INTERNATIONAL **STANDARD**

ISO 9927-3

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Cranes — Inspections — Part 3:
Tower cranes

Appareils de levage à charge suspend
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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 9927-3 was prepared by Technical Committee ISO/TC 96, Cranes, Subcommittee SC 7, Tower cranes.

a de Cran de Cran Click to view the STANDARDSISO. COM. Click to view the STANDARDSISO. ISO 9927 consists of the following parts, under the general title Cranes – Inspections:

- Part 1: General
- Part 3: Tower cranes

Cranes — Inspections —

Part 3:

Tower cranes

1 Scope

This part of ISO 9927 specifies the regular inspections to be carried out on tower granes. It is intended to be used in conjunction with ISO 9927-1. It does not cover inspection prior to the first use of a tower crane.

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 4309, Cranes — Wire ropes — Care, maintenance, installation, examination and discard

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

3 General

In order to ensure safe operation of tower cranes, their proper working and operational condition shall be maintained. Therefore, all cranes need to undergo regular inspections. This ensures that deviations from safe conditions are detected and can be rectified. The inspections shall be arranged by the user.

The regular inspections are

- daily inspections
- frequent inspections
- periodic inspections, and
- thorough inspections.

NOTE The manufacturer can give inspection instructions that differ from those of this part of ISO 9927. In this case, it is the manufacturer's instructions that are applicable.

Annex A gives an overview of the inspections (periodicity, content, persons in charge, results and reports).

Daily inspections

General 4.1

Daily inspection shall be performed before starting. This inspection shall consist of a visual inspection (in general, no dismantling is required) and functional tests as defined hereafter.

They shall be carried out by a competent person (e.g. the crane driver).

4.2 Content

The inspections before each start shall take in

- 509921.3:2005 the functioning of mechanisms, in particular the brakes (generally without load), a)
- the functioning of limiting and indicating devices, and b)
- observation of conspicuous defects, including ropes.

4.3 Results

Any defect shall be pointed out to a person who can take a suitable decision to leave the tower crane in use, repair, thorough inspection of a part of the tower crane or the whole tower crane, limitation of use).

The causes of these defects shall be sought, depending on the type of component and defect concerned.

The record book shall be updated (date of the repair, method).

Frequent inspections

General

Click to view Frequent inspections shall comprise visual inspections (in general, no dismantling is required), as specified in 5.2, and the functional tests according to 4.2.

They shall be carried out by a competent person (e.g. an experienced technician, see ISO 9927-1).

Items to be inspected 5.2

The following items shall be inspected.

- Level of lubricants, leakage of lubricants, greasing. a)
- b) Hydraulic equipment: leakage.
- Hooks and latches: visible deformation, cracks, wear. C)
- Wire ropes: in accordance with ISO 4309. d)
- Connections, joints: corrosion, visual inspection. e)
- f) Break wear: thickness of brake linings, adjustment, noise, etc.
- Hydraulic and pneumatic hoses: in particular those which are bent during operations. g)
- Electrical installation: state, signs of deterioration, moisture accumulation. h)
- i) Anchorage: braces or guys supporting cranes (condition).

5.3 Periodicity

The periodicity of the frequent inspections shall take into account the actual use of the tower crane and the environment in which the tower crane is working.

The minimum periodicity is as follows:

- a) for 5.2 a) to 5.2 e), monthly;
- b) for 5.2 f) to 5.2 i), twice yearly.

5.4 Results

Any defect shall be pointed out to a person who can take a suitable decision (to leave the tower crane in use, repair, thorough inspection of a part of the tower crane or the whole tower crane, limitation of use).

The causes of these defects shall be sought, depending on the type of component and defect concerned.

The record book shall be updated (date of the repair, method).

6 Periodic inspections

6.1 General

Periodic inspections are inspections made periodically, as indicated in 6.3, and after each re-erection.

Periodic inspections shall comprise visual inspections (in general, no dismantling is required), and functional tests, both with and without load, as defined below.

They shall be carried out by a competent person (e.g. an experienced technician, see ISO 9927-1).

The competent person shall be in possession of

- the report of the previous inspections, and
- the automatic registered data, where available, (cycles, hours, days, loads, etc.) permitting knowledge of the service time of the components for which data exist.

6.2 Content

The periodic inspections shall include the content of the frequent inspections.

The functional tests for all components shall be performed in the most unfavourable position for these components.

