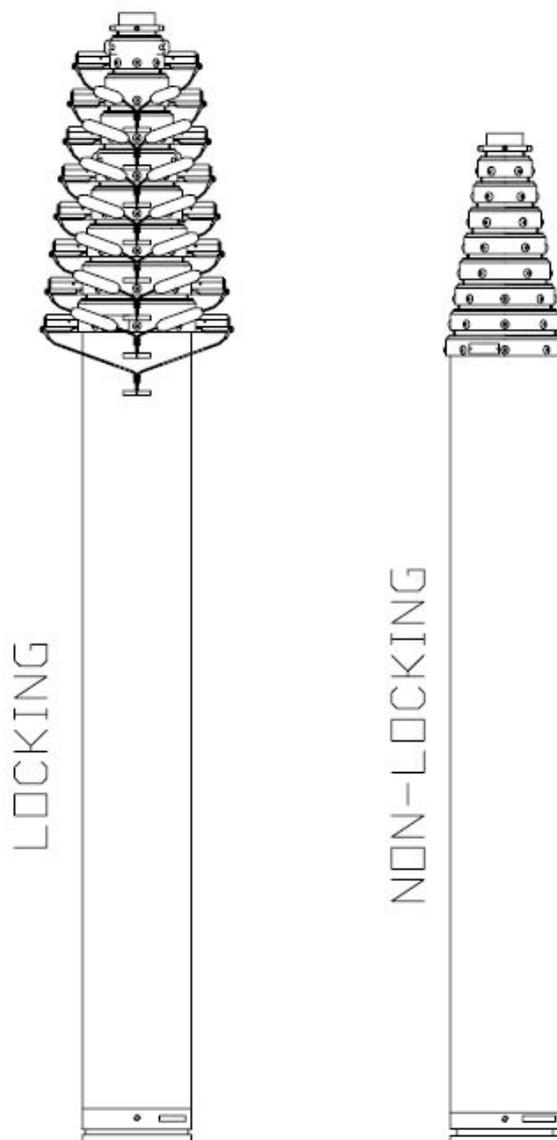




TIANHE PNEUMATIC TELESCOPIC MAST OPERATOR MANUAL



Tianhe Telescopic Mast Factory
Dezheng Industrial Zone Wenzhou
www.tianhemast.com
ISO Registered Quality System



PNEUMATIC MAST

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1. INTRODUCTION

This manual covers the installation, operation, and maintenance for TIANHE pneumatic masts. Mast models covered include standard duty non-locking, heavy duty non-locking, heavy duty locking, super heavy duty non-locking and super heavy duty locking models. The pneumatic mast comprises a non-locking or locking telescoping mast.

The telescoping mast is the structure used to raise the payload to an operational level. It consists of several concentric, nesting mast sections, fabricated from aluminum tube, that extend and retract pneumatically. The telescoping mast can be non-locking or locking. The non-locking telescoping mast must remain pressurized to support the payload at an extended height. The locking telescoping mast can be depressurized once the desired sections are raised and locked into position. The base mast section is constructed from the tube with the largest diameter and the top mast section is constructed from the tube with the smallest diameter. The intermediate mast sections are any mast section in between the base and top mast sections. Aluminum collars are fitted to the top end of each mast section, except for the top mast section that is fitted with a top tube stop. When the telescoping mast is completely retracted, the collars nest on top of each other. The collars on a locking mast are fitted with a locking mechanism including a yoke assembly. Where guying is required, lugs or holes used to attach the guy lines are integral to the locking mast's fabricated collar. Each mast section, except the base mast section, has two rectangular keys along the length of the tube. The keys match with keyways on the larger, adjacent mast section's collar. The keys and keyways are used to establish azimuth (rotational) integrity between the sections.

2. SAFETY PRECAUTIONS

1. Make sure there is no electrical lines over head when you deploy the mast.
2. Make sure the pressure supply do not go over 30PSI
3. Make sure the mast when deploying is in a vertical position
4. Make sure the mast is not over-loaded
5. Make sure the mast is not working on a hurricane or typhoon day
6. Make sure when the mast retracting , your hands are off mast collar edge in order not to hurt and being clamped.

3 . INSTALLATION

Safety Instruction – Installation! At all times while using pipe and hose during installation, recognize that:

- 1.) Pipe and hose should be routed, mounted and restrained to protect from damage;
- 2.) Do not use second hand piping for installation;
- 3.) Do not bend air pipe and hose at a radius less than specified by the manufacturer;
- 4.) Pipes should be marked to avoid hazards from incorrect connection;
- 5.) The exhaust should be fitted with a silencer and be directed away from personnel;
- 6.) When routing piping, install in such a way as to minimize torsion on the joints;
- 7.) Mounting air pipe and hose shall be accomplished only by the use of tools to prevent readily disconnecting air pipe and hose from mast.

