

# ASSEMBLY AND MAINTENANCE PROCEDURE FOR BONDURA® 3.3

**Read the instructions carefully!** Bolt Norge AS does not guarantee the product if the assembly and maintenance procedures are not followed. The Bondura bolt is Type Approval Certificated by DNV, and follow the guiding lines by API Specifications 8c, DNV Rules for Lifting Appliances, FEM Rules for Heavy Lifting Appliances, NS 5514 crane standard.

## ASSEMBLY PROCEDURE

### 1. Preparations

- 1.1 Remove any burr. Clean the support.
- 1.2 Align the bolt hole. The middle section must line up with the support on each side (see Fig. 1). Use a jack or hoist if necessary.

**If the bolt is hammered into a hole where the bearing and the support does not line up, the bolt may be damaged.**

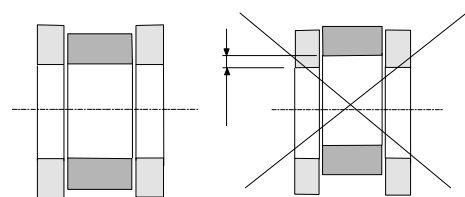


Fig. 1  
Support and centre bearing must line up

### 2. Fitting the bolt

- 2.1 Unscrew nuts and remove taper sleeves on the Bondura Bolt.
- 2.2 Fit the bolt in the joint so that the bolt's tapered end is even with the outside of the support (see Fig. 2a and 2b).

**If the bolt is not centre-aligned, the taper sleeve may bottom out in the support before the expansion is completed. The bolt will then be partially loose, and may "cut" the bolt threads/lock screws.**

Remember that the "locking segment" on the bolt must be facing the locking bracket (see Fig. 3).

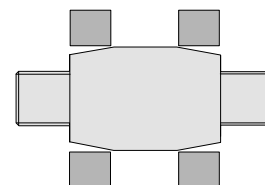


Fig. 2a  
Correct centring of bolt

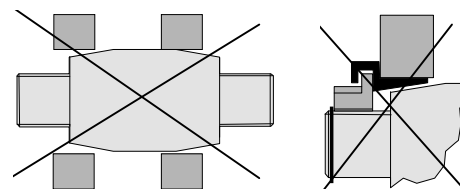


Fig. 2b  
Incorrect centring of the bolt results in poor "wedging force"

### 3. Fitting taper sleeves

- 3.1 Fit the taper sleeves with the nut and tighten up by alternating between the two ends.
- 3.2 Tighten up to specified torque (see table). Run the equipment for about one hour and retighten to the correct torque. **Retightening after installation is necessary (see "Maintenance").**

In Table 1 you will find the required distance "x" from the taper flange to the support before the expansion. It also specifies when the taper sleeve must be replaced with an over-sized taper.

### 4. Locking of Bondura Bolt

**The Bondura does not rotate or slide out because the taper sleeves expand and result in a "wedging force" between the bolt and support.**

- 4.1 The locking brackets are welded or screwed to the support. The locking brackets must be fastened to the support with a distance of 1-1.5 mm between the locking bracket and the taper's locking segment. After being fitted and tightened, the locking plate must lie all the way down to the hexagonal side of the nut (see Fig. 3 and 4).
- 4.2 If requirements from the employer, the screws may be fastened by using a wire through the hole of the screw heads, or using Norlock washers.

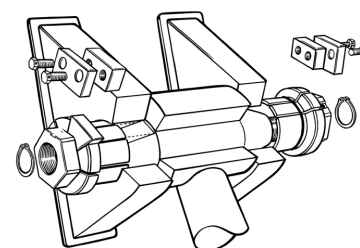


Fig. 3  
The locking segment is an extra assurance to prevent bolt rotation

| Bolt diameter | "X" before expansion | Min. "X". Switch to over-sized taper |
|---------------|----------------------|--------------------------------------|
| 30-200        | 7                    | 1                                    |

Table 1 shows the acceptable distance "x" between the taper flange and support



Fig.4  
The nut is secured by the locking plate.

## MAINTENANCE OF BONDURA® 3.3

Establish procedures for maintenance. This will extend the lifetime of the bolts. Lack of maintenance may result in the bolts coming loose and sliding out of the bolt hole. If this happens, parts of the bolt or equipment may fall down.

### 5. Bondura Bolt lubrication

Follow the instructions from the vendors regarding type of grease and frequency. The bolt is lubricated most effectively when it is "unloaded", as the weight of the equipment may prevent lubrication of the bearing surfaces of the bolt.