- a) Verification of the tower crane's identification and plates.
- b) Verification of the presence of the instruction handbook.
- c) Verification of the records of maintenance.
- d) Verification of the components, equipment and steel structure. Compare the component installed on the tower crane with the component listed in the documentation.
- e) Consideration of the condition of equipment indicating its deterioration:
 - the gear or its components are loose and its oil (lubricant) leaks;
 - visible couplings between particular components (e.g. motor, gear, brakes, drums) show wear or damage;

ISO 9927-3:2005(E)

 unusual noise and vibration is noticeable; unusual high temperature is noticeable; fastening bolts are loose, fissured or defective; brake linings are worn or damaged; the general condition (corrosion, dirt) is doubtful; Tick to view the full PDF of IsO 9921.3:2005 the electrical installation (cable entries, cable attachments) shows damage; — wire ropes (see ISO 4309); hooks (see Annex B). Functional tests. Functioning and efficiency, with the rated load of mechanisms, in particular the brakes, and limiting and indicating devices. Steel structure and rails: — welding; — corrosion; remaining deformation; cracks.

Periodicity

h) Support of the tower crane/crane-track.

For an example, see ISO 9927-1:1997, Annex A

f)

Tower cranes shall be inspected at least each year and after each re-erection.

NOTE 1 Some verifications can be performed when the tower crane is dismantled.

Changing of the pulley block or addition of a jib extension or tower section are not considered as dismantling NOTE 2 and re-erection.

After folding and unfolding of a self-erecting tower crane, there is need only for an inspection limited to b), c), NOTE 3 f), g) and h) of 6.2

Results 6.4

Periodic inspections shall be recorded. This report shall indicate the components verified and remaining defects. An example of such a report is presented in Annex C.

The report shall be given to a person who can take a suitable decision (to leave the tower crane in use, repair, thorough inspection of a part of the tower crane or the whole tower crane, limitation of use).

The causes of these defects shall be sought, depending on the type of component and defect concerned.

The record book shall be updated (date of the repair, type, etc.).

7 Thorough inspections

7.1 General

Thorough inspections are detailed inspections made with a periodicity according to 7.3 (and as identified in Annex A).

They shall be performed by a competent person, capable of defining the actions needed to be taken depending on the results of these inspections (e.g. an expert engineer, see ISO 9927-1).

The competent person shall be in possession of

- the report of the previous inspections, and
- the automatic registered data, where available, (cycles, hours, days, loads, etc.) permitting knowledge of the service time of the different components for which data exist.

7.2 Content

The thorough inspections shall comprise at least all the elements of the periodic inspections.

A thorough inspection can require non-destructive tests and/or dismanting if considered justified, taking into account

- the content of the previous verifications (daily, frequent, periodic or thorough),
- the results of the current tests, and
- the result of the current visual checks.

When dismantling, special care shall be taken in order to avoid mistakes or wrong operation while following the maintenance instructions. If these are not available, the manufacturer of the tower crane or of the component concerned should be contacted for assistance.

During the thorough inspection, particular attention shall be given to the following:

- vibration;
- unusual noise or temperature;
- poor general condition, corrosion;
- alignment of machinery, motors and gears, rails, wheels, shafts;
- brakes;
- connections, bolts, pins.

7.3 Periodicity

7.3.1 Periodicity for tower cranes or components for tower cranes with no automatic registration on use

Thorough inspection of a component or the tower crane is recommended at periodic intervals, as follows:

- 4 years;
- 8 years;
- 10 years;

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12 years;
 14 years;
 every year after 14 years.

7.3.2 Periodicity for tower cranes or components for tower cranes with automatic registration of data on use

The instruction handbook should contain the periodicity of the thorough inspection of the crane and of the corresponding components based on the registered data, at least at the intervals given in 7.3.1.

In addition to the periodicity, the manufacturer should give guidance to reinitialise the value of the parameter (return to zero, keep the value as new origin, etc.).

7.4 Results

The report of the thorough inspection shall contain the result of the inspection made by the competent person as well as his conclusions and recommendations, including the time until the next thorough inspection.

An example of such a report is given in Annex C.

When the tower crane or a component is not used as classified or is in a condition which seems to be hazardous, the competent person (see 7.1) will recommend appropriate action.

The causes of defects shall be sought, depending on the type of component and defect concerned.

The record book shall be updated (date of the repair, type, etc.).

8 Exceptional inspection

8.1 General

The inspection shall be carried out after

- a) exceptional circumstances, such as
 - extreme weather conditions (storm),
 - an earthquake of medium seismic intensity,
 - overload, collision or foundation disturbance,
- b) after substantial modification, for example, increase of rated capacity, change of mechanisms, transfer of control station, change of power, change in design of the load-bearing structure, welding on the loadbearing structure, modification of control system or change in operating condition relative to the class of utilisation and load spectrum.

