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Petroleum, petrochemical and natural gas industries — Safety of machineries — Powered elevators

Industries du pétrole, de la pétrochimie et du gaz naturel — Sécurité des machines — Élévateurs motorisés

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Foreword

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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 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 67, *Materials, equipment and offshore structures for petroleum, petrochemical and natural gas industries*, Subcommittee SC 4, *Drilling and production equipment*, in collaboration with the European Committee for Standardization (CEN) Technical Committee CEN/TC 12, *Materials, equipment and offshore structures for petroleum, petrochemical and natural gas industries*, in accordance with the Agreement on technical cooperation between ISO and CEN (Vienna Agreement).

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 is a type-C standard as stated in ISO 12100.

This document is of relevance, in particular, for the following stakeholder groups representing the market players with regard to machinery safety:

— machine manufacturers (small, medium and large enterprises);

— health and safety bodies (regulators, accident prevention organizations, market surveillance, etc.)

Others can be affected by the level of machinery safety achieved with the means of the document by the above-mentioned stakeholder groups:

— machine users/employers (small, medium and large enterprises);

— machine users/employees (e.g. trade unions, organizations for people with special needs);

— service providers, e. g. for maintenance (small, medium and large enterprises);

— consumers (in case of machinery intended for use by consumers).

The above-mentioned stakeholder groups have been given the possibility to participate at the drafting process of this document.

The machinery concerned and the extent to which hazards, hazardous situations or hazardous events are covered are indicated in the Scope of this document.

When requirements of this type-C standard are different from those which are stated in type-A or type-B standards, the requirements of this type-C standard take precedence over the requirements of the other standards for machines that have been designed and built according to the requirements of this type-C standard.

Petroleum, petrochemical and natural gas industries — Safety of machineries — Powered elevators

1 Scope

This document specifies general safety requirements for the design, testing and production of powered elevators. The requirements are applicable for onshore and offshore applications of such elevators in the petroleum and petrochemical industries.

This document does not cover any other type of elevator. It is not applicable to the following types of products:

— remote control devices;

— lifting nubbins;

— lifting plugs;

— lifting subs;

— internal gripping devices;

— equipment for lifting tubular from and onto a vessel;

— elevator links or bails.

This list is not exhaustive.

This document is not applicable to powered elevators manufactured before the date of this publication.

NOTE Annex A provides the relation between the clauses of the European Directive on machinery (Directive 2006/42/EC) and this document, for potential significant hazards and the safety requirements dealing with them for powered elevators.

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 3864 (all parts), *Graphical symbols — Safety colours and safety signs*

ISO 12100, *Safety of machinery — General principles for design — Risk assessment and risk reduction*

ISO 13849-1, *Safety of machinery — Safety-related parts of control systems — Part 1: General principles for design*

ISO 13534, *Petroleum and natural gas industries — Drilling and production equipment — Inspection, maintenance, repair and remanufacture of hoisting equipment*

ISO 13535:2000, *Petroleum and natural gas industries — Drilling and production equipment — Hoisting equipment*

ISO 13850, *Safety of machinery — Emergency stop function — Principles for design*

ISO 13854, *Safety of machinery — Minimum gaps to avoid crushing of parts of the human body*

ISO 14120, *Safety of machinery — Guards — General requirements for the design and construction of fixed and movable guards*

ISO 80079-36, *Explosive atmospheres — Part 36: Non-electrical equipment for explosive atmospheres — Basic method and requirements*

ISO 80079-37, *Explosive atmospheres — Part 37: Non-electrical equipment for explosive atmospheres — Non-electrical type of protection constructional safety "c", control of ignition sources "b", liquid immersion "k"*

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 https://www.iso.org/obp

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

3.1
control system
system that responds to input signals from parts of the *elevator* (3.5), operators, external control equipment or any combination of these, and generates corresponding output signals to the elevator actuators, causing the elevator to perform in the intended manner

3.2
danger zone
space within, under and/or around machinery in which a person can be exposed to a hazard

[SOURCE: ISO 12100:2010, 3.11]

3.3
design verification
process of examining the result of a given design or development activity to determine conformity with specified requirements

[SOURCE: ISO/TS 29001:2010, 3.1.8]

3.4
DROPS
dropped objects
industry-wide initiative focused on preventing dropped objects

Note 1 to entry: DROPS ultimate goal is delivering a second nature dropped objects prevention strategy across the industry.

3.5
elevator
lifting accessory to be used for lifting and handling of tubular in the on- and offshore drilling industry on or in the vicinity of the drill floor

3.6
fatigue life
number of stress cycles of a specific character that an *elevator* (3.5) sustains before failure of a specified nature occurs

3.7
feedback signal
signal generated by the *elevator* (3.5) that can be used for monitoring or functional use

Note 1 to entry: Examples of feedback signals include elevator set for safe lifting, weight in elevator, and elevator open.

