considered to establish the safety level.

5.2.1.4 The values in Table 2 are globally harmonized values based upon current applicable national or regional standards, with the recognition that some of the values are not absolute in nature.

5.2.1.5 When existing national, regional or international escalator or moving walk safety standards are revised, these GSPs (i.e. these values and generic International Standards) should be considered.

5.2.2 Process of implementing GSPs]

In evaluating an escalator or moving walk or its components for compliance with a particular GESR, the following risk assessment and risk reduction process, in accordance with ISO 14798, shall be applied.

a) The risk scenario, which includes the hazardous situation addressed in a GESR and the harmful event, shall be formulated.

b) Risk shall be estimated, evaluated and assessed.

c) If the risk level requires mitigation, protective measures are proposed. The protective measures should eliminate the hazard or reduce the risk. Reducing the risk may include implementing GSPs.

d) After applying the protective measures, the risk shall be re-assessed. Step c) is repeated until the risk has been sufficiently mitigated.

e) If a new hazard is created as a result of mitigating a given risk, the risk resulting from this new hazard shall be fully mitigated using the above-mentioned process.

5.2.3 Ways of using GESRs and GSPs

5.2.3.1 With respect to a specific task affecting the safety of escalators and moving walks, such as designing an escalator or moving walk or its components, GESRs and related GSPs can be used in two ways, namely

a) one can begin with the risk assessment of scenarios related to the task in order to identify the applicable GESRs and related GSPs, as in 5.2.3.2, or

b) one can begin with a review of all GESRs in order to identify those that could be applicable to the task, as in 5.2.3.3.

NOTE In addition to designing, tasks can include installing or servicing of, or writing design-prescriptive safety standards for escalators and moving walks or their components.

5.2.3.2 When designing an escalator or moving walk or its components, a review of the intended use, foreseeable misuse (see ISO 14798:2009, 4.5.5.4) and design should be made, in which all possible risk scenarios are formulated and risk assessment is performed, in order to find out which, if any, GESRs and relevant GSPs are applicable to the design. All risk scenarios that could occur during operation and use should be considered, as well as during the maintenance, repair or inspection of the escalator and moving walk.

The risk scenarios shall include specifications of all hazardous situations, combined with all harmful events (i.e. causes, effects and possible levels of harm). The risk analysis of a scenario shall be followed by the process of risk estimation and evaluation in accordance with the methodology specified in ISO 14798. As long as a risk is assessed as not sufficiently mitigated, the proposed design shall have to be continually improved until the applicable GESRs are fulfilled.

NOTE 1 For the practical use of GESRs, see ISO/TS 25740-1:2011, 5.2.

NOTE 2 Rationales for GESRs, given in notes following each GESR in Table 2, are intended to provide further understanding of the intent and use of GESRs.

5.2.3.3 The process may start with the review of GESRs. In this case, one considers the design or actual installation of the escalator or moving walk or its components with the intent of identifying those GESRs that can be applicable to the design, installation of the escalator or moving walk or its components. Compliance with each identified GESR shall be assessed. If the compliance is not self-evident, risk assessment shall be completed to demonstrate compliance.

5.2.4 Applicability of GESRs and GSPs

When analysing the safety of an escalator or moving walk design or component, or when writing a design-prescriptive requirement or standard, the applicability of all GESRs should be determined. Only systematic descriptions of all risk scenarios combined with the risk assessment of all scenarios (see ISO 14798) determine applicability of individual GESRs and relevant GSPs.

Table 2 addresses safety hazards in specific GESRs. The relevant GSP(s) given for a GESR does/do not necessarily mitigate all risks relevant to a specific escalator or moving walk, component or function. However, such risks should be addressed by another GESR and associated relevant GSP(s).

5.2.5 Safety objectives of GSPs

5.2.5.1 When designing an escalator or moving walk, appropriate components and functions should be selected in terms of specific GSPs (see Table 2). Examples are size, dimensions, strength, force, material, deceleration and acceleration. Reliability of performance of safety-related parts, as applicable, and their ability to eliminate or sufficiently mitigate the risks to achieve compliance with the objective specified in the GESR should be established.

5.2.5.2 Table 1 contains examples that illustrate the methods described in 5.2.3.1 a). The examples are consistent with the corresponding examples of ISO/TS 25740-1:2011, Table 1.

a) Cases 1, 2, 3 and 4 illustrate the method described in 5.2.3.1 a), where a GESR and corresponding GSP are used to mitigate a risk.

b) The examples are not comprehensive in that other risks pertaining to the scenarios are not addressed. A comprehensive risk assessment would address all risks.

5.2.5.3 In case 2 of Table 1, in order to eliminate or mitigate the risks to user/non-user, the following shall be determined:

a) the maximum height of the position of the guards above the floor level to avoid falling from height,

b) the minimum dimensions (height, width, distance to handrail edge etc.) in order to prevent access beyond the guards.

Additionally, the maximum perforation (openings) in the guards should not allow a foothold in order to by-pass the guards, and all exposed fastener heads for the guard shall be of the vandal-resistant type.

NOTE 1 There are additional GESRs applicable to the guards on the machinery.

NOTE 2 All GESR headings from ISO/TS 25740-1 are listed in Table 2 and aligned with their relevant GSPs.

