4 Maintenance

Section 4.1 lists routine inspection and maintenance procedures. Section 4.2 and 4.3 describes dismantling and assembling as required for non-routine inspection and repair of the main components. Section 4.5 specifies a procedure for resurfacing worn screw flights. Finally, some general comments regarding spare parts are given in Section 4.6.

4.1 Routine Maintenance

To ensure trouble free and stable operation, the mechanical condition of the screw press should be checked periodically as recommended in the following table.

Note that this table refers to conditions after start-up when normal operation has been established.

Table 8 - Routine Mechanical Maintenance

Object	Task	Frequency
Oil	Check oil level	Once per month
	Change oil	After 3000 h
Grease	Add and check grease	Once per month
Bearing inspection	Check for vibration (noise)	Once per month
	Check for abnormal heating	Once per month
Wear of screw flights	Check for rounding and diameter red.	Once per year

In the following, these activities are discussed in more detail.

Oil/Grease Service
Grease lubricated bearings (inlet bearing assembly) should be greased and the oil level of the outlet bearing assembly checked based on a schedule as indicated in the table above. Also, check for oil leakage (seal damage). The lubrication points are shown in the figure of Section 2.8 where also the types and amounts of oil and grease are listed.

Bearing Inspection
Due to the slow speed of the screw press and the large dimensions of the bearing components, manual inspection for vibration (noise) using a simple listening device such as a mechanic's stethoscope is normally sufficient. Abnormal temperature can often be checked for by hand. If the press operates at high temperature, a thermometer should be used.

4.2 Dismantling

The Kværner screw press is designed for dismantling in modules. The procedures for dismantling of these modules are as follows:

However, before starting such work, please observe the following:

All dimensions (bolts, nuts, etc.) are metric unless otherwise noted. The seal water connection at the inlet end as well as the air pressure connection on the outlet house have pipe threads. Pipe wrenches should not be used on the Kværner Screw Press. When splitting flange connections use the jacking screws provided. Do not use screw drivers, chisels, etc.

When working on the press, make sure that bolts, tools or others materials are not left in the press or can be lost. Cover the frame outlet and other openings. Dismantling of the bearing assemblies should only be performed under dry and dust-free conditions. Disable and/or disconnect the drive coupling and remove instrumentation systems as required for workspace.

Cover Dismantling
Remove the locking brackets on both sides of the cover and open the eccentric locks on the top. The cover can now be partially or completely removed as required.

4.2 Dismantling

The Kværner screw press is designed for dismantling in modules. The procedures for dismantling of these modules are given in the following. However, before starting such work, please observe the following:

All dimensions (bolts, nuts, etc.) are metric unless otherwise noted. The seal water connection at the inlet end as well as the air pressure connection of the outlet house have pipe threads. Plumbing pipe wrenches should not be used for work on the Kværner Screw Press. When parting flange connections, use the provided jacking screws. Do not use screw drivers, chisels, etc.

When working on the press, make sure that bolts, tools or others materials are not left in the press or can be lost. Cover the frame outlet and other openings. Dismantling of bearing assemblies should only be performed under dry and dust-free conditions. Disable or disconnect the drive coupling and remove instrumentation systems as required for workspace.

Cover Dismantling
Remove the locking brackets on both sides of the cover, and open the eccentric locks on the top. The cover can now be removed partly or completely as required.

Mantle Screen Section Dismantling
For inspection of the final flights of the press screw, replacement of screen plates or for removal of a pulp plug that cannot be flushed out, it is necessary to open the high pressure screen. For convenience the mantle is divided horizontally in two halves.

1. Preparation. Remove the cover as described above.

2. Upper section. Remove the bolts of the flanges at both ends of the mantle. Leave two bolts at each end of the lower section so that it does not fall down. Loosen the bolts of the dividing flange. Use the jacking screws to release the connection and then remove the bolts. Insert two eye bolts in the threaded holes (M 16) on top of the mantle and lift it out.

3. Lower section. If the lower section also must be removed, it should be rotated to the upper position before it is lifted out of the press.

