

## 1. GENERAL INSTRUCTION FOR FANS STARTING AND RUNNING

### 1.1. CHECK BEFORE STARTING






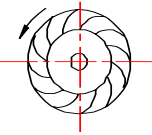
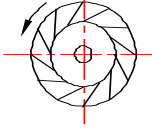
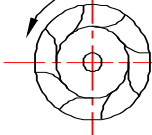
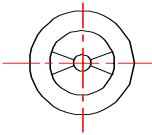
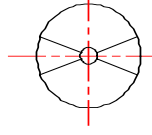
- **That all bolts have been normally tightened**
  - Anchorage bolting
  - Bearing stands on base
  - Motor/base
  - Bearing/stands
  - Bearing covers/housings
  - Hub/shaft assembly
  - Inlet cones/casing
  - Casing/base
  - Inlet boxes/casing
  - Casing/casing
  - Dampers/casing inlets
  - Actuator/damper
  - Miscellaneous bolting
  
- **Bearing lubrication control**
  - Open bearing housing and check quantity, quality and distribution of lubricant
  - Running parameters of lubrication system (see specific instruction)
  
- **Alignment control**
  - Radial run out
  - Axial run out
  
- **Free rotation of impeller**
  - Radial clearance between impeller inlet and cone
  - Sealing device runs properly
  - Hand rotation of complete rotor with driver
  
- **Connections**
  - Axial deflection of flexible
  - Radial deflection of flexible
  - No load on fan connexion flanges

- **Guards control**
  - On couplings
  - On cooling disk
  - On shaft between bearing
  - Inlet protective screen
  - Outlet protective screen
  
- **Fitting**
  - Damper or guide vane blades fitted for pre rotation of gas flow at impeller inlet
  
- **Foreign objects**
  - Fan inner inspection
  - Ducting inner inspection
  
- **Protection of plant before starting**
  - Control of conformity of electric connection
  - Authorisation of field responsible for starting-up
  - Damper or inlet guides vane closed for starting

## 1.2. CHECK DURING STARTING PERIOD

- **Rotation direction (see table 1)**

**Table. 1**

				
				
Backward curved blade	Backward inclined	Forward backward curved	Radial vanes	Open radial

- **Vibrations and sounds**

- Fan bearing-coupling side*

- Axial
    - Vertical
    - Horizontal
    - Sound

- Fan bearing-opposite coupling*

- Axial
    - Vertical
    - Horizontal
    - Sound

- Motor bearing-coupling side*

- Axial
    - Vertical
    - Horizontal
    - Sound

- Motor bearing-opposite coupling*

- Axial
    - Vertical
    - Horizontal
    - Sound

- **Bearing temperature**

- Fan bearing-coupling side 15 mn after starting
  - Fan bearing-opposite coupling 15 mn after starting

- **Oil lubrication system**

- Level checking
  - Temperature checking
  - Flow rate checking

- **Shaft seal**

- Temperature

- **Gas flow control**
  - Actuator power supply
  - Voltage/pressure
  - Actuator control supply
  - Voltage/pressure
  - Actuator control operation

### **1.3. CHECK AFTER STARTING**

- **Running throughout the working range**
  - Vibrations
  - Sound
  - Amp.et max.flow (as per contract)
  
- **Bearing temperature progress**
  - Every quarter of one hour during one hour
  - Every hour during 6 hours
  - Stuffing box temperature

## 2. LIST OF COMMON TROUBLES

TROUBLE	POSSIBLE ORIGIN	REMEDY
<b>2.1 Bearing overheating</b>	A. Lubricant excess in bearings B. Improper quality of lubricant C. Lack of lubricant in bearing D. Too small radial clearance in bearings E. Loosen belt drive (slipping) F. Cooling disk not mounted G. Excessive temperature of gas H. Ambient temperature over 40°C	A. Restore correct amount of lubricant check grease valve working (if any) B. Remove bearings and clean them up lubricate again with proper lubricant C. Restore correct amount of lubricant D. Reset radial clearance E. Tighten the belts according to manufacturer instructions F. Fit cooling disk on shaft G. Check the running conditions restore correct gas temperature H. For every 15°C increase in temperature of bearing, the lubrication interval should be reduced to half of specified value
<b>2.2 Abnormal noises in bearings</b> ● whistling sounds  ● hammering or rumbling sounds in bearing housing	A. Insufficient or inadequate lubrication B. Wearing of bearings C. Foreign objects in bearing housing D. Bearing damaged at mounting, printing, picking or wearing of rolling elements	A. Check lubrication devices working-restore correct amount of lubricant B. Replace the bearings C. Remove, clean up and check bearings-change the bearings if necessary and lubricate D. Change the bearings

