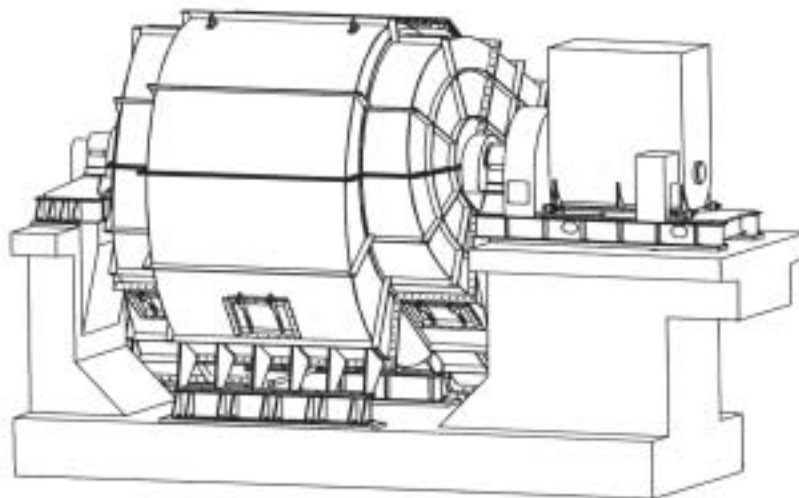




**STORAGE, ERECTION, OPERATION  
AND MAINTENANCE MANUAL FOR  
CENTRIFUGAL FANS**

**MODEL - KAE / KZE**





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**CUSTOMER :**



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## SAFETY PRECAUTIONS

The operation and maintenance of machinery of any kind requires a person to be cautious and aware of the damages that exist. In order to avoid injuries to personnel and damage to machinery, the following precautions are necessary.

1. Never apply power to the fan motor for any reason until the fan has been completely installed in its system, and the system inspected to be sure that no debris has been left in the fan and ducts, and it is known that the inspection doors at the inlet and outlet of the air passages are shut. The usual procedure is to remove the fuses from the disconnect switch and open its safety isolation switch until the installation is completed and inspected.
2. Start the fan momentarily and disconnect it. Observe rotation of wheel or the drive rotation is correct. Do not allow the fan to run backwards, except only momentarily.
3. Do not open or access the inspection doors while the fan is running.
4. Always open the disconnect switch and lock it in the open position with a padlock before doing any service or maintenance work on the fan.
5. After service of any kind make certain that all adjustments have been properly made and tightened, inspection doors closed, there is no debris in the air passages and all tools have been removed before unlocking the disconnect switch to place the fan in operation.
6. Make a periodic inspection of the fan wheel, bearings and coupling to be sure that corrosion has not set in to weaken them. Where there are signs of corrosion there is danger of mechanical failure. Corroded parts should be replaced.
7. Always use caution in every maintenance or operational procedure.



## CONDITION ON DELIVERY

### GENERAL

- The fan meets the technical safety standards applicable in the EC at the time of delivery. The rules and regulations for the prevention of accidents applicable at the time of delivery were taken into account in the fan design.
- It is not allowed to modify the original condition of the fan without the approval of Reitz. The warranty expires when parts other than original Reitz Turbovent spare parts and/or purchased parts and corresponding to the original parts are used.

### TRANSPORT

- The fans are sent either in assembled condition or in dismantled condition depending upon the size of the fan. Individual components are dispatched with proper packing.
- Use the lifting lugs provided for lifting the casings and base frame.
- Make sure that all packages are received as per the packing list.
- Do not use the tapped holes provided in the shaft for lifting.
- Avoid metal to metal contact while lifting the rotor.
- Handle the rotor carefully. Any slight damage will effect the balancing and rebalancing has to be done at site.
- On receipt of goods, check for the damages due to transport and inform us immediately.

### STORAGE

1. Storage for a period of more than three months must be ensured in the best possible condition, basically protected from dampness so as to avoid oxidization of the different parts of the fan unit.
2. The mechanical parts with machined surfaces are coated with anti-corrosion varnish. In the case of prolonged storage, before putting in to service, the equipment will be inspected periodically and the machined parts will be protected from time to time using protective coating in case of need.
3. They will be stored in sufficiently large premises, thus providing space for inspection and easy maintenance of the equipment stored. Moreover, the storage premises will protect the equipment from sudden changes in temperature, dust foreign matter, etc.



## FAN ERECTION

1. Check the foundation with regard to the general assembly drawing.
2. Maintain the foundation as even as possible.
3. Mark the center lines.

## FOUNDATION BOLTS & FRAME

4. Insert the foundation bolts in the foundation pockets.
5. Place the base frame on the foundation and maintain the height by providing packer plates under base frame.
6. Fasten the foundation bolts to the base frame & align the base frame horizontal level by adjusting the steel packers.
7. Fill up the foundation pockets with grouting material.
8. Align the base frame and pedestal with precision level. The permissible deviation is 0.04mm/metre.

## BEARING PEDESTALS

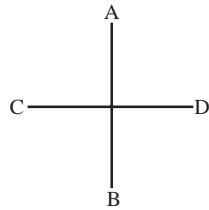
9. Place the bearing pedestal on the base frame where a separate pedestal is there.
10. Check the level, height and center to center of bearing pedestal.

## CASING AND INLET BOXES

11. Place the casing bottom part on the bearing pedestal.
12. Maintain the centre axis of the shaft and casing as per GA drg.