4. Screen plates: 96910-xxx. Each mantle section has one screen plate that is attached to the mantle by means of screws.

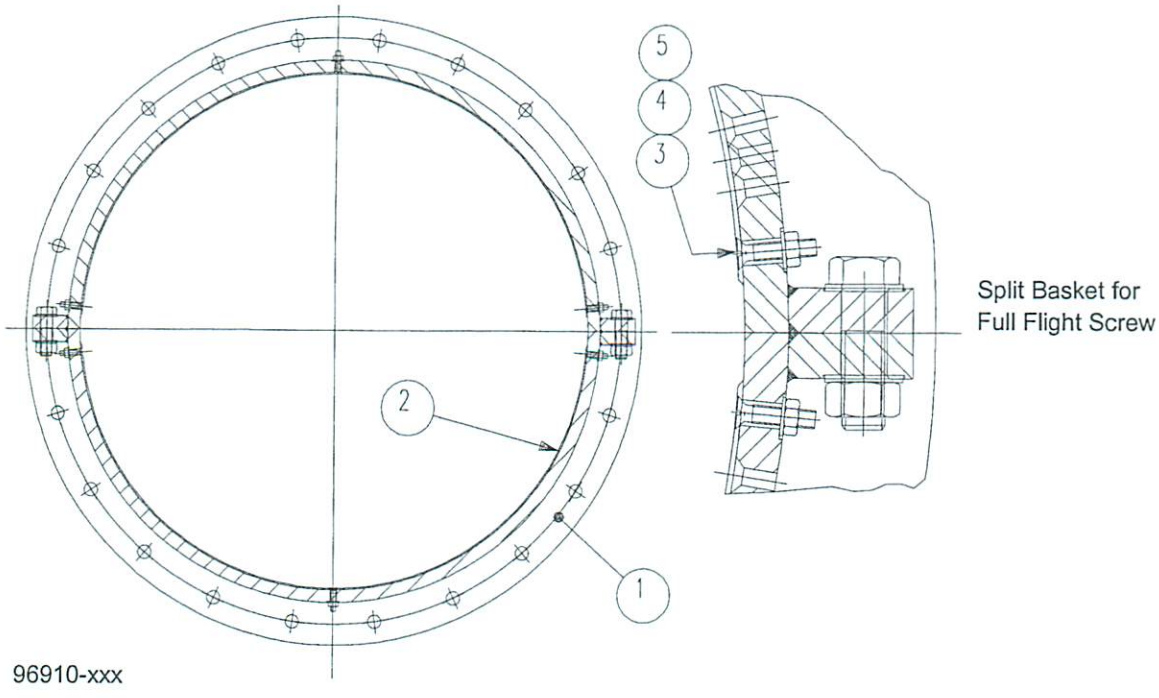


Figure 11 - Mantle Screen Section

Table 9 - Parts List. - 96910-xxx Mantle Screen Section

ITEM	QTY	PART NO.	NAME
000	0	96913-000	Screen plate
001	1	49916-002	Split mantle screen
002	2	96913-xxx	Screen plate
003	66	20040-013	Locking nut
004	66	20017-039	Washer
005	66	20013-146	Countersunk screw

Press Screw Assembly Dismantling

The press screw should normally be removed from the press as a complete assembly with the outlet bearing left in place.

For screw presses with divided outlet house, dismantling proceeds as follows:

1. Preparation. Remove the air pressure piping at the outlet house, water and instrumentation connections at the inlet house. Drain the oil from the outlet bearing. Remove the cover and remove both sections of the mantle screen section as described above.

2. Cylindrical screens. Remove all bolts from the flanges of the cylindrical screen sections and slide the screens forward, at least 10 mm from the inlet house.

3. Inlet house. Remove all bolts from the flange connection between the inlet house and the inlet bearing house. Loosen the bolts of the flange connection between the upper and lower section of the inlet house and release the connection using the jacking screws. Remove all flange bolts and lift the upper section of the house away.

4. Outlet house, upper section. Remove all bolts from the flange connection between the outlet house and the outlet bearing house. Loosen the bolts of the flange connection between the upper and lower section of the outlet house and release the connection using the jacking screws. Remove all flange bolts and lift the upper section of the house away.

5. Press screw assembly. The press screw, with the inlet and outlet bearing assembly still enclosed in the housing, and with the counterpressure cone and shredders in place, can now be lifted up and out of the press. The cylindrical screens may also be left in place until the press screw can be placed on wood supports in a level, clean work area.

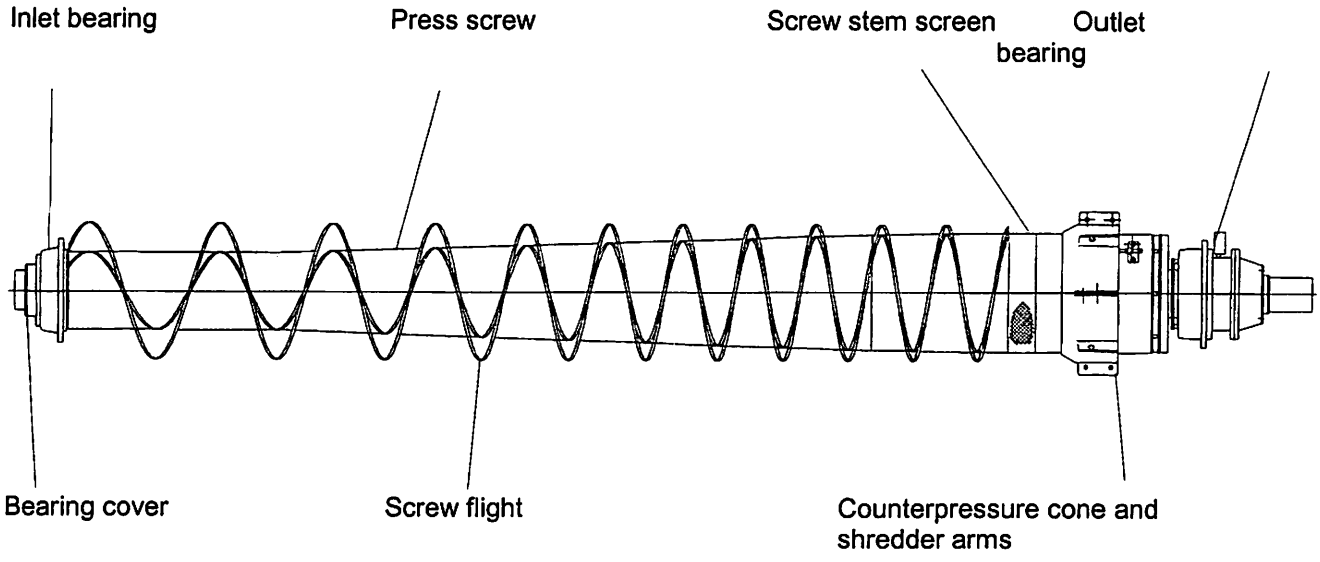


Figure 12 - Press Screw Assembly

Cylindrical Screen Dismantling
The cylindrical screens operate at relatively low pressure.

These screen sections are normally removed from the press screw assembly after it is removed from the press.

Alternatively, the cylindrical screen sections may be pulled out towards the inlet end, leaving the screw in place. In this case, only the inlet house is dismantled and removed (for certain types, also the inlet bearing assembly). *Note: The press screw must be properly blocked in the central position to avoid damage to other parts of the press.*

Use the flanges of the screen for support, not the screen plates. Change the support point as required to remove the screen sections.

