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Machinery for forestry — Winches — Dimensions, performance and safety

Matériel forestier — Treuils — Dimensions, performance et sécurité

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Foreword

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

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

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

Attention is drawn to the possibility that some of the elements of this document may be the subject of patent rights. ISO shall not be held responsible for identifying any or all such patent rights.

ISO 19472 was prepared by Technical Committee ISO/TC 23, *Tractors and machinery for agriculture and forestry*, Subcommittee SC 15, *Machinery for forestry*.

This first edition of ISO 19472 cancels and replaces ISO 4254-4:1990, ISO 6816:1984 and ISO 6687:1994, of which it constitutes a technical revision.

Machinery for forestry — Winches — Dimensions, performance and safety

1 Scope

This International Standard defines dimensions and specifies performance and safety requirements for winches used in forestry. It is applicable to fixed and detachable winches and their components mounted on mobile and self-propelled forestry machinery such as skidders and forwarders as defined in ISO 6814 and on agricultural tractors used for skidding in forestry operations. It is not applicable to winches used for hoisting operations on cranes, draglines, high lead logging, cable logging systems or yarding.

2 Normative references

The following referenced documents are indispensable for the application 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 3457:2003, *Earth-moving machinery — Guards — Definitions and requirements*

ISO 3600:1996, *Tractors, machinery for agriculture and forestry, powered lawn and garden equipment — Operator's manuals — Content and presentation*

ISO 3767-4:1993, *Tractors, machinery for agriculture and forestry, powered lawn and garden equipment — Symbols for operator controls and other displays — Part 4: Symbols for forestry machinery*

ISO 6814:2000, *Machinery for forestry — Mobile and self-propelled machinery — Terms, definitions and classification*

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

ISO 9244:1995, *Earth-moving machinery — Safety signs and hazard pictorials — General principles*

ISO 10968:2004, *Earth-moving machinery — Operator's controls*

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

ISO 13852:1996 *Safety of machinery — Safety distances to prevent danger zones being reached by the upper limbs*

3 Terms and definitions

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

3.1
barrel diameter
A
diameter of the rope drum barrel measured in millimetres

See Figure 1.

3.2
flange diameter
B
diameter of the rope drum flanges measured in millimetres

See Figure 1.

3.3
distance between flanges
C
distance between the flanges of the rope drum measured in millimetres at half the depth of the flange minus the rope clearance distance

See Figure 1.

3.4
depth of flange
D
radial distance from the outside diameter of the rope drum flange to the surface on the rope drum barrel measured in millimetres

See Figure 1.

3.5
throat clearance
E
minimum distance from the barrel of the rope drum to the winch housing at any point located between the flanges of the rope drum

See Figure 1.

3.6
rope clearance distance
S
distance from the outmost periphery of the winch flange or housing that shall be left free from rope to ensure the rope stays within the drum

See Figure 2.

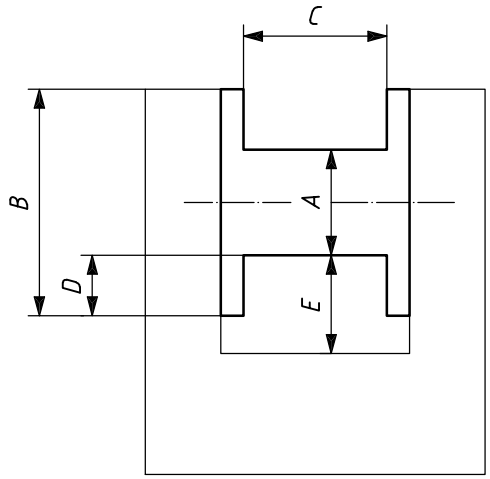


Figure 1 — Basic dimensions of winch drum

4 Symbols

A Barrel diameter, in millimetres (mm)

B Flange diameter, in millimetres (mm)

C Distance between flanges, in millimetres (mm)

D Depth of flange, in millimetres (mm)

E Throat clearance, in millimetres (mm)

L Rope length, in metres (m)

S Rope clearance distance, in millimetres (mm)

d Rope diameter, in millimetres (mm)

F Line pull, in newtons (N)

n Rotational frequency of input shaft, in revolutions per second (r/s)

T Torque on winch input shaft, in newton metres (N · m)

R Total gear reduction between the winch input shaft and the rope drum

u Efficiency of total gear reduction between input shaft and rope drum at the speed corresponding to the torques used for *T*

v Line speed, in metres per second (m/s)

5 Performance requirements

5.1 Drum storage capacity

5.1.1 Rope clearance distance, S

The rope clearance distance to be used in the calculations according to 5.1.2 shall be equal to two rope diametres ($S = 2d$).

