INTERNATIONAL STANDARD

ISO 25745-1

Second edition
2023-07

Energy performance of lifts, escalators and moving walks —

Part 1: Energy measurement and verification

Performance énergétique des ascenseurs, escaliers mécaniques et trottoirs roulants —

Partie 1: Mesure de l'énergie et vérification

Reference number
ISO 25745-1:2023(E)

COPYRIGHT PROTECTED DOCUMENT

ISO copyright office
CP 401 • Ch. de Blandonnet 8
CH-1214 Vernier, Geneva
Phone: +41 22 749 01 11
Email: copyright@iso.org
Website: www.iso.org

Published in Switzerland

Contents

Page

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 document 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).

ISO draws attention to the possibility that the implementation of this document may involve the use of (a) patent(s). ISO takes no position concerning the evidence, validity or applicability of any claimed patent rights in respect thereof. As of the date of publication of this document, ISO had not received notice of (a) patent(s) which may be required to implement this document. However, implementers are cautioned that this may not represent the latest information, which may be obtained from the patent database available at www.iso.org/patents. ISO shall not be held responsible for identifying any or all such patent rights.

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

For an explanation of 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 www.iso.org/iso/foreword.html.

This document was prepared by Technical Committee ISO/TC 178, *Lifts, escalators and moving walks*, in collaboration with the European Committee for Standardization (CEN) Technical Committee CEN/TC 10, *Lifts, escalators and moving walks,* in accordance with the Agreement on technical cooperation between ISO and CEN (Vienna Agreement).

This second edition cancels and replaces the first edition (ISO 25745-1:2012), which has been technically revised.

The main changes are as follows:

— updated scope for lifts regarding energy storage systems and fan.

A list of all parts in the ISO 25745 series can be found on the ISO website.

Any feedback or questions on this document should be directed to the user’s national standards body. A complete listing of these bodies can be found at www.iso.org/members.html.

Introduction

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

This document 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;

— 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 document, 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 document is suitable for national or regional jurisdictional energy performance purposes.

Energy performance of lifts, escalators and moving walks —

Part 1: Energy measurement and verification

1 Scope

1.1 General

This document 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 document 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 document does not cover energy aspects, such as:

a) hoistway lighting;

b) heating and cooling equipment, including fans 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) non-lift equipment consumption through the power sockets;

i) energy storage systems if used as an alternative energy source for operation.

1.3 Escalators and moving walks

For escalators and moving walks, this document does not cover 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 Normative references

There are no normative references in this document.

3 Terms and definitions

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

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

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

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

3.1
ancillary current
current drawn by the ancillary circuit(s) through the ancillary switch(es)

3.2
ancillary energy
energy (3.6) used by the *ancillary equipment* (3.3)

3.3
ancillary equipment
equipment such as lighting, fans, heating, alarm devices and emergency battery supplies

3.4
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 1 to entry: See Annex A.

3.5
autostart condition
condition when an escalator or moving walk is stationary, powered up and ready to start when initiated by passenger detection

3.6
energy
power consumed over time

3.7
energy meter
instrument capable of measuring *energy* (3.6)

3.8
idle
condition when a lift is stationary at a floor following a run before the standby mode is entered

3.9
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 1 to entry: See Annex A.

3.10
no load condition
condition when an escalator or moving walk is running at *nominal speed* (3.11, 3.12) without passengers

Note 1 to entry: If one or more passengers are on the escalator or moving walk, it is considered as running under load condition.

3.11
nominal speed
<escalator> speed in the direction of the moving steps when operating the equipment in the *no load condition* (3.10), stated by the manufacturer as that for which the escalator has been designed

3.12
nominal speed
<moving walk> speed in the direction of the pallets or belt when operating the equipment in the *no load condition* (3.10), stated by the manufacturer as that for which the moving walk has been designed

3.13
non-lift equipment
equipment not required by the lift to perform all the necessary operations to ensure the safe and intended functioning of the installation

3.14
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

3.15
running current
current drawn by the lift, when it has achieved rated speed in either the up or down direction

3.16
slow speed condition
condition when an escalator or moving walk is running at slow speed without passengers

3.17
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

Note 1 to entry: For units with power back-up systems, the lift should be connected and operating on main power with backup power outputs disabled while the measurements are taken.