Table 1 — Subject: *Mechanical hazards*: Not applicable to this example
Date: Not applicable to this example

Case number	Scenario			Estimation of risk elements		Protective measures (risk reduction measure)	After protective measures		Residual risk
	Hazardous situation	Harmful event		S[a]	P[b]		S[a]	P[b]	
		Cause	Effect						
1	**Hazard: Mechanical — Contact with moving parts**								
	Non-users outside the machinery can get in touch with the moving LCU system due to insufficient covers.	Non-user can enter their upper limbs through openings and come into contact with the moving LCU system.	Upper limb injury (crushing, shearing, trapping)	2	B	Remark: This hazard is addressed by GESR ISO/TS 25740-1:2011, 6.3.1. [p1] Where a full imperforate enclosure is not provided, see ISO 13857:2008. [p2] Where equipment is covered on all sides, but perforated, see ISO 13857:2008, Tables 5 and 6, for mechanical protection. [p3] Where equipment is not covered on all sides, see ISO 13857:2008, Table 2, for the distances a, b and c, and Figures 1 and 2.	2	F	

[a] S — Levels of severity of the harm (see 4.5.3):

1 — High 2 — Medium 3 — Low 4 — Negligible

[b] P — Level of probability of occurrence of harm (see 4.5.4):

A — Highly probable B — Probable C — Occasional D — Remote E — Improbable F — Highly improbable

Table 1 *(continued)*

Case number	Scenario			Estimation of risk elements		Protective measures (risk reduction measure)	After protective measures		Residual risk
	Hazardous situation	Harmful event		S[a]	P[b]		S[a]	P[b]	
		Cause	Effect						
2	**Hazard Mechanical – Falling due to foreseeable misuse**								
	User or non-users climbing on the outside of the balustrade	Falling from critical height	Fatality	1	C	Remark: This hazard is addressed by GESR ISO/TS 25740-1:2011, 6.3.1. [p1] Escalators and moving walks shall be provided with devices on the lower outer decking at a point (1 000 ± 50) mm above the floor level where the bottom of the device intersects with the balustrade decking and shall extend to a length *l*5 of at least 1 000 mm parallel with the balustrade decking where no stepping is possible. The device shall extend to at least a height in line with the top of the handrail not conflicting with the requirements of b_{10} and b_{12}.	1	E	Use of special means to intentionally bypass the device

[a] S — Levels of severity of the harm (see 4.5.3):

1 — High 2 — Medium 3 — Low 4 — Negligible

[b] P — Level of probability of occurrence of harm (see 4.5.4):

A — Highly probable B — Probable C — Occasional D — Remote E — Improbable F — Highly improbable

Table 1 *(continued)*

Case number	Scenario			Estimation of risk elements		Protective measures (risk reduction measure)	After protective measures		Residual risk
	Hazardous situation	Harmful event		S[a]	P[b]		S[a]	P[b]	
		Cause	Effect						
3	**Slipping, tripping, falling hazard**								
	Users entering the LCU system in the downward direction	Falling due to loss of balance caused by stepping on a descending LCU	Fatality	1	D	Remark: This hazard is addressed by GESR ISO/TS 25740-1:2011, 6.3.1. [p1] The LCU of an escalator shall be guided in such a way that the front edges of the LCU leaving the comb and the rear edges of the LCU entering the comb are moving horizontally for a length of at least: — 0,80 m for $v \leq 0{,}5$ m/s of the LCU; — 1,20 m for $0{,}50 \text{ m/s} < v \leq 0{,}65$ m/s of the LCU; — 1,60 m for $v > 0{,}65$ m/s of the LCU. [p2] In the user carrying area of the escalator the LCU shall be horizontal with a tolerance of ±1° in the direction of travel. [p3] At the upper landings of moving walks with an inclination of more than 6°, the LCU shall move for a length of at least 0,40 m at a maximum angle of 6° before entering or after leaving the comb.	1	F	

[a] S — Levels of severity of the harm (see 4.5.3):

1 — High 2 — Medium 3 — Low 4 — Negligible

[b] P — Level of probability of occurrence of harm (see 4.5.4):

A — Highly probable B — Probable C — Occasional D — Remote E — Improbable F — Highly improbable

Table 1 *(continued)*

Case number	Scenario			Estimation of risk elements		Protective measures (risk reduction measure)	After protective measures		Residual risk
	Hazardous situation	Harmful event		S[a]	P[b]		S[a]	P[b]	
		Cause	Effect						
4	**No manual stopping in case of dangerous situation**								
	There is an emergency situation on the machinery.	Users/non-users cannot intentionally stop the movement of the machinery.	Not-stopping of the machinery increases the likelihood for further injuries or machinery damage.	2	B	Remark: This hazard is addressed by GESR ISO/TS 25740-1:2011, 6.3.1. [p1] A stop switch with a red actuator for emergency situations shall be provided visibly located at each landing of the escalator/moving walk. [p2] The distances between stop switches for emergency situations shall not exceed: — 30 m on escalators; — 40 m on moving walks.	2	F	

[a] S — Levels of severity of the harm (see 4.5.3):

1 — High 2 — Medium 3 — Low 4 — Negligible

[b] P — Level of probability of occurrence of harm (see 4.5.4):

A — Highly probable B — Probable C — Occasional D — Remote E — Improbable F — Highly improbable

5.3 Use of ISO/TS 25740-1 and this document

This document shall supplement ISO/TS 25740-1 in providing a uniform process for assessing the safety of escalators and moving walks. The GESRs and GSPs are intended for use by:

a) writers of safety or safety related standards for escalators and moving walks;

b) escalator and moving walk designers, manufacturers and installers, maintenance and service organizations;

c) independent [third-party] conformity assessment bodies; and

d) inspection and testing bodies and similar organizations.

NOTE See ISO/TS 25740-1:2011, 5.3.2 to 5.3.5 for detail on procedure followed by these types of users. See ISO/TS 25740-1:2011, Annex A, for an overview of GESRs in relation to subsystems of escalators and moving walks.

6 Global safety parameters

Global safety parameters listed in Table 2 should be applied as described in Clause 5.

