

# ASSEMBLY AND MAINTENANCE PROCEDURE FOR BONDURA® 6.1

**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.**

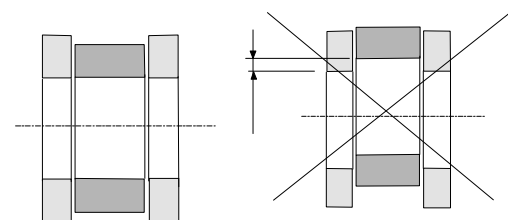


Fig. 1  
Support and centre bearing must line up.

### 2. Fitting the bolt

Applies to Bondura 6.1 dia. 30-57.2 mm: Unscrew the nut on the centre shaft, and remove the locking plate and taper sleeve on the service end of the bolt. Fit the nut and install the bolt in the joint (see fig. 2a).

Applies to Bondura 6.1 dia. 60-180 mm: Remove the locking plate and taper sleeve from the service end of the bolt before fitting the bolt in the joint.

- 2.1 Fit the bolt in the joint so that the bolt's tapered end on the locking side is even with the outside of the support. Place a protective sleeve over the end of the centre shaft and hammer the bolt carefully in place.

**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 taper screws and lock screws (see Fig. 2a and 2b).**

Tighten nut to specified torque (dia. 30-57.2) and the centre shaft (dia. 60-180 mm), so that the inner taper sleeve expands. Check once again that the bolt's tapered end is even with the outside of the support.

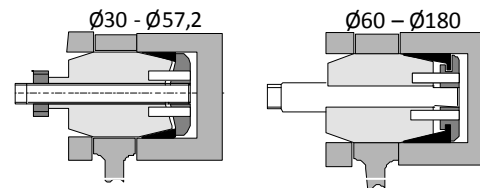


Fig. 2a  
Correct centring of bolt

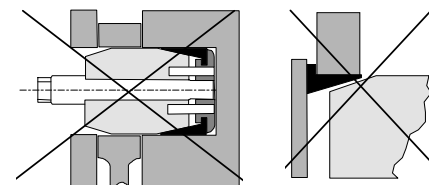


Fig. 2b  
Incorrect centring of the bolt results in poor "wedging force»

### 3. Fitting taper on locking side

- 3.1 Fit the taper sleeve and fasten the end plate with the nut/taper screws. Tighten to specified torque (see Table 2).

Applies to Bondura 6.1 dia. 30-57.2 mm: Unscrew nut and fit the locking plate. Both the inner and outer tapers expand at the same time when the nut is tightened. The centre shaft must be held back, not turned.

- 3.2 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. In order to prevent moisture from entering from the outside, you may use O-rings or sealing compound on the taper sleeve, between bolt and support.

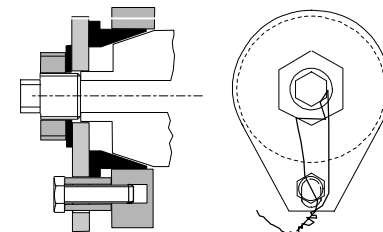


Fig. 3a  
Locking of 30-90 mm dia

### 4. Locking of Bondura bolt

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

- 4.1 As an extra precaution, the locking plate must be fastened with a locking screw to the equipment. Use the clamping screw protector to ensure that the locking plate is not bent when tightening the locking screw (see Fig. 3a and 3b).
- 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.

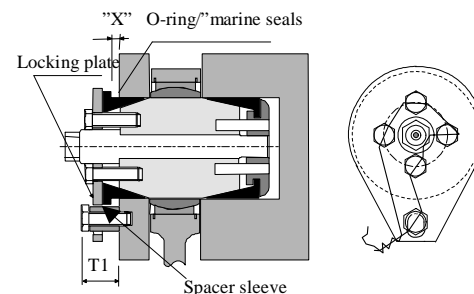


Fig. 3b  
Locking of 100-180 mm dia. bolt

Bolt dia. dia	"X" before expansion	Min. "x" Switch to over-sized taper
30 - 40	5	1
45 - 65	8	4
70 - 95	9	5
100 - 180	9	5
200 - 250	10	6

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

**MAINTENANCE OF BONDURA ® 6.1**

**Establish procedures for maintenance. This will extend the lifetime of the bolts. Lack of maintenance may result in the bolts becoming 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 plate screws/nut and centre shaft 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 2 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 plates, taper sleeves and screws are in place.
- ❖ That the bolt cannot rotate (intact anti-rotation lock).
- ❖ 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 table 1. If you are in doubt as to whether the bolt is centre-aligned, it is possible to unscrew the plate and check the bolt. 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 2 mm). Switch to over-sized taper. Tighten the plate screws/nut and centre shaft 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).

