

ASSEMBLY AND MAINTENANCE PROCEDURE FOR BONDURA® 6.6 & 6.0

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.

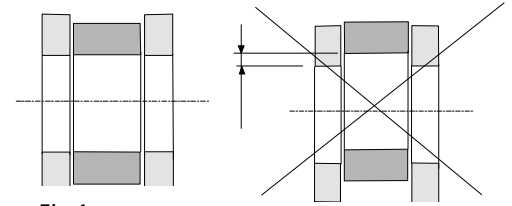


Fig. 1

Support and centre bearing must line up

2. Fitting the bolt

- 2.1 Unscrew the locking plates on the Bondura Bolt and remove the taper sleeves.
- 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 taper screws and lock screws.

Applies to Bondura 6.6 & 6.0 dia 20-65 mm: **NOTE! Remember that the locking tab on the bolt must fit into the slot on the locking plate (see Fig. 3a.)**

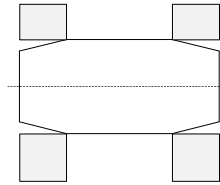


Fig. 2a

Correct centring of bolt

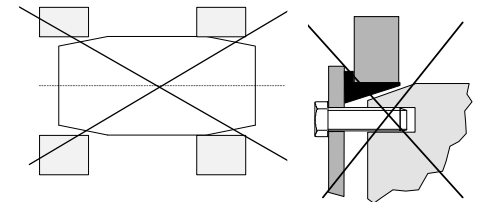


Fig. 2b

Incorrect centring of the bolt results in poor "wedging force"

3. Fitting taper sleeves

- 3.1 Fit the taper sleeves. Fill the hollow between pin and plate with grease and fasten the end plates with the plate screws.
When tightening the screws, alternate between the different sides to ensure that the bolt does not shift. Tighten up with specified torque (see table).
- 3.2 Knock with a heavy hammer all around the plate to be sure that the cone sleeves have expanded properly. See fig.3b
- 3.3 Tighten all screws again with specified torque
- 3.4 Repeat 6.2 and 6.3 until the screws have the specified torque.
- 3.5 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. 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 the bolt and support.

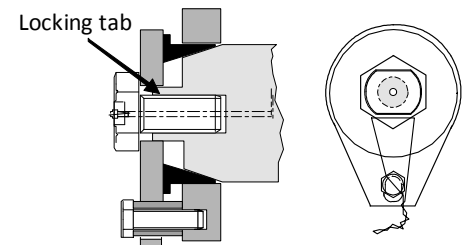


Fig. 3a Locking of 20-65 mm dia bolt

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.

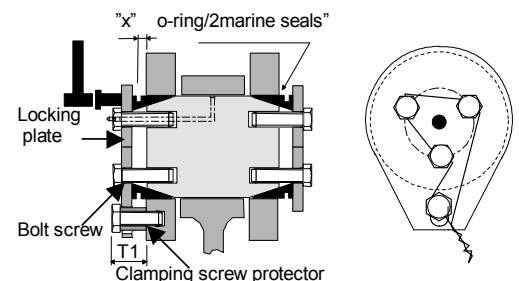


Fig. 3b

Locking of 70-320 mm dia bolt

Bolt diameter dia	"X" before expansion	Min. «X». Switch to over-sized taper
20-40	5	1
45-65	8	4
70-95	9	5
100-180	9	5
200-320	10	6

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

MAINTENANCE OF BONDURA® 6.6 & 6.0

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 retightening the screws that holds the taper sleeves in place.

When they are retightened, the taper sleeves expand and also absorb wear and ovality. This may absorb play of up to 2 mm in diameter. If the play is larger, you must use an over-sized taper.

Check this box for used equipment. You have to take into consideration the possibility of ovality 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
Drawworks	Annually

- ❖ Check that the distance between the taper flange and support is not less than the minimum. The distance between the taper flange and support must be the same (within approx. 2 mm) on both sides. It will be the same in both supports.

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 supports is too great for the taper sleeve (exceeds 2 mm). Switch to over-sized taper.
- ❖ Tighten the bolt screws to the specified torque in order to expand the taper sleeves. First "unload" the equipment. The weight of the equipment may prevent complete tightening (see Fig. 5).

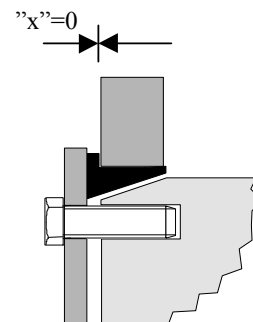


Fig. 4. Too much play results in no "wedging force". Switch to over-sized taper. "X" is measured between the taper flange and support.

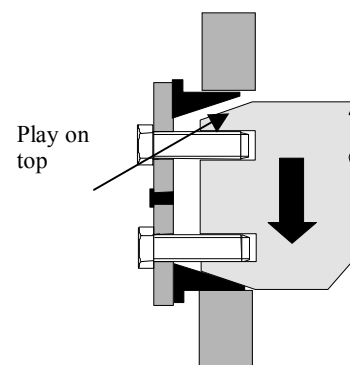


Fig. 5. A heavy load on the bolt prevents complete tightening. Unload the bolt before tightening.

INSTALLATION AND MAINTENANCE BONDURA ® 6.6 & 6.0

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 this is the case, 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.

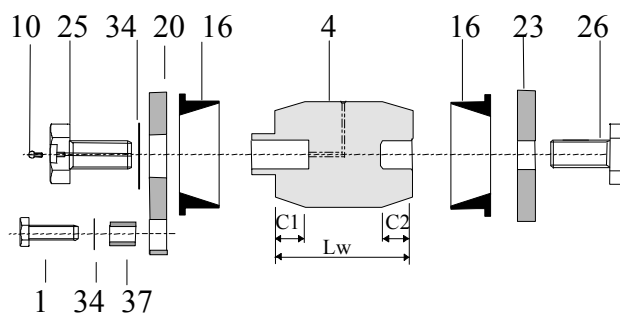
8. Disassembly of type 6.6 & 6.0 Bondura Bolts

The equipment must always be unloaded before starting the disassembly.

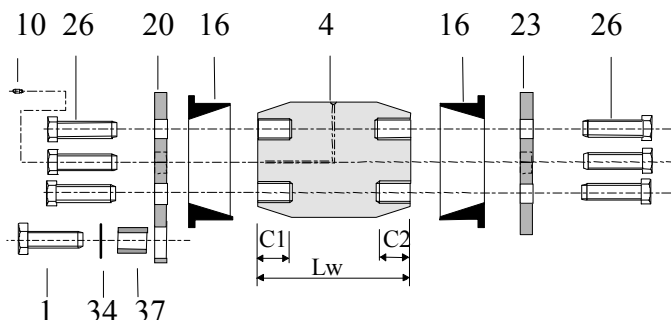
- 8.1 Unscrew the locking plate.
- 8.2 In most cases the tapers may be removed by using a pry bar/chisel between the support and the taper flange. We recommend using penetrating oil first. In case of large bolt dimensions or problems, use a "taper puller" to pull off the taper sleeves, see "Pullers».
- 8.3 In most instances, the bolts will come out easily. Another option is to pull out the bolts by screwing on the locking plate and using a puller / jack on the locking plate. On larger bolt dimensions or in the event of problems, the bolt can be pulled out using a hydraulic jack. "Pullers".

Bondura 6.6 dia 20 – 65 mm

Clamping screw	1
Bolt	4
Lubrication nipple	10
Con K6	16
Locking plate	20
Free plate	23
Bolt screw	26
Bolt screw	25
Washer	34
Screw protector	37

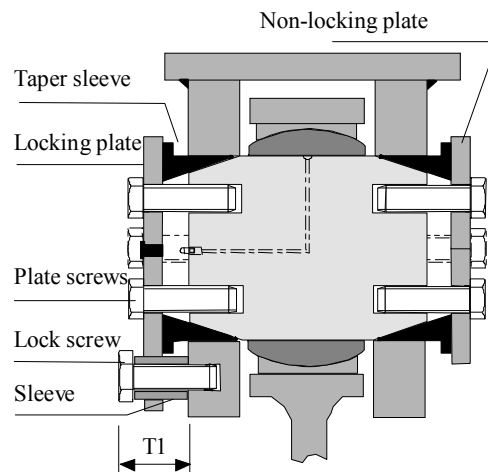
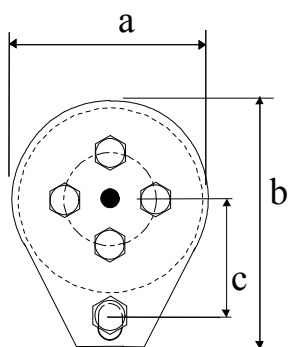
**Bondura 6.6 dia 70 – 320 mm**

Clamping screw	1
Bolt	4
Lubrication nipple	10
Con K6	16
Locking plate	20
Free plate	23
Bolt screw	26
Washer	34
Screw protector	37

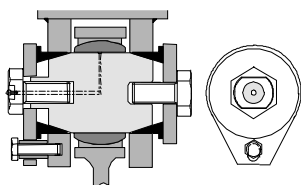


INSTALLATION AND MAINTENANCE BONDURA ® 6.6 & 6.0

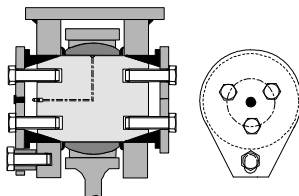
Dimensions and data for Bondura type 6.6 and 6.0



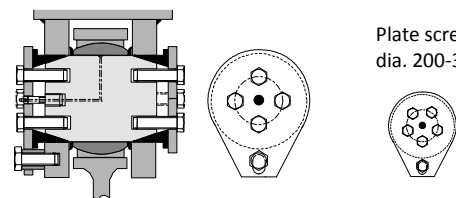
Design 20-65 mm dia.



Design 70-130 mm dia.



Design 140-320 mm dia.



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

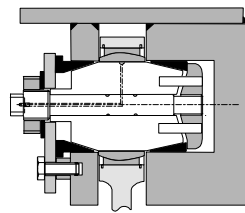
All torque value in dry condition. For lubricate value- reduce with 10%. 1Nm =0,737 ft*lb

BOLT DIA	DIMENSION				LOCK SCREW	PLATE SCREWS		
	see dimensioned drawings					M	Torque (Nm) dry	Spanner gap NV
mm	a	b	c	T1 max	Lock screw dimensions			
20	37	50	23	23	M10 x 30 3/8UNCx1 1/4"	43	17	M10
25 - 30	37	50	28	23	M10 x 30 3/8UNCx1 1/4"	73	19	M12
31.8 - 40	46	67	31	23	M10 x 30 3/8UNCx1 1/4"	177	24	M16
44.4 - 65	71	113	55	28	M12 x 40 7/16UNCx1 1/2"	346	30	M20
70 - 80	101	141	61	31	M16 x 40 5/8UNCx1 3/4"	115	22	M14
85 - 95	101	141	66	31	M16 x 40 5/8UNCx1 3/4"	177	24	M16
100 - 110	133	179	78	40	M20 x 50 3/4UNCx2"	177	24	M16
114 - 127	133	179	85.5	43	M20 x 50 3/4UNCx2"	346	30	M20
140 - 150	190	250	112	50	M30 x 80	500	36	M24
160 - 180	190	250	120	50	M30 x 80	500	36	M24
200 - 250	264	347	160	63	M36 x 90	500	36	M24
260-300	338	426	190	63	M 36 x 90	600 500	46 36	M30 M24
320-380	338	426	210	63	M 36 x 90	600 500	46 36	M30 M24

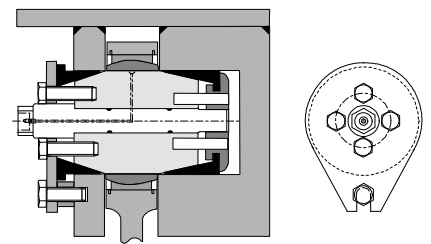
INSTALLATION AND MAINTENANCE BONDURA® 6.6 & 6.0

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.

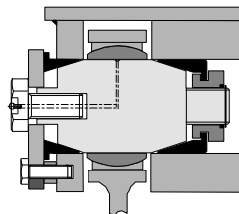


Bondura® 6.1 dia. 30-57 mm

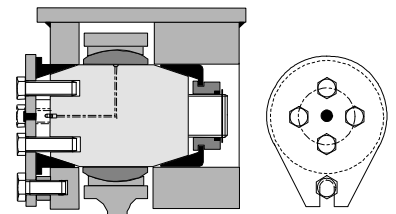


Bondura® 6.1 dia. 60-180 mm

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.

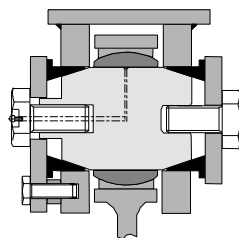


Bondura® 6.2 dia. 30-65 mm

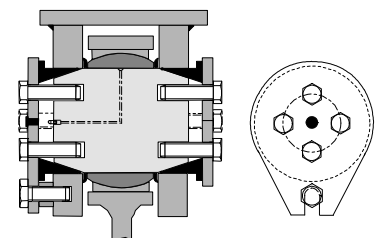


Bondura® 6.2 dia. 70-120 mm

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.

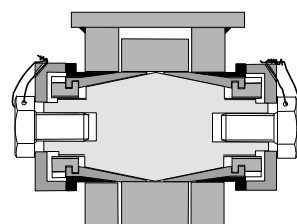


Bondura® 6.6 dia. 20-65 mm

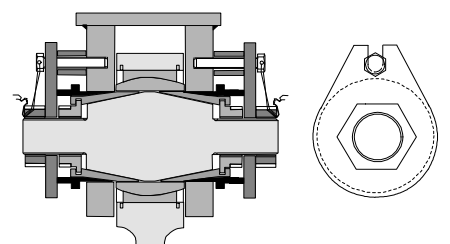


Bondura® 6.6 dia. 70-320 mm

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.

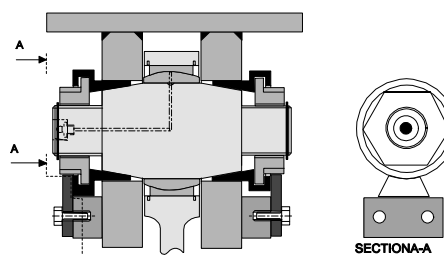


Bondura® 3.6.3.6 dia. 30-80 mm

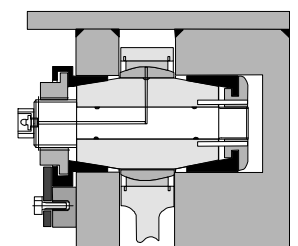


Bondura® 3.6.3.6 dia. 90-320 mm

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