BS EN ISO 25745-1:2012

BSI Standards Publication

Energy performance of lifts, escalators and moving walks

Part 1: Energy measurement and verification (ISO 25745-1:2012)

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National foreword

This British Standard is the UK implementation of EN ISO 25745-1:2012.

The UK participation in its preparation was entrusted to Technical Committee MHE/4, Lifts, hoists and escalators.

A list of organizations represented on this committee can be obtained on request to its secretary.

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

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Energy performance of lifts, escalators and moving walks - Part 1: Energy measurement and verification (ISO 25745-1:2012)

Performance énergétique des ascenseurs, escaliers mécaniques et trottoirs roulants - Partie 1: Mesurage de l'énergie et vérification (ISO 25745-1:2012)

Energieeffizienz von Aufzügen, Fahrtreppen und Fahrsteigen - Teil 1: Energiemessung und Konformität (ISO 25745-1:2012)

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Foreword

This document (EN ISO 25745-1:2012) has been prepared by Technical Committee ISO/TC 178 "Lifts, escalators and moving walks" in collaboration with Technical Committee CEN/TC 10 “Lifts, escalators and moving walks” the secretariat of which is held by AFNOR.

This European Standard shall be given the status of a national standard, either by publication of an identical text or by endorsement, at the latest by April 2013, and conflicting national standards shall be withdrawn at the latest by April 2013.

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Endorsement notice

The text of ISO 25745-1:2012 has been approved by CEN as a EN ISO 25745-1:2012 without any modification.

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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.

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ISO 25745-1 was prepared by Technical Committee ISO/TC 178, *Lifts, escalators and moving walks*.

ISO 25745 consists of the following parts, under the general title *Energy performance of lifts, escalators and moving walks*:

— *Part 1: Energy measurement and verification*

Additional parts, dealing with energy calculation and classification for lifts (elevators) and energy calculation and classification for escalators and moving walks, are planned.

Introduction

This International Standard has been prepared in response to the rapidly increasing need to ensure and to support the efficient and effective use of energy. This International Standard provides:

a) a consistent method of measuring actual energy usage of an installed lift, escalator and moving walk;

b) a simple method to periodically verify that energy usage of an installed unit has not changed — this is in support of regulatory periodic energy verification requirements.

This International Standard is intended to be a reference for the following parties:

— building developers or owners determining and confirming the energy consumption of a building;

— building owners and service companies for performing regulatory periodic energy verification;

— the manufacturers, installers and maintenance providers of lifts, escalators and moving walks;

— consultants and architects involved in specification of lifts, escalators and moving walks.

The total energy consumption over the entire life cycle of lifts, escalators and moving walks consists of the energy to manufacture, install, operate, and the disposal of lifts, escalators and moving walks. However, for the purpose of this International Standard, only the power consumption of the lift, escalator or moving walk required for its operation is considered in the assessment of energy consumption and its verification.

This International Standard is suitable for national or regional jurisdictional energy performance purposes, such as European Directive 2010/31/EU.[4]

INTERNATIONAL STANDARD ISO 25745-1:2012(E)

Energy performance of lifts, escalators and moving walks —

Part 1:
Energy measurement and verification

1 Scope

1.1 General

This part of ISO 25745 specifies:

a) methods of measuring actual energy consumption of lifts, escalators and moving walks on a single unit basis;

b) methods of carrying out periodic energy verification checks on lifts, escalators and moving walks in operation.

This part of ISO 25745 only considers the energy performance during the operational portion of the life cycle of the lifts, escalators or moving walks.

1.2 Lifts

For lifts, this part of ISO 25745 does not cover energy aspects, such as:

a) hoistway lighting;

b) heating and cooling equipment in the lift car;

c) machine room lighting;

d) machine room heating, ventilation and air conditioning;

e) non-lift, display systems, closed circuit television security cameras, etc.;

f) non-lift, monitoring systems (building management systems, etc.);

g) the effect of lift group dispatching on energy consumption;

h) consumption through the power sockets.