GSPs are grouped in Table 2 in the same order as GESRs are grouped in ISO/TS 25740-1, which is based on locations where a person can be exposed to a hazard, such as spaces adjacent to the machinery, landings, on the LCU and working areas. Users of this document, who prefer the regrouped GESRs and related GSPs based on the escalator and moving walk subsystems, should use ISO/TS 25740-1:2011, Table A.1.

Table 2 — Global safety parameters (GSPs) for specific GESRs

Global Essential Safety Requirement (GESR)	Global safety parameters (GSPs) referenced in this document	Remarks/Diagrams/Comments
Common GESRs and GSPs related to persons at different locations (ISO/TS 25740-1:2011, 6.2)		
1. Strength and size (ISO/TS 25740-1:2011, 6.2.1)	NOTE Local regulations and/or standards apply.	Remark 1: Safety factors should be considered relative to the material being used and its application, based on sound engineering practice considering all applicable codes and standards. Remark 2: The supporting structure (truss) shall be designed to withstand the loads defined in the local codes and standards (e.g. EN 115–1 is referring to EN 1993, A17.1 referring to AISC and BSL-EO). Remark 3: Landings shall be designed to withstand the load defined in local codes and standards. Consideration of exceptional application of additional loads other than passengers (e.g. fork lifts) shall be addressed by the customer. Solutions can be determined by either considering this load in the design or by preventing access/application of the additional load. Prevention can be achieved by different means (e.g. instruction, training or physical barriers). Remark 4: Power transmitting elements (e.g. chain, brake, link between operational brake and step/pallet/belt drive, machine and connecting elements) shall be designed in consideration of loads imposed and safety factors required. Remark 5: Seismic conditions shall be considered according to local regulations (see also item 3).

Table 2 *(continued)*

Global Essential Safety Requirement (GESR)	Global safety parameters (GSPs) referenced in this document	Remarks/Diagrams/Comments
2. Falling down or off the area containing the travel path (ISO/TS 25740-1, 6.2.2)	[p1] Minimum height of balustrade 900 mm measured vertically from the LCU nose line. [p2] Balustrades should be designed to resist the simultaneous (vertical and horizontal) application of a static lateral force of 585 N/m and a vertical load of 730 N/m. [p3] The dimensions for the continuation of the handrail beyond the comb step/pallet intersection shall be at least 300 mm at normal handrail height. [p4] The deceleration, measured on a downward moving escalator/moving walk or horizontal moving walk, in the direction of travel shall not exceed 1 m/s^2 during the operation of the braking system. [p5] Escalators with a rise of more than 6 m shall have a maximum angle of 30°. [p6] Handrail speed deviation of 15 % relative to the actual speed of the LCU over a specified period shall automatically cause the stop of the escalator. [p7] Handrail shall move in the direction of the LCU with a tolerance of 0 % to +2 % relative to its speed. [p8] The lower inner decking and the interior panel shall have an angle of inclination of at least 25° to the horizontal. [p9] The horizontal part up to the interior panel shall be less than 30 mm. [p10] Horizontal distance between skirt and balustrade less than 150 mm if angle of inclination less than 45°. [p11] The newel including the handrails shall project horizontally beyond the comb intersection line by at least 0,60 m in longitudinal direction. [p12] The width of the handrail shall be between 70 mm and 100 mm. [p13] The distance between the centre line of the handrails shall not exceed the distance between the skirting by more than 0,45 m. [p14] The distance between the inner edge of the handrail and the inner edge of the balustrade shall not exceed 50 mm.	Comment on [p1]: Different maximum heights are defined for the balustrade in local codes and standards. Different minimum angles of the inner decking are defined in local codes and standards. Comment on [p4]: Braking distances are defined in local codes and standards Comment on [p6] The relevant period is subject to local codes and standards. Local standards and regulations apply. Comment on [p7] The term “substantially the same speed” given in ASME A17.1 is subject to interpretation. A recommendation is to adopt this requirement. Remark 1: The balustrade provides for the passenger’s safety by ensuring stability during the use of the escalator/moving walk, supports the handrail and protects from falling off the travel path. The balustrade including the handrail is not considered to be a barrier as requested by building codes. Remark 2: Starting is only permitted by a competent person with authorization. To ensure that the escalator/moving walk is started without people on a LCU, the LCU-system has to be within sight of this person. Remark 3: Except for emergency stopping, the manual stopping operation shall be done without passengers travelling on the escalator/moving walk. Automatic stopping is permitted only after all passengers have left the escalator/moving walk.

Table 2 *(continued)*

Global Essential Safety Requirement (GESR)	Global safety parameters (GSPs) referenced in this document	Remarks/Diagrams/Comments
		Remark 4: A handrail speed monitoring device should be provided to monitor deviations of the handrail speed. In case of speed deviations or broken handrails the escalator/moving walk shall be stopped. Remark 5: Signs are needed to inform the passengers of safe conduct. They should be legible and durable. Remark 6: Additional fall prevention requirements need to be considered based on the location of escalators and moving walks (e.g. atrium). Remark 7: Transition radii in relation to speed are specified in local codes and standards which determine acceleration limits. Remark 8: Requirements on the surface of the LCU and the comb plate are covered by item 6. Remark 9: For change of speed, see 29.
3. Supports for escalator and moving walk equipment (ISO/TS 25740-1, 6.2.3**)**	NOTE Local regulations and/or standards apply.	Remark 1: Seismic requirements need to be considered based on the location of the escalators/moving walks in seismic zones. Remark 2: Regarding safety factors, these should take account of: — sound engineering practice; — material properties; — intended use and loading conditions; — environmental conditions; — life cycle; — building regulations, national codes and standards.