<b>TROUBLE</b>	<b>POSSIBLE ORIGIN</b>	<b>REMEDY</b>
<b>2.3 Fan vibration</b>	A. Dust deposit on blade	A. Clean up the impeller
	B. Wearing strip snatching off	B. Check wearing-strip and replace if necessary
	C. Irregular erosion of corrosion of impeller	C. Rebalance or change the rotor
	D. Deflexion of wheel or shaft caused by overheating	D. Eliminate causes of overheating-change the rotor
	E. Poor balancing of impeller	E. Make impeller balancing
	F. Wrong alignment of coupling or belt drives	F. Reset alignments according to special instruction
	G. Improper tightening of belts	G. Tighten the belts according to manufacturer instruction-check alignment
	H. Poor balancing or incorrect working of driving machines	H. Check balancing and working condition of driving machines-repair or change them if necessary
	I. Poor shimming or anchoring of motor-fan	I. Reset the shim-packing and anchoring according to instructions
	J. Loose bolting of bearing assembly	J. Tighten assembly bolting at required torque
	K. Improper anti-vibrating pad mounting (resonance)	K. Replace improper pads with correctly selected ones
	L. Excessive rotation speed	L. Check motor speed or belt drive ratio-make the necessary correction
	M. Surging	M. Change gas flow setting until an acceptable vibration level is reached

<b>TROUBLE</b>	<b>POSSIBLE ORIGIN</b>	<b>REMEDY</b>
<b>2.4 Abnormal noises in fan</b>	<p>A. Foreign object in fan</p> <p>B. Internal frictions</p> <p>C. External frictions</p>	<p>A. Inspect the fan-rotate the fan by hand</p> <p>B. Check clearance between wheel and inlet cone and between shaft and sealing device-rotate the fan by hand</p> <p>C. Check location and fixing of guards-rotate the fan by hand</p>
<b>2.5 Premature wearing of bearings</b>	<p>A. Excessive vibrations</p> <p>B. Improper lubrication</p> <p>C. Fan excited by external vibration when stopped</p> <p>D. Conservation of fan when stopped without precaution against corrosive agents</p>	<p>A. Check and correct the various causes of vibration</p> <p>B. Check and correct lubrication</p> <p>C. Machines or isolate the fan itself</p> <p>D. Take precautionary measures required by surrounding and working conditions (intermittent running, conservation or reheating when stopped, etc)</p>
<b>2.6 Impossible starting or excessive starting time</b>	<p>A. Locking of rotor</p> <p>B. Low voltage at motor connexions</p> <p>C. Motor release</p> <p>D. Too low power rating of motor</p> <p>E. Improper starting process</p> <p>F. Excessive power consumption when starting</p>	<p>A. Check and rotation of the fan and investigate for the locking causes (frictions, obstacles etc)</p> <p>B. Check the line voltage-Reinforce the line if excessive losses</p> <p>C. Check setting of security devices</p> <p>D. Change the motor</p> <p>E. Correct the starting equipment</p> <p>F. Make sure that flow control device are in close position when starting</p>

<b>TROUBLE</b>	<b>POSSIBLE ORIGIN</b>	<b>REMEDY</b>
<b>2.7 Deficiency in performances</b>	<p>A. Excessive speed</p> <p>B. Pressure drop lower than expected in duct work</p> <p>C. Too low rotation speed</p> <p>D. Poor duct work design at fan inlet and outlet</p> <p>E. Wrong rotation direction</p> <p>F. Wrong mounting of impeller (double inlet)</p> <p>G. Excessive clearance between impeller and inlet cone</p>	<p>A. Check motor speed or belt drive ratio-make the necessary correction</p> <p>B. Set the control devices so as to get design gas flow</p> <p>C. Check motor speed or belt drives ration-make the necessary correction. Tighten belts as required</p> <p>D. Correct the design and dimensioning of duct work</p> <p>E. Reverse motor rotation direction</p> <p>F. Reverse the direction of impeller on shaft</p> <p>G. Set clearances according to instructions</p>

### 3.1 CLEANING AND BALANCING

Dust deposits may occur in certain installations and these may cause unbalance of the fan impeller due to erosion or corrosion, thus gradually causing damage to the bearings.

Under such conditions, periodic vibration checks are recommended to determine any changes in the condition of the fan.

If necessary, the fan must be cleaned or rebalanced.

Large quantities of dust deposits may also reduce the fan performance.

### 3.2 VIBRATION SEVERITY RANGE

Fig 2

<b>RMS VELOCITY Mm/s effective</b>		<b>ACTION</b>
00.00	04.40	Good
04.40	07.10	Check at regular intervals
07.10	11.20	Check at regular intervals and balance at convenient ime
11.20	18.00	Clean and rebalance
	18.00	Shut down immediately
	11.20	Alarm
	18.00	Shut down