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Machinery for forestry — Winches —

Part 2: Traction aid winches

Matériels forestiers — Treuils —

Partie 2: Treuils d'aide à la traction

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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).

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This document was prepared by Technical Committee ISO/TC 23, *Tractors and machinery for agriculture and forestry*, Subcommittee SC 15, *Machinery for forestry,* in collaboration with the European Committee for Standardization (CEN) Technical Committee CEN/TC 144, *Tractors and machinery for agriculture and forestry,* in accordance with the Agreement on technical cooperation between ISO and CEN (Vienna Agreement).

A list of all parts in the ISO 19472 series can be found on the ISO website.

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

Introduction

This document is a type-C standard as stated in ISO 12100:2010.

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 organisations, 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).

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.

Traction aid winches are used with forest machines when operating in sloped terrain and on soils with limited bearing capacity or poor traction. Such winches do provide traction aid to a supported machine. The combined tractive effort provided by the machine's wheels or tracks and the traction aid winch makes it easier to access steep slopes and manage unfavourable soil conditions while maintaining productivity by avoiding excess uphill driving or driving around a gradient, especially with harvesters, fellers, forwarders and skidders. Forest floor damages are greatly reduced which leads to a lower risk of erosion after logging operations. Machine stability is also enhanced, and thus general safety of operation is improved. Traction aid winches offer a possibility for machines to work on slopes which otherwise would be difficult to negotiate. This makes it simpler to mechanize work in steep terrain which otherwise would have to be performed manually.

Forestry winches for typical logging, such as the ones used for skidding or cable yarding of stems/logs, are designed for a different application than traction aid winches. The control systems, safety features, and performance measures of forestry winches have been designed for a purpose that is incompatible with the requirements of traction aid applications. Therefore, forestry winches should not be used in traction aid applications.

The main categories of winches for tractive efforts are shown in Figure 1. Further aspects of the design and operation of traction aid winches can be found in Annex E.