### 6. Inspection/retightening

Purpose:

It always takes some time before the bolt and the support is "broken in".

The resulting "play" must be absorbed by retightening the screws that holds the taper sleeves in place. When they are retightened, the taper sleeves expand and also absorb wear and ovality in the bolt supports. The taper sleeve may absorb play of up to 3 mm in diameter. If the play is larger, you must use an over-sized taper (see Fig. 4).



**Check this box for used equipment. One has to take into consideration the possibility of extra play. Retighten several times during the first 100 hours, before switching to the procedures in Item 6b**

The maintenance of the Bondura Bolt consists of two elements:

#### a) Inspection

Establish inspection procedures, e.g. every time the bolts are lubricated.

- ❖ That locking brackets, locking plates, taper sleeves and screws are in place.
- ❖ That the wire safety is intact.
- ❖ Check that the bolt has not shifted to one side.
- ❖ (if this is the case, see Item 1 under Troubleshooting)

#### b) Retightening/inspection:

Establish retightening/inspection procedures as specified below.

| Equipment                       | Interval         |
|---------------------------------|------------------|
| Travelling block / clevis       | Annually         |
| Bail / top drive link           | 3 times per year |
| Other top drive bolts           | 2 times per year |
| Dolly                           | 2 times per year |
| Drill string compensator        | Annually         |
| Pipe handling machinery, cranes | Annually         |
| Draw works                      | Annually         |

- ❖ Check that the distance between the taper flange and support is not less than the min. "x" stated in the table. The distance between the taper flange and support must be the same (within approx. 2 mm) on both sides of the bolt. Normally the play will be the same in both supports.

If there is doubt as to whether the bolt is centre-aligned, check that the nut is an equal distance from the retainer ring on both sides. If the distance is less than min. "x", the cause may be that:

- a) the bolt has shifted to one side.
- b) the play in the support is too great for the taper sleeve (exceeds 3 mm). Switch to over-sized taper. Tighten the taper nut to the specified torque in order to expand the taper sleeves. First "unload" the equipment. The weight of the equipment may prevent effective tightening (see Fig. 5).

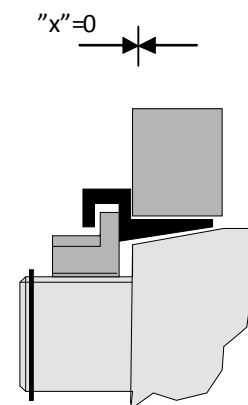


Fig. 4  
Too much play results in no "wedging force". Switch to over-sized taper. "X" is measured between the taper flange and support.

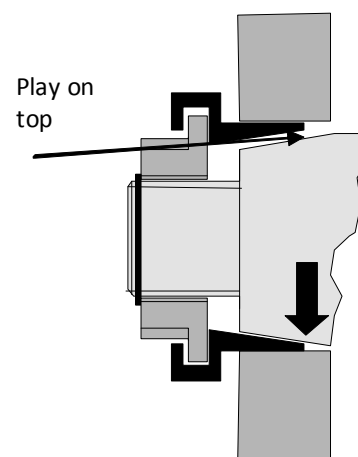


Fig. 5  
A heavy load on the bolt prevents complete tightening. Unload the bolt before tightening.

INSTALLATION AND MAINTENANCE BONDURA ® 3.3

**7. Troubleshooting**

**- If the bolt "rotates" or cuts the lock screws:**

- \* Check that the bolt is properly centre-aligned (see Item 2, Fig ).
- \* Tighten the taper nut in order to expand the taper sleeves.
- \* Check that the distance between the taper flange and support side is not less than the min. "x" stated in Table 1. If this is the case, the play in the support is too great for the taper sleeve (exceeds 3 mm). Switch to over-sized taper.
- \* If the bolt still rotates, it may be that the bearing surface on the bolt or bearing liner is "torn" and must be replaced.