Safety Instruction – Control Valve! Improper positioning and operation of Control Valve can result in moderate injury or equipment damage. Control valve must be mounted in a location such that the operator has full view of the mast, but does not make contact with the mast during operation. Use only a Hold-To-Run type control valve.

1. **MOUNTING** – When mounting the pneumatic system, leave enough space around the unit for ventilation and

for access to make initial installation, periodic adjustments, and future maintenance procedures as easy as possible. To reduce vibration in the system place rubber washers or grommets on the bolts between the mounting pads and the mounting surface. To reduce noise, separate the system from the inside workspace of the vehicle.

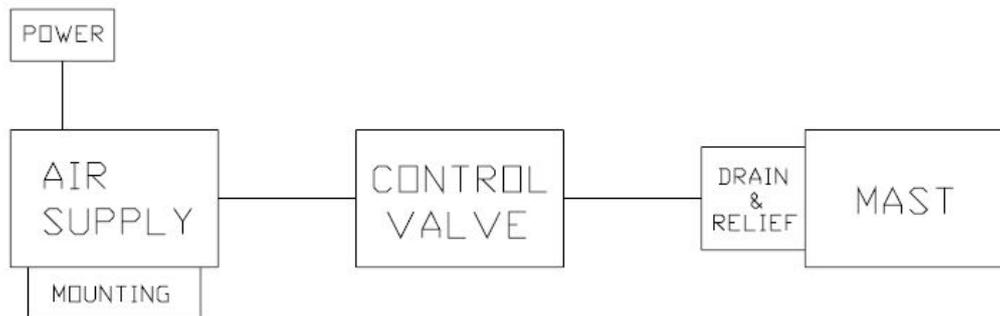
2. **ELECTRICAL** – In accordance with applicable electrical codes, select the proper wiring size, circuit breakers, or fuse size according to the maximum current draw of the pneumatic system being installed. Refer to rating information plate on the compressor motor. Be sure to properly ground the compressor motor and all other electrical components. Operation of the compressor may cause interference unless proper isolation or shielding is used. NOTE: A qualified electrician should perform installation and adjustments.

3. **AIR SUPPLY** – The compressor should have adequate ventilation to provide at least 10 SCFM of clean dry air at the air intake at all times. The recommended temperature range for inlet air is 32° F (0° C) to 95° F (35° C), so it works best when located in a heated compartment. The compressor should not be operated without the air filters in place.

4. **CONTROL VALVE** – A control valve should be installed to direct airflow in and out of the mast. The control valve should be positioned to avoid unintentional operation. Mast movement should stop when the controller is released (hold-to-run type). If the controller is not a hold-to-run type, an emergency stop must be provided. The control valve should be operable by a person wearing gloves and mounted so it can be used with the mast in full view. The control valve should be suitable for outdoor use and marked “Up”, “Down” or similar. A check valve or similar device should be installed directly to the mast through rigid piping that would prevent an extended mast from exhausting uncontrollably if there is a pneumatic failure, such as a hose burst.

5. **DRAIN & RELIEF FITTINGS** – A drain cock and a safety valve should be installed at the air

inlet at the base of the mast. The drain cock empties water that may have accumulated inside the mast. The drain cock should be opened periodically to drain the mast, particularly after the mast has been operated in the rain. The drain cock on any mast should be left open once the mast is fully retracted and once a locking mast is completely extended and locked into position. The safety valve prevents the mast from being over pressurized.



4. OPERATING INSTRUCTION

Mast Erection

1. Make sure that there is no electrical wire above the mast before operating the mast or you can be killed.
2. With the mast assembled in the tripod/vehicle/ concrete mount , guy ropes fitted if required, and air compressor or foot pump circuit is connected before work, and the pneumatic tube is correctly connected.
3. Pull and hold the detent release(handle) for the first section , DO NOT start pumping air into the mast if the detent is not pulled.
4. Start pumping the compressor or foot pump, once the mast has started to extend by a couple of inches release the detent release mechanism (handle) and continue pumping.
5. As the mast section becomes fully extended slow the pumping and the detent will be heard to clicking back into the extended section as it reaches full height (Latch-pin Locked). Stop Pumping the compressor or foot pump .
6. Pull and hold the detent release mechanism (handle) for the next section.
7. Follow steps 3,4and 5 until the mast is extended to the required height.
8. Close the air compressor or foot pump (you can remove it)

To Lower Mast.