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

3.18
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 1 to entry: For units with power back-up systems, the escalator or moving walk should be connected and operating on main power with backup power outputs disabled while the measurements are taken.

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

Note 3 to entry: There can be other electrical loads not associated with the escalator or moving walk, which should not be included.

3.19
standby current
current drawn by the lift, when in *standby condition* (3.17, 3.18)

3.20
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

3.21
verification
procedure to identify any significant changes in *energy* (3.6) characteristics during the life of the lift, escalator or moving walk

Note 1 to entry: Verification can be used to compare actual consumption with projected consumption.

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

4.1 General

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 4.2 and 5.2)	Main energy — running Main energy — idle and standby Ancillary energy — running Ancillary energy — idle and stand-by	Energy meter (see 5.1)
Energy verification check (see 4.3.2 and 5.3)	Main current — running Main current — idle and standby Ancillary current — running Ancillary current — idle and stand-by	Current probe (see 5.1)

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

Type of measurement	Measurements to be made	Instrumentation
Power measurement (see 4.2 and 6.2)	Power in standby condition Power in autostart condition Power in slow speed condition Power in no load condition Ancillary power	Power meter (see 6.1)
Power verification check (see 4.3.3 and 6.3)	Power in no load condition	Power meter (see 6.1)
NOTE No reference cycle is used for escalators and moving walks. Therefore, a power measurement and power verification check is applied.		

4.2 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. It can be used to assess actual consumption and compare with projected consumption. The specification for the measurement system is indicated in 5.1 for lifts and 6.1 for escalators and moving walks.

4.3 Lift, escalator and moving walk energy verification check

4.3.1 General

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

4.3.2 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 the equipment, to determine whether the energy consumption of the equipment has changed. The specification for the measurement system is indicated in 5.1.

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.

4.3.3 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 the equipment, to determine whether the energy consumption of the equipment has changed. The specification for the measurement system is indicated in 6.1.

4.4 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 A group of lifts can be more energy efficient than single units operating alone.

5 Measurement procedures for a lift installation

5.1 Preliminaries

5.1.1 Instrumentation

The measuring instrumentation shall be as follows:

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 the IEC 62053 series[2] or a power and energy analyser as defined in IEC 61000-4-30[1] or any other equivalent instrument.

The instruments selected shall be 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.

5.1.2 Accuracy

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

5.1.3 Test setup

The setup 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 stable 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 setup conditions are applicable to new installations; however, existing installations can require an instrumentation setup, which is specific to that installation.

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

5.1.4 Coupling points

In lift systems where the main switch feeds the ancillary switch, measurements may be taken at the main coupling point, see Figure A.1.

5.2 Procedures for the energy measurements

5.2.1 General

Follow the requirements in 5.1.

5.2.2 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, see Figure A.1;

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;

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.

5.2.3 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 point, see Figure A.1;

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 finishing the reference cycle and immediately record the standby energy for a period of 1 min;

f) maintain the empty car at the bottom landing for 30 min after finishing the reference cycle and immediately record the standby energy for a period of 1 min;

g) calculate the idle, 5 min standby and 30 min 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), e) and f) after appropriate times after the doors have closed and without the lift moving from the floor.

5.2.4 Ancillary energy — running

The procedure is as follows:

a) connect the energy meter to the ancillary power line at the ancillary power coupling point, see Figure A.1;

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;

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.

5.2.5 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, see Figure A.1;

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 finishing the reference cycle and immediately record the standby energy for a period of 1 min;

f) maintain the empty car at the bottom landing for 30 min after finishing the reference cycle and immediately record the standby energy for a period of 1 min;

g) calculate the idle, 5 min standby and 30 min 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), e) and f) after appropriate times after the doors have closed and without the lift moving from the floor.