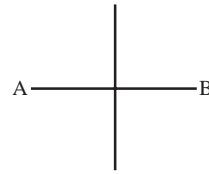
## ROTOR ASSEMBLY

13. Place the rotor on the pedestal. Make sure that inlet cone(s) is placed along with the rotor.
14. Adjust the thermal expansion clearance in free bearing.
15. Align the impeller shaft with precision level. The permissible deviation is 0.04 mm/metre.
16. Align the bearings with reference to shaft as per fig no.1.
17. Fix the coupling half on fan shaft.
18. Place the top half of the casing.
19. Bolt is tightly with bottom part by providing sealing rope.
20. Adjust the inlet cone as per required dimensions. Please refer fig no.2 for adjusting the inlet cone.
21. Fix the coupling half on motor shaft.
22. Place the motor in its position.
23. Align the fan motor coupling as per fig no.3



**FIXED BEARING**

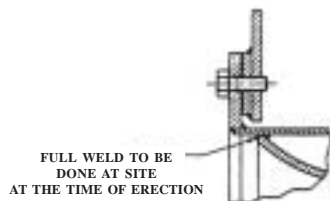
A → B = 0.05  
C → D = 0.05



**FREE BEARING**

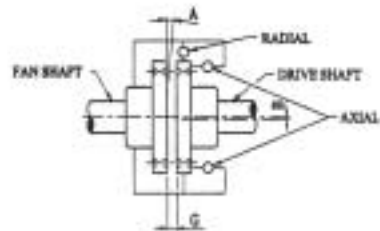
A → B = 0.05

**FIG.No.-1**



**INLET CONE FIXING**

**FIG.No.-2**



A - ALLOWABLE AXIAL MISALIGNMENT MAX. 0.05MM  
B - ALLOWABLE RADIAL MISALIGNMENT MAX. 0.05MM  
G - COUPLING GAP

**COUPLING ALIGNMENT**

**FIG.No.-3**

## COUPLING ALIGNMENT

24. Check the height level variation of coupling halves.
25. Gap between coupling halves should be maintained as per the dimensions.
26. Level and align the motor to the fan shaft level by using brass/stainless steel shims underneath the motor pads.
27. Align the motor with respect to the fan coupling. Alignment of the couplings should be done using two axial dial gauges and one radial gauge.
28. Couple the fan and motor through the coupling after taking a trial run of motor in decoupled condition.
29. Fix the inlet damper with inlet box.
30. Fix the common driving shaft of dampers.
31. Fix the inlet and outlet flexible connection.
32. Fix the actuator bracket on the casing.
33. Fix the actuator with actuator bracket.
34. Fix the linkage between actuator and damper.
35. Fix the sealing arrangement on inlet boxes.
36. Bolt cooling disc halves together on the shaft.
37. Weld the coupling guard fixing angle on the bearing pedestal.



#### **4. Fan Installation**

##### **4.1 Pre-Assembly (no special instructions)**

##### **4.2 Installation sequence**

###### **General remarks**

Before start working the personnel charged with the mounting must have read the installation instructions and the operating instructions for the fan.

As for the mounting the generally valid legal and other binding regulations for accident prevention and environmental protection must be observed and applied.

For mounting and dismantling use only means of transport and lifting that are designed for the load of the components (see nameplate / bill of material)

Use only qualified assembly masters as installation staff.

###### **Foundation**

A requirement for the installation of the fans is that foundations have been prepared in accordance with the foundation plan. Hardening times and shrinking of the foundation have to be observed. Furthermore, it has to be guaranteed that the loading capacity of the foundation has been thoroughly examined and documented by the construction company.

In case fans are mounted and installed on foundations insufficient in load bearing capacity the drive components like shaft, coupling and motor and exposed to the danger of misalignment. The consequent distortion and faulty alignment have negative effects on the operation of the fans and might result in a destruction of the drive units. The installation instructions have to be carefully observed.

###### **Storage on site :**

If the fan is not installed and / or put in operation immediately, it has to be stored in a dry place that is free from vibrations. Turn the rotor manually once a week to ensure that all parts of the antifriction bearings are moistened with the lubricant or conservation oil. Protect the antifriction bearings from dirt.

###### **Sealing :**

The sectional splitting flange of the housing are to be sealed prior to screwing in accordance with the sealing instructions (see erection drawing)

Screwed connection: All screwed connections have to be tightened with the corresponding tightening moment (see erection drawing)

###### **Sequence of Installation :**

1. Prior to the start of the installation the foundation has to be checked for evenness and dimension accuracy. The company performing the installation has to draw up a report on surveying referring to different metering points and hand in this report to those responsible for the direction of works prior to the grouting of the foundation with the fan parts housing lower part, bearing pedestal and motor pedestal. The permission for grouting is given with the acceptance of the survey report by the management of the works. Survey report see annex 1.
2. The areas of support for housing beam, bearing pedestal and motor pedestal have to be aligned exactly in x and y direction.





3. Hang the foundation fastenings (e.g. anchor rods) in the housing beams. Place the housing beam to the foundation without fixing them. Pad the beams with alignment plates in correspondence with the given grouting height. It has to be observed during the mounting that the housing beams have to be flush to each other and must be aligned in horizontal and vertical direction. Additionally, observe the parallelism of the housing beams to the shaft centre line (alignment in z-direction). For the dimensions see erection drawing.
4. Hang the foundation fastening in the motor pedestal and place the pedestal on the foundation without fixing it. Proceed with padding and aligning the pedestal in accordance to pt 3.
5. After the foundation fastenings have been hanged, the pedestal receiving the non-location bearing is to be padded with alignment plates and aligned analogously to the housing beams and the motor pedestal and is to be placed on the foundation without being fixed. The bearing height has to be taken into consideration when padding the pedestal. The non-locating bearing height may differ from the height of the locating bearing in case the bearings are of different sizes. Carry out and check the exact installation and alignment in x-y-and z-direction with a leveling device. The distance between locating and non-locating bearing is to be observed (see the indication of the erection drawing)
6. Fasten the fan parts to the foundation following the instructions of the fastener manufacturer. Check and the leveling after screwing and rectify it if necessary.
7. Mount the lower housing part on the housing supports and centre it in x-and y-direction. Should the lower housing consists of several parts, the sectional splitting flanges are to be sealed acc, the sealing instructions prior to screwing.
8. Place the lower bearing housing parts to the bearing and motor pedestal respectively. Insert the fastening screws with washers and nuts loosely in the provided bore holes. Check again the alignment plates between foundation and pedestal. Distortions of the bearing pedestal surfaces are permitted neither in radial nor axial direction.
9. Place the fan top part with the discharge to the fan lower part, align it and screw the parts. The internal connection plates for screwing are accessible through the mounting and inspection openings of the housing and suction boxes.
10. Place the inlet cone lower parts in the housing and align them with the flange of the lower housing parts. Push the guiding plates in the slot of the housing division (gap of approx. 16mm) and screw them slightly at first since the inlet cone will be aligned again after the rotor mounting.
11. Mount the rotor(Shaft, anti-friction bearings and coupling halves) by slinging the carrying straps to the shaft and fix them at the supplied carrying beam (See fig. 1)
12. Insert the rotor in the fan housing lower part as shown in figure 2. Please observe that

the rotor has to be shifted in radial direction for approx. 550mm (truly axial and centred to the housing) before the bearing housing lower parts are inserted. See the erection