3.8
insert
gripping/holding device, with or without teeth that embed into the side of the tubular, which can create friction in order to suspend the tubular

3.9
interface
connection of the *elevator* (3.5) with the associated external infrastructure and vice versa

Note 1 to entry: The interface can be any transfer of signals or power by means of for example hydraulics, pneumatics, electrics or wireless.

3.10
internal control device
device located on the *elevator* (3.5) itself

Note 1 to entry: Internal control devices are parts of the *control system* (3.1), which detect input signals and/or generate output signals.

3.11
locking
ensuring that the securing is maintained

3.12
movement of the powered elevator
movement of parts of the *elevator* (3.5), excluding movements of the elevator (e.g. generated by the top drive)

3.13
pick up
lifting tubular from a non-vertical (typical near horizontal) position outside the drill floor area into a vertical position in the drill floor area

3.14
powered elevator
lifting accessories to be used for lifting and handling of tubular in the onshore and offshore drilling industry on or in the vicinity of the drill floor, of which the movement of the mechanics is done partly or completely mechanically using a *power source* (3.15)

3.15
power source
engine or motor which provides mechanical energy for linear or rotational movement

[SOURCE: ISO 11449:1994, 3.2]

3.16
primary feedback signal
signal generated by the elevator status that indicates the *elevator* (3.5) is set for safe lifting

3.17
product verification
evaluation of the implementation of the product against the requirements to determine that they have been met

[SOURCE: ISO 16404:2013, 3.3]

3.18
remote control device
device located at a distance from the *elevator* (3.5)

Note 1 to entry: Remote control devices are parts, which detect input signals and/or generate output signals.

3.19
safe lift
lifting of tubular in a safe way, without creating an unacceptable risk for equipment and personnel

Note 1 to entry: Safe lifts are ensured by maintaining sufficient contact between the *elevator* (3.5) and the tubular to be lifted, preventing inadvertent loss of contact and verifying that these conditions are fulfilled.

3.20
safe working load
maximum load that can be handled by the manual *elevator* (3.5) after subtracting the foreseeable dynamic load for the specific application from its rated load

3.21
secondary feedback signal
other signal than *primary feedback signal* (3.16) generated by the elevator status that indicates any other state than readiness for safe lifting (e.g. weight indication)

3.22
securing
fastening of the wrap-around of an *elevator* (3.5) around a tubular

EXAMPLE 1 To latch (completing a circle).

EXAMPLE 2 To set *slips* (3.26).

3.23
service life
expected lifetime, or acceptable period of use in service

Note 1 to entry: Service life is the length of time that the *elevator* (3.5) can be expected to be "serviceable" or to be supported by the manufacturer.

3.24
short ton
ston
unit of weight equal to $9{,}071\,847 \cdot 10^2$ kg

Note 1 to entry: 1 ton (US) = 1 ston = $9{,}071\,847 \cdot 10^2$ kg.

3.25
size component
replaceable component which is required in order to handle a specific size and/or type of tubular

3.26
slip
tapered or wedge-shaped *size component* (3.25) used to grip the tubular, and whose exterior is tapered to match the taper of the elevator frame

Note 1 to entry: A slip either has non-replaceable teeth or is fitted with *inserts* (3.8).

3.27
verification
<for safe manual elevator lift> assurance that the *elevator* (3.5) is in the required condition for the action to be performed, for any position or any allowable user situation for which the elevator is designed

3.28
wrapping
closing the elevator around the tubular in order to prepare the elevator for securing

4 Abbreviated terms

ESD emergency shutdown

HMI human machine interface

MSDS material safety data sheet

PL performance level

SWL safe working load

5 Safety requirements and/or protective/risk reduction measures

5.1 General requirements for powered elevators

The powered elevator shall comply with ISO 13535 and the additional requirements according to this document. The requirements of this document take precedence over those of ISO 13535.

The powered elevator shall be designed according to the principles of ISO 12100 for relevant but not significant hazards which are not dealt with by this document.

5.2 Mechanical strength

The mechanical strength of the powered elevator shall be in accordance with ISO 13535:2000, Clause 5.

Adequate mechanical design shall be verified by a static test in accordance with ISO 13535:2000 and Annex B.

5.3 Safety design of powered elevators

5.3.1 General

The powered elevator design and product verification shall be carried out in accordance with Annex B.

5.3.2 Ergonomic design

The powered elevator shall allow safe handling of the elevator during all stages of the transport, installation and operation process.

5.3.3 Fastening methods and DROPS prevention of parts

5.3.3.1 Primary-fixing

Primary fixing is the primary method by which an item is fixed to prevent unintentional dropping or falling, e.g. bolted connection/welds.

5.3.3.2 Securing against loosening (secondary retention)

Secondary retention is the method for securing a part from unintended loosening resulting in loss of clamping force and/or pre-tension and/or unscrewing and/or displacement and/or loss of any part.

All parts for which unintended loosening can create a hazard shall be fastened with a method preventing unintended loosening, e.g. by tab-washer, spring washer.