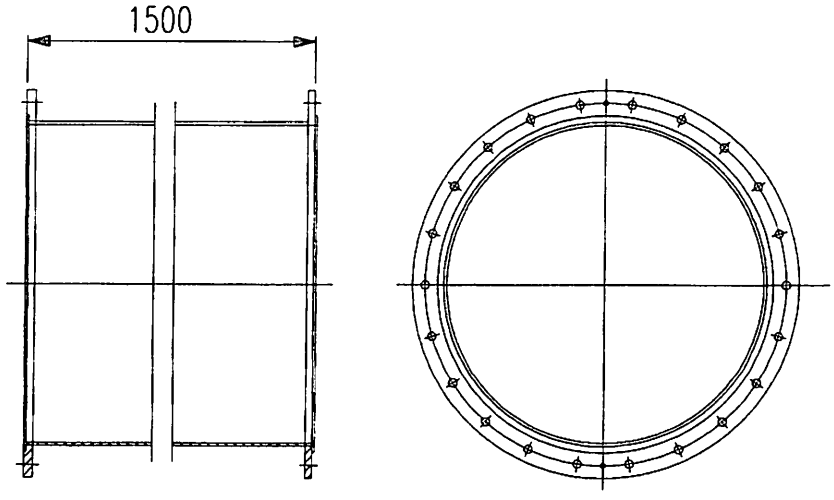


Figure 13 - Cylindrical Screen

Inlet Bearing Assembly Dismantling
If the press screw assembly has been removed with the bearings in place, proceed as follows:

1. Outer house. Remove the screws, Pos. 22, and the cover, Pos. 3.

2. Inner house. Loosen the adapter sleeve, Pos. 8 by opening the lock nut a few turns and strike the sleeve with a hammer on a "bridge" that spans the bearing so that the hammer load is applied simultaneously to both sides of the sleeve. Pull out the inner bearing house, Pos. 2, including the bearing and the adapter sleeve. Use the jacking screws.

3. Gland and seal. Remove the screws, Pos. 23, and pull out the seal house, Pos. 4, with the seal rings and the lantern ring. Take care not to damage the seal rings.

4. Bearing holder. Remove the outer bearing house, Pos. 1, using the jacking screws.

5. Wear sleeve. Remove the wear sleeve, Pos. 6, and check for damage and wear. Replace if necessary. The wear sleeve is bonded to the shaft with Locktite and it may be necessary to heat it to 200 °C to remove it.

6. Bearing and seal ring. Remove the bearing, Pos. 7, from the house and examine its condition. Replace if necessary. Also examine the O-rings, Pos. 13, 14 and 16, and the seals, Pos. 10 and Pos. 11. These should normally be replaced.

7. Lantern ring. Remove the lantern ring, Pos. 9, and the ring Pos. 12 with O-ring Pos. 15, and examine its conditions. Replace if necessary.

Alternatively, the inlet bearing assembly may be dismantled with the press screw still in the press. The work proceeds as indicated above.

Note: The press screw must be properly blocked in the central position to avoid damage to other parts of the press.

