JITAMITRA ELECTRO ENGINEERING PRIVATE LIMITED
Works: Plot B-20/2 and Plot N-7, MIDC Area, Ahilyanagar (Ahmednagar) 414111, Maharashtra, India

Fan Installation,

Operation & Maintenance

Centrifugal Fans and Blowers · Original Instructions
SITE EDITION — for the engineer and fitter at the fan

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www.jitamitrablowers.com · Jitamitra Help Desk +91 8329172325 (phone / WhatsApp)
sales@jitamitrablowers.com
CIN U31908PN2009PTC134884 · GSTIN 27AACCJ3420G1ZX

Engineered for Every Application

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1 Before you touch the fan

This manual is written for the engineer and the fitter at the fan. It carries the installation, commissioning, operating and maintenance instructions for every Jitamitra centrifugal fan, in the order the work is actually done. It is a condensed issue of Jitamitra's Comprehensive Fan Manual JEE-MAN-001; where you need the reasoning, the derivation or a rarely used procedure, ask Jitamitra for the full document.

Two documents beat this one. The General Arrangement (GA) drawing and the nameplate are specific to your fan; this manual is general. Where a dimension, a clearance, a torque or a limit here differs from the GA drawing, the GA drawing governs.

1.1 Signal words

Signal word	What it means
⚠ DANGER	A hazard that WILL cause death or serious injury if not avoided.
⚠ WARNING	A hazard that COULD cause death or serious injury if not avoided.
⚠ CAUTION	A hazard that MAY cause minor or moderate injury if not avoided.
NOTICE	Equipment or property damage only — no risk of personal injury, and no safety-alert triangle.
NOTE	Technical guidance.

The action in every DANGER, WARNING, CAUTION and NOTICE message is mandatory. The labels and tags on the fan use the same four signal words, with the same meanings.

1.2 The rules that never bend

⚠ WARNING

Never reach into the casing or across rotating parts while the fan is running. At speed the impeller is not visible and contact can be fatal. A large impeller stores enormous rotational energy and can keep turning for several minutes after power is removed — never open an access door, inlet or outlet until it has come fully to rest and LOTO is applied.

- Apply Lockout / Tagout before every maintenance, inspection or adjustment task. No exceptions. Confirm with a colleague that LOTO is applied before you start.
- Never run a belt-drive fan without the belt guard fitted and secured. Removing a guard requires LOTO.
- Never stand in line with the shaft axis or in the plane of impeller rotation while the fan runs — a failed or loosened impeller ejects fragments along those lines.
- Never brake a coasting impeller by hand or by any mechanical means. Let it stop.
- Let a hot fan cool below 50 °C before maintenance. Casing and bearing-housing surfaces at operating temperature cause severe burns.
- Do not open a casing on a hazardous, toxic or oxygen-deficient gas until the system has been purged and proved safe under the plant permit-to-work.
- Verify the fan interior is clear of tools, rags and loose hardware before closing any access door. Anything left inside becomes a projectile.

NOTE ATEX fans, additionally: verify earthing continuity (1 Ω maximum) before every start and after any work that disturbed a bonded joint; use only non-sparking tools (copper-beryllium or aluminium-bronze) inside the casing; and never reset an ATEX interlock trip without a competent person confirming the cause is corrected.

1.3 Record your fan before you begin

Read these off the nameplate and the GA drawing now, and keep them with this manual. Every enquiry, spare-part order and service call needs the first two.

From the nameplate	Value	From the GA drawing	Value
Fan serial number		Arrangement and rotation	
Project / tag number		Fan weight (for the lift)	
Model		Bearing designation	
Duty — flow, static pressure		Hold-down bolt size and torque	
Speed (rev/min) and motor kW		Impeller axial setting and cone clearance	
Gas temperature		Recommended grease grade	

NOTE The serial number plus the project / tag number is the traceability key. Arrangement, rotation, weight, bearing designation and grease grade are NOT on the nameplate — they are on the GA drawing and in this manual.

2 Receiving, lifting and storage

Most first-start failures are not manufacturing defects. They are transport and storage damage that the site could have prevented. Read this section before the fan is unloaded.

2.1 On arrival — before you sign

1. Photograph all four sides of the crate or package before opening anything.
2. Read and photograph every shock, tilt and humidity indicator fitted, whether or not it has tripped. An unread indicator proves nothing later. Clear window and un-filled arrow are normal; red window, filled arrow or a pink humidity card mean the fan is potentially transit-damaged.
3. Confirm the project number on the label matches the purchase order and delivery note.
4. Look for a bent base, cracked casing, damaged guards or loose components.

5 Cross-check the packing list against what arrived; note shortages and missing accessories.
6 Confirm the document envelope is present — this manual, the approved GA drawing, the fan test report, the balancing report, the dimensional and inspection report, the motor maker's manual, the bearing datasheet, the packing list, plus the Declaration of Conformity and the transmission card and the coupling maker's datasheet where they apply.

NOTICE

If transit damage is suspected: photograph it from several angles, annotate the carrier's delivery note and have the driver acknowledge it, and DO NOT sign a damage-free receipt. Notify Jitamitra (sales@jitamitrablowers.com) and the transport company in writing within 48 hours of receipt. Claims raised after 48 hours may not be accepted. Retain all packaging and indicators until the claim is settled.

2.2 What the factory protection is, and when to remove it

Protection	Leave it until
Bearing housings packed FULL of Shell Gadus S2 V100 2 — a deliberate overpack against moisture	First start, on EVERY fan however short the storage: reduce to one-third of the free cavity — remove each cap, scoop out the excess, refit the cap to its own housing. Stored more than 45 days: clean out and repack instead (§2.5). A housing packed solid will overheat.
Plastic wrap on the plummer blocks and the exposed shaft, with a JST-11 tag tied outside each bearing guard	First start. Remove every piece of wrap and reset the grease (row above), then remove the tag.
Anti-brinelling (shipping-restraint) device on the shaft, where fitted, with a JST-15 tag	After the fan is levelled and grouted and the grout has cured — and BEFORE the shaft is turned or the fan is started (§3.3).
Yellow transport brackets on the flexible bellows, where fitted, with a JST-16 tag	The ducts are about to be connected (§3.8).
Inlet and outlet flanges blanked	The fan is positioned and about to be connected to ductwork.
Corrosion-inhibiting film on shaft ends and machined faces	Installation.
Belts slackened or removed on belt-drive fans	Drive installation. Re-tension to the values in §3.5.
Sealed moisture / VCI barrier with desiccant, where fitted	The fan is ready to install. Once opened the desiccant is spent — move straight into a storage regime (§2.4).

NOTE Move the fan as close to its installation point as possible before taking it out of the crate. Handling it inside the packaging reduces impact and shock damage to the impeller and bearings.

2.3 Lifting

⚠ DANGER

Incorrect lifting drops the fan. Never allow anyone to stand or pass under a suspended fan.

Lift ONLY from these points

- The marked casing-top lifting lugs, used as a pair with shackles or latched hooks — rated for the complete fan as supplied (fan, motor and base frame).
- The structural base frame or its designated lugs — slings or chain block on the base-frame steel, or shackles through the lifting holes.
- Lugs on a bolted-on casing section (split casing) lift that section only. Never lift the complete fan from a single lug.

Never sling from any of these

Do NOT lift by	Why
Shaft	Bending and bearing brinelling; the sling slips off a machined round surface.
Impeller, wheel or blades	Distorts the balanced rotor, destroys the balance grade, can crack blades.
Motor or motor eyebolt	The eyebolt is rated for the motor alone; the motor mount is overloaded.
Belt guard or fan guards	Non-structural sheet metal — it crushes and releases the load.
Inlet cone or inlet box	Thin fabrication; distorts and destroys impeller clearance.
Flexible bellows or expansion joint	Not load-bearing — it tears.
Ductwork or any bolt-on accessory	Not part of the fan structure — it fails.

Rigging rules

- Rigging capacity at least 2× the fan weight, inspected and within its test certification. The fan weight is on the GA drawing.
- Minimum sling angle 45° to the horizontal. At 45° each of two legs carries 0.71 of the load; at 60°, 0.58; vertical, 0.50. At 30° each leg carries the WHOLE load — not permitted.
- Spreader bar for impeller diameters above 800 mm, and for large casing sections, so the slings do not crush the frame or pull the corners inward.
- An eyebolt takes an inclined pull only as a matched pair, only up to 45° from its axis, never with an included angle over 90°, and screwed right down to the collar.
- Take the strain slowly, lift just clear, pause and confirm the load is level and no sling bears on the casing or any non-structural part. Lower gently — do not drop the last few millimetres.
- Keep the fan upright on its base frame throughout, and never tilt it beyond 15° from horizontal.
- Under the Factories Act 1948 s.29 every lifting machine, chain, rope and item of tackle is thoroughly examined by a competent person at least once in 12 months and the record kept. Do not use uncertified gear for a fan lift.

