INTERNATIONAL STANDARD

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Personal fall-arrest systems —

Part 3: **Self-retracting lifelines**

Systèmes individuels d'arrêt de chute —

Partie 3: Cordes d'assurance autorétractantes

Reference number
ISO 10333-3:2000(E)

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Foreword

ISO (the International Organization for Standardization) is a worldwide federation of national standards bodies (ISO member bodies). The work of preparing International Standards is normally carried out through ISO technical committees. Each member body interested in a subject for which a technical committee has been established has the right to be represented on that committee. International organizations, governmental and non-governmental, in liaison with ISO, also take part in the work. ISO collaborates closely with the International Electrotechnical Commission (IEC) on all matters of electrotechnical standardization.

International Standards are drafted in accordance with the rules given in the ISO/IEC Directives, Part 3.

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 part of ISO 10333 may be the subject of patent rights. ISO shall not be held responsible for identifying any or all such patent rights.

International Standard ISO 10333-3 was prepared by Technical Committee ISO/TC 94, *Personal safety — Protective clothing and equipment*, Subcommittee SC 4, *Personal equipment for protection against falls*.

ISO 10333 consists of the following parts, under the general title *Personal fall-arrest systems*:

— *Part 1: Full-body harnesses*

— *Part 2: Lanyards and energy absorbers*

— *Part 3: Self-retracting lifelines*

— *Part 4: Vertical rails and vertical lifelines which incorporate a sliding-type fall arrester*

— *Part 5: Connectors*

The system performance tests will be the subject of a future part 6 to ISO 10333.

Introduction

In cases where the hazard of falling from a height exists and where, for technical reasons or for work of very short duration, safe access cannot be otherwise provided, it is necessary to consider the use of personal fall-arrest systems (PFAS). Such use should never be improvised and its adoption should be specifically provided for in the appropriate formal provisions for safety in the work place.

PFAS complying with this part of ISO 10333 should satisfy ergonomic requirements and should only be used if the work allows means of connection to a suitable anchor device of demonstrated strength and if it can be implemented without compromising the safety of the user. Personnel should be trained and instructed in the safe use of the equipment and be observant of such training and instruction.

This part of ISO 10333 is based on current knowledge and practice concerning the use of PFAS that incorporate a full-body harness as specified in ISO 10333-1.

This part of ISO 10333 presumes that the manufacturer of the PFAS, subsystems or components will, for the sake of consistency and traceability, operate a quality management system which will comply with national and regional regulations in force at the time. Guidance on the form this quality management system may take can be found in ISO 9000 (all parts), *Quality management and quality assurance standards*.

Personal fall-arrest systems —

Part 3:
Self-retracting lifelines

1 Scope

This part of 10333 specifies requirements, test methods, instructions for use and maintenance, marking, labelling and packaging, as appropriate, for self-retracting lifelines, including self-retracting lifelines that have an integral-rescue facility.

Self-retracting lifelines are used as a connecting sub-system in personal fall-arrest systems (PFAS), which will be specified in a future International Standard (see ISO 10333-6 in the Bibliography), and are attached to anchor devices that are above the work place.

This part of 10333 is applicable only to self-retracting lifelines limited to single-person use of a total mass not exceeding 100 kg.

NOTE Users of PFAS whose total mass (which includes attached tools and equipment) exceeds 100 kg are advised to seek advice from the equipment manufacturers regarding the suitability of the equipment, which may need additional testing to take into account the larger mass.

This part of 10333 does not specify those additional requirements that would apply when self-retracting lifelines are subjected to special conditions of use (where, for example, there exist unusual limitations concerning access to the place of work and/or particular environmental factors). Thus treatments to ensure the durability of the materials of construction (such as heat treatment, anti-corrosion treatment, protection against physical and chemical hazards) are not specified in this part of 10333, but should comply with appropriate International Standards or, failing that, with national standards and other specifications dealing with relevant physical characteristics and/or the safety of users.

2 Normative references

The following normative documents contain provisions which, through reference in this text, constitute provisions of this part of ISO 10333. For dated references, subsequent amendments to, or revisions of, any of these publications do not apply. However, parties to agreements based on this part of ISO 10333 are encouraged to investigate the possibility of applying the most recent editions of the normative documents indicated below. For undated references, the latest edition of the normative document referred to applies. Members of ISO and IEC maintain registers of currently valid International Standards.

ISO 1140:1990, *Ropes — Polyamide — Specification*.

ISO 1141:1990, *Ropes — Polyester — Specification*.

ISO 1834:1999, *Short link chain for lifting purposes — General conditions of acceptance*.

ISO 1835:1980, *Short link chain for lifting purposes — Grade M (4), non-calibrated, for chain slings etc*.

ISO 2307:1990, *Ropes — Determination of certain physical and mechanical properties*.

ISO 3108:1974, *Steel wire ropes for general purposes — Determination of actual breaking load*.

ISO 4878:1981, *Textiles — Flat woven webbing slings made of man-made fibre*.

