POTAIN®
by Manitowoc

Slewing ring bolts and screws
Service Guide

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Manitowoc®

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1 Maintenance - Slewing ring bolts and screws - General notes

1.1 Foreword

This document presents all the general and specific instructions for the maintenance of the slewing ring bolts and screws for **POTAIN** tower cranes.

It consists of four chapters:

- The chapter **Slewing ring bolts and screws - General notes** contains the general information valid for all maintenance tasks on the slewing ring bolts and screws.
- The chapter **Slewing ring bolts and screws - Angle tightening** ➠ page 2-1 contains the specific maintenance instructions for cranes equipped with slewing ring bolts and screws tightened using angle control.
- The chapter **Slewing ring bolts and screws - Tightening with hydraulic tensioner** ➠ page 3-1 contains the specific maintenance instructions for cranes equipped with slewing ring bolts and screws tightened using a hydraulic tensioner.
- The chapter **Slewing ring bolts and screws - Torque tightening** ➠ page 4-1 contains the specific maintenance instructions for cranes equipped with slewing ring bolts and screws tightened using torque control.

Color bars are present on the edge of the pages in this document to facilitate navigation between different chapters. Each chapter has a specific color:

- Red bar : **Slewing ring bolts and screws - General notes**
- Green bar : **Slewing ring bolts and screws - Angle tightening**
- Blue bar : **Slewing ring bolts and screws - Tightening with hydraulic tensioner**
- Orange bar : **Slewing ring bolts and screws - Torque tightening**

Note
An identification table guides the technician to the chapter that corresponds to the model of the crane requiring maintenance. ➠ page 1-5

This service guide describes all the rules for checking and inspecting the slewing ring bolts and screws and the instructions for replacing the slewing ring bolts and screws. In particular, this document contains:

- The interval times for periodic checks.
- The interval times for systematic replacements.
- The means for identifying the slewing ring bolts.
- The procedures for checking the slewing ring bolts.
- Instructions when replacing the slewing ring bolts.

Note
The term **"slewing ring bolt"** used in this document refers to both the slewing ring bolts and the slewing ring screws.

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WARNING
Risk of serious accident and damage to equipment

Only one type of bolt is permitted, according to the crane model in question. The method of tightening or checking suitable for the bolt type must be strictly applied.

► Carefully follow the instructions provided.

1.2 Identification of the slewing ring bolts and associated tightening procedure

Depending on the crane model, different types of bolts can be encountered.

The slewing ring bolts have a marking on the bolt head, on one side of the nut, and on one side of the washer(s).

The slewing ring studs have a marking on the stud head.

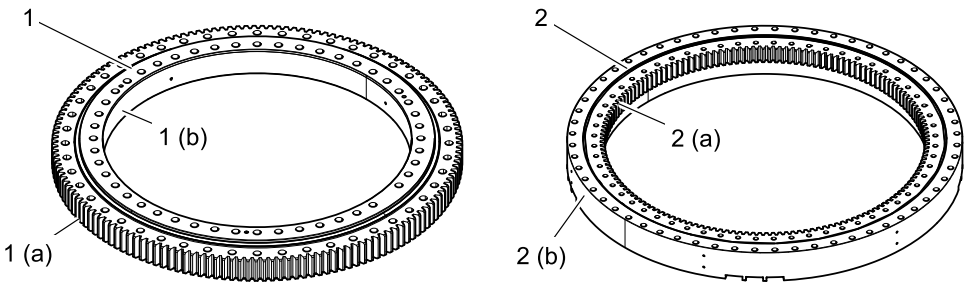
WARNING
Risk of serious accident and damage to equipment

Only one type of bolt is permitted, according to the crane model in question. The method of tightening or checking suitable for the bolt type must be strictly applied.

► Carefully follow the instructions provided.

1.3 Slewing ring

1.3.1 Overview



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1 Slewing ring with external teeth
1(a) Fixed ring
1(b) Rotating ring

2 Slewing ring with internal teeth
2(a) Fixed ring
2(b) Rotating ring

1.3.2 Description

There are two types of slewing ring:

1. Slewing rings with external teeth.
2. Slewing rings with internal teeth.

Whether the teeth are external or internal, a slewing ring is always made up of two rings:

1. A fixed ring:
   - The fixed ring is always the one that supports the teeth.
   - The fixed ring is the part of the slewing ring that is fixed to the fixed towerhead or chassis of the crane.
2. A rotating ring:
   - The rotating ring is the one that does not have teeth.
   - The rotating ring is the part of the slewing ring that is fixed to the slewing tower-head or slewing platform of the crane.

1.3.3 Slewing ring assembly

The slewing rings are assembled by means of high-strength prestressed bolts (screws or studs, nuts, washers) designed to resist significant stresses.

They are prestressed in order to reduce the amplitude of the alternating stresses to which they are subjected in order to increase their fatigue strength.

Three techniques can be utilized to obtain this prestress:

- Tightening by means of a torque wrench according to a defined tightening torque,
- Tightening by means of a specific tool or possibly a torque wrench according to a defined rotation angle,
- Direct tightening of the bolt by means of a hydraulic tensioner.

The choice of suitable tightening means depends on the machine type and the bolt type.

WARNING
Risk of serious accident and damage to equipment

If the slewing ring bolts or studs break, the crane could fall.

- ► Periodically check to make sure the slewing ring bolts are tightened correctly and systematically replace them according to the maintenance plan.
- ► Never reuse damaged bolts.
- ► Never use even slightly rusty bolts.
- ► Never use bolts other than those recommended by the manufacturer.
- ► Never grease screws, nuts or their bearing surface before assembling.
- ► Check the calibration of the tools used to check for tightening.
- ► In the event of a breakage of a bolt, immediately stop the machine, then replace the bolt according to the instructions in the specific chapters.

1.4 Tools and accessories

On some crane models, work on the slewing ring bolts requires the use of an access platform. The crane models concerned as well as the reference numbers for these platforms are detailed in the specific chapters.

Note
For more information and to order the platform for your crane model, contact your **'Crane Care'** agent.

The reference numbers of the specific tools (hydraulic torque wrench, hydraulic tensioner, etc.) required for work on the slewing ring bolts are given at the beginning of the procedure in the corresponding chapters.

1.5 Technicians

The different steps for placing the platform and checking the slewing ring bolts require two technicians.

1.6 Maintenance schedule by tightening type

Note
Before each erection of the crane, if the next time for checking the tightening of the bolts is less than one year away, it is strongly recommended to check the tightening of the slewing ring bolts again.

Note
All of the checking and maintenance operations must be recorded in the crane maintenance logbook.

Tightening type	Interval	Type of maintenance action
Angle tightening	Before each erection of the crane	Checking visually and by touch
	500 hours or 3 months	Checking visually and by touch
	4000 hours or 2 years	Torque check
	Every 12 years	Systematic replacement of all of the slewing ring bolts.
Tightening with hydraulic tensioner	Before each erection of the crane	Checking visually and by touch **Note** Dismantled crane: towerhead on ground
	500 hours or 3 months	Checking visually and by touch
	4000 hours or 2 years	Torque check
	Every 12 years	Systematic replacement of all of the slewing ring bolts. **Note** Dismantled crane: towerhead on ground

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Tightening type	Interval	Type of maintenance action
Torque tightening	Before each erection of the crane	Checking visually and by touch **Note** Dismantled crane: towerhead on ground
	500 hours or 3 months	Checking visually and by touch
	4000 hours or 2 years	Torque check
	Every 8 years	Systematic replacement of all of the slewing ring bolts. **Note** Dismantled crane: towerhead on ground

1.7 Chapter identification tables

Note
The following tables identify the chapter to be used for maintenance according to the crane range and the type of tightening.

Note
For cranes not mentioned in the tables below: Consult your **Manitowoc Crane Care** agent.

Note
To determine the diameter of the screw bolts, please refer to the "Spare parts" manual for your crane.

Range Igo

Range	Tightening type	Chapter
Igo Igo M Igo MA	Angle	2

Range Hup

Range	Tightening type	Chapter
Hup Hup C Hup M	Angle	2

Range Igo T

Range	Tightening type	Chapter
Igo T	Angle	2

Range GTMR

Range	Tightening type	Chapter
GTMR	Angle	2

Range HD

Range	Tightening type	Chapter
HD	**Note** Contact your **Manitowoc Crane Care** agent.	

Range HDT

Range	Tightening type	Chapter
HDT	Angle	2

Range MC

Range	Tightening type	Chapter
MC	With hydraulic tensioner	3

Range MCH

Range	Tightening type	Chapter
MCH	With hydraulic tensioner	3

Range MCR

Range	Tightening type	Chapter
MCR	With hydraulic tensioner	3

Range MCT Europe

Range	Tightening type	Chapter
MCT 68 MCT 88	With hydraulic tensioner	3

Range MCT Asia

Range	Tightening type	Chapter
MCT 80 to MCT 560 MCT 205 to MCT 565 MCT 85 With slewing ring bolts reference: E-60327-20 **Note** Refer to the spare parts manual for the reference of the slewing ring bolts	With hydraulic tensioner	3
MCT 85 With slewing ring bolts reference: G-18338-65 **Note** Refer to the spare parts manual for the reference of the slewing ring bolts	With torque	4

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Range MDT City

Range	Tightening type	Chapter
MDT 98 to MDT 218 MDT 109 to MDT 219 **Note** Only the cranes MDT XX8 and MDT XX9 are concerned	With hydraulic tensioner	3

Range MDT

Range	Tightening type	Chapter
MDT 248 to MDT 368 MDT 249 to MDT 809 **Note** Only the cranes MDT XX8 and MDT XX9 are concerned	With hydraulic tensioner	3
MDT 132 to MDT 412 **Note** Only the cranes MDT XX2 are concerned	With torque	4

Range MD

Range	Tightening type	Chapter
MD 509	With hydraulic tensioner	3
MD 559 MD 569 MD 689	With torque	4

Range MRH

Range	Tightening type	Chapter
MRH	With hydraulic tensioner	3

Range MR

Range	Tightening type	Chapter
MR 90 MR 160 MR 225 MR 295 MR 298	With hydraulic tensioner	3
MR 405 MR 418 MR 605 MR 608 MR 615 MR 618	With torque	4

Range MD Maxi

Range	Tightening type	Chapter
MD MAXI	**Note** Contact your **Manitowoc Crane Care** agent.	

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2 Maintenance - Slewing ring bolts and screws - Angle tightening

2.1 Foreword

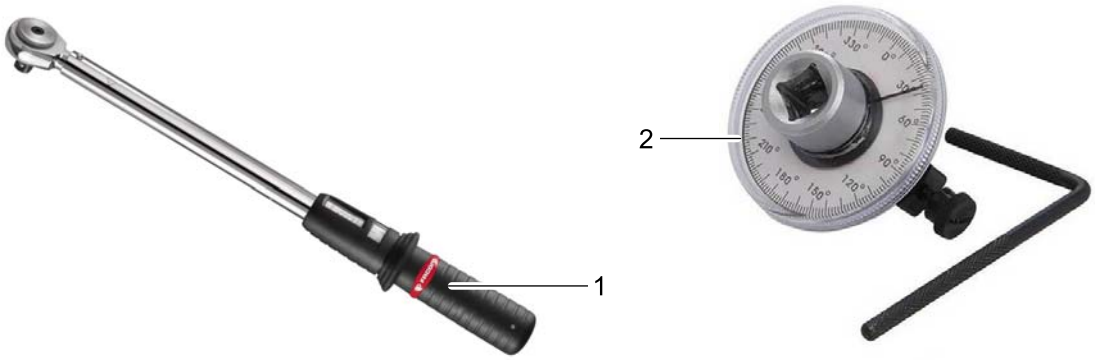
This chapter presents all the instructions for maintenance of the slewing ring bolts and screws tightened using angle control.

Note
In addition to this chapter, it is essential to consult the chapter 1 **Slewing ring bolts and screws - General notes** ➠ page 1-1.

2.2 Tools and accessories

Several tools could be needed during the checking and tightening of the slewing ring bolts:

Note
The tools and accessories cited below are just a proposition. There are other alternatives.



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1. Torque wrench
2. Angular gauge
3. Sleeves (dimensions according to the type of slewing ring bolts)
4. Paint marker to identify the checked or replaced slewing ring bolts.

2.3 Checking the slewing ring bolts visually and by touch

Procedure

► Check the condition of the slewing ring bolts visually and by touch.

Note
This check consists of visually checking for any missing slewing ring bolts, nuts, or washers, visually checking for any corrosion, and checking by touch for any loosening.

Note
Touch means manually checking the proper positioning and fixation of each one of the slewing ring bolts. This allows checking if any slewing ring bolts are broken.

Result 1
No slewing ring bolts are defective.

► The checking procedure is finished.

Result 2
A bolt has a defect.

► Replace the defective bolt as well as the two adjacent bolts. ➠ page 2-6

Note
In the event one of the slewing ring bolts is defective, replace it as well as the adjacent bolts.
At the next dismantling of the crane, change all of the bolts on the ring in question.
The slewing ring bolts that were replaced temporarily pending the dismantling of the crane must also be replaced with new ones.

► Record the replacement and the number of slewing ring bolts replaced in the maintenance logbook.

► Inform your **Manitowoc Crane Care** agent.

2.4 Checking the tightening of the slewing ring bolts

DANGER
Danger of death from falling
Access to the slewing ring bolts may be difficult due to the configuration and height of the crane.

► Carefully follow the safety instructions for operations where access is difficult and for working at a height.

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DANGER
Risk of crushing

During work on the slewing ring bolts, the technician is exposed to a risk of crushing if the correct safety measures are not applied.

- ► Before any work, the crane must not be put into weathervaning, and the slewing brake must be engaged.

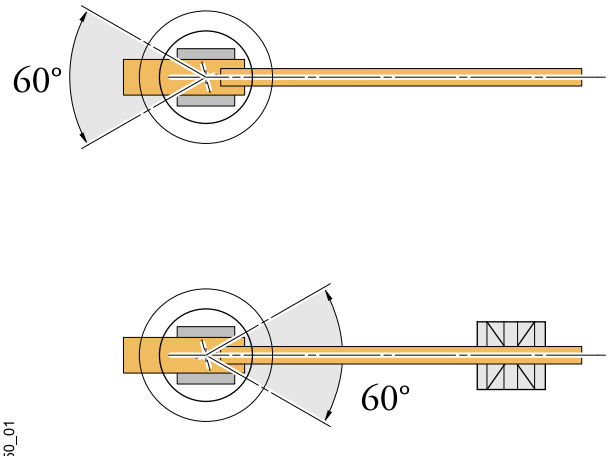
Note
The check described below is performed when the crane is erected.

Note
The tightening of the bolts is checked on the part of the assembly that is not subjected to tensile stress.

Procedure

1. Lock the jib by activating the slewing brake.

Checking the tightening of the bolts of the fixed ring of the slewing ring by successive 60° sectors



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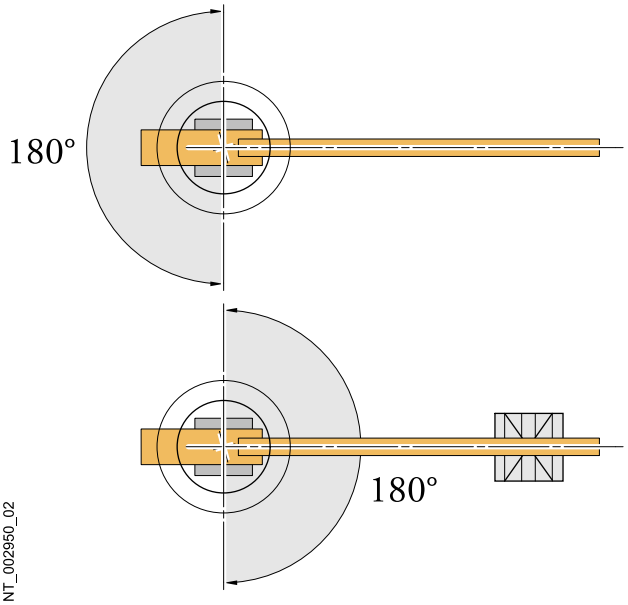
2. Check that the "rear" bolts are tightened without load. ➠ page 2-4
3. Check that the "side" bolts are tightened with or without load. ➠ page 2-4

Note
The load used should be slightly lower (by 60% to 90%) than the maximum authorized load.