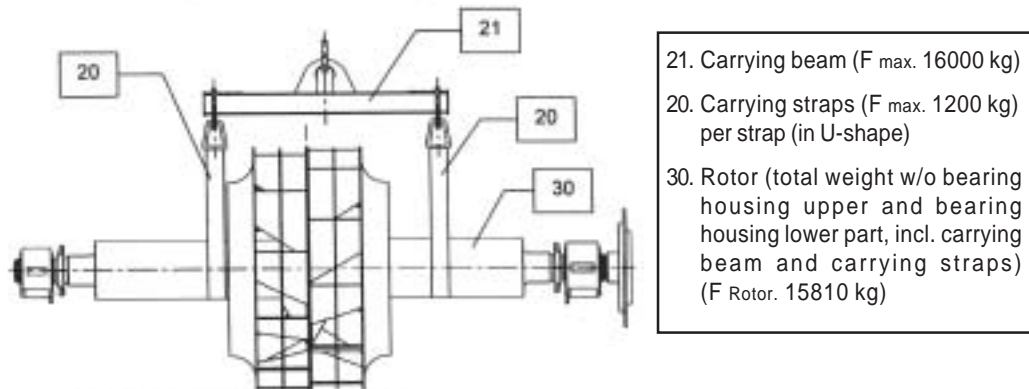


Fig-1 rotor at carrying beam

drawing for the axial play in the non-locating bearing Figure 2 Rotor insertion in the fan housing and bearing housing lower parts

13. When placing the rotor in the bearing housing lower parts it has to be observed that the outer rings of the anti-friction are parallel to the bearing seals. The anti-friction bearing must not be tilted in the bearing housing lower part. Pay attention to the correct positioning of the oil supply rings.

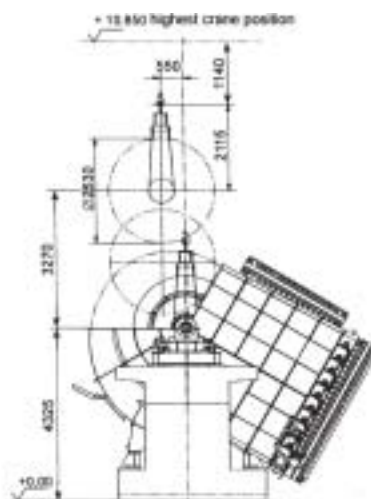


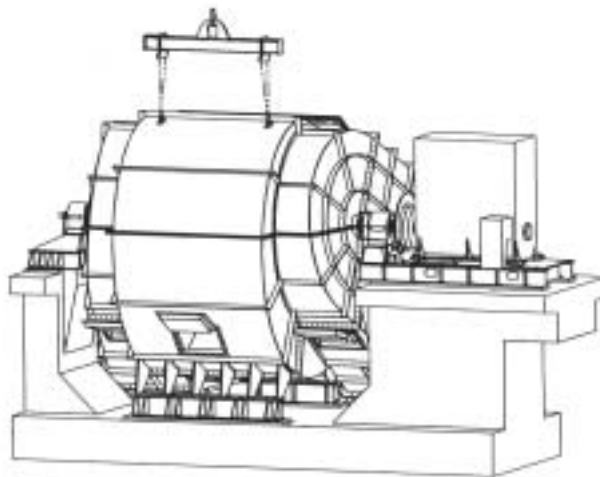
Fig-2 Rotor insertion in the fan housing and bearing housing lower part

**Attention :**

The operation temperature or an increase in the temperature of the handled gas may lead to corresponding extension of the shaft length. The change in the shaft length has to be compensated in the non-locating bearing which has therefore to be set accordingly (see erection drawing)



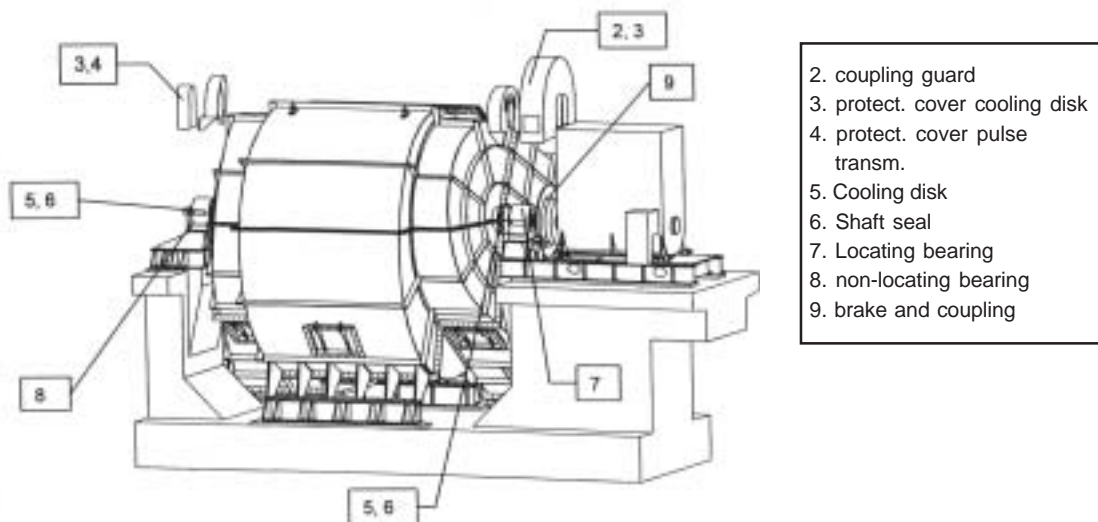
14. Tighten the bearing fastening screws crosswise but do not yet use the tightening moment. Afterwards turn the rotor manually. Meter the radial bearing play at the lower, charged rolling elements between the rolling elements and inner ring. Distortions are not permitted. Place on the bearing upper housing parts (observe the marking), insert the clamping sleeves and tighten the fastening screw. The tightening moments are to be observed.
15. Attach the bearing housing side covers with the fastening screws and the seal to the bearing housing and upper and lower parts. Tighten the bearing fastening screws crosswise with the corresponding tightening moment. Pin the bearing housing lower parts to the bearing pedestal.
16. Fill the bearing housings with the proper quantity of lubrication oil of the recommended ISO viscosity class ISO-VG68. see the inspection glasses for read off the oil level.
17. Mount the upper inlet cone segment on the inlet cone. Screw down the fastening screws but not yet tightly.
18. Lift the fan housing upper part with the carrying beam (see fig.3) and place it upon the fan housing lower part observing the sealing. Take care not to tilt otherwise damage the inlet cones. Screw down the fastening screws of the housing division flanges and the connection plates.