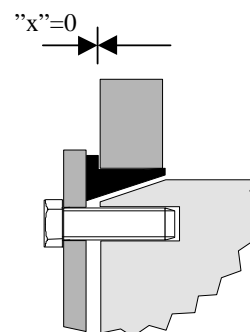


Fig. 4. Too much play results in no "wedging force". Switch to over-sized taper. "X" is measured between the taper flange and support.

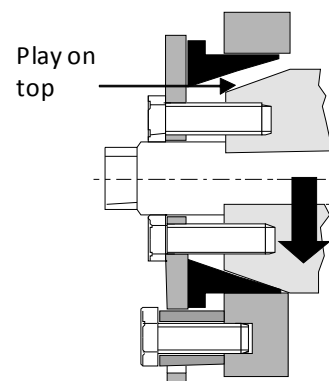


Fig. 5 A heavy load on the bolt prevents complete tightening. Unload the bolt before tightening.

**7. Troubleshooting**

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

- \* Check that the bolt is properly centre-aligned (see Item 2, Fig. 2)
- \* Tighten the bolt screws 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 the play in the support is too great for the taper sleeve (exceeds 2 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 bolt screws are 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 6.1 Bondura Bolt**

**The equipment must always be unloaded before starting the disassembly.**

- 8.1 Remove the locking plate.
- 8.2 Unscrew the centre shaft counter-clockwise 2-3 turns.
- 8.3 Hold a wooden block against the centre shaft and tap it with a hammer to loosen the inner taper sleeve (see Fig. 6). In most cases the outer taper can be removed by using a pry bar/chisel between the support and taper flange. We recommend using penetrating oil first. In case of large bolt dimensions or problems, use a "taper puller" to pull off the taper sleeves, see "Pullers».
- 8.4 In most instances, the bolt will come out easily. Alternatively, the centre shaft can be screwed out and the bolts pulled out by screwing in a pull-rod on the outer threads on the bolt. In the event of problems, the bolt can be pulled out using a hydraulic jack (see "Pullers").

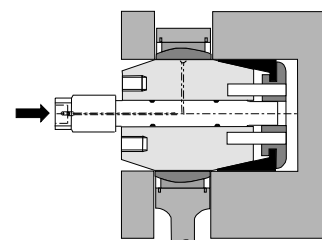
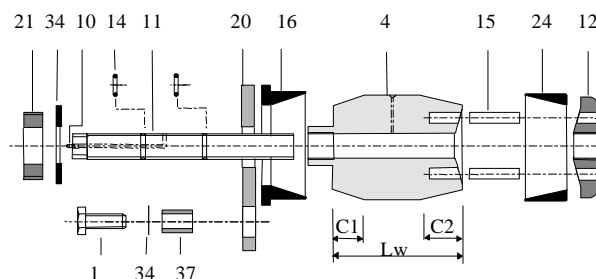


Fig. 6  
Loosening inner taper sleeve

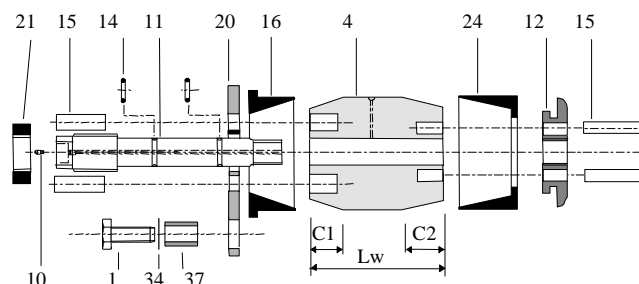
**Bondura 6.1 dia. 30 - 65 mm**

- |                       |                    |
|-----------------------|--------------------|
| 1 Clamping screw      | 16 Con K6          |
| 4 Bolt                | 20 Locking plate   |
| 10 Lubrication nipple | 21 Center pin nut  |
| 11 Centre shaft       | 24 Con K1B         |
| 12 Plate nut          | 34 Washer          |
| 15 Locking pin        | 37 Screw protector |



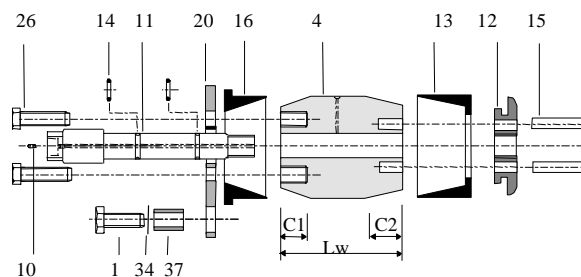
**Bondura 6.1 dia. 70 - 95 mm**

- |                       |                    |
|-----------------------|--------------------|
| 1 Clamping screw      | 16 Con K6          |
| 4 Bolt                | 20 Locking plate   |
| 10 Lubrication nipple | 21 Center pin nut  |
| 11 Centre shaft       | 24 Con K1B         |
| 12 Plate nut          | 34 Washer          |
| 15 Locking pin        | 37 Screw protector |

