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Cranes — Condition monitoring — **Part 1:** General

Appareils de levage à charge suspendue — Surveillance —
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.

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.

International Standard ISO 12482-1 was prepared by Technical Committee ISO/TC 96, *Cranes*, Subcommittee SC 5, *Use, operation and maintenance*.

ISO 12482 consists of the following parts, under the general title *Cranes* — *Condition monitoring*:

— Part 1: *General*

The following parts are planned for future publication:

— Part 2: *Mobile cranes*

— Part 3: *Tower cranes*

— Part 4: *Jib cranes*

— Part 5: *Overhead travelling and portal bridge cranes*

Annex A forms an integral part of this part of ISO 12482.

Introduction

The attention of users of ISO 12482 is drawn to the fact that no crane can be designed and built for infinite usage. All cranes have to work within the constraints of their intended use, and thus should undergo condition monitoring.

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Cranes — Condition monitoring —

Part 1: General

1 Scope

The purpose of this part of ISO 12482 is to:

- ensure that the design constraints of the intended use of a crane are clearly identified;
- define actions to be taken when the crane has been used over a period of time and has approached these constraints, to ensure a new safe working period.

A description is given of the special assessment required to monitor the condition of a crane.

2 Normative references

The following standards contain provisions which, through reference in this text, constitute provisions of this part of ISO 12482. At the time of publication, the editions indicated were valid. All standards are subject to revision, and parties to agreements based on this part of ISO 12482 are encouraged to investigate the possibility of applying the most recent editions of the standards indicated below. Members of IEC and ISO maintain registers of currently valid International Standards.

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

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

ISO 4306-2:1994, *Cranes — Vocabulary — Part 2: Mobile cranes*.

ISO 4306-3:1991, *Cranes — Vocabulary — Part 3: Tower cranes*.

ISO 9927-1:1994, *Cranes — Inspections — Part 1: General*.

3 Definitions

For the purposes of this part of ISO 12482, the definitions of crane types given in ISO 4306-1, ISO 4306-2 and ISO 4306-3, together with the following definitions, apply.

3.1 constraint: Boundary parameter used for assessment and identified in accordance with ISO 4301 for the usage intended.

3.2 special assessment (SA): Thorough examination and evaluation of the crane, to be made when the crane approaches the design constraints.

3.3 general overhaul (GO): All actions required after a special assessment, according to the assessment report recommendations, before further use of the crane.

3.4 safe working period (SWP): Period of time between two successive general overhauls.

3.5 serial hoist: Hoist, in accordance with ISO 4306-1:1990, subclause 4.7, which is designed and produced independently of a specific crane or application.

4 Special assessment

Cranes are inspected at intervals in accordance with ISO 9927-1. However when the crane approaches the

design constraints, a special assessment shall be made to monitor the condition of the crane.

The supplier of the crane shall ensure that criteria for when and how such an assessment shall be carried out (e.g. number of crane cycles, load spectrum, etc.) are provided to the user/owner.

The special assessment shall cover all parts of the crane in which deterioration may affect safe use, and should include the following main groups of parts:

- load-carrying structures;
- mechanical systems;
- hydraulic systems;
- pneumatic systems;
- electrical systems;
- safety systems.

The user/owner shall ensure that adequate records are maintained (see clause 8) to enable determination of the approach to the design constraints. During the regular inspections (see ISO 9927-1) these records shall be inspected to ensure that the special assessment is carried out at the appropriate time.

NOTE 1 It should be recognized that different parts of the crane may approach the design constraints at different times (e.g. the hoist mechanism before the travel motion system).

5 Responsibility for special assessment

The special assessment procedure, based upon the information provided by the supplier (see clause 7), shall be carried out under the supervision of the expert engineer (see ISO 9927-1). The expert engineer may seek the assistance of specialists in particular types of examination whenever necessary.

The results of the special assessment, together with any conclusions, requirements or recommendations, shall be contained in a report (see clause 9) to be given to the user/owner of the crane.

6 Responsibility of the user/owner

6.1 Duties of the user/owner

The user/owner shall ensure that:

- a) records are kept of the crane use, inspections and maintenance;

- b) the special assessment is carried out at the appropriate time;
- c) any general overhaul requirements given in the special assessment report are carried out before further use of the crane.