**Fig-3** Fan showing mounted upper housing cover

19. Align the inlet cones to the impeller inlet nozzle observing the concentricity of impeller inlet nozzle and inlet cones. The gap is to be checked all over the circumference (admissible gap width see erection drawing). The inlet cone must not rub against the impeller nozzle.
20. Mount on the seals centrally on both sides of the fan suction boxes following the erection drawing. Moisten the graphite rings with lubrication oil.

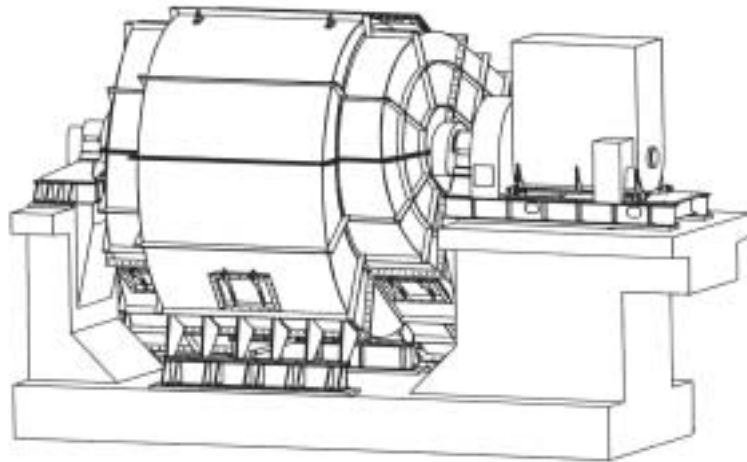
21. Place the drive motor with the motor-side coupling half on the motor pedestal. Line both motor support fastenings with two alignment plates of stainless steel.
22. Align the coupling following its installation instructions and operating manual. It might be necessary to use additional alignment plates or to replace the original alignment plates of 1 mm thickness by thinner plate. Observe the admissible coupling offset acc to the manufacturer's specification as well as the prescribed tightening moments of the screws.
23. Install the brake and connect compressed air and electric power supply.
24. Mount the monitoring devices like temperature probes and vibration meter (one of each per bearing housing) and digital speed indicator on the free shaft end and connect them to the bearing pedestal.
25. Install the cooling disks at the prescribed positions on the shaft (see erection drawing).
26. Mount the protection guards and covers for the pulse transmitter, the cooling disks and the coupling.



**Fig 4** Fan showing dismantled protection covers and guards

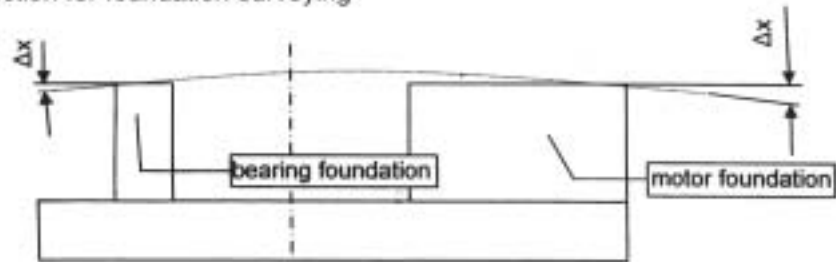
27. Remove all mounting accessories like ladder, scaffolds, planking, stanchions, braces and carrying straps from the fan interior. Take likewise away all cleaning rags, devices and tools from the fan and the exterior mounting area. Install all safety contrivances. Check the rotor afterwards for free running. Rubbing of parts or impeller must not be heard.

28. Seal the inspection openings and close them, tighten the fastening screws.
29. Connect the electric power supply to the motor observing the prescriptions of the motor producer and the utility company.