Table 2 *(continued)*

Global Essential Safety Requirement (GESR)	Global safety parameters (GSPs) referenced in this document	Remarks/Diagrams/Comments
4. Maintenance of escalators and moving walks (ISO/TS 25740-1, 6.2.4)	No parameter.	Remark 1: The maintenance instructions shall contain appropriate information such as: 1. A schedule of maintenance operations. 2. The need to address any relevant local regulations, other requirements, and their implications on the escalator and moving walk maintenance. 3. The need for maintenance to be carried out by a qualified maintenance provider employing competent personnel.
5. Equipment inaccessible to users and non-users (ISO/TS 25740-1, 6.2.5)	[p1] Escalators and moving walks shall be provided with devices (see 1 in Figure B.1) on the lower outer decking at a point (1 000 ± 50) mm above the floor level (see $h9$ in Figure B.1) where the bottom of the device intersects with the balustrade decking and shall extend to a length $l5$ (see Figure B.1) of at least 1 000 mm parallel with the balustrade decking where no stepping is possible. The device shall extend to at least a height in line with the top of the handrail not conflicting with the requirements of b_{10} (see Figure B.1) and b_{12} (see Figure B.2).	Comment on [p1]: Appropriate measures shall be taken to discourage people from climbing on the outsides of the balustrade if there is a danger of people falling from them. Remark 1: This kind of measures shall not create new risks, e.g. trapping and shearing. Remark 2: Machinery spaces shall be secured to ensure access only to authorized persons (e.g. by key lock, special tool, special fasteners, access control). If the machinery space is accessible via a door, the door requires an emergency opening system from inside.
6. Surfaces of the LCU, landing and working areas (ISO/TS 25740-1, 6.2.6)	[p1] Adjacent floor surfaces at each landing shall be continuous with top of the landing plate with no abrupt change in elevation greater than 6 mm so that an edge presenting a tripping hazard is avoided.	Comment on [p1] This requirement covers those edges of the cover plate where persons (users and non-users) are crossing and addresses the interface between building and machinery. Remark 1: A level standing area in the working zone shall be provided. Remark 2: Landing areas, working spaces and tread surfaces for escalators and moving walks shall provide a secure foothold taking into account environmental influences.

Table 2 *(continued)*

Global Essential Safety Requirement (GESR)	Global safety parameters (GSPs) referenced in this document	Remarks/Diagrams/Comments
7. Hazards due to relative movement (ISO/TS 25740-1, 6.2.7)	[p1] Lowest point of entry of the handrail between 100 mm and 250 mm from the finished floor level. Horizontal distance between newel and handrail entry at least 300 mm [p2] Horizontal distance between the outer edge of the handrails and adjacent equipment at least 160 mm. [p3] In between the outer edges of the handrails of the escalator or moving walk a clear height of not less than 2,30 m measured from any point of the LCU shall be maintained. [p4] The distance between the outer edge of the handrail and walls or other obstacles shall be not less than 80 mm horizontally and 25 mm perpendicularly below the lower edge of the handrail. [p5] The handrail shall be a minimum of 80 mm horizontally (see b_{10} in Figure B.1) and 25 mm perpendicularly (see b_{12} Figure B.2) away from adjacent surfaces. The reduction of this area is permitted as long as b_{18} is not less than 8 mm as shown in Figure B.2 (Point A on the handrail profile – Point B perpendicularly minimum 25 mm below the lower edge of the handrail and horizontally maximum to the outer edge of the handrail). No point of the balustrade shall be above the direct line from A to B. The distance between the handrail profile and guide or cover profiles shall not be wider than 8 mm (see b_6' and b_6" in Figure B.2).	Comment on [p1]: Handrail entries shall be provided with a monitoring device that initiates stopping of the machine. Comment on [p3 and p4]: This is to prevent collision and to provide a minimum free area around escalators and moving walks. Comment on [p4]: The 80 mm clearance is required in the continuous vertical rise at 25 mm below lower edge of the handrail and above. Remark 1: Local codes and standards apply for: — clearances between outer edge of the handrail and walls; — deflectors and guards for criss-cross arrangements and floor intersections; — minimum headroom measured vertically from the LCU nose line; — provisions for unrestricted access between equipment and building interfaces; — provisions to avoid pinching or trapping of hand or fingers on the equipment and/or between equipment and building interfaces; — the vertical distance below the lower edge of the handrail and the equipment; — clearance between the handrail newel and building/equipment interface e.g. barriers and traffic columns. Remark 2: At the point of entry of the handrail into the newel a guard shall be installed to prevent the pinching of fingers and hands.

Table 2 *(continued)*

Global Essential Safety Requirement (GESR)	Global safety parameters (GSPs) referenced in this document	Remarks/Diagrams/Comments
8. Sharp edges (ISO/TS 25740-1, 6.2.8)	GESR is self-explanatory, see also ISO 12100:2010.	Remark 1: Sharp edges present a cutting, shearing or scraping hazard if exposure to body parts occurs. Removal of sharp edges should be considered as the first course of action. The radius of an edge which sufficiently mitigates the risk of injury and satisfies the GESR will depend on the following: — material properties of the edge, — surface finish of the edge, — relative velocity of body part to the edge at the time of contact, and — level of protection (if any) of the body part, e.g. clothing, etc. Moreover, the probability of contact influences the risk. The risk may also be mitigated by shielding the user from the sharp edge. Sound engineering practice considering all the variables should be used in reaching a safe conclusion.
9. Hazards arising from the risk of electrical shock (ISO/TS 25740-1, 6.2.9)	NOTE Local regulations and/or standards apply.	Remark 1: For guidance see: — IEC 60204–1; — IEC 60364–4-41; — IEC 60529; — IEC 61140; — IEC/TS 61201. Points to be considered: a) Protection with regard to direct contact; b) additional protection by residual current operated protective device (RCD); c) protection with regard to indirect contact. Remark 2: Protection against electrostatic loading is not covered under Remark 1. Means to discharge electrostatic loading shall be provided (e.g. by brushes).