1.3 Escalators and moving walks

For escalators and moving walks, this part of ISO 25745 covers energy aspects of the ancillary equipment, such as:

a) lighting with the exception of comb plate lighting and step gap lighting and traffic light;

b) cooling and heating;

c) alarm devices and emergency battery supplies equipment, etc.

2 Terms and definitions

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

2.1
ancillary current
current drawn by the ancillary circuit(s) through the ancillary switch(es)

2.2
ancillary energy
energy used by the ancillary equipment

2.3
ancillary equipment
equipment such as lighting, fans, heating, alarm devices and emergency battery supplies

2.4
ancillary power coupling point
point where ancillary power measurements are taken, and which is located at the output side of the lift, escalator or moving walk ancillary power breaker

NOTE See Annex A.

2.5
autostart condition
condition when an escalator or moving walk is stationary, powered up and ready to start when initiated by passenger detection

2.6
energy
power consumed over time

2.7
energy meter
instrument capable of measuring energy

2.8
idle condition
condition when a lift is stationary at a floor following a run before the standby mode is entered

2.9
load condition
condition in which an escalator or moving walk is running with one or more passengers

2.10
main power coupling point
point where the main power measurements are taken, and which is located at the output side of the main switch/disconnect for the lift, escalator or moving walk

NOTE See Annex A.

2.11
no load condition
condition when an escalator or moving walk is running at nominal speed without passengers

2.12 Nominal speed

2.12.1
nominal speed
<escalator> speed in the direction of the moving steps or pallets when operating the equipment in the no load condition (i.e. without persons), stated by the manufacturer as that for which the escalator has been designed

2.12.2
nominal speed
<moving walk> speed in the direction of the belt when operating the equipment in the no load condition (i.e. without persons), stated by the manufacturer as that for which the moving walk has been designed

2.13
reference cycle
<lift> cycle during which the empty car is run from the bottom terminal landing, to the top terminal landing, and then back to the bottom terminal landing including two complete door cycles

2.14
running current
current drawn by the lift, when it has achieved rated speed in either the up or down direction

2.15
slow speed condition
condition when an escalator or moving walk is running at slow speed without passengers

2.16 Standby condition

NOTE 1 For units with power back-up systems, the lift, escalator or moving walk should be connected and operating on main power with back up power outputs disabled while the measurements are taken.

NOTE 2 Care should be taken to ensure that the application of the standby condition does not compromise the safety of the installation.

2.16.1
standby condition
<lift> condition when a lift is stationary at a floor and may have reduced the power consumption to a lower level set for that particular lift

2.16.2
standby condition
<escalator or moving walk> condition when the escalator/ or moving walk is stationary and powered on and can be started by authorized personnel

NOTE There may be other electrical loads not associated with the escalator or moving walk, which should not be included.

2.17
standby current
current drawn by the lift, when in standby condition

2.18
terminal landings cycling test
test for lifts when the car is continuously cycled between the bottom terminal landing and the top terminal landing, with the door operations enabled and no load in the car

2.19
verification
procedure to identify any significant changes in energy characteristics during the life of the lift, escalator or moving walk

3 Measurement and verification of lift, escalator and moving walk energy usage

3.1 General

This part of ISO 25745 specifies:

a) an accurate method of energy measurement in order to confirm manufacturers' declarations of energy usage;

b) quick and simple procedure for measurements to identify any significant changes in energy usage during the life of the installation.

Measurements and verifications may be performed after commissioning, in-service and after modernization if required.

The measurements shall be:

— practical in the field;

— repeatable;

— able to utilize commonly available measuring equipment;

— performed by a trained, competent person.

Tables 1 and 2 summarize measurements to be made and the instrumentation required.

Table 1 — Lift measurement and verification of energy usage

Type of measurement	Measurements to be made	Instrumentation
Energy measurement (see 3.2 and 4.2)	Main energy — running Main energy — idle and standby Ancillary energy — running Ancillary energy — idle and standby	Energy meter (see 4.1)
Energy verification check (see 3.3.2 and 4.3)	Main current — running Main current — idle and standby Ancillary current — running Ancillary current — idle and standby	Current probe (see 4.1)

Table 2 — Escalator and moving walk measurement and verification of energy usage

Type of measurement	Measurements to be made	Instrumentation
Power measurement (see 3.2 and 5.2)	Power in standby condition Power in autostart condition Power in slow speed condition Power in no load condition Ancillary power	Power meter (see 5.1)
Energy verification check (see 3.3.3 and 5.3)	Power in no load condition	Power meter (see 5.1)
NOTE No reference cycle is used for escalators and moving walks. Therefore a power measurement and power verification check is applied.		