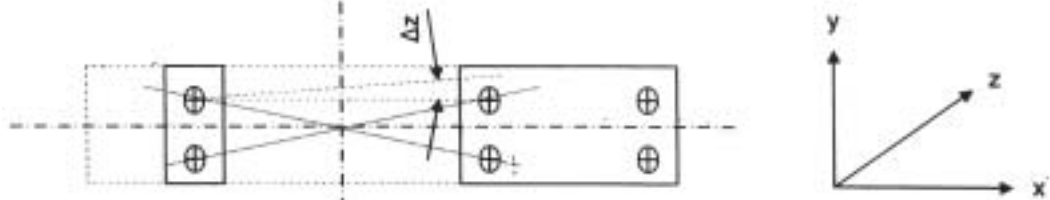


**Fig 5** Fan completely assembled and ready for service.

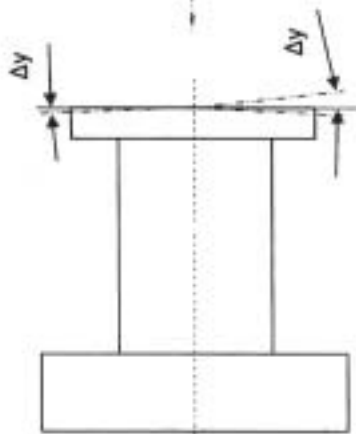
Direction for foundation surveying



**Fig-1** Front view foundation, representation of the radial deviation, referred to the total foundation dimensions



**Fig-2** Top view foundation, representation of the deviation in Z-direction



**Fig-3** Side view foundation block, representation of the horizontal deviation in radial direction

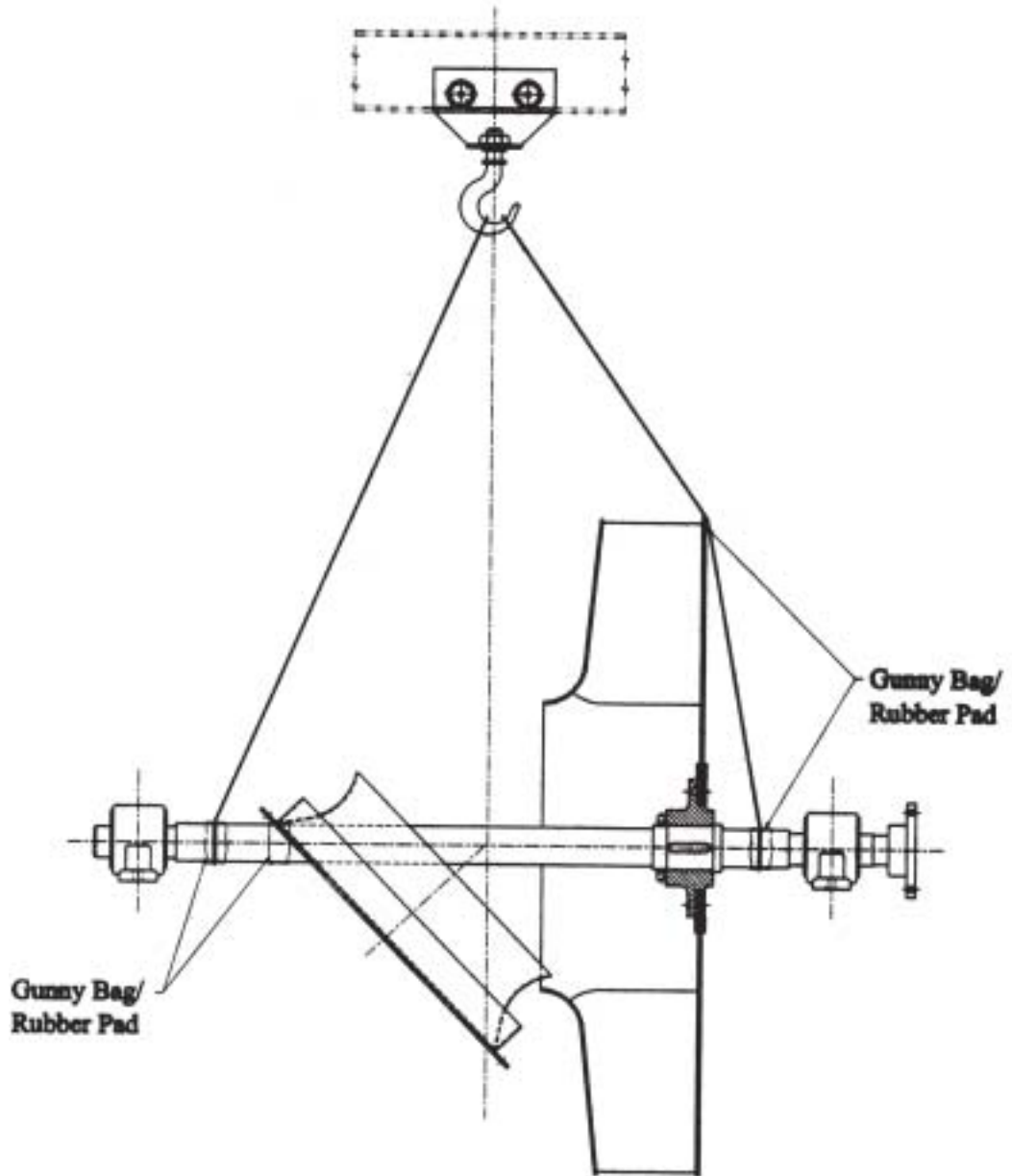


FIG. No. - 4



## OPERATION

### A. PRE-START CHECKS:

Before starting any fan for the first time, following checks are necessary for its successful operation.

1. Impeller handling matches with that of fan casing.
2. Direction of rotation of driving unit is same as that of required by driven unit.
3. Handling of inlet dampers, if provided, is same as required.

#### How to check the handling of inlet dampers:

##### i. Multi-louvre inlet Damper (MILD):

Direction of rotation of damper blades from close to open, should be same as that of impeller.

##### ii. Inlet guide vane (IGV):

Direction of rotation of operating ring from close to open, should be same as that of impeller.

4. All debris is removed from inside of fan casing / inlet box.
5. Impeller is free to rotate, by checking manually only.
6. Lubrication of bearings has been done properly.
7. If the bearing housings are of water-cooled type, ensure that the cooling water is flowing through the bearing housing continuously before starting up of the fan.

### B. STARTING/STOPPING SEQUENCE:

#### STARTING SEQUENCE:

1. Set inlet dampers at their fully closed position.
2. Start fan drive.
3. Note bearing temperatures and vibrations if any.

#### NOTE:

1. Fans which normally operate at above ambient temperatures, may overload their driving motor if they operate at lower temperature with vanes or dampers open. Therefore they must be started with vanes or dampers fully closed, as the vanes or dampers are opened, a check must be made on the motor ammeter to prevent overloading of the motor.
2. If the fans are provided with both inlet and outlet dampers, it is advisable to keep the inlet dampers fully closed and outlet dampers fully open at the time of starting.

#### STOPPING SEQUENCE:

1. Close inlet damper
2. Stop fan drive
3. Note bearing temperatures





**Note:**

1. If the fan bearing housings are of water cooled type, continue the supply of water, till the time of fan has cooled down.
2. Fan can be stopped without closing inlet dampers. But, in that case, an interlock should be arranged, so that the inlet dampers close automatically (in case of actuator driven dampers only), as soon as fan drive is switched off.
3. If the fans are provided with both inlet and outlet dampers, outlet dampers can be kept open at the time of stopping or should be closed after the fan comes to stand still position.