The reliability of the retention method shall be assessed in accordance with ISO 12100.

5.3.3.3 Securing against dropping (DROPS prevention)

Appropriate design measures shall be taken for all parts, which can become a hazardous dropped object in case of component failure.

The reliability of the securing method shall be assessed in accordance with ISO 12100.

The causes of failure taken into account shall include:

a) vibration;

b) improper maintenance;

c) corrosion;

d) shock loading;

e) collision.

The potential for dropped objects/falling objects shall be prevented by measures including but not limited to:

a) design;

b) speciality fasteners;

c) lanyards, cabling or safety wire;

d) guarding.

5.3.4 Suspension points

The powered elevator shall be designed so that it cannot inadvertently disconnect from its suspension points regardless of the angle of rotation relative to the suspension points.

When the powered elevator has secondary suspension points for suspending another elevator underneath, these suspension points shall be tested in accordance with B.2. The rating of each secondary suspension point, determined in accordance with ISO 13535, shall be marked at the suspension point sufficient to indicate the maximum load that can be applied.

5.3.5 Moving parts, pinch points and guards

The powered elevator shall be designed to provide safe operator contact with designated areas for operation. The provisions made shall include at least the following.

a) Dedicated areas for placing hands for operating the elevator shall be coloured green by means of paint, grip points or otherwise.

b) Handles shall be designed so that an operator cannot be injured by other parts of the elevator. If interference is unavoidable, adequate protective measures such as guards shall be provided.

c) When other measures are not practical, warnings shall be displayed near or on identified potentially hazardous pinch points.

Any hazardous areas reachable for a second operator not visible to the first operator, shall be protected as follows:

— minimum gaps provided to avoid crushing shall comply with the requirements given in ISO 13854;

— guards or parts providing the function of a guard shall comply with the requirements given in ISO 14120.

5.4 Other protective measures

5.4.1 Risks due to surfaces, edges or angles

Sharp edges, rough surfaces and sharp angles shall be avoided in areas where the operator can have contact with the powered elevator during normal operations, e.g. grips, handles.

5.4.2 Size and type verification (errors of fitting)

The powered elevator, slips and inserts shall be marked so that the user can easily verify their size, type or reference number sufficient to determine the correct combination of parts (e.g. by visual observation or reference to the instructions) for the intended use. See also Clause 9.

5.4.3 Static electricity

Taking into account that powered elevators are predominately made from steel suspended by steel parts, no bonding issues are considered in this document. However, the designer shall assess any requirement in accordance with ISO 80079-36 and ISO 80079-37.

5.4.4 Loss of stability

The powered elevator shall be designed so that it cannot overturn when stored at an angle of 10° in any direction.

5.4.5 Explosion prevention

The powered elevator shall be assessed in accordance with ISO 80079-36 and ISO 80079-37. If the elevator is not capable of igniting a potentially explosive atmosphere, it shall neither be classed nor be marked as such.

NOTE Sparks due to metal-to-metal contact during the tubular handling process can occur and cannot be avoided. Therefore, reliance on other protective measures, e.g. monitoring for the detection of explosive gas mixtures and shutdown systems, can be required.

5.4.6 Controls

If an output signal (e.g. electrical, pneumatic or hydraulic) is generated by the powered elevator, the elevator shall be assessed for explosion safety in accordance with 5.4.5.

5.4.7 Elevator coating

Because the powered elevator requires periodic inspection in accordance with ISO 13534, any protective coating shall allow inspection or shall be removable in order to make the required inspection possible.

The removal method shall not affect the integrity of the affected parts.

The type of coating shall be applied such that removal of the coating is only possible in a safe way.

The type of initial coating shall be determined by the manufacturer.

5.4.8 Noise

The powered elevator can make noise when opening or closing due to contact with parts, tubular, etc. However, the noise emitted by a powered elevator is not a relevant hazard.

NOTE Due to the noise emitted at the drill floor, the user of the elevator can be obligated by rig procedure to wear ear protection.

5.5 Specific risks for powered elevators

5.5.1 General

Specific risks for powered elevators shall be assessed according to ISO 12100 for the subjects including but not limited to:

a) external power source (5.5.2);

b) feedback signals (5.5.3);

c) controls (5.4.6);

d) danger zones (5.5.4).

5.5.2 External power source

The external power supply shall meet the requirements as per instructions (i.e. user manual) of the elevator.

It shall be possible to isolate the powered elevator from its power source (e.g. by valves or switches).

5.5.3 Feedback signals

5.5.3.1 Primary feedback signal

The powered elevator shall provide a primary feedback signal.

The primary feedback signal can be any audio, visual, electrical, hydraulic, air, combinations or any other signal as per ISO 13849-1, in order to indicate that the elevator is ready for safe lift.

The primary feedback signal shall be of a permanent nature (high) all the time as long as the status is valid. Loss of signal, indicating loss of safe lift status, shall also be of permanent nature (low). These settings allow real time monitoring.