ISO 9227:1990, *Corrosion tests in artificial atmospheres — Salt spray tests.*

ISO 10333-1:—[1]), *Personal fall-arrest systems — Part 1: Full-body harnesses.*

ISO 10333-5, *Personal fall-arrest systems — Part 5: Connectors*.

ISO 14567:1999, *Personal protective equipment for protection against falls from a height — Single-point anchor devices*.

EN 892:1996, *Mountaineering equipment — Dynamic mountaineering ropes — Safety requirements and test methods.*

EN 1891:1998, *Personal protective equipment for prevention of falls from a height — Low stretch kernmantel ropes.*

3 Terms and definitions

For the purposes of this part of ISO 10333, the following terms and definitions apply.

3.1 Self-retracting lifeline

3.1.1
self-retracting lifeline
SRL
connecting subsystem which is anchored above the work place, incorporating a tensioned lifeline, which is extracted and automatically retracted in response to the normal movements of a worker, and a braking means which automatically locks and holds the lifeline in response to the sudden motion of a fall, in a similar fashion to the operation of a motor car inertia reel seat belt

See Figure 1.

3.1.2
integral-rescue facility
mechanism which is completely integral to the SRL and cannot be removed without dismantling the SRL

NOTE It can be used by a rescuer to recover a worker who, being connected to the SRL, is in post fall-arrest suspension, or has become incapacitated. This may involve the rescuer raising or lowering the worker as appropriate.

3.1.3
energy absorbers integral to the lifeline
component designed to dissipate the kinetic energy generated during a fall, which limits the arresting forces applied to the SRL, anchor device and faller, the mechanism of which is completely integral to the lifeline and cannot be removed without mutilating the product

3.1.4
fall indicator
mechanism which gives visual confirmation to a user whether or not the self-retracting lifeline has been subjected to a fall arrest

3.1.5
maximum working length
maximum length of extracted lifeline available, when measured from the lifeline connector to the self-retracting lifeline housing anchor attachment point

See Figure 2.

1) To be published.

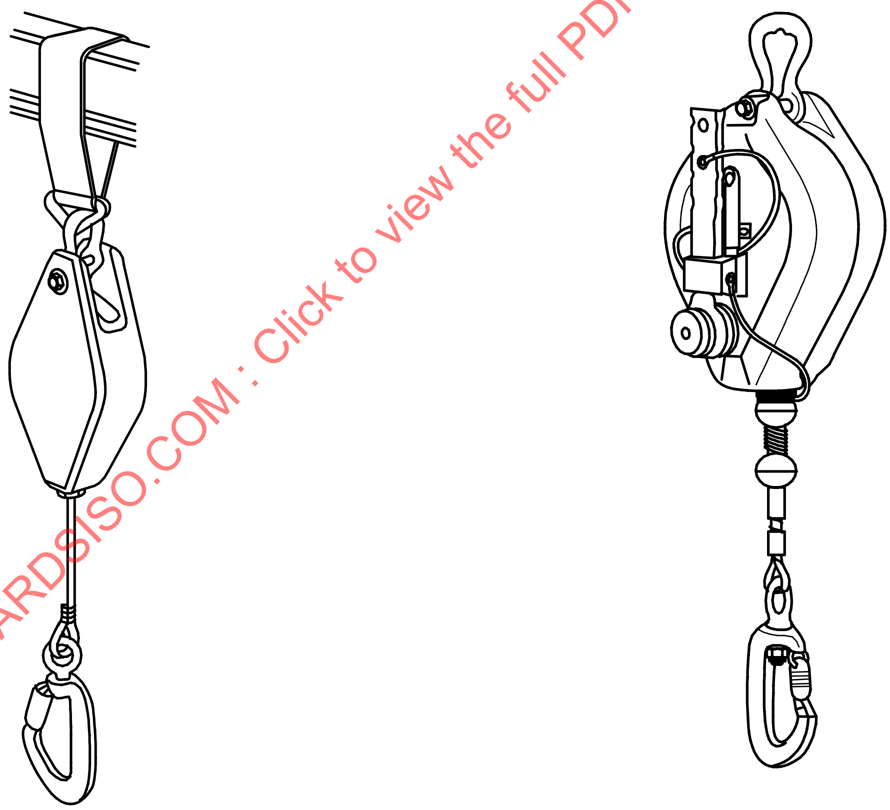
3.1.6
swivel connector
connector in accordance with ISO 10333-5, with a swivel facility to allow the connector to rotate about its major axis

3.1.7
post fall-arrest suspension
state in which, after having been brought to a complete stop by a fall-arresting means, the faller remains suspended in the full-body harness

3.1.8
total mass
total sum of the worker’s mass plus all attached clothing and equipment