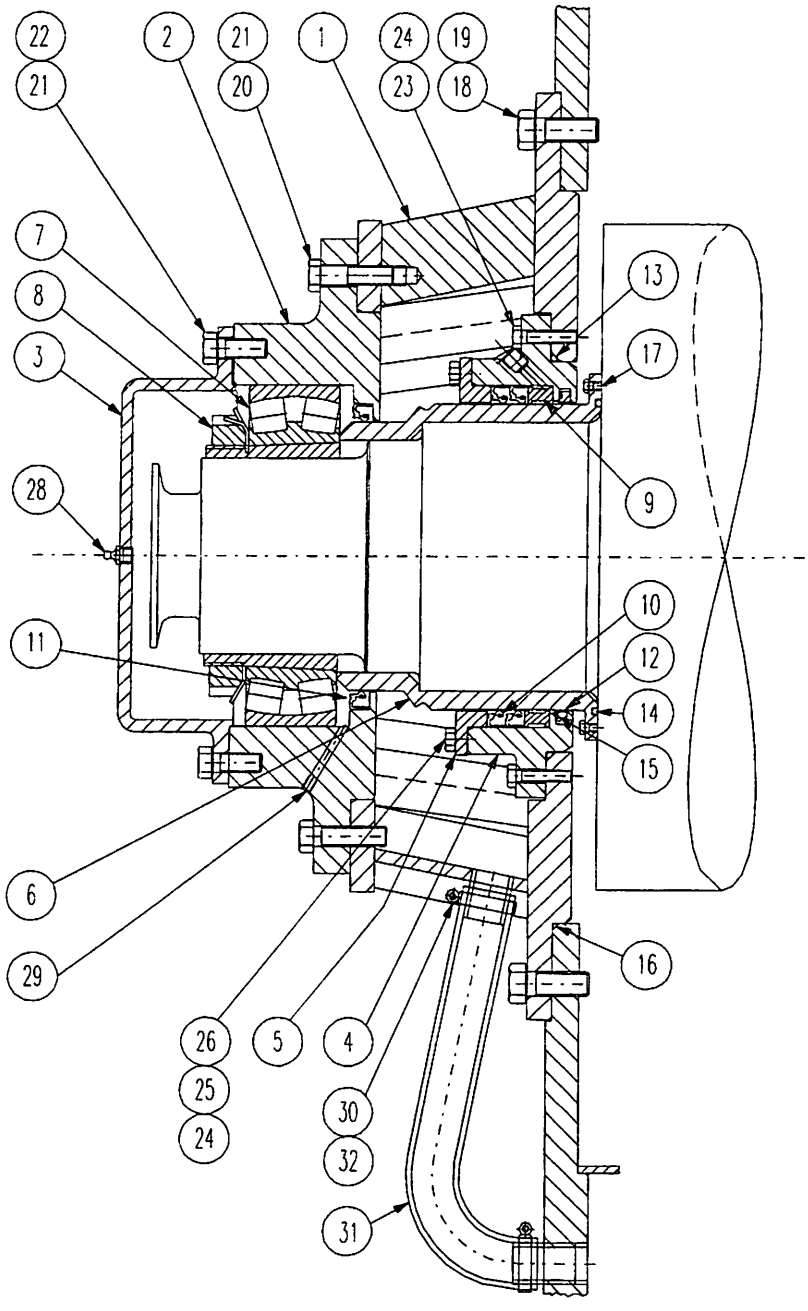


Figure 14 - Inlet Bearing

Table 10 - Parts List. 49995-003 Bearing, Inlet End

ITEM	QTY	PART NO.	NAME
001	1	A1860-001	Bearing holder
002	1	49997-003	Bearing house
003	1	45608-007	Cover
004	1	49998-003	Sealing house
005	1	49999-002	Gland
006	1	50002-002	Wear sleeve
007	1	20347-045	Spherical roller bearing, SKF 23036 CCK
008	1	20144-036	Adapter sleeve, SKF H3036
009	1	50001-002	Sealing water ring
010	2	20071-278	Sealing water ring, ø 250/280 x 15 EPDM w/spring, stainless steel
011	1	20071-168	Sealing water ring, GACO SM 22025015 w/spring, stainless steel
012	1	A2485-001	Ring
013	1	20070-039	O-ring, GACO RM 3193-57 Nitril 72 SH
014	1	20070-033	O-ring, GACO RM 2493-57 Nitril 72 SH
015	1	20175-742	O-ring, ø 260 x 3 Nitril w/Tipaflon
016	1	20175-191	O-ring, 600 x 4 Nitril 72 SH
017	6	20003-294	Hexagon screw
018	12	20003-340	Hexagon screw
019	12	20017-002	Washer
020	8	20004-175	Hexagon screw
021	16	20017-001	Washer
022	8	20003-359	Hexagon screw
023	6	20004-347	Hexagon screw
024	10	20017-039	Washer
025	4	20002-303	Stud
026	4	20005-025	Hexagon nut
028	1	20386-003	Lub. Nipple
029	1	20048-072	Set screw
030	2	20206-006	Welding socket
030A	1	20133-071	Bend
031	1	20431-440	Hose
032	2	20433-052	Hose clamp

Outlet Bearing Assembly Dismantling
When the press screw assembly has been removed with the bearing assembly in place dismantling, proceeds as follows:

1. Outer housing. Unscrew the bolts, Pos. 30, and pull out the outer housing, Pos. 3, together with the bearing, Pos. 14 and the seal ring, Pos. 19, taking care not to damage the seal ring.

2. Radial bearing. Remove the distance ring, Pos. 13, and the screws. Loosen the adapter sleeve, Pos. 12, by opening the lock nut a few turns and strike the sleeve with a hammer on a "bridge" that spans the bearing so that the hammer load is applied simultaneously to both sides of the sleeve. Pull out the bearing house, Pos. 2, with the radial bearing, Pos. 11. Examine the condition of the bearing and the O-rings, Pos. 22 and 23, and replace if necessary.

3. Locking and spacer rings. Remove the locking ring, Pos. 10, and the spacer ring, Pos. 9.

4. Bearing house. Using the jacking screws, remove the bearing house, Pos. 1, with the axial bearing, Pos. 8 with seal assembly and seal ring, Pos. 36. Examine the condition of the bearing and seals and replace if necessary.

5. O-rings and seals. Replacing the O-rings is generally recommended. The main seal rings, Pos. 18, 19 and 36, in the inner and outer seal houses should also normally be replaced.

6. Wear sleeves. The wear sleeves, Pos. 15 and 16, are bounded to the shaft with Locktite. Heat the sleeve carefully to 200-300 °C. While it is hot, apply a torque to loosen the connection. The sleeve must be completely removed before the temperature falls below about 200 °C.

Alternatively, the outlet bearing assembly may be dismantled with the press screw still in the press. The work proceeds as indicated above.

Note: The press screw must be properly blocked in the central position to avoid damage to other parts of the press.