4. Check that the "front" bolts are tightened with load. ➠ page 2-4

Note
The load used should be slightly lower (by 60% to 90%) than the maximum authorized load.

Checking the tightening of the bolts of the rotating ring of the slewing ring by successive 180° sectors



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5. Check that the "rear" bolts are tightened without load. ➠ page 2-4
6. Check that the "front" bolts are tightened with load. ➠ page 2-4

Note
The load used should be slightly lower (by 60% to 90%) than the maximum authorized load.

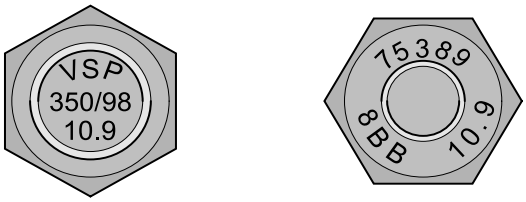
2.4.1 Checking the tightening of the slewing ring bolts

Procedure

Checking the tightening of the slewing ring bolts

Note
This check consists of using a torque wrench (or hydraulic wrench) to check that there is no excessive loosening of the slewing ring bolts.

All the bolts must be checked for each of the rings of the slewing ring.



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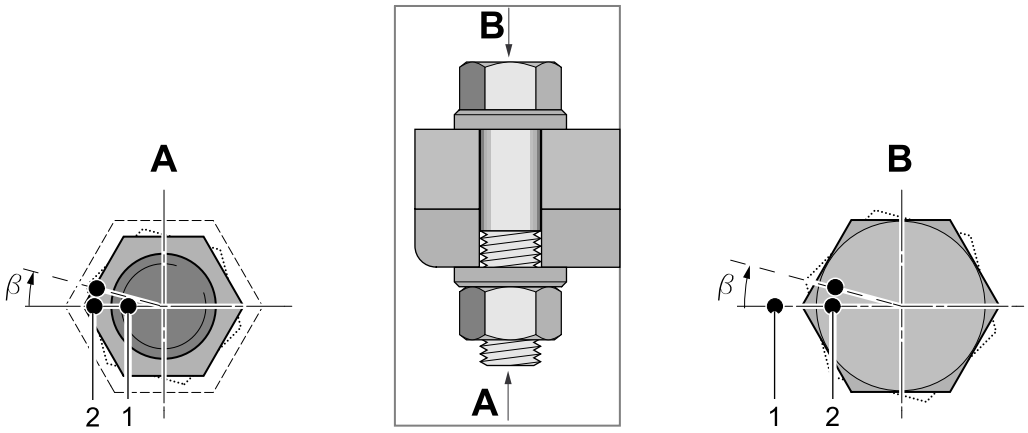
1. Check that the bolt head does not bear the marking "HR" and that the information indicated is the manufacturer symbol, the batch number, and the bolt class.



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2. Depending on which is accessible, mark the position of the nut compared to the bolt, view **(A)**, or the position of the bolt head compared to the support, view **(B)**, using the points **(1)** and **(2)**.
3. Tighten the nut or the bolt head (whichever is accessible) to the recommended torque.
   Torque table for checking the slewing ring bolts ➠ page 2-5

Checking the position of the nut

4. Check the position of the nut compared to the bolt or the position of the bolt head compared to the support.
   Result 1
   β: 0° to 15°
   The bolt is sufficiently tightened and does not need to be replaced.
   Result 2
   β: Min. 15°
   ► This bolt is defective. Replace it and the two adjacent bolts as well. ➠ page 2-6

Note
If there are at least three defective bolts, replace all the bolts of the ring.

Torque table for checking the slewing ring bolts

Note
Minimum tensioner precision: +/- 10%

Nominal diameter of the slewing ring bolts	Checking torque
M16	150 N·m (110.6 ft·lb$_f$)
M20	300 N·m (221.3 ft·lb$_f$)
M22	400 N·m (295.0 ft·lb$_f$)
M24	500 N·m (368.8 ft·lb$_f$)
M27	750 N·m (553.2 ft·lb$_f$)

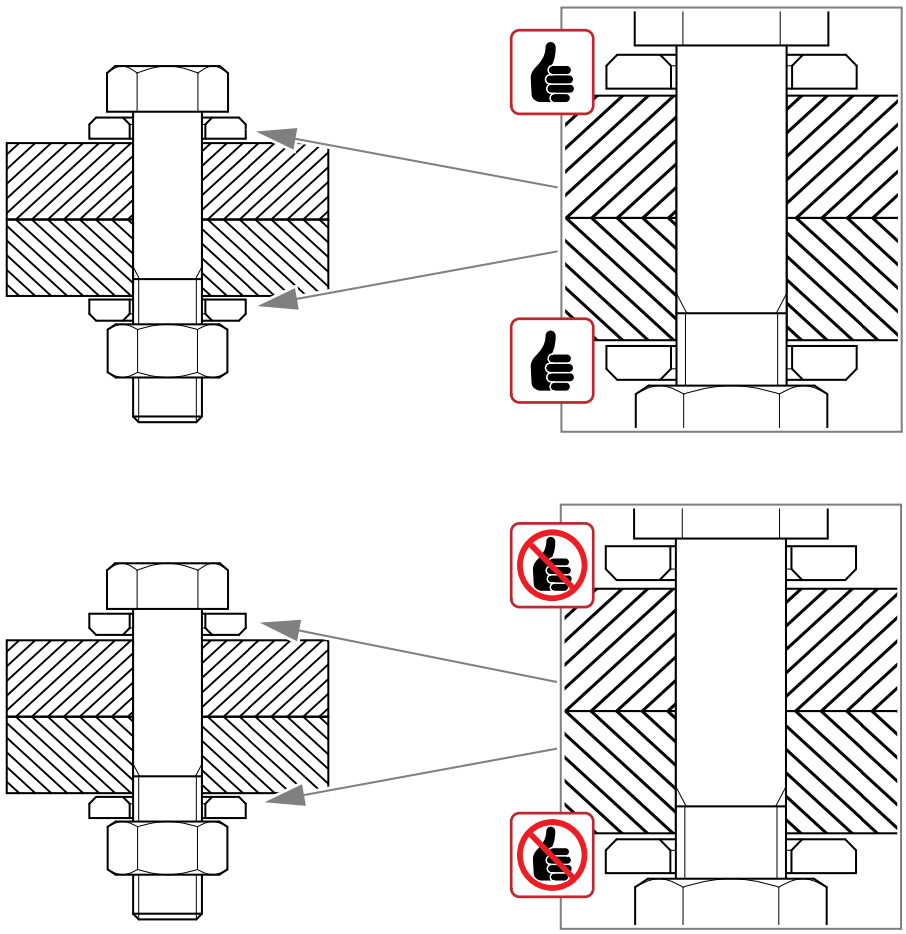
2.5 Replacement of broken or defective slewing ring bolts

Note
This procedure explains the method for replacing the slewing ring bolts after detection of a breakage or a defect.

Procedure

1. Remove the slewing ring bolt to be replaced and the two adjacent bolts.
2. Remove any excess grease and filings from the bore holes and the area around the slewing ring bolts to be replaced.

Putting the slewing ring bolts in place



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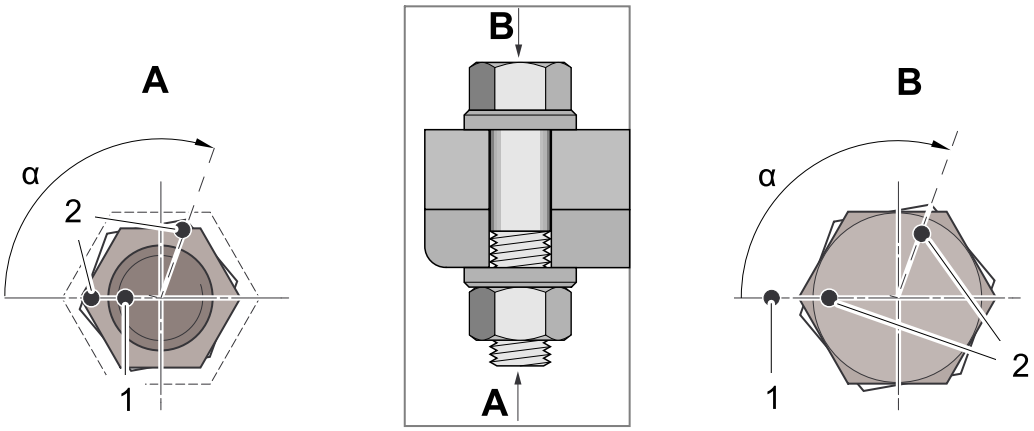
3. Put the new slewing ring bolts in place.

Note
It is essential to position the chamfers of the washers on the side of the bolt head or stud and on the side of the nut.

Note
It is essential to position the nuts so that the marking indicating the class (10.9 or 12.9) is visible once in place.

4. Tighten the replaced bolts to the initial torque specified for the bolt size.

Tightening values ➠ page 2-7



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5. Then, tighten the replaced bolts to the final tightening angle α specified for the bolt size.
Tightening values ➠ page 2-7

Tightening values

Nominal diameter of the slewing ring bolts	Initial torque	Final tightening angle
M16	100 N·m (73.8 ft·lb$_f$)	75 ±10°
M20	150 N·m (110.6 ft·lb$_f$)	90 ±10°
M22 Bolt length: 140 mm to 165 mm (5.51 in to 6.50 in)	150 N·m (110.6 ft·lb$_f$)	95 ±10°
M22 Bolt length: 170 mm to 200 mm (6.69 in to 7.87 in)	150 N·m (110.6 ft·lb$_f$)	105 ±10°
M24	150 N·m (110.6 ft·lb$_f$)	100 ±10°
M27	150 N·m (110.6 ft·lb$_f$)	115 ±10°

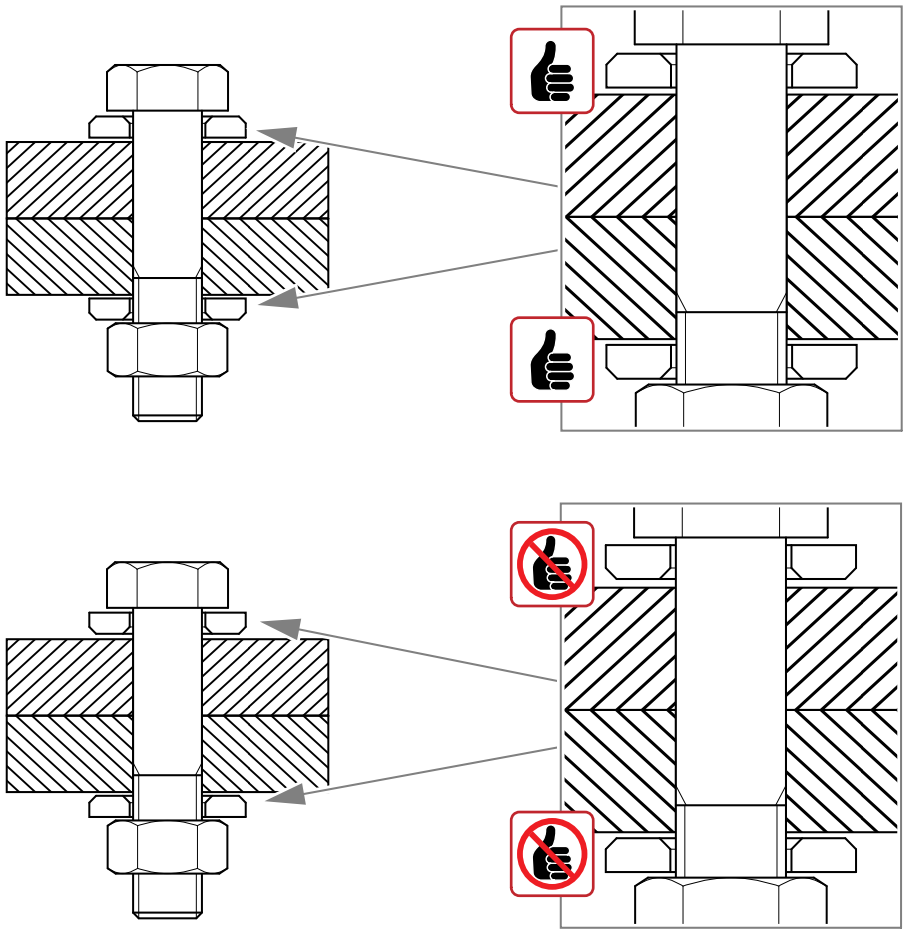
2.6 Replacing all the slewing ring bolts

Note
It is recommended to replace the slewing ring bolts in the workshop.

Procedure

1. Remove the slewing ring bolt to be replaced and the two adjacent bolts.
2. Remove any excess grease and filings from the bore holes and the area around the slewing ring bolts to be replaced.

Putting the slewing ring bolts in place



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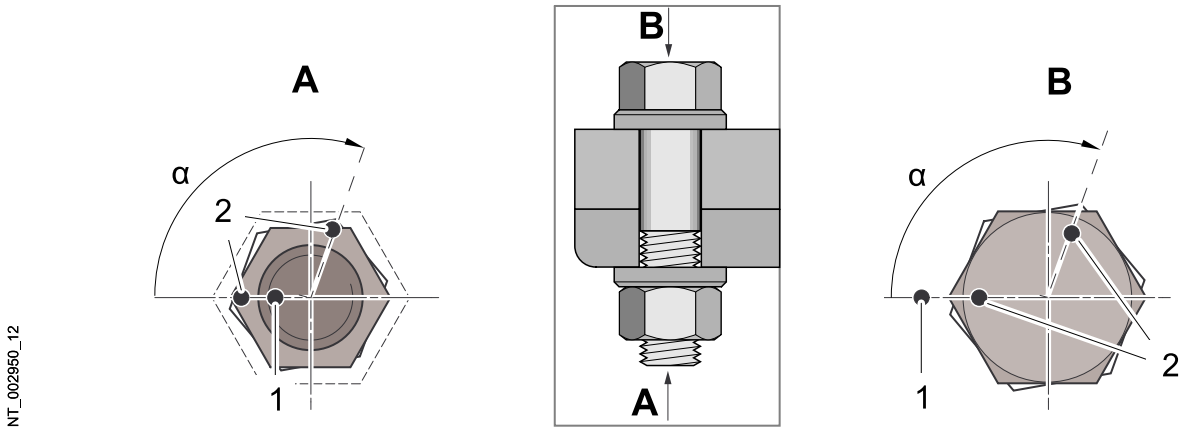
3. Put the new slewing ring bolts in place.

Note
It is essential to position the chamfers of the washers on the side of the bolt head or stud and on the side of the nut.

Note
It is essential to position the nuts so that the marking indicating the class (10.9 or 12.9) is visible once in place.

4. Tighten all the bolts on one ring in compliance with the initial torque relative to the bolt diameter and by observing the order of "crosswise tightening". ➠ page 2-9



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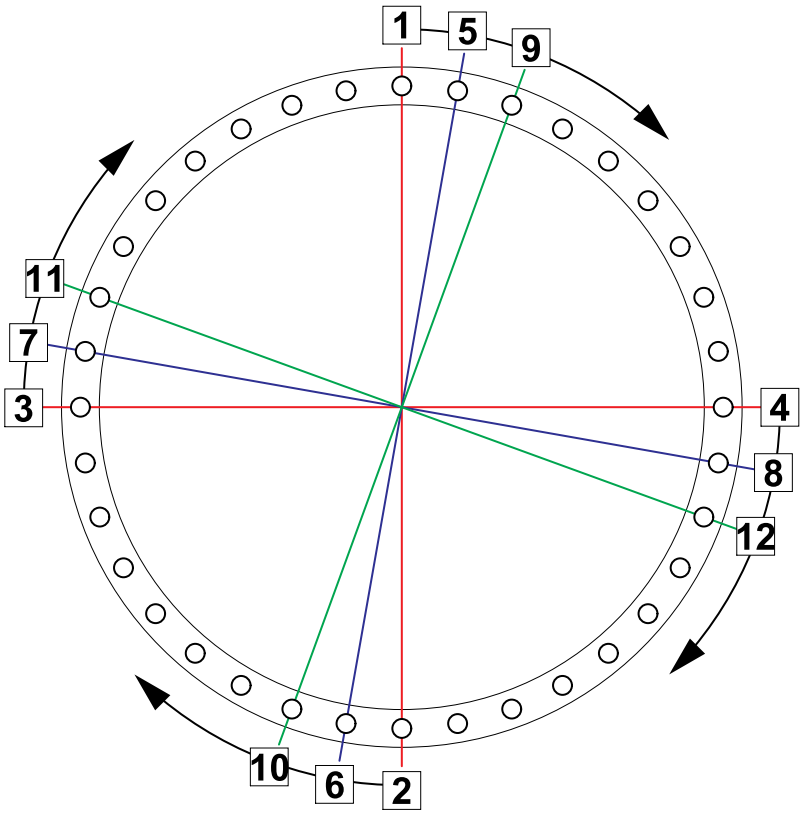
5. Tighten all the bolts on one ring to the final torque or final tightening angle α specified for the bolt size and by observing the order of "crosswise tightening".
➠ page 2-9

6. Repeat the previous five steps for the second ring.

2.7 Reminder of the tightening order for the slewing ring bolts

Note
This procedure must be followed when replacing all of the slewing ring bolts on one ring.



