


Scale: :	Size: <b>A4</b>	Type: <b>Propeller Equipment</b>				<b>MAN Diesel</b>	
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## IMPORTANT

This instruction contains important information regarding tightening, lubricating, sealing and securing of screw connections, as well as special handling of propeller blade screws during re-fitting of propeller blades.

This information is necessary when installing and overhauling the propeller equipment. The given instructions have to be carefully followed when tightening up the propeller equipment in order to ensure a correct assembling of the equipment.

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## Tightening procedure

For MAN propeller equipment, 3 different methods of screw tightening are used i.e.:

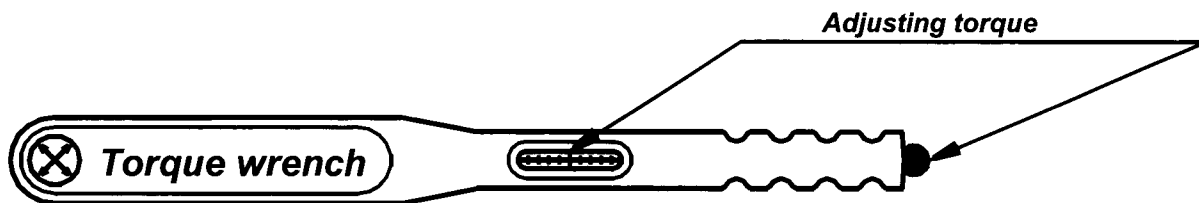
1. Tightening by torque wrench.
2. Pretightening by torque wrench and additional tightening by turning the screw a specified arc length.
3. Turning the screw until a specified elongation of the screw is achieved.



### **Note**

*Flange and bearing surfaces are to be cleaned and free of damages. Flange surfaces are to be degreased and bearing surfaces to be oiled.*

## 1. Tightening by torque wrench



After adjusting the torque wrench to the torque specified under tightening data **all** the screws in the connection are cross tightened. After this first tightening one (1) and **only** one (1) bolt is completely loosened and then retightened by the torque wrench to the specified torque.

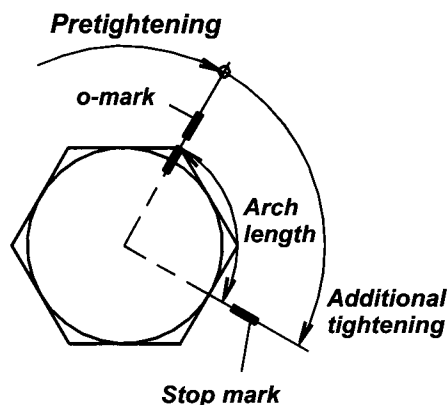
This second cross tightening is repeated until all the screws in the connection are tightened.



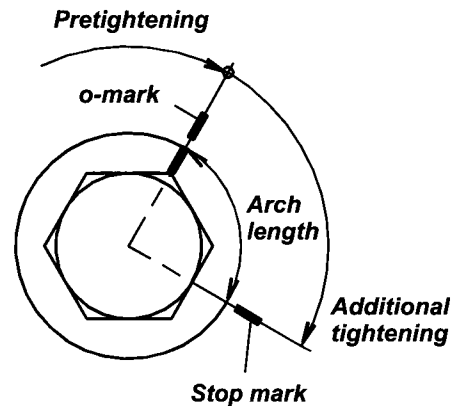
### **Note**

*Mark the screws both after the first and second tightening in order to make sure that all bolts are tightened correct.*

## 2. Pretightening by torque wrench and additional tightening by turning the screw a specified arc length



Hexagon screw



Unbrako screw / socket screw

After adjusting the torque wrench to the torque specified under tightening data **all** the screws in the connection are cross pretightened by the torque wrench. Now **all** the screws are additionally cross tightened to the specified arc length by slugging spanner or a hydraulic tool according to the above sketch.

After this first tightening one (1) and **only** one (1) screw is completely loosened and retightened according to the above description - remember to mark both new 0-mark and stop-mark.

