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Energy performance of lifts, escalators and moving walks —

Part 2: Energy calculation and classification for lifts (elevators)

Performance énergétique des ascenseurs, escaliers mécaniques et trottoirs roulants —

Partie 2: Calcul énergétique et classification des ascenseurs

ICS 91.140.90

ISO/CEN PARALLEL PROCESSING

This draft has been developed within the International Organization for Standardization (ISO), and processed under the **ISO-lead** mode of collaboration as defined in the Vienna Agreement.

This draft is hereby submitted to the ISO member bodies and to the CEN member bodies for a parallel five-month enquiry.

Should this draft be accepted, a final draft, established on the basis of comments received, will be submitted to a parallel two-month approval vote in ISO and formal vote in CEN.

To expedite distribution, this document is circulated as received from the committee secretariat. ISO Central Secretariat work of editing and text composition will be undertaken at publication stage.

Pour accélérer la distribution, le présent document est distribué tel qu'il est parvenu du secrétariat du comité. Le travail de rédaction et de composition de texte sera effectué au Secrétariat central de l'ISO au stade de publication.

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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.

International Standards are drafted in accordance with the rules given in the ISO/IEC Directives, Part 2.

The main task of technical committees is to prepare International Standards. Draft International Standards adopted by the technical committees are circulated to the member bodies for voting. Publication as an International Standard requires approval by at least 75 % of the member bodies casting a vote.

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.

ISO 25745-1 was prepared by Technical Committee ISO/TC 178, *Lifts, escalators and moving walks*, Subcommittee WG10.

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*

— *Part 2: Energy Calculation and Classification for Lifts (Elevators)*

— *Part 3: Energy Calculation and Classification for Escalators and Moving Walks*

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. The Standard provides;

a) A method to estimate energy consumption on a daily and an annual basis for lifts.

b) A method for energy classification of new, existing or modernised lifts.

c) Guidelines for reducing energy consumption that can be used to support building environmental and energy classification systems.

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

— building developers/owners to evaluate the energy consumption of various lifts;

— building owners and service companies when modernising installations including reduction of energy consumption

— the installers and maintenance providers of lifts;

— consultants and architects involved in specification of lifts.

The total energy consumption over the entire life cycle of lifts consists of the energy to manufacture, install, operate, and the disposal of lifts. However for the purpose of this standard only operating energy (running and standby) performance is considered.

In the preparation of this standard Technical Committee ISO/TC 178, Subcommittee WG10 has initiated extensive research, which included the simulation of over 300 typical lift installations.The results of this research have been used to provide the numerical values shown in Tables 2 – 4.

This standard only considers traction and hydraulic technology, but may be used as a reference for alternative technologies.

This Standard can be used in relationship with national/regional jurisdictional energy performance purposes, such as European Directive 2010/31/EU, amongst others.

Energy Performance of Lifts — Part 2: Energy Calculation and Classification for Lifts (Elevators)

1 Scope

This standard specifies:

a) a method to estimate energy consumption based on measured values, calculation or simulation, on an annual basis for traction and hydraulic lifts on a single unit basis;

b) energy classification system for new, existing and modernized traction and hydraulic lifts on a single unit basis;

c) guidelines for reducing energy consumption of existing lifts that can support building environmental and energy classification systems

This standard only considers the energy performance during the operational portion of the life cycle of the traction and hydraulic lifts.

This Standard does not cover energy aspects, which affect the measurements, calculations and simulations, such as:

i) hoistway lighting;

ii) heating and cooling equipment in the lift car;

iii) machine room lighting;

iv) machine room heating, ventilation and air conditioning;

v) non-lift display systems, CCTV security cameras, etc.;

vi) non-lift monitoring systems (e.g.: building management systems, etc.);

vii) input power harmonics (harmonics are addressed in the EMC standards);

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

ix) environmental conditions;

x) consumption through the power sockets;

xi) lifts whose travel includes an express zone.

2 Normative references

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3 Terms, definitions and symbols

For the purposes of this document, the terms, definitions and symbols of Part 1 of this Standard apply in addition to the following.

Terms and definitions

3.1
average cycle
cycle of one up and one down trip each covering the average travel distance of the target installation

3. 2
energy
power consumed over time

3.3
idle condition
condition when the lift is stationary at a floor following a run before the standby mode is entered

3.4
load factor
ratio between the running energy used by a car carrying an average load and the running energy measured with an empty car

3.5
reference cycle
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
Note: The cycle can commence at the top terminal landing and return there if this is more convenient.