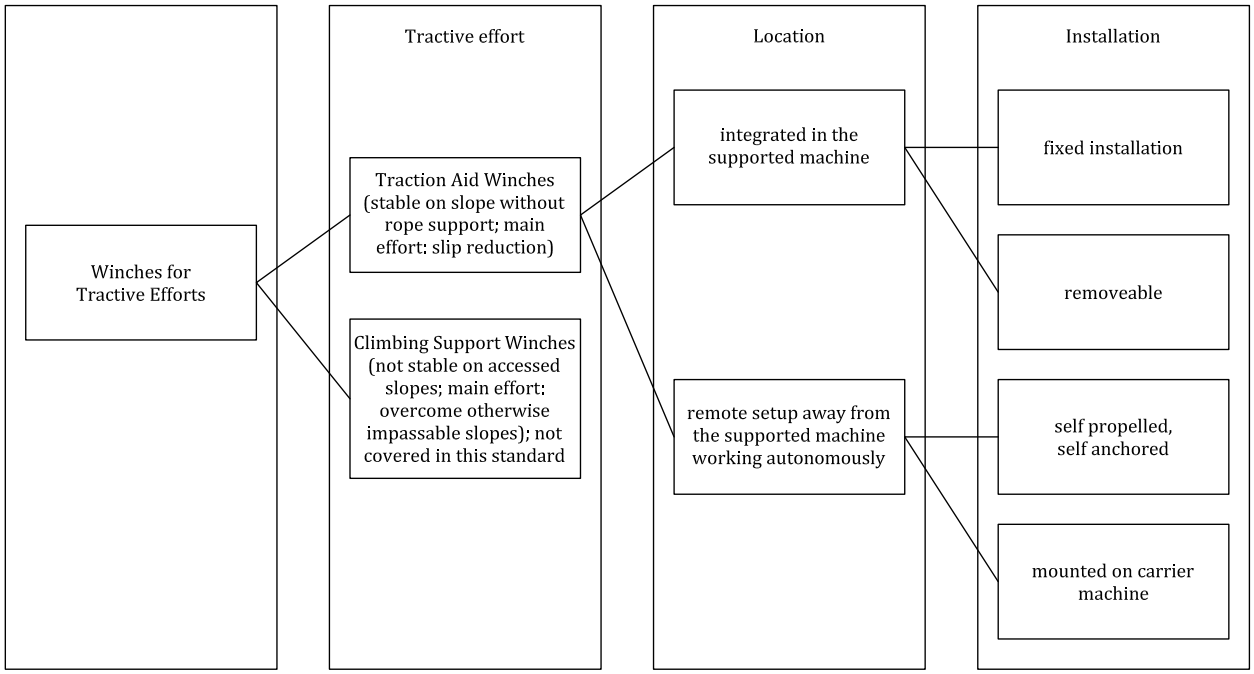


Figure 1 — Categorization of winches for tractive efforts

Machinery for forestry — Winches —

Part 2: Traction aid winches

1 Scope

This document defines the dimensions and specifies the performance and safety requirements for traction aid winches used in forestry for assisting supported machines while going uphill and downhill (pulling and braking).

This document is applicable to fixed and detachable winches and their components, connections and communications, which are used with mobile and self-propelled forestry machinery as defined in ISO 6814:2009 and earth moving machinery as defined in ISO 6165:2012. It is also applicable to remote traction aid winch systems which are installed on a position away from the supported machine. In addition, this document defines requirements for the assembly of supported machine and traction aid winch. It is not applicable to winches which are not using a controlled rope force while going downhill and winches used for skidding, hoisting operations on cranes, draglines, high lead logging, rope logging systems or yarding. The kind of prime mover used to drive a traction aid winch does not limit the applicability of this document. This document is intended to be applied to traction aid systems used on machines where, without use of these systems, the machine remains stationary on slopes under its independent control (see Annex E).

Forestry machines, as defined in ISO 6814:2009, that are used as anchor or supported machines are not in the scope of this document. Requirements for the safety of many types of supported machines are within the scope of ISO 11850:2011.

This document is not applicable to traction aid winches manufactured before the date of its publication.

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 2867:2011, *Earth-moving machinery — Access systems*

ISO 3600:2015, *Tractors, machinery for agriculture and forestry, powered lawn and garden equipment — Operator's manuals — Content and format*

ISO 3744:2010, *Acoustics — Determination of sound power levels and sound energy levels of noise sources using sound pressure — Engineering methods for an essentially free field over a reflecting plane*

ISO 4254-1:2013, *Agricultural machinery — Safety — Part 1: General requirements*

ISO 4309:2017, *Cranes — Wire ropes — Care and maintenance, inspection and discard*

ISO 4413:2010, *Hydraulic fluid power — General rules and safety requirements for systems and their components*

ISO 4871:1996, *Acoustics — Declaration and verification of noise emission values of machinery and equipment*

ISO 6750-1:2019, *Earth-moving machinery — Operator's manual — Part 1: Contents and format*

ISO 8084:2003, *Machinery for forestry — Operator protective structures — Laboratory tests and performance requirements*

ISO 10968:2020, *Earth-moving machinery — Operator's controls*

ISO 11201:2010, *Acoustics — Noise emitted by machinery and equipment — Determination of emission sound pressure levels at a work station and at other specified positions in an essentially free field over a reflecting plane with negligible environmental corrections*

ISO 11684:1995, *Tractors, machinery for agriculture and forestry, powered lawn and garden equipment — Safety signs and hazard pictorials — General principles*

ISO 11850:2011, *Machinery for forestry — General safety requirements*

ISO 12100:2010, *Safety of machinery — General principles for design — Risk assessment and risk reduction*

ISO 12508:1994, *Earth-moving machinery — Operator station and maintenance areas — Bluntness of edges*

ISO 13849-1:2015, *Safety of machinery — Safety-related parts of control systems — Part 1: General principles for design*

ISO 13850:2015, *Safety of machinery — Emergency stop function — Principles for design*

ISO 13857:2019, *Safety of machinery — Safety distances to prevent hazard zones being reached by upper and lower limbs*

ISO 15077:2020, *Tractors and self-propelled machinery for agriculture — Operator controls — Actuating forces, displacement, location and method of operation*