**- If there is axial movement in the bolt, and it no longer is centre-aligned in the supports:**

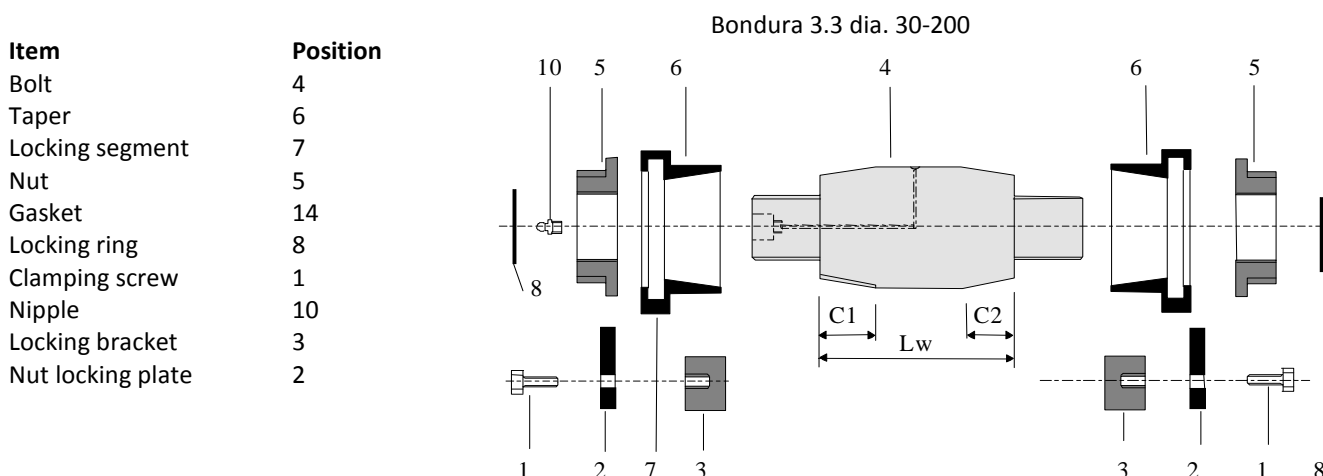
- \* Check that the taper nut is properly tightened and that the distance "x" between the taper flange and support is not smaller than stated in Table 1. If necessary, switch to over-sized taper.

**8. Disassembly of type 6.6 Bondura Bolt**

The equipment must always be unloaded before starting the disassembly.

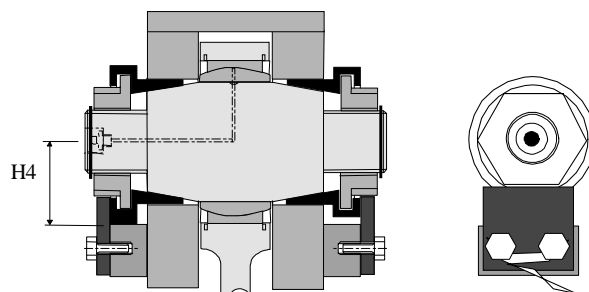
8.1 Unscrew taper nut with taper sleeve.

8.3. In most instances, the bolts will come out easily. Alternatively, the bolts may be pulled out using a puller/jack (see "Pullers").



**Dimensions and data for Bondura type 3.3**

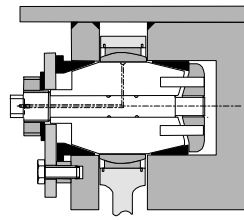
| Bondura nut | Bolt dim.    | Spanner | Torque      | Dimension     |
|-------------|--------------|---------|-------------|---------------|
| Nut M3      | 25 - 29 mm   | NV 30   | 10 - 15 kpm |               |
| Nut M3      | 30 - 38 mm   | NV 30   | 20 - 30 kpm | H4 = 31.5 mm  |
| Nut M3      | 39 - 51 mm   | NV 41   | 40 - 60 kpm | H4 = 37 mm    |
| Nut M3      | 52 - 71 mm   | NV 55   | 70 - 90 kpm | H4 = 44 mm    |
| Nut M3      | 72 - 91 mm   | NV 60   | 100-150 kpm | H4 = 56.5 mm  |
| Nut M3      | 92 - 111 mm  | NV 75   | 150-200 kpm | H4 = 64 mm    |
| Nut M3      | 112 - 131mm  | NV 75   | 200-240 kpm | H4 = 74 mm    |
| Nut M3      | 132 - 152 mm | NV 105  | 300-380 kpm | H4 = 89 mm    |
| Nut M3      | 152 - 172 mm | NV 105  | 380-405 kpm | H4 = 99 mm    |
| Nut M3      | 172 - 200 mm | NV 130  | 380-405 kpm | H4 = 111.5 mm |



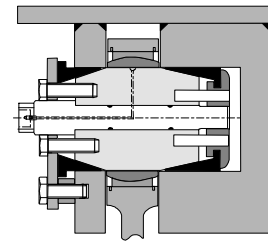
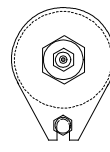
INSTALLATION AND MAINTENANCE BONDURA® 3.3

**STANDARD BONDURA® BOLT PROGRAM**

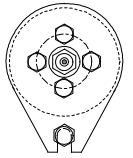
**Bondura® 6.1** is used where there is access only from one side, or limited access on one side. The bolt is installed from one side. The inner taper sleeve is tightened via the centre shaft. Both taper sleeves are tightened (serviced) from one side.