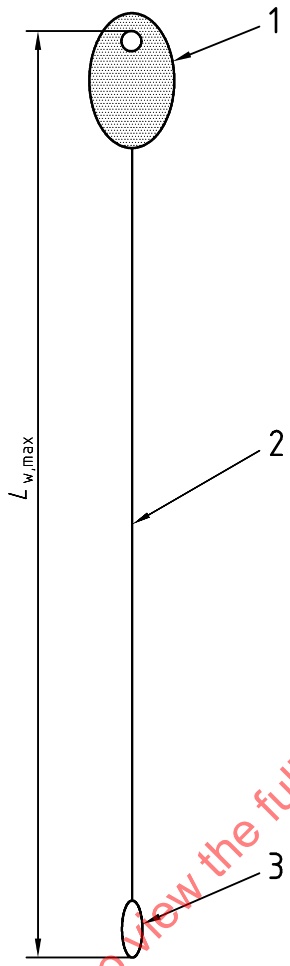
3.1.9
minimum locking test mass
smallest mass, which when attached to the external termination of a fully retracted SRL and then released, will cause the internal locking mechanism of the SRL to engage and to stay engaged

3.1.10
displacement “*H*”
during the dynamic performance test, the total fall distance of the 100 kg test mass, measured from the attachment point of the mass at its pre-release position to its post-arrest equilibrium position



a) SRL without integral-rescue facility **b) SRL with integral-rescue facility**

Figure 1 — Examples of self-retracting lifelines



$L_{w,max}$ = maximum working length

Key

1 Housing anchor attachment point
2 Lifeline (fully extracted)
3 Lifeline connector

Figure 2 — Self-retracting lifeline

3.2 General terms and definitions

3.2.1
personal fall-arrest system
PFAS
assembly of interconnected components and subsystems, including a full-body harness worn by the user, that when connected to a suitable anchor device will arrest a fall from a height

NOTE A PFAS minimizes the fall-arrest forces, controls the total fall distance as to prevent collision with the ground or other relevant obstruction, and maintains the faller in a suitable post-fall-arrest attitude for rescue purposes.

3.2.2
component
constituent part of a PFAS or subsystem that has completed the manufacturer's production cycle and is available for purchase

3.2.3
subsystem
constituent part of a PFAS which may consist of one or more components, and is used to connect the user from the fall-arrest attachment element of the full-body harness to the anchor device and performs the two essential functions of a PFAS as follows:

a) connecting;

b) arresting and energy absorbing

4 Requirements

4.1 General

To ensure that components assembled into a PFAS perform correctly it is recommended that they be tested in accordance with ISO 10333-6.[1]

4.2 Lifeline

4.2.1 Fibre ropes and webbing

4.2.1.1 Fibre ropes, webbing and sewing threads for lifelines shall be made from virgin high-tenacity filament or multi-filament synthetic fibre or fibres suitable for the intended use.

4.2.1.2 The number of strands of a laid lifeline shall be at least three. Three-strand polyamide lifelines shall comply with ISO 1140 and three-strand polyester lifelines shall comply with ISO 1141.

4.2.1.3 Lifelines constructed from braided rope shall comply with EN 892 (single rope) or EN 1891, type A. Any equivalent material is acceptable.

4.2.1.4 Where lifelines are specified for, or when it is known that lifelines will be used in work carried out near welding or oxy-cutting stations, or heat sources, they shall be protected by suitable heat-protective means.

4.2.1.5 The minimum breaking force of fibre rope or webbing material used in the construction of lifelines shall be 22 kN.

4.2.2 Wire ropes

The minimum diameter of wire rope material used in the construction of lifelines shall be 5 mm with a minimum breaking force of 15 kN.

4.2.3 Terminations

4.2.3.1 The end of the lifeline which is intended for connection to the user's full-body harness shall be terminated with a swivel connector which complies with ISO 10333-5.

4.2.3.2 Eye splices in laid fibre rope shall consist of four tucks using all the yarns in the strands and two tapered tucks. The length of the splicing tails emerging after the last tuck shall be at least one rope diameter. Tails shall be whipped to the rope and protected with a rubber or plastic sleeve, or otherwise integrally finished to prevent the termination or splice from unravelling. Sealing compounds used shall be compatible with the rope material. Eyes shall be formed around a plastic or metal thimble of size and strength in accordance with rope manufacturer's recommendations.

4.2.3.3 Stitched eye terminations on webbing lifelines shall be sewn using lock stitching. Thread shall be compatible with the webbing material and shall be a contrasting colour to facilitate inspection. Reinforcement or another method shall be used to protect terminations from concentrated wear at all webbing-to-metal fitting interfaces. Webbing ends shall be seared or otherwise prevented from unravelling.

4.2.3.4 Eye terminations of wire rope lifelines shall be manufactured either with

a) a spliced eye with one compression swage with thimble, or

b) a return eye with a minimum of two compression swages with thimble.

4.2.3.5 Selection of swage fitting, size, material type, compression die size/pressure, position of swage(s) on rope, and thimble size, shall be carried out in accordance with the rope manufacturer's recommendations. In particular, aluminium swages are recommended for steel wire ropes and copper swages for stainless-steel wire ropes.

4.2.3.6 Wire rope ends shall be brazed, whipped or have an equivalent finish to prevent unravelling. Brazing should be carried out prior to forming the eye.