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Note
The order in which the slewing ring bolts are tightened must be followed.

Note
Apply the tightening instructions according to the type of slewing ring bolt.

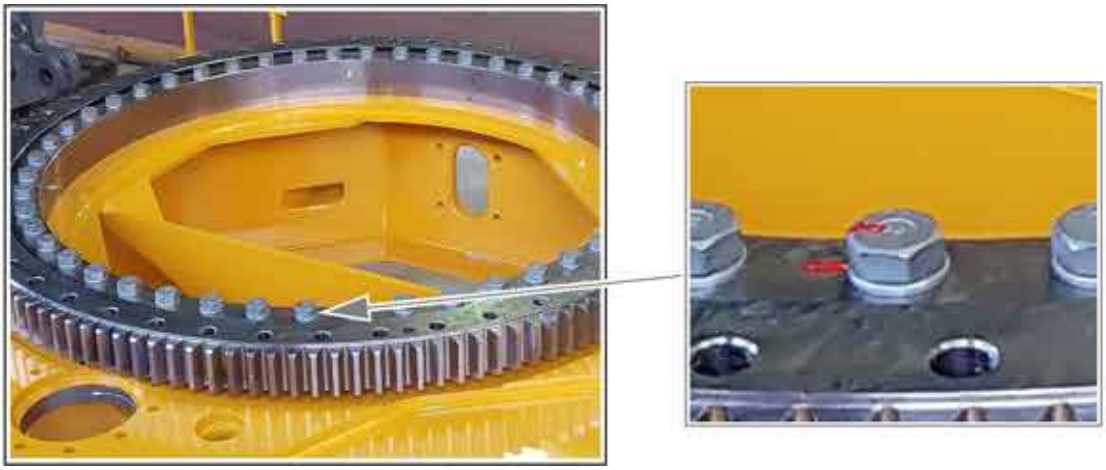
Always tighten the slewing ring bolts in a crosswise pattern:

1. Tighten bolt [1], then mark it with a paint marker pen.
2. Tighten bolt [2] located 180° from bolt [1], then mark it with a paint marker pen.
3. Tighten bolt [3] located 90° from bolt [2], then mark it with a paint marker pen.
4. Tighten bolt [4] located 180° from bolt [3], then mark it with a paint marker pen.
5. Tighten bolt [5] next to bolt [1], then mark it with a paint marker pen.
6. Tighten bolt [6] located 180° from bolt [5], then mark it with a paint marker pen.
7. Tighten bolt [7] located 90° from bolt [6], then mark it with a paint marker pen.
8. Tighten bolt [8] located 180° from bolt [7], then mark it with a paint marker pen.
9. Continue the tightening procedure for all the slewing ring bolts by repeating the previous steps.

Note
Always use the crosswise tightening technique.

It is strictly prohibited to tighten the slewing ring bolts in just one area at a time.

2.7.1 Marking of slewing ring bolts



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Note
The slewing ring bolts must be marked once they are tightened.

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3 Maintenance - Slewing ring bolts and screws - Tightening with hydraulic tensioner

3.1 Foreword

This chapter presents all the instructions for maintenance of the slewing ring bolts and screws tightened using a hydraulic tensioner.

Note
In addition to this chapter, it is essential to consult the chapter 1 **Slewing ring bolts and screws - General notes** ➠ page 1-1.

3.2 Tools and accessories

Several tools could be needed during the checking and tightening of the slewing ring bolts:

Note
The tools and accessories cited below are just a proposition. There are other alternatives.

Note
'Manitowoc' recommends using a hydraulic tensioning cylinder powered by an electric pump given the loads exerted. However, it is possible to use a manual pump, especially for checking the tightening of the screw bolts, or for the ad-hoc replacement of a few broken or defective screw bolts.

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1. Manual pump: U-64435-37
2. Electric pump
3. Hydraulic tensioner HTA20 for slewing ring bolts M20, M22, and M24: 82017093
   Hydraulic tensioner HTA27 for slewing ring bolt M27: 82017094

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4. Sleeves (dimensions according to the type of slewing ring bolts)
5. Paint marker to identify the checked or replaced slewing ring bolts.

3.3 Checking the slewing ring bolts visually and by touch

Procedure

► Check the condition of the slewing ring bolts visually and by touch.

Note
This check consists of visually checking for any missing slewing ring bolts, nuts, or washers, visually checking for any corrosion, and checking by touch for any loosening.

Note
Touch means manually checking the proper positioning and fixation of each one of the slewing ring bolts. This allows checking if any slewing ring bolts are broken.

Result 1
No slewing ring bolts are defective.

► The checking procedure is finished.

Result 2
A bolt has a defect.

► Replace the defective bolt as well as the two adjacent bolts. ➠ page 3-9

Note
In the event one of the slewing ring bolts is defective, replace it as well as the adjacent bolts.
At the next dismantling of the crane, change all of the bolts on the ring in question.
The slewing ring bolts that were replaced temporarily pending the dismantling of the crane must also be replaced with new ones.

► Record the replacement and the number of slewing ring bolts replaced in the maintenance logbook.

► Inform your **Manitowoc Crane Care** agent.

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3.4 Checking the tightening of the slewing ring bolts

DANGER
Danger of death from falling

Access to the slewing ring bolts may be difficult due to the configuration and height of the crane.

► Carefully follow the safety instructions for operations where access is difficult and for working at a height.

DANGER
Risk of crushing

During work on the slewing ring bolts, the technician is exposed to a risk of crushing if the correct safety measures are not applied.

► Before any work, the crane must not be put into weathervaning, and the slewing brake must be engaged.

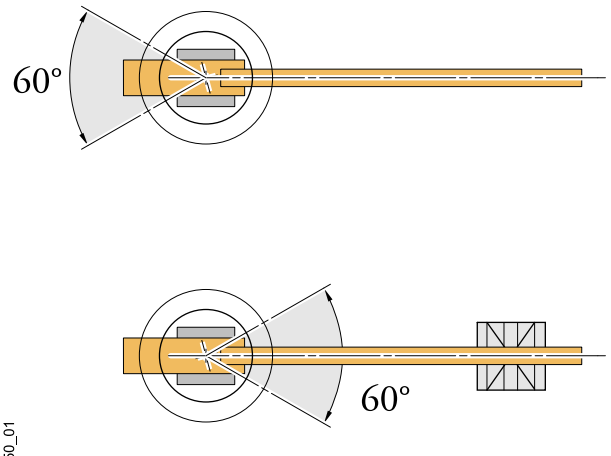
Note
The check described below is performed when the crane is erected.

Note
The tightening of the bolts is checked on the part of the assembly that is not subjected to tensile stress.

Procedure

1. Lock the jib by activating the slewing brake.

Checking the tightening of the bolts of the fixed ring of the slewing ring by successive 60° sectors



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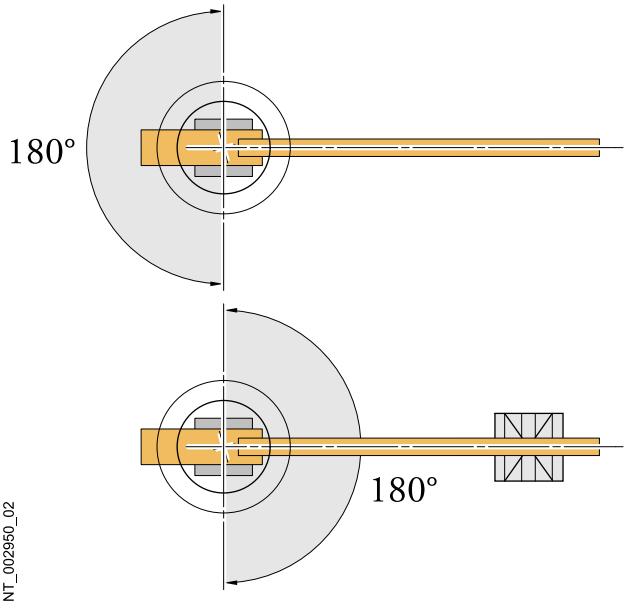
2. Check that the "rear" bolts are tightened without load. ➠ page 3-4
3. Check that the "side" bolts are tightened with or without load. ➠ page 3-4

Note
The load used should be slightly lower (by 60% to 90%) than the maximum authorized load.

4. Check that the "front" bolts are tightened with load. ➠ page 3-4

Note
The load used should be slightly lower (by 60% to 90%) than the maximum authorized load.

Checking the tightening of the bolts of the rotating ring of the slewing ring by successive 180° sectors



NT_002950_02

5. Check that the "rear" bolts are tightened without load. ➠ page 3-4
6. Check that the "front" bolts are tightened with load. ➠ page 3-4

Note
The load used should be slightly lower (by 60% to 90%) than the maximum authorized load.

3.5 Methods for checking the slewing ring bolts

There are two methods of checking the tightening of slewing ring bolts tightened using a hydraulic tensioner: the simplified method (without hydraulic tensioner), which is easier to implement, and the conventional method (with a hydraulic tensioner).

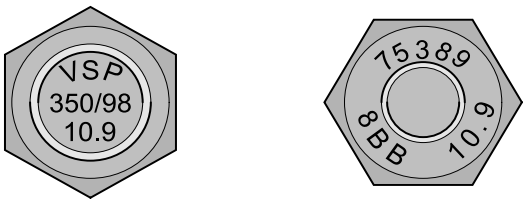
3.5.1 Checking the tightening of the slewing ring bolts: simplified method (without hydraulic tensioner)

Procedure

Checking the tightening of the slewing ring bolts

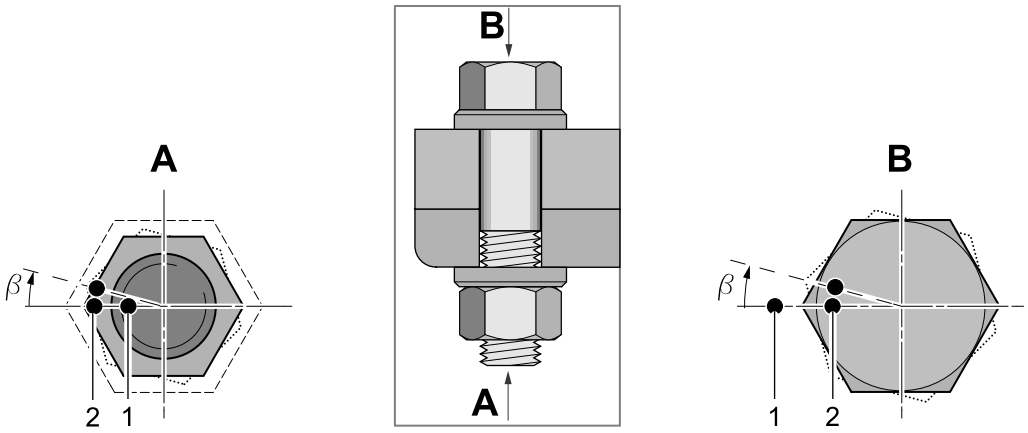
Note
This check consists of using a torque wrench (or hydraulic wrench) to check that there is no excessive loosening of the slewing ring bolts.

All the bolts must be checked for each of the rings of the slewing ring.



NT_002950_03

1. Check that the bolt head does not bear the marking "HR" and that the information indicated is the manufacturer symbol, the batch number, and the bolt class.



NT_002950_11

2. Depending on which is accessible, mark the position of the nut compared to the bolt, view **(A)**, or the position of the bolt head compared to the support, view **(B)**, using the points **(1)** and **(2)**.
3. Tighten the nut or the bolt head (whichever is accessible) to the recommended torque.
   Torque table for checking the slewing ring bolts ➠ page 3-5

Checking the position of the nut

4. Check the position of the nut compared to the bolt or the position of the bolt head compared to the support.
   Result 1
   β: 0° to 15°
   The bolt is sufficiently tightened and does not need to be replaced.
   Result 2
   β: Min. 15°
   - ► Leave the bolt in its final position.
   - ► Check that the slewing ring bolts are tightened using a hydraulic tensioner. ➠ page 3-8

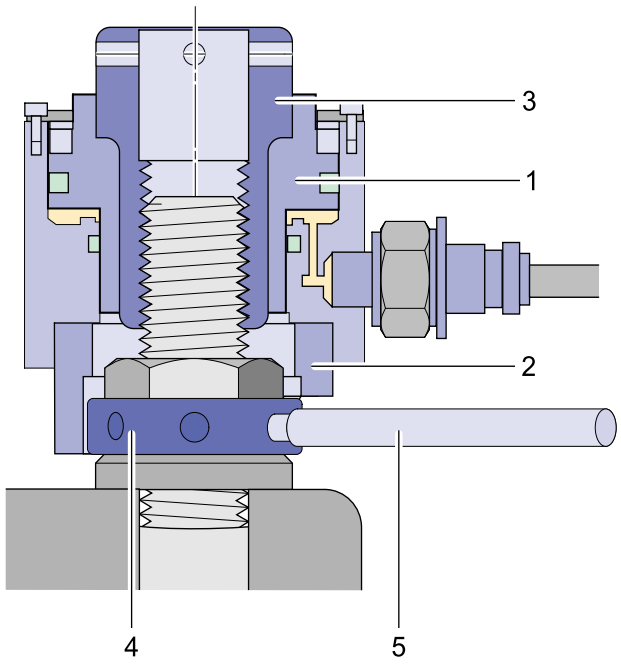
Torque table for checking the slewing ring bolts

Note
Minimum tensioner precision: +/- 10%

Nominal diameter of the slewing ring bolts	Checking torque
M16	150 N·m (110.6 ft·lb$_f$)
M20	300 N·m (221.3 ft·lb$_f$)
M22	400 N·m (295.0 ft·lb$_f$)
M24	500 N·m (368.8 ft·lb$_f$)
M27	750 N·m (553.2 ft·lb$_f$)

3.5.2 Checking the tightening of the slewing ring bolts: conventional method (with a hydraulic tensioner)

Diagram - Hydraulic tensioner



NT_002950_04

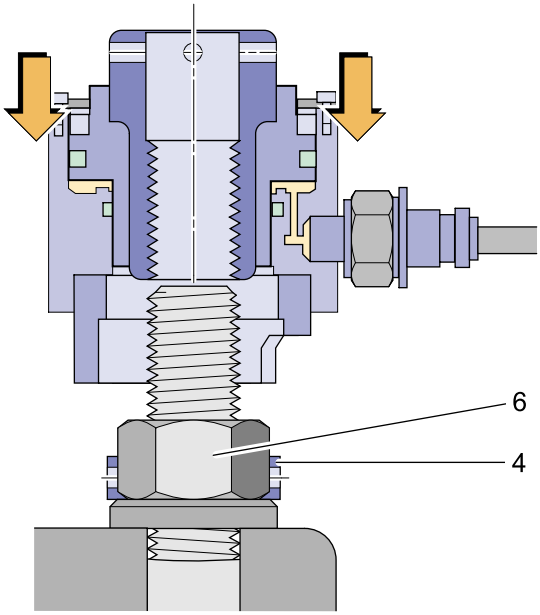
1 Ring-shaped cylinder
2 Support
3 Tie rod
4 Positioning key
5 Pin

Using the hydraulic tensioner to tighten the slewing ring bolts

Pre-tasks

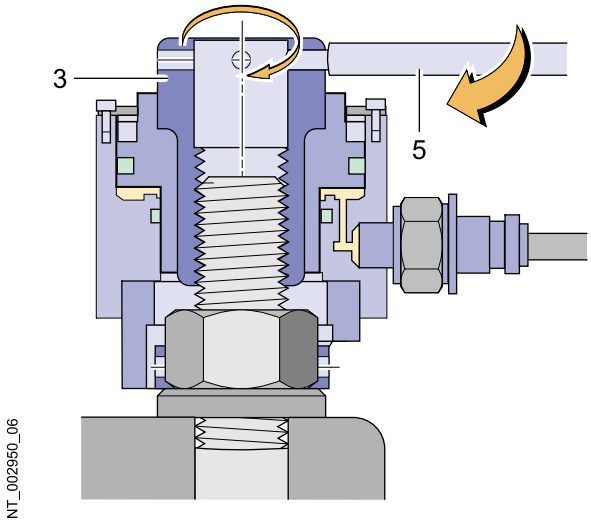
1. Check the internal thread of the tie rod.
2. Check whether the ring-shaped cylinder of the tensioner abuts in resting position (rod retracted).