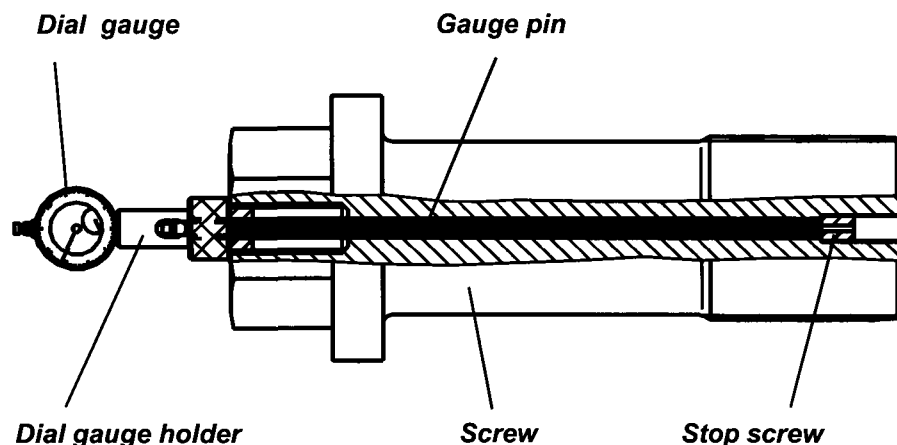
This second cross tightening is repeated until all the screws in the connection are tightened.



### Note

*Mark the screws both after the first and second tightening in order to make sure that all the screws are tightened correct.*

### 3. Turning the screw until a specified elongation of the screw is achieved (Propeller blade screws)



#### Tightening screw to a prescribed elongation

First of all make sure that the centre hole in the screw as well as the contact face for the gauge holder is clean and the stop screw is mounted.

All the screws in the connection are tightened by hand (max 50 Nm). One (1) of the screws in the connection is supplied with the measurement equipment i.e. the gauge pin and the dial gauge with holder. The dial gauge is adjusted to zero (0) and the dial gauge with holder is removed. The screw is now tightened by slugging spanner or a hydraulic tool until the specified elongation is obtained - remember to make check measurements during the tightening in order not to overtighten and damage the screw connection. Be aware that the dial gauge pointer is moving counter clockwise.

This procedure is repeated for all the screws in the connection in such a way that the screws are cross tightened.

After this first cross tightening one (1) and only one (1) screw is completely loosened and retightened according to the above description. This second tightening is repeated until all the screws in the connection are tightened.



#### Note

Mark the screws both after the first and second tightening in order to make sure that all the screws are tightened correct.

## Lubricating and sealing of screws

Before assembling a threaded joint the threads and contact faces have to be cleaned and lubricated (irrespective of the thread is with nylon lock or not).

All screws in an MAN B&W propeller equipment have to be lubricated with:

### **MOLYKOTE PASTA GN+**

The molykote pasta has to be applied in a very **thin** layer by use of a brush.

#### **NB! The following procedure should be used for propeller blade screws:**

MOLYKOTE GN+ is carefully stirred till paste consistency is achieved. If dried up, ordinary lubricating oil is added before stirring.

At start, all surfaces (threads and below head) should be dry and free from grease, degreased by solvent. \*Newly delivered blade flanges and screws from Alpha are ready for final lubrication and mounting. However, inspect the threads before mounting very carefully for any damage – if any, these are to be removed by use of a smooth cut file followed by polishing with smooth abrasive cloth.

MOLYKOTE GN+ is added to the blade screw with a brush, after which it is polished into the surface with a cloth.

A new thin coating of MOLYKOTE GN+ is added to the blade screw thread and below the head with a brush.

The blade flange thread is wiped with a cloth in the best possible way. Inspect the threads very carefully for any damage – if any, these are to be removed by use of a threaded tap before being carefully applied a thin coating of MOLYKOTE GN+ with a toothbrush or similar \* (a normal paint brush cannot be used for this purpose).

### **IMPORTANT**

- Land the blade screws very carefully in the flange, in order not to damage the thread inlet.
- Never use any kind of high speed tools or air impact spanners on blade screws.
- Turn the blade screws by hand, all the way down to the bottom position. Never use tools on a blade screw, which can not be turned by hand – but unscrew it and investigate the cause.