5.3 Procedures for the energy verification check

5.3.1 General

Follow the requirements in 5.1.

Measurements shall be taken for each power phase.

5.3.2 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, see Figure A.1;

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 running 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 running current at rated speed at mid-travel and record the value or measure the current profile over the whole travel.

5.3.3 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, see Figure A.1;

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.

5.3.4 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, see Figure A.1;

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 running current at rated speed and record value;

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

5.3.5 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, see Figure A.1;

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.

6 Measurement procedures for an escalator or moving walk installation

6.1 Preliminaries

6.1.1 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.

The energy meters can be those defined in the IEC 62053 series[2] or a power and energy analyser as defined in IEC 61000-4-30[1] or any other equivalent instrument.

The instruments selected shall be 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.

6.1.2 Accuracy

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

6.1.3 Test setup

The setup 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 shall be measured separately by switching ancillary equipment on (see 6.2.7).

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 setup conditions are applicable to new installations; however, existing installations can require an instrumentation setup, 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, see Figure A.2.

6.2 Procedures for power measurement

6.2.1 General

Follow the requirements in 6.1.

6.2.2 Main power — running

The procedure is as follows:

a) connect the power meter to the main power lines at the main power coupling point, see Figure A.2;

b) measure and record the active power in watts.

6.2.3 Power measured in standby condition

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

Execute the procedure in 6.2.2.

6.2.4 Power measured in autostart condition (if available)

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

Execute the procedure in 6.2.2.

6.2.5 Power measured in slow speed condition (if available)

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

Execute the procedure in 6.2.2 for at least one complete revolution of the step or pallet band or belt.

6.2.6 Power measured in no load condition

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

Execute the procedure in 6.2.2 for at least three complete revolutions of the step or pallet band or belt.

6.2.7 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, see Figure A.2;

b) measure and record the active power.

6.3 Procedures for the power verification check

Follow the procedure in 6.2.6.

7 Reporting

7.1 General information

The following information shall be provided on each report:

— measured supply voltages;

— instrument type, accuracy, identification/model numbers, settings and calibration date;

— 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);

— 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.

7.2 Lift reporting

7.2.1 General

The information specified in 7.2.2 to 7.2.5 shall be provided in each report.

7.2.2 Main energy — running:

— main energy — running;

— number of cycles;

— main energy — running/cycle.

7.2.3 Main energy — Idle and standby:

— main energy — idle;

— main energy — standby;

— recording time;

— idle and standby power.

7.2.4 Ancillary energy — running:

— ancillary energy — running;

— number of cycles;

— ancillary energy per cycle.

7.2.5 Ancillary energy — idle and standby:

— ancillary energy — idle;

— ancillary energy — standby;

— recording time;

— idle and standby power.

7.3 Lift energy usage verification check

7.3.1 General

The information specified in 7.3.2 to 7.3.5 shall be provided in each report.

7.3.2 Main current — running:

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

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

7.3.3 Main current — idle and standby:

— main current — idle and standby, each phase.

7.3.4 Ancillary current — running:

— ancillary current — running, each phase up direction;

— ancillary current — running, each phase down direction.

7.3.5 Ancillary current —idle and standby:

— ancillary current — idle and standby, each phase.

7.4 Escalator and moving walk energy reporting

All information according to 6.2, as well as the step width, rise, direction, speed (running and idle), shall be reported. Additional information about applied technologies should be reported.

7.5 Escalator and moving walk energy verification check reporting

All information according to 6.3, as well as the step width, rise, direction, speed (running), shall be reported. Additional information about applied technologies should be reported.