3.2 Lift energy measurements or escalator and moving walk power measurements

This measurement may be run on request after commissioning and at any point during the equipment life cycle as needed. The specification for the measurement system is indicated in 4.1 for lifts and 5.1 for escalators and moving walks.

3.3 Lift, escalator and moving walk energy verification check

3.3.1 General

This check is to verify that power usage of a unit has not significantly changed over the life of the installation by a quick, simple procedure.

3.3.2 Lift

Only the current is measured, as this is the most likely element of energy consumption to change with equipment ageing. Initially a current or a current profile is established after equipment commissioning and after modernization. Thereafter checks may be performed at any time during the operating life of equipment, to determine whether the energy consumption of the equipment has changed. The specification for the measurement system is indicated in 4.1.

Usually aging affects the energy consumption when the lift is running. Therefore unless modifications have been made it should only be necessary to measure the main current running.

3.3.3 Escalator and moving walk

Initially power in the no load condition is measured. Thereafter, periodic checks of power in the no load condition may be performed at any time during the operating life of equipment, to determine whether the energy consumption of the equipment has changed. The specification for the measurement system is indicated in 5.1.

3.4 Multiple lift, escalator and moving walk installations

In the case of multiple lift, escalator and moving walk installations, each unit is tested as a standalone piece of equipment.

NOTE It is important to note that a group of lifts can be more energy efficient than single units operating alone.

4 Measurement procedures for a lift installation

4.1 Preliminaries

4.1.1 Instrumentation

The measuring instrumentation shall comply with the following:

a) an ammeter and voltmeter capable of measuring root mean square values;

b) an energy meter capable of measuring energy with unbalanced loads.

The energy meters can be those defined in IEC 62053[2] or a power and energy analyser as defined in IEC 61000-4-30[1] or any other equivalent instrument. It is important to ensure that the instruments selected are compatible with the technology of the installation, in particular for regenerative drives or where non sinusoidal wave-shapes may be present and supply systems where no neutral is provided.

4.1.2 Accuracy

The measured value shall have accuracy of at least than ±10 %.

4.1.3 Test set up

The set up conditions shall be as follows.

a) The instrument model numbers utilized for the test procedures shall be recorded.

b) The tests shall be conducted without changing any lift parameters. The lift unit parameters (ID, location, etc.) shall be recorded for identification purposes.

c) Public usage or entry to the lift shall be prevented and the terminal landing entrances shall be barricaded.

d) The lift shall be run in a cycling mode until a normal operating temperature of the lift machine is achieved.

e) It shall be ensured that there is no load in the car.

f) All features that are usually active during normal operation shall be active during the test.

NOTE 1 These set up conditions are applicable to new installations; however, existing installations can require an instrumentation set-up, which is specific to that installation.

NOTE 2 Environmental conditions, such as temperature and humidity, can affect the test results.

4.1.4 Coupling points

In lift systems where the main switch feeds the ancillary switch, then measurements may be taken at the main coupling point.

4.2 Procedures for the energy measurements

Carry out the requirements defined in 4.1.

4.2.1 Main energy — running

The procedure is as follows:

a) connect the energy meter to all phases of the main power lines at the main power coupling point;

b) measure and record the supply voltages;

c) set the energy meter for measurement of energy;

d) set the lift up for automatic terminal landings cycling, if available, otherwise arrange this manually;

e) run the empty car to the bottom landing;

f) start the measurement;

g) start the terminal landings cycling test (see 2.18);

h) stop the cycling operation after a minimum of 10 cycles;

i) measure the energy and record the value;

j) record the number of cycles;

k) divide the total energy by the number of cycles to produce an average value and record this value.

Additional measurements may also be taken for different travel distances or loads provided the travel distance or load is reported.