1. Using air compressor or foot pump to put a little air pressure into the mast bottom section not over 15PSI.
2. Starting with the bottom section , drag the bottom tube mast collar detent mechanism (handle) and hold on , disconnect air supply and allow air pressure to escape from the air valve/mast ,once the mast has started to retract by a couple of inches release the detent release mechanism (handle) until the section fully retracted ,you will hear a sound of click which is the latch-pin auto locked.
3. Follow steps 2 for each section until the mast is fully closed.

5. MAINTENANCE & SERVICE INSTRUCTIONS

Mast Cleaning and Lubrication

TIANHE pneumatic telescoping masts should be cleaned and lubricated on a regular basis to insure smooth operation and to prolong useful life. This maintenance should be performed typically once a month depending upon local environmental conditions and frequency of use. Signs that cleaning and lubrication are needed can be:

- A noticeable gritty film on the exterior surfaces of the mast sections
- Erratic extension or retraction of the mast
- Noisy operation of the mast
- Sticking of one or more mast sections when mast is extending or retracting

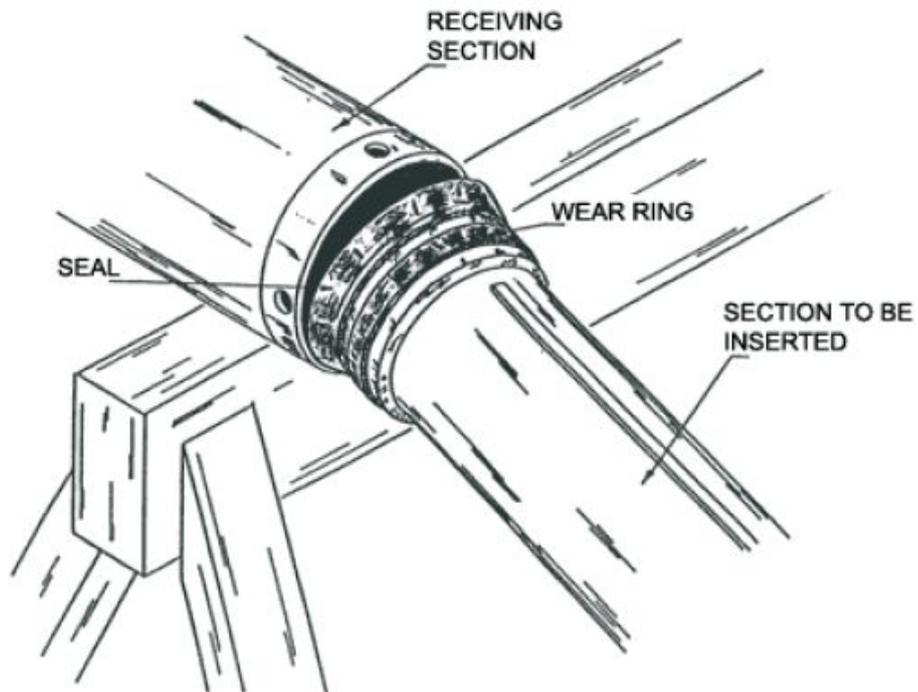
PROCEDURE:

1. Remove top load from the mast. This will allow the sections of a non-locking mast to more easily be extended from smallest to largest. See Step 3. On locking masts, the sequence of extension can be controlled by the locking collars.
2. When a regulator exists in the pneumatic system, reduce its pressure to between 5 and 10 PSIG. NOTE: 10 PSIG should be sufficient pressure to extend all sections of the mast without a top load. If any section will not extend with 10 PSIG the mast may require overhaul. Consult the factory.
3. One person operating the air control valve should slowly pressurize the mast just enough to extend the top mast section. Another person may need to hold down the larger mast section collars to assure the proper sequence of extension. Close the air control valve as soon as the mast section is up.
4. Dampen a rag with a non-abrasive cleanser or solvent such as lacquer thinner to wipe down the extended mast section. Do not allow the cleaning fluid or solvent to run down inside the collar.
5. Repeat steps 3 and 4 for the next larger mast section.
6. Inject approximately 1/2 oz. of Mast Lubricant* or a lightweight machine oil into the weep hole (drain) of the exposed mast section. The weep holes are located between one and three feet below the collar on each tube except the top one.
7. Repeat steps 3, 4 and 6 for each of the remaining mast sections. The larger diameter sections should be injected with approximately 1 oz. of lubricant.

8. Lower the mast completely. Allow several minutes for the lubricant to settle and spread around the wear ring and seal at the bottom of each mast section.