## Sealing

Additionally some of the screws have to be sealed by a silicone sealing compound under the screw head.

In those cases only the threads have to be lubricated.

Screws to be sealed can be seen under tightening data. As sealing compound is used:

RHODORSIL SEALANT 7306  
or similar.

## Securing of screws

For MAN propeller equipment, 3 different methods of screw securing are used i.e.:

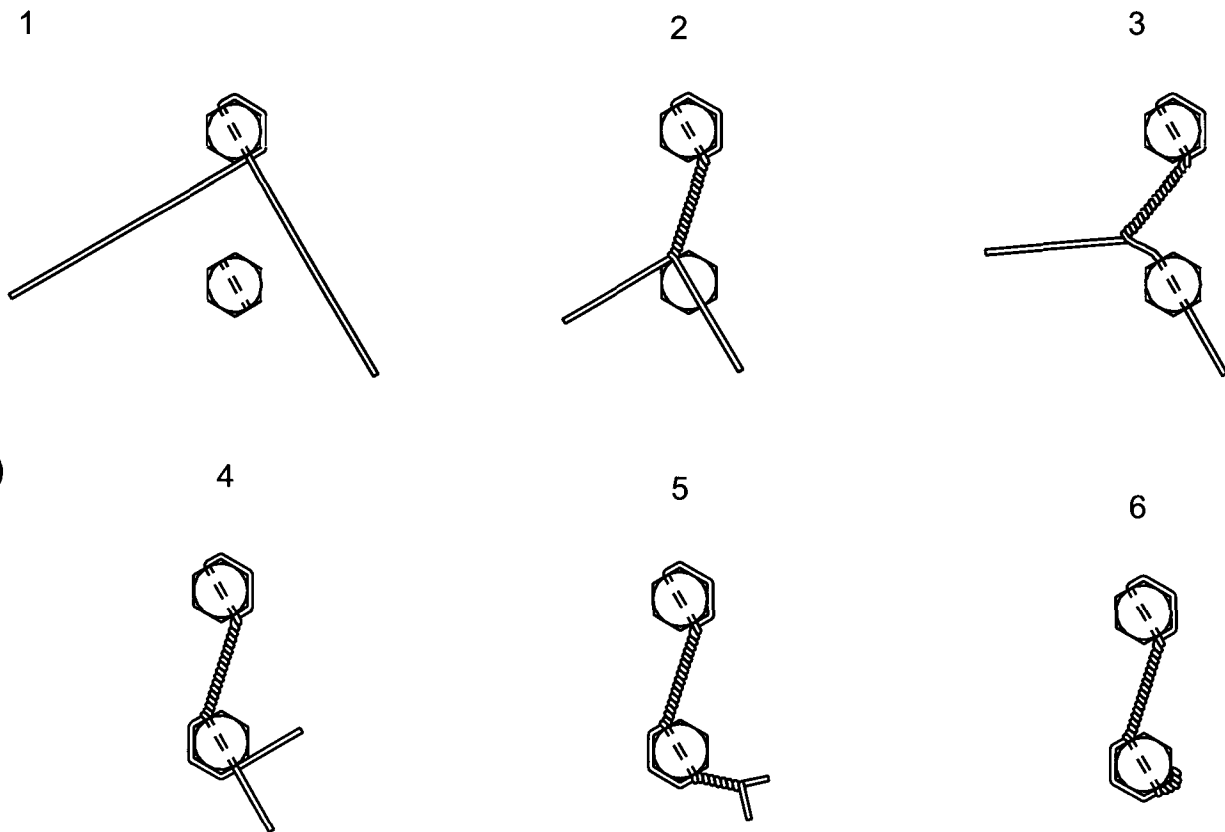
1. Wire securing
2. Weld securing
3. Nylon lock securing



### Note

*The screws have to be correctly tightened before securing. Do **not** overtighten or loosen screws in order to get a correct alignment of wire holes, cross flats etc.*