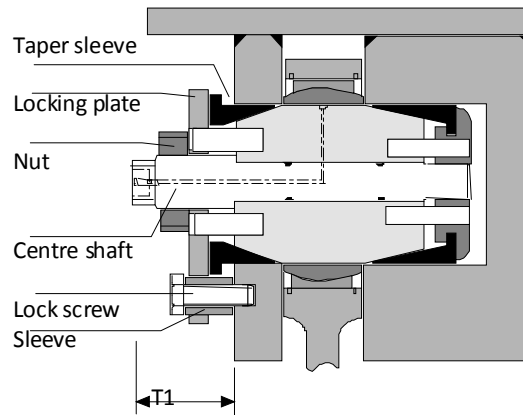
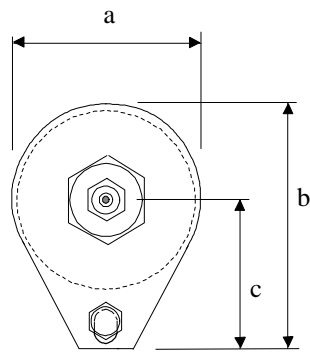


**Bondura 6.1 dia. 100 - 180 mm**

- |                       |                    |
|-----------------------|--------------------|
| 1 Clamping screw      | 15 Locking pin     |
| 4 Bolt                | 16 Con K6          |
| 10 Lubrication nipple | 20 Locking plate   |
| 11 Centre shaft       | 26 Bolt screw      |
| 12 Plate nut          | 34 Washer          |
| 13 Cone K1            | 37 Screw protector |



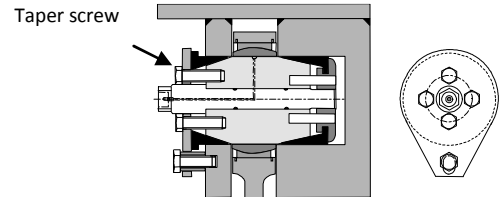
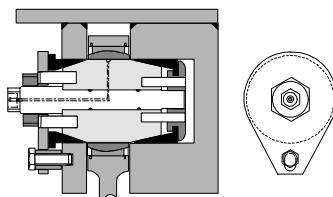
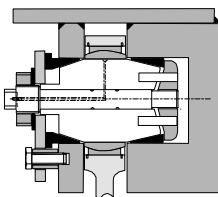
**Dimensions and data for Bondura type 6.1**



Design 30-57.2 mm dia.

Design 60-95 mm dia.

Design 110-180 mm dia.



All locking plates have a hole for through sleeve and lock screw. This is to prevent the locking plate falling down if anything should happen to the taper screws.

**All torque value in dry condition. For lubricate value- reduce with 10%. 1Nm =0,737 ft\* lb**

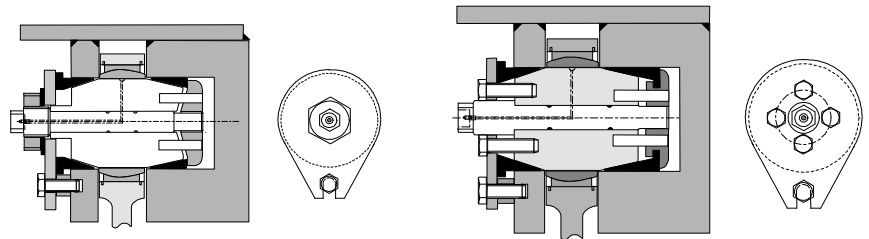
BOLT DIA	DIMENSION see dimensioned drawings				LOCK SCREW dimensions	TIGHTENING Centre shaft	TIGHTENING Taper screws	TIGHTENING Nut
	a	b	c	T1 max				
mm					Lock screw dimensions	Torque (Nm)/ Spanner gap NV (mm)	Torque (Nm)/ NV (mm)	Torque (Nm)/ NV (mm)
<b>30 - 35</b>	37	63	28	37	M10 x 30 3/8UNCx1 1/4"	- /NV 8		50 /NV 19
<b>38.1 - 40</b>	37	67	31	37	M10 x 30 3/8UNCx1 1/4"	- /NV 13		100 /NV 24
<b>44.4 - 57.1</b>	71	113	55	46	M12 x 40 7/16UNCx1 1/2"	100 /NV 16		150 /NV 36
<b>60 - 65</b>	71	113	55	42	M12 x 40 7/16UNCx1 1/2"	150 /NV 19		150 /NV 36
<b>70 - 76.2</b>	101	141	61	50	M16 x 45 5/8UNCx1 3/4"	200 /NV 22		400 /NV 46
<b>80 - 95</b>	101	141	66	50	M16 x 45 5/8UNCx1 3/4"	300 /NV 22		400 /NV 46
<b>100 - 110</b>	133	179	78	40	M20 x 50 3/4UNCx2"	400 /NV 24	177 /NV 24	
<b>114 - 130</b>	133	179	85	40	M20 x 50 3/4UNCx2"	400 /NV 24	177 /NV 24	
<b>140 - 150</b>	190	250	120	50	M30 x 90	1000 /NV 36	*346 /NV 30	
<b>160 - 180</b>	190	250	120	50	M30 x 90	1000 /NV 36	*346 /NV 30	