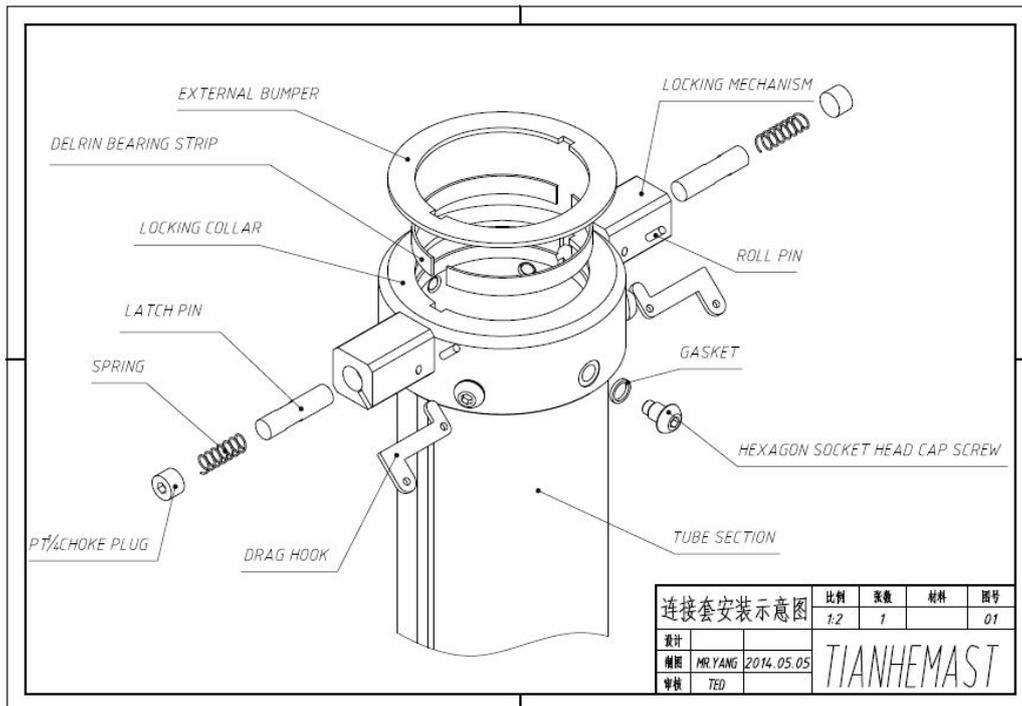
6. CAD GRAPH & WIND FORCE ANALYSIS GRAPH

MAST ASSEMBLING PICS



LOCKING PNEUMATIC MAST COLLAR

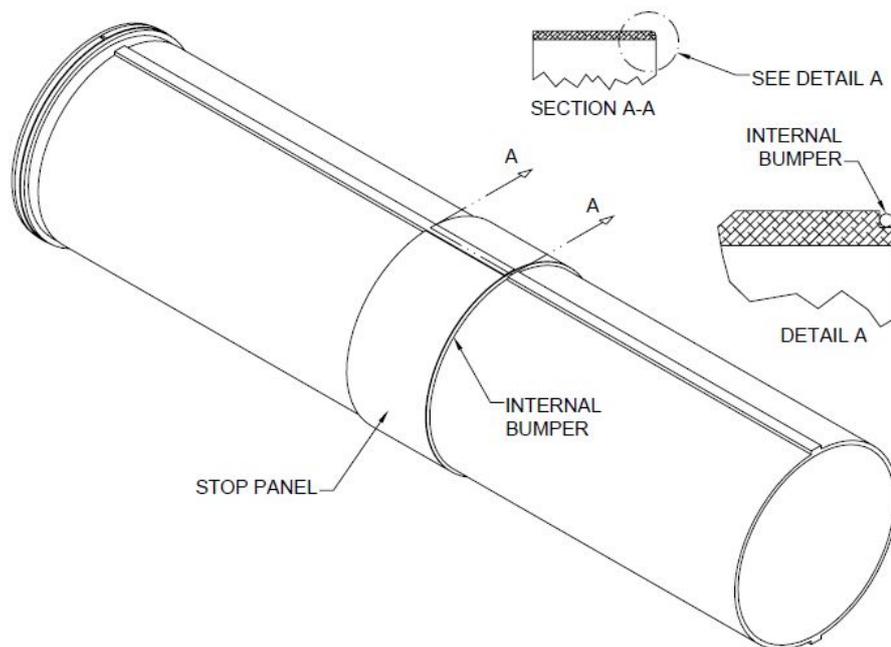
Below pics showed a locking mast technical way of assembling , see the arrow “LATCH PIN ”
 Because the mast is using keyway tube ,there is both keyway in each side of the mast, LATCH
 PIN locking mechanism system that go into the keyway to lock the mast , when depressurized the
 mast won't retract unless you drag the handle yoke.