ISO 15817:2012, *Earth-moving machinery — Safety requirements for remote operator control systems*

ISO 15818:2017, *Earth-moving machinery — Lifting and tying-down attachment points — Performance requirements*

ISO 16625:2013, *Cranes and hoists — Selection of wire ropes, drums and sheaves*

ISO 20474-1:2017, *Earth-moving machinery — Safety — Part 1: General requirements*

EN 12385-1:2002+A1:2008, *Steel wire ropes — Safety — Part 1: General requirements*

EN 12385-2:2002+A1:2008, *Steel wire ropes — Safety — Part 2: Definitions, designation and classification*

EN 12385-3:2004+A1:2008, *Steel wire ropes — Safety — Part 3: Information for use and maintenance*

EN 12385-4:2002+A1:2008, *Steel wire ropes — Safety — Part 4: Stranded ropes for general lifting applications*

EN 13411-3:2004+A1:2008, *Terminations for steel wire ropes — Safety — Part 3: Ferrules and ferrule securing*

EN 13411-6:2004+A1:2008, *Terminations for steel wire ropes — Safety — Part 6: Asymmetric wedge socket*

EN 13411-8:2011, *Terminations for steel wire ropes — Safety — Part 8: Swage terminals and swaging*

EN 14492-1:2006+A1:2009, *Cranes — Power driven winches and hoists — Part 1: Power driven winches*

EN 17067:2018, *Forestry machinery — Safety requirements on radio remote controls*

EN 60204-1:2018, *Safety of machinery — Electrical equipment of machines — General requirements*

IEC 60447:2004, *Basic and safety principles for man-machine interface, marking and identification — Actuating principles*

3 Terms, definitions and symbols

3.1 Terms and definitions

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

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

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

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

3.1.1
traction aid
working method in which a forest machine is using an assisting rope to support the machine's own tractive or braking effort by a regulated pulling and/or braking force which is kept constant or regulated according to the slip or other traction defined parameters of the supported machine while the supported machine when stopped remains stationary on the slope travelled upon without any further rope assistance

3.1.2
winch
mechanism which transmits pull by means of a rope from a power-driven drum, for example a drum hoist, friction hoist or capstan

[SOURCE: ISO 4306-1:2007, 4.6, modified — The mechanism has been specified to be used for applications other than lifting.]

3.1.3
traction aid winch
winch mounted on the self-propelled forest machine itself or placed separately providing *traction aid* (3.1.1)

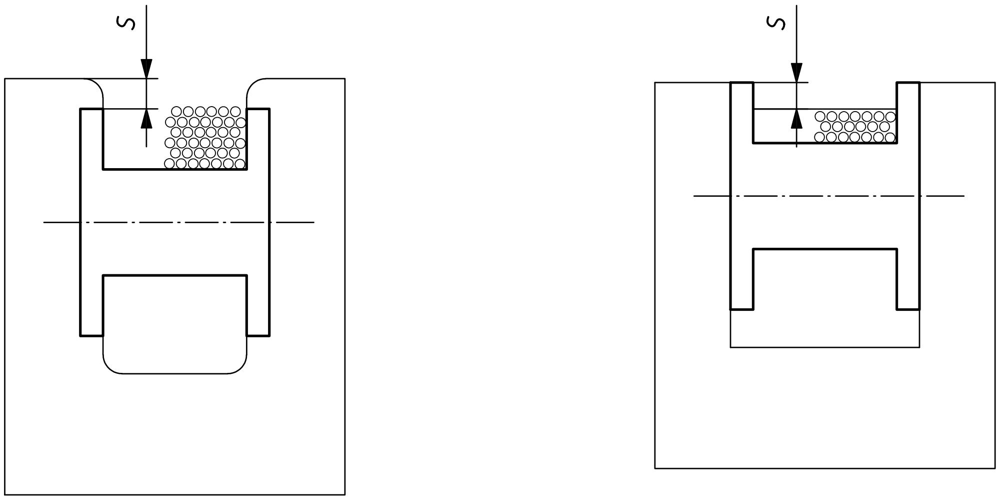
3.1.4
rope
arrangement of individual wires twisted in order to form single strands and out of them an integral unit which is able to transmit tensile forces