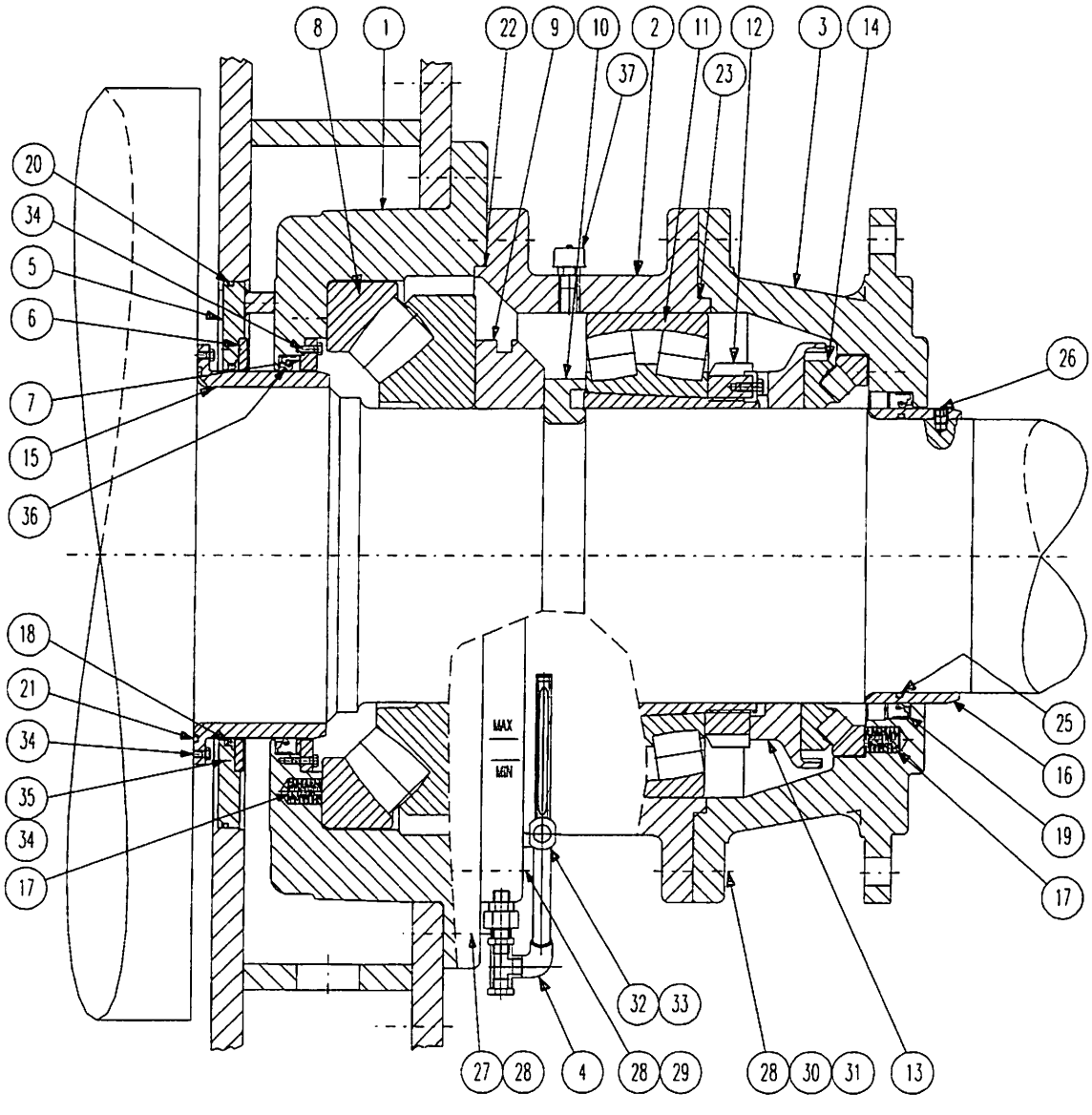


Figure 15 - Outlet Bearing

Table 11 - Parts List. 50100-007/008/009 Bearing, Outlet End

ITEM	QTY	PART NO.	NAME
001	1	50101-003	Inside bearing house
002	1	50102-002	Bearing house
003	1	50103-007/008/009	Ext. bearing house
004	1	A1933-001	Oil gauge glass
005	1	50257-002	Sealing house
006	1	50109-002	Clamp ring
007	1	50108-003	Clamp ring
008	1	20136-056	Roller bearing
009	1	50107-002	Spacer ring
010	1	50106-002	Spacer ring
011	1	20347-081	Sph. roller bearing
012	1	20144-054	Adapter sleeve
013	1	50105-002	Ext. spacer ring
014	1	20136-055	Roller bearing
015	1	50110-002	Wear sleeve
016	1	50111-002	Wear sleeve
017	24	47423-001	Helical spring, DY 24/44, DIN 17223
018	1	20348-024	Variseal rotary
019	1	20733-011	Sealing ring, SMIM 280310/15
020	1	20175-186	O-ring, 510 x 5 Nitril 72 SH
021	1	20175-042	O-ring, GACO RM3393-57 Nitril 72 SH
022	1	05025-201	O-ring, ø 4 x 1726 Nitril 72 SH
023	1	05025-202	O-ring, ø 4 x 1538 Nitril 72 SH
025	1	20070-034	O-ring, GACO RM 2593-57
026	2	20048-066	Set screw
027	20	20007-171	Hexagon screw
028	80	20018-060	Washer
029	20	20019-055	Hexagon screw
030	20	20019-039	Hexagon screw
031	20	20005-030	Hexagon nut
032	1	20496-405	Pipe clamp
033	1	20003-297	Hexagon screw
034	6	20013-087	Countersunk screw
034A	18	20003-294	Hexagon screw
035	6	20017-041	Washer
036	1	20071-241	Sealing ring, 350 / 380 x 16 Nitril 72
037	1	20317-012	Filter plug

Counterpressure Arrangement Dismantling
The counterpressure arrangement consists of a set of pneumatic, piston actuated flaps and a fixed cone unit.

The piston units can be removed as an assembly, complete with pistons, flaps, and other elements. For convenience, replacement of the complete unit is suggested, allowing maintenance to be carried out in a workshop. Dismantling of a piston unit is carried out as follows:

1. Preparation. Turn off the air pressure.

2. Piston unit. See parts list 96893-001. Remove the four nuts, Pos. 4, and pull the unit off the stud bolts.

3. Maintenance. See parts list 96892-001. Replacement of all slide rings, Pos. 5, O-Ring, Pos. 8, seal ring, Pos. 6, and the scraper ring, Pos. 7, is normally recommended, even if only some of them seems to be worn.

The fixed counterpressure cone consists of two sections that are bolted together.

1. Loosen connection. Loosen the bolts and rotate until one section is on top. Provide support for the lower section.

2. Remove cone. Insert an eye bolt in the top half, remove the clamping bolts and lift it out of the outlet house. Rotate the lower section to the top position and lift it up using an eye bolt.