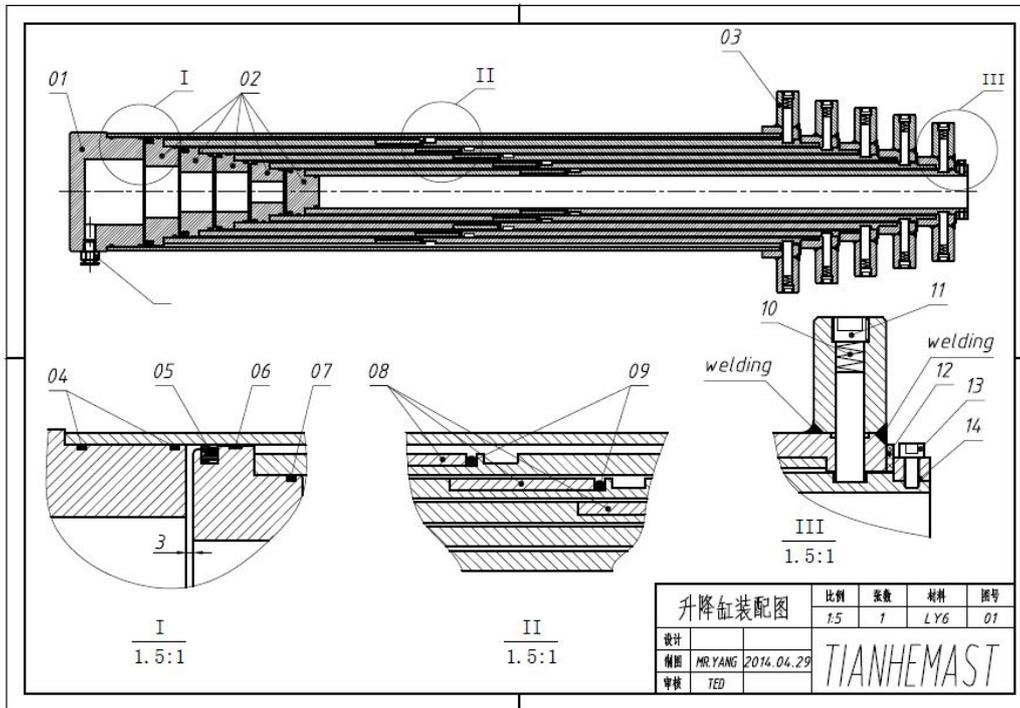
MAST TUBE SECTION INTERNAL STRUCTURE

Stop panel stops each section have a certain length remaining in the bigger section tube and the “certain length ” is well calculated by TIANHE Engineer to have more wind load and safety factor.

Internal Bumper is to reduce the shock when the mast each section fully extended.



LOCKING MAST ASSEMBLING GRAPH



| ITEM MATCHING TABLE | | |
|---------------------|-----------------|--------------------------|
| ITEM | NAME | REMARKS |
| 01 | BOTTOM BASE | |
| 02 | PISTON | |
| 03 | COLLAR | |
| 04 | O RING | ACCORDING TO BOTTOM BASE |
| 05 | Y RING | ACCORDING TO BOTTOM BASE |
| 06 | DELFIN | ACCORDING TO PISTON SIZE |
| 07 | O RING | ACCORDING TO PISTON SIZE |
| 08 | STOP PANEL | ACCORDING TO TUBE SIZE |
| 09 | INTERNAL BUMPER | ACCORDING TO TUBE SIZE |
| 10 | SPRING | |
| 11 | CHOKE PLUG | PT 1/4" |
| 12 | EXTERNAL BUMPER | ACCORDING TO TUBE SIZE |
| 13 | M6 SCREW | |
| 14 | CONNECT | |
| | | |
| | | |
| | | |

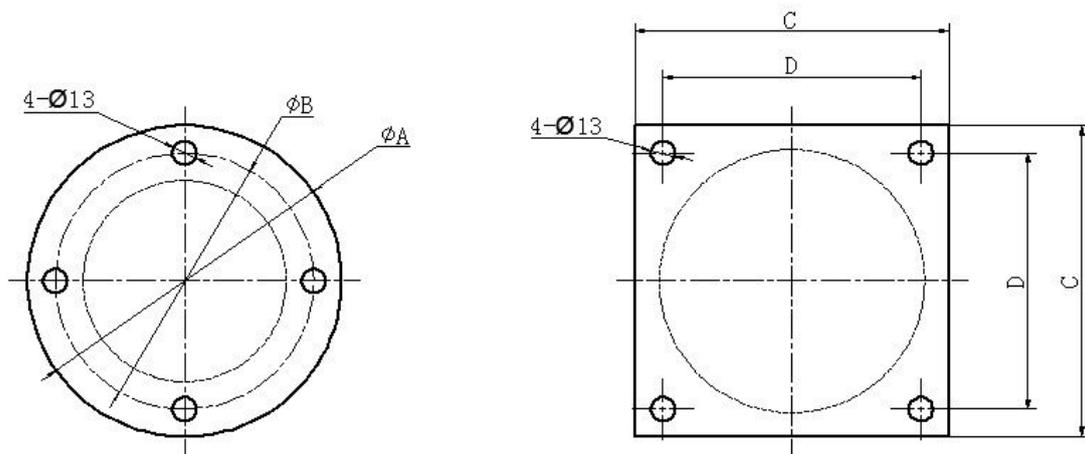
PNEUMATIC MAST BOTTOM FLANGE

Locking mast & Non-locking mast bottom base flange are the same .