**INNOVATION: from 1/1.02, the screws for locking plate are changed from M16 to M20. Torque is changed.**

ASSEMBLY AND MAINTENANCE : BONDURA® 6.1

**STANDARD BONDURA® BOLT PROGRAM**

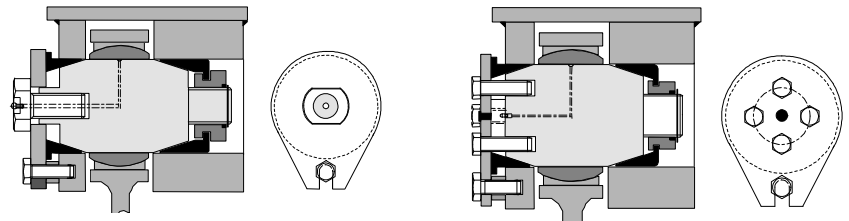
**Bondura® 6.1** is used where there is access only from one side, or limited access on one side. The bolt is installed from one side. The inner taper sleeve is tightened via the centre shaft. Both taper sleeves are tightened (serviced) from one side.



**Bondura® 6.1** dia. 30-57 mm

**Bondura® 6.1** dia. 60-180 mm

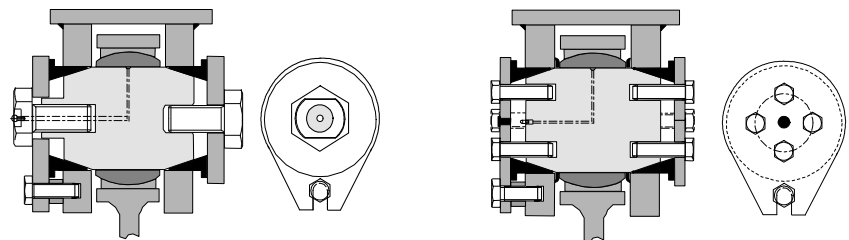
**Bondura® 6.2** is used in non-fixed joints when one or both supports are extra wide. This solution is also used when the bolt cannot protrude past the support on one side, but where there is access to tighten the bolt from both sides.



**Bondura® 6.2** dia. 30-65 mm

**Bondura® 6.2** dia. 70-120 mm

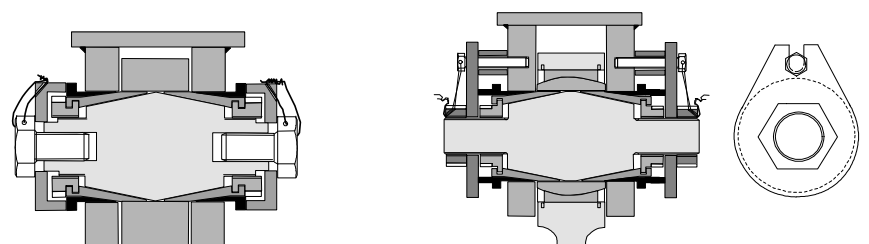
**Bondura® 6.6** fits most bolt locations in non-fixed joints. The bolt requires access from both sides in order to tighten the bolt screws.



**Bondura® 6.6** dia. 20-65 mm

**Bondura® 6.6** dia. 70-320 mm

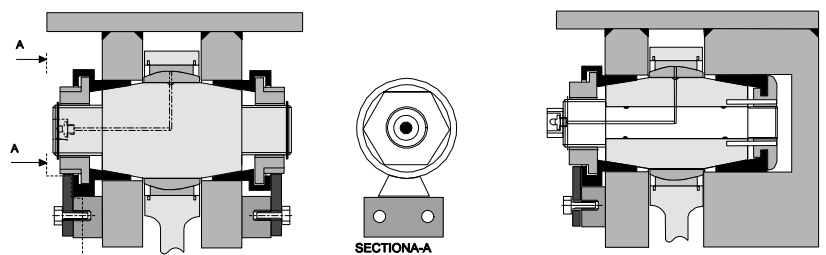
**Bondura® 3.6.3.6** has expanding taper sleeves on both outer and inner support, ensuring a fixed connection also in the middle segment. Examples of applications for this bolt are in fixed structural connections such as framed structures and when joining sections. It is also used in self-aligning plain 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

**Bondura® 3.1** dia. 60-140 mm