Table 2 *(continued)*

Global Essential Safety Requirement (GESR)	Global safety parameters (GSPs) referenced in this document	Remarks/Diagrams/Comments
10. Electrical equipment (ISO/TS 25740-1:2011, 6.2.10)	No parameter	Remark 1: The equipment shall be designed and installed in such a way that in case of malfunction it stops safely and remains in a safe state. Remark 2: Local codes and standards apply for the smoke detection and the control of the machinery.
11. Electromagnetic compatibility (ISO/TS 25740-1, 6.2.11)	[p1] Immunity limits according to ISO 22200 [p2] Emission limits according to ISO 22199	
12. Illumination of LCU and landings (ISO/TS 25740-1, 6.2.12)	[p1] Illumination measured at any point of the comb intersection line: ≥50 lx	Comment related to [p1]: Step treads shall be illuminated throughout their run while the unit is running and no substantial contrast shall exist at any point over the length of the unit, including the entry and exit area. Remark 1: The provision for illumination at the landing is normally included in the building lighting system.
13. Effects of earthquake (ISO/TS 25740-1, 6.2.13)	NOTE Local regulations or standards apply.	Remarks: Local regulations require – depending on the place of installation – suitable support of the building interface such that the escalator or moving walk remains in position on the structure. For example, see ASME A.17.1/B.44, EN 115–1 and MLIT-N 1046.
14. Hazardous materials (ISO/TS 25740-1, 6.2.14)	NOTE Local standards and regulations apply	
15. Environmental influences (ISO/TS 25740-1, 6.2.15)	NOTE Local standards and regulations apply	
16. Noise and vibration (ISO/TS 25740-1, 6.2.16)	[p1] The emission sound pressure level shall not exceed 70 dB(A). NOTE Local standards and regulations apply for step/pallet and handrail vibration.	Comment related to [p1]. This value is based on EN 115-1. ISO 18738-2 lays down uniform definitions and measurement methods for sound measurements (e.g. emission sound pressure).

Table 2 *(continued)*

Global Essential Safety Requirement (GESR)	Global safety parameters (GSPs) referenced in this document	Remarks/Diagrams/Comments
		Remark 1: ISO 18738-2 lays down uniform definitions and measurement methods for vibrations. Remark 2 (immunity): For electronic components exposed to vibrations, see IEC 60068–2-6 and IEC 60068–2-27 for the testing of transmitter elements of the fail safe circuit. The characteristic of vibrations dealt with in these IEC standards are far away from those affecting the user or the mechanical components, but may affect the function of electric components.
17. Exclusive use of machinery spaces **(**ISO/TS 25740-1:2011, 6.2.17**)**	No parameter	Remark: Machinery spaces shall not be used for purposes other than intended for the operation of escalators or moving walks, i.e. they shall not contain ducts, cables or devices other than for the operation of escalators or moving walks needed. NOTE Sprinkler systems and heat/smoke detection systems directly connected with the machinery are permitted. See also item 10.
18. Starting **(**ISO/TS 25740-1:2011, 6.2.18**)**	No parameter	Remark 1: Manual starting to be carried out only by a competent person with authorization. It is the task of that person to ensure that no users are on the LCU and the machinery is ready for safe operation. Remark 2: Local regulations and standards apply for automatic starting.

Table 2 *(continued)*

Global Essential Safety Requirement (GESR)	Global safety parameters (GSPs) referenced in this document	Remarks/Diagrams/Comments
GESRs and GSPs related to non-users (ISO/TS 25740-1:2011, 6.3**)**		
19. Contact with moving or rotating parts (ISO/TS 25740-1:2011, 6.3.1)	[p1] Where a full imperforate enclosure is not provided, see ISO 13857. [p2] Where equipment is covered on all sides, but perforated, see ISO 13857:2008, Tables 5 and 6, for mechanical protection. [p3] Where equipment is not covered on all sides, see ISO 13857:2008, Table 2, for the distances a, b and c, and Figures 1 and 2. [p4] The exterior panels shall withstand a force of 250 N at any point at right angles on an area of 25 cm^2 without breakage or deflection resulting in any gap.	Comment on [p2]: e.g. ventilation openings. Remark 1: Inspection covers and access to machinery space shall be secured to ensure access only to authorized persons (e.g. by key lock, special tool, special fasteners, access control). Remark 2: Unintentional contact with moving handrails, see item 22.
20. Failure mode (ISO/TS 25740-1:2011, 6.3.2)	No parameter	Remark: The design should be based on sound engineering practice considering applicable codes and standards.
21. Environmental influence (ISO/TS 25740-1:2011, 6.3.3)	No parameter	Remark: Areas which are commonly accessible to non-users and users are dealt with under items 5 and 6.
GESRs and GSPs related to persons at the landings (ISO/TS 25740-1:2011, 6.4**)**		
22. Falling from the landings (ISO/TS 25740-1:2011, 6.4.1)	[p1] Where escalators or moving walks are located adjacent to walls, devices (see item 1 in Figure B.3) to restrict access to the balustrade decking shall be provided at the top and bottom ends of these walls when the lower outer decking width b_{13} exceeds 125 mm. On adjacent parallel arrangements, this protection shall be provided when the combined balustrade decking width b_{14} exceeds 125 mm. The device shall extend to the height h_{10}.	Remark: Where it is possible for people to come into contact with the outer edge of a handrail at a landing and they can be drawn into a hazardous situation, such as toppling over a balustrade, appropriate preventative measures can be taken, see examples in EN 115–1and JEAS 422 . Some examples are: — prevention of entry into the space by the placement of permanent barriers; — increasing the height of the building structure of the fixed balustrade in the hazard area by at least 100 mm above the handrail level and positioned between 80 mm and 120 mm from the outer edge of the handrail.