The performance level of the primary feedback signal shall be assessed according to ISO 13849-1 and shall be PL-level d as a minimum and this level shall be documented in the instructions.

5.5.3.2 Secondary feedback signal

The performance level of the secondary feedback signal shall be assessed according to ISO 13849-1 and the resulting PL-level shall be documented in the instructions.

EXAMPLE A load cell is applied indicating the weight of the load. If the load is exceeding the rating, a signal can give feedback to the HMI, cancelling the lifting. Therefore, this signal is assessed according to ISO 13849-1.

Secondary feedback signals shall not indicate that the elevator is set for safe lifting.

5.5.4 Danger zone

The powered elevator shall be designed in such a way, that no direct personnel interference inside the rigs and tool red zone for operating the elevator is required.

The elevator red zone shall be defined in the instructions.

5.6 Stops for an assembly of machinery

5.6.1 General

For the powered elevator functioning in automatic mode, the starting of the elevator, restarting after a stop, or a change in operating conditions may be possible without intervention, provided this does not lead to a hazardous situation.

The movement of the powered elevator does not comprise movements generated by an external device (e.g. the top drive).

In case starting, stopping, normal or an operational stop function is part of the powered elevator design, the signals required for obtaining this signal shall be assessed according to ISO 13849-1.

The powered elevator shall be designed in such a way that the requirements in 5.6.2 to 5.6.5 can be met, even in cases where the controls are not part of the design.

5.6.2 Start of the movement

Starting of any movement of the powered elevator shall only be possible when a signal is given by the operator to the elevator, allowing it to start the sequence of movement and/or when the elevator is armed for such a movement by such a signal.

The actual start of the movement can be delayed, e.g. because the powered elevator has to detect the tubular first before the movement can start.

After a power failure, the powered elevator may resume the start of the movement as long as this does not create a dangerous situation.

A risk assessment shall be carried out to establish whether a dangerous situation is possible. If such a dangerous situation after a power failure is deemed possible, then mechanical, electrical, software or other features shall be added to avoid any unplanned and/or uncontrolled movements.

5.6.3 Normal stop

If applicable, the powered elevator shall be fitted with a control device whereby the machinery can be brought safely to a complete stop (if applicable after finalizing its cycle).

If applicable, each workstation shall be fitted with a control device to stop some or all the functions of the powered elevator.

The powered elevator stop control shall have priority over the start controls.

5.6.4 Operational stop

Where, for operational reasons, a stop control that does not cut off the energy supply to the actuators is required, the stop condition shall be monitored and maintained.

NOTE This also is applicable for the end of stroke and/or hard stop in function of “operational stop”.

5.6.5 Emergency shutdown

The emergency shutdown (ESD) shall be assessed according to ISO 13850.

ESD buttons are not allowed inside the elevator red zone.

An ESD is not mandatory for the powered elevator. The preferred elevator status is at all times fully open or ready for safe lift.

After an ESD is triggered, the powered elevator shall stop all movements as per normal and/or operational stop.

5.7 Failure of power supply

Any failure of the power supply and/or signals shall not lead to a dangerous situation.

The powered elevator shall not change its intended mode of operation, e.g. close when originally the command “open” was given.

In case a stop signal is given before a power failure occurs, the powered elevator shall stop all movements as per normal and/or operational stop, even when the power is restored.

Any possible failure of the powered elevator after a failure of the power supply and/or signal(s) shall be assessed according to ISO 12100.

5.8 Verification of safety requirements and/or protective/risk reduction measures

5.8.1 General

Conformance with the requirements of Clause 5 shall be verified in accordance with Annex B.

All foreseeable aspects of the powered elevator operation, including misuse foreseeable by the manufacturer, shall be given proper consideration at the design stage to ensure that the design and construction of the elevator itself do not create hazards during any step of the intended operational process. The manufacturer shall establish these aspects in the limits of the design.

5.8.2 Service life

The manufacturer shall establish the service life of the powered elevator during the design process and verify this by performing a life cycle test in accordance with B.1.2.

For establishing service life, historically proven designs or field data can also be used. This type of data shall provide information on the design over a period of at least five years.

5.8.3 Fatigue life

Fatigue life should be determined in accordance with ISO 13535.

An estimation of the number of cycles possible under certain environmental conditions within the time period of 20 years shall be carried out in accordance with ISO 13535.

5.8.4 Maintenance

The powered elevator shall be designed in such a way that maintenance and cleaning during use can be carried out in a safe manner.