There are two kinds of bottom flange below ,round type & square type.

Square type bottom flange is fitting OD which is over 160mm type mast.(not contain 160mm)

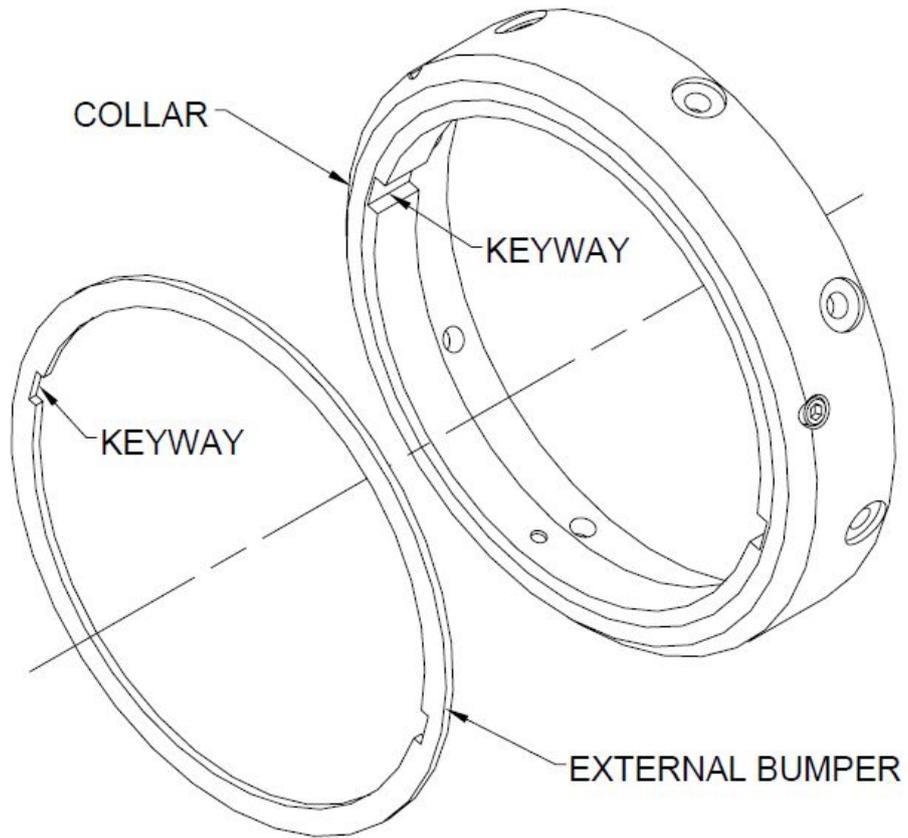
Round type bottom flange is fitting OD which is smaller than 160mm (contain 160mm)