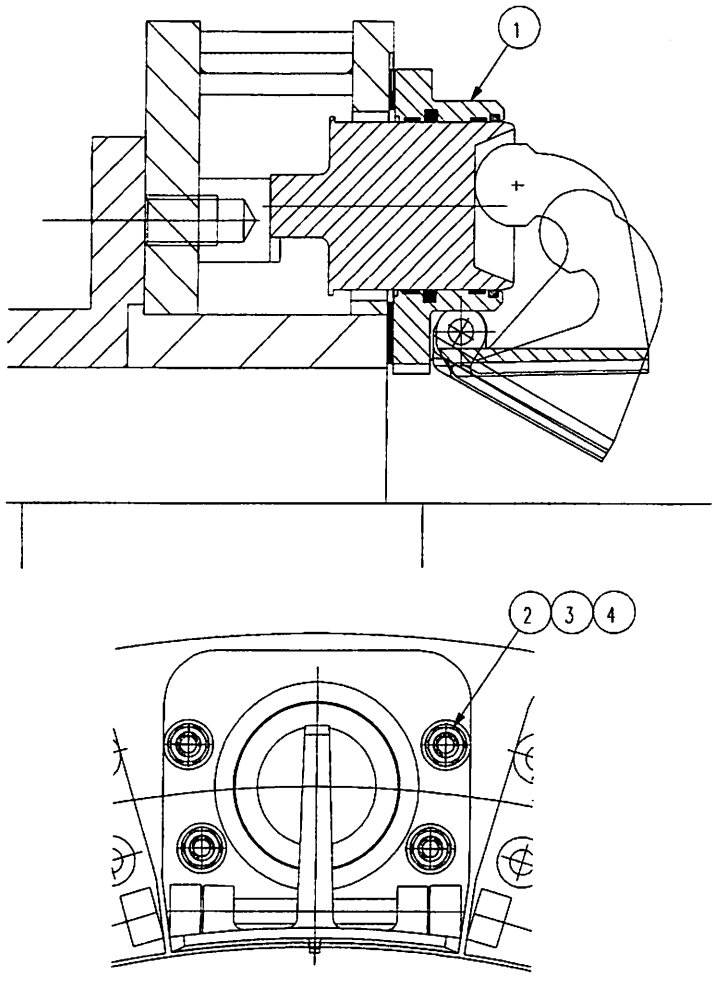


Figure 16 - Counterpressure Arrangment

Table 12 - Parts List. 96893-001 Counterpressure Arrangment

ITEM	QTY	PART NO.	NAME
001	22	96892-001	Counterpressure
002	88	20002-303	Stud
003	88	20017-039	Washer
004	88	20040-013	Lock nut

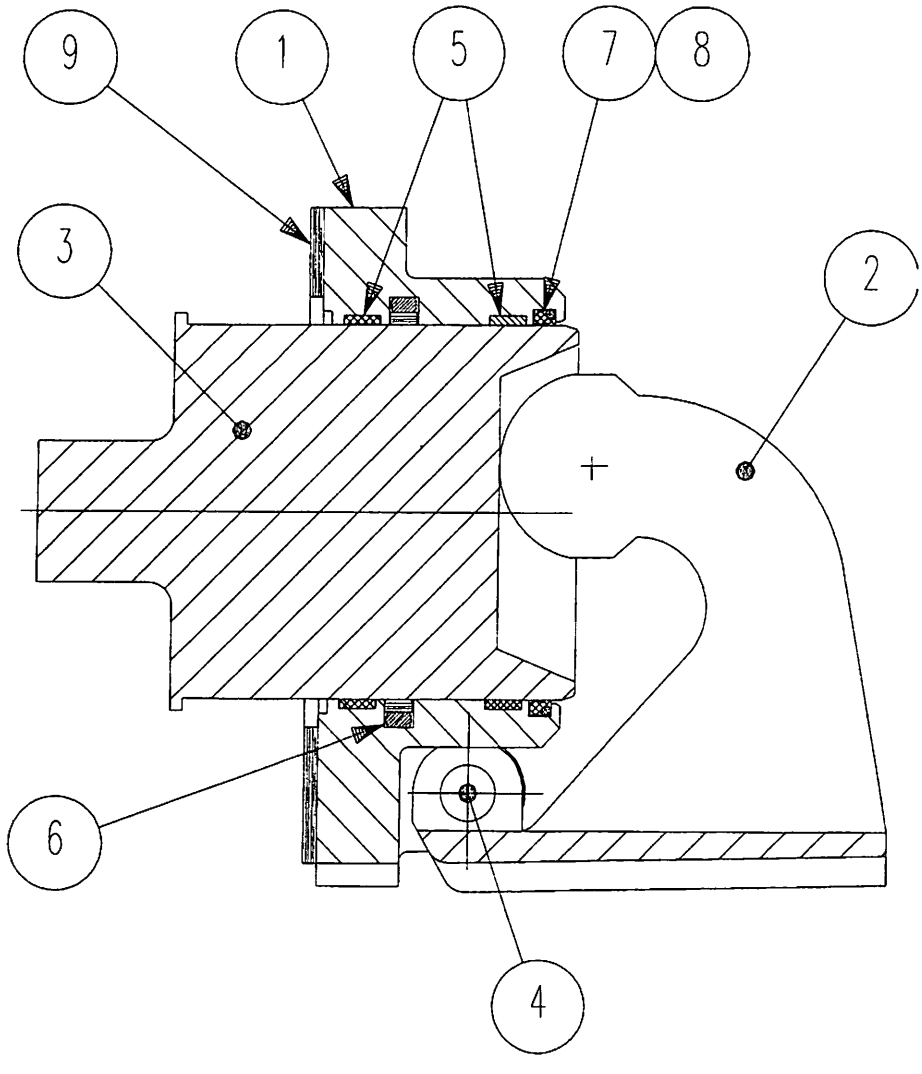


Figure 17 - Counterpressure Piston Unit

Table 13 - Parts List. 96892-001 Counterpressure Piston Unit

ITEM	QTY	PART NO.	NAME
001	1	96922-001	Cylinder
002	1	96923-001	Counterpressure flap
003	1	96924-001	Piston
004	1	49519-001	Pivot pin
005	2	20472-011	Slide ring
006	1	20071-180	Seal ring, 80 / 92 x 6,3 Viton / PTFE
007	1	20838-025	Scraper ring
008	1	20070-457	O-ring, 82,22 x 2,62 EPDM Compound No. 3957-152
009	1	96925-001	Seal, 3 x 150 x 144 Neoprene 70 SH

Inlet House Screen Dismantling
The inlet house screen plate is mounted in a machined groove. If this screen plate must be replaced, the welding must be ground off.