## 1. Wire securing



1. Insert wire, dimension according to tightening data, grasp the upper end of the wire and bend it around the head of the screw, then under the other end of the wire. Be sure that the wire is tight around the head.
2. Twist the wire clockwise until it is just short of the hole in the second screw. Keeping the wire under tension, twist it until tight. When the wire is tight, the wire is to have approximately 7-10 twists per 25 mm.
3. Insert the uppermost wire in the second screw and pull it tight.
4. Bend the lower wire around the screw and under the one protruding from the screw.
5. Keeping the wire under tension, twist it min. 3 twists counter clockwise until tight.
6. During the final twisting motion, bend the wire along the screw head. Cut off excess wire.

Any tendency of the screws to loosen will be counteracted by a tightening of the locking wire. Do not secure more than four screws in a series, unless otherwise specified.

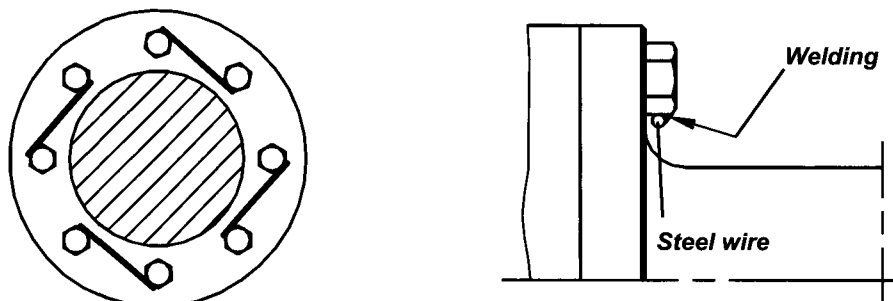


## 2. Weld securing



**Propeller blade connection**

<b>Welding data for securing of blade screws</b>		
Steel wire (mm)	Electrode dim. (mm)	Electrode type
Ø5	Ø2.5	Cromarod 316LP or Cromarod 308L or OK 61.30
Ø8	Ø3.25	
Ø10	Ø3.25	



**Flange connections**

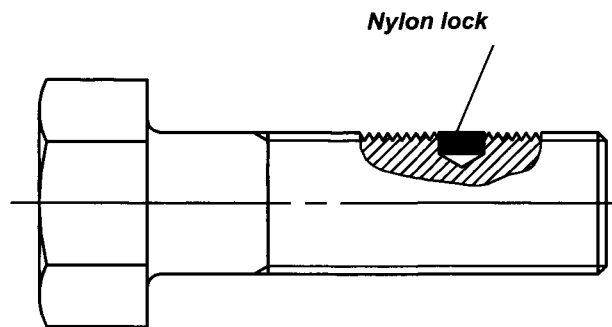
Steel wire, dimension according to tightening data, is welded on to the screw heads according to the above sketches.

Any tendency of the screws to loosen will be counteracted by a tightening of the steel wire welded on to the screw head.

### 3. Nylon lock securing

Screws are delivered from MAN with the nylon lock mounted - however, when refitting screws we recommend to renew the nylon locks. If not possible, it is recommended to renew the screws.

The new nylon lock is to be sealed with loctite type 242 or similar and after mounting to be grinded close to the thread as shown on the above sketch.



**Nylon locked screw**



#### **Note**

*The nylon material must be in quality PA6-6 or similar.*

## **Special handling of propeller blade screws, re-fitting**

Steel exposed to cathodic protection by zinc anodes in seawater will absorb hydrogen.

High tensile strength steel, as propeller blade screws, can be sensitive to hydrogen embrittlement in form of delayed fracturing during dismounting and re-fitting of propeller blades (re-use of blade screws).

### **I M P O R T A N T !**

In order to avoid the risk of delayed fracturing due to hydrogen embrittlement, the blade screws **MUST** either be re-newed or heat treated as follows:

**4 hours at 250 deg C.**

#### **Note !**

The time stated is after complete heat penetration of the screws

### **Exceptional Case !**

Blade screws marked/stamped "**H**" in the threaded end, need not to be heat treated as described above.