4.2.3.7 Knots shall not be used to form lifeline terminations.

4.2.3.8 The internal termination of the lifeline to the lifeline drum or other shall be such that:

a) the lifeline cannot be separated from the drum in normal use, especially when the lifeline is at the maximum working length;

b) the connection between the lifeline drum or other can withstand the tensile strength requirements specified in 4.3.8.

4.2.4 Energy absorbers integral to the lifeline

Lifelines may be so constructed as to include an integral energy absorber as the sole means of kinetic (fall) energy dissipation in the SRL, which remains external to the SRL when the lifeline is fully retracted. Such materials and mechanisms where utilized in the SRL design shall be protected from external contaminants, sharp objects and adverse climate by the fitting of a protective cover.

4.3 Design

4.3.1 General

4.3.1.1 The design of working parts, their location and the protection afforded to them shall be such as to prevent the possibility of performance being impaired by casual interference.

4.3.1.2 The SRL design shall be smoothly finished and free from defects due to faulty material and manufacture; there shall be no sharp or rough edges that may cut, abrade or otherwise damage the lifeline material or cause injury to the user.

4.3.1.3 The SRL shall incorporate an automatic locking feature which is capable of preventing further accelerated lifeline extraction during a fall by engaging some means of braking device. The design shall be such so that it shall not be possible to override the automatic locking feature when in use.

4.3.1.4 The SRL shall have a suitable means of attachment on the upper portion of the SRL housing for connection to the intended anchor device.

4.3.1.5 The SRL shall have a suitable means of retraction incorporated to ensure the full unassisted and automatic retraction of the lifeline with the mass of the lifeline being solely supported by the SRL housing.

4.3.1.6 The surfaces in contact with the lifeline, at the position where the lifeline exits the SRL housing, shall be radiused and free from sharp edges likely to cause undue lifeline wear.

4.3.2 Corrosion resistance

4.3.2.1 When tested in accordance with 6.1, all metal materials shall be free from red rust, as visible to the unaided eye, or other evidence of corrosion of the base metal. Post-test presence of white scale or tarnishing is acceptable.

4.3.2.2 When the SRL is dismantled, the internal parts, in particular the automatic locking mechanism, shall not show signs of corrosion that can affect the functioning of the SRL.

4.3.3 Locking performance after conditioning

4.3.3.1 The SRL shall be heat-conditioned in accordance with 6.2.3, after which it shall lock without subsequent slippage, and shall be capable of being unlocked when tested in accordance with 6.2.8.

4.3.3.2 The SRL shall be cold-conditioned in accordance with 6.2.4, after which it shall lock without subsequent slippage, and shall be capable of being unlocked when tested in accordance with 6.2.8.

4.3.3.3 The SRL shall be wet-spray-conditioned in accordance with 6.2.5, after which it shall lock without subsequent slippage, and shall be capable of being unlocked when tested in accordance with 6.2.8.

4.3.3.4 The SRL shall be dust-conditioned in accordance with 6.2.6, after which it shall lock without subsequent slippage, and shall be capable of being unlocked when tested in accordance with 6.2.8.

4.3.3.5 The SRL shall be oil-conditioned in accordance with 6.2.7, after which it shall lock without subsequent slippage, and shall be capable of being unlocked when tested in accordance with 6.2.8.

4.3.4 Locking reliability

When tested in accordance with 6.3, the SRL shall lock without subsequent slippage in each of 1 000 operations.

4.3.5 Retraction capability

When tested in accordance with 6.4, the SRL shall be capable of retracting the full length and mass of the lifeline without sticking or jamming in each of 25 operations.

4.3.6 Dynamic performance with the lifeline at full extraction

4.3.6.1 When tested in accordance with 6.5, the SRL shall lock and limit the arrest force to a maximum of 6,0 kN. During the test, the SRL shall function correctly prior to its locking. The SRL shall retain the test mass clear of the ground, and, with the exception of energy dissipating devices, without fracturing or rupture of any element in the load-bearing path.

NOTE The purpose of this requirement is to assess if the SRL can maintain a safe-arrest performance at full extraction.

4.3.6.2 If the SRL has a fall-indicating device, it shall operate in accordance with the manufacturer's technical data.

4.3.7 Dynamic performance

4.3.7.1 When tested in accordance with 6.6, the SRL shall lock and limit the arrest force to a maximum of 6,0 kN. The displacement H shall not exceed 2,0 m. During the test, the SRL shall function correctly prior to its locking. The SRL shall retain the test mass clear of the ground, and, with the exception of energy-dissipating devices, without fracturing or rupture of any element in the load-bearing path.

4.3.7.2 If the SRL has a fall-indicating device, it shall operate in accordance with the manufacturer's technical data.

4.3.8 Static strength

When tested in accordance with 6.7 the SRL shall sustain a force as specified in Table 1 and, with the exception of energy dissipating devices, without tearing or rupture of any external or internal element.