Table 2 *(continued)*

Global Essential Safety Requirement (GESR)	Global safety parameters (GSPs) referenced in this document	Remarks/Diagrams/Comments
23. Access and egress (ISO/TS 25740-1:2011, 6.4.2)	[p1] At the exit(s) of each individual escalator or moving walk a sufficient unrestricted area shall be available to accommodate persons. The width of the unrestricted area shall at least correspond to the distance between the outer edges of the handrails plus 80 mm on each side. The depth shall be at least 2,50 m measured from the end of the balustrade. It shall be permissible to reduce it to 2,00 m if the width of the unrestricted area is increased to at least double the distance between the outer edges of the handrails plus 80 mm on each side.	Remark 1: An area shall be kept free of all obstacle (safety zone/unrestricted area). Even temporary obstacles are prohibited. Fixed devices like guiding barriers for improving the traffic flow or traffic columns are not considered to be obstacles. Remark 2: A minimum clear height is required for the safe/unrestricted area defined in local codes and standards. Remark 3: Caution signs shall be located at the landings which shall be clearly visible. Remark 4: Lateral displacement of the LCU shall be minimised to ensure clearance between the step/pallet tread and the comb teeth.
24. Alignment of LCU and landing (ISO/TS 25740-1:2011, 6.4.3)	[p1] The LCU of an escalator shall be guided in such a way that the front edges of the LCU leaving the comb and the rear edges of the LCU entering the comb are moving horizontally for a length of at least: — 0,80 m for $v \leq 0{,}5$ m/s of the LCU; — 1,20 m for 0,50 m/s $< v \leq$ 0,65 m/s of the LCU; — 1,60 m for $v >$ 0,65 m/s of the LCU. [p2] In the user carrying area of the escalator the LCU shall be horizontal with a tolerance of ±1° in the direction of travel. [p3] At the upper landings of moving walks with an inclination of more than 6°, the LCU shall move for a length of at least 0,40 m at a maximum angle of 6° before entering or after leaving the comb.	Comment on [p1]: For the definition of the maximum permissible difference in height between two consecutive LCUs at the landings local codes and standards apply. Remark 1: For rises >6 m local codes and standards apply. Remark 2: For moving walks local codes and standards apply. Remark 3: The comb plate should be adjustable and the combs should be readily replaceable. Remark 4: For the mesh depth of the combs into the grooves of the tread local codes and standards apply.

Table 2 *(continued)*

Global Essential Safety Requirement (GESR)	Global safety parameters (GSPs) referenced in this document	Remarks/Diagrams/Comments
		Comment on [p2]: This tolerance is used to accommodate field conditions. Comment on [p3]: For moving walks where the LCU is a pallet, the movement is specified as follows: The front edge of the pallet leaving the comb and the rear edge of the pallet entering the comb shall move without changing the degree of angle over at least 0,40 m.
GESRs and GSPs related to user on the LCU (ISO/TS 25740-1:2011, 6.5)		
25. Strength and size (ISO/TS 25740-1:2011, 6.5.1)	[p1] Step width ≥0,56 m and ≤1,10 m. [p2] Pallet width ≥0,56 m and ≤1,65 m for moving walks with an inclination up to 6°. [p3] Step depth ≥0,38 m. [p4] Step height ≤0,24 m. [p5] Step tread/static load test: Single force of 3 000 N (including weight of the plate) applied perpendicular to the tread surface on a steel plate 0,20 m × 0,30 m in size.. The tread surface shall not deflect by more than 4 mm and no permanent deformation permitted. [p6] Step riser/static load test: The riser shall not deflect by more than 4 mm and no permanent deformation permitted, when subjected to a single load of 1 500 N applied normal to the surface, on an area of 25 cm^2. [p7] Pallets/static load test: The pallet shall be tested for deflection with a single force which, for a pallet area of 1 m^2, shall be 7 500 N (including weight of the plate). The force shall be applied perpendicular to the tread surface on a steel plate 0,30 m × 0,45 m in size. The tread surface shall not deflect by more than 4 mm and no permanent deformation permitted. [p8] Step/pallet dynamic load test: The step/pallet shall be subjected to a load pulsating between 500 N and 3 000 N at one frequency between 5 Hz and 20 Hz for at least 5 × 10^6 cycles.	Remark: LCU shall be designed to withstand the load that is defined in local codes and standards. The step treads shall be horizontal with a tolerance of ±1° in the direction of travel. Comment on [p2] Pallet width for moving walks >6° to be defined in local codes and standards. Comment on [p5, p7] Test load in the centre of the tread surface. Comment on [p6] Test load in three positions across the width of the riser, on the centre line in the middle and at both ends. Comments on [p5, p6, p7] — The thickness of the test plate should be at least 25 mm. — Setting tolerances are allowed. Comments on [p9] The dynamic test shall be adjustable to ensure that the specified deflections above are achieved throughout the test. It shall be applied with one frequency between 5 Hz and 20 Hz for at least 5 x 10^6 cycles whereby an undisturbed sinusoidal force flow shall be achieved.