3.1.5
rope diameter
d
maximum distance which can be measured between the outer boundaries of a perpendicular cross section of a rope

3.1.6
service mass
mass of the supported machine including the operating mass of the supported machine and its permitted payload, and if the winch is mounted onto it, the mass of the winch system including rope

3.1.7
rope clearance distance
S
distance from the outmost periphery of the winch flange or housing left free from rope to ensure the rope stays within the drum

Note 1 to entry: See Figure 2.



a) Winch with drum housing **b) Winch without drum housing**

NOTE The housing material can be either full (360°) or partial, with alternative means of ensuring that the rope remains within the drum.

Figure 2 — Rope clearance distance of winch drum

[SOURCE: ISO 19472:2006, 3.6, modified — The definition has been editorially revised to remove the requirement. The accompanying figure has been changed.]

3.1.8
rope deflection angle
angle between the actual running direction of the rope and a line perpendicular to the drum axis or the groove direction of the drum grooving while they are projected on a plane through the drum axis and parallel to the incoming direction of the rope

3.1.9
power transmission
two or more connected parts that transmit power

3.1.10
maximum speed
highest possible speed in the intended direction of movement in kilometres per hour

[SOURCE: ISO 17253:2014, 3.5, modified — the definition has been editorially revised to be succinct and clear.]

3.1.11
pulling
working action where the *traction aid winch* (3.1.3) is spooling the rope while transferring a force to the supported machine

3.1.12
dynamic braking
<retarder action> working action where the *traction aid winch* (3.1.3) is unspooling rope while transferring a force between the supported machine and an anchoring point or the body of the winch

3.1.13
static braking
<holding brake> working action where the *traction aid winch* (3.1.3) is set fixed up to a predetermined force which is thus transferred onto the supported machine in order to hold the supported machine at a given position while it will allow the traction aid winch to unwind once a given maximum holding force is exceeded

3.1.14
nominal tensile force
minimum breaking force of a rope divided by the required working coefficient (safe working limit)

3.1.15
overload protection
device which automatically prevents impermissible high loads at the winch during operation

3.1.16
rope drive
system of ropes which run on rope drums and via rope pulleys as well as rope fastening parts

3.1.17
rope end connector
device situated at the free end of a winch rope which has direct contact to the rope that enables connection of the rope to the load, the supported machine, an anchoring point or allows transferring the rope force onto sling gear

Note 1 to entry: The rope end connector is capable of transmitting the rope force between elements (e.g. from the rope through shackles to an attachment point).

3.1.18
sling gear
parts and devices that form the connection between the anchoring point and the rope or between an anchoring point and an additional deflection pulley

Note 1 to entry: Examples of recognized sling gear include shackles, loop fastening straps, round slings or rope slings together with shackles.

3.1.19
deflection pulley
fastened component of the rope drive, generally installed at a location away from the traction aid winch system, which allows the rope to deflect angles ≤ 180° from its initial direction

3.1.20
guide roller
fixed component of the rope drive, generally forming part of the traction aid winch system, which allows the rope to deflect a desired angle from its initial direction

3.1.21
pressure roller
fixed component of the rope drive with the task of ensuring adequate spooling quality

3.1.22
installation mode
operation mode in which the *traction aid winch* (3.1.3) is operated manually for winching and spooling in order to connect winch, anchoring points and supported machine

3.1.23
synchronized mode
operation mode in which the *traction aid winch* (3.1.3) is operated automatically with both pre-set pulling and braking forces or other traction relevant parameters and with a speed of the winch which is regulated according to the forward or reverse speed of the supported machine

Note 1 to entry: Control is normally effectuated by regulation of the rope force.