The verifications shall be performed by a competent person (experienced technician or engineer, depending on the nature of the verification).

8.2 Content

The extent of the inspection shall be proportional to any damage or modification that may have occurred.

Annex A (normative)

Overview of inspections

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	Daily inspection	Frequent inspection	Periodic inspection	Thorough inspection
When (periodicity)	— Before each start up of the tower crane tower crane	— Monthly or every six months and/or according to the manufacturer's	 At a determined period (legal, given by the manufacturer or recommendation) After dismantling/re-erection 	 After finding a fundamental failure At a determined period, either legal, given by the manufacturer, or given by recommendation following report (frequent or periodic inspection) As recommended in 7.3
What (content)	See 4.2	OSee 5.2	See 6.2	See 7.2
Ном	Visual inspectionsFunctional testsWithout dismantling	Visual inspections Functional tests Without dismantling	 Visual inspections, including reading of recording instruments Functional tests (loaded and unloaded) Without dismantling, if not otherwise required by the manufacturer. 	— Same as for the periodic inspection If necessary, with dismantling or measurement (play) or specific tests on all or part of the tower crane
By whom	Competent person (e.g. crane driver)	Competent person (experienced technician)	Competent person (experienced technician)	Competent person (engineer)
Inspection results	 OK, or request for repair if fault found, or can give rise to a request for a thorough inspection (repetitive cases, major fault, etc.), or can give rise to a request for adequate information (e.g. driving, instructions, limit of use, etc.) 	 OK or, request for repair if fault found or, can give rise to a request for a thorough inspection (repetitive cases, major fault, etc.), or can give rise to a request for a adequate information (driving, instructions, limit of use, etc.) 	— OK, or request for repair if fault found, or a thorough inspection (repetitive cases, major fault, etc.), or a adequate information (driving, instructions, limit of use, etc.)	 Date of the next inspection Partial or total changes ^a, or scrapping, or request for repair, or can give rise to a request for a adequate information (driving, instructions, limit of use, etc.)

9

		11.0		
	Daily inspection	Frequent inspection	Periodic inspection	Thorough inspection
Report	Not systematic	Not systematic Michigan Not systematic Michigan Not systematic Michigan Not systematic Michigan Not systematic	The report shall include a check list of the points checked and a summary of the detected defects.	The report shall include a check list of the points checked and a summary of the detected defects.
Maintenance book	Updating of maintenance book if repair is involved	Updating of maintenance book with Chadating of maintenance book with reports on maintenance work, defects, reports on maintenance work, defects, damages, repairs, etc.	Updating of maintenance book with reports on maintenance work, defects, damages, repairs, etc.	Updating of maintenance book with reports on maintenance work, defects, damages, repairs, etc.
a Systematic ch	nanges of certain parts can be recommenc	Systematic changes of certain parts can be recommended by the manufacturer or by way of recommendations.	endations.	

Annex B

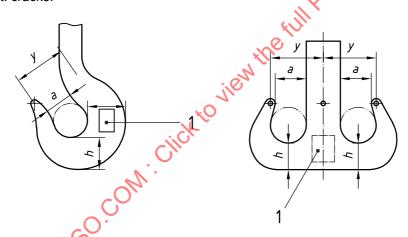
(informative)

Verification of hooks

This annex gives an example for the verification of hooks.

To apply the following method, the initial dimensions of the hooks need to be known. They are available from the manufacturer of the tower crane or of the hook.

- Deformation: if the openings a and y (see Figure B.1) have widened by more than 10 %, which is the maximum permissible limit, replace the load hook.
- Surface fissures: damage and surface fissures may be removed notchless, provided that the permissible tolerance levels are not exceeded.
- Wear: on single or twin hooks, it shall not be greater than 5 % of height h (see Figure B.1). It is not permitted to carry out welding work on load hooks, e.g. to compensate for wear.
- Hook neck shaft: cracks.



Key

1 marking

Figure B.1 — Shape and dimensions of hooks

Reference values for a, h and y are to be taken from the instruction manual. If they are not available, the manufacturer of the tower crane or of the hook shall be contacted.