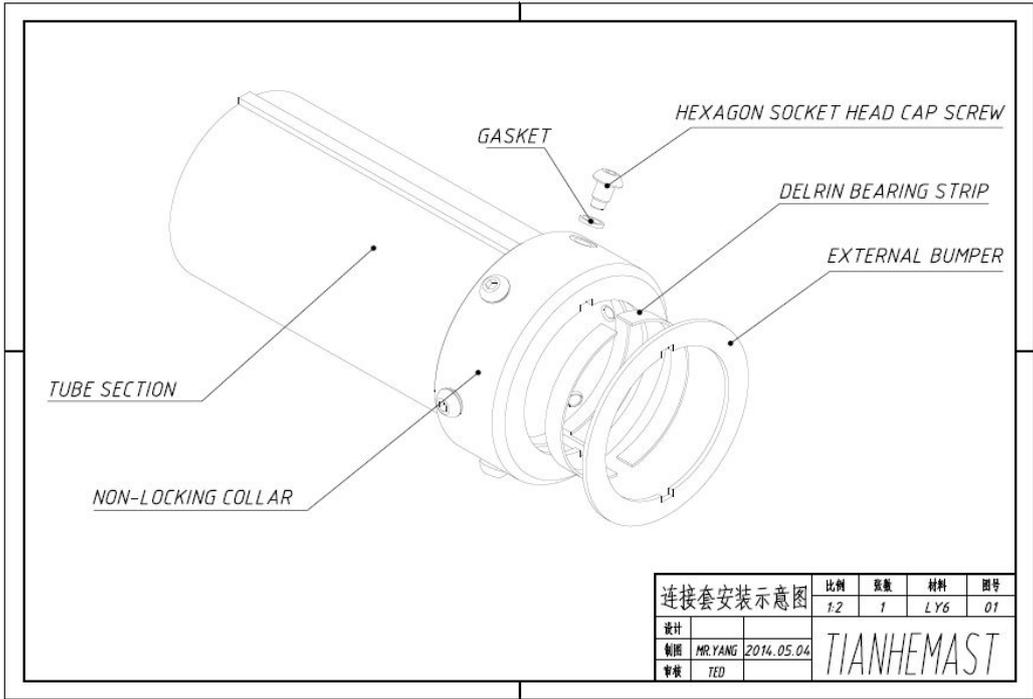


PNEUMATIC MAST BOTTOM FLANGE

NON-LOCKING PNEUMATIC MAST COLLAR

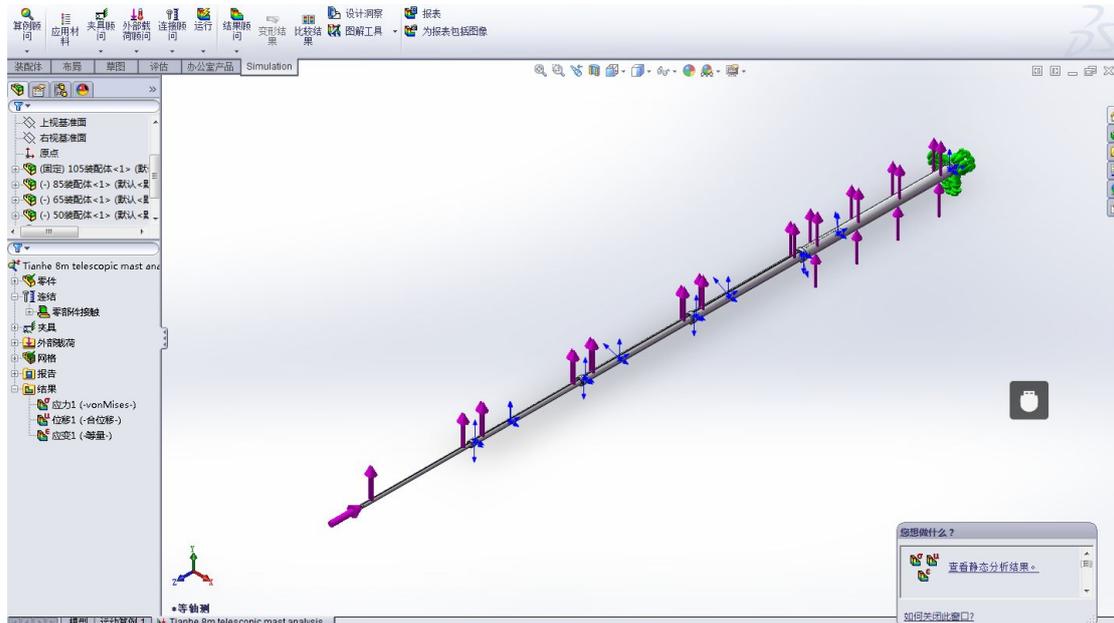
External Bumper is to reduce shock when mast each section is fully retracted.