3.1.24
auxiliary mode
operation mode in which the *traction aid winch* (3.1.3) is operated manually for pulling purposes foreseen by the manufacturer

3.1.25
supported machine
self-propelled machine, as defined in ISO 6814:2009 or ISO 6165:2012, equipped with a fixed or removable *traction aid winch* (3.1.3) or attached to a remote traction aid winch to which the traction aid winch system transfers a pulling or a braking force at a rope speed regulated according to the speed of such a machine in order to facilitate its mounting or descending slopes or help to overcome unfavourable soil conditions

3.1.26
rope speed
speed of the rope with reference to the position of the *traction aid winch* (3.1.3) at which the rope is spooled or unspooled by the traction aid system especially in *synchronized mode* (3.1.23)

3.1.27
working coefficient
ratio of the minimum breaking force of the rope and the maximum applied force to the rope (this means active pulling or dynamic braking) with the maximum applied force resulting from the operation of the force limiter

3.1.28
rated pulling force
maximum nominal pulling force for which a *traction aid winch* (3.1.3) has been designed by the manufacturer

3.1.29
proper spooling
operating a winch in a way that rope windings are situated one next to the other in layers which cover the whole width of the drum and which does not allow rope from an upper layer to slip down into a lower layer

3.1.30
attachment point
connecting point at the supported machine which is designed for attaching the rope of a remote traction aid winch

3.1.31
anchoring point
fixed point in the area of the upper end of the driving path of a supported machine with sufficient bearing capacity (e.g. on a tree, on a heavy mobile machine or in the ground) used to attach the rope of an integrated *traction aid winch* (3.1.3) or the body of a remote traction aid winch to provide sufficient counter bearing for the arising forces of the rope of the respective traction aid winch

3.1.32
sheave
rotary mounted cylindrical device, usually fitted with grooves around which the winching rope is wound partially or several times, which is used to deflect the pulling direction of a rope a given angle

3.1.33
capacity
maximum value of a force the referred element is able to exert or to bear

3.1.34
integrated traction aid winch fixed installation
traction aid winch system, which forms an integral part of the supported machine and which is driven entirely by the power source of the supported machine while the winch system rope is not moving against the ground and is attached to an anchor point on the upper side of the slope negotiated by the supported machine

3.1.35
integrated traction aid winch removable installation
traction aid winch system consisting of a self-contained winch system unit containing the winch system which can be attached to or removed from the supported machine using a coupling system and which is driven entirely by the power source of the supported machine while the rope is not moving against the ground and is attached to an anchor point on the upper side of the slope negotiated by the supported machine

3.1.36
remote traction aid winch
traction aid winch system purpose built (integrated into an anchor machine or attached to an anchor machine) which is operated remotely from the supported machine and which is positioned above the supported machine on the upper side of the slope or to the side of the machine if used in combination with a deflection pulley while the supported machine is attached to the rope of this winch system and the system rope is moving with respect to the surrounding area

3.1.37
anchor machine
machine which a remote traction aid winch is integrated into or attached to

3.1.38
anchor winch
winch mounted on a remote traction aid winch system and used to keep this system in a stable position by guy lines which in turn are connected to stumps, trees, plate and pin, earth anchors or rock anchoring points and which can be tightened as needed

3.1.39
safe state
state automatically or manually applied after a malfunction of the control system, where the controlled equipment, process or system is stopped or switched to a safe mode to prevent unexpected movements or the potentially hazardous build-up of stored energy (e.g. high-voltage electricity, hydraulic pressures or compressed springs)

[SOURCE: ISO 15998:2008, 3.1.10]

3.1.40
self-propelled remote traction aid winch
remote traction aid winch which is equipped with a crawler track or wheeled chassis and which is driven to its site of operation either by a ride-on driver or use of pedestrian-control

3.2 Symbols

Symbol	Definition	Unit
d	maximum distance which can be measured between the outer boundaries of a perpendicular cross section of a rope	mm
S	distance from the outmost periphery of the winch flange or housing left free from rope to ensure the rope stays within the drum	mm

4 Safety requirements for traction aid winches

4.1 General

Traction aid winches shall be in accordance with the following safety requirements. In addition, traction aid winches shall be designed according to ISO 12100:2010 for relevant but not significant hazards. For a list of hazards related to the use of traction aid winches, see Annex C.