5.1.2 Calculations

For winches with S built into the portion of the housing extending beyond the rope drum flange, as shown in the example of Figure 2 a), the length of rope in metres that can be stored on the rope drum shall be calculated using Equation (1):

$$L = (A + D) \times D \times C \times K \times 10^{-3} \quad (1)$$

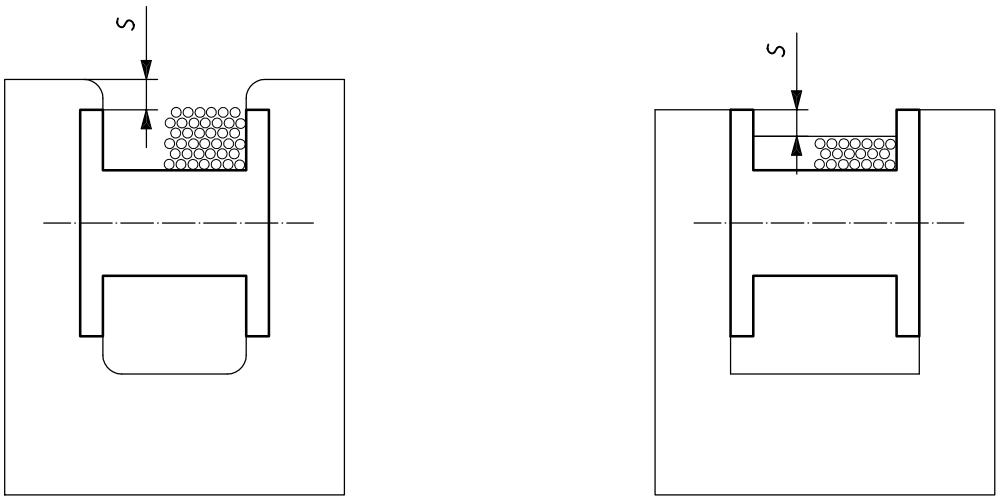
For all other winches, as shown in the example of Figure 2 b), the length of rope in metres that can be stored on the rope drum, taking S into account, shall be calculated using Equation (2):

$$L = (A + D - S) \times (D - S) \times C \times K \times 10^{-3} \quad (2)$$

where, in Equations (1) and (2), K is a factor, function of the diameter, d, of the rope used (see Table 1) and where

$$K = \frac{\pi}{(1{,}04)^2} \quad (3)$$

NOTE The values of K given in Table 1 allow for a normal oversize on cables of 4 %. The formula for calculating K is based on uniform rope winding and will not give correct figures if rope is wound non-uniformly on the rope drum.



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

Table 1 — Factor K as a function of rope diameter d

d	K	d	K
8	0,045 4	19	0,008 05
9	0,035 9	20	0,007 26
10	0,029 0	22	0,006 00
11	0,024 0	24	0,005 04
12	0,020 2	26	0,004 30
13	0,017 2	28	0,003 70
14	0,014 8	32	0,002 84
16	0,011 3	35	0,002 37
18	0,008 96	36	0,002 24
		38	0,002 01

5.2 Line pull, F

Calculate the line pull in newtons using Equations (4) to (6).

a) Bare drum line pull

$$F = \frac{2\,000 \times T \times R \times u}{A + d} \tag{4}$$

b) Full drum line pull

For winches with S built into the portion of the housing extending beyond the rope drum flange, as shown in the example of Figure 2 a):

$$F = \frac{2\,000 \times T \times R \times u}{B - d} \tag{5}$$

For all other winches, as shown in example of Figure 2 b), taking S into account:

$$F = \frac{2\,000 \times T \times R \times u}{B - (2S + d)} \tag{6}$$

The breaking strength of the rope used could be exceeded in the specification for the line pull. In this case, the maximum rated bare drum pull, see c), in relation to the static breaking load of the rope, shall be in accordance with 6.3.

c) Maximum rated bare drum pull

Calculate the maximum rated bare drum pull of the winch as specified by the winch manufacturer using Equation (4) under one or a combination of the following conditions:

1) when the torque on the input shaft is influenced by a torque converter, calculate for a stall condition while the engine is at the full governor control position;

2) when the torque on the input shaft is influenced by the transmission gear ratios, calculate for maximum engine torque with the transmission in the gear, giving the highest line pull;

3) when the torque on the input shaft is influenced by a fixed gear ratio only, calculate for maximum engine torque.

NOTE The total winch pull may be limited by the machine on which the winch is mounted.