Table 2 *(continued)*

Global Essential Safety Requirement (GESR)	Global safety parameters (GSPs) referenced in this document	Remarks/Diagrams/Comments
	[p9] Step/pallet dynamic torsional test: The step/pallet design shall be such that the structure can accommodate torsional loading equivalent to a ±2 mm displacement of the trailer wheel centre, moving in an arc whose centre is the chain wheel centre. The ±2 mm displacement is a relative to a trailer wheel to chain wheel centre distance of 400 mm. This ratio shall be maintained, when the 400 mm dimension is varied. [p10] When a force of 500 N is applied to the interior panel at any point of the panelling at right angles on an area of 25 cm^2, there shall be no gap greater than 4 mm and no permanent deformation.	After the test the step shall show no indication of crack initiation. Comment on [p10] If glass is used for the interior panel, local codes and standards apply.
26. LCU support **(**ISO/TS 25740-1:2011, 6.5.2**)**	No parameter.	Remark: The LCU supporting structures shall be designed to withstand the loads defined in the local codes and standards.
27. Entrapment between LCU component parts **(**ISO/TS 25740-1:2011, 6.5.3**)**	[p1] The clearance between two consecutive steps or pallets in any usable position measured at the tread surface in the direction of travel shall not exceed 6 mm (see Figures B.4 and B.5, Figure B.6, detail S and Figure B.7, detail U). The measurement shall be carried out as the dimensions of the gaps are indicated in Figures B.4 and B.5. For pallets the measurements shall be done according to Figure B.8, detail T and Figure B.9, detail V. [p2] In the area of the transition curves of moving walks with meshed front edges and rear edges of the pallets, this clearance is permitted to be increased to 8 mm (see Figure B.9, detail V).	Comment on [p1] Step/step riser and pallet shall be cleated and intermesh with the adjacent step/step riser or pallet.
28. Entrapment between LCU and adjacent surfaces **(**ISO/TS 25740-1:2011, 6.5.4**)**	[p1] The skirting shall deflect not more than 4 mm under a single force of 1 500 N at the most unfavourable point over an area of 2 500 mm^2. No permanent deformation shall result from this. This shall be met up to a height 25 mm above the line of the LCU nose line or the tread surface. Above the height of 25 mm the force requirement of the balustrade of 500 N shall be fulfil. If the comb plate lighting or part of it is arranged in the area of skirting of 25 mm above the surface the same force requirement applies.	Remark 1: The stiffness of the skirt, friction coefficient on the skirt surface, the gap in combination with the use of the skirt deflector shall interact in such a way that the probability of entrapment is minimized. ASME and JIS require skirt obstruction devices to prevent a caught object from being pulled into the comb. Remark 2: The vertical displacement of the LCU shall be limited to ensure continuously intermeshing between adjacent LCUs and between LCU and comb (see also item 24).

Table 2 *(continued)*

Global Essential Safety Requirement (GESR)	Global safety parameters (GSPs) referenced in this document	Remarks/Diagrams/Comments
29. Uncontrolled movement of an LCU (ISO/TS 25740-1:2011, 6.5.5)	[p1] A device shall be provided to detect excessive speed before the speed exceeds a value of 1,2 times the nominal speed and the braking sequence shall be initiated immediately (see also item 2).	Comment on [p1] Reference speed is: — the speed at rated load in the up-direction (ASME); — the speed of the escalator is designed for operation at no load condition (EN 115–1/JIS). Remark 1: Unintended reversal of the travel direction shall be detected and the LCU shall be stopped. Remark 2: Unexpected start/restart shall be prevented. Remark 3: The brake shall be designed to hold the stopped LCU under all load conditions up to the brake rated load in case of power failure.
30. LCU collision with objects in or beyond the travel path (ISO/TS 25740-1:2011, 6.5.6)	NOTE Local codes and standards apply.	Remark 1: A limitation of displacement of the LCU is required (see items 24 and 28). Remark 2: Undue elongation of the parts directly driving the LCU shall be monitored. Remark 3: In case of the LCU impacting the comb, the LCU-system shall stop. Remark 4: In case of vertical displacement of the LCU from the intended travel path, the LCU-system shall stop. Remark 5: Parts facing the travel path and their projection to the travel path in the direction of travel (in particular between the skirting and the interior panel) shall be arranged and formed in such a manner as to eliminate any risk of harm caused by trapping.

Table 2 *(continued)*

Global Essential Safety Requirement (GESR)	Global safety parameters (GSPs) referenced in this document	Remarks/Diagrams/Comments
31. Change of speed of the LCU (ISO/TS 25740-1:2011, 6.5.7)	[p1] The deceleration, measured on a downward moving escalator or moving walk, in the direction of travel shall not exceed 1 m/s^2 during the operation of the operational brake. [p2] For escalators, the radius of curvature in the upper and lower transition shall be at least 1,0 m.	Remark: 1 For excessive speed and unintentional reversal of the direction of travel, see item 29. Remark 2: Local codes and standards define the provision of automatic starting and stopping, the change of the speed with specified acceleration/deceleration rates in case of no users are on the LCU-system. Intentional speed variation is not permitted, except for the above.
32. Stopping means adjacent to the LCU (ISO/TS 25740-1:2011, 6.5.8)	[p1] A stop switch with a red actuator for emergency situations shall be provided visibly located at each landing of the escalator/moving walk. [p2] The distances between stop switches for emergency situations shall not exceed: — 30 m on escalators; — 40 m on moving walks.	Comment on [p1]: Additional requirements for the means are given in ASME, EN 115–1 and JIS. Stopping means shall be placed in conspicuous and easily reachable positions, at least at or near each landing. ASME has specific requirements on provisions, dimensions and locations. Remark 1: Local codes and standards require additional stopping means: — where the exit can be blocked by structural means (e.g. shutters, fire protection gates); — for the use of baggage carts on moving walks.
33. Succeeding LCUs (ISO/TS 25740-1:2011, 6.5.9)	[p1] In the case of successive LCU systems without intermediate exits they shall have the same capacity.	Comment on [p1]: If no intermediate exit exists: — Stopping of a LCU system shall cause stopping of feeding LCU systems; — Electrical interlocking shall ensure the same running direction. Remark: A.17.1 uses the term “tandem operation” for successive LCU systems.
34. Stopping of the LCU (ISO/TS 25740-1:2011, 6.5.10)	No parameter.	Remark: Stopping is regarded as the initiation of a braking sequence. Special attention shall be given to the relationship between speed, braking distance and deceleration.