Table 1 — Force requirements for static strength

Component	Maximum force kN
SRL with webbing-based lifeline	15
SRL with fibre-rope-based lifeline	15
SRL with wire-rope-based lifeline	12
NOTE The higher strength requirement for textile materials is necessary as these materials are more prone to wear and are more vulnerable to damage than their metallic counterparts.	

4.3.9 SRL-tripod installations

Where according to the manufacturer's claims and information a SRL is permitted for use with a tripod, the SRL shall meet the requirements as specified for SRL-tripod combinations in ISO 14567.

4.4 Integral-rescue-facility design

4.4.1 General

4.4.1.1 The requirements of 4.4 apply to SRLs that have an integral-rescue feature.

4.4.1.2 SRLs with an integral-rescue facility shall meet the requirements specified in 4.2 and 4.3. An integral-rescue facility can be so designed as to permit lifting only, or both lifting and lowering.

4.4.1.3 SRLs with an integral-rescue facility shall have a controlling means, which when so engaged will permit the lifting or lifting and lowering of a worker connected to the lifeline, by a second independent person. When disengaged, the controlling means shall not interfere with the extraction, retraction, locking and arrest functioning of the SRL.

4.4.2 Engagement of rescue facility

4.4.2.1 The design, arrangement and stowage of the controlling means shall be such as to prevent the possibility of inadvertent engagement of the rescue facility.

4.4.2.2 When operated in accordance with manufacturers' instructions, the time required to engage the rescue facility shall not exceed 20 s.

4.4.3 Lifting and lowering

When tested in accordance with 6.8 the lifting, or when tested in accordance with 6.9 the lifting and lowering of the test masses shall be possible without lifeline restriction, slippage and inadvertent disengagement of the rescue facility. When the controlling means is released, the test mass shall come to a halt immediately and within a stopping distance of 50 mm.

4.4.4 Static strength (rescue facility engaged)

When tested in accordance with 6.10 the SRL shall sustain a force as described in Table 1 without tearing or rupture of any external or internal element. The test force shall be sustained for at least 5 min.

NOTE This requirement is based on the scope of this part of ISO 10333 which specifies single person use of a total mass not exceeding 100 kg.

5 Apparatus

5.1 Test structure, comprising a rigid anchor structure so constructed that its natural frequency of vibration in the vertical axis at the anchor point is not less than 100 Hz and so that the application of a force of 20 kN on the anchor point does not cause a deflection greater than 1 mm.

The rigid anchor point should be a ring of (20 ± 1) mm bore and (15 ± 1) mm diameter cross-section, or a rod of the same diameter cross-section.

The rigid anchor point shall be at such a height to prevent the test mass from striking the floor during dynamic testing.

5.2 Static-strength test apparatus, comprising a test frame, winch or hydraulic puller and indicator, with sufficient traverse to load the components for test.

5.3 Quick-release device, compatible with the eyebolt of the test mass or connectors, which ensures the release of the test mass without initial velocity.

5.4 Force-measuring instrumentation, capable of measuring forces from 1,2 kN to 20 kN with an accuracy of ± 2 % and of withstanding a force of 50 kN without damage, and arranged so that measurements are carried out with a continuously active band up to 100 Hz but with a minimum sampling rate of 1 000 Hz.

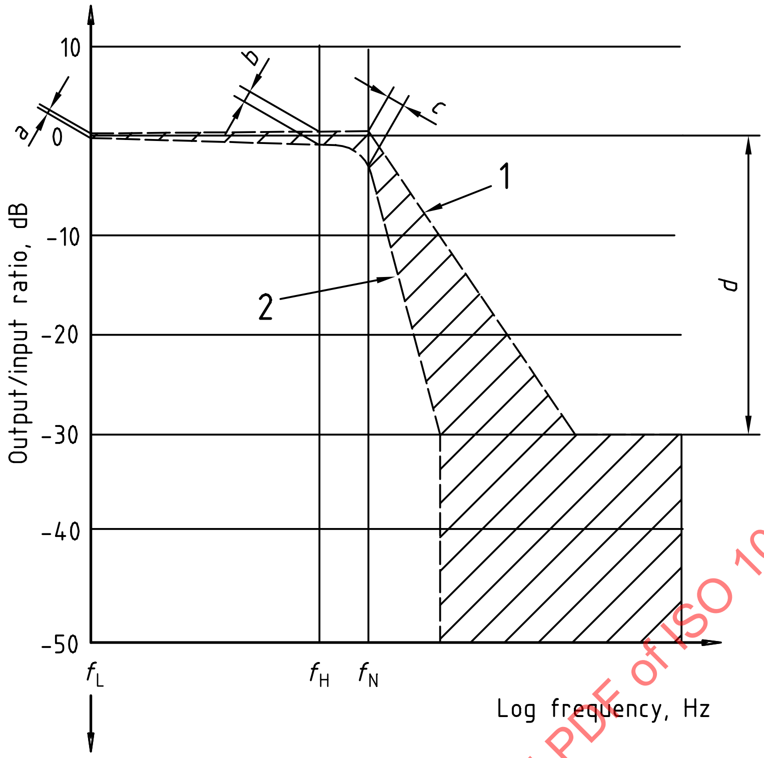
The arrest force measurement system shall have a corner frequency of 100 Hz and frequency response characteristics which fall within the shaded area illustrated in Figure 3.