2.4 Storage

Up to 45 days — short-term	More than 45 days — long-term (mandatory, additional)
Store under cover, clean, dry, ventilated. If outdoor storage is unavoidable, sheet the fan weatherproof. Blank the inlet and outlet flanges against dust, water, insects and debris. Keep the fan upright on its base frame. Keep the plastic wrap on the plummer blocks, and any rain cover supplied over them, until first start. Outdoors or damp with no rain cover supplied: fit a temporary one (an inverted plastic box or a sheet-metal cover, fixed against rain). Cover the motor bearings too — the drive-end shaft entry and both end shields — until first start. Avoid extreme temperature swings — condensation inside the bearing housings corrodes them rapidly. Do not store next to running compressors, pumps or presses. Vibration at standstill false-brinells the bearings. If it cannot be avoided, put rubber isolation pads (10 mm minimum, Shore 40–60) under all four corners of the base frame. Rotate the impeller by hand at least once every 2 weeks and confirm free rotation. Log every rotation. Repair paint damage and bare metal at once; check drain plugs are closed.	Pack each bearing housing COMPLETELY full with fresh Shell Gadus S2 V100 2. Remove each cap, fill the whole cavity, refit the cap to the housing it came from — caps are match-fitted pairs. Leave the anti-brinelling device fitted, where the fan has one. Removing it early lets shaft vibration brinell the races. Keep rotating the impeller by hand every 2 weeks — the full grease pack does not replace this. Coat all bare shaft ends and machined faces with a corrosion inhibitor. Inspect monthly for rust on casing, shaft ends and fasteners; act at once. Slacken all belts. A set left tensioned beyond 2 months takes a permanent set. Blank every opening — inlet, outlet, drains, instrument connections. Keep a storage log: delivery date, each inspection, each rotation, condition, actions. The log is required for warranty validity.

NOTE Elastomers age in store. Before commissioning after long storage, inspect flexible connectors, anti-vibration mounts, gaskets and belts for cracking, hardening, crazing or loss of flexibility, and replace rather than commission a doubtful part. Store them cool, dark, dry, relaxed and away from sunlight, ozone (motors, welding), heat and oil.

2.5 Re-commissioning after storage of more than 45 days

NOTICE

Do not start a fan that has been in long-term storage without completing this. Starting on corroded bearings, a seized shaft or hardened grease causes immediate failure.

1. Remove both bearing caps. Inspect for rust, brown discolouration on races or rolling elements, contamination or debris.
2. If rust or contamination is found, strip the bearing out, clean everything with solvent and a lint-free cloth, and inspect races and rolling elements under good light. Replace the bearing if there is any pitting, corrosion or deformation — do not run it.
3. If sound, remove ALL old grease and push fresh grease through the bearing from one side until old grease exits the other, then repack the housing to ONE THIRD of its cavity volume. Scoop out any excess.
4. Refit each cap onto the housing it came from and torque the cap bolts (§6.7, Table B).
5. Remove every anti-brinelling device, from the shaft end and from under the shaft.
6. Rotate the impeller by hand through several full revolutions — free, no stiffness, no binding, no rough spots. If it is not free, find out why before going further: seized bearing, debris in the casing, seized coupling.
7. Confirm no contact between the impeller eye and the inlet-cone lip. Measure if in any doubt.
8. Belt drives: inspect for cracking, hardening, flat spots or glazing. A set stored slack for more than 2 months should be run 30 minutes and re-tensioned; replace the whole set if flat spots or cracks are visible. Check pulley alignment before re-tensioning.
9. Megger the motor: minimum 1 MΩ per kV of rated voltage and at least 1 MΩ absolute. Below that, dry the motor with warm air before starting. Clear the cooling passages of nests, debris and insects. Regrease motor bearings if stored over 6 months and they are greaseable.
10. Then run the full commissioning sequence from §5.1.

NOTE A shutdown of more than 2 weeks but less than 45 days needs the shorter check in §5.9 — not this procedure.

3 Installation

NOTICE

The three most common causes of fan failure at commissioning are (1) incorrect motor wiring — a wrong phase sequence giving reverse rotation; (2) an unlevel or insufficiently rigid foundation; and (3) ductwork bolted rigidly to the fan flanges without flexible bellows, distorting the casing. Read §3.8 and §3.9 with particular care.

3.1 Pre-installation checklist

☐	Check	Confirm
☐	GA drawing on site and reviewed	All dimensions and clearances understood.
☐	Foundation ready	Concrete minimum M20, cured 28 days. Steelwork installed and inspected. Level within 1 mm per metre.
☐	Hold-down bolts positioned	Locations match the GA drawing; diameter and projection confirmed.
☐	Motor supply correct	Voltage, phases, frequency and capacity for the motor starting current.
☐	Motor wiring diagram to hand	Terminal configuration confirmed before connection.
☐	Phase-rotation meter available	Mandatory. Not optional.
☐	Lifting equipment certified	Rated capacity above 2× fan weight, current certification.
☐	Anti-brinelling devices still fitted	They come off at commissioning, not now.
☐	Flexible bellows on site	Correct size, yellow transport brackets identified for removal.

☐	Check	Confirm
☐	Duct support plan confirmed	No duct load will transfer to the fan flanges.
☐	Belt-tension tool available	Spring balance; laser alignment tool or straight-edge. Belt-drive fans.
☐	Safety arrangements in place	Permit issued if required, safe access, PPE available.
☐	Storage period confirmed	Stored more than 45 days — complete §2.5 first.

3.2 Foundation, levelling and grouting

Parameter	Requirement
Concrete grade	Minimum M20 (20 N/mm²). M25 or higher for fans above 15 kW or above 1500 rev/min.
Curing	Minimum 28 days before installation and grouting. Never grout onto green concrete.
Foundation mass	3× to 5× the total fan assembly weight. Heavier transmits less vibration.
Flatness	Maximum 1 mm deviation per 1000 mm in any direction. Check with a precision level.
Hold-down bolt size	As the GA drawing. Floor values: M16 up to 100 kg, M20 for 100–500 kg, M24 above 500 kg. Use bolt sleeves so the position can still be adjusted.
Steelwork for AVM mounting	Heavy channel section, minimum ISMC 150×75 or equivalent. Light angle or flat-bar structures resonate and are not acceptable.

NOTE Every hold-down torque comes from the GA drawing. This manual carries no generic anchor-bolt torque table by size and grade; the sizes above are a floor, not a substitute for the GA value.

Levelling

1. Position the fan on the foundation. Do not tighten the hold-down bolts yet.
2. Place steel shim packs on BOTH sides of every hold-down bolt position — four positions minimum, more on a long base. Never single-point packing, and never one shim or wedge under one side: that leaves a rocking condition that will not damp out.
3. Put a precision level on the shaft or on a machined face of the base frame. Shim until the fan is level in both axes to within 0.5 mm per metre.
4. Tighten all hold-down bolts finger-tight, re-check level — it shifts — and re-adjust the shims.
5. Tighten progressively in a CROSS pattern (not around the perimeter) to the GA-drawing torque.
6. Re-check level after final tightening.

NOTICE

Never weld the fan down in place of hold-down bolts. Welds crack under vibration and give no controlled clamping force.

Grouting

1. Build formwork around the base-frame perimeter.
2. Mix non-shrink cementitious grout to its maker's instructions — minimum 30 N/mm².
3. Pour from one side and let it flow under the frame; tap the formwork to drive out voids.
4. Cure at least 48 hours before any load; 7 days before commissioning is preferred.
5. Re-torque every hold-down bolt after full cure — grout shrinkage relaxes bolt tension.

NOTE Where grouting is impossible, increase packing to at least 6 points per side, lock the packers with a high-strength epoxy shim compound, and re-check and re-torque the hold-down bolts every 3 months.

Anti-vibration mounts

- AVMs are for a fan on an elevated fabricated steel structure — over an oven, furnace, dryer or shot-blast chamber, or on a raised platform — where the structure itself would amplify vibration.
- Mount on heavy channel steelwork, ISMC 150×75 or equivalent, at all base-frame corners and at the intermediate points on the AVM layout drawing. All mounts the same type and compression.
- After installation measure each mount's deflection under load. All should deflect equally within ±10%. Unequal deflection means an unlevel base or an overloaded mount.
- Never fit AVMs AND bolt the fan rigidly to a concrete foundation. They defeat each other — use one method only.
- An AVM changes the fan from rigidly to flexibly supported, and that changes its vibration acceptance limits (§5.7). Record which mounting the fan is on, and state the direction with the reading — a fan can be rigid in one direction and flexible in another.
- Where the mount is not on the GA drawing, its selection needs five inputs and an isolator chosen without them amplifies vibration instead of isolating it: the mass carried at each point, the running speed (and the lowest speed if on a VFD, where isolation is worst), the natural frequency of the supporting structure, the acceptance criterion for transmitted vibration, and the ambient conditions the elastomer or spring must survive. Get the selection from Jitamitra or the mount manufacturer.

3.3 Removing the shipping restraints

NOTICE

Remove the anti-brinelling / shipping-restraint devices only AFTER the fan is levelled and grouted and the grout has cured — and BEFORE the motor is rotated or the fan is started. Turning the shaft with a restraint fitted damages the bearing, the shaft or the restraint; leaving one on at start prevents rotation and overloads the drive.