4.2.2 Main energy — idle and standby

The procedure is as follows:

a) connect the energy meter to all phases of the main power lines at the main power coupling points;

b) measure and record the supply voltages;

c) run the car through a reference cycle;

d) record the idle energy for a period of 1 min starting immediately after finishing the reference cycle;

e) maintain the empty car at the bottom landing for 5 min after the doors have closed and record the standby energy for a period of 1 min;

f) calculate the idle power in watts by dividing the recorded energy value by the measurement time and record the value;

g) calculate the standby power in watts by dividing the recorded energy value by the measurement time and record the value.

NOTE Some lifts can have further energy reduction modes (e.g. sleep modes); in these cases, measurements can be taken in a similar manner to those specified in d) and e) after appropriate times after the doors have closed and without the lift moving from the floor.

4.2.3 Ancillary energy — running

The procedure is as follows:

a) connect the energy meter to the ancillary power line at the ancillary power coupling point;

b) measure and record the supply voltages;

c) set the energy meter for measurement of energy;

d) set the lift up for automatic terminal landings cycling, if available, otherwise arrange this manually;

e) run the empty car to the bottom landing;

f) start the measurement;

g) start the terminal landings cycling test (see 2.18);

h) stop the cycling operation after a minimum of 10 cycles;

i) measure the energy and record the value;

j) record the number of cycles;

k) divide the total energy by the number of cycles to produce an average value and record the value.

Additional measurements may also be taken for different travel distances provided the travel distance is reported.

4.2.4 Ancillary energy — idle and standby

The procedure is as follows:

a) connect the energy meter to the ancillary power line at the ancillary power coupling point;

b) measure and record the supply voltages;

c) run the car through a reference cycle;

d) record the idle energy for a period of 1 min starting immediately after finishing the reference cycle;

e) maintain the empty car at the bottom landing for 5 min after the doors have closed and record the standby energy for a period of 1 min;

f) calculate the idle power in watts by dividing the recorded energy value by the measurement time and record the value;

g) calculate the standby power in watts dividing the recorded energy value by the measurement time and record the value.

NOTE Some lifts can have further energy reduction modes (e.g. sleep modes); in these cases, measurements can be taken in a similar manner to those specified in d) and e) after appropriate times after the doors have closed and without the lift moving from the floor.

4.3 Procedures for the energy verification check

Carry out the requirements defined in 4.1.

Measurements shall be taken for each power phase.

4.3.1 Main current — running

The procedure is as follows:

a) clamp the current probe on one phase of the main power line, at the main power coupling point;

b) with the empty car at the bottom landing, measure and record the main supply voltages;

c) run the empty car to the top landing and measure the current at rated speed at mid-travel and record the value or measure the current profile over the whole travel;

d) run the empty car to the bottom landing and measure the current at rated speed at mid-travel and record the value or measure the current profile over the whole travel.

4.3.2 Main current — idle and standby

The procedure is as follows:

a) clamp the current probe on one phase of the main power line, at the main power coupling point;

b) run the car through a reference cycle;

c) with the empty car at the bottom landing, measure and record the main supply voltages;

d) record the idle current value immediately;

e) maintain the empty car at the bottom landing for 5 min;

f) measure the standby current and record the value.

4.3.3 Ancillary current — running

The procedure is as follows:

a) clamp the current probe on one phase of the ancillary power line, at the ancillary power coupling point;

b) with the empty car at the bottom landing, measure and record the ancillary supply voltages;

c) run the empty car to the top landing and measure the current at rated speed and record value;

d) run the empty car to the bottom landing and measure the current at rated speed and record value.

4.3.4 Ancillary current — idle and standby

The procedure is as follows:

a) clamp the current probe on one phase of the ancillary power line, at the ancillary power coupling point;

b) run the car through a reference cycle;

c) measure and record the ancillary supply voltages;

d) record the idle current value immediately;

e) maintain the empty stationary car at the bottom landing for 5 min;

f) measure the standby current and record the value.

5 Measurement procedures for an escalator or moving walk installation

5.1 Preliminaries

5.1.1 Instrumentation

The measuring instrumentation shall be a power meter with the following capabilities:

a) capable of measuring active power, three values per second;

b) sufficient measuring range for several loads, auto start and power on;

c) possibility to measure recovered energy.

