






Maintenance Manual

Fixed tilt structure - Bipile

STANDARD MANUAL

This is the standard manual. It shall be customized for each project during the design phase. Copyright © 2017-2021, Trina Solar Co., Ltd. All rights reserved.

CONTROL REVISION

REV	DATE (dd/mm/yy)	DESCRIPTION	ELABORATED	REVISED	APPROVED
1	12/01/17	INITIAL DOCUMENT	 VBG	 JAM	 MAI
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1 INTRODUCTION

The purpose of this manual is to serve as a guide for a correct maintenance of the TrinaTracker. Fixed Structure. It is recommended to read this document carefully before proceeding. The staff in charge of the maintenance must be qualified and specialized in this kind of operations. In case of any doubt contact the Technical Department of TrinaTracker.

The damages caused by negligence of not qualified and trained people or the incorrect usage of the components are not included in the warranty.

TrinaTracker manufactures a wide range of fixed structures; consequently it is possible to find in this manual several images for the same area. In such a case the one that suits the provided solution must be considered.

TrinaTracker is only responsible of the supplied elements. The instructions contained in this manual must be strictly followed; otherwise, the manufacturer is exempt from any responsibility. The modifications or alterations made without the authorization of the manufacturer or the usage of not original spare parts exempt the manufacturer from any responsibility relative to the structure and safety of people that manipulate the assembly.

It is recommended the exclusive presence of authorized staff for the structure installation. The people working or moving on site are required to respect the basic safety and prevention. They will be equipped with the clothing and personal protection equipment (helmets, gloves, shoes, etc), also they will adopt prevention measures as not standing under hanging loads, using gloves to avoid damages from irregular surfaces of the materials, checking the parts tying, make sure that the resistance of cables and slings is enough to support the weights of the parts to lift and/or any other applicable to the applicable task.

TrinaTracker is not responsible of the eventual damages caused by electric equipment during the maintenance operations or other.

2 TOOLING INFORMATION

Next is a list of the necessary tooling to make the maintenance to the structure:

- **TORQUE WRENCH** (adjustable to the tightening torque to apply according the table in this document).
- **IMPACT SCREWDRIVER**, with the applicable adaptation to the metric values covered in the table attached.
- **WRENCHES**, according the metric value.
- **DIGITAL LEVEL**, to check the gradient.

3 MAINTENANCE

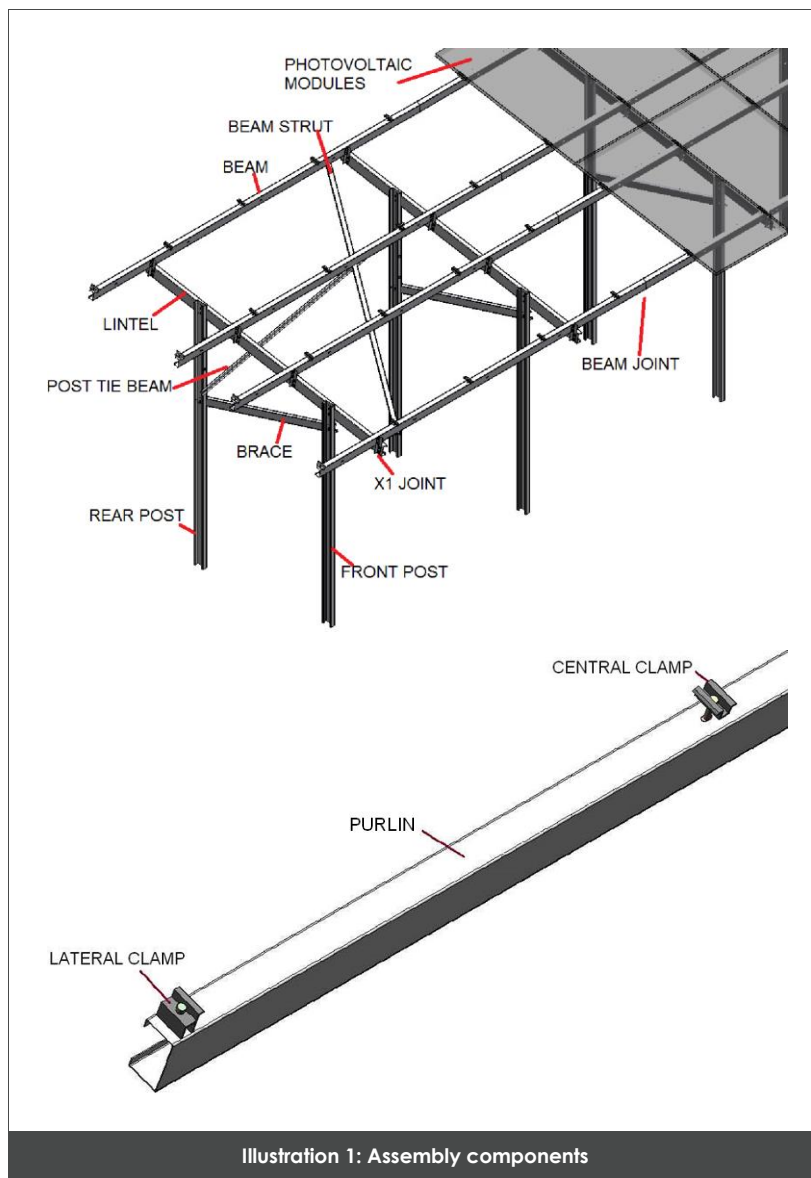
The structure has been designed to minimize the maintenance works. Anyway, to ensure the durability of the structure, it is recommended to carry out the following operations with a minimum frequency of one year:

- Check the tightening torque of the hardware. Adjust it to the needed torque.
- Check the galvanization status and painting of the different components of the structure. In transport and assembly phases small blows or scratches could happen and slightly damage the galvanization or painting. Also the bolts treatment could be affected during tightening phase. In any of this cases apply zinc paint with a minimum zinc content of 90%.

A yearly inspection is at least recommended to every table/assembly of the structure; check in if the correct angle of the table according to drawings.

MAINTENANCE OF FIXED STRUCTURE					Checked by:				
					Checked date:				
Location of table Row - Table		Bolts tightening				Galvanization inspection / rust			
		M8	M12	M16		Posts	Beams	Rest of parts	
	Checked								
	Remarks								
	Checked								
	Remarks								
	Checked								
	Remarks								

3.1. Check of the assembly elements



Bolts used in the assembling at the different structural elements

REFERENCE	Fastener
Post + Lintel	M16
Post + Lintel (Block)	M6
Post +Post tie beam	M12
Post + Brace	M16
Joint X1 + Lintel	M12
Joint X1 + Beam	M12
Beam + Beam joint	M12
Beam + Tie beam	M12
Beam + Aluminium Clamp	M8

Below is a table indicating the tightening torque for the most common bolts, to serve as a reference:

REFERENCE	Tightening torque (Nm) Quality A2-70	Tightening torque (Nm) Quality 8.8
M8 (joints without contact between the surfaces)*	10	10
M12 (rigid joints)	57	77
M16 (rigid joints)	140	190

- Rigid joints are defined as when connected pieces are in contact, or the separation between them is so small that when is tighten to the correct torque they are totally in contact.
- Joints without contact are defined as when the connected pieces are not in contact after tightening to the correct torque. In this case if they are tightened excessively, they could break or deform.

Initial pre-tensioning strengths might be reduced due to possible variations in temperature, internal stress, friction, or the effect of non-rigid elements between joints.

Therefore, when following the "check list", the same tightening torque shall be applied and under the same temperature conditions as those followed during the assembly process. The admissible tolerances when following the installation "check list" are:

- The tolerance of the tightening torque for rigid joints shall be $\pm 15\%$

- The tolerance of the tightening torque for joints with no contact shall be $\pm 0/-15\%$

TrinaTracker reserves the right to modify the tolerance values described in this document.

The screws shall be tightened following bolt tightening procedure:

1. Pre-tighten the bolts to 75% of the torque level according to the tightening torque table above, starting with the top screws and then the bottom screws, crosswise. The tighten shall be done mechanically (with torque wrench) or manually, in both cases using calibrated impact head tools with the purpose of preventing any form of erosion on the edges of the screw due to wear on the head. The tool head shall be replaced when damage is detected on the edges of the screw.
2. Final tighten: Calibrated and certified torque wrench shall be used to apply the specified tightening torque within tolerances as referenced above. Once the torque is applied, is mandatory that the bolt shall be marked with permanent marker.

Do not proceed to step 2 until step 1 has been applied in all the screws in the joint. Bear in mind, symmetrical joints have their own specific tighten sequence.

However, rust can appear on some edges of the screw heads during assembly. These shall be repaired by the company responsible for performing the assembly tasks with Zinc rich paint.

- ❗ **TrinaTracker is not responsible for hardware that is damaged during the assembly stage or the repairing works related to it.**

3.2. Inspection galvanizing

It is recommended to yearly verify the existence or appearance of rust or corrosion to repair it as soon as possible and avoid that the rust areas increase.

As a summary, the action to carry out would be, remove the rust area and then protect with paint rich in zinc. Verify especially the areas exposed to assembly as:

- Top part of posts (damages from ramming procedure).
- Parts with damage possibilities due to handling.