1. Confirm the fan is levelled, grouted and cured.
2. Locate every restraint — typically at the shaft ends, across the impeller, and any bearing-locking brackets. Cross-check the packing list and GA drawing.
3. Remove each one completely, with its JST-15 tag, and keep the brackets and fasteners with the fan documentation.

4 Rotate the impeller by hand through at least 5 full revolutions: free, no binding, no contact, no rough spots.
5 Record the removal on the commissioning checklist.

3.4 Assembly

Completely assembled fans

- Lift onto the foundation, level, pack and grout (§3.2).
- Remove all transit packing and blanking plates once the fan is positioned.
- Verify the impeller turns freely by hand before connecting ductwork or making any electrical connection.
- Fit the bellows (§3.8), connect independently supported ductwork, then the electrical connection (§3.9).

Field-assembled (split) fans

All parts are trial-assembled and match-marked at the works. Follow the match marks. Never force mating parts whose marks do not align — that is poor fit, misalignment and vibration.

1 Set the base frame and lower casing half or pedestal on the foundation; level and pack before tightening.
2 Install shaft and bearings into the pedestal — bearings already in their housings at one-third grease fill. Confirm the shaft turns freely.
3 Fit the impeller and set its axial position per the GA drawing (taper-lock procedure below).
4 Fit the upper casing half with match marks aligned; tighten casing bolts progressively in a cross pattern.
5 Fit the inlet cone; set the axial position per the GA drawing and adjust the radial clearance (below).
6 Rotate the impeller by hand through at least 5 revolutions — no contact, no binding.
7 Fit accessories in the correct orientation, then the belt drive or coupling, aligning before tensioning.
8 Fit all guards and covers, tighten everything, then make the electrical connection.

⚠ WARNING

Taper-lock bush — never apply grease, oil or anti-seize to the bush tapers or the matching hub taper. They must be clean and dry. Lubricant on the taper prevents the interference fit, and the bush will slip, loosen the impeller and cause violent vibration.

1 Clean bush and hub bore tapers with a clean dry cloth — no rust, paint or grease.
2 Check the key is seated in the shaft keyway and the hub keyway.
3 Slide the bush into the hub. Insert the locking screws finger-tight.
4 Slide the assembly onto the shaft to the axial position on the GA drawing (check the dimension from the casing edge to the impeller back plate).
5 Tighten the locking screws progressively in sequence, alternating between screws — never all at once. Above 800 mm impeller diameter, drive the bush progressively home with a copper or aluminium hammer, then re-torque.
6 Re-verify the axial position — it shifts as the bush tightens.
7 Bend the locking-washer tab into the nut slot where one is fitted.

Inlet-cone clearance

- Set the impeller axial position first, then fit and adjust the cone.
- Position the cone so the lip sits inside the impeller eye; check the axial overlap against the GA drawing.
- Rotate the impeller slowly by hand while adjusting — the lip must not touch at any point of rotation.
- Set the radial clearance concentric and equal all round. Typically 0.5–1.5% of impeller diameter — the GA drawing gives the exact value.
- On an ATEX fan the clearance is also a safety limit: at least 0.5% of the contact diameter and never less than 2 mm, axially and radially (it need not exceed 13 mm). Below 400 mm impeller diameter the 2 mm floor governs, not the percentage. Record the gap you set — the ATEX maintenance schedule re-checks it.
- On a high-temperature fan set the cone biased toward the bottom of the eye, to allow for upward thermal expansion of the shaft.
- Tighten the cone bolts and re-check the clearance — it shifts on tightening. Rubbing noise at first start is usually this: loosen, readjust, re-tighten before commissioning.

3.5 Belt drives

1 Fit the pulleys per the GA drawing — the distance from shaft end to pulley face must match on both shafts. Taper-lock pulleys follow the taper-lock rule above: no grease on tapers.
2 Check alignment with a laser pulley-alignment tool on both pulley faces; on site without one, lay a long straight-edge across both faces: it must touch both at top and bottom, with no gap. Maximum misalignment 3 mm per metre of shaft centre-to-centre distance.
3 Correct by moving the motor on its slide plate. Never move the fan shaft — its position is fixed by its bearings.
4 Slacken the motor slide fully towards the fan, then place the belts over both pulleys BY HAND. Never lever a belt on with a screwdriver: it stretches the cord and the belt fails early. Fit all belts of a matched set together.
5 Move the motor away until the belts are approximately tensioned.
6 Tension by the spring-balance method: apply the force from the table below perpendicular to the belt at mid-span, and confirm the deflection is 16 mm per metre of span (span 650 mm → 10.4 mm).
7 Lock the slide plate and tighten all motor slide bolts.
8 Re-check pulley alignment — tensioning shifts the motor.
9 Fit and secure the belt guard before any electrical connection or test run.

Belt section	Small pulley dia. (mm)	Deflection force (N)	Section data
SPA	100–132	25–35	Top width ~12.7 mm, height ~10 mm. Light duty — small fans, HVAC, auxiliary drives.
SPA	140–200	35–45	
SPB	112–224	45–65	Top width ~16.3 mm, height ~13 mm. Medium duty — standard industrial fans to about 75 kW.
SPB	236–315	65–85	
SPC	224–355	85–115	Top width ~22.0 mm, height ~18 mm. Heavy duty — large

Belt section	Small pulley dia. (mm)	Deflection force (N)	Section data
			industrial fans, high-power drives.
SPC	375–560	115–150	

NOTICE

Over-tensioned belts load the fan and motor bearings radially and are the primary cause of premature bearing failure on belt-drive fans. Under-tensioned belts slip, generate heat and wear both belt and pulley grooves fast. Tension to the table.

NOTE The guard must fully enclose both pulleys and all belt runs with no finger access through ventilation slots (EN ISO 12499), be rigid with no rattle or flex, and carry a clear panel or inspection slot so belt condition can be checked without removing it. The laser tool is the preferred check and the straight-edge the site fallback, judged against the same limit — use the laser above 15 kW or wherever vibration has been a problem.

3.6 Couplings

A coupled fan (Arrangement 8) runs its shaft in its own two bearings and is driven from the motor through a flexible coupling. A direct-drive fan (Arrangement 4) carries the impeller on the motor shaft and has no coupling.

- Clean both shaft ends, remove burrs with a fine file, and check the shaft diameters against the hub bores.
- Interference-fit hubs: heat to 80–100 °C in hot oil or with an induction heater and slide on quickly. Never a flame.
- Clearance-fit hubs with a keyway: fit the key and tighten the grub screws with a medium-strength threadlocker. Taper-lock hubs: the taper-lock rule — no grease.
- Set the hub face-to-face gap from the coupling datasheet; that gap is what lets the flexible element work.
- Align with a laser shaft-alignment system, reading offset and angularity directly. Without one, use rim and face dial indicators: clamp the bracket to one hub, set one indicator on the rim of the other hub and one on its face near the outer edge, and measure the diameter the face tip sweeps. Rotate both halves together through 360° and read at the top, the two sides and the bottom. Offset = rim TIR ÷ 2. Angularity = face TIR ÷ that diameter (× 100 for mm per 100 mm) — do NOT halve the face reading. Work out both in each plane.
- Correct by shimming the motor with stainless shims or by lateral jacking screws. NEVER move the fan shaft. Re-measure and repeat until both are within the table below.

Alignment limits — offset in mm, angularity in mm per 100 mm

Speed	Limit	Offset	Angularity
Up to 1500 rpm	Excellent	0.05	0.04
Up to 1500 rpm	Acceptable	0.09	0.06
Above 1500 rpm	Excellent	0.03	0.02
Above 1500 rpm	Acceptable	0.05	0.03

NOTE Align as close to zero as possible: aim for Excellent, never worse than Acceptable. Never outside the coupling maker's limits — they are in the coupling datasheet in your document pack. VFD: use the row for the top speed. Record the achieved offset and angularity in both planes. The acceptance test is the commissioning vibration reading: a coupled fan that will not reach 4.5 mm/s r.m.s. rigidly mounted is misaligned or soft-footed, whatever the readings say. The same table is printed on the coupling-alignment label on the guard.

3.7 Accessories

- Install every accessory in the correct flow orientation — check the flow arrow on the body against the GA drawing. Wrong orientation reverses or defeats the function.
- Inlet guide vanes: the blades must pre-rotate the air in the SAME direction as the impeller. Vanes fitted the wrong way round cut performance significantly and make unusual noise. Actuate through full travel by hand and confirm free movement; set the actuator open and closed limits before commissioning.
- Dampers and louvres: set parallel-blade pivot axes horizontal unless the unit is designed for a vertical axis. Verify full-open and full-closed are reached without obstruction. On outdoor weather louvres the frame drain holes must face DOWN.
- Silencers: bellows between the fan flange and the silencer, silencer supported independently — never resting its weight on the fan flange or bellow. Splitter types are directional. Confirm the baffle packs are seated and secured; loose baffle material enters the airstream.
- Actuators: match the mechanical movement range to the actuator rotation, set both end-of-travel limits under power, and test the manual override for a power failure. In hazardous areas use only ATEX-rated actuators and wiring for the zone.
- Inlet filters: seat the element frame firmly against the housing seal with no bypass around the perimeter, secure the retention clips so suction cannot blow it out, and mark the first service date on the housing.
- Vibration switches: mount on the bearing-housing surface nearest the bearing — not on the base frame, not on the casing. Stud mount is preferred for a permanent installation. Wire in LATCHING mode so the fan cannot restart automatically after a trip. Set the trip after the commissioning baseline is measured: baseline + 3 mm/s r.m.s., or the shutdown level for the category (9.0 mm/s rigid, 12.5 flexible for BV-3), whichever is LOWER.