3.6
running current
current drawn by the lift, when it has achieved rated speed in either the up or down direction

3.7
short running cycle
cycle during which the empty car is run for a travel distance of between one quarter to half of travel height with the travel distance centred around the mid-point of the shaft and back to the starting point over a sufficient distance for the lift car to reach stable rated speed in both directions

3.8
standby condition
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: There may be other electrical loads not associated with the lift, which shall not be included.
Note 2 For units with energy storage systems, which may influence the measurement in standby condition the lift must be connected and operating on main power supply with the energy storage outputs disabled while the measurements are taken. (see also 5.6).
Note 3: Care shall be taken to insure that the application of the standby condition does not compromise the safety of the installation.

3.9
standby current
current used by the lift, when in standby condition

3.10
trip(s)
movement(s) from a starting (departure) landing to the next stopping (arrival) landing not including re-levelling

Symbols

a	is the average acceleration (m/s^2)
d_{op}	is the number of operating days per year
E_d	is the total daily energy consumption (Wh)
E_{nr}	is the daily non running (idle/standby) energy consumption (Wh)
E_{rav}	is the running energy consumption of an average cycle (Wh)
E_{rc}	is the running energy of reference cycle according to ISO 25745-1 (Wh)
E_{rd}	is the daily running energy consumption (Wh)
E_{rm}	is the average running energy consumption per metre of travel (Wh/m)
E_{sc}	is the running energy of the short cycle (Wh)
E_{spc}	is the specific running energy for a short cycle (mWh/kg*m)
E_{spr}	is specific runningenergy for ISO reference cycle (mWh/kg*m)
E_{ssc}	is the start/stop energy consumption for each trip (Wh)
E_y	is the annual energy consumption (Wh)
j	is the average jerk (m/s^3)
k_L	is the load factor
n_d	is the number of trips per day
P_{id}	is the power used in idle mode (W)
P_{st30}	is the standby power used after 30 minutes (W)
P_{st5}	is the standby power used after 5 minutes (W)
Q	is the rated load (kg)
R_{id}	is the ratio of idle time consuming P_{id} (%)
R_{st30}	is the ratio of 30-minute time consuming P_{st30} (%)
R_{st5}	is the ratio of 5-minute time consuming P_{st5} (%)
s_{av}	is the average travel distance for target installation (m)
s_{rc}	is the one way travel distance of reference cycle according to ISO 25745-1 (m)
s_{sc}	is the one way travel distance of the short cycle (m)
t_{av}	is the time to travel the average travel distance, including door times (s)
t_d	is the time for the opening, opened and closing times of the lift doors at the landings
t_{nr}	is the non running (idle and standby) time(s) per day (h)
t_{rd}	is the running time per day (h)
v	is the rated speed (m/s)

4 Data collection and analysis tools

Data can be collected by measurement from existing installations or test facilities or obtained by simulation or calculation.

The energy values used to estimate annual energy consumption can be obtained using the energy measurement methodologies as specified in Part 1 of this standard or by calculation or simulation.

Energy measurements for existing lifts may be taken during commissioning or during the life of the installation.

Running energy measurements can be achieved on new or existing lifts by running the empty lift car between one terminal landing and the other terminal landing and then back to the first terminal landing in accordance with the reference cycle as specified in Part 1 of this standard.

Running energy measurements can be achieved in test facilities or on existing installations by either

a) running the empty lift car between one terminal landing and the other terminal landing and then back to the first terminal landing (full cycle), including the energy used during the two door operations, in accordance with the reference cycle as specified in Part 1 of this standard, or;

b) running the empty lift car from a defined landing in the test facility to a predetermined point in the lift well and then back to the defined landing (short cycle), including the energy used during the two door operations, in accordance to the measurement procedures specified in Part 1 of this standard.

Each cycle comprises two trips.

The running energy of the short cycle should be determined with the travel centred on the mid point between the defined landing and the predetermined point, in order to reduce inaccuracies due the influence of suspension means, travelling cables, etc. The travel of the short cycle may be between 1/2 and 1/4 of the total travel height. However the lift should always reach rated speed during the cycle. For lifts with two stops no short running cycle evaluation is needed because the lift always runs the full travel height.

Option b) allows a test facility to be arranged to match the terminal to terminal travel distance of a target installation with a specified rated speed. Option b) cannot be applied to two stop installations (see 5.1 and 5.2.5)

Idle power (P_{id}), 5-minute standby power (P_{st5}) and 30-minute standby power (P_{st30}) can be obtained as specified in Part 1 of this standard by measurement or by calculation or simulation.

The measurement of the 30-minute standby power is only necessary if any lift energy consuming components switch to a lower energy level after a time exceeding 5 minutes.

The standby power values should be determined taking into account the manufacturer's powering down sequence times of the energy consuming components when the lift is in operation. The transition times from standby, hibernate or sleep modes should be indicated in the documentation of the installation.

Note: Some manufacturers may have a number of standby states depending on their powering down sequence and recovery times; sometimes known as sleep, hibernate, energy reduction state etc.