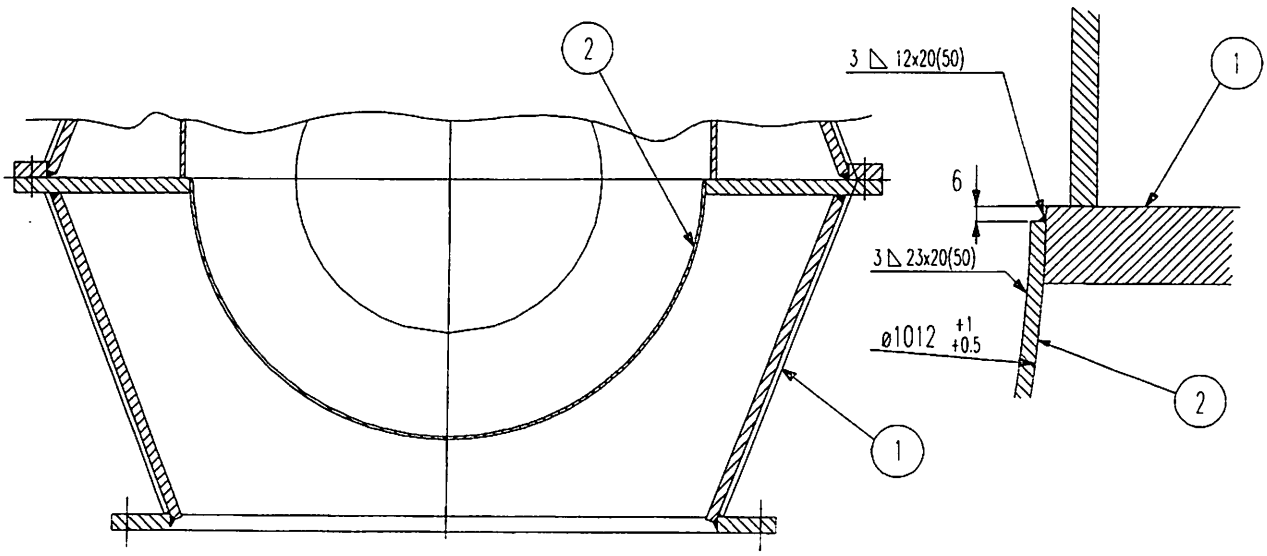


Figure 18 - Inlet House Screen

Table 14 - Parts List. A1801-xxx Inlet House with Screen

ITEM	QTY	PART NO.	NAME
000	0	50019-000	Screen inlet house
001	1	A1800-001	Inlet house
002	1	50019-xxx	Screen inlet house

Screw Stem Screen Dismantling
The screw stem screen is mounted in a machined groove on the screw stem, in the area after the final screw flight. It is welded on by circular and axial weld seams. To dismantle, the welding must be ground off.

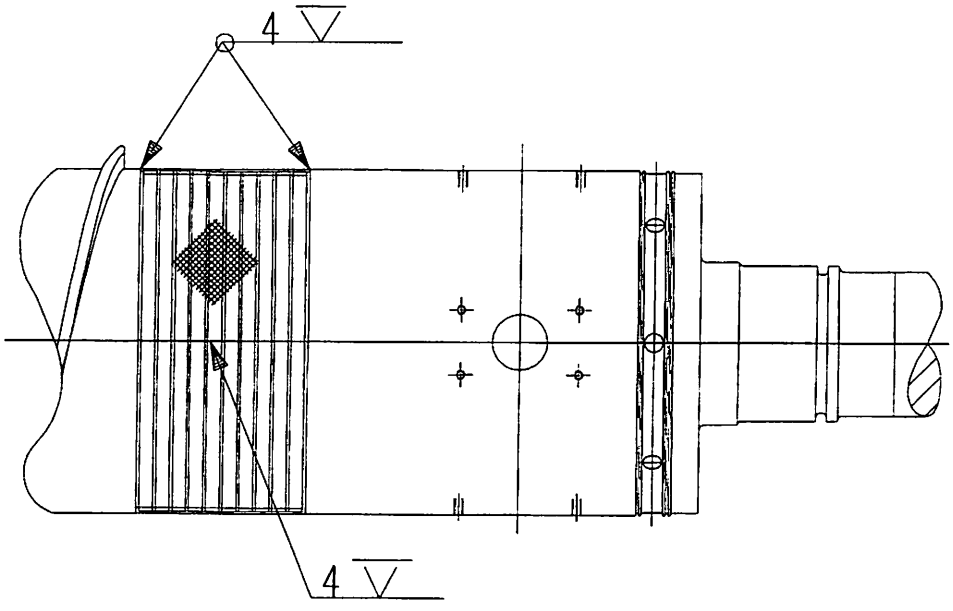


Figure 19 - Screw Stem Screen

4.3 Assembling

Before assembling the press, check that all connecting surfaces are thoroughly clean and that there are no fibre or other impurities present.

An adjustable torque wrench is recommended for tightening all bolts. The following table lists the nominal torques.

Table 15 - Recommended Torque for Screws, (Nm)

Material type	Screw size				
	M10	M12	M16	M20	M24
ISO 3506, A4 70	30	55	140	270	470
ISO 3506, A4 80	45	75	185	365	630

Note that the listed torques are based upon the use of lubrication of good quality, i.e. Copaslip Antiseize Assembly Compound (Molyslip Int.), or Chesterton Nr. 725 Nickel Anti-Seize Compound (Chesterton Ind.)

The assembly work generally follows the reverse procedure given for dismantling. Observe the following:

Bearing assemblies. The seal rings in both bearings must be installed with the lip in the correct direction. Fill with grease and oil as required. Check that the oil level in the outlet bearing as seen through the sight glass is correct.

Tighten bolts. Check that all bolts are properly tightened.

External connections. Re-attach the air supply and the seal water piping, and check for leaks. Make sure that both are functional. Re-install instrumentation.

Levelling. After extensive maintenance work has been completed, the levelling (alignment) of the press should be checked and the press screw should be turned by hand without the drive coupling in place to check for touching between the press screw and the screen system.

Wear Sleeve Assembling
The following procedure should be used for mounting a wear sleeve on a shaft:

1. Preparation. Clean the surfaces to be bonded. Remove remains of old bonding material using a metal brush or light sanding.

2. Solvent cleaning. Spray and wipe off both mating surfaces with a standard solvent (trichlorethane or isopropyl alcohol) and allow time for evaporation of the remaining solvent.

3. Apply activator. Apply Loctite Activator T (or similar), and allow time for the evaporation of the activator.

4. Apply bonding. Apply Loctite 648 (or similar) on the shaft.

5. Heat carefully. Heat the wear sleeve carefully to 100 - 150 °C. Mount the sleeve on the shaft while rotating slightly.