IMPORTANT Care should be taken to ensure that the instruments selected are compatible with the technology of the installation, in particular for regenerative drives or where non sinusoidal wave-shapes may be present.

5.1.2 Accuracy

The measured results shall have an accuracy of at least ±10 %.

5.1.3 Test set-up

The set-up conditions shall be as follows.

a) Public usage or entry to the escalator or moving walk shall be prevented and the landing entrances shall be barricaded.

b) The instrument model numbers utilized for the test procedures shall be recorded.

c) The tests shall be conducted without changing any escalator or moving walk parameters. The unit parameters (ID, location, etc.) shall be recorded for identification purposes.

d) All ancillary equipment is switched off. Energy consumption of ancillary equipment according to 1.3 has to be measured separately by switching ancillary equipment on (see 5.2.6).

e) The escalator or moving walk shall be run until a stable machine temperature is achieved.

f) It shall be ensured that there is no load on the escalator or moving walk.

NOTE 1 These set-up conditions are applicable to new installations; however, existing installations can require an instrumentation set-up, which is specific to that installation.

NOTE 2 Environmental conditions, such as temperature and humidity, can affect the test results.

NOTE 3 An illustration of the instrumentation coupling points can be found in Annex A, when the ancillary equipment is supplied separately to the main power supply.

5.2 Procedures for power measurement

Carry out the requirements in 5.1.

5.2.1 Main power — running

The procedure is as follows:

a) connect the power meter to the main power lines at the main power coupling point;

b) measure and record the active power in watts;

5.2.2 Power measured in standby condition

The escalator or moving walk shall be in the standby condition (2.16.2).

Execute the procedure specified in 5.2.1.

5.2.3 Power measured in autostart condition (if available)

The escalator or moving walk shall be in the autostart condition (2.5).

Execute procedure 5.2.1

5.2.4 Power measured in slow speed condition (if available)

The escalator or moving walk shall be in the slow speed condition (2.15).

Execute procedure 5.2.1 for at least one complete revolution of the step or pallet band or belt.

5.2.5 Power measured in no load condition

The escalator or moving walk shall be in the no load condition (2.11).

Execute procedure 5.2.1 for at least three complete revolutions of the step or pallet band or belt.

5.2.6 Power measured in ancillary equipment

The procedure is as follows:

a) connect the power meter to the ancillary power lines at the ancillary coupling point;

b) measure and record the active power.

5.3 Procedures for the power verification check

Carry out the procedures specified in 5.2.5.

6 Reporting

6.1 General information

The following information shall be provided on each report:

— supply voltages;

— instrument type, accuracy, model numbers and settings;

— machine room, lift well and lift car temperatures;

— date, time, person making measurements, building name, unit location, unit numbers and date of installation;

— standby conditions (e.g. lights on or off, fan on or off, etc.);

— for lifts — rated load, rated speed, travel, technology, counterweight etc.;

— for lifts — condition of all active components such as doors, lights, fans, etc.;

— for escalators and moving walks — step width, rise or travel, nominal speed (running and idle), angle of inclination, etc.

6.2 Lift reporting

6.2.1 General

The information specified in 6.2.2 to 6.2.5 shall be provided in each report.

6.2.2 Main energy — running:

— main energy — running;

— number of cycles;

— main energy — running/cycle.

6.2.3 Main energy — Idle and standby:

— main energy — idle;

— main energy — standby;

— recording time;

— idle and standby power.

6.2.4 Ancillary energy — running:

— ancillary energy — running;

— number of cycles;

— ancillary energy per cycle.

6.2.5 Ancillary energy — idle and standby:

— ancillary energy — idle;

— ancillary energy — standby;

— recording time;

— idle and standby power.

6.3 Lift energy usage verification check

6.3.1 General

The information specified in 6.3.2 to 6.3.5 shall be provided in each report.

6.3.2 Main current — running:

— main current — running, each phase, up direction;

— main current — running, each phase, down direction;.

6.3.3 Main current — idle and standby:

— main current — idle and standby, each phase.

