SLOVENSKI STANDARD
SIST ISO 4308-1:2012

01-oktober-2012

Nadomešča:
SIST ISO 4308-1:1997

Žerjavi in dvigalna oprema - Izbira dvigalnih vrvi - 1. del: Splošno

Cranes and lifting appliances - Selection of wire ropes - Part 1: General

Grues et appareils de levage - Choix des câbles - Partie 1: Généralités

Ta slovenski standard je istoveten z: ISO 4308-1:2003

ICS:

53.020.30	Pribor za dvigalno opremo	Accessories for lifting equipment

SIST ISO 4308-1:2012 **en**

INTERNATIONAL STANDARD

ISO 4308-1

Third edition
2003-05-01

Cranes and lifting appliances — Selection of wire ropes —

Part 1: General

Grues et appareils de levage — Choix des câbles — Partie 1: Généralités

Reference number
ISO 4308-1:2003(E)

ISO copyright office
Case postale 56 • CH-1211 Geneva 20
Tel. + 41 22 749 01 11
Fax + 41 22 749 09 47
E-mail copyright@iso.org
Web www.iso.org

Published in Switzerland

Contents

Page

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 4308-1 was prepared by Technical Committee ISO/TC 96, *Cranes*, Subcommittee SC 3, *Selection of wire ropes*.

This third edition cancels and replaces the second edition (ISO 4308-1:1986), which has been technically revised.

ISO 4308 consists of the following parts, under the general title *Cranes and lifting appliances — Selection of wire ropes*:

— *Part 1: General*

— *Part 2: Mobile cranes — Coefficient of utilization*

Cranes and lifting appliances — Selection of wire ropes —

Part 1:
General

1 Scope

This part of ISO 4308 specifies two methods for the selection of wire rope to be used on lifting appliances as designated in ISO 4306-1, one based on the value of the rope selection factor C and the other based on the value of the coefficient of utilization Z_p

This part of ISO 4308 establishes the minimum requirements for acceptable strength and performance levels of wire ropes with respect to the design, application and maintenance of the lifting appliance.

This part of ISO 4308-1 establishes the minimum requirements for the diameters of drums and sheaves that are to be associated with the selected wire rope.

A non-exhaustive list of types of lifting appliance to which this part of ISO 4308 is applicable is given in Annex A.

Annex B provides some examples of rope selection.

Annex C gives factors, additional to those mentioned above, which may need consideration when selecting the wire rope.

Annex D specifies the selection method for the diameter of the compensating sheave when used in relation to hoists.

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 2408:1985, *Steel wire ropes for general purposes — Characteristics*

ISO 4301-1:1986, *Cranes and lifting appliances — Classification — Part 1: General*

ISO 4306-1:1990, *Cranes — Vocabulary — Part 1: General*

ISO 4309, *Cranes — Wire ropes — Care, maintenance (including installation), inspection*

3 Terms and definitions

For the purposes of this part of ISO 4308, the following terms and definitions apply.

3.1
parallel-closed rope
stranded rope consisting of at least two layers of strand laid helically in one closing operation around a strand or fibre centre

3.2
rotation-resistant rope
multi-strand rope
non-rotating rope
stranded rope designed to generate reduced levels of torque and rotation when loaded

NOTE 1 Rotation-resistant ropes generally comprise an assembly of two or more layers of strands laid helically around a centre, the direction of lay of the outer strands being opposite to that of the underlying layer.

NOTE 2 Ropes having three or four strands can also be designed to exhibit rotation-resistant properties.

3.3
single-layer rope
stranded rope consisting of one layer of strands laid helically around a core

3.4
stranded rope
assembly of several strands, laid helically in one or more layers around a core (single-layer rope) or centre (rotation-resistant or parallel-closed rope)

NOTE Single-layer ropes consisting of three and four strands may or may not have a core.

4 Type of rope

Where possible, the wire rope selected shall be in accordance with ISO 2408.

Selection of wire rope not specified by ISO 2408 is permitted, but in such cases the supplier of the wire rope shall show, to the user, documentation which is supported by the rope-maker's technical file for the product, that clearly demonstrates that the product has acceptable strength and performance levels with respect to the design of mechanisms, application and maintenance of the appliance.

5 Duty conditions

The mechanisms of lifting appliances shall be classified according to the duty conditions laid down in ISO 4301-1.