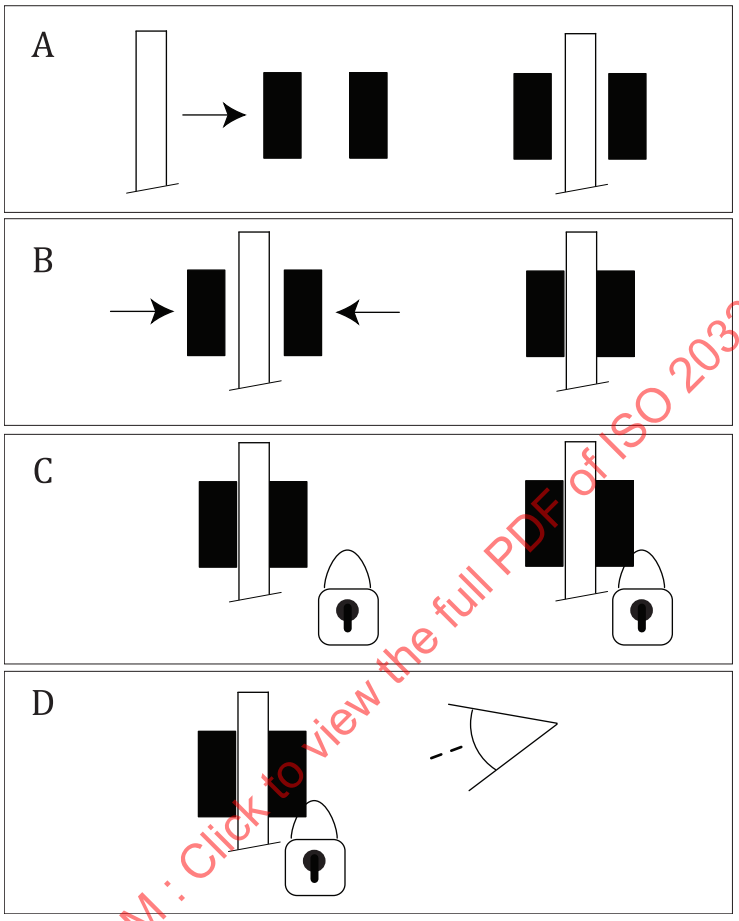
6 Functions for preparing the elevator for a safe lift — Wrapping, securing, locking and verification

6.1 General

The powered elevator shall have a mechanism to prepare the elevator for safe lifting. It shall not be possible to open or affect the integrity of this mechanism unintentionally, e.g. by external impacts, hoses, ropes or forces generated by the tubular.

6.2 Black box approach

While it is not possible to describe all possible designs for creating a state for safe lift, procedures for all powered elevators include the four steps of wrapping, securing, locking and verification of readiness for safe lift as a part of the function of the elevator. These steps are shown schematically in Figure 1.



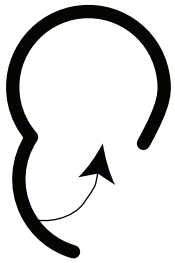
Key

A wrapping
B securing
C locking
D verification

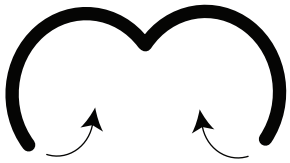
Figure 1 — Schematic of steps in black box approach to closing of powered elevators

6.3 Wrapping

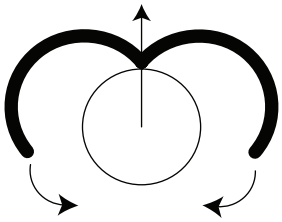
The powered elevator is closed by wrapping around the tubular. Figure 2 shows examples of wrapping with various types of elevators.



a) Moving the door to complete the wrap-around



b) Moving body halves to complete the wrap-around



c) Moving elevator by tubular relative to elevator movement, completing the wrap-around

d) Closing jaws to complete the wrap-around

Figure 2 — Examples of wrapping

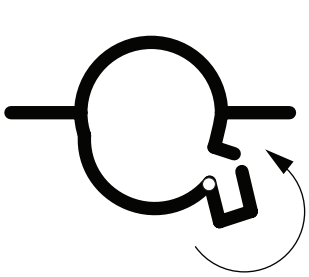
6.4 Securing

Once the powered elevator is in its wrapped position, the elevator shall be secured in order to prevent the tubular from slipping out of the elevator during any stage of the process, e.g. during pick up, lifting, lowering and stabbing.

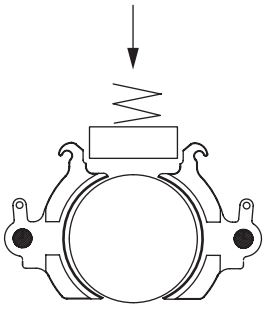
The securing element(s) shall, if applicable, follow a “self-securing” principle, i.e. the angle of contact surfaces shall be such that any loads forcing the securing mechanism in the opening direction force the securing elements in their securing position.

The securing mechanism shall be able to withstand any opening forces foreseeable by the manufacturer. The securing mechanism shall withstand wear within the specified service life and in accordance with inspections and maintenance specified in the manufacturer's instruction handbook without losing its function.