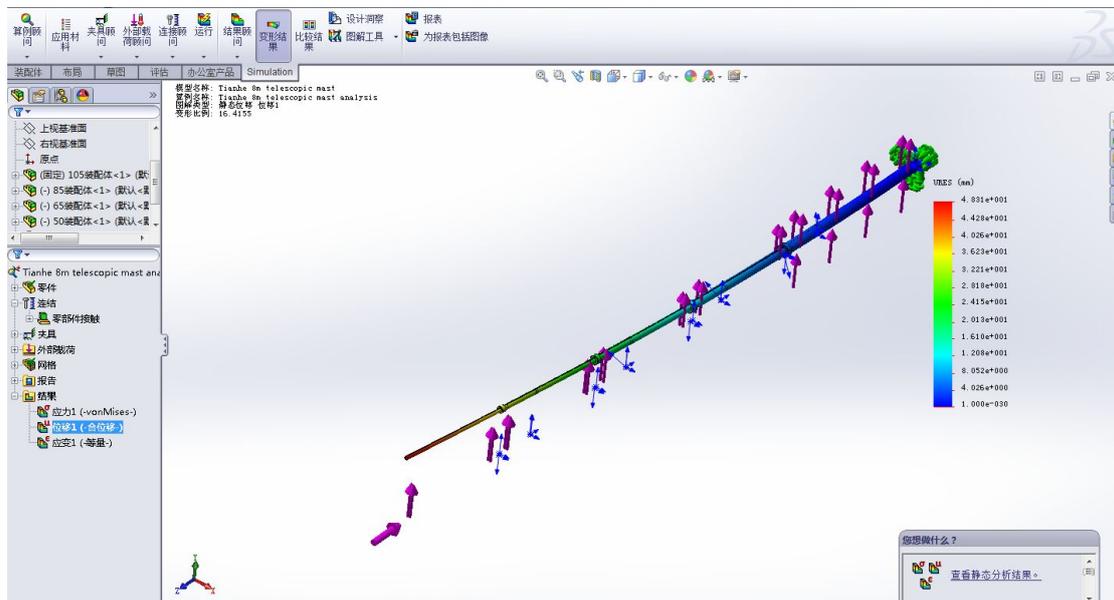


| 连接套安装示意图 | | 比例 | 张数 | 材料 | 图号 |
|----------|---------|------------|----|-----|----|
| 设计 | | 1:2 | 1 | LY6 | 01 |
| 制图 | MR.YANG | 2024.05.04 | | | |
| 审核 | TED | TIANHEMAST | | | |

3D CAD PROTOTYPING



WIND FORCE & TOP LOAD FORCE LOADED AND CALCULATED BY COMPUTER



By doing this finite element method , the calculation make sure the mast internal force meet the yield strength & tensile strength of 6005T5 aluminum maximum force limited range .

CERTIFICATE OF TIANHEMAST

شهادة – 증명서 – Certificat – 證明書 – Сертификат – Certificate

Verification of Compliance



No. EC.1282.0G130704.WLT1486

Certificate's Holder: Wenzhou Lucheng Tianhe Automation
Component Co., Ltd.
No. 18, Dezheng Industrial Zone, Wenzhou, China

Product: Telescopic Mast
Model(s): GSD-60-FA(1800-6000),
GSD-90-FA(2500-9000),
GSD-300-FA(4200-30000),
GSD-180-FA(3200-18000),
GSD-120-FA(3200-12000),
GSD-60-TR(1800-6000),
GSD-100-TR(2800-10000),
GSD-04-HJ(1260-3300),
GSD-03-HJ(890-2350),
GSD-80-MA(2420-8000)

Directives: 2006/42/EC Machinery

Standards: EN ISO 12100:2010

Remark: This Verification of Compliance has been issued on a voluntary basis. ECM confirms that a Technical Construction File (TCF) is existent for the above listed product(s). The TCF satisfactorily covers the essential requirements of the above listed Directive(s). Other relevant Directives have to be observed in case they are applicable. This Document is only valid for the equipment and configuration described and in conjunction with the TCF detailed above. Whereas the Manufacturer is responsible of the certification of the product(s) and not exempted to perform all the necessary activities before placing the product(s) on the market. The Manufacturer is also responsible of the internal production control to ensure the product(s) are in compliance with the essential requirements of the above mentioned Directive(s). This certificate can be checked for validity at www.entecerma.org

Date of issue JULY 2013

Certification Chief Manager

Tim Mahan



Certification Deputy Manager

Jane Russell



Ente Certificazione Macchine Srl

Via Mincio, 386/a – 41056 Savignano s./P. (MO) - ITALY

+39 059 763736 - +39 059 766306 +39 059 761838 info@entecerma.it www.entecerma.it

7. TROUBLE SHOOTING

| PROBLEM | POSSIBLE CAUSE(S) | POSSIBLE SOLUTION(S) |
|--------------------------------------|---|--|
| Mast frozen in extended position. | Mast Base Section not drained routinely. Typically freezes around collar area. | Wrap warming blankets around collar until ice melts. Use heat gun or 500W quartz light. 2. Depressurize Mast. Inject 1 oz. Antifreeze, suited for aluminum engines, where top of collar and Intermediate tube meet. |
| Mast frozen in nested position | Mast Base Section not drained routinely. Typically damages Tubes. | Send to manufacturer for repair or replacement. |
| Mast will not lower without rocking. | 1. Mast not oiled routinely. 2. Not enough weight 3. Bent tube 4. Broken internal bumper 5. Inserts tight | 1. Oil the mast routinely . 2. Add weight to platform or sub adapter 3. Check tube trueness. Order placement if bent. 4. Depressurized , remove collar& lift tube to check internal bumper. Order placement. 5. Depressurize. Disassemble. File & grind to prefit collar inserts as necessary. |
| Mast will not extend | 1. Mast piston seal worn 2. Bent tube 3. Delrin bearing strip worn | 1. Order placement 2. Check tube trueness. Order placement if bent 3. Order placement |
| | | |
| | | |