6.2 If criteria are not available

Where the user/owner does not have assessment criteria for a crane, the following shall be used to indicate when a special assessment shall be carried out:

- a) any increase in the frequency of reported defects;
- b) when the regular inspection (see ISO 9927-1) reveals a significant deterioration in the condition of the crane.

In no circumstances shall the special assessment be carried out later than the following number of years after manufacture for:

- tower cranes, loader cranes, mobile cranes: 10 years;
- all other cranes: 20 years.

7 Criteria for special assessment

The supplier shall ensure that, when providing criteria for special assessment of the crane, the following are included:

- a) number of load cycles or number of operating hours, as appropriate;
- b) distance travelled;
- c) load spectrum;
- d) exceptional circumstances to which the crane has been subjected (e.g. environmental, climatic or accident);
- e) list of parts and areas to be critically assessed;
- f) methods of assessment (measurement, nondestructive testing, acoustic emission, etc.);
- g) acceptance criteria.

The criteria shall take into account crane usage. Suppliers therefore should not give criteria based purely on time elapsed.

Provisions for determining and assessing design constraints for serial hoists are given in annex A.

8 User/owner records

8.1 Contents of records

The crane user/owner shall keep records of the crane usage adequate to identify the criteria given by the crane supplier. Records shall also be kept of maintenance, inspections and unusual occurrences (e.g. unexpected loads from operational error, extreme climatic conditions, etc.), breakdowns, repairs and modifications.

8.2 If records are not available

Where complete records are not available for the history of the crane, it shall be inspected in accordance with annex A of ISO 9927-1:1994 and any requirements as a result of that inspection shall be carried out before further use of the crane.

A special assessment shall be carried out within 12 months of the date of that inspection, or of an earlier

date if specified by the person carrying out the inspection.

9 Special assessment report

A report, containing the following, shall be prepared by the expert engineer carrying out the special assessment of the crane:

- a) names and qualification of all persons participating in the assessment;
- b) identification of the criteria used for the assessment;
- c) results of the special assessment;
- d) requirements for any action (GO) to be taken before further use of the crane;
- e) recommendations for actions to be carried out within a given time period;
- f) criteria for next assessment.

NOTE 2 Items d) and e) should comply with the manufacturer's recommendations.

Annex A

(normative)

Provisions for assessing serial hoists

Many elements in a serial hoist are not accessible at the prescribed inspections. Therefore this annex makes provisions for the assessment of serial hoists.

A.1 Classification for design constraints

In order to match serial hoists as far as possible to the actual working conditions, they are classified into groups of mechanisms as a whole, in accordance with ISO 4301-1.

Assuming given load cycles (with given relationships of distance of travel, positioning, hoisting grounded load, etc.) according to ISO 4301-1 and load spectrum, the classification results in the design constraints, D , given in table A.1.

The design constraints are expressed as hours that the serial hoist is in motion.

Figure A.1 illustrates the operation of a serial hoist in accordance with this part of ISO 12482.

A.2 Design constraints

Anyone offering a serial hoist for use (manufacturer, supplier, importer, etc.) shall document the design constraints D , in hours, in the operating instructions and also the working conditions on which these are based. The working conditions can be stated by specifying the group classification of the mechanism (ISO 4301-1) or by specifying the load spectrum factor, K_m , of the load spectrum.