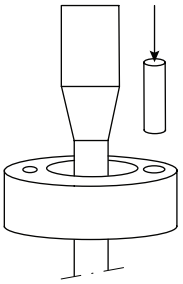
Figure 3 shows examples of securing by various types of action.



a) Securing by a mechanical action between the closing movement(s) of the elevator door(s)/body halve(s) and the securing mechanism



b) Securing by a mechanical action between the closing movement(s) of the suspension elements relative to the tubular and the securing mechanism



c) Securing by movement of the closing (hinge) pin relative to the lugs

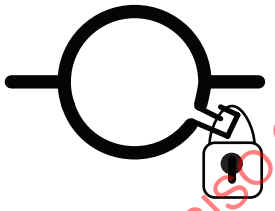
Figure 3 — Examples of securing

6.5 Locking

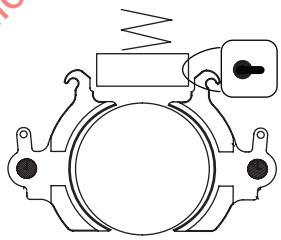
Once secured after wrapping, the securing mechanism of the powered elevator shall be lockable in this position. Reversing the locked state of the elevator shall only be possible by an intentional action.

The lock shall be protected from any forces that could unintentionally open the locking mechanism in a secure state. The lock shall withstand wear within the specified service life and in accordance with inspections and maintenance specified in the manufacturer's instruction handbook without losing its function.

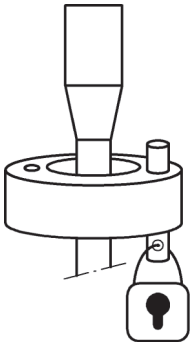
Figure 4 shows examples of locking of various securing mechanisms.



a) Locking the securing element (latch)



b) Locking the securing element (block)



c) Locking the securing element (pin)

Figure 4 — Examples of locking

6.6 Verification of readiness for safe lift

A device shall be provided in order to ensure verification that the powered elevator is prepared for a safe lift. The device shall be designed in such a way that this condition can be verified for any allowable user situation.

It shall not be possible to obtain a positive verification when the elevator is not correctly prepared for safe lift. The verification shall be clear and unambiguous.

The actions for wrapping, securing and locking may be combined, for example by hydraulic actuators performing these functions.

7 Closed-ring powered elevator

7.1 Wrapping

Figure 5 illustrates the wrapping of the closed-ring powered elevator by inserting the tubular in the axial direction into the elevator.

Sufficient tubular contact for a safe lift shall be generated once the closing mechanism is operated.

Tubular contact can be accomplished by use of gravity, springs or any other mechanism, or by the operator manipulating the closing mechanism.

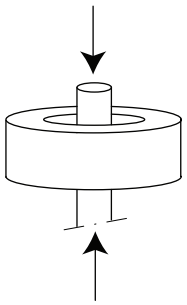


Figure 5 — Wrapping of closed-ring powered elevator around tubular

7.2 Securing and locking

Securing and locking are next carried out to ensure that tubular contact is accomplished and maintained.

In order to maintain the safe lift setting, the powered elevator shall be designed in such a way that the mechanism in the closed position cannot open in case the tubular is forced upward. However, the mechanism may move upwards enough to allow the tubular to slide in the elevator to prevent damage to the closing mechanism.

Tubular contact shall be restored without manual interference once the tubular is moving in a downward direction.

7.3 Verification

Verification for closed-ring powered elevators is carried out in the same manner as for other powered elevators. See 6.6.

8 Instructions for use

8.1 General

Information for use shall be in accordance with this clause and ISO 13535:2000, Clause 11.

8.2 Instruction handbook

An instruction handbook shall be supplied with the powered elevator. The instructions handbook shall be in accordance with ISO 13535:2000, 11.3 and shall as a minimum contain the following information:

a) brief description of the elevator;

b) limits of the design including:

1) rated load; for vertical and/or non-vertical lift (as applicable);

WARNING — While adjusting the rated load by subtracting additional dynamic loading identified on site to establish a safe working load (SWL) for specific operations is an established industry practice. This has not been taken into account in the requirements for the determination of the rated load of the elevator. If carried out, this practice is the sole responsibility of the operator of the rig and would require a suitably trained and competent operator. Working without a functioning hook load monitoring system could lead to failure of the equipment.