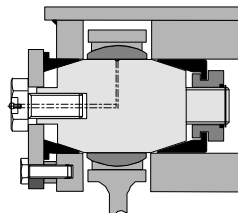
**Bondura® 6.1** dia. 30-57 mm



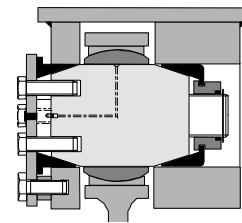
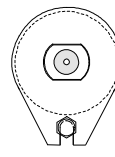
**Bondura® 6.1** dia. 60-180 mm



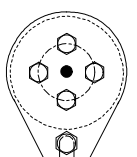
**Bondura® 6.2** is used in non-fixed joints when one or both supports are extra wide. This solution is also used when the bolt cannot protrude past the support on one side, but where there is access to tighten the bolt from both sides.



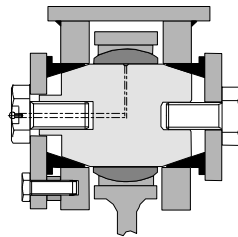
**Bondura® 6.2** dia. 30-65 mm



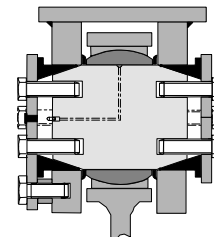
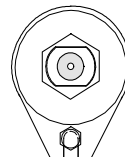
**Bondura® 6.2** dia. 70-120 mm



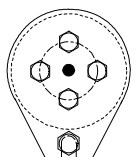
**Bondura® 6.6** fits most bolt locations in non-fixed joints. The bolt requires access from both sides in order to tighten the bolt screws.



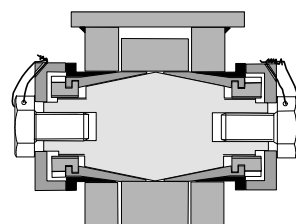
**Bondura® 6.6** dia. 30-65 mm



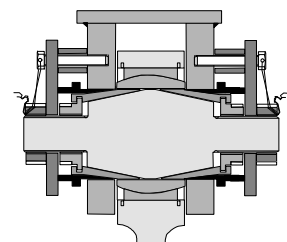
**Bondura® 6.6** dia. 70-320 mm



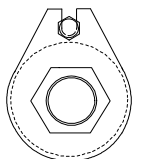
**Bondura® 3.6.3.6** has expanding taper sleeves on both outer and inner support, ensuring a fixed connection also in the middle segment. Examples of applications for this bolt are in fixed structural connections such as framed structures and when joining sections. It is also used in self-aligning plain bearings where the bolt is "locked" to the inner sleeve of the bearing. When the inner taper sleeves expand during installation, this ensures that the bearing does not turn on the bolt surface.



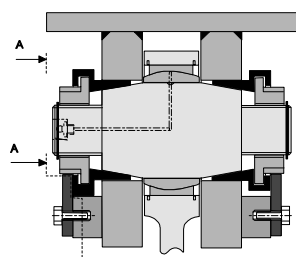
**Bondura® 3.6.3.6** dia. 30-80 mm



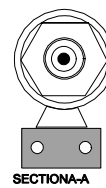
**Bondura® 3.6.3.6** dia. 90-320 mm



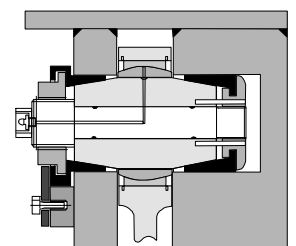
**Bondura® 3.1 and 3.3** are first generation expanding bolts. They are now replaced mainly by 6.1 and 6.6 with the exception of special bolt positions.



**Bondura® 3.3** dia. 30-200 mm



SECTION A-A



**Bondura® 3.1** dia. 60-140 mm