3.8 Duct connection

NOTICE

Never connect ductwork rigidly and directly to the fan flanges. Rigid connections transmit duct loads and thermal expansion into the casing, distorting it — which gives impeller-to-nozzle contact, seal failure and vibration. Flexible bellows at BOTH inlet and outlet are mandatory, whatever the duct material, temperature or pressure.

- Support every duct section independently within 500 mm of the fan flange. Weight, thermal expansion and pressure thrust are carried by the duct supports, never by the fan casing. Verify after installation that the duct stands or hangs free of the flange and bellow.
- Minimum straight inlet run of 3 duct diameters before the fan inlet. Bends, elbows or transitions inside that distance distort the inlet, lose performance and make noise.
- Minimum straight outlet run of 2 duct diameters after the fan.
- Where a close-coupled bend is unavoidable, fit turning vanes inside the bend to restore uniform flow, per AMCA 201 system-effect practice. For an extractor hood on an abrupt outlet transition, fit a vortex breaker. Contact Jitamitra for the design — it depends on the duct dimensions and fan geometry.
- Remove all yellow transport brackets from the bellows before making duct connections. Left in place they transmit fan vibration straight into the ductwork and can crack the connections.
- Check the bellow fabric is not twisted, folded or kinked, and that any airflow-direction arrow or internal liner faces the right way.
- Fit the bellow slightly COMPRESSED: about a 150 mm assembly gap between duct flanges through the bellow, against a 170 mm taut length — 20 mm of compression is correct.
- Tighten flange bolts evenly and do not over-tighten; the bolts compress the fabric and excessive load cuts its edge. After connection the bellow must flex freely in all directions — not stretched, not over-compressed, not twisted.
- Above 80 °C gas, use metallic or high-temperature fabric bellows rated for the operating temperature. Standard rubber or PVC fails rapidly. Confirm the material rating with Jitamitra.

NOTE Inlet system effect is a real, quantifiable loss, not a margin. An elbow or drop-box hard against the fan inlet can cost up to about 45% of the design flow, and the fan never recovers it. The 3-diameter straight run protects the duty point the fan was selected for.

3.9 Electrical connection

⚠ DANGER

All electrical work by a qualified electrician only. Verify the supply is isolated and LOTO applied before making any connection. Incorrect wiring causes electrocution, motor failure, fire or fan damage.

- Terminal configuration (star or delta) comes from the motor nameplate and the motor manufacturer's manual, and depends on the supply voltage against the motor rated voltage. For a 415 V / Δ, 240 V / Y motor: on a 415 V 3-phase supply connect DELTA (U1–W2, V1–U2, W1–V2; supply to U1, V1, W1); on a 240 V 3-phase supply connect STAR (join U2, V2, W2; supply to U1, V1, W1). A star-delta starter needs all six terminals brought out and the motor rated for delta at the supply voltage.
- Tighten terminal screws to the torque in the motor manual and fully secure the terminal-box cover before energising.
- MCB sizing: In = Iz + (0.25 × Iz), where Iz is the motor nameplate full-load current. Select the next standard size above. Worked example: FLA 20 A → In = 25 A → fit a 32 A MCB. Minimum short-circuit breaking capacity 1 kA. Have a qualified electrical engineer confirm the final selection, cable sizing and upstream coordination.
- Star-delta: set the changeover timer to 5–10 seconds initially and fine-tune at commissioning; set the overload relay to the motor nameplate FLA and no higher. Star-delta starting gives one third of DOL torque — a high-inertia fan or a low-resistance system may not reach speed in star and may need DOL or a soft starter.

⚠ DANGER

Never assume the phase sequence is correct. Measure it with a phase-rotation meter on the supply cables at the motor disconnect BEFORE connecting the motor — the electrician may have wired correctly and the site supply itself still be in a non-standard sequence. Reverse rotation gives very little flow, high motor current, and can loosen the impeller hub, which is designed for the forward torque direction only.

VFD connection

- Screened motor cable only, rated at least 1.25× motor current, within the drive maker's maximum length (typically 50–100 m without an output filter).
- Never run the VFD motor cable in the same conduit or trunking as control, instrumentation or other power cables.
- Earth the screen at BOTH ends — VFD output terminal and motor terminal box — preferably with 360° screen-termination glands. Earth VFD chassis, motor frame and fan base frame to a common point.
- Above 11 kW on a VFD, either the motor non-drive-end bearing is insulated or a shaft-earthing ring is fitted. Otherwise VFD common-mode voltage drives bearing currents that destroy the bearing, often within 6–18 months.
- Programme the motor parameters from the nameplate — voltage, current, frequency, speed, cos φ, kW. Set minimum and maximum frequency from the fan datasheet; default maximum 50 Hz unless the fan is designed for more. Set the minimum stable speed above the stall region and programme resonance skip bands.

Earthing

Check	Acceptance value
Protective earth conductor, motor earth terminal to site earth	Cross-section per IEC 60364 — same as the phase conductors up to 16 mm², half above 16 mm².
Earth bonding, fan base frame to site earth	Bonded.
Earth bonding, ductwork to site earth	Bond the duct independently — continuity through a flexible bellow cannot be relied on.
Earth-bonding resistance at site, standard fan	1 Ω maximum between fan metalwork and the site earth electrode. Record it in the commissioning report.
Earth-bonding resistance, ATEX fan — including bellows, guards and accessories	1 Ω maximum, EVERY conductive part bonded. Verify before every start and after any maintenance that disconnected a bond.
Motor insulation resistance before energising	Not less than 2 MΩ at works test; 1 MΩ per kV of rated voltage in service.

⚠ WARNING

ATEX fans: do not start in a hazardous area with an unverified or failed earth connection. This is a mandatory requirement, not a good practice.

4 Commissioning

Commissioning is the controlled handover from installed equipment to operating equipment, and it is the most consequential stage in the life of the fan. A perfectly manufactured, correctly installed machine can still be destroyed in its first minutes by a reversed rotation, an over-fast VFD ramp or an unwatched bearing temperature. Do every step, in sequence — each one catches a different class of failure, and a check skipped here becomes a warranty claim later.

NOTE Fill in and sign the Commissioning Report AS YOU WORK. Do not reconstruct it afterwards from memory. The signed report is how the commissioning date reaches Jitamitra, and the 12-month warranty limb runs from that date.

4.1 Pre-commissioning checklist

#	Item	Confirm	☐
1	Anti-brinelling devices removed	Both shaft devices, shaft end and under-shaft.	☐
2	Bellow transport brackets removed	Yellow brackets off, inlet and outlet.	☐
3	All transit protection removed	Plastic wrap off the bearings and the shaft, with items 1 and 2; every transit tag (JST-11, JST-15, JST-16) collected.	☐
4	Blanking plates removed	All flange blanks off; casing and ductwork clear of debris.	☐
5	Impeller rotates freely	Minimum 5 full revolutions by hand — smooth, no contact, no binding, no rough spots.	☐
6	Inlet cone clearance confirmed	Even all round; no contact between cone lip and impeller eye.	☐
7	Guards fitted and secured	Belt guard, shaft cover, all safety guards bolted and secure.	☐
8	Foundation bolts torqued	To the GA-drawing torque; grout cured where applicable.	☐
9	Belt drive tensioned and aligned	16 mm deflection per metre of span; alignment checked (laser or straight-edge).	☐
10	Coupling aligned	Offset and angularity within the §3.6 table in both planes — Excellent aimed for, Acceptable the worst; never outside the coupling maker's limits; readings recorded.	☐
11	Bearing grease reset — one-third fill	Every fan: the full factory pack reduced to one-third. Stored over 45 days: cleaned out and repacked with fresh Shell Gadus S2 V100 2.	☐
12	Motor correctly wired	Against the motor maker's diagram; three phases connected; terminal cover secured.	☐
13	Phase sequence measured	Phase-rotation meter at the motor supply. Mandatory.	☐
14	Earthing verified	1 Ω maximum, fan metalwork to site earth. Value recorded.	☐
15	MCB / overload set	To the motor nameplate full-load current.	☐
16	Flexible bellows correct	Both flanges, about 150 mm assembly gap, not twisted.	☐
17	Duct supports independent	No duct load on the fan flange or bellow.	☐
18	Dampers set for start	Closed or partly open to reduce the motor starting load.	☐
19	Accessories connected	IGV, dampers, actuators, filters, vibration switches installed and functional.	☐
20	LOTO removed — area clear	All locks and tags removed; all personnel clear of the fan and rotating parts.	☐

4.2 First start — the rotation check

⚠ WARNING

Rotating impeller. Before this step confirm every person is clear of the fan and all rotating components, and that the belt guard and shaft cover are fitted. Never stand in line with the shaft axis or in the plane of impeller rotation.