Procedure

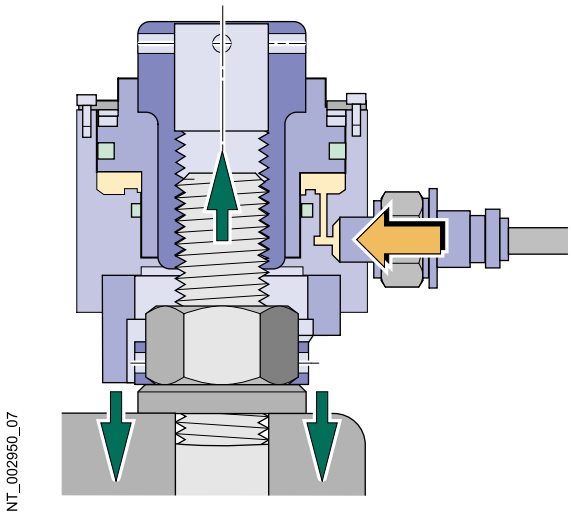


NT_002950_05

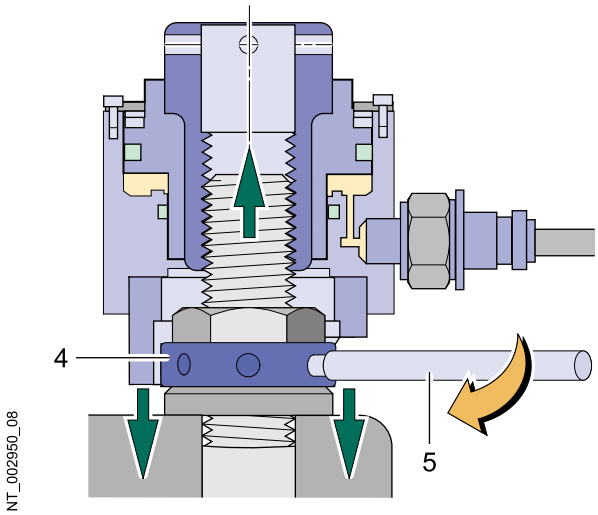
1. Place the positioning key **(4)** around the nut **(6)** and fit the hydraulic tensioner.



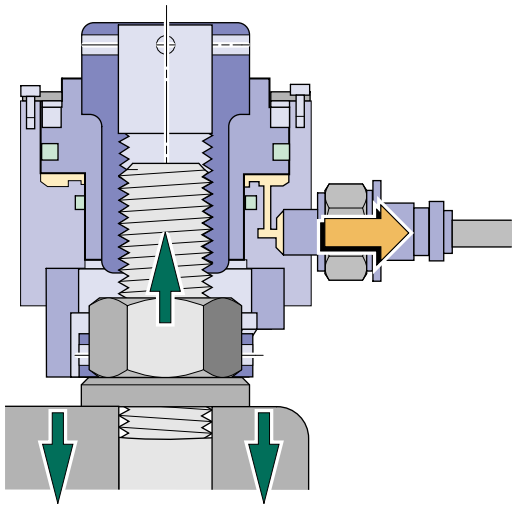
2. Screw the tie rod **(3)** onto the screw as far as possible using the pin **(5)**.



3. Connect the hydraulic couplings of the tensioner.
   ◁ When the tensioner is pressurized, it will apply the required tensile load.

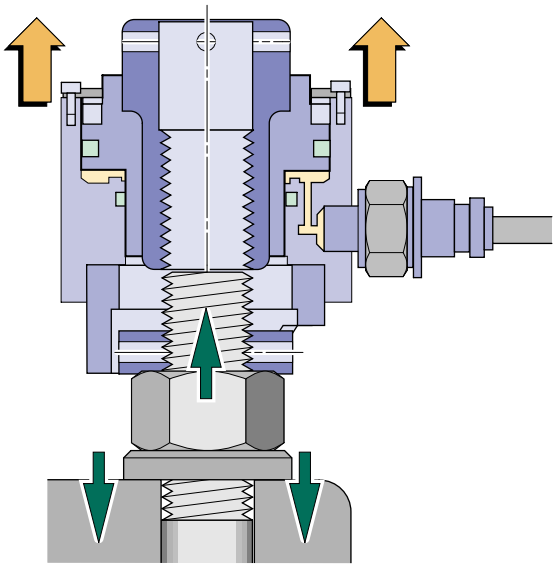


4. Screw in the nut by means of the positioning key **(4)** and the pin **(5)**.



NT_002950_09

5. Release the pressure.
   ◁ The piston is pushed back.

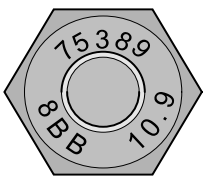


NT_002950_10

6. Remove the hydraulic tensioner and the positioning key.

Checking the tightening of the slewing ring bolts using a hydraulic tensioner

Procedure



NT_002950_03

1. Check that the screw head does not bear an "HR" symbol and that the information indicated is the manufacturer symbol, the batch number and the bolt class.

2. Use the hydraulic tensioner to tighten the slewing ring bolts. ➠ page 3-6
3. Check that the bolts are properly tightened.
   Table of check pressures according to tensioner type ➠ page 3-9

Note
Use the most suitable hydraulic tensioner according to the crane model and the diameter of the slewing ring bolts to be checked. The correct pressure must be used for the hydraulic tensioner chosen for checking.

Result 1
The nut cannot be moved.
The tightening is correct.
Result 2
The nut can be moved.
► This bolt is defective. Replace both it and the two adjacent bolts. ➠ page 3-9

Note
If there are at least three defective bolts, replace all the bolts of the ring.

Table of check pressures according to tensioner type

Note
The specified values are calculated for the use of an HTA-type tensioner. If any other type of tensioner is used, please contact us to verify the data.

Note
Minimum tensioner precision: +/- 10%
Maximum tolerance for pressure values: +/-2%

Check pressures (set values) and corresponding traction loads				
	Nominal diameter of the slewing ring bolts			
	M20	M22	M24	M27
Hydraulic tensioner HTA20	750 bar (10,878 psi) 150 kN (33,720 lb_f)	925 bar (13,416 psi) 185 kN (41,590 lb_f)	1,075 bar (15,592 psi) 215 kN (48,330 lb_f)	
Hydraulic tensioner HTA27	530 bar (7,687 psi) 143.1 kN (32,170 lb_f)	675 bar (9,790 psi) 182.25 kN (40,971.4 lb_f)	770 bar (11,168 psi) 207.9 kN (46,738 lb_f)	960 bar (13,924 psi) 259.2 kN (58,270 lb_f)

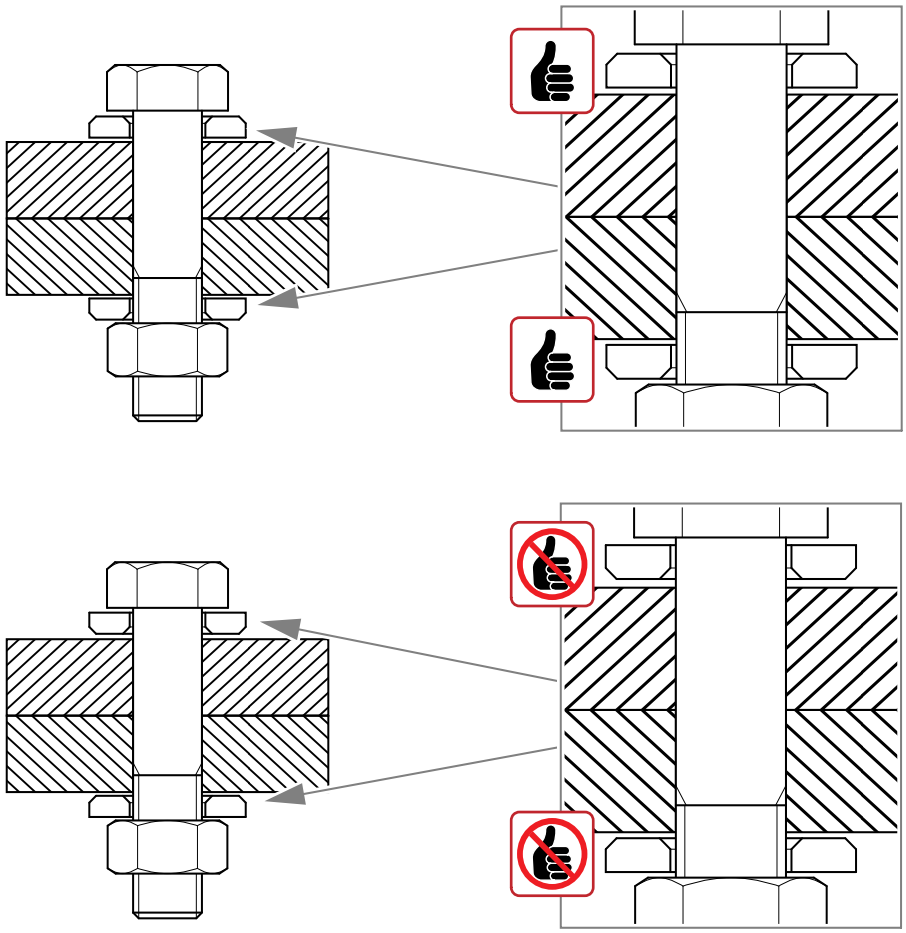
3.6 Replacement of broken or defective slewing ring bolts

Note
This procedure explains the method for replacing the slewing ring bolts after detection of a breakage or a defect.

Procedure

1. Place the crane in the same position as for checking ➠ page 3-3.
2. Remove the slewing ring bolt to be replaced and the two adjacent bolts.
3. Remove any excess grease and filings from the bore holes and the area around the slewing ring bolts to be replaced.

Putting the slewing ring bolts in place



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4. Put the new slewing ring bolts in place.

Note
It is essential to position the chamfers of the washers on the side of the bolt head or stud and on the side of the nut.

Note
It is essential to position the nuts so that the marking indicating the class (10.9 or 12.9) is visible once in place.

5. Use the hydraulic tensioner to tighten the slewing ring bolts. ➠ page 3-6
6. Depending on the tensioner used, apply a tensile load to the bolt using the check pressure (corresponding to 80% of the nominal tightening pressure) indicated in the table below.
   Table of check pressures according to tensioner type ➠ page 3-11
7. Depending on the tensioner used, apply a tensile load to the bolt using the nominal tightening pressure indicated in the table below.
   Table of nominal tightening pressures according to tensioner type ➠ page 3-11

Note
For further information, contact your agent **Manitowoc Crane Care**.

Table of check pressures according to tensioner type

Note
The specified values are calculated for the use of an HTA-type tensioner. If any other type of tensioner is used, please contact us to verify the data.

Note
Minimum tensioner precision: +/- 10%

Maximum tolerance for pressure values: +/-2%

Check pressures (set values) and corresponding traction loads				
	Nominal diameter of the slewing ring bolts			
	M20	M22	M24	M27
Hydraulic tensioner HTA20	750 bar (10,878 psi) 150 kN (33,720 lb_f)	925 bar (13,416 psi) 185 kN (41,590 lb_f)	1,075 bar (15,592 psi) 215 kN (48,330 lb_f)	
Hydraulic tensioner HTA27	530 bar (7,687 psi) 143.1 kN (32,170 lb_f)	675 bar (9,790 psi) 182.25 kN (40,971.4 lb_f)	770 bar (11,168 psi) 207.9 kN (46,738 lb_f)	960 bar (13,924 psi) 259.2 kN (58,270 lb_f)

Table of nominal tightening pressures according to tensioner type

Note
The specified values are calculated for the use of an HTA-type tensioner. If any other type of tensioner is used, please contact us to verify the data.

Note
Minimum tensioner precision: +/- 10%

Maximum tolerance for pressure values: +/-2%

Nominal tightening pressures (set values) and corresponding traction loads				
	Nominal diameter of the slewing ring bolts			
	M20	M22	M24	M27
Hydraulic tensioner HTA20	950 bar (13,779 psi) 190 kN (42,710 lb_f)	1,175 bar (17,042 psi) 235 kN (52,830 lb_f)	1,375 bar (19,943 psi) 275 kN (61,820 lb_f)	
Hydraulic tensioner HTA27	700 bar (10,153 psi) 189 kN (42,490 lb_f)	870 bar (12,618 psi) 234.9 kN (52,808 lb_f)	1,010 bar (14,649 psi) 272.7 kN (61,305 lb_f)	1,300 bar (18,855 psi) 351 kN (78,910 lb_f)

3.7 Replacing all the slewing ring bolts

DANGER
Danger of death from falling

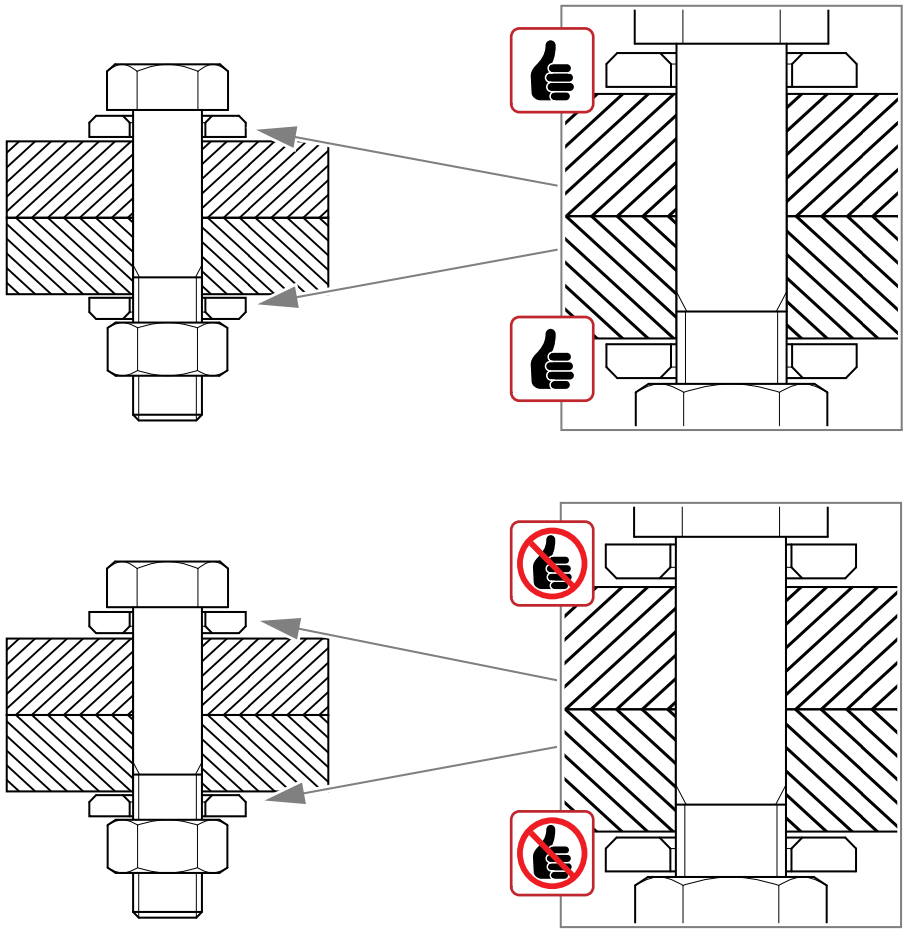
During systematic replacement of the slewing ring bolts every 12 years, access to the slewing ring bolts may be difficult due to the configuration and height of the crane.