6. Cure. Allow 20 minutes curing time before applying any load to the parts. Curing time for maximum strength is 3 hours (depending on the temperature).

4.4 Installation of wear segments

Normally, only the edges of the final flights of the press screw, i.e. the part of the screw that is within the high pressure, divided mantled screen section, are subject to a significant degree of wear. However, all parts of the flight edge should be checked.

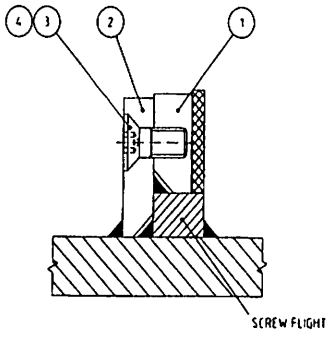
The last 2 ¼ flights in the compression zone are equipped with replaceable ceramic coated wear segments.

Wear Segment Dismantling
The following procedure should be used for dismantling:

1. Take off the last portion of the covers.
2. Hose off pulp & debris from the divided mantle screen.
3. Remove the bolts that hold the top divided mantle screen.
4. Lift off the top divided mantle screen.
5. Remove any pulp that has blocked the head of the counter sunk screws, and dismantle the worn out/damaged wear segments. Use a 6mm Allen key.
6. Throw away the old counter sunk screws and the wear segments. The wear segments may be thrown away together with stainless steel scrap

Wear Segment Assembling
The following procedure should be used for assembling:

1. Preparation. Clean the surface of the wear segment holders.
2. Apply bonding. Apply Loctite 270 (or similar) on the counter sunk screws.
1. Assembly. Screw the counter sunk screws (2 on each wear segment) and torque to 44Nm. Reinstall the top divided mantle screen and the covers.
2. Cure. Allow at least 45 minutes curing time before start-up.



Pos.no	Description
1	Wear Segment
2	Holder plate
3	M10X25 A4-70
4	Loctite 270

Figure 20 - Wear Segments

5 After Sales and Services.

5.1 Periodical check

To ensure that the screw press is in a good condition at all times, Kvaerner can offer a periodical check including a full inspection of the entire machine. This check can be reserved through the After Sales and Service Department, and will be carried out by one of our service engineers.

5.2 Ordering of spare parts

When ordering spare parts, the customer should submit the following information to ensure a fast and correct order handling:

- Description of part
- Screw Press type and size (For instance SP45LP)
- Kvaerner Pulping Order number 016035
- History of the screw press. Possible modifications/work carried out on the screw press by the customer or another company should be described as accurately as possible.

5.3 Ordering of service

If the screw press is not working to the customer's satisfaction, or if service is needed for other reasons, this can be ordered through the After Sales and Service Department. When ordering this service, it is equally important to submit as much information as possible about the screw press (see 9.2 Ordering of spare parts)

Ordering of service or spare parts should be done to:

Kvaerner Pulping Inc.
2995 Le Corbusier
Laval, Quebec H7L 3M3
Canada

Order phone: 450-686-2552
Telefax: 450-686-9928

6 Spare Parts

6.1 Spare Parts Recommendation

The specific requirement for spare parts for a Kværner Screw Press depends on several factors such as:

- Pulp type including its wear characteristics.
- Consequences of down-time due to failure if parallel processing lines are available, or if reduced performance is acceptable for a short period of time, down time may be less critical.
- Number of presses installed of the same type.

The following represents general recommendations to be considered when a stock of spare parts is considered.

Screen System
The screen plates are normally not prone to wear and thus very seldom have to be replaced for this reason. However, if foreign materials (e.g. steel scrap, concrete fragments, etc.) enter the press with the pulp, there is a strong possibility for serious damage. For this reason, a set of spare screen plates should be kept in stock at the mill. A typical set of spare screens includes one inlet house screen, one cylindrical low pressure screen, a set of screen plate segments for the high pressure (mantle) screen section, and one screen plate for the press screw stem.

Bearing Assembly
If damage to the screen plates has occurred, the bearing components may also be damaged. Therefore, a complete set of bearing components (inlet bearing assembly and outlet bearing assembly) should also be kept in stock as spare parts. Replacement of bearing parts should be considered to be a preventive measure, not just replacement of parts that are visibly damaged. Therefore these parts are made available in sets and it is always recommended that the complete sets of parts are replaced.

Wear Sleeves
The bearing systems are designed with wear sleeves (most models). For high-wear applications, a set of wear sleeves is generally recommended.

Wear Segments
The Wear Segments are not prone to much wear (except for the last 5-10 segments). However, if foreign materials (e.g. steel scrap, concrete fragments, etc.) enter the press with pulp, there is a strong possibility for serious damage. For this reason a set of e.g. 5-10 spare segments should be kept in stock at the mill.

7 Technical Specification / Design Data

Technical Specification Data

	Art. No.	
Inlet house	A1801-002	17,3 %
Screen compl.	49900-002	17,3 %
Split basket	96910-002	17,3 %
Screw full flight	H0703-004	22,7 %
Bearing outlet	50100-008	

Screen Configuration Data

		Art. No.	Diameter	Open area %
Screen No. 1	Inlet house	50019-002	1,5 mm	17,3
Screen No. 2	Screen compl.	49900-002	1,5 mm	17,3
Screen No. 3	Screen compl.	49900-002	1,5 mm	17,3
Screen No. 4	Screen compl.	49900-002	1,5 mm	17,3
Screen No. 5	Split basket	96913-002 (2 pcs)	1,5 mm	17,3
Screen No. 6	Screw shaft	H0701-001	1,2 mm	22,7
Full flight screw		H0703-001		

Design Data

Pulp Type	85% ONP/15% OMG
Capacity	1700 ADSTPD
Inlet Feed Consistency	8 %
Discharge Consistency	30 %
Freeness of Pulp	150 CSF
pH	6 - 9
Inlet Temperature	100 °F
Filtrate Consistency	Max 0,5 %