**C. OPERATING TECHNIQUE:**

**EACH SHIFT:**

*When taking over, operator must observe the following:*

1. Fan bearings temperature is satisfactory-not in excess of 75deg.C.
2. Vibrations of bearings are normal-not in excess of 6.6mm/sec RMS velocity.

**ONCE PER WEEK:**

1. When convenient to stop fan, operate dampers over entire range to prove satisfactory condition of moving parts.

**LONG TERM (ANNUAL INTERVALS):**

1. Examine and service the main drive coupling, in accordance with manufacturer's instructions and renew grease.
2. Examine all fan parts for wear and treat where necessary.
3. Examine damper control linkages and clean and lubricate where necessary.
4. Remove and examine a sample number of damper spindle bearings. If cleaning and treatment with grease in necessary, treat all bearings, in accordance with manufacturer's instructions.
5. Remove covers from fan shaft bearings and examine parts for wear and cleanliness.

The optimum interval between long term maintenance procedures will be based upon experience.



## MAINTENANCE

### A. HANDLING

Care is taken, in over works, to ensure that no damage is done to parts of the fan during manufacture, assembly, dismantling and packing for transport.

Fans should, therefore, arrive at site in perfect condition.

Small fans may be dispatched as completed assemblies, with or without their drive units. Such fans are suitable for fixing in their working position, after being checked for transit damage. Larger fans are dispatched in broken down parts and assemblies, each one of which must be inspected for transit damage, on arrival at the destination.

Any damage, discovered or suspected at initial site inspections, must be reported immediately.

#### **FAN CASING:**

These castings are provided with a removable section to enable the impeller or impeller/shaft assembly to be removed and replaced. Removable sections incorporate lifting lugs, designed to carry the necessary load.

Fixed sections of fan casing are provided with temporary worker lifting lugs and when necessary, stiffening members.

The purpose of these temporary members is to ensure simple and safe handling of the sections during manufacture, transport and site installation.

All temporary members will be painted yellow and must be removed during the commissioning of the fan.

#### **BASE PLATES OR PEDESTALS**

If lifting lugs are not incorporated, the items must be lifted by means of eyebolts through bearing or motor bolt holes or by hook slings attached to side plates through handholes.

#### **BEARINGS:**

Bearings must be protected against damage during installation and maintenance procedures.



## **IMPELLER & SHAFT**

Impellers must never be slung by their blades or side plates. To lift an impeller, a bar must be placed through hub and slings attached, on either, on either side, taking care not to damage the hub bore (Please refer annexure.1).

When shaft extends both sides of impeller, a sling on either side must be used to equalise the load taking care to protect the shaft surfaces against scratching or bruising.

When dealing with an overhung impeller and shaft assembly, place a sling round shaft, close to the back plate and another sling round the side plate to obtain balance.

Impeller must not be rested on blades or side plated, but must be placed standing on edge, with the weight taken on side and back plate.

## **LIFTING APPLIANCES:**

All appliances such as shackles, slings, lifting beams, etc., whether made specially for the fan or not, must be stamped to show the safe working load and also be subject to the periodic testing and verification.

## **B. INSPECTION FOR WEAR:**

**Atleast once a year it is advisable to attend the following.**

1. Examine impeller (remove all traces of deposit before carrying out this examination). If there is evidence of severe abrasion, and impeller is to be used again, without repairs, check for balance.

The recommended maximum out of balance measured as a R.M.S. velocity at the fan shaft bearings, is 5.5mm/sec. Where vibration equipment is fitted, it should be set to alarm at 5.5mm/sec. and trip at 10 mm/sec.

2. Examine fan housing and inlet boxes for signs of wear. If worn, consult the manufacturer.
3. Examine damper control assembly, for wear of dampers, spindles and linkages parts.
4. Examine shaft bearings and couplings and make adjustments or replacements where necessary. The seals in bearing end covers should be renewed.
5. Check position of impeller in casing level of fan shaft alignment of driving unit and make adjustments where necessary.
6. Tighten all H.D. Bolts in casing, baseplates and pedestals.
7. Fans operating under conditions of severe abrasion should be inspected more regularly, as experience dictates.



**NOTE:**

If the impeller is to be repaired and welding is involved, special welding procedures may be required to suit the materials of construction.

Before attempting any such welding, the manufacturer should be consulted.

**C. BEARING RENEWAL:**

One set of new bearings should always be carried in stock. If bearings are found damaged, those are to be replaced by new bearings.

**D. COUPLINGS:**

***RENEWING OR REPLACING HALF COUPLING:***

In the event of renewing or replacing a half coupling the following should be attended to:

1. Always use withdrawing gear to remove coupling half.
2. If heat has to be applied to the coupling boss, keep the adjacent portion of the fan shaft cool by wet rags or air blast.
3. To refit half coupling, coat bore and shaft with a mixture of white lead and boiled linseed oil molybdenum disulphide paste or similar lubricant.
4. Check dimensions of feather in shaft keyway before fitting coupling, the feather should be tight on sides and clear at the top.
5. If a hammer to be used, interpose a hardwood block to prevent damage and apply pressure to opposite end of shaft to avoid damage to bearings.

**E. FOUNDATIONS:**

Inspect supporting concrete for cracks or other signs of deterioration and repair as required. Inspect supporting steel work for loose bolts or rivets and tighten where necessary.

All H.D. Bolts on fan casing, inlet boxes, base plates and pedestals, bearings driving units etc., to be checked and tightened up where required.

**F. SHUT DOWN MAINTENANCE:**

1. Open inspection door in casing and inlet box. Clean the impeller blades and internals.
2. Check for erosion of the impeller.
3. Check the overlap and radial clearance between impeller shroud and inlet cone. If found disturbed adjust the same.
4. Remove used bearing lubricant from bearing housing.
5. Check the bearing condition like roller clearance and the rolling surfaces of races.
6. Fill new lubricant in the bearing housing.
7. Check alignment of fan and motor. If necessary correct the same.
8. Check the inlet damper flaps movement.
9. Apply grease for inlet damper bearing housing and ball & socket joints.
10. Check tightness of all fixing bolts.
11. Check tightness of coupling bolts.
12. Check the linkage between inlet damper and actuator.
13. Check the tightness of all fixing bolts.