6 Selection procedure

6.1 Calculation of C values

The value of the rope selection factor, C, is a function of the coefficient of utilization, Z_p, and is given by Equation (1):

$$C = \sqrt{\frac{Z_p}{K' \cdot R_o}} \tag{1}$$

where

C is the rope selection factor (minimum);

K' is the empirical factor for minimum breaking load of a given rope construction (see Table 3 of ISO 2408:1985 or as otherwise provided by the rope supplier);

R_o is the minimum tensile strength of the wire used in the rope, in newtons per square millimetre[1)];

Z_p is the minimum practical coefficient of utilization.

6.2 Z_p values

Table 1 gives the values of Z_p which shall be used for each classification group of mechanism in order to meet the minimum requirements of this part of ISO 4308. It also gives the calculated values of C corresponding to the rope type (6 × 36 WS - IWRC) with R_o = 1 770 N/mm^2 and with an empirical factor K' = 0,356.

Table 1 — Z_p values and C values (for R_o = 1 770 N/mm^2 and K' = 0,356)

Classification of mechanism	Z_p value	C value
M1	3,15	0,071
M2	3,35	0,073
M3	3,55	0,075
M4	4,0	0,080
M5	4,5	0,085
M6	5,6	0,094
M7	7,1	0,106
M8	9,0	0,120

NOTE Whilst Equation (1) shows the exact relationship between C and Z_p, the values shown in Table 1 have been corrected by rounding to three decimal places.

For ropes having a tensile strength R_o and an empirical factor K' different from those shown above, different values of C may be calculated using Equation (1) and substituted in Equation (2) indicated in 6.3.

1) 1 N/mm^2 = 10^6 N/m^2 = 1 MPa

6.3 Calculation of minimum rope diameter

The minimum diameter of the rope, d_{min}, in millimetres, is given by Equation (2):

$$d_{min} = C\sqrt{S} \tag{2}$$

where

d_{min} is the calculated minimum diameter of the rope, and is the value used in the selection process for calculating the drum and sheave diameters;

C is the rope selection factor;

S is the maximum rope tension, in newtons, obtained by taking into account the following factors:

— rated working load of the appliance;

— mass of the pulley block and/or other lifting attachments;

— mechanical advantage of reeving;

— efficiency of the rope reeving;

— the increase in force in the rope caused by the rope inclination at the upper extreme position of the hook, if the rope inclination with respect to the drum axis exceeds 22,5°.

The nominal diameter of the rope selected (d) shall be within the range: d_{min} to $d_{min} \times 1{,}25$.

6.4 Calculation of minimum breaking force

The minimum breaking force, F_{min}, in newtons, of the particular rope intended for use is given by Equation (3):

$$F_{min} = S \cdot Z_p \tag{3}$$

where

S is the maximum rope tension, in newtons, as established in 6.3;

Z_p is the minimum practical coefficient of utilization.

Examples of rope selection are given in Annex B.

7 Diameter of rope drums and sheaves

The minimum pitch circle diameter of the rope drums and rope sheaves shall be calculated using the minimum rope diameter established in 6.3 and by applying the respective values of h_1, h_2 as shown in Table 2 and the rope type factor t, as shown in Table 3, as applicable, and which relates to the classification of the mechanism, in Equations (4) and (5):

$$D_1 \geqslant h_1 \cdot t \cdot d_{\min} \tag{4}$$

or

$$D_2 \geqslant h_2 \cdot t \cdot d_{\min} \tag{5}$$

where

D_1 is the minimum pitch circle diameter of the drum;

D_2 is the minimum pitch circle diameter of the sheave;

$d_{\min}$ is the minimum diameter of the rope, calculated in accordance with 6.3;

h_1 is the selection factor for the drum (ratio of the pitch circle diameter of the drum to the calculated diameter of the rope);

h_2 is the selection factor for the sheave (ratio of the pitch circle diameter of the sheave to the calculated diameter of the rope);

t is the rope type factor in accordance with Table 3. The rope type factor takes into account the different bending fatigue performance of different types of rope.

Table 2 — Selection factors h_1 and h_2

Classification of mechanism	Drums h_1	Sheaves h_2
M1	11,2	12,5
M2	12,5	14,0
M3	14,0	16,0
M4	16,0	18,0
M5	18,0	20,0
M6	20,0	22,4
M7	22,4	25,0
M8	25,0	28,0

For hoists, the minimum pitch circle diameter of any compensating sheave shall be calculated in accordance with Annex D.