Annex A
(informative)

Measuring instrument coupling points

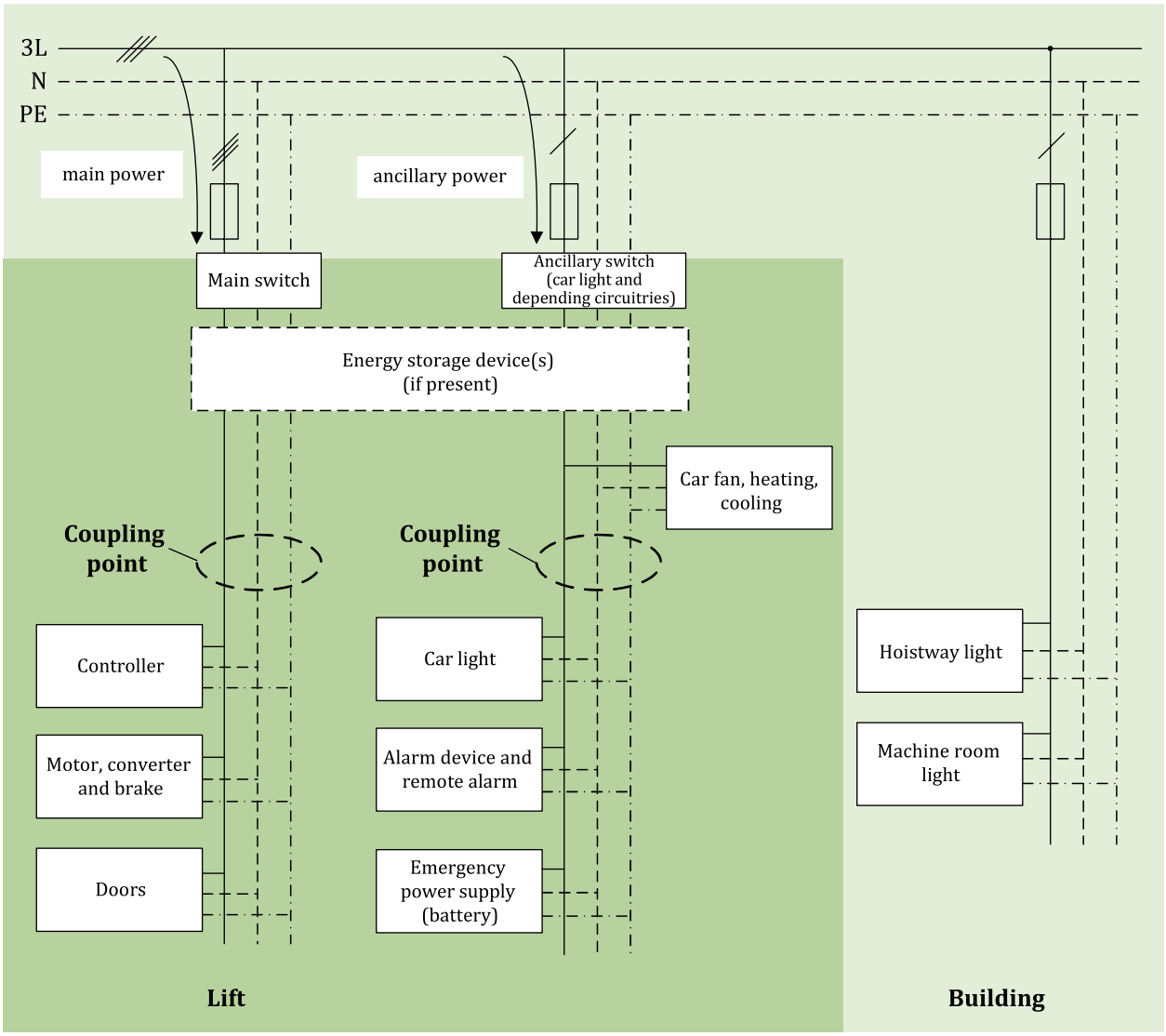

Figure A.1 — Illustration of measuring instrument coupling points — lifts

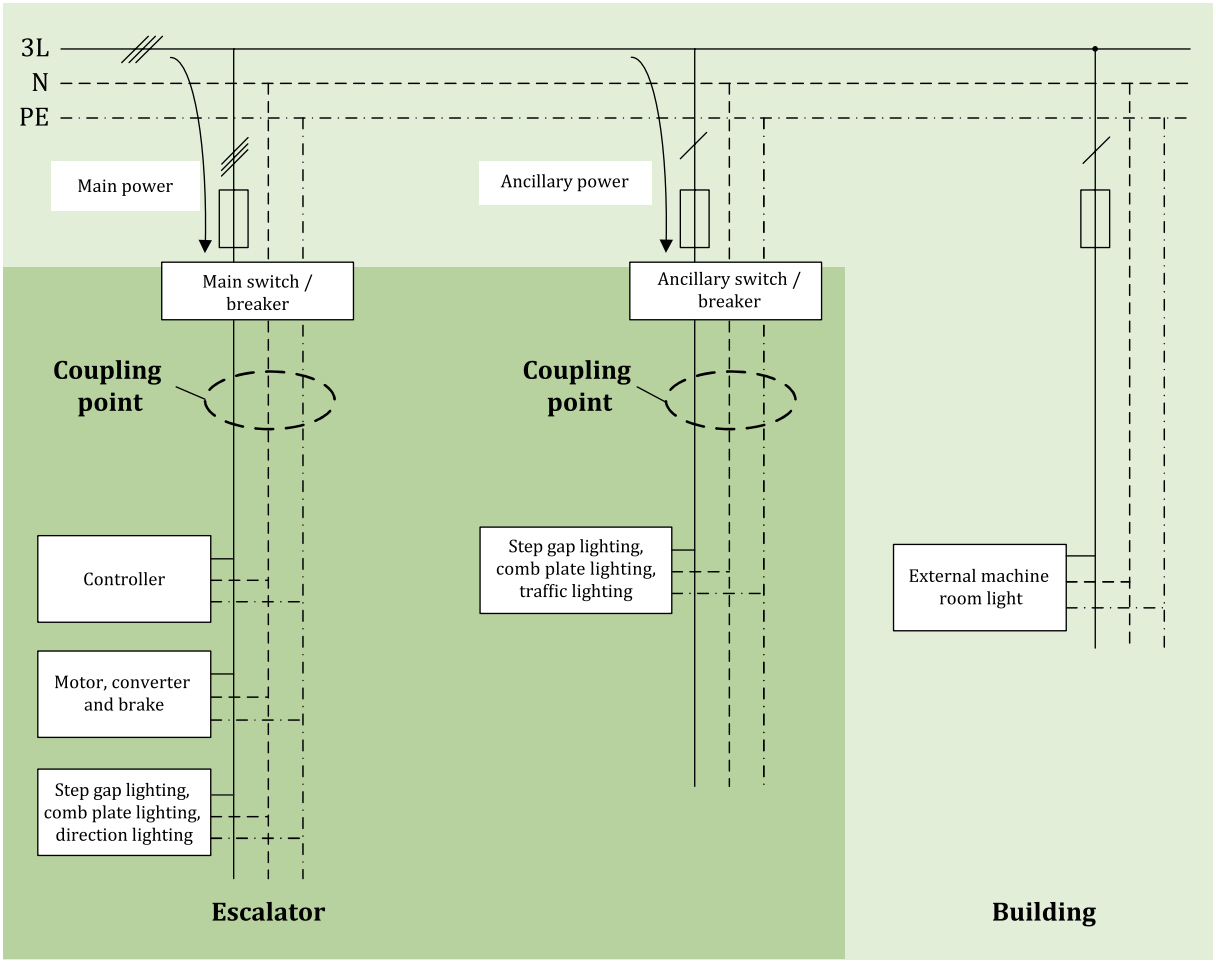

Figure A.2 — Illustration of measuring instrument coupling points — escalators and moving walks

Bibliography

[1] IEC 61000-4-30, *Electromagnetic compatibility (EMC) — Part 4-30: Testing and measurement techniques — Power quality measurement methods*

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

ICS 91.140.90

Price based on 16 pages