The arrest force measurement system shall have a recorder to obtain the time trace of the force, either at the actual time (when recording with the auxiliary measuring device) or at a later time, after storage of the information.

5.5 Steel test masses, of (100 ± 1) kg, (150 ± 1) kg, (30 ± 1) kg, and a range of masses from 5 kg to 10 kg in 1 kg increments, as appropriate to test, rigidly connected to an eyebolt which provides a secure connection point.

The eyebolt shall be central at one end, but an offset additional eyebolt position is also permissible to accommodate horizontal dimensional constraints of relevant testing procedures and equipment.

5.6 Apparatus for corrosion-resistance test, capable of performing the neutral salt-spray test procedure described in ISO 9227:1990.



Frequency response values:

a = ± 1/4 dB — f_L = 0,1 Hz

b = + 1/2 dB, – 1 dB — f_H = 60 Hz

c = + 1/2 dB, – 3 dB — f_N = 100 Hz

d = – 30 dB

Key

1 Slope = – 9 dB per octave

2 Slope = – 24 dB per octave

Figure 3 — Frequency response characteristics for the force-measuring instrumentation

5.7 Apparatus for conditioning tests:

5.7.1 Heat-conditioning apparatus, consisting of a chamber capable of maintaining the temperature at (40 ± 2) °C and the relative humidity at (85 ± 5) %.

5.7.2 Cold-conditioning apparatus, consisting of a refrigerated chamber capable of maintaining the temperature at (–30 ± 2) °C.

5.7.3 Wet-spray-conditioning apparatus, capable of delivering the rate of approximately 70 l/h within a temperature range of 10 °C to 30 °C.

5.7.4 Dust-conditioning apparatus, consisting of a box, equipped with a vent and air filter, of 1 m^3 internal capacity with provision for agitating dust with blasts of air from a 6 bar supply. There shall also be a provision for a cord to be passed vertically through the top of the box for operation of the mechanism under test.

5.8 Apparatus for locking-reliability test, capable of repeatedly locking and unlocking the SRL in each of 1 000 operations, under the gravitational acceleration of a falling mass.

6 Test methods

NOTE A new specimen may be supplied for each test.

6.1 Corrosion resistance

The SRL shall be submitted to the neutral salt-spray test in accordance with ISO 9227 for an initial exposure of 24 h, followed by 1 h drying, followed by a second exposure of 24 h. The SRL shall be mounted in an upright fashion in the spray chamber with the lifeline fully retracted.

After the test, the SRL is to be dismantled in accordance with manufacturer's instructions and examined for evidence of corrosion.

6.2 Locking tests after conditioning

6.2.1 General

A minimum period of 2 h shall be allowed between locking-conditioning tests with the SRL in ambient conditions and at a temperature of (20 ± 2) °C.

6.2.2 Establishing the size of minimum locking test mass

Suspend the SRL by its upper anchoring attachment, approximately 2,5 m above the walk level. Ensure that the lifeline is fully retracted and attach a 5 kg test mass to the external termination. Allow the mass to fall and observe to see if the SRL locking mechanism arrests the 5 kg mass.

In the distance available, the 5 kg mass may be insufficient to activate the SRL locking mechanism, in particular those with lifeline lengths of 12 m and above. Or the mass may bounce several times before being finally arrested. In such cases, increase the test mass by increments of 1 kg, until the SRL successfully arrests the mass.

Use the established size of minimum locking test mass to assess the locking ability in the conditioning tests.

6.2.3 Heat conditioning

6.2.3.1 The heat-conditioning apparatus shall comply with 5.7.1.

6.2.3.2 Place the SRL in the chamber for a period of 2 h at a temperature of (40 ± 2) °C and at a relative humidity of (85 ± 5) %. The lifeline is to be fully extracted and held in position by a clip. Remove the SRL, and before 90 s has elapsed, test in accordance with 6.2.8.

6.2.4 Cold conditioning

6.2.4.1 The cold-conditioning apparatus shall comply with 5.7.2.

6.2.4.2 Place the SRL in the chamber for a period of 2 h at a temperature of (− 30 ± 2) °C. The lifeline is to be fully extracted and held in position by a clip. Remove the SRL, and before 90 s has elapsed, test in accordance with 6.2.8.

6.2.5 Wet spray

6.2.5.1 The wet-spray-conditioning apparatus shall comply with 5.7.3.

6.2.5.2 Suspend the SRL by its upper anchoring attachment in a tank, and spray water onto it within the temperature range of 10 °C to 30 °C for 3 h at a rate of approximately 70 l/h. The lifeline is to be fully extracted and held in position by a clip. Remove the SRL, and before 90 s has elapsed, test in accordance with 6.2.8.