1. Close the inlet or outlet damper if one is fitted — it reduces the motor starting load.
2. Start the motor, run for 2–3 seconds only, and stop.
3. Observe the direction of rotation immediately, through the belt-guard inspection slot or at the shaft or coupling end. Do NOT use an airflow check instead: a reversed centrifugal fan still discharges out of the outlet, so the air direction looks correct.
4. Compare against the rotation arrow on the casing. They must match.
5. Correct — go to §4.3. Incorrect — apply LOTO immediately, swap any two of the three motor supply cables AT THE MOTOR TERMINAL BOX (for example V1 and W1), never at the switchboard or starter, remove LOTO and repeat the momentary start.

⚠ WARNING

Do not run the fan in reverse for more than 5 seconds. A backward-running centrifugal impeller delivers only 40–50% of rated airflow while drawing significantly higher current, and extended reverse running can overload the motor and loosen the impeller hub.

4.3 Short test run — 5 minutes

- Run for 5 minutes with the damper partly open.
- Listen for grinding, rubbing, screeching, metallic knocking or any rhythmic sound. If you hear one, stop and investigate. Do not run to failure.
- Watch for abnormal movement, vibration or smoke — stop immediately if any appears.
- Clamp-meter the motor current on all three phases: balanced within ±5%. Record them.
- Observe the bearing housings for the initial temperature rise — a gradual rise is expected.
- If all is normal after 5 minutes, open the damper to the normal operating position and go on to the extended run.

4.4 Extended run — first 8 hours

NOTICE

Do NOT add grease during the first 8-hour run. High bearing temperature in the early hours is caused by excess grease churning — adding more makes it worse. Let the fan expel the excess naturally through the grease relief hole.

Time after start	Expected temperature	What it means
0–30 min	Rising rapidly, 40–80 °C at the outer ring	Normal — elements churning grease. The relief hole may begin expelling excess. Expected.
30 min – 2 h	Warmest phase — must stay below 100 °C outer ring (≈ 88 °C housing)	Peak grease-churning phase. A freshly packed bearing runs warm while the excess is expelled. Do NOT add grease. The limit does not move for run-in.
2–6 h	Falling toward 70 °C outer ring (≈ 58 °C housing)	Good sign — excess expelled, temperature declining, fan operating normally.
6–24 h	Settles at or below 70 °C outer ring (≈ 58 °C housing)	Normal steady state; the pattern is established.
After 24 h	Steady, up to 70 °C outer ring (≈ 58 °C housing)	Record this value and the instrument used as the baseline bearing temperature. A fan settling at 70–85 °C outer ring is in the elevated band — acceptable, but halve the relubrication interval.

⚠ WARNING

If the temperature has not begun to fall after 3–4 hours, or is in the alarm band — 85–100 °C at the outer ring, about 73–88 °C read on the housing — and still climbing: stop the fan and apply LOTO. Inspect the bearings; check for grease over-fill or the wrong grease. If it reaches 100 °C at the outer ring (about 88 °C on the housing) at any point, stop immediately — grease churning does not push a bearing past its seals.

Interval	What to check
Every 15 min, first 2 hours	Both bearing temperatures; unusual noise; vibration by hand-touch on the bearing housing; motor current.
Hourly, hours 2–8	Bearing temperature; motor current; belt tension on belt drives (belts stretch in the first hours); grease expulsion from the relief hole (normal).
End of the 8-hour run	Record final bearing temperature at DE and NDE; measure and record vibration; record motor current on all three phases; belt-tension check.

4.5 Belt drives after first start

When	Action
After 1 hour running	Stop the fan, apply LOTO, check belt tension by the spring-balance / deflection method, re-tension if deflection exceeds 16 mm per metre of span, check pulley alignment, remove LOTO.
After 1 week (40 h)	Repeat. This is normally the second and final adjustment — the belts have bedded in.
Monthly thereafter	Include the belt-tension check in routine monthly maintenance.

NOTE Belt squeal at first start or in the first hours is an early sign of under-tension. Stop, apply LOTO, re-tension. Never run a squealing belt — slip generates heat and wears both belt and pulley grooves fast.

4.6 Electrical checks at steady state

- After 1–2 hours of running, clamp-meter all three phases and record. Phase balance within ±5% — more imbalance means supply-voltage imbalance or a winding problem.
- Measured current must be at or below the nameplate full-load amperes. Slightly below FLA is normal (fans are sized with a service-factor margin). At or above FLA the fan is at or beyond its design limit — investigate. Significantly below FLA suggests a lower duty point than design — check the damper position and system resistance.
- Touch the motor casing at the cooling-air outlet end: warm, not painfully hot. Above about 80 °C at the surface, check the cooling-air inlet for dust or debris and check that the running current is within rating. Record the motor body temperature.

4.7 Vibration baseline

After steady-state temperature is reached — at least 1 hour of running after the 8-hour break-in — measure and record the baseline. This is the reference for all future condition monitoring: a change from baseline means more than any single absolute value. Jitamitra fans are assessed by filter-out (broadband) velocity in mm/s r.m.s. on the bearing housings, per ISO 14694 Table 5, measured per ISO 14695.

- Measure at BOTH bearing housings — Drive End and Non-Drive End.
- At each, measure in three directions — Horizontal, Vertical, Axial. Six readings.
- Place the sensor on the machined surface of the bearing housing nearest the bearing. NOT on the base frame, NOT on the casing.
- Mark the six points permanently on the housings and use the same mounting and, wherever possible, the same instrument for every reading you intend to trend — instrument and mounting differences alone account for ±10% between two readings of the same fan.

Level (ISO 14694, BV-3)	Rigid (mm/s r.m.s.)	Flexible (mm/s r.m.s.)	Assessment and action
Start-up	≤ 4.5	≤ 6.3	A newly commissioned fan MUST be at or below this. Record as the baseline and hand over.
Normal running	4.5 – 7.1	6.3 – 11.8	Acceptable in service. A rise above baseline with running hours is expected and safe while below alarm. Trend monthly.

Level (ISO 14694, BV-3)	Rigid (mm/s r.m.s.)	Flexible (mm/s r.m.s.)	Assessment and action
Alarm	7.1 – 9.0	11.8 – 12.5	Investigate immediately. Monitor closely and limit running at this level to the time needed to plan and make the correction.
Shutdown	> 9.0	> 12.5	Stop the fan. Correct the cause before restart. Continuing risks bearing failure and cracking of rotor parts and casing welds.

NOTE BV-3 covers industrial process and power-generation fans up to 300 kW — the great majority of the Jitamitra range, and the category assumed here. Petrochemical fans above 37 kW and large transit or tunnel units are BV-4: start-up 2.8, alarm 4.5, shutdown 7.1 rigidly mounted; 4.5, 7.1 and 11.2 flexibly mounted. Fans above 300 kW go to ISO 20816-3. Rigid or flexible is decided by the SUPPORT, not by intent: rigid means the lowest natural frequency of fan plus support lies above running speed. A foundation is rigid enough in practice when its own vibration near the fan feet is under 25% of the reading at the adjacent bearing housing. DO NOT HAND OVER a fan that is above its start-up level — it has an installation problem: check foundation bolts, belt or coupling alignment, inlet cone clearance, impeller balance and duct connections first.

4.8 Star-delta and VFD starting

Star-delta

- In star the fan accelerates on one third of DOL torque and keeps speeding up only while motor torque exceeds fan demand. On a high-inertia impeller, or with the damper open on a low-resistance system, it may not reach speed before the timer fires — and at changeover the motor then draws full DOL current, tripping the overload.
- Close the inlet and/or outlet damper FULLY before the first star-delta start.
- Start and monitor current with a clamp meter throughout. In star, current is about one third of normal DOL starting current.
- The motor should be at or near rated speed — at least 90% of synchronous — before the timer fires. If it is not, shorten the star period by 1–2 seconds and repeat, and confirm the damper is fully closed and the system is not an open low-resistance path.
- After a successful start, open the damper to the operating position and confirm the current settles near FLA.
- If it trips on every start despite a closed damper and a correct timer, the motor may not suit the fan inertia — contact Jitamitra; DOL or a soft starter may be needed.

VFD

- Enter the motor nameplate data — voltage, current, frequency, speed, cos φ, kW. Set the minimum frequency, typically 20–25 Hz and never below the speed at which the motor is still adequately cooled; set the maximum, typically 50 Hz or the datasheet figure. Enable the current (torque) limit at 150% of motor rated current as a starting point.
- Ramp times are a floor, by impeller diameter: up to 1000 mm, 30 s minimum for 0–50 Hz; 1000–2000 mm, 60 s; above 2000 mm, 120 s and contact Jitamitra. Set the deceleration time equal to or longer than the acceleration time — too-fast deceleration regenerates and trips the DC bus on a high-inertia fan.
- Find the resonances: run slowly from minimum to maximum frequency while watching vibration on the bearing housing. Any range where vibration rises sharply — typically more than 2× baseline — is a resonance. Programme a skip band of resonance ± 3 Hz (33 Hz → 30–36 Hz), verify the fan cannot operate inside it, and record every skip band.
- A resonance at the normal operating speed cannot be skipped away — it points to a foundation or structural stiffness problem. Contact Jitamitra before commissioning further.
- Above 11 kW confirm the NDE bearing is insulated or a shaft-earthing ring is fitted. With a working ring, shaft voltage measures below 5 V peak; above 5 V means poor contact. Record the bearing-protection method.

