

Cranes and lifting appliances — Selection of wire ropes —

Part 1: General

ICS 53.020.30

National foreword

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- present to the responsible international/European committee any enquiries on the interpretation, or proposals for change, and keep the UK interests informed;
- monitor related international and European developments and promulgate them in the UK.

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Cranes and lifting appliances — Selection of wire ropes —

Part 1: General

Grues et appareils de levage — Choix des câbles —

Partie 1: Généralités



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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.

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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):

$$C = \sqrt{\frac{Z_p}{K' \cdot R_0}} \quad (1)$$

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_0 is the minimum tensile strength of the wire used in the rope, in newtons per square millimetre¹⁾;

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 $R_0 = 1\,770 \text{ N/mm}^2$ and with an empirical factor $K' = 0,356$.

Table 1 — Z_p values and C values (for $R_0 = 1\,770 \text{ N/mm}^2$ 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_0 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) $1 \text{ N/mm}^2 = 10^6 \text{ N/m}^2 = 1 \text{ MPa}$