- ► The slewing ring bolts must be replaced with the towerhead of the crane on the ground. It is recommended to carry out this work in the workshop.

Procedure

1. Remove all of the slewing ring bolts from the first ring (fixed or rotating).
2. Remove any excess grease and filings from the bore holes and the area around the slewing ring bolts to be replaced.

Putting the slewing ring bolts in place



3. Put the new slewing ring bolts in place.

Note
It is essential to position the chamfers of the washers on the side of the bolt head or stud and on the side of the nut.

NT_004668_03

Note
It is essential to position the nuts so that the marking indicating the class (10.9 or 12.9) is visible once in place.

4. Use the hydraulic tensioner to tighten the slewing ring bolts. ➠ page 3-6
5. Tighten all the bolts on one ring by exerting a tensile force with the check pressure (corresponding to 80% of the nominal tightening pressure) according to the table below and by observing the order of "crosswise tightening". ➠ page 3-14
   Table of check pressures according to tensioner type ➠ page 3-13
6. Then tighten all the bolts on one ring by exerting a tensile force with the nominal tightening pressure and by observing the order of "crosswise tightening".
   ➠ page 3-14
   Table of nominal tightening pressures according to tensioner type ➠ page 3-13

Note
For further information, contact your agent **Manitowoc Crane Care**.

7. Repeat the previous seven steps for the second ring.

Table of check pressures according to tensioner type

Note
The specified values are calculated for the use of an HTA-type tensioner. If any other type of tensioner is used, please contact us to verify the data.

Note
Minimum tensioner precision: +/- 10%

Maximum tolerance for pressure values: +/-2%

Check pressures (set values) and corresponding traction loads				
	Nominal diameter of the slewing ring bolts			
	M20	M22	M24	M27
Hydraulic tensioner HTA20	750 bar (10,878 psi) 150 kN (33,720 lb_f)	925 bar (13,416 psi) 185 kN (41,590 lb_f)	1,075 bar (15,592 psi) 215 kN (48,330 lb_f)	
Hydraulic tensioner HTA27	530 bar (7,687 psi) 143.1 kN (32,170 lb_f)	675 bar (9,790 psi) 182.25 kN (40,971.4 lb_f)	770 bar (11,168 psi) 207.9 kN (46,738 lb_f)	960 bar (13,924 psi) 259.2 kN (58,270 lb_f)

Table of nominal tightening pressures according to tensioner type

Note
The specified values are calculated for the use of an HTA-type tensioner. If any other type of tensioner is used, please contact us to verify the data.

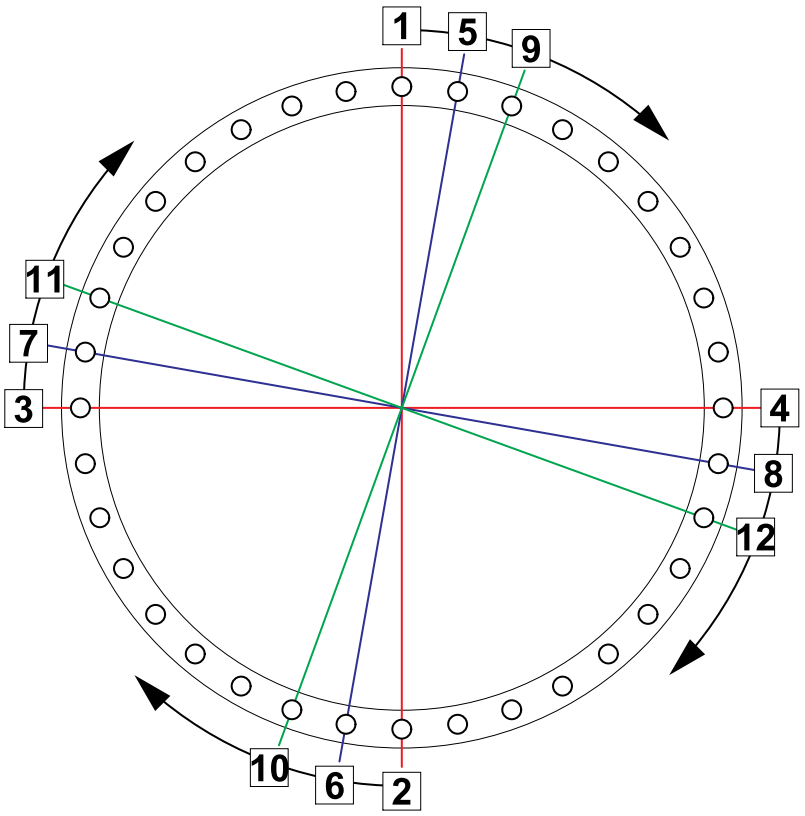
Note
Minimum tensioner precision: +/- 10%

Maximum tolerance for pressure values: +/-2%

Nominal tightening pressures (set values) and corresponding traction loads				
	Nominal diameter of the slewing ring bolts			
	M20	M22	M24	M27
Hydraulic tensioner HTA20	950 bar (13,779 psi) 190 kN (42,710 lb_f)	1,175 bar (17,042 psi) 235 kN (52,830 lb_f)	1,375 bar (19,943 psi) 275 kN (61,820 lb_f)	
Hydraulic tensioner HTA27	700 bar (10,153 psi) 189 kN (42,490 lb_f)	870 bar (12,618 psi) 234.9 kN (52,808 lb_f)	1,010 bar (14,649 psi) 272.7 kN (61,305 lb_f)	1,300 bar (18,855 psi) 351 kN (78,910 lb_f)

3.8 Reminder of the tightening order for the slewing ring bolts

Note
This procedure must be followed when replacing all of the slewing ring bolts on one ring.



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Note
The order in which the slewing ring bolts are tightened must be followed.

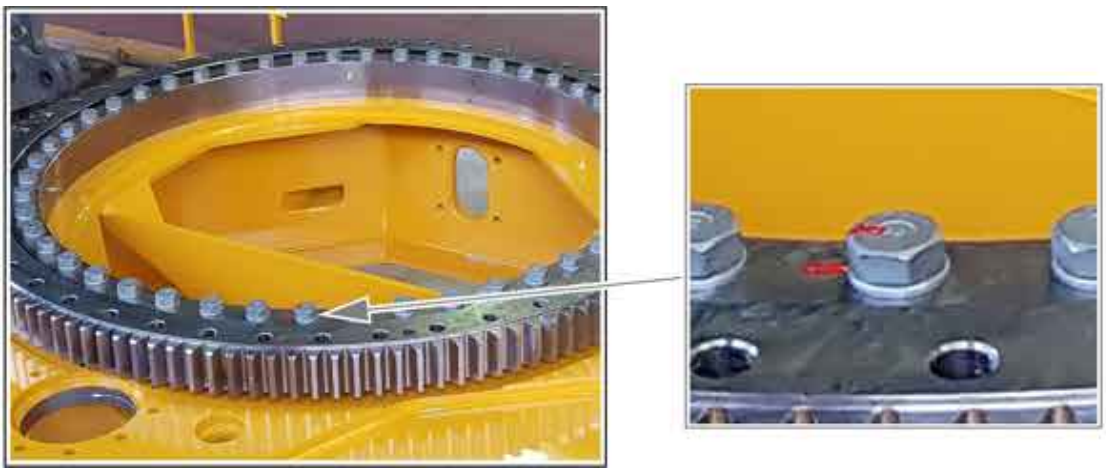
Note
Apply the tightening instructions according to the type of slewing ring bolt.

Always tighten the slewing ring bolts in a crosswise pattern:

1. Tighten bolt [1], then mark it with a paint marker pen.
2. Tighten bolt [2] located 180° from bolt [1], then mark it with a paint marker pen.
3. Tighten bolt [3] located 90° from bolt [2], then mark it with a paint marker pen.
4. Tighten bolt [4] located 180° from bolt [3], then mark it with a paint marker pen.
5. Tighten bolt [5] next to bolt [1], then mark it with a paint marker pen.
6. Tighten bolt [6] located 180° from bolt [5], then mark it with a paint marker pen.
7. Tighten bolt [7] located 90° from bolt [6], then mark it with a paint marker pen.
8. Tighten bolt [8] located 180° from bolt [7], then mark it with a paint marker pen.
9. Continue the tightening procedure for all the slewing ring bolts by repeating the previous steps.

Note
Always use the crosswise tightening technique.
It is strictly prohibited to tighten the slewing ring bolts in just one area at a time.

3.8.1 Marking of slewing ring bolts



NT_004534_02

Note
The slewing ring bolts must be marked once they are tightened.

ENU / 2020-11-30

4 Maintenance - Slewing ring bolts and screws - Torque tightening

4.1 Foreword

This chapter presents all the instructions for maintenance of the slewing ring bolts and screws tightened using torque control.

Note
In addition to this chapter, it is essential to consult the chapter 1 **Slewing ring bolts and screws - General notes** ➠ page 1-1.

4.2 Tools and accessories

Several tools could be needed during the checking and tightening of the slewing ring bolts:

Note
The tools and accessories cited below are just a proposition. There are other alternatives.

MT_004666_05

1. Torque wrench (minimum accuracy ±10 %)
2. Torque multiplier
3. Holding key
4. Hydraulic torque wrench kit
5. Sleeves (dimensions according to the type of slewing ring bolts)
6. Paint marker to identify the checked or replaced slewing ring bolts.

Note
A hydraulic torque wrench can be used instead of the usual torque wrench and torque multiplier.

4.3 Identification and dimensions of the slewing ring bolts

4.3.1 Identification of slewing ring bolts of type HR

The bolt head has the marking **HR** followed by the class: **10.9** or **12.9**.

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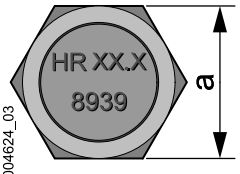
Note
Additional information present is the manufacturer's marking and the batch number.

4.3.2 Dimensions of the screw head

	Nominal diameter of thread	(a): dimensions across flats
 NT_004624_03	27 mm (1.06 in)	46 mm (1.81 in)
	30 mm (1.18 in)	50 mm (1.97 in)

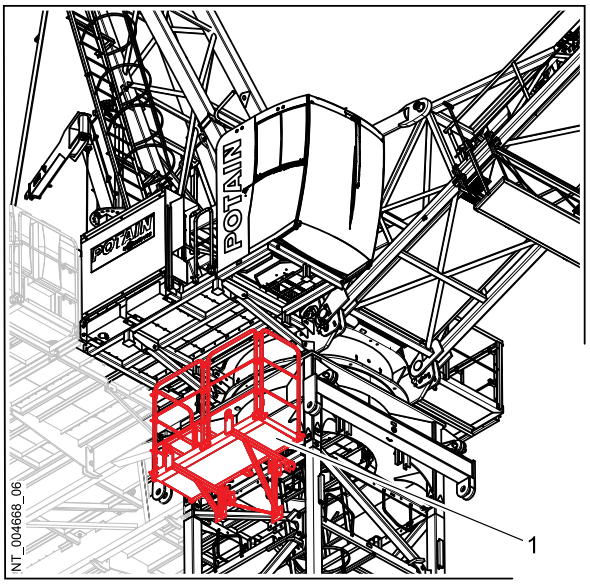
4.4 Checking the condition of the tension bolts of the slewing ring

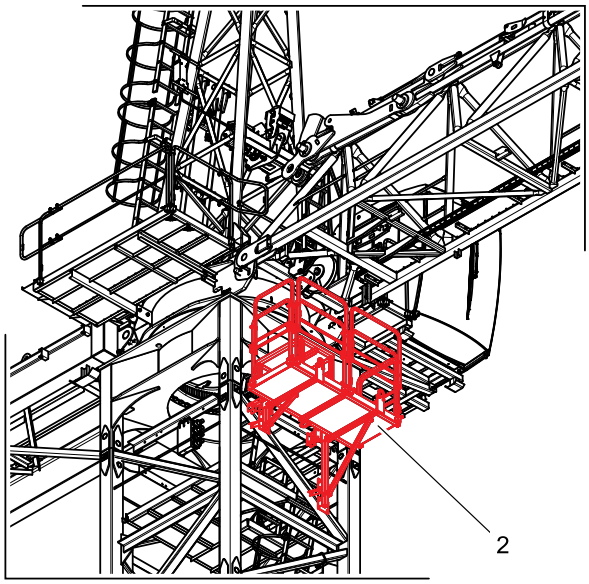
4.4.1 Access platform for the slewing ring bolts

Note
Some crane models require a platform for all checking operations (visual, by touch, and with torque) when the crane is operating.

Note
The platforms give access to the rotating ring of the slewing ring through a range of approximately 60°.

Note
The illustration below is an example of a platform set up on a crane.





1 Platform on a crane type **MR**

2 Platform on a crane type **MD 559, MD 569, MD 689**

Identification of the platforms by crane model

Note
For crane models not present in the table below, a platform is not required.

Note
The installation folders of the platforms can be consulted in GTL module DocsOnline.

Crane type	Platform references	Reference numbers of the installation folders for the platforms
MD 559 **MD 569** **MD 689** **MR 418** **MR 608** **MR 615** **MR 618**	84101274	30U-0000-054-1

4.4.2 Checking the slewing ring bolts visually and by touch

Procedure

► Check the condition of the slewing ring bolts visually and by touch.

Note
This check consists of visually checking for any missing slewing ring bolts, nuts, or washers, visually checking for any corrosion, and checking by touch for any loosening.

Note
Touch means manually checking the proper positioning and fixation of each one of the slewing ring bolts. This allows checking if any slewing ring bolts are broken.

Result 1
No slewing ring bolts are defective.
► The checking procedure is finished.
Result 2
A bolt has a defect.
► Replace the defective bolt as well as the two adjacent bolts. ➠ page 4-19

Note
In the event one of the slewing ring bolts is defective, replace it as well as the adjacent bolts.
At the next dismantling of the crane, change all of the bolts on the ring in question.
The slewing ring bolts that were replaced temporarily pending the dismantling of the crane must also be replaced with new ones.

► Record the replacement and the number of slewing ring bolts replaced in the maintenance logbook.
► Inform your **Manitowoc Crane Care** agent.

4.5 Checking tightening torque

Note
There are two possibilities for checking the tightening of the slewing ring bolts:
- Check with the towerhead on the ground
- Check with the crane in operation (crane erected)

Procedure

► Go to the paragraph that corresponds to the crane configuration:
Result 1
Check with the towerhead on the ground.
► Check the tightening torque of the slewing ring bolts with the towerhead on the ground. ➠ page 4-5
Result 2
Check with the crane in operation (crane erected).
► Check the tightening torque with the crane in operation (crane erected). ➠ page 4-8

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4.5.1 Checking the tightening torque of the slewing ring bolts with the towerhead on the ground

Note
Before carrying out this operation, it is essential to have the crane towerhead on the ground.

Note
Every sixth bolt must be checked for each of the rings of the slewing ring.

Note
Depending on access, two methods of checking the tightening torque are proposed:

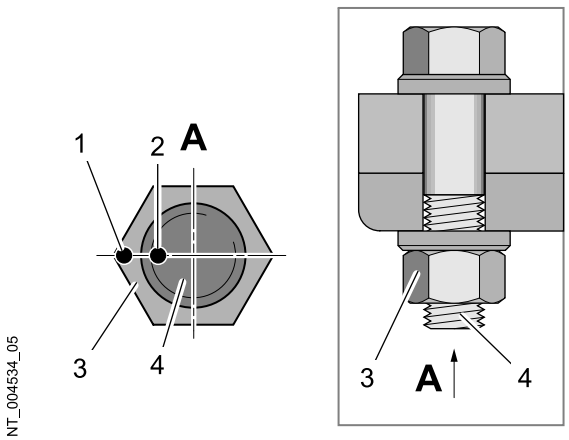
- The first consists of checking the tightening at the level of the nut.
- The second consists of checking the tightening at the screw head.

Note
Before any checking of the tightening torque, clean and degrease the nuts and the screw threads.