4.9 Performance verification and sign-off

Measurement	How
Fan speed (rev/min)	Contact or non-contact tachometer at the shaft or belt-guard inspection point.
Airflow (m³/h)	Pitot traverse or flow meter where duct instrumentation exists; otherwise record "site measurement not available — verify by system balance".
Static pressure (Pa)	Manometer or gauge at inlet and outlet where tappings exist.
Motor current (A)	Clamp meter, all three phases, all three recorded.
Bearing temperature (°C)	Contact or infrared thermometer at DE and NDE housings.
Vibration (mm/s r.m.s.)	DE and NDE, H / V / A — six readings.
Belt tension (N)	Belt drives only — spring-balance deflection check.
Earthing resistance (Ω)	Earth-resistance meter — record the actual value.

NOTE Compare measured speed and current against the GA drawing and Technical Data Sheet. Speed within ±2% and current within ±5% of design confirms the duty point. Beyond ±10%, contact Jitamitra. A site duct rarely gives a laboratory traverse — treat site figures as an installed-system check against the test report, not as a rating, and expect system effect to explain a shortfall before the fan does. Standard air for a rating is 1.2 kg/m³ at 20 °C; correct a site reading taken at another density before comparing, because pressure and power scale with density and flow does not.

Commissioning is complete only when all of these are true

- Every applicable item in the pre-commissioning checklist is confirmed and signed.
- Rotation direction is confirmed correct.
- The 8-hour bearing break-in is complete with temperatures in the acceptable range.
- The vibration baseline is measured and recorded, at or below the start-up level for the category.
- All measured performance data is recorded.
- Belt tension has been re-checked after the first hour and after the first week (belt drives).
- VFD skip bands are programmed (VFD fans).
- The Commissioning Report is signed by the commissioning engineer and the customer representative.

Commissioning sign-off	Entry
Customer / site	
Job / project no.	
Fan tag / model / arrangement	
Date commissioned	
Mounting at the vibration reading	Rigid / Flexible
Commissioning engineer — name, signature, date	
Customer representative — name, signature, date	
Outcome	Accepted / Accepted with conditions / Rejected

NOTICE

The signed Commissioning Report is how the commissioning date reaches Jitamitra. Warranty runs to whichever expires first: 12 months from that commissioning date, or 18 months from the date of Jitamitra's tax invoice. Where no commissioning date is established in writing, the invoice limb applies alone. Lodge a signed copy with Jitamitra.

5 Operation

5.1 Starting

- Confirm all personnel are clear of the fan and all rotating components.
- Confirm all guards are fitted and secured — belt guard, shaft cover, inlet and outlet screens.
- Confirm LOTO is fully removed: every padlock and tag off, isolator closed, supply restored.
- On damper-controlled systems, set the damper to the start position (partly or fully closed) to reduce the motor starting load.
- Energise, and let the motor accelerate to full speed — typically 2–5 s on DOL, 5–15 s on star-delta, per the programmed ramp on a VFD.
- Open the dampers to the operating position.
- Watch and listen through the first 1–2 minutes. Anything abnormal: stop and investigate.

NOTICE

If the fan trips during starting, do not immediately try again — wait at least 5 minutes for the motor to cool. On star-delta, a maximum of 2 cold starts or 1 hot start per hour is the rule of thumb; the motor nameplate gives the permitted starts per hour and it governs. High-inertia fans — large wheels, radial and large-backward families — draw high current through a long run-up and heat the windings; count and space your starts.

5.2 What to watch, and how often

Parameter	Normal	Interval	If outside
Bearing temperature	Up to 70 °C outer ring (≈ 58 °C housing)	Daily; continuous where monitoring is fitted	See §5.3.
Vibration	≤ 7.1 mm/s r.m.s. (BV-3 rigid)	Monthly minimum; continuous where a switch is fitted	Alarm 7.1–9.0: investigate immediately, weekly monitoring. Above 9.0: stop the fan.
Motor running current	≤ nameplate FLA	Quarterly minimum	Above FLA: possible over-duty, wrong gas density or mechanical overload. See §5.4.
Unusual noise	None	Every start; listen during operation	Any new or increasing noise: investigate promptly.
Belt tension	16 mm deflection per metre of span	Monthly	Re-tension if over-deflected; reduce if under-deflected.

Always compare a reading against its own commissioning baseline, not only against the absolute limit. A reading of 3.0 mm/s that has doubled from a 1.5 mm/s baseline matters more than a static 3.0 mm/s that has been steady for months.

5.3 Bearing temperature — the numbers and what sets them

The ceiling is a SEAL limit. Every contact seal that fits these housings — felt, V-ring, double-lip, taconite — is rated to +100 °C, so the limit holds whichever one your fan has, and they all bind well before the grease (120 °C) or the cage. A labyrinth seal (200 °C) is the only exception, and that is a high-temperature build, stated on the GA drawing with the bearing and grease that go with it. Every published bearing limit is an OUTER-RING temperature, while an infrared gun or a probe on the outside of the plummer block reads the HOUSING, which runs 10–15 °C cooler. They are not the same quantity. Read the housing, compare against the housing column, and record which instrument you used.

Outer ring (housing reads)	Status	Action
Up to 70 °C (up to ≈ 58 °C)	NORMAL	Normal steady-state running. Record and trend. Relubricate at the tabled interval — that interval is quoted at 70 °C.
70–85 °C (≈ 58–73 °C)	ELEVATED	Acceptable, but HALVE the relubrication interval — grease life halves for every 15 °C above 70 °C. Check lubrication, belt tension, ambient temperature and cooling airflow.
85–100 °C (≈ 73–88 °C)	ALARM	Find the cause and limit running at this level. Grease life is quartered and the seals are near their ceiling. Increase monitoring frequency and plan an inspection. A fault is developing.
Above 100 °C (above ≈ 88 °C)	STOP THE FAN	Stop immediately, apply LOTO. Above the seal limit the seal, then the grease, then the cage are all out of specification. Inspect bearings, grease condition, belt over-tension and cooling obstruction. Do not restart until the cause is corrected.

5.4 Motor current

- A gradual rise over months means rising system resistance (clogging filters, closing dampers), impeller deposit build-up, or bearing deterioration.
- A sudden rise means an acute fault — a winding problem, mechanical seizure, or a change in process conditions. Investigate immediately.
- Phase-to-phase imbalance above ±5%: check supply voltage balance and winding condition.
- Sustained running above nameplate FLA overheats the motor and will eventually trip or fail it.
- A rising current at fixed speed and damper position means the fan is doing more work than at commissioning — usually denser gas, a duty pushed beyond design, or deposits. Confirm gas density and duty against the nameplate before assuming a mechanical fault.

5.5 Stopping, and the emergency stop

- Close the inlet or outlet damper before stopping the motor — it prevents a sudden pressure drop and reduces the transient surge on the next restart.
- Stop via the normal control command and watch the fan decelerate. The impeller should slow smoothly; investigate any unusual vibration or noise during deceleration.
- Do not enter the fan area or open access doors until the impeller is completely at rest.
- Above 80 °C gas, run the controlled cool-down in §5.6 BEFORE stopping.

Stop at once, by emergency stop, on any of these

- A sudden severe increase in vibration — a shed deposit, a cracked blade, a loose component.
- Any new grinding, screeching or metallic knocking.
- Visible smoke, a burning smell, or sparks from motor or bearings.
- Bearing temperature reaching 100 °C at the outer ring — about 88 °C read on the housing. (The alarm band starts at 85 °C outer ring, about 73 °C on the housing.)
- A vibration-switch trip.
- Rubbing or scraping — impeller contact with the casing or inlet cone.
- Visible deformation or cracking of casing, ductwork or base structure.
- Any event that creates an immediate risk to people.

⚠ DANGER

After an emergency stop, apply LOTO before ANY physical investigation, and do not enter the fan area until the impeller has fully stopped. Note the time of the stop and any unusual noise during the coast-down — both help the diagnosis.

Restart after an emergency stop

- Do not restart without identifying and correcting the cause. Restarting on a fault worsens the damage.
- Under LOTO, inspect impeller, bearings, belt drive or coupling, foundation bolts, casing and duct connections, and the motor terminals and wiring for evidence of overheating.
- Correct the fault. On an ATEX fan, complete the earthing check and the ATEX safety checklist before restart.
- Remove LOTO and run the 5-minute test run as at commissioning before returning to full operation.