2) intended use;

3) characteristics of the size/type of elevator;

4) characteristics of the tubular which can be handled by the elevator, including type and size;

5) the range of temperatures within which the elevator can safely be operated;

6) specific training of operators, if necessary;

7) any restriction for operation in special atmospheres (e.g. high humidity, explosive, saline, acid, alkaline);

8) warnings against reasonably foreseeable misuse (e.g. pick up); in case it is physically impossible to prevent misuse, information shall be given to inform user about the hazards associated with this misuse;

c) instructions for installation;

d) instructions for operation and use, including the correlation between involved operators (in generic terms);

e) instructions (if applicable) for safe rotation of the elevator, either manually or using a rotating device;

f) interface requirements for the elevator links and their suspensions;

g) instructions for handling and storage;

h) instructions for stability (where applicable);

i) instructions for periodic maintenance, including acceptance criteria for wear and tear and also a list of parts requiring particular operation, checking or replacement (e.g. not to re-use cotter pins);

j) instructions for safely carrying out work; including for example the definition of space required for safe repair, maintenance, storage and operation activities, taken into account hazards arising during these activities e.g. ejecting springs (see Figure 6);

k) instructions for functional testing;

l) use of original (OEM) spare parts;

m) instructions for load testing after re-manufacture;

n) material safety data sheet (MSDS) information;

o) reference to ISO 13534 regarding the inspection intervals and type of inspection;

p) detailed methods by which interchangeable size components can safely be installed and removed;

q) the following WARNINGS with regard to the following issues:

1) impact due to the elevator engaging the coupling of the tubular;

2) verification of the elevator securing and locking mechanism shall be possible at all times, for example:

   i) if the mechanism is covered with mud, it shall be cleaned,

   ii) in darkness, sufficient lighting shall be present, and

   iii) in harsh weather conditions, measures shall be taken to allow correct verification.

3) colour codings for tubular size and type shall not be used;

   EXAMPLE 4 ½" DP, IU, IEU and EU tubulars are the same size but cannot be interchangeable.

4) the elevator operator shall carry out a "health and safety risk assessment in the workplace";

5) the elevator shall only be used by qualified and authorized personnel;

6) (for closed-ring powered elevators only) there can be a risk for tubular to slide through the elevator, e.g. when the tubular load is low relative to the bite action of the inserts;

7) any maintenance to the elevator shall be carried out off the well centre unless it can be performed in a safe manner;

r) recommendations shall be given about foreseeable emergency situations:

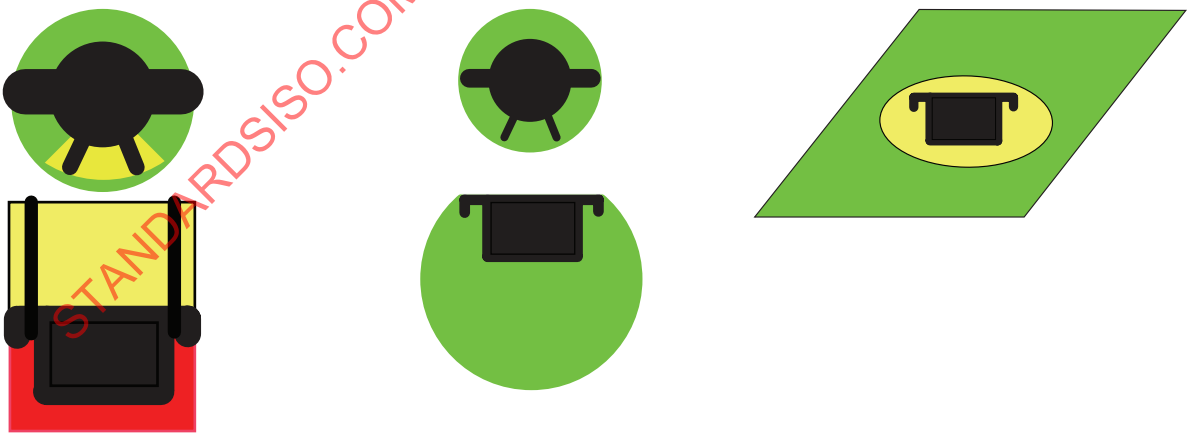
   1) how to remove the elevator from the tubular when the elevator is stuck on the tubular;

   2) how to remove the elevator from the tubular when the tubular is stuck in the slips;

   3) the limitations of the elevator and the possible resulting hazardous situation which may occur when applying such measures; the necessary assessment of the emergency situation and the possible hazards resulting from solving the emergency situation shall be made by the operator;

s) a statement as follows: "the A-weighted emission sound pressure level at the operator's ears is less than 70 dB(A)".

NOTE See also 5.4.8.



a) Operation **b) Storage and transport** **c) Maintenance and installation**

Key

green zone	safe
yellow zone	unsafe but accessible when needed
red zone	unsafe at all times

Figure 6 — Examples of space required for safe repair, maintenance, storage and operation (working)

9 Marking of powered elevators

Marking of the powered elevator shall be in accordance with this clause and ISO 13535:2000, Clause 10.