Procedure

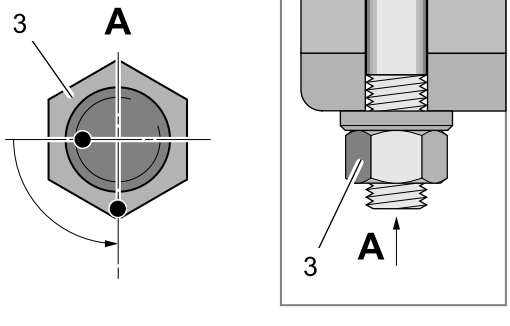
1. Perform this procedure when the condition below exists.

Conditions
- Checking tightening torque at the level of the nut.



NT_004534_05

► Place two marks **(1)** and **(2)** using a paint marker to mark the position of the nut **(3)** in relation to the screw **(4)**.

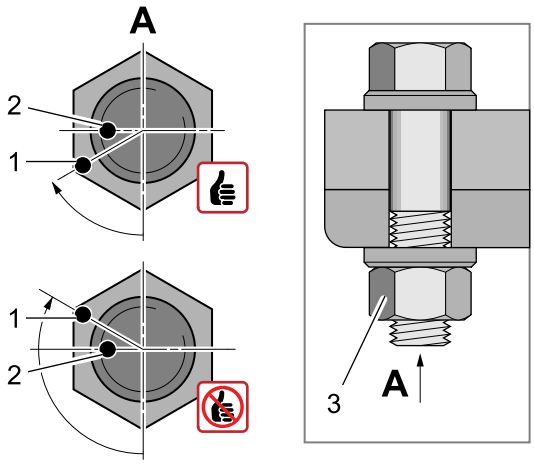


NT_004534_06

► Loosen the nut **(3)** by one quarter-turn.

Note
Lock the head of the screw properly.

Note
If loosening is impossible, contact your **'Manitowoc Crane Care'** agent.



NT_004534_07

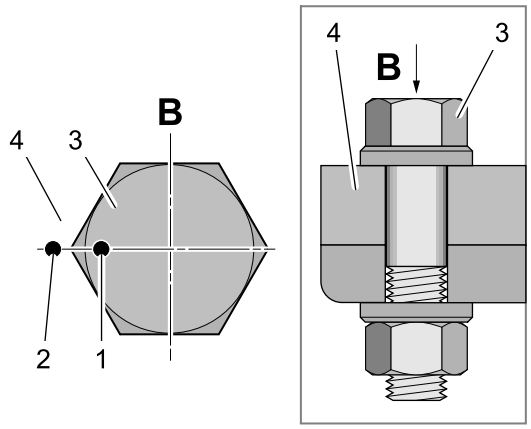
► Tighten the nut **(3)** to **the checking torque** recommended using a torque wrench.
Torque values for checking and tightening
➠ page 4-7

Result 1
The mark **(1)** remains behind the mark **(2)**.
► The check is satisfactory.
► Tighten the nut **(3)** to **the rated tightening torque** recommended using a torque wrench.
Torque values for checking and tightening
➠ page 4-7

Result 2
The mark **(1)** goes beyond the mark **(2)**
► The check is not satisfactory; replace all the slewing ring bolts ➠ page 4-21.
► Record the replacement of all the slewing ring bolts in the maintenance logbook.
► Inform your **Manitowoc Crane Care** agent.

2. Perform this procedure when the condition below exists.

Conditions
- Checking tightening torque at the level of the screw head.



NT_004534_08

► Place two marks **(1)** and **(2)** using a paint marker to mark the position of the screw **(3)** in relation to the ring support **(4)**.

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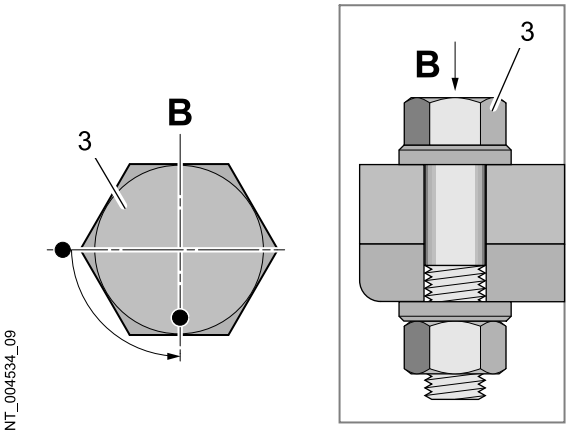
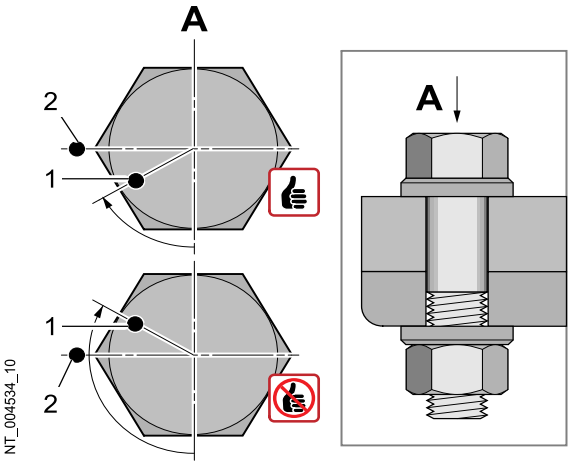


► Loosen the screw **(3)** by one quarter-turn.

Note
Lock the nut properly.

Note
If loosening is impossible, contact your **'Manitowoc Crane Care'** agent.



► Tighten the screw **(3)** to **the checking torque** recommended using a torque wrench.
Torque values for checking and tightening
➠ page 4-7

Result 1

The mark **(1)** remains behind the mark **(2)**.

► The check is satisfactory.
► Tighten the screw **(3)** to **the rated tightening torque** recommended using a torque wrench.
Torque values for checking and tightening
➠ page 4-7

Result 2

The mark **(1)** goes beyond the mark **(2)**.

► The check is not satisfactory; replace all the slewing ring bolts ➠ page 4-21.
► Record the replacement of all the slewing ring bolts in the maintenance logbook.
► Inform your **Manitowoc Crane Care** agent.

Replacement of broken or defective slewing ring bolts

Note
This procedure explains the method for replacing the slewing ring bolts after detection of a breakage or a defect.

3. Remove the slewing ring bolt to be replaced and the two adjacent bolts.
4. Eliminate the excess grease and filings on the bores and the environment around the slewing ring bolts to be replaced.
5. Put the new slewing ring bolts in place.
6. Tighten the replacement slewing ring bolts to the **rated tightening torque** recommended using a torque wrench.
Torque values for checking and tightening ➠ page 4-7

Torque values for checking and tightening

Note
Use a torque wrench with a minimum accuracy of ±10%.

Bolt type and class	Torque for checking	Rated tightening torque
M27-CL 10.9	1,080 N·m (796.6 ft·lb$_f$)	1,350 N·m (995.7 ft·lb$_f$)
M30 - CL 10.9	1,460 N·m (1,076.8 ft·lb$_f$)	1,820 N·m (1,342.4 ft·lb$_f$)
M30 - CL 12.9	1,600 N·m (1,180.1 ft·lb$_f$)	2,000 N·m (1,475.1 ft·lb$_f$)

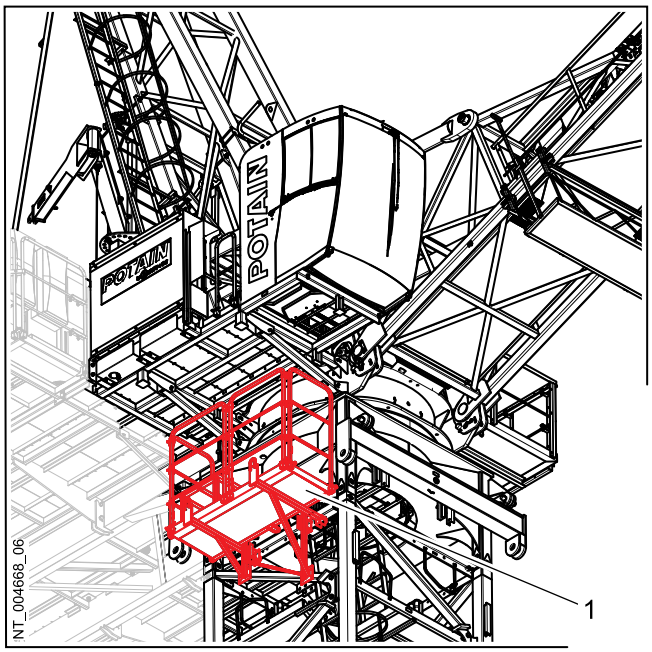
4.5.2 Checking the tightening torque with the crane in operation (crane erected)

Access platform for the slewing ring bolts

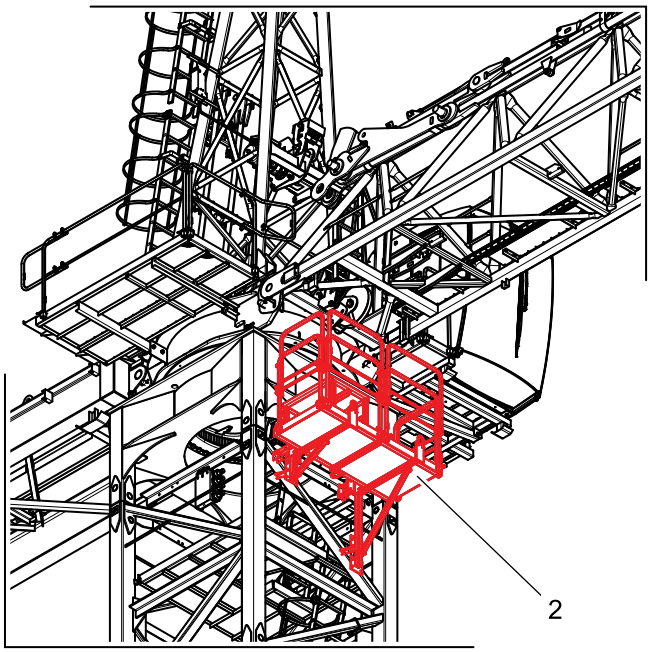
Note
Some crane models require a platform for all checking operations (visual, by touch, and with torque) when the crane is operating.

Note
The platforms give access to the rotating ring of the slewing ring through a range of approximately 60°.

Note
The illustration below is an example of a platform set up on a crane.



1 Platform on a crane type **MR**



2 Platform on a crane type **MD 559, MD 569, MD 689**

Note
This chapter has two sections: the first section is for checking the bolts of the rotating ring and the second is for checking the bolts of the fixed ring.

Pre-tasks

► Consult the installation folder of the platform specific to the crane model.
Identification of the platforms by crane model

Note
For crane models not present in the table below, a platform is not required.

Note
The installation folders of the platforms can be consulted in GTL module DocsOnline.

Crane type	Platform references	Reference numbers of the installation folders for the platforms
MD 559 **MD 569** **MD 689** **MR 418** **MR 608** **MR 615** **MR 618**	84101274	30U-0000-054-1

Procedure

1. Position the crane to check the slewing ring bolts for the rotating ring. ➠ page 4-9
2. Position the crane to check the slewing ring bolts for the fixed ring. ➠ page 4-14

4.5.3 Positioning the crane to check the slewing ring bolts for the rotating ring

DANGER
Danger of death from falling

Access to the slewing ring bolts may be difficult due to the configuration and height of the crane.

► Carefully follow the safety instructions for operations where access is difficult and for working at a height.

DANGER
Risk of crushing

During work on the slewing ring bolts, the technician is exposed to a risk of crushing if the correct safety measures are not applied.

► Before any work, the crane must not be put into weathervaning, and the slewing brake must be engaged.

DANGER
Risk of crushing

When changing the slewing movement of the crane between two checks of the slewing ring bolts, there is significant risk of being crushed.

► It is imperative that the operator(s) on the platform are in a safe place during the crane's slewing movement phases.

Note
Use the cab indicator to position the jib according to the angles and the maximum moment given in this procedure.

Note
Each slewing ring bolt checked must be identified using a paint marker.

Note
A crane without a suspended load on its hook has a rear torque.

A crane with a suspended load on its hook has a front torque.

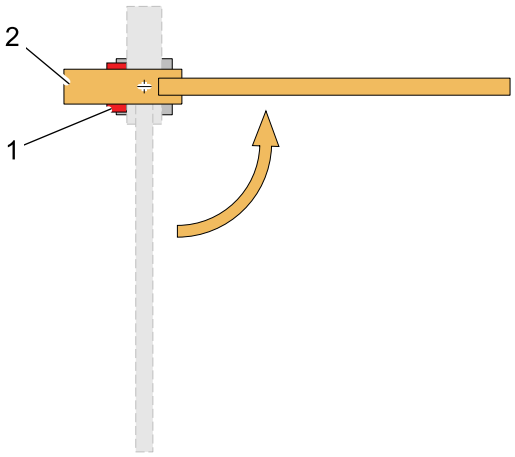
Procedure

1. Perform this procedure when the condition below exists.

Conditions
- With access platform

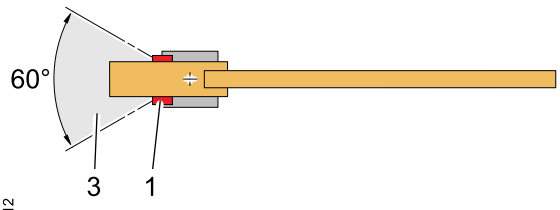
► Place the access platform on the crane.

► Slew the crane to position the crane's counter-jib **(2)** above the platform **(1)**.



NT_004544_06

► Lock the jib of the crane by activating the slewing brake.

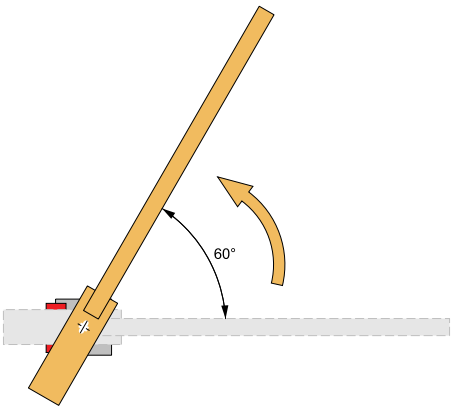


NT_004544_12

- Check the tightening of the slewing ring bolts ➠ page 4-16 of the zone **(3)** accessible from the platform **(1)**.

Note
The check is carried out **without a load**.

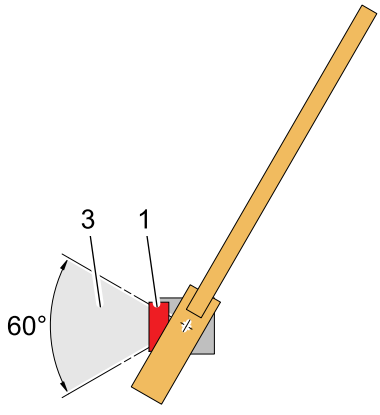
- Slew the crane 60° to the left.



NT_004544_07

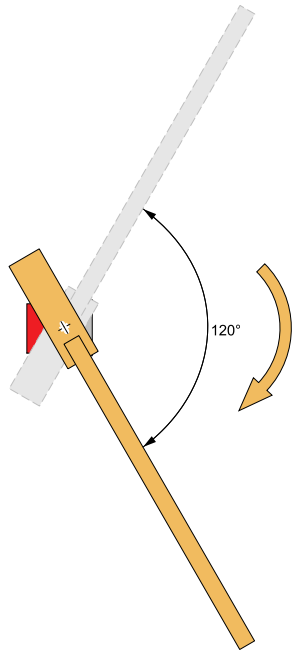
- Lock the jib of the crane by activating the slewing brake.
- Check the tightening of the slewing ring bolts ➠ page 4-16 of the zone **(3)** accessible from the platform **(1)**.

Note
The check is carried out **without a load**



NT_004544_13

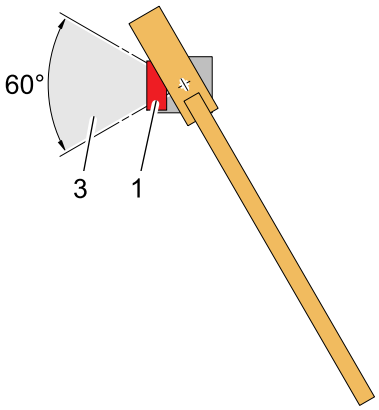
- Slew the crane 120° to the right.