5.6 Operating limits

The nameplate and GA drawing give this fan's limits and take precedence over any general figure. As a family, Jitamitra centrifugal fans are built to per-axis maxima of 2,25,000 CMH, 2,000 mmWC static, 425 HP (about 317 kW) and 500 °C gas — individual-axis maxima, never reached simultaneously.

Parameter	Limit	Consequence of exceeding
Maximum flow	Nameplate / GA drawing	Motor overload; more noise and vibration; possible aerodynamic instability.
Maximum total pressure	Nameplate / GA drawing	Motor overload; casing distortion on fans not designed for closed-valve operation.
Maximum speed	Nameplate / GA drawing	Impeller stress exceedance and risk of catastrophic mechanical failure. Never exceed.
Maximum inlet gas temperature	Nameplate	Bearing damage, seal failure, impeller thermal distortion. On ATEX fans, temperature-class exceedance.
Minimum flow	Read the stall line off the fan's own curve — commonly 50–60% of rated flow on a backward-curved wheel	Surge and instability below minimum flow; severe vibration and possible impeller damage.
Zero flow (blocked outlet)	Not permitted beyond the moment needed to start and open the damper	Rapid heat build-up in the gas inside the casing; motor overload. On ATEX fans the surface can become an ignition source.
Gas density	Within ±10% of design, or as confirmed by Jitamitra	Pressure and power scale directly with density: 10% denser gas raises motor load by roughly 10% and can push a correctly selected motor over FLA.

5.7 Special operating conditions

Hot gas above 80 °C

NOTICE

Do not stop a hot fan suddenly. The motor stops but the casing and impeller stay hot; the shaft-mounted heat-shield cooling disc stops turning and no longer cools the inboard bearing, and residual heat soaks into the bearing and cooks the grease. Cool down first: reduce or close the hot-gas supply, keep the fan running until the inlet gas is below 80 °C, and only then stop. If a process emergency forces an immediate stop, direct compressed air or an external fan at the bearing housings for at least 15 minutes after the fan stops. The cooling disc works only while the shaft turns — below about 20 Hz on a VFD it does almost nothing.

Dusty or abrasive gas

- Track the vibration trend — rising vibration is the primary indicator of deposit accumulation.
- Do not cycle the fan on and off repeatedly on sticky or hygroscopic dust; every stop lets deposits settle and harden. Continuous running keeps the impeller cleaner.
- Abrasive service: check blade leading-edge erosion at every inspection and replace or resurface when erosion exceeds 20% of the original blade thickness.
- Radial (JRB) and radial-tip (JRT) wheels are the choice for heavy dust and abrasive service — open, self-cleaning blade forms that tolerate wear plates. Backward-curved and aerofoil wheels are more efficient but far more sensitive to deposits and erosion. If the airstream is dirtier than the datasheet assumed, confirm the correct family with Jitamitra rather than pushing an efficiency wheel into abrasive duty.

Surge and stall

- A centrifugal fan becomes aerodynamically unstable below roughly 50–60% of design flow — left of the peak-pressure point on the curve, where the slope reverses and flow cannot be held steady.
- Symptoms: a pulsating rhythmic whumping noise; high vibration fluctuating with the pulsation; fluctuating motor current; low flow at high pressure.
- Open the damper or blow-off valve to raise flow above the surge point. Never leave a fan running in surge — every blade takes violent alternating loads, which drives rapid impeller fatigue and can crack a blade or the backplate.
- If the process genuinely needs flow below the minimum, fit a minimum-flow bypass recirculating outlet to inlet.
- Parallel fans: two fans into a common duct can trap one left of its peak while the other carries the flow. Bring fans up and down one at a time, keep dampers coordinated, and throttle to rebalance rather than adding head. Contact Jitamitra for the combined-curve analysis before changing a parallel arrangement.

VFD operation

- Never command a speed inside a programmed skip band.
- Avoid continuous operation below 25 Hz unless the fan and motor are designed for it — motor cooling falls with speed and bearing lubrication may be marginal. Below 30 Hz, check bearing temperature more often.
- Do not exceed the programmed ramp rate; rapid cycles stress the motor windings and the VFD output stage.
- A VFD saves energy on the cube law — 80% speed draws roughly half the power — but the same physics sets a floor: it does not remove the minimum-flow limit, it must respect it. Do not remove or bypass a shaft-earthing ring.

5.8 Changing the duty safely

Method	How it moves the duty	Energy cost	Safe-operating rule
Damper (throttle)	Raises the system curve; the point rides up the fixed fan curve to lower flow	Highest — energy wasted across the damper	Never throttle below minimum flow (about 50–60% of rated); never hold the outlet fully closed except momentarily at start.
Inlet guide vanes	Pre-swirls the inlet air, reshaping the curve to lower flow at reduced power	Medium	Open and close gradually; keep the duty in the stable region.
VFD	Lowers speed, moving the whole fan curve down along the fixed system curve	Lowest — power falls with the cube of speed	Stay above the minimum stable speed, respect skip bands, observe low-speed cooling limits.

- Confirm the target flow is at or above the minimum stable flow before you start.
- Move the damper or vanes a few percent at a time and pause for the system to settle. After each step check that current stays at or below FLA and watch for surge symptoms.
- On a VFD, command the new speed and let it ramp at the programmed rate — do not override the ramp. Verify the new point is right of the fan-curve peak and outside every skip band.
- Record the final damper or vane position, or the set frequency, with the resulting current and vibration.
- Remember the system curve is parabolic — doubling flow quadruples the pressure the fan must overcome. Changing a filter, adding ductwork or opening a branch moves the system curve and shifts the operating point with no change to the fan. Re-check current and vibration after any such change.

NOTICE

Do not oversize the duty margin to be safe and then throttle it back. Chronic heavy throttling wastes power across the damper, drives the operating point toward the unstable region and shortens fan life. Where flow must be turned down often, use a VFD or IGV and select close to the true duty.

5.9 Restart after a shutdown of more than 2 weeks

- Inspect the bearing housings for moisture ingress or condensation. Rotate the impeller by hand and listen and feel for stiffness or roughness.
- If any condensation shows at the grease relief hole or the bearing seal, remove the cap, inspect and regrease before starting.
- Belt drives: check the belts for cracking, hardening or set, and re-check tension. Direct drives: check the coupling elements for cracking or deformation.
- Check nothing has entered the casing — insects, debris, condensed water — and that all guards are in place and access doors closed.
- Do a momentary 2–3 second start and re-confirm the rotation direction before returning to full operation.

NOTE Beyond 45 days this is not enough — run the full re-commissioning procedure in §2.5. Forty-five days is the point at which grease degradation in the housing becomes a real risk.

6 Maintenance

⚠ DANGER

Apply LOTO before any maintenance, inspection or adjustment. Confirm with a colleague that it is applied before you start work. Let the impeller come completely to rest, and let a hot fan cool below 50 °C. Impeller blades are sharp even when stationary — wear cut-resistant gloves for any impeller work.

6.1 The schedule

Shorten every interval for severe service — dusty, abrasive or high-temperature duty accelerates wear on every rotating component. Record every activity in the maintenance log (§6.8).

Interval	Task	By
Daily	Listen for unusual noise or a change in vibration	Operator
Daily	Look at the bearing housings for visible overheating or grease leakage	Operator
Daily	Check guards, flanges and flexible connections; confirm damper position	Operator
Weekly	Measure bearing temperature with a contact thermometer	Technician
Weekly	Actuate inlet guide vanes through full travel to prevent pivot seizure (if fitted)	Technician
Weekly	Verify earthing continuity — ATEX fans only	ATEX-trained
Monthly	Measure vibration at DE and NDE bearing housings	Technician
Monthly	Measure motor running current on all three phases	Technician
Monthly	Belt tension check and adjustment (belt drives)	Technician
Monthly	Damper and louvre pivot lubrication — multi-purpose grease (if fitted)	Technician
Per Table in §6.3	Bearing re-lubrication	Technician
Quarterly	Impeller cleaning — interval by application, see §6.4	Technician
Quarterly	Coupling alignment check (coupled fans)	Technician
Quarterly	Inspect flexible bellows for damage, tears or mould	Technician
Quarterly	Inspect inlet-cone clearance	Technician
Quarterly	Check foundation and hold-down bolts — re-torque if necessary	Technician
Quarterly	Motor insulation resistance — critical or high-humidity applications	Electrician
6-monthly	Belt pulley alignment check — laser or straight-edge	Technician
6-monthly	Coupling flexible-element inspection	Technician
6-monthly	Inspect silencer internal baffles for degradation or blockage	Technician
6-monthly	Motor insulation resistance — standard applications	Electrician
6-monthly	Actuator limit-switch position check and re-calibration	Technician
6-monthly	ATEX fans: measure and record impeller-to-casing and inlet-cone clearances	ATEX-trained
Annual	Full impeller inspection — erosion, corrosion, weld cracks, blade condition	Technician
Annual	Belt replacement if any belt is worn, cracked or glazed	Technician
Annual	Pulley groove inspection for wear	Technician
Annual	Fan casing inspection — internal and external, corrosion, paint, structure	Technician
Annual	Safety-label legibility check — replace any damaged or faded label, ordered by the JST number printed on it	Technician
3–5 years, or 25,000–30,000 running hours	MAJOR OVERHAUL — full disassembly, bearing replacement, impeller rebalance, casing inspection, belt and coupling replacement, reassembly and re-commissioning	Jitamitra / specialist

6.2 Grease — what to use

Grade	Product	Where
Standard	Shell Gadus S2 V100 2 — NLGI Grade 2, lithium base, channelling type	All standard fans. Bearing operating temperature to 100 °C.
High-temperature	Shell Gadus S3 T100 2 (−20 to +160 °C), or IndianOil Servogem Super HT (−10 to +180 °C) — NLGI 2, lithium complex	High-temperature BUILDS only. A high-temperature fan is a package — seal, bearing and grease selected together — not a grease substitution: a standard contact seal binds at 100 °C however good the grease is. The GA drawing states the seal, bearing and grease.
NOT PERMITTED	EP (extreme-pressure) greases; moly (MoS_2) greases; any multi-purpose grease not listed above	EP and moly additives are incompatible with the bearing steel chemistry at elevated temperature and cause accelerated wear.