**LUBRICATION :**

**GREASE LUBRICATION :**

Following lubricants for fan bearings are recommended, if the speed of fans is below 1500 RPM and temperature of air/gas handled by fan is not more than 200 deg.C

Servogem	2	of	IOCL
Servogem	3	of	IOCL
Supertec	PDOO	of	Balmer Lawrie
Or	Equivalent		

If the speed of fan is more than 1500 RPM but less than 3500 RPM and or temperature of air/gas handled by fan is more than 200 deg.C., then following lubricants are recommended.

XHP 222 Mobil Grease for Temperature upto 120 Deg.C  
 Mobilith SHC 220 or Polyrex Li Complex for above 120 Dec.C.

Make : EXXON MOBIL

Servogem EP.2/Servogem EP3 OF IOCL  
 Lithoplex EP2 of IPCL  
 Supertec PD2 of Balmer Lawrie or equivalent.

**GREASING TO STANDARD SN 500 SERIES BEARING HOUSINGS**

Bearing No.	Bearing Housing No.	Initial fill (gms/brg)	Greasing Interval (hrs)	Refilling Quantity (gms/brg)	Replacement Interval of grease (hrs)
22209 EK	SN 509	80	1600	10	10,000
22211 EK	SN 511	130	1600	20	10,000
22213 EK	SN 513	200	1600	25	10,000
22215 EK	SN 515	300	1600	40	10,000
22216 EK	SN 516	350	1600	50	10,000
22217 EK	SN 517	400	1200	50	10,000
22218 EK	SN 518	500	1200	70	8,000
22220 EK	SN 518	700	1200	100	8,000
22222 EK	SN 520	900	800	120	6,000
22224 EK	SN 524	1100	800	150	6,000
22226 EK	SN 526	1400	800	200	6,000
22228 CCK	SN 528	1400	800	200	6,000
22232 CCK	SN 532	2000	800	250	6,000
23134 CCK	SD 3134	1800	800	250	4,000
23136 CCK	SD 3136	2200	800	300	4,000
23138 CCK	SD 3138	2900	800	400	4,000



## OIL LUBRICATION

In case of oil lubrication of Fan bearings, the following lubricants are recommended.

Bearing	Brg.Hsg. No.	Initial Fill Ltrs	Initial Fill (mm)	
			Max	Min
22216 CC/C3	216	1.0	60	48
22218 CC/C3	218	1.1	60	48
22220 CC/C3	220	1.2	65	50
22222 CC/C3	222	1.3	77	50
22322 CC/C3	322	2.0	95	67
22224 CC/C3	224	1.7	80	60
22324 CC/C3	324	2.8	100	65
22226 CC/C3	226	2.3	85	60
22326 CC/C3	326	3.4	105	70
22228 CC/C3	228	2.4	85	60
22328 CC/C3	328	4.2	115	70
22230 CC/C3	230	2.8	90	60
22330 CC/C3	330	6.0	120	75
22232 CC/C3	232	3.3	95	65
22332 CC/C3	332	6.5	125	80
22234 CC/C3	234	5.0	105	75
22334 CC/C3	334	7.5	130	85
22236 CC/C3	236	5.2	115	80
22336 CC/C3	336	10.5	155	90
22238 CC/C3	238	5.8	120	85
22240 CC/C3	240	7.0	125	85
22244 CC/C3	244	8.5	140	95
22243 CC/C3	248	9.5	155	110

- Oil with viscosity grade of 46 (or) 68 (or) 100, as applicable.
- Make : IOCL, BPCL, HPCL.
- Mobil Rarus SHC 1026 of Viscosity grade 68 or 100 of Make : EXXON MOBIL.



## TROUBLE SHOOTING

### A. VIBRATION

If a fan is allowed to run for long periods in an unbalanced stage, either the impeller shaft or bearings will sustain damage, and out of balance should be corrected as soon as possible. Cause of vibration and suggested remedies are given below:

#### CAUSES

#### SUGGESTED REMEDY

1. Deposit on Impeller	In most cases deposit will be heaviest on backs of blades. This must be removed and the Impeller thoroughly cleaned with a wire brush.
2. Misalignment of fan and driving unit	Correct the alignment
3. Abrasion of Impeller	Impeller wear may cause out of balance, even though wear is not sufficiently severe to justify replacement or repairs. Re-balance impeller in position.
4. Impeller damaged in transit or erection	Rectify any obvious damage and rebalance impeller in position. If badly damaged return impeller to our works.
5. Bent shaft	Shaft should be replaced.
6. Slack H.D. Bolts in Bearings, base plates or Pedestals	Tighten all H.D. Bolts and check alignment
7. Inferior concrete foundations or grouting*	Renew concrete or grouting with a stronger mixture of good quality material. Make sure plinth is feather into concrete floor or supporting steel work.
8. Weak structural support	Reinforce supporting structure with additional members, suitably tied to existing members. Experience has proved that bolted structures are less satisfactory than riveted. If the structure is bolted, holes should be reamed and fitted bolts with locking washers used.

#### Note

The recommended maximum "out of balance" running, measured as an R.M.S Velocity at the fan shaft bearings, is 5.5mm/sec. It is recommended that the fan is tripped and steps taken to improve the condition if the "out of balance" reaches 10mm/sec.