NT_004544_08

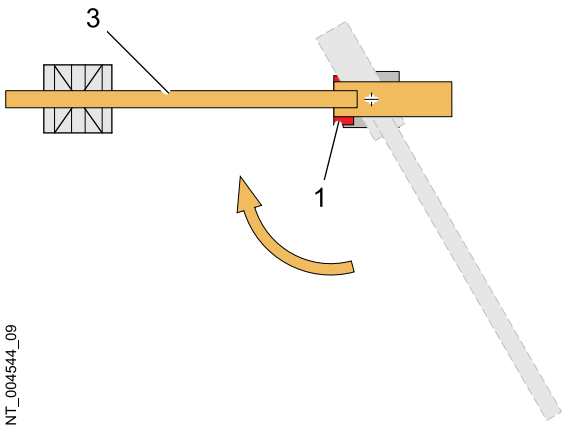
- Lock the jib of the crane by activating the slewing brake.
- Check the tightening of the slewing ring bolts ➠ page 4-16 of the zone **(3)** accessible from the platform **(1)**.

Note
The check is carried out **without a load**



NT_004544_14

- Slew the crane until **the jib** of the crane is positioned above the platform **(1)**.



NT_004544_09

- Lock the jib of the crane by activating the slewing brake.

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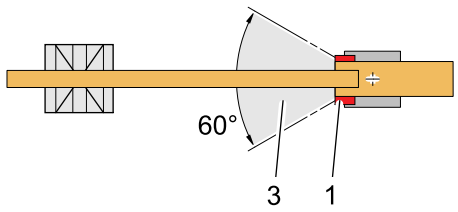


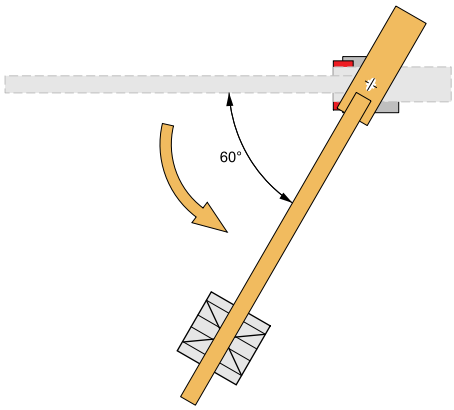
NT_004544_15

- Check the tightening of the slewing ring bolts page 4-16 of the zone **(3)** accessible from the platform **(1)**.

Note

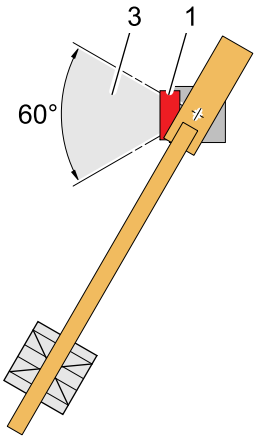
Checking is carried out **with a load** between 60% and 90% of the maximum authorized load.

The load must be positioned in order to reach at least 70% of the maximum moment authorized.



NT_004544_10

- Slew the crane 60° to the left.
- Lock the jib of the crane by activating the slewing brake.



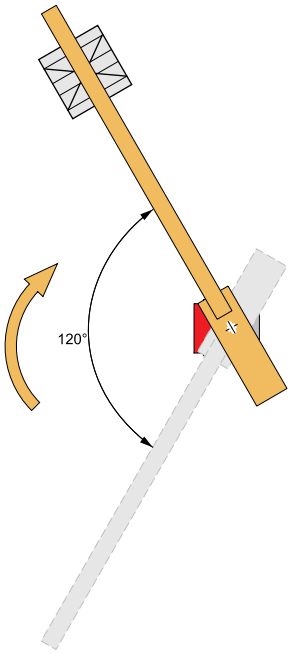
NT_004544_16

- Check the tightening of the slewing ring bolts page 4-16 of the zone **(3)** accessible from the platform **(1)**.

Note

Checking is carried out **with a load** between 60% and 90% of the maximum authorized load.

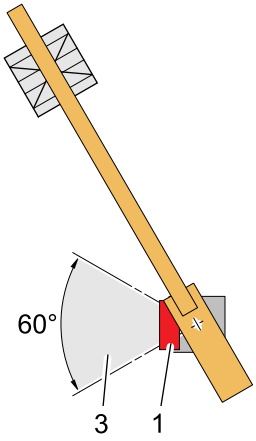
The load must be positioned in order to reach at least 70% of the maximum moment authorized.



NT_004544_11

► Slew the crane 120° to the right.

► Lock the jib of the crane by activating the slewing brake.



NT_004544_17

► Check the tightening of the slewing ring bolts ➠ page 4-16 of the zone **(3)** accessible from the platform **(1)**.

Note

Checking is carried out **with a load** between 60% and 90% of the maximum authorized load.

The load must be positioned so that at least 70% of the maximum authorized moment is reached.

2. Perform this procedure when the condition below exists.

Conditions
- Without access platform

► Check the tightening of the slewing ring bolts. ➠ page 4-16

4.5.4 Positioning the crane to check the slewing ring bolts on the fixed ring

DANGER

Danger of death from falling

Access to the slewing ring bolts may be difficult due to the configuration and height of the crane.

► Carefully follow the safety instructions for operations where access is difficult and for working at a height.

DANGER
Risk of crushing

During work on the slewing ring bolts, the technician is exposed to a risk of crushing if the correct safety measures are not applied.

► Before any work, the crane must not be put into weathervaning, and the slewing brake must be engaged.

Note
Access to the slewing ring bolts for the fixed ring is done from the inside of the crane towerhead.

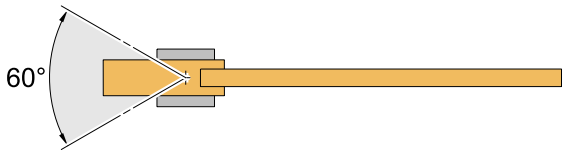
Note
Each slewing ring bolt checked must be identified using a paint marker.

Procedure

1. Lock the jib of the crane by activating the slewing brake.

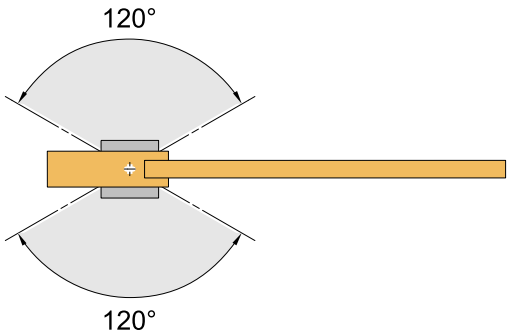
Note
It is forbidden to slew the crane during the entirety of this procedure. The jib must remain at the same angle of reference.

2. Check the tightening of the "rear" bolts (60° behind) without load. ➠ page 4-16

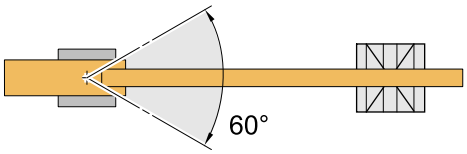


NT_004544_01

3. Check the tightening of the "side" bolts (120° at each side) without load. ➠ page 4-16



NT_004544_02



NT_004544_03

4. Check the tightening of the "front" bolts (60° in front) with load. ➠ page 4-16

Note
Checking is carried out **with a load** between 60% and 90% of the maximum authorized load.
The load must be positioned in order to reach at least 70% of the maximum moment authorized.

4.5.5 Checking tightening torque

Note
Every sixth bolt must be checked for each of the rings of the slewing ring.

Note
Depending on access, two methods of checking the tightening torque are proposed:

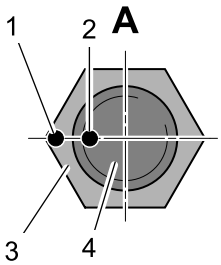
- The first consists of checking the tightening at the level of the nut.
- The second consists of checking the tightening at the screw head.

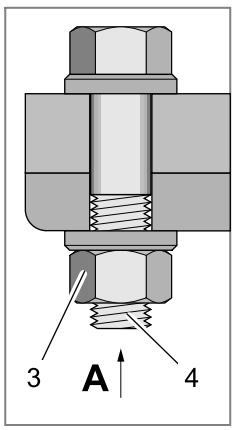
Note
Before any checking of the tightening torque, clean and degrease the nuts and the screw threads.

Procedure

1. Perform this procedure when the condition below exists.

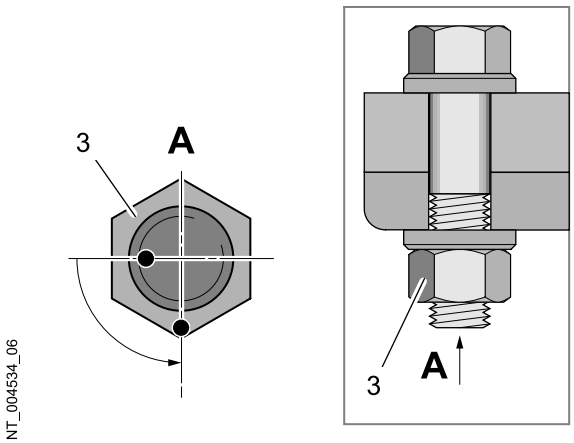
Conditions
- Checking tightening torque at the level of the nut.





NT_004534_05

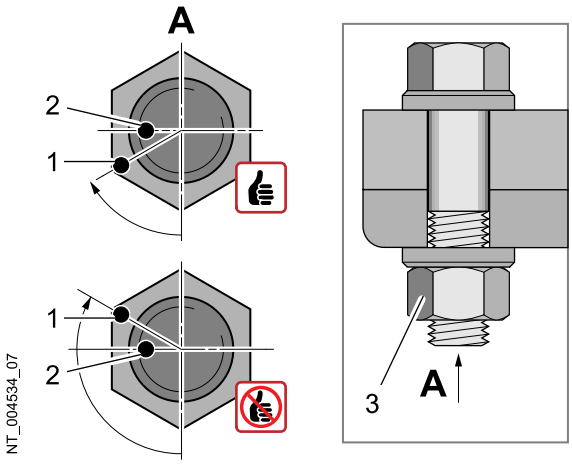
► Place two marks **(1)** and **(2)** using a paint marker to mark the position of the nut **(3)** in relation to the screw **(4)**.



► Loosen the nut **(3)** by one quarter-turn.

Note
Lock the head of the screw properly.

Note
If loosening is impossible, contact your **'Manitowoc Crane Care'** agent.



► Tighten the nut **(3)** to **the checking torque** recommended using a torque wrench.
Torque values for checking and tightening
➠ page 4-19

Result 1
The mark **(1)** remains behind the mark **(2)**.
► The check is satisfactory.
► Tighten the nut **(3)** to **the rated tightening torque** recommended using a torque wrench.
Torque values for checking and tightening
➠ page 4-19

Result 2
The mark **(1)** goes beyond the mark **(2)**
► The control is not satisfactory. Replace this bolt and the two adjacent bolts ➠ page 4-19.

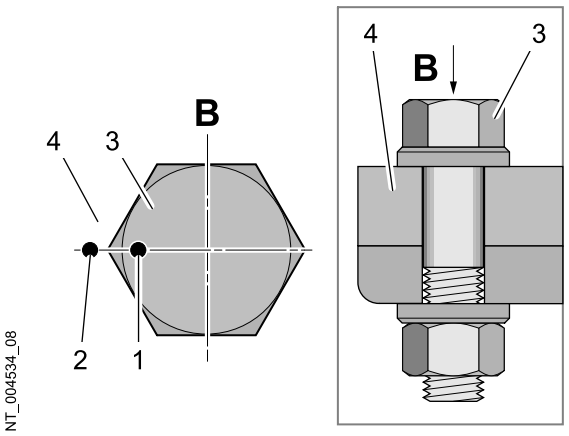
Note
In the event several of the slewing ring bolts are defective (three or more), replace them as well as their adjacent bolts.
At the next dismantling of the crane, change all of the bolts for the implicated ring.
The slewing ring bolts that were replaced temporarily pending the dismantling of the crane must also be replaced with new ones.

► Record the replacement and the number of slewing ring bolts replaced in the maintenance logbook.
► Inform your **Manitowoc Crane Care** agent.

2. Perform this procedure when the condition below exists.

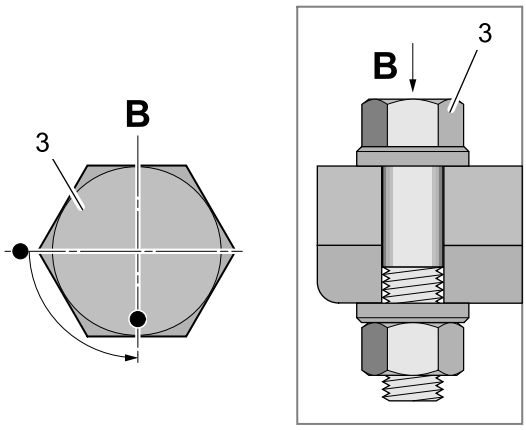
Conditions

- Checking tightening torque at the level of the screw head.



NT_004534_08

► Place two marks **(1)** and **(2)** using a paint marker to mark the position of the screw **(3)** in relation to the ring support **(4)**.

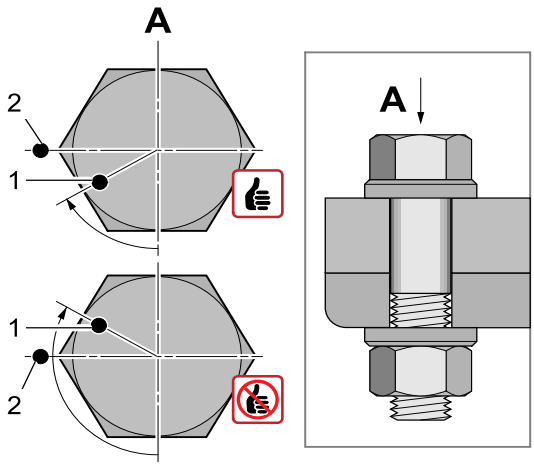


NT_004534_09

► Loosen the screw **(3)** by one quarter-turn.

Note
Lock the nut properly.

Note
If loosening is impossible, contact your **'Manitowoc Crane Care'** agent.



NT_004534_10

► Tighten the screw **(3)** to **the checking torque** recommended using a torque wrench.
Torque values for checking and tightening
➠ page 4-19

Result 1

The mark **(1)** remains behind the mark **(2)**.

► The check is satisfactory.

► Tighten the screw **(3)** to **the rated tightening torque** recommended using a torque wrench.
Torque values for checking and tightening
➠ page 4-19

Result 2

The mark **(1)** goes beyond the mark **(2)**.

► The control is not satisfactory. Replace this bolt and the two adjacent bolts ➠ page 4-19.

Note

In the event several of the slewing ring bolts are defective (three or more), replace them as well as their adjacent bolts.

At the next dismantling of the crane, change all of the bolts for the implicated ring.

The slewing ring bolts that were replaced temporarily pending the dismantling of the crane must also be replaced with new ones.

- ► Record the replacement and the number of slewing ring bolts replaced in the maintenance logbook.
- ► Inform your **Manitowoc Crane Care** agent.

Torque values for checking and tightening

Note

Use a torque wrench with a minimum accuracy of ±10%.