6.2.6 Dust

6.2.6.1 The dust-conditioning apparatus shall comply with 5.7.4.

6.2.6.2 Place the SRL 150 mm above the base of the box. Introduce (4,5 ± 0,5) kg of dry cement on the floor of the box and, at intervals of 5 min, agitate it by projecting blasts of air for a 2 s period in a downward direction. After 1 h, beginning coincidentally with the air blasts perform the following movement sequence.

6.2.6.3 With a drum or other means within the box, hand-driven by an external crank, withdraw the lifeline entirely and then allow it to retract to the initial position. This is to be repeated at intervals of 1 h until five such movement sequences have been completed.

6.2.6.4 After the final movement sequence stop the blasts of air. Allow the dust to settle for 15 min, and remove the SRL from the box. Before 90 s has elapsed, test in accordance with 6.2.8.

6.2.7 Oil conditioning

The lifeline is to be fully extracted and held in position by a clip. Immerse the lifeline in commercial grade diesel oil at a temperature of (20 ± 2) °C for a period of no less than 30 min. Allow the lifeline to hang freely and to drain for 24 h. Within 1 h of the 24 h draining period, test in accordance with 6.2.8.

6.2.8 Locking test

6.2.8.1 Suspend the SRL by its upper anchoring attachment, remove the clip if necessary, and allow the lifeline to retract back into the SRL housing under controlled restraint.

6.2.8.2 Attach the minimum locking test mass as established in 6.2.2 to the external termination of the lifeline. Allow the mass to fall. Observe that the SRL locks and arrests the mass and that the SRL can be unlocked after test.

6.3 Locking reliability test

6.3.1 The apparatus shall comply with 5.8.

6.3.2 Install the SRL in the apparatus by its upper anchoring attachment and with the lifeline fully retracted. Withdraw the lifeline from the SRL for a distance of 1 m and move it over a distance of 300 mm. At the end of the movement cause the SRL to lock by the application of a falling mass. This mass shall be the minimum locking test mass as established in 6.2.2.

6.3.3 Repeat for a total of 1 000 relative movements. Observe that the SRL locks on each movement.

6.4 Retraction test

6.4.1 Install the SRL by its upper anchoring attachment and with the lifeline fully retracted. The installation is to be at a height so that all of the lifeline can be extracted without it being supported by the floor or other structure. A tag lead is to be attached to the external termination of the lifeline to permit extraction.

6.4.2 Extract the full length of the lifeline at a speed below the lock on speed of the SRL, and allow it to retract back into the SRL housing under controlled restraint. Observe that the SRL is capable or retracting the full length and mass of the lifeline without sticking or jamming in each of 25 extractions and retractions.

6.5 Dynamic performance test at full lifeline extraction

6.5.1 Install the SRL by its upper anchoring attachment to the force measurement instrument which is attached to the test structure. Connect the 100 kg test mass to the external termination of the lifeline.

6.5.2 Lower the test mass slowly until all of the lifeline is extracted and the test mass is supported entirely by the SRL. Record this position relative to the test house floor. Raise the test mass (300 ± 50) mm, ensuring that the SRL retracts the lifeline by the same amount, and secure to the quick-release device. Ensure that the lifting eyebolt on the test mass is at a maximum horizontal distance of 300 mm from the vertical axis of the test-rig anchor point.

6.5.3 Release the test mass. Measure and record the force with respect to time. After the arrest confirm that the test mass is retained by the SRL and, with the exception of energy dissipating devices, that no element has fractured or ruptured in the load-bearing path. If the SRL has a fall-indicating device, confirm that it has operated in accordance with manufacturer's instructions.

6.6 Dynamic performance

6.6.1 With the lifeline in the fully retracted condition, install the SRL by its upper anchoring attachment to the force measurement instrument which is attached to the test structure.

6.6.2 Extract the lifeline by a distance of 600 mm and attach a clip to prevent retraction. Connect the 100 kg test mass to the external termination of the lifeline.

6.6.3 Raise the test mass to the level of the SRL so as to allow a subsequent free fall distance of 600 mm in accordance with Figure 4. At a maximum of 300 mm from the vertical axis of the test-rig anchor point, secure the test mass to the quick-release device.

6.6.4 Release the test mass. Measure and record the force with respect to time and the displacement H in accordance with Figure 4. After the arrest confirm that the test mass is retained by the SRL, and, with the exception of energy dissipating devices, that no element has fractured or ruptured in the load-bearing path.

6.6.5 If the SRL has a fall-indicating device, confirm that it has operated in accordance with manufacturer's instructions.

6.7 Static strength

6.7.1 Fully extract the lifeline from the SRL housing. Clip the lifeline to prevent retraction, and sever it as to leave 1,0 m remaining outside the housing. Terminate the free end for connection into the tensile-test apparatus. Alternatively the manufacturer is permitted to supply test specimens ready for test with a manufacturer's termination.

6.7.2 Install the SRL into the tensile-test machine so that the test force can be applied between the anchor point and the lifeline termination, without the locking mechanism of the SRL engaged.