Annex C (informative)

Example of report for periodic, thorough or exceptional inspections

Company:	Date:
Crane type:	Serial No.:
Manufacturer:	Year of construction:
Address of customer/hirer:	3.1.
Construction site:	Stock number:
Person undertaking the inspection:	Signature:
Inspection observations:	and the second s
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SISO	
RDS	
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Person undertaking the inspection: Inspection observations: STANDARDS SO. OM. Click to Viscon Standard Standa	

No.	Subassembly	Part to be checked	Existing or	Condition or	Function	Repair or		Re-exa	Re-examination
	•		complete	maintenance		replacement	ļ	Necessary	Carried out
	STA		+	+	+	+	Yes	N 8	Date/ Signature
1	Crane document	Grane book							
		Instruction handbook							
		Spare parts lists							
		8							
). (
2	Rail track/area for the erection	Substructure horizontal							
		Substructure able to take the loads							
		Length of sleepers							
		Condition of sleepers	'C						
		Distance of sleepers	101						
		Gauge	N. N						
		Inner radius of curved rail	(O)	×					
		Rail dimensions							
		Rail fixings		Ó					
		Rail joints/joint plates		Ó					
		Running-up key for travelling limiter			,s ⁰				
		Travel limits			60,				
					2				
						ر. ر:			
Notation:	+ met - not met	O not necessary				200			
						b			

			Q _G							
No.	Sut	Subassembly	Part to be checked	Existing or	Condition or	Function	Repair or		Re-examination	nation
). C	complete	maintenance		replacement	Necessary		Carried out
			9	+	+	+	+	Yes	N _O	Date/ Signature
ဇ	Signs / safety distances		Type plate							
			Signs							
			Warning signs	70						
			Safety distances	(0)						
			to	14%						
			to	Ø `	Ę,					
			to							
			to		Ó					
			Barriers		Ó					
						C				
						0				
Notation:	+ met	not met	O not necessary			600				

	o,						_	
No.	Subassembly	Part to be checked	Existing or	Condition or	Function	Repair or		Re-examination
				maintenance		replacement	Necessary	/ Carried out
		ARK	+	+	+	+	Yes No	Date/ Signature
4	Undercarriage or portal	Free of cracks						
		Outrigger arm support						
		Outrigger arm lock						
		Rail wheels						
		Wheel flanges						
		Travelling gears						
		Travelling brakes (travelling test)	×O					
		Guarding of danger spots	jie					
		Devices to limit fall due to wheel failure	NIK					
		Rail clamps	υ ⁻	براز				
		Track clearer		, O				
		Supporting devices		√				
		Transport safety retainer removed		O [*]				
					(S)			
					6			
Notation:	+ met - not met	O not necessary			Si.	A		
						3.2005		

No.	Subassembly	Part to be checked	Existing or	Condition or	Function	Repair or		Re-exan	Re-examination
	S		complete	maintenance		replacement		Necessary	Carried out
	, K		+	+	+	+	Yes	o Z	Date/ Signature
2	Slewing gear	Clearance of the slewing ring							
		Fastening of the slewing ring							
		Test run of the slewing ring							
		Slewing gear pinion							
		Fastening of the gear O							
		Slewing gear brake							
		Free jib slewing							
		Guarding of danger spots							
			jie						
9	Hoisting winch	Coupling	, di						
		Changing gear							
		Interlock of changing gear							
		Rope drum mounting		N.					
		Fastening of the hoisting winch		%					
		Clearance of brake linings		6	, S				
		Brake disk			S				
		Brake release unit			0				
		Springs			3				
		Brake test				.5.			
		Lowering without power				2.			
		Rope fastening				9 5			
		2 safety turns)			
Notation:	+ met - not met	O not necessary							

Function	maintenance replacement Necessary Carried out	- + - + - Yes No Date/ Signature															ું જે	C
Existing or Cond		+ + + +							0,	(8)	4%	E S						
Part to be checked		ARC	Coupling	Changing gear	Interlock of changing gear,	Rope drum mounting 79.	Fastening of the luffing winch	Clearance of brake linings	Brake disk	Brake release unit	Springs	Brake test	Lowering without power	Rope fastening	2 safety turns		O not necessary	
Subassembly	*		1														- not met	
Sub			Luffing gear														+ met	
, O			7														Notation:	

		~										
No.	gnS	Subassembly	Part to be checked	Existing or	Condition or	on or	Function		Repair or		Re-examination	ination
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				+	+	I	+	+	-	Yes	No	Date/ Signature
8	Auxiliary hα	Auxiliary hoisting winch	Coupling Coupling									
			Changing gear									
			Interlock of changing gear									
			Rope drum mounting									
			Fastening of the auxiliary winch	, O								
			Clearance of brake linings	je								
			Brake disk	147								
			Brake release unit	N.	\(\)							
			Springs									
			Brake test			K						
			Lowering without power			Ó						
			Rope fastening				S					
			2 safety turns				9					
							2	o.				
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Notation:	+ met	not met	O not necessary						200			
									(2)			