Bolt type and class	Torque for checking	Rated tightening torque
M27-CL 10.9	1,080 N·m (796.6 ft·lb$_f$)	1,350 N·m (995.7 ft·lb$_f$)
M30 - CL 10.9	1,460 N·m (1,076.8 ft·lb$_f$)	1,820 N·m (1,342.4 ft·lb$_f$)
M30 - CL 12.9	1,600 N·m (1,180.1 ft·lb$_f$)	2,000 N·m (1,475.1 ft·lb$_f$)

4.6 Replacement of broken or defective slewing ring bolts

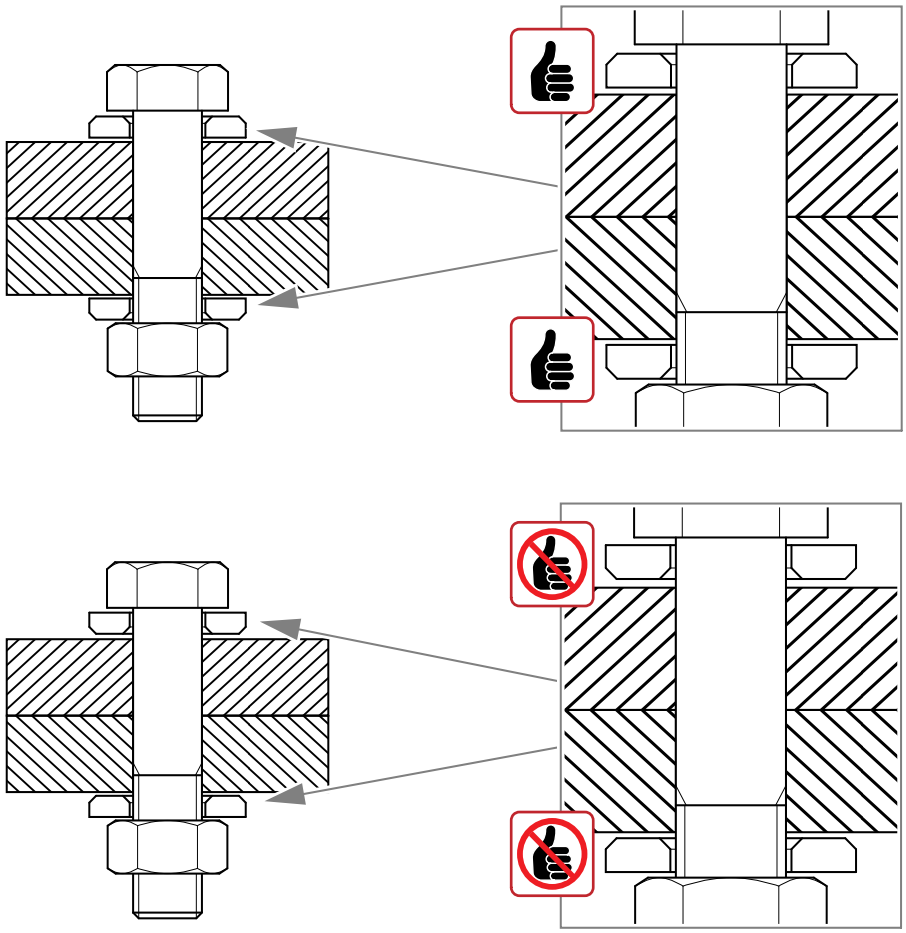
Note

This procedure explains the method for replacing the slewing ring bolts after detection of a breakage or a defect.

Procedure

1. Remove the slewing ring bolt to be replaced and the two adjacent bolts.
2. Eliminate the excess grease and filings on the bores and the environment around the slewing ring bolts to be replaced.

Putting the slewing ring bolts in place



NT_004668_03

3. Put the new slewing ring bolts in place.

Note
It is essential to position the chamfers of the washers on the side of the bolt head or stud and on the side of the nut.

Note
It is essential to position the nuts so that the marking indicating the class (10.9 or 12.9) is visible once in place.

4. Tighten the replacement slewing ring bolts to the **rated tightening torque** recommended using a torque wrench.
Torque values for checking and tightening ➠ page 4-20

Torque values for checking and tightening

Note
Use a torque wrench with a minimum accuracy of ±10%.

Bolt type and class	Torque for checking	Rated tightening torque
M27-CL 10.9	1,080 N·m (796.6 ft·lb$_f$)	1,350 N·m (995.7 ft·lb$_f$)
M30 - CL 10.9	1,460 N·m (1,076.8 ft·lb$_f$)	1,820 N·m (1,342.4 ft·lb$_f$)
M30 - CL 12.9	1,600 N·m (1,180.1 ft·lb$_f$)	2,000 N·m (1,475.1 ft·lb$_f$)

4.7 Replacing all the slewing ring bolts

DANGER

Danger of death from falling

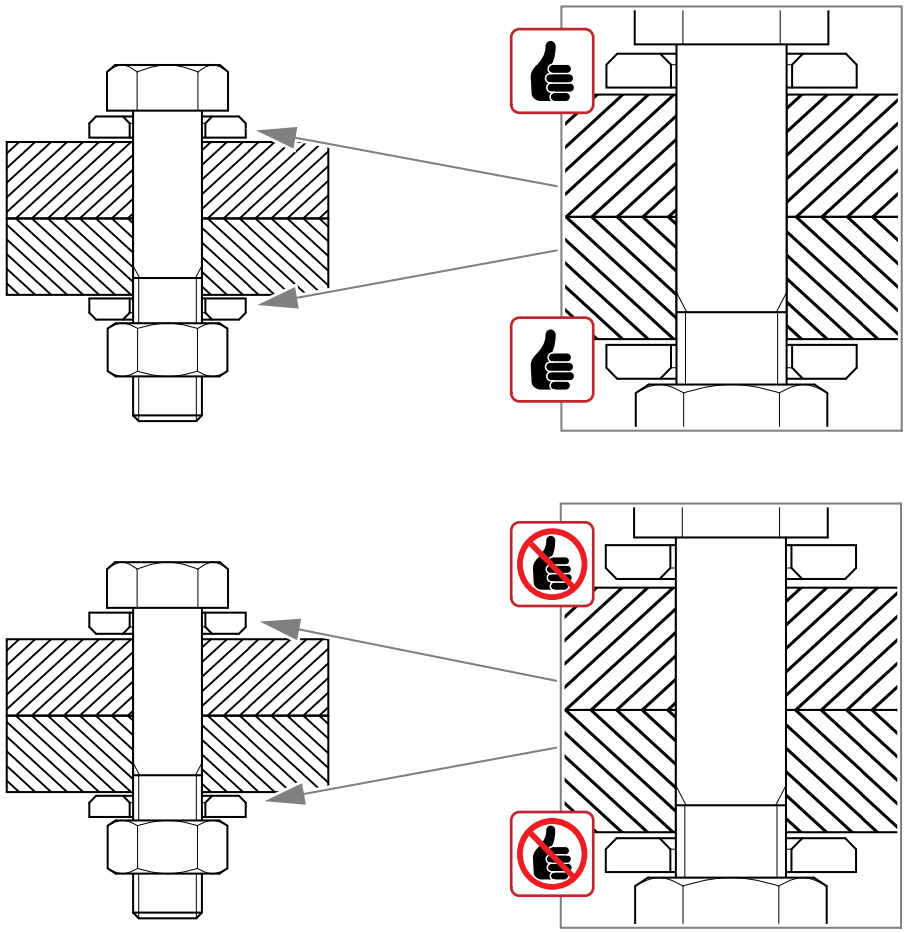
During systematic replacement of the slewing ring bolts every 8 years, access to the slewing ring bolts may be difficult due to the configuration and height of the crane.

► The slewing ring bolts must be replaced with the towerhead of the crane on the ground. It is recommended to carry out this work in the workshop.

Procedure

1. Remove all of the slewing ring bolts from the first ring (fixed or rotating).
2. Eliminate the excess grease and filings on the bores and the environment around the slewing ring bolts to be replaced.

Putting the slewing ring bolts in place



NT_004668_03

3. Put the new slewing ring bolts in place.

Note
It is essential to position the chamfers of the washers on the side of the bolt head or stud and on the side of the nut.

Note
It is essential to position the nuts so that the marking indicating the class (10.9 or 12.9) is visible once in place.

4. Tighten the slewing ring bolts to the rated tightening torque recommended using a torque wrench.
Torque values for checking and tightening ➠ page 4-22

Note
Tightening of the slewing ring bolts must be done with the crosswise tightening method ➠ page 4-23.

5. Repeat the four preceding steps for the second ring.

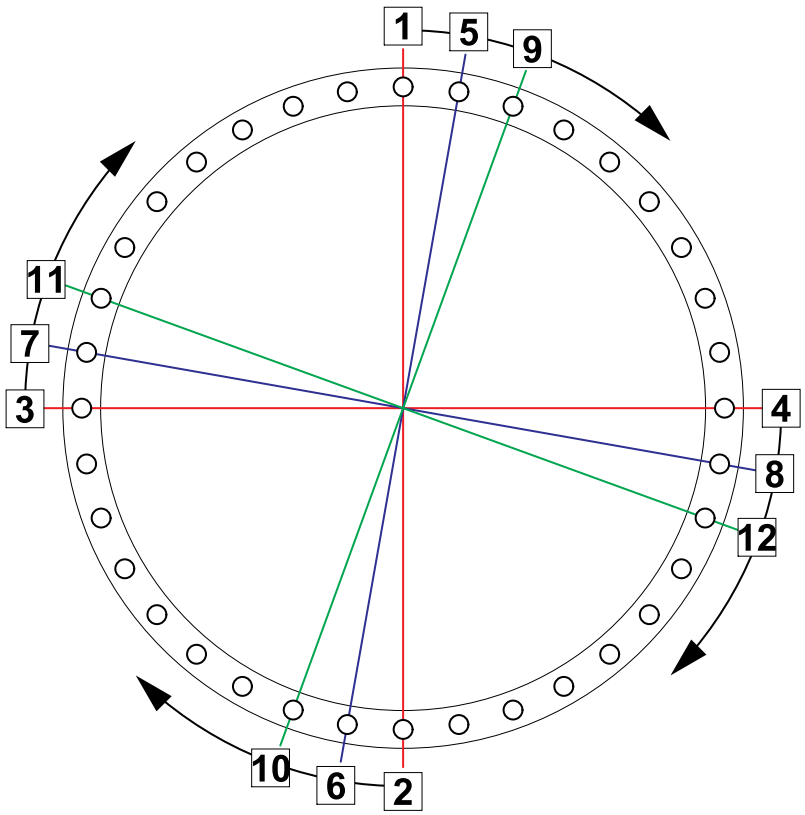
Torque values for checking and tightening

Note
Use a torque wrench with a minimum accuracy of ±10%.

Bolt type and class	Torque for checking	Rated tightening torque
M27-CL 10.9	1,080 N·m (796.6 ft·lb$_f$)	1,350 N·m (995.7 ft·lb$_f$)
M30 - CL 10.9	1,460 N·m (1,076.8 ft·lb$_f$)	1,820 N·m (1,342.4 ft·lb$_f$)
M30 - CL 12.9	1,600 N·m (1,180.1 ft·lb$_f$)	2,000 N·m (1,475.1 ft·lb$_f$)

4.8 Reminder of the tightening order for the slewing ring bolts

Note
This procedure must be followed when replacing all of the slewing ring bolts on one ring.



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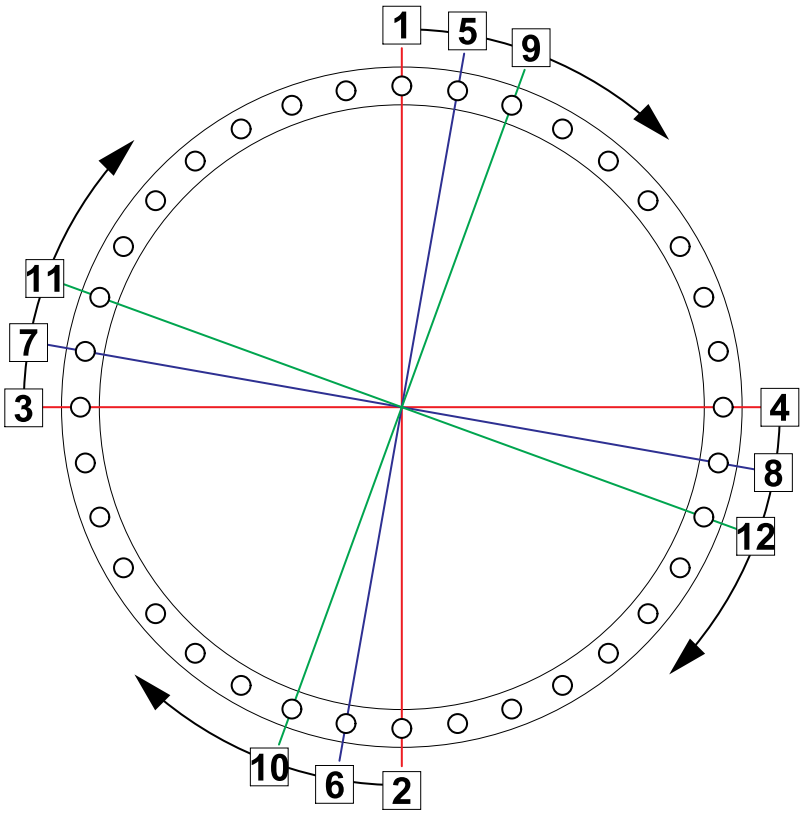
Note
The order in which the slewing ring bolts are tightened must be followed.

Note
Apply the tightening instructions according to the type of slewing ring bolt.



NT_004534_01

Always tighten the slewing ring bolts in a crosswise pattern:

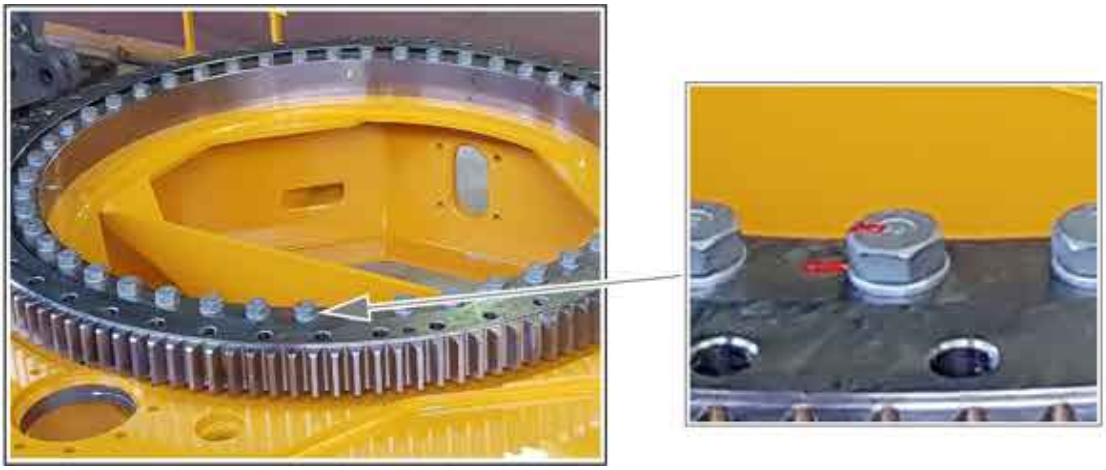
1. Tighten bolt [1], then mark it with a paint marker pen.
2. Tighten bolt [2] located 180° from bolt [1], then mark it with a paint marker pen.
3. Tighten bolt [3] located 90° from bolt [2], then mark it with a paint marker pen.
4. Tighten bolt [4] located 180° from bolt [3], then mark it with a paint marker pen.
5. Tighten bolt [5] next to bolt [1], then mark it with a paint marker pen.
6. Tighten bolt [6] located 180° from bolt [5], then mark it with a paint marker pen.
7. Tighten bolt [7] located 90° from bolt [6], then mark it with a paint marker pen.
8. Tighten bolt [8] located 180° from bolt [7], then mark it with a paint marker pen.
9. Continue the tightening procedure for all the slewing ring bolts by repeating the previous steps.

Note

Always use the crosswise tightening technique.

It is strictly prohibited to tighten the slewing ring bolts in just one area at a time.

4.8.1 Marking of slewing ring bolts



NT_004534_02

Note

The slewing ring bolts must be marked once they are tightened.

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Appendix
A Preventive maintenance schedule

A.1 Preventive maintenance

Interval	Maintenance Tasks	Page
At each fitting of the crane	Slewing ring	
	Checking the slewing ring bolts visually and by touch	2-2
	Checking the slewing ring bolts visually and by touch	3-2
	Checking the slewing ring bolts visually and by touch	4-3
500 hours or 3 months / whichever occurs first	Slewing ring	
	Checking the slewing ring bolts visually and by touch	2-2
	Checking the slewing ring bolts visually and by touch	3-2
	Checking the slewing ring bolts visually and by touch	4-3
4000 hours or 2 years / whichever occurs first	Slewing ring	
	Checking the tightening of the slewing ring bolts	2-2
	Checking the tightening of the slewing ring bolts	3-3
	Checking tightening torque	4-4
8 years	Slewing ring	
	Replacing all the slewing ring bolts	4-21
12 years	Slewing ring	
	Replacing all the slewing ring bolts	3-12
	Replacing all the slewing ring bolts	2-7

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