The powered elevator shall be marked visibly, legibly and indelibly with the following minimum information:

a) the business name and full address of the manufacturer and, where applicable, his authorized representative or, when space is limited, at least the business logo or URL;

b) designation of the machinery;

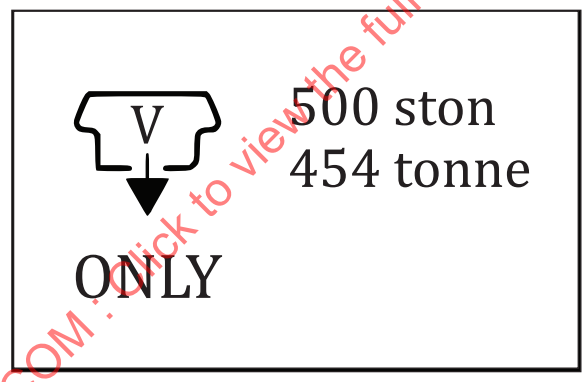
c) designation of series or type;

d) serial number, if any;

e) the year of construction, i.e. the year in which the manufacturing process is completed (it is prohibited to pre-date or post-date the elevator);

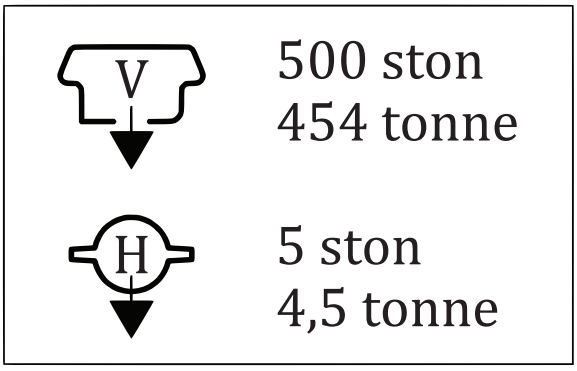
f) rated load;

The rated load shall be marked for lifting the load in vertical and/or non-vertical positions, using the symbols shown in Figures 7 and 8 for the applicable type(s) of lift. The rated load shall be shown in units of both metric tonnes and short tons, and/or their abbreviations. It is allowed but not mandatory also to use units of kilonewtons (kN).



NOTE In this case, the rated load is 500 ston (454 tonne).

Figure 7 — Rated load symbol for "vertical lifting" only



NOTE In this case, rated loads of 500 ston (454 tonne) for "vertical lifting" and 5 ston (4,5 tonne) for "non-vertical lifting".

Figure 8 — Rated load symbols for "vertical lifting" and "non-vertical lifting"

g) mass, if applicable.

Where the powered elevator or elevator part to be handled during use with lifting equipment has a mass >25 kg, the mass shall be indicated.

Elevators classed for use in a potentially explosive atmosphere shall be marked.

The powered elevator and size components shall be marked allowing the user to verify that the elevator is fitted with or without the correct size component (e.g. bushings, slips or inserts) for lifting of the intended tubular size/type(s).

The powered elevator shall carry full information essential for safe use, relevant to elevator type.

Non-hard marking, i.e. electronically by chips or bar codes, is permitted only in addition to rather than as an alternative to other readily visible methods of marking.

Minimum dimensions of characters used for marking shall be in accordance with ISO 13535. When the powered elevator or elevator part does not permit marking with these dimensions, the maximum practicable size shall be used.

Safety colours and safety signs of elevators shall be in accordance with ISO 3864.

Annex A
(informative)

Relation between the clauses of European Directive on machinery (Directive 2006/42/EC) and this document

Table A.1 — Powered elevators — Relation between the clauses of European Directive on machinery (Directive 2006/42/EC) and this document

Machinery directive clause	Description	Relevant clause of this document
1.1		
1.1.1	Definitions	Clause 3
1.1.2	Principals of safety integration	5.1, 5.5.1
1.1.3	Materials and products	5.2, 5.4.7
1.1.4	Lighting	n/a
1.1.5	Design of machinery to facilitate its handling	5.3.2, Clause 9
1.1.6	Ergonomics	5.3.2
1.1.7	Operating positions	n/a
1.1.8	Seating	n/a
1.2	Control systems	5.4.6
1.2.1	Safety and reliability of control systems	5.5.1, 5.5.2
1.2.2	Control devices	3.10, 3.18
1.2.3	Starting	5.6.2
1.2.4	Stopping	5.6.3
1.2.4.1	Normal stop	5.6.3
1.2.4.2	Operational stop	5.6.4
1.2.4.3	Emergency stop	5.6.5
1.2.4.4	Assembly of machinery	n/a
1.2.5	Selection of control or operating modes	n/a
1.2.6	Failure of the power supply	5.8
1.3	Protection against mechanical hazards	
1.3.1	Risk of loss of stability	5.4.4, Clause 9
1.3.2	Risk of break-up during operation	5.2
1.3.3	Risks due to falling objects or ejected objects	5.3
1.3.4	Risks due to surfaces, edges, or angles	5.4
1.3.5	Risks related to combined machinery	n/a
1.3.6	Risks related to variations in operating conditions	n/a
1.3.7	Risks related to moving parts	n/a
1.3.8	Choice of protection against moving parts	n/a
1.3.8.1	Moving transmission parts	n/a
1.3.8.2	Moving parts involved in the process	n/a
1.3.9	Risks of uncontrolled movements	n/a
n/a = Not applicable.		