maintenance replacement + - + - + + - + + - + - + + + + + + + + + + + + + + + + +	No.	qns	Subassembly	Part to be checked	Existing or	Condition or	Function	Repair or	ř	Re-exa	Re-examination
Trolley travelling mechanism Repelpuleys Wheel flanges / guides rollers Trolleys travelling limiter Coupling Goupling Fastening of the trolley Javelling Juns Repe fastenings Coupling Fastening of the maintenance cage Limit stops 2 safety turns Fetch back of the maintenance cage Coupling Fred ballast Loose ballast (weight) Fred ballast weight) Fred ballast moving Secured against falling down Slinging points + met - not met O not necessary					complete	maintenance		replaceme		Necessary	Carried out
Trolley travelling mechanism Rope pouleys Wheel flanges / gu Trolleys travelling Coupling Coupling Coupling Fastening of the tridrum Rope fastenings Limit stops 2 safety turns Fetch back of the Fixed ballast (weight the second against fastening to the trived against fastening to the trived against fastening points + met - not met O not neces			STA	6						oN se	Date/ Signature
Mechanism Rope polleys Wheel flanges / gu Wheel flanges / gu Trolleys travelling Coupling Fastening of the tridrum Rope fastenings Limit stops 2 safety turns Fetch back of the Etch back of the Etc	6	Trolley trav	/elling	Rail wheels							
Wheel flanges / gu Trolleys travelling Coupling Coupling Fastening of the tr drum Rope fastenings Limit stops 2 safety turns Fetch back of the Eatlast Loose ballast (weig Secured against in Secured against in Secured against if Slinging points + met - not met O not neces		mechanisn	C	Rope pulleys							
Trolleys travelling Coupling Fastening of the transmorth of tran				Wheel flanges / guides rollers							
Ballast Ballast Ballast Loose ballast (weigner for the form of the trans of the trans of the form of				Trolleys travelling limiter							
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Ballast Ballast Loose ballast (weight weight weight) Ballast Loose ballast (weight) Ballast Conse ballast (weight) Ballast Conse ballast (weight) Ballast Conse ballast (weight) Ballast Conserved against fart Secured against fart Secured against fart Secured against fart Conserved against fart Ballast Conserved against fart Conserved against fart Ballast Conserved against fart Conserved a				Rope fastenings							
Ballast Loose ballast (weight weight				Limit stops							
Ballast Loose ballast (weigner) Fixed ballast (weigner) Secured against in Secured against in Secured against in Secured against in the contract of the contract in the contract of the contract in the cont				2 safety turns),						
Ballast + met - not met					ile						
Ballast + met - not met					N. N						
Ballast + met - not met					O,	×					
+ met - not met	10	Ballast		Ballast							
+ met - not met				Loose ballast (weight)		20					
+ met - not met				Fixed ballast (weight)		, C					
+ met - not met				Secured against moving		S	0.				
Slinging + met - not met O				Secured against falling down			JO ₂				
+ met - not met O				Slinging points			S				
+ met - not met O								C			
+ met - not met O								.? .?			
	Notation:	+ met						905			

	•							
No.	Subassembly	Part to be checked	Existing or	Condition or	Function	Repair or	Re-ex	Re-examination
		30	сощріете	maintenance	-	replacement	Necessary	Carried out
			+	+	+	+	Yes No	Date/ Signature
11	Tower construction	Welds free of cracks						
		Corner posts						
		Diagonals						
		Bolt connections						
		Pin connections	~C					
		Tower joints	J.					
			7/2					
			ne					
12	Jib construction	Welds free of cracks						
		Upper and lower chords		\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\				
		Diagonals		%				
		Bolt connections		Ś				
		Pin connections			Co			
		Jib joints			9			
					2			
						رج. ر		
Notation:	+ met - not met	O not necessary				000		
						0		

	Subassembly \mathcal{O}_{λ}	Part to be checked	Existing or	Condition or	on or	Function		Repair or	ш	Re-exan	Re-examination
	ζ,	20	complete	maintenance	ance		rep	replacement	Nece	Necessary	Carried out
		DAR	+	+	ı	+	+	I	Yes	o N	Date/ Signature
13	Counter-jib	Welds free of cracks									
		Counter-jib chords / girder									
		Diagonals									
		Bolt connections									
		Pin connections									
		Counter-jib joints									
		<i>y</i>	s. (
			, i								
14	Access, walkways,	Ladders	en en								
	plattorms	Hoop guards	in								
		Personal protective equipment against falls from a height	ک ` -	الرع							
		Walkways		\$	~						
		Platforms			, C						
		Safety device against falling down				,C					
						O					
						30	C				
Notation:	+ met - not met	O not necessary					100				
							.J.	2			