International Standard 6687

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Machinery for forestry — Winches — Performance requirements

Matériel forestier — Treuils — Exigences de performance

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Foreword

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Draft International Standards adopted by the technical committees are circulated to the member bodies for approval before their acceptance as International Standards by the ISO Council.

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It has been approved by the member bodies of the following countries:

Australia	India	Norway
Belgium	Iraq	Romania
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Canada	Italy	Spain
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The member bodies of the following countries expressed disapproval of the document on technical grounds:

Austria
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Machinery for forestry — Winches — Performance requirements

1 Scope and field of application

This International Standard specifies a uniform method of defining specification definitions, drum storage capacity, line pull and line speed for winches used in tree harvesting machines.

2 Definitions (see figure and table 1)

2.1 barrel diameter, A : Diameter of the cable drum barrel measured in millimetres.

2.2 flange diameter, B : Diameter of the cable drum flanges measured in millimetres.

2.3 distance between flanges, C : Distance measured between the flanges of the cable drum in millimetres, measured at 1/2 × (depth of flange − safety distance).

$$\frac{D-S}{2}$$

2.4 depth of flange, D : Radial distance from the outside diameter of the cable drum flange to the surface on the cable drum barrel measured in millimetres.

2.5 safety distance, S : Outmost periphery of the flange that shall be left free from cable. It shall be equal to two cable diameters, $S = 2d$.

2.6 throat clearance, E : Minimum distance from the barrel of the cable drum to the winch housing at any point located between the flanges of the cable drum.

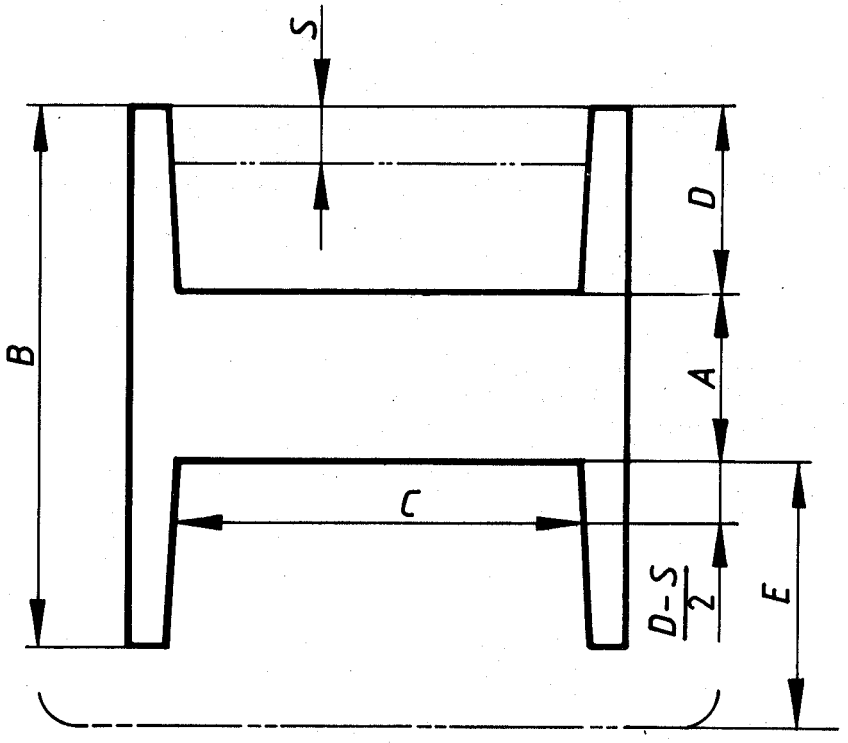
$$E > D$$

3 Performance requirements

3.1 Symbols and units (see the figure)

Table 1 — Symbols and units

Symbol	Definition	Unit
A	Barrel diameter	mm
B	Flange diameter	mm
C	Distance between flanges	mm
D	Depth of flange	mm
E	Throat clearance	mm
L	Cable length	m
S	Safety distance	mm
d	Cable diameter	mm
F	Line pull	N
n	Rotational frequency of input shaft	r/s
T	Torque on winch input shaft	N·m
R	Total gear reduction between the winch input shaft and the cable drum	
u	Efficiency of total gear reduction between input shaft and cable drum at the speed corresponding to the torque used for T	
v	Line speed	m/s



NOTE — This sketch of the winch is only indicative and does not relate to a specific winch.

Figure — Basic dimensions of winches

3.2 Drum storage capacity

The length of cable, in metres, that can be stored on the cable drum taking into account the safety distance, S, shall be calculated using the following formula :

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

where K is a factor, function of the diameter of cable used (see table 2), calculated as follows :

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

Table 2 — Factor, K, as a function of the diameter, d, of the cable

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

The values of K allow for a normal oversize on cables of 4 %. The formula for calculation of K is based on uniform cable winding and will not give correct figures if cable is wound non-uniformly on the cable drum.

3.3 Line pull

3.3.1 Bare drum and full drum

Line pull, in newtons, shall be calculated using the following formula :

a) Bare drum line pull :

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

b) Full drum line pull :

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

NOTE — The breaking strength of the cable used may be exceeded in the specification for the line pull.

3.3.2 Rated line pull of winch

The rated line pull of the winch is the maximum approved bare drum line pull as specified by the manufacturer and calculated in accordance with 3.3.1 above.

3.3.3 Maximum calculated line pull of installed winch

The maximum bare drum line pulls shall be calculated in accordance with 3.3.1 and one or a combination of the following conditions.

a) When the torque on the input shaft is influenced by a torque converter, the maximum line pull shall be calculated for a stall condition while the engine is at full governor control position;

b) When the torque on the input shaft is influenced by the transmission gear ratios, the maximum line pull shall be calculated for maximum engine torque with the transmission in the gear, giving the highest line pull;

c) When the torque on the input shaft is influenced by a fixed gear ratio only, the line pull shall be calculated for maximum engine torque;

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

3.4 Line speed

3.4.1 Bare drum and full drum

Line speed in metres per second shall be calculated using the following formula :

a) Bare drum line speed

$$v = \frac{n\,(A + d)}{318{,}4\ R}$$

b) Full drum line speed

$$v = \frac{n[B - (2S + d)]}{318{,}4\ R}$$

3.4.2 Maximum line speed

The maximum bare drum and full drum line speed shall be calculated in accordance with 3.4.1 above using the maximum speed available at the winch input shaft under no load conditions and stabilized engine speed.