Table 2 *(continued)*

Global Essential Safety Requirement (GESR)	Global safety parameters (GSPs) referenced in this document	Remarks/Diagrams/Comments
GESRs and GSPs related to persons in working areas (ISO/TS 25740-1:2011, 6.6**)**		
35. Working space (ISO/TS 25740-1:2011, 6.6.1)	[p1] Minimum dimensions to stand or move: — See ISO 15534-1, ISO 15534-2 and ISO 15534-3, using P99 values. [p2] Minimum distance to danger zones: — Minimum distances to danger zones to be protected with guard/cover in accordance with ISO 13857:2008, 4.2.1, 4.2.2 and Table 1, or — Protected with guard/covers in accordance with ISO 14119 and ISO 14120. [p3] Openings in protective structure or guard/cover in accordance with: — ISO 13857.	Remark 1: Also comply with local codes and standards. Equipment to be maintained should be readily accessible. Remark 2: For electrical protection, see item 9.
36. Accessible equipment (ISO/TS 25740-1:2011, 6.6.2)	No parameter	Remark 1: For guidance see ISO 13854, ISO 13857, and ISO 14122. Remark 2: Any exterior panels which are designed to be opened (e.g. cleaning purposes) shall be provided with an electrical safety devices which stops the LCU-system and refrains from restarting. These panels should be mechanically secured and opened only by special tools/key. NOTE See also items 35, 38 and 42.
37. Access to and egress from working spaces (ISO/TS 25740-1:2011, 6.6.3)	[p1] Vertical distance between access point and work space — ≤0,5 m according to ISO 14122-3:2001, 7.1.2. — >0,5 m a fixed ladder in accordance with ISO 14122-4 can be used. [p2] Minimum 50 lx at floor level in access routes to working spaces.	Comment on [p1] Provides guidance for routine access and egress. Comment on [p2] Local codes and standards for the lighting of access routes to working spaces may require higher values. Remark 1: If the working space is accessable via a door, the door requires an emergency opening system from inside.

Table 2 *(continued)*

Global Essential Safety Requirement (GESR)	Global safety parameters (GSPs) referenced in this document	Remarks/Diagrams/Comments
38. Strength of working areas (ISO/TS 25740-1:2011, 6.6.4)	[p1] Working platforms to be provided in accordance with ISO 14122-2.	Comment on [p1]: For guidance on design loading, see ISO 14122-2:2001, 4.2.5. Remark 1: In case the enclosure of the supporting structure is used as a working platform, it needs to be designed according to the ISO 14122-2 loading requirements.
39. Movement of the LCU under the sole control of an authorized person (ISO/TS 25740-1:2011, 6.6.5)	[p1] Only one portable inspection control shall be in operation at a time. [p2] One portable inspection control per unit shall be provided. [p3] An inspection control outlet shall be provided at each landing. [p4] The main switches shall be capable of being locked or otherwise secured in the "isolated" position.	Comment on [p1]: All other starting devices shall be rendered inoperative when using an inspection control. Comment on [p4]: Also known as "lockout-tagout" safety procedure. Remark 1: The operating elements of this control device shall be protected against accidental operation. The escalator or moving walk is permitted to run only as long as the operating elements are switched on by permanent application of manual pressure. Each control device shall have a stop switch (for further information, see local codes and standards). Remark 2: Local codes and standards define the length of the cable for the inspection control.
40. Protection from moving parts (ISO/TS 25740-1:2011, 6.6.6)	[p1] According to ISO 12100:2010, Clause 5, effective protection and guards shall be provided for moving and rotating parts if they are accessible.	Remark 1: See also item 39 for inspection control. Remark 2: For guidance on shearing and crushing protection, see ISO 13857 and ISO 13854 (e.g. LCU-system, chain, flywheel).

Table 2 *(continued)*

Global Essential Safety Requirement (GESR)	Global safety parameters (GSPs) referenced in this document	Remarks/Diagrams/Comments
41. Stopping devices in working areas (ISO/TS 25740-1:2011, 6.6.7)	[p1] A stop switch according to ISO 13850:2006, Category 0 shall be provided in each working area.	Comment on [p1]: The actuator of this stopping device shall be coloured red and the background shall be coloured yellow. It shall be positioned so that it is readily accessible. It shall apply the principle of direct opening action of the control circuit with mechanical latching. The switching positions shall be marked clearly and permanently. Remark 1: See also item 39 for inspection control. Remark 2: The intention of this stopping device is the interruption of the power to the motor before entering the working area. Therefore a turn switch is appropriate to fulfil the requirement.
42. Means of protection from various hazards (ISO/TS 25740-1:2011, 6.6.8)	No parameter.	Remark 1: See item 8 for sharp edges. Remark 2: For guidance on temperatures of accessible surfaces, see local codes and standards.
43. Electric shock in working spaces (ISO/TS 25740-1:2011, 6.6.9)	No parameter.	For guidance, see item 9.
44. Illumination of working spaces (ISO/TS 25740-1:2011, 6.6.10)	[p1] The lighting intensity shall be at least 200 lx in working spaces.	Comment on [p1]: JIS requires 150 lx in working spaces. Remark 1: A portable lamp shall be permanently available in the working spaces inside the supporting structure. Remark 2: EN 115–1 requires permanent installed lighting for working spaces outside the supporting structure.