6.3.4 Ancillary current — running:

— ancillary current — running, each phase up direction;

— ancillary current — running, each phase down direction.

6.3.5 Ancillary current —idle and standby:

— ancillary current — idle and standby, each phase.

6.4 Escalator and moving walk energy reporting

All information according to 5.2 shall be reported, also step width, rise, direction, speed (running and idle). The reporting of additional information about applied technologies is recommended.

6.5 Escalator and moving walk energy verification check reporting

All information according to 5.3 shall be reported, also step width, rise, direction, speed (running). The reporting of additional information about applied technologies is recommended.

Annex A
(informative)

Measuring instrument coupling points

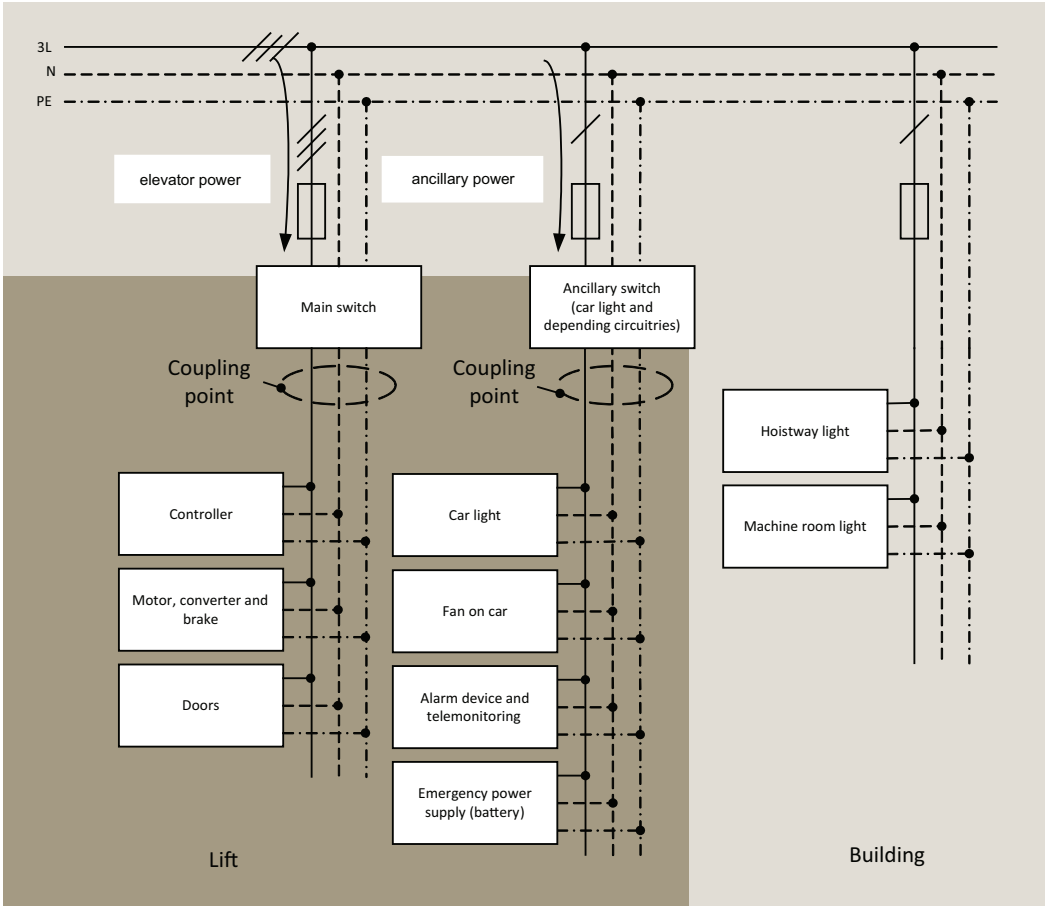

Figure A.1 — Illustration of measuring instrument coupling points — lifts

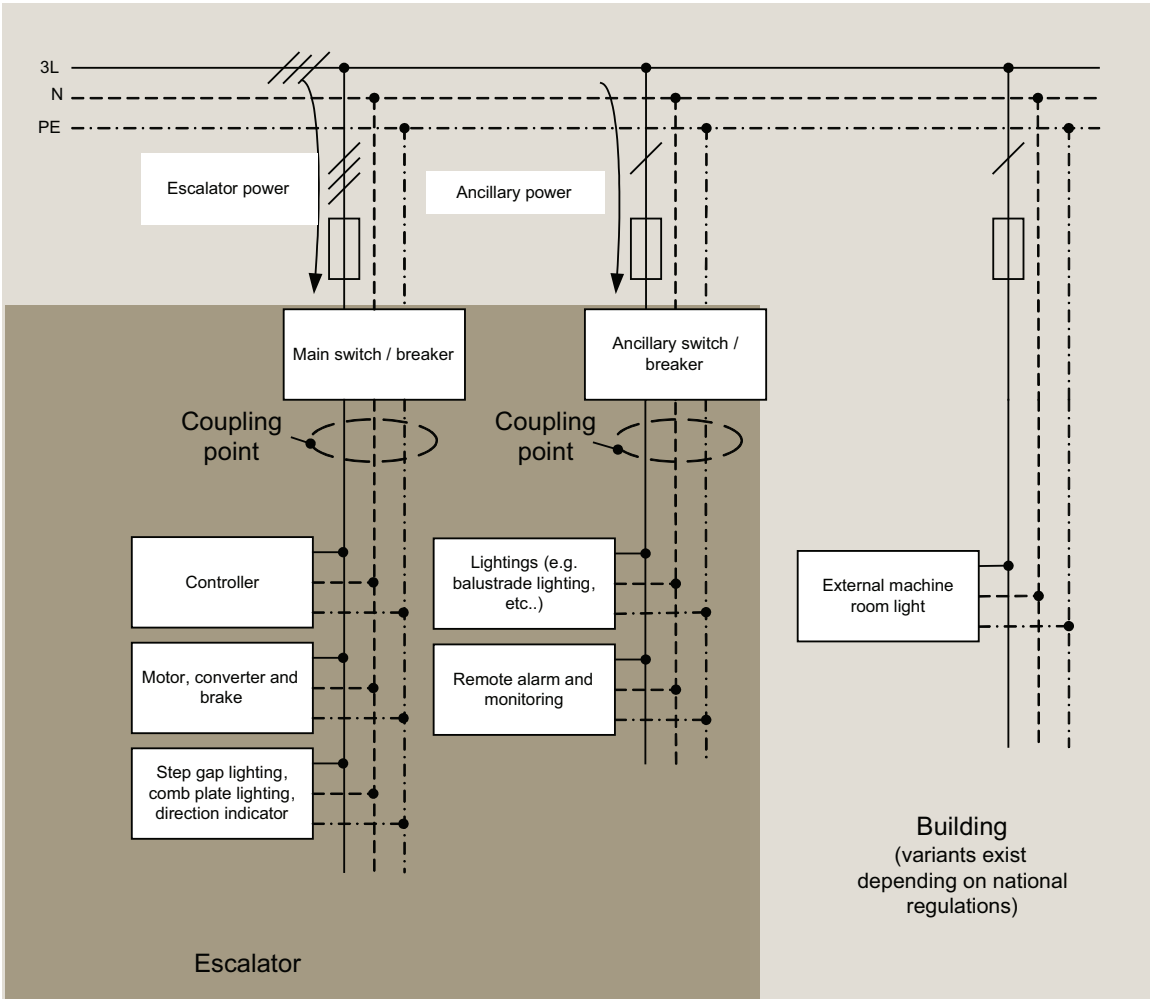

Figure A.2 — Illustration of measuring instrument coupling points — escalators and moving walks

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[2] IEC 62053 (all parts), *Electricity metering equipment (a.c.) — Particular requirements*

[3] CHARTERED INSTITUTION OF BUILDING SERVICES ENGINEERS. *Guide D: Transportation systems in buildings*, Chapter 13. London: CIBSE, 2010

[4] Directive 2010/31/EU of the European Parliament and of the Council of 19 May 2010 on the energy performance of buildings. *Off. J. Eur. Union* 2010-06-18, **L153**, pp. 13–35

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