NOTICE

Never mix grease types in one housing. Mixing incompatible greases causes saponification — the grease hardens into a soap-like compound that lubricates nothing and the bearing fails. To change type, purge the old grease completely first.

6.3 Re-lubrication — interval and quantity

Take the interval from the shaft diameter and the running speed. Intervals are RUNNING HOURS. The quantity is what to ADD at each re-lubrication — not the housing fill, which is one third of the free internal volume and never more.

Shaft dia.	1000 rev/min	1500	2000	2500	3000–3500	Qty per shot
24–40 mm	240 h	240 h	240 h	160 h	160 h	~10 g
42–65 mm	240 h	240 h	160 h	160 h	160 h	~20 g
70–90 mm	240 h	160 h	160 h	120 h	120 h	~50 g

Shaft dia.	1000 rev/min	1500	2000	2500	3000–3500	Qty per shot
100–115 mm	120 h	120 h	80 h	—	—	~110 g
130–150 mm	120 h	80 h	—	—	—	~200 g

NOTE A dash means the speed is outside the recommended envelope for that shaft diameter — do not run it there without consulting Jitamitra. Where the bearing designation is known from the GA drawing or the bearing datasheet, the better quantity is the bearing's own: Gp = 0.005 × D × B grams, with D the bearing outside diameter and B its width in mm. For the SKF spherical rollers on this range that gives 10 g for a 22210 EK, 15 g for 22212, 19 g for 22214, 23 g for 22216, 32 g for 22218, 41 g for 22220, 53 g for 22222, 62 g for 22224, 74 g for 22226 and 22 g for a 22310 EK.

Correct the interval for the conditions your fan actually runs in

Condition	Correction	Why
Every 15 °C the bearing runs ABOVE 70 °C at the outer ring	Halve	Grease ages faster with temperature — the correction that matters most on a fan.
Every 15 °C BELOW 70 °C at the outer ring	Double, no more than twice in total	Slower ageing at lower temperature.
Vertical shaft	Halve	Grease drains away from the bearing under gravity.
High vibration or shock loading	Reduce	Grease slumps and churns instead of staying in the track.
Heavy contamination, dust or moisture ingress	Reduce	Contaminant is carried into the rolling contact — purge more often, smaller quantities.
Very heavy load, above about 15% of the bearing's dynamic capacity	Reduce	Shorter grease life under high contact stress.
Dusty environment, ambient above 40 °C, or above 3000 rev/min on a large shaft	Reduce a further 30–50%	Compound severity.
Self-aligning BALL bearing instead of spherical roller	Longer interval permitted	The bearing-type factor is half that of a roller bearing. Apply the correction — do not simply double the interval.

- Corrections MULTIPLY. A bearing on a vertical shaft running at 85 °C takes a QUARTER of the tabled interval, not half.
- Where the corrected interval is shorter than about six months, top up with the tabled quantity. Where it is longer than six months, RENEW the fill completely instead — clean out and repack to one third — because grease that has sat that long has aged whether the fan ran or not.
- Renew the fill completely, rather than topping up, after several top-ups, when the fan returns from storage, and after any bearing change.
- These corrections change WHEN you grease, never HOW MUCH.
- A grease relief hole blocked with old grease turns every re-lubrication into an overfill. Clear it before you pump.

The procedure

⚠ WARNING

Grease with the fan RUNNING at normal speed — that is how you see the old grease expelled. Use a grease gun with a flexible or extended nozzle and keep hands well clear of the rotating shaft and belt drive. Grease-resistant gloves and eye protection.

1. Inject fresh grease SLOWLY through the nipple on the plummer-block housing, using a hand-operated gun with measured strokes. Never a high-pressure pneumatic gun at high flow — it damages the seal and forces in too much too fast, causing the very over-greasing you are trying to avoid.
2. Inject only the tabled quantity. Do not exceed it.
3. Watch the relief hole on the opposite side. Old grease beginning to be expelled confirms the fresh grease has displaced it.
4. Stop injecting as soon as old grease is expelled.
5. Expect the temperature to rise for 15–30 minutes as the fresh grease redistributes. If it is still rising after an hour, the housing is over-filled — let the fan purge the excess naturally rather than digging grease out by hand.
6. Record the date and quantity in the maintenance log.

6.4 Impeller

Deposit build-up is the most common maintenance-related cause of vibration. As little as 50–100 g on one blade can push vibration past safe limits. The monthly vibration trend OVERRIDES the calendar: if vibration is trending up, clean now.

Application	Interval	Clean before the scheduled date if
Clean air / HVAC — no dust	12 months	Vibration up more than 1 mm/s above baseline; visible deposits through the inspection door.
Light dust — general industrial ventilation	6 months	Vibration up more than 0.5 mm/s above baseline; any visible build-up on blades or hub.
Moderate dust — woodworking, light material handling	3 months	Any upward vibration trend; visible deposits over 2 mm thick.
Heavy dust — cement, grain, heavy industrial	6 weeks	Any vibration rise above the commissioning baseline. Inspect monthly.
Fibrous — cotton, fibreglass, textile	4–6 weeks	Fibrous wrapping seen on blade roots or hub. Inspect monthly.
Sticky or hygroscopic — food, chemicals	Monthly	Any balance change observed. Do not let deposits harden.
Abrasive — sand, fly ash, coal dust	3 months	Any vibration rise. Inspect for leading-edge erosion at the same time.
Oil mist or wet gas	3 months	Oily deposits on blades. Check for moisture in the bearing housings.

Cleaning

- LOTO applied, fan cooled to ambient, cut-resistant gloves on.
- Remove loose deposits with a stiff plastic or nylon brush. Never a steel wire brush on stainless or coated impellers. For abrasive work use a plastic scraper or nylon pad — never steel tools on painted or coated impellers.
- For hard baked-on deposits, soak with a solvent or water compatible with the impeller material and coating, allow 15–30 minutes to soften, then scrub.
- Never direct a high-pressure jet at the bearings or bearing housings — water ingress contaminates the grease and destroys the bearing.
- Inspect every blade after cleaning. If significant asymmetric material came off, re-balance before restarting.
- Verify the interior is clear of tools and rags, close and secure every door and fastener, then remove LOTO.
- Record cleaning date, deposit type and amount, impeller condition and any damage found.

Inspection — at every clean and at the annual inspection

- Blade leading edges: erosion, pitting, thinning. Photograph and compare against previous records. Resurface or replace when erosion exceeds 20% of original blade thickness.
- Blade roots and hub-disc welds: inspect for cracks under strong light.
- Taper lock or hub fastening: tight, no movement of the impeller on the shaft, no fretting marks at the hub-shaft interface.
- Coating or paint: degradation, blistering or loss. Coating loss in corrosive or abrasive service requires re-coating before return to service. Mask every label and plate before repainting, and replace any label lost by its JST number.
- Balance weights: factory-fitted weights still present and secure. A missing balance weight is a common source of vibration after cleaning.
- Abrasive duties additionally — inspect the casing scroll cut-off (tongue) and the back-plate wear region for grooving and metal loss, and check hardfacing and replaceable liners against their wear allowance. Replace a liner before the parent metal is exposed: replacing a bolted-in liner is a planned job, repairing an eroded-through casing is not. Uneven back-plate wear means the impeller is running eccentric — investigate before it becomes a crack. Record measured wear so the erosion rate can be trended.

⚠ WARNING

Any crack in an impeller blade, a blade-root weld or the hub disc requires immediate shutdown and assessment by Jitamitra engineering. Do not weld or repair impeller cracks in the field without engineering approval. An impeller that fails at speed destroys the casing and can kill.

Re-balancing

Re-verify the dynamic balance whenever the impeller has been removed and refitted (even with no other work — taper-lock re-seating alters balance), whenever significant asymmetric material was removed in cleaning, after any weld repair, after a blade is replaced or repaired, and after a shaft change. Standard Jitamitra fans balance to G 6.3; API 673 fans to G 2.5. Field balancing with calibrated portable equipment is acceptable below 1000 mm impeller diameter, