5 MECHANICAL MAINTENANCE

1

TRANSPORTATION AND INSTALLATION

1.1 Condition on Delivery

The final operation in the manufacture of a MG Dryer is polishing the surface to a very fine surface finish. This finish is of primary importance for correct operation of the Dryer and must be preserved at all costs during storage and handling. The requirements for such a large area of highly polished surface means that exceptional care must be taken in storing and handling a Dryer. In addition to the fine surface finish, the geometrical shape must be maintained within very close limits.

Before Dryers are despatched from Valmet-Karlstad the polished face is protected by coating with a sealing material, which can easily be removed before placing the Dryer in use. The face is then lagged with wood, the Dryer is wrapped in impregnated lining paper and crated.

The projecting shaft journals are protected in the same way as the polished face. The machined faces for bearings and drive are of vital importance and require careful protection during handling.

The special packing for the Dryer is completed with a transport cradle of iron beams. This cradle has two saddles and the distance between them is adjusted in such a way that the weight of the Dryer will rest near the heads.

No other part of the Shell face may be loaded.
The radius of the saddles is fitted to the wooden packing of the Dryer and pads of hard rubber in the saddles will smooth out possible irregularities of the wooden packing.

When the Dryer has been placed in the transport cradle in our works it is kept in position in the cradle by removable end beams against the edges of the Dryer heads. The cradle is fixed to the Dryer with iron straps around the Dryer. Pieces of plate sleeves are fastened around the wooden packing of the journals. They protect the journals when lifting the Dryer with wires around them on transshipment by crane.

1.2 Transportation

1.2.1 Use of Transport Cradle

The Dryer should be transported in the transport cradle all the way from our works to the machine hall in the mill.

1.2.2 Transshipment by Crane

If possible, the Dryer should be transshipped by crane and with the use of a lifting beam (spreader) with sufficient length. Wires shall then be placed around the journals of the Dryer.

If no lifting beam is available, but the transshipment can be effected by crane, the lifting wires must usually be brought together to one point.

It is then necessary that the lifting crane has sufficient lifting height so that the upper parts of the heads will not be exposed to high forces from the wires. The angle between the wires must not exceed 45°. This must also be noticed when using too short a lifting beam. The wooden packing on the upper part of the heads is strengthened to protect the Dryer from friction of the wires. Please note that the last mentioned method of lifting must only be used in exceptional cases as the risks for damages are higher.

1.2.3
Moving of the Dryer Manually

The transport cradle is provided with lifting lugs in the ends. In these lugs jacks or similar arrangements may be placed under the cradle for pulling of the package. If the package is to be pulled on a quay or in a machine hall, and beams, plates etc., are used as bearer, rolls may be placed between the cradle and the bearer. The cradle must rest on at least two rolls under each side of the beam. Bearers or rolls must not damage the lower part of the Dryer.

1.2.4
Stowage

During transport by sea the Dryer shall be loaded under deck. Loading on deck is not allowed. When stowing the Dryer, Stays should be placed from the transport cradle and the journals of the Dryer to suitable fastening points in the vessel. Stays must not be placed against the packing of the shell face or against the heads to avoid these parts exposed to pressure at rough sea.

During transport by rail, car etc, the Dryer shall be fastened in a similar way, i.e. with supports against the transport cradle and with wires from the transport cradle and the journals of the Dryer to the trailer. Stays must not be placed against the heads of the Dryer or the shell face.

During all transports and on storage in harbours and other places in connection with transshipment, the Dryer must be carefully protected with tarpaulins.

1.2.5
Special Marking

a) On the packing of the Dryer Journals:

- LIFT HERE

b) On the Packing of the Dryer Shell:

- THE CYLINDER HAS TO REST IN THE CRADLE UNTIL ERECTION. NO SUPPORTS MUST BE PLACED AGAINST THE SHELL SURFACE AND THE HEADS. LASHING AND SECURING ONLY AROUND THE JOURNALS AND AGAINST THE CRADLE.

c) On the packing of the Dryer Heads:

- NO SUPPORTS AGAINST THE HEADS.

d) On various places of the package:

- NOT TO BE BUMPED

e) On the upper surface of the Transport Cradle longitudinal beams:

- SUPPORTS ONLY AGAINST THE CRADLE

1.2.6
Inspection during Transport

At loading, transport, transshipment and discharge every precaution must be taken in order to avoid damages to the packing and the Dryer. During transport inspections should be made to control that the packing is intact. All damages on the packing may cause damages to the Dryer. As the handling of the Dryer during transport is very important, the consignee should check for possible sea transport damages at transshipment of the Dryer in the destination port. We recommend all parties in the transport chain to observe the conditions of the goods and to take photos especially in connection with transshipment as they will be brought to another means of transport and made ready for forwarding.

1.3
Storage

1.3.1
Storage for less than three (3) Months.

When the Dryer has reached the erection place it must remain in the transport cradle until mounting in the machine. The packing must not be removed. Before the Dryer has come under roof it must be carefully covered with tarpaulins. Immediately after the Dryer reached the erection place, it must be stored indoors under proper conditions. This means, among other things, storage in uniform temperature, so that the Dryer is protected against hazardous effects from the atmosphere.

1.3.2
Storage for more then three (3) Months.

1 If crating and wrapping materials are dry and intact:

The Dryer must be stored indoor under satisfactory conditions.

Remove the wrappings from the Journals and clean with paraffin (Kerosene). Smear the surfaces with grease to protect against corrosion and fit bearings and brackets. Fill the housings with oil until it runs out at the shaft. Plug the oil outlet if necessary.

Remove the Dryer from the skid and place it on the bearing housings, so that the drum is at least 300 mm (11,8") above the floor. Remove the wood lagging from the Dryer face and the head but let other wrappings and the protective coating remain on the Dryer. Every third day the Dryer must be turned about 60° in the same direction in order to reduce the possibility of permanent distortion.

2 If crating or wrapping material is damaged or unsatisfactory:

Get in touch with Valmet-Karlstad immediately for an inspection of the Dryer.

1.4 Installation

The Dryer must be carefully protected during installation. Wood lagging and wrappings should be left in position for as long as possible.

The Dryer should be transported into the erection site in the skid. Lift as described in Section 1.2. All blocking up must be done under the skid - not under the Dryer.

After the Dryer has been blocked up in its final position, remove the steel straps keeping skid and Dryer together and the wood lagging on the Heads. This lagging is made in two parts, which can be removed separately. Remove the wrappings from the Journals, wash the bearing faces with Paraffin (Kerosene) and fit bearings and housings according to given instructions. Fill the bearing housings with oil of the appropriate grade to be used in service. The level should be just below the bottom of the shaft.

In bearing housings designed for a circulation lubrication system the return oil outlet must be plugged.

When the Dryer is supported in its bearings the shipping skid can be removed.

If the Dryer is to remain in the machine for a long period of time before start-up, it should be turned about 60° every third day.

1.5 Removal of Wrappings

Although the wood lagging and wrappings on the Dryer Drum should be kept on as long as possible, it is advisable to remove them whilst the overhead travelling crane can still be used, i.e. before any framework or Hood is fitted over the Dryer.

Place two steel ropes around the Dryer at points about one quarter of the face width from each side. Tension the ropes with the overhead crane, preferably using a lifting beam, so that the ropes can be kept parallel to each other. The ropes must not be arranged as a noose around the Dryer, but both ends must be attached to the same hook or beam.

Cut off the steel strapping holding the wood lagging and remove the boards one by one, starting from the top.

The paper and plastic wrappings can now be removed. Use a brass or aluminium knife, never use any steel, or other hard metal, tools. The simplest way is to make an axial cut and roll up the material. When the roll gets too big and difficult to handle, cut it off, make a new cut and start to roll again.

The removal of the protective coating on the face is facilitated by the use of a high-pressure spray gun and liquid solvent (Paraffin, Kerosene or similar). If a spray gun is not available, scrape off the thick coating first by using a wooden or plastic tool - the use of a metal or hard object is absolutely forbidden. The remainder of the coating can be removed by washing with Paraffin (Kerosene) or similar solvent.

1.6 Inspection

After the whole Dryer has been carefully cleaned, the face must be inspected. If any corrosion occurred, this can be removed by using a whetstone 400-500 grain size, and plenty of solvent.

Note: Rub only in the direction of the circumference.

Areas that have been grinded must be thoroughly washed with solvent afterwards. In all cases where damage has occurred to the Dryer's face Valmet-Karlstad must be contacted.

After inspection the entire Dryer face must be wiped with mineral oil.

1.7 Start-up

Set the Doctors as per given instruction. Fit the special start-up blades of phosphor bronze.

Disconnect the steam and condensate rotary joints, as these can be damaged if run without steam.

Note: Check that the lubrication system for bearings and gearbox has the right oil temperature (approx. 104° F/ 40° C) on the lubrication system and check the oil flow before starting the MG Dryer drive.

During the initial running period, at a speed of 30-100 fpm (10 - 30 mpm), the entire Dryer face must be wiped with oil continuously. This is done by wrapping a strip of felt around the blade of the Cleaning Doctor and soaking it in mineral oil. Add oil at regular intervals to keep the felt saturated.

Note: No doctoring takes place during the initial start-up period.

1.8 Warming-up

After the Dryer has been run for about 24 hours with the oil-saturated felt against the face, the warming-up phase can start.

Check that the steam and condensate system has been thoroughly cleaned from all foreign materials by undoing the connections at the rotary joints and blowing the system clean with steam (43,5 - 72,5 psi/3 - 5 bar).

Arrange a strainer at the steam inlet to trap any particles of material that could enter the rotary joints and damage the seals. This is especially important on Dryers for tissue, where particles might collect in the condensate drainage system.

Warming-up procedure should follow the instruction in Section 3.1 with exception for the cold running period which should be according to the above.

It is also recommended, during the initial warming-up after installation, to hold the heating up for 30 min after each 36°F (20°C) temperature increase. This enables inspection of the Dryer and the auxiliary equipment.

The face of the Dryer must be wiped with oil continuously throughout the warming-up phase. When the paper is first run over the Dryer, the felt must still be in contact with the Dryer face, but no more oil should be added. After about two reels have been run the strip of felt can be removed and the cleaning doctor applied.

After about 24 hours of running, the phosphor bronze doctor blades can be replaced by steel blades. Examine the edge of the blade carefully and remove any burrs with a whetstone. When steel blades are applied the loading pressure should be minimum required to perform the doctoring operation.

1.9 Cooling

The practice of cooling the Dryer face by running with saturated felts is not recommended, as this can produce dangerous stresses in the Dryer. Valmet-Karlstad recommends that the Dryer is allowed to cool whilst rotating without any induced aids. If a quicker rate of cooling is required, the hood exhaust fans (only) may be operated to draw room air over the Dryer.

1.10 Shutdowns

When the Dryer is not in operation during a temporary production shutdown, it should be run at crawl rate as for Sunday operation to prevent permanent distortion.

Liquid paraffin (mineral oil) should be applied to the face to prevent corrosion. This oil does not need to be wiped off when production is restarted.

During a long shutdown the surface temperature should be maintained at 95 - 104°F (35 - 40 °C) to prevent corrosion. This will also reduce the time required to warm up again.

2

CROWN CURVE

Due to deformation from internal pressure, linear loads and temperature differences the Dryer shell has to be grinded to a specific crown to give a straight nip in the press roll position. This crown curve calculated theoretically with respect to the above.

The crown curve for this Dryer is shown on drawing KSD7356684. The curve is made for a grinding pressure of 24 psi(689 kPa) and an operating pressure of 30 psi (207 kPa).

3

GRINDING OF THE SHELL

Due to wear of the Dryer shell, the Dryer normally requires re-grinding at even time intervals.

This grinding is done with a grinding prism that is installed in a suitable place in the machine. The installation of this equipment is different depending on the type of grinder used.

The Dryer must be grinded according to the supplied crown curve drawing and with the specified grinding steam pressure.

It is very important to keep track of the thickness of the Dryer shell as it will decrease due to wear and grindings.

The Dryer is a pressure vessel and there is a specified relation between the maximum allowed working pressure in the Dryer and the thickness of the shell.

These values are shown in Fig. 1 and may never be exceeded.

If, during a grind, a surface defect should be detected this may be repaired by plugging or by metal spraying.

Spot repairing by metal spraying is the preferred method.

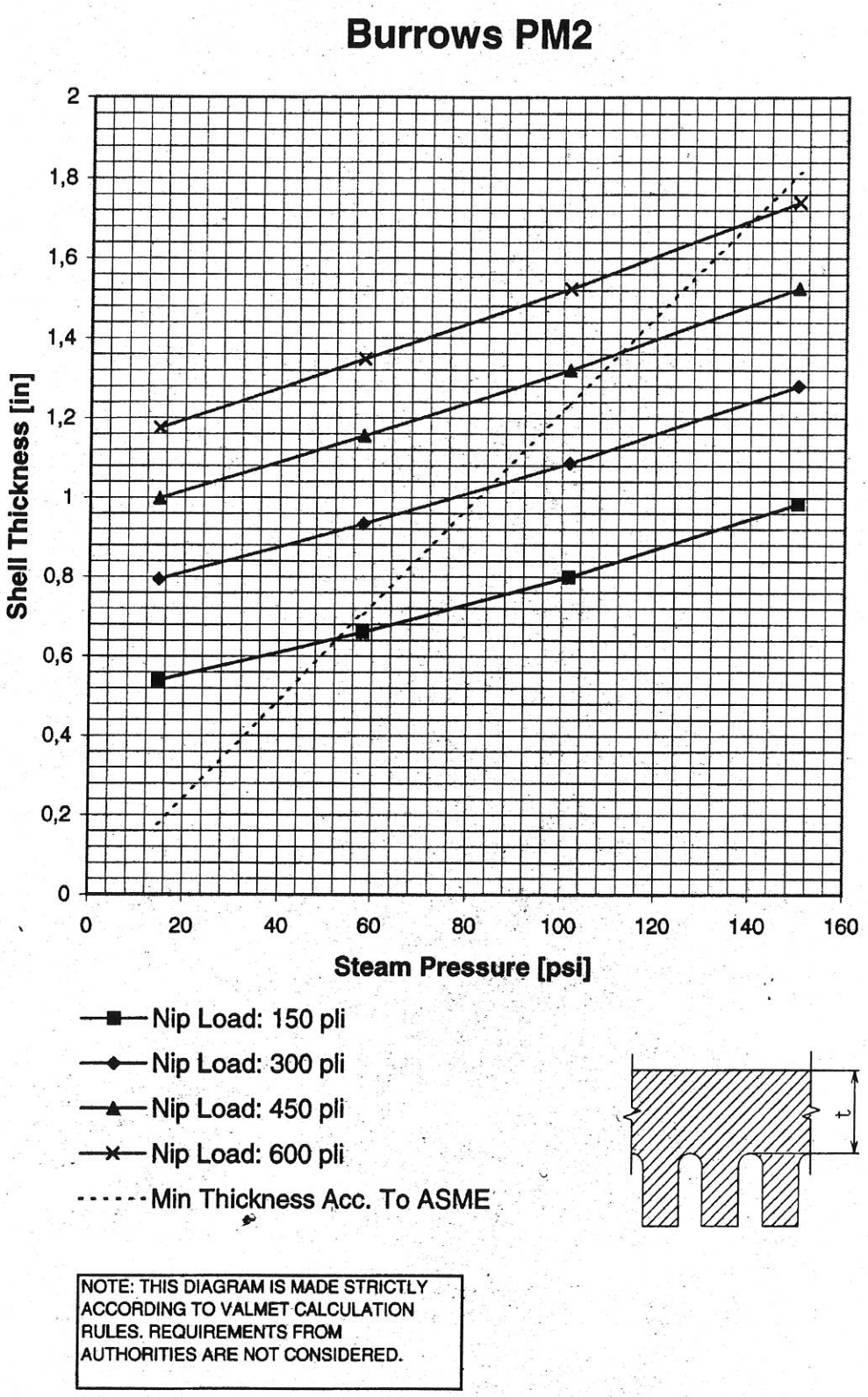

Burrows PM2
Shell Thickness [in]
2
1,8
1,6
1,4
1,2
1
0,8
0,6
0,4
0,2
0
0
20
40
60
80
100
120
140
160
Steam Pressure [psi]
Nip Load: 150 pli
Nip Load: 300 pli
Nip Load: 450 pli
Nip Load: 600 pli
Min Thickness Acc. To ASME
t
NOTE: THIS DIAGRAM IS MADE STRICTLY ACCORDING TO VALMET CALCULATION RULES. REQUIREMENTS FROM AUTHORITIES ARE NOT CONSIDERED.

Figure 1

3.1 Start-up Instructions for MG Dryer after Regrinding

After the grinding is finished and all machine components are re-installed, the test-run and warming-up phase can start.

During this heating-up period the shell surface should be treated with oil to achieve a durable surface on the Dryer.

Following procedures are recommended:

1 Clean Dryer surface carefully.

2 Install bronze doctor blades in the cleaning doctor blade holders.
Any sharp edges on the blades must be carefully ground to smooth by using a whetstone.

3 During the entire start-up period the Dryer surface should be treated with mineral oil. This can be done by putting a strip of felt over the cleaning doctor with a low pressure against the Dryer. The felt should be saturated with mineral oil. The mineral oil should be free of additives that can cause buildup on the Dryer face.

4 Rotate the Dryer on crawl speed (30-100 fpm/10-30 mpm).

5 Add oil to the felt strip at regular intervals.
Also move the felt strip occasionally so that there is always a clean surface against the shell surface.

6 Run the Dryer for 2 hours in this way without steam.
After that open the steam supply to the Dryer and start to warm up the Dryer with about 36° F(20°C) per hour.

7 Add oil continuously during the warming-up period.

8 The bronze doctor blade in the cleaning doctor holder may be used to clean the Dryer shell during this phase if necessary.

9 When the Shell temperature has reached about 100°C (212°F), the bronze doctor blade in the cleaning doctor holder shoud be used continuously.

10 Change felt strip when it becomes dirty and add oil at regular intervals.

11 Continue to run like this for at least 2 hours or until the machine is ready to produce paper.

12 When paper is, for the first time, brought over the Dryer continue to use bronze Doctor Blades. Keep running with the felt against the Dryer surface until about 2 rolls of paper have been produced.
The bronze blades should preferably be used for about one day's production.
If production problems occur with the bronze blade and a steel blade must be installed, check this carefully for burrs and sharp edges. If any are found these must be rounded off.

Keep the bronze blade in the cleaning position for at least 24 h.

4

INTERNAL INSPECTIONS

To make internal inspections possible each head has a manhole cover.

To prevent steam leaks there is a gasket between the manhole cover and the head.

To make lifting of the cover easier there is a threaded hole in it for the installation of a lifting lug.

Before performing internal inspections:

- The Safety Instruction "Work inside a MG Dryer" is to be followed.
- Make sure the ventilation is sufficient.

If no operating problem indicates the need for an internal inspection we still recommend this once every year.

Check List for Internal Inspection:

- Look for any loose items inside the Dryer .
- Check the bolt connections. Check if locking plates and tack weldings are intact.
- Check header clearance and for any plugging of these.
- Check steam pipes for leaks.

Open journal manhole for inspection of condensate removal pipe and riser pipe connections to this.

5
BOLT TIGHTENING PROCEDURES

5.1
Application

This instruction is applicable only if not otherwise stated on the Dryer assembly drawing.

5.2
Purpose

The correct function and safety of the Dryer are based on the realization of the conditions assumed at the design. This procedure is to be followed to obtain the maximum strength in the joint.