## VIBRATION IDENTIFICATION

Malfunction	AMPLITUDE	FREQUENCY	REMARKS
a) Unbalance	Propotional to unbalance, largest in Radial direction	1 x RPM	Most common cause of vibration
b) Misaligned coupling or beatings & bent shaft	Large in axial direction (50% or more of radial vibration)	1 x RPM usual sometimes 2 x RPM or 3 x RPM	If the impeller is supported by sleeve bearings and there is no misalignment, balance the rotor.
c) Bad antifriction bearings	Unsteady	very high (several times of RPM)	Generally, bearing is responsible for very high frequency.
d) Eccentric journals	Usually not large	1 x RPM	Attempt to balance
e) Mechanical looseness		2 x RPM	Usually accompanied by unbalance and / or misalignment
f) Bad drive belts	Erratic or pulsing	1,2,3, or 4 x belt RPM	Strobe light is best instrument to find out faulty BELT.
g) Electrical	Disappears when power is switched off	1 x RPM or 2 x RPM	If vibration amplitude drops off as soon as power is switched off, cause of resonance.
h) Aerodynamic Forces		1 x RPM or No. of impeller Blades X RPM	Rare as a cause of trouble, except in cases of resonance.





## RESILIENT COUPLINGS

### **Assembly and Maintenance Instructions:**

- A) Assembly:** Care is necessary in the assembly of couplings, particularly in checking for both parallel and angular alignment and in setting the correct gap. The coupling grooves must be completely packed with grease before the spring is inserted and a further liberal application of the outer cover the maximum possible quantity of grease should be injected through the grease valve.
- B) Lubrication:** For normal service, grease such as the following are generally satisfactory.
- Servogem 2 of IOCL
  - Servogem 3 of IOCL
  - Lithoplex MP2 of BPCL
  - Lithoplex MP3 of BPCL
- C) Maintenance:**
1. Periodically replenish grease through the grease valves.
  2. Open up covers occasionally to check shaft alignment and to ensure that springs are lubricated against wear.
  3. Clean out and renew grease in accordance with the above instructions as necessary, but atleast every 12 to 15 months.

## GREASE CAPACITIES OF RESILIENT COUPLINGS

The grease capacity for any given size of Resilient coupling varies according to the design and type.

Coupling No.	Approximate Grease Capacity		Coupling No.	Approximate Grease Capacity	
101Z	1 oz.	30 gms	366	4 lbs.	2 Kilos
102Z	1 oz.	30 gms	422	8 <sup>1</sup> / <sub>4</sub> lbs	3 <sup>3</sup> / <sub>4</sub> Kilos
103Z	1 oz.	30 gms	431	5 <sup>3</sup> / <sub>4</sub> lbs	2 <sup>3</sup> / <sub>4</sub> Kilos
104Z	2 oz.	60 gms	432	5 <sup>3</sup> / <sub>4</sub> lbs	2 <sup>3</sup> / <sub>4</sub> Kilos
106Z	4 oz.	20 gms	478	7 <sup>1</sup> / <sub>2</sub> lbs	3 <sup>1</sup> / <sub>2</sub> Kilos
107Z	4 oz.	20 gms	482	9 lbs	4 <sup>1</sup> / <sub>4</sub> Kilos
108Z	5 oz.	150 gms	556	10 <sup>1</sup> / <sub>4</sub> lbs	5 Kilos
109Z	7 oz.	200 gms	600	12 <sup>3</sup> / <sub>4</sub> lbs	5 <sup>3</sup> / <sub>4</sub> Kilos
110Z	8 oz.	1/4 Kilo	634	17 lbs	7 <sup>3</sup> / <sub>4</sub> Kilos
111Z	1 lb.	1/2 Kilo	666	22 lbs	10 Kilos
113Z	1 <sup>1</sup> / <sub>2</sub> lbs.	3/4 Kilo	722	50 lbs	23 Kilos
114Z	1 <sup>3</sup> / <sub>4</sub> lbs.	3/4 Kilos	734	65 lbs	30 Kilos
115Z	2 <sup>1</sup> / <sub>2</sub> lbs.	1 <sup>1</sup> / <sub>4</sub> Kilos	762	80 lbs	37 Kilos
117Z	2 <sup>3</sup> / <sub>4</sub> lbs.	1 <sup>1</sup> / <sub>4</sub> Kilos	788	95 lbs	43 Kilos



## Radial fans

Single stage : Upto  $\Delta$ pt=2500 dapa and 3500kw power output

Twin stage : Upto  $\Delta$ pt=3550 dapa and 315 kw power output

Multi state : Upto  $\Delta$ pt=5000 dapa and 250 kw power output

## Axial Fans

Industrial design, DN 355-800 mm, adjustable vanes, tubular housing and wall mounted installation.

## Fan accessories

Protecting grille, inlet nozzles, compensators, metal vibration buffers, circular filters, duct filters, counter flange, transition pieces, suction boxes.

## Special fan designs

Resistant to acid, heat and cold, gas-sealed, spark proof, impact resistant, low wear, heat insulated and for direct pumping. Fans with special wear resistant lining on the impeller and rubber lining casings. Complete Fans with stainless steel construction for special duty conditions.

## Throttle units

Torsion regulator, throttle valves, throttle blends, positioning motors.

## Sound Protection

Fan sound insulation, carriage sound absorbers, tubular sound absorbers, sound-proof booths, sound insulated walls, disc sound absorbers.

## Services

- \* Project specific engineering
- \* Installation of the fan into the system
- \* Existing fan performance
- \* Collecting data and evaluation
- \* Replacement parts
- \* Retrofit of Reitz impeller into others fan Casing for improvement of efficiency.
- \* Maintenance and inspection

## Reitz fans are providing reliable service throughout various sectors of industry :

- \* Cement
- \* Power station engineering
- \* Chemical, fertilizer and pharmaceuticals
- \* Paper & pulp, sugar industry
- \* Mining and Metallurgical industries
- \* Dust extraction systems
- \* Food / dairy industry
- \* Smelting, steel and rolling mills
- \* Waste incineration plants
- \* Glass industry
- \* Petrochemical and Refineries
- \* Ventilation and gas humidification plants

## Product mix

- \* Radial Fans
- \* Special Fan designs
- \* Fan accessories
- \* Throttle elements
- \* Acoustics and sound Protection

## We undertake

- \* Incorporation of fan into the overall system.
- \* Engineering tailored to project requirements.
- \* Fan performances review and maintenance / inspection, Energy savings.
- \* Retrofitting of high efficiency impellers into the existing fans.

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