6.7.3 Apply the test force in accordance with Table 1 at a rate of stressing which is not to exceed (150 ± 10) mm/min.

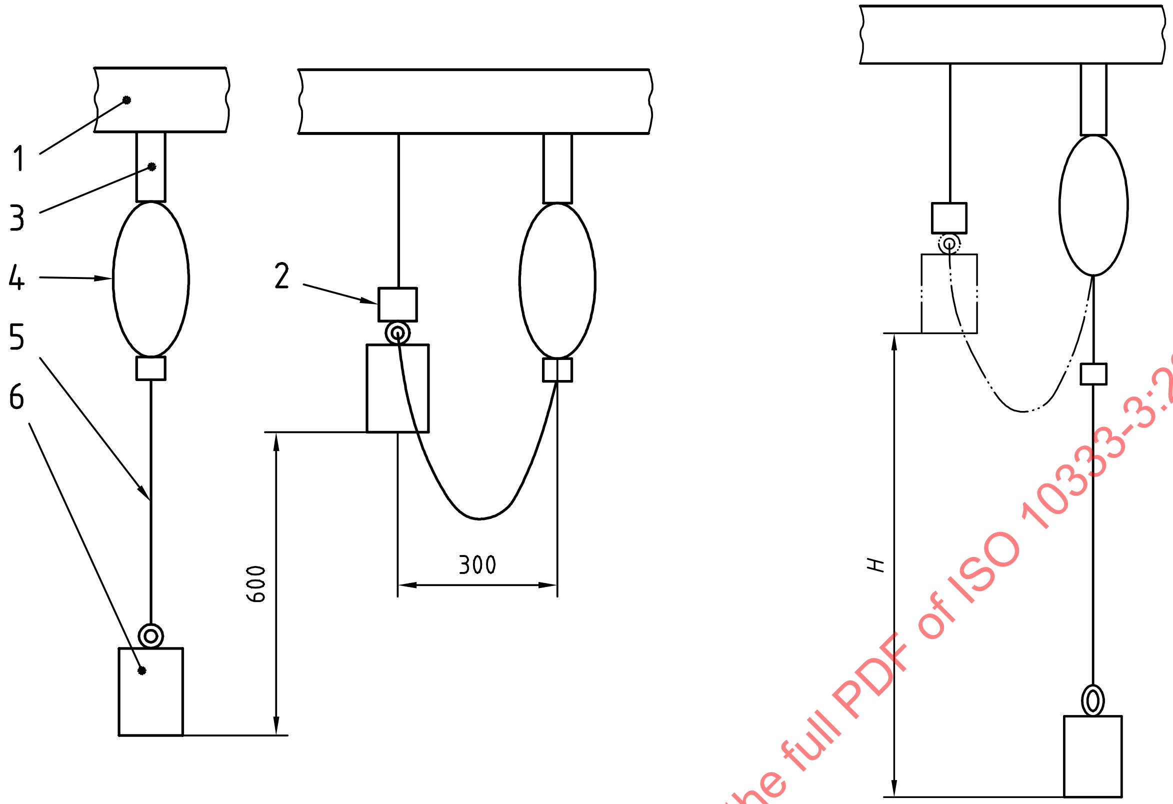
NOTE Tensile force is to be applied to fully deploy any energy dissipating material or device that is integral to the lifeline, prior to applying the test force.

6.7.4 The test force is to be maintained for a period of 5 min. Observe that there is no fracture or rupture of any element in the load-bearing path.

NOTE Once the respective tensile force has been sustained for the 5 min period, it is permissible, in order to assess the failure load and mode, to progress the test to destruction.

6.7.5 If the SRL offers more than one anchor attachment, each point is to be tested in accordance with 6.7 with a new specimen.

Dimensions in millimetres



a) **Pre-release position of test mass** b) **Post-arrest equilibrium position of test mass**

Key

1 Test-rig anchor
2 Quick-release device
3 Load cell
4 SRL
5 Lifeline
6 Test mass

Figure 4 — Dynamic performance test

6.8 Lifting test for SRL with lift only integral-rescue facility

6.8.1 Install the SRL by its upper anchoring attachment to the test structure, which is to be at a height at least equivalent to the working length of SRL. Fully extract the lifeline, and pull rapidly to cause lock-on of the braking mechanism.

6.8.2 Connect the 150 kg test mass, and lower until it is supported entirely by the SRL. Ensure that the SRL remains locked during this process.

6.8.3 Engage the rescue facility by activating the controlling means in accordance with manufacturer's instructions. Ensure that this can be done within 20 s.

6.8.4 Raise the test mass by using the controlling means. Observe that there is no lifeline restriction and slippage and no inadvertent disengagement of the rescue facility.

6.8.5 Release the controlling means at three random intervals during the raising of the test mass. Observe that the test mass comes to a halt immediately and within a stopping distance of 50 mm.

6.8.6 Continue to raise the test mass until the lifeline is fully retracted.

6.8.7 Repeat 6.8.1 to 6.8.6 using the 30 kg test mass instead of 150 kg.