5.3
Bolt Joints

The following bolt joints are included in the construction:

1 Shell to head flange joint.

2 Head to journal flange joint.

3 Journal to journal flange joint.

4 Manhole cover fasteners.

5 Internal equipment for condensate removal.

5.4
Bolts and Nuts

Bolts and nuts for the four first joints according to Paragraph 3 above are specially ordered for the Dryers to conform to American Standard ASTM-A-193 (bolts) and ASTM-A-194 (nuts).
Bolts are on the top of the Head marked B-7 and nuts on the outside face 2-H. Dimensions according to drawings.
Bolts and nuts for Items 5 Paragraph 3 above are Valmet-Karlstad standard fasteners according to SMS 1943 or ISO 4014 (bolts) and SMS 1989 or ISO 4032 (nuts). Dimensions according to drawings.
Dead soft copper washer are to be placed under the square heads of the bolts in the shell to head and head to journal joints. Dimensions according to drawings.

5.5
Pre-treatment

Before assembly the bolt threads are greased with anti-seize assembly compound.

5.6
Tightening

All bolts should be pre-loaded to pre-determined values. The preload of the stud bolts in the journal to journal flanges must be checked by measuring the elongation of the studs. Other bolts or nuts are tightened to specified torques. The tightening may be done without control up to estimated 25 % of the stated pre-load. After that the tightening must be done under control to definite pre-load according to value indicated on the drawings.

6

THE STUFFING BOX SEALING

6.1
Compression procedure

To carry out the condensate through the journals, these are supplied with insulating sleeves (see also "cond. removal system" under flap 3). There is a space between the insulating sleeve and the journal to prevent heat transport from the steam and condensate in to the bearings, which can cause damage to the bearings.

The inner part of the insulating sleeve is sealed with a gasket made of graphite (see detail under flap 10).

At the outer part of the insulating sleeve there is a stuffing box sealing to enable the sleeve to expand during heating up. The stuffing box sealing is made of three graphite rings and one steel ring. The graphite rings are compressed approx. 0,12" (3 mm) at delivery. If a leakage occurs after the start up, is it possible to recompress the graphite rings according to following instruction:

Measure the actual gap between the journal (item 1) and the flange (item 2),

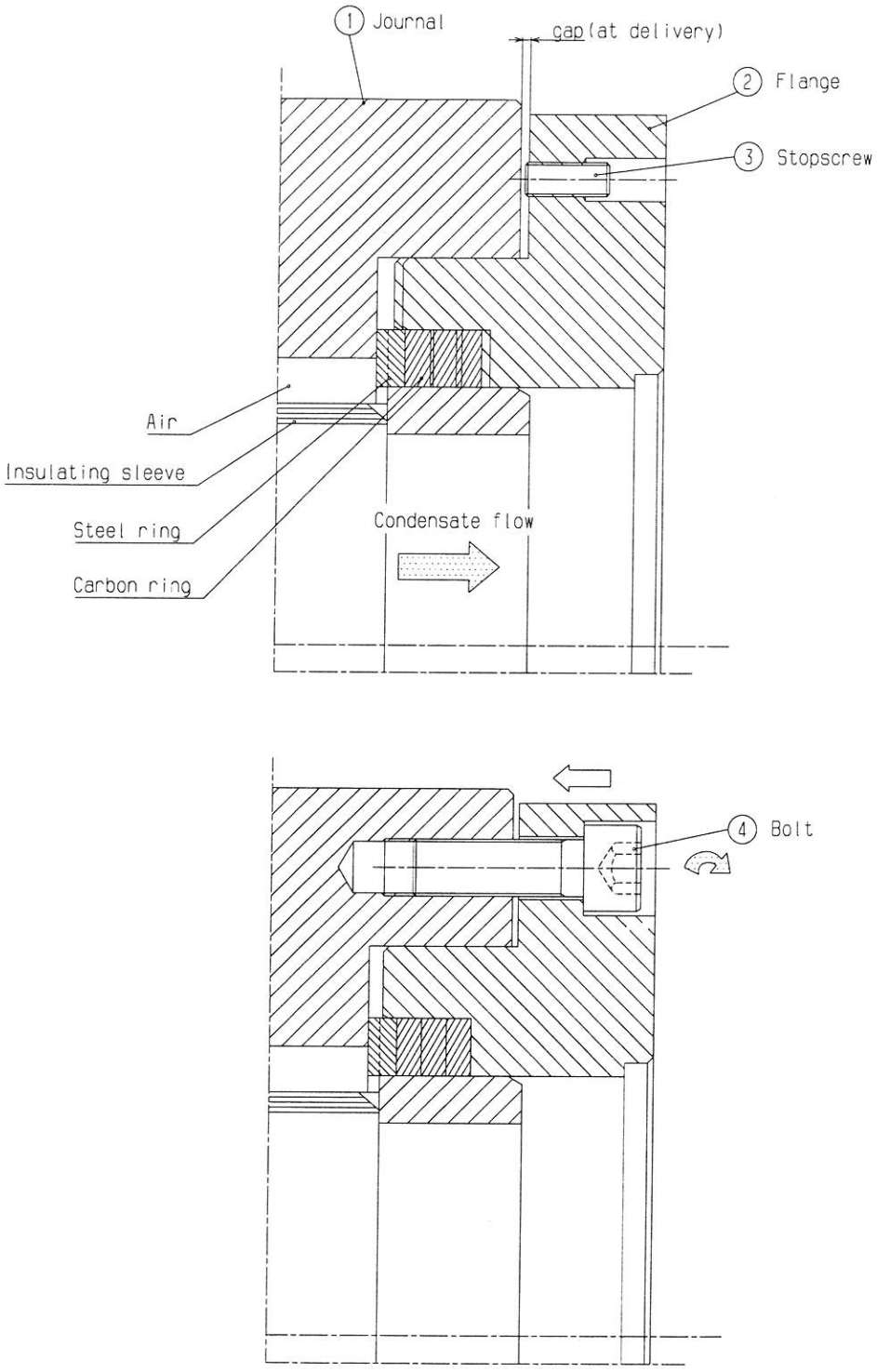
Loosen the stopscrews, (item 3) to enable the compression of the graphite rings.

In order to not misalign the graphite rings it is recommended to make four guide plates. The thickness of these plates shall be at least 0,04"(1 mm) smaller than the actual gap acc. to 1.

Place the guide plate equally spaced between the flange and the journal. Tighten the flange with the bolts (item 4) in the new position. Loosen the guide plates and check the dimension of the gap and finally secure the position with the stop screw (item 3). Check if the leakage has stopped after start up, otherwise repeat from 1.

If the leakage do not stop, check for damage on the graphite rings or on the inner gasket sealing and change it if necessary.

Stuffing box sealing



KSD 0026334

Figure 2

7
BEARINGS

7.1
General

The MG Dryer Bearings are SKF Spherical Roller Bearings with conical inner rings.

The designation of the Bearings is: SKF 23168 CCK/HA3/C084/W33.

The Bearings are oil lubricated.

The Bearings are calculated for:

- Oil inlet temperature: 104°F (40 °C)
- Steam temperature: 365°F(185° C)

Lubricating values:

- Viscosity: ISO VG 460
- Bearing temperature: 194°F(90°C)
- Oil flow: 1,59 US gallons(6 l) /min/bearing

Drawings of the bearings and housing,
See Section 10.
Drawing Nos. I-001987, I-001988.

For details about bearing maintenance and installation procedures, see SKF Instructions
(last in this section, Enclosures)

8

STEAM AND CONDENSATE ROTARY JOINTS

See enclosures

9

SHAFT MOUNTED GEARBOX

For mounting, lubrication and maintenance instructions, see Falk manual, last in this section.

ENCLOSURES

Section 01
Manufacturing Documents

Shop reports
incl. crown curve, location of defects and location of films.

(See separte list of contents)

Section 02
Enclosures

Tab 1

SKF	Excerpts from Pub.4100E
	Instructions for MG Dryer bearings for T.D. and D.S.
	Step by step mounting procedure

Tab 2

JOHNSON	Steam and condensate rotary joints

Tab 3

FALK	Gearbox