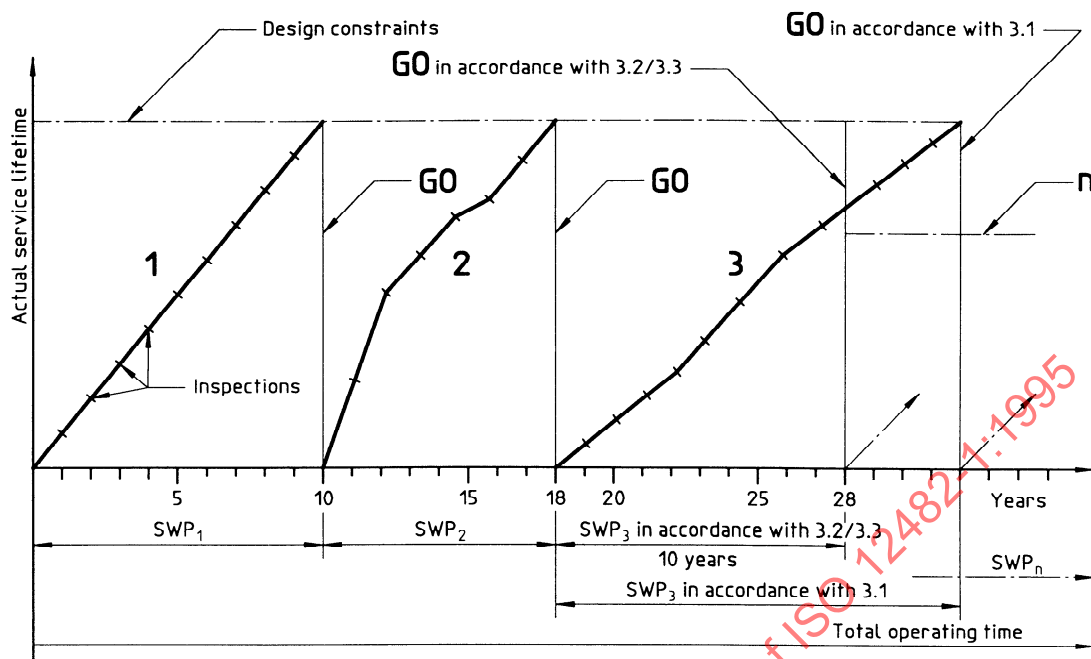
The calculations given in A.4.2 and A.4.3 are based on a comparison of the actual service lifetime and the design constraints D for state of loading 4, "very heavy" ($K_m = 1$) according to table A.1.

A.3 Recording working conditions

The working conditions shall be recorded in one (or more) of three ways (see A.3.1 to A.3.3). The user/owner is responsible for the correctness of recording and documentation in the log-book. Documentation shall be carried out at least once a year during the regular inspections (see ISO 9927-1).

Table A.1 — Design constraints for serial hoists

State of loading	Load spectrum factor, K_m	Design constraint, D h							
		Group classification of mechanism as a whole (ISO 4301-1)							
		M1	M2	M3	M4	M5	M6	M7	M8
1 — Light	$< 0,125$	800	1 600	3 200	6 300	12 500	25 000	50 000	100 000
2 — Moderate	$0,125 < K_m \leq 0,25$	400	800	1 600	3 200	6 300	12 500	25 000	50 000
3 — Heavy	$0,25 < K_m \leq 0,5$	200	400	800	1 600	3 200	6 300	12 500	25 000
4 — Very heavy	$0,5 < K_m \leq 1$	100	200	400	800	1 600	3 200	6 300	12 500



Key

- GO General overhaul
- 1 Period of operation according to classification
- 2 Period of variable operation (heavier load)
- 3 Period of variable operation (lighter load)
- n New design constraints (after GO), which may be lower than the previous ones and shall be specified by the manufacturer

Figure A.1 — Design constraints and safe working periods (SWPs)

A.3.1 Instrument recording

The working conditions and working hours are recorded by special instruments. The actual service lifetime is obtained by evaluating the data collected.

A.3.2 Log-book documentation together with suitable counters

The actual load spectrum factor K_m and the effective operating hours t_i are documented by the user/owner of the serial hoist. The serial hoist is equipped with a suitable counter (for time or distance) which allows the effective operating hours t_i to be calculated. The serial hoist shall also be equipped with a rated capacity limiter.

A.3.3 Log-book documentation without counters

The actual load spectrum factor K_m and the effective operating hours t_i are documented by the user/owner of the serial hoist.

A.4 Reaching design constraints

At each inspection, the competent person responsible for carrying out inspection shall check whether the design constraints have been reached. Depending on the method of recording, the design constraints are considered to have been reached as follows.

A.4.1 When recording by instrument

When the recording instrument indicates that the design constraints have been reached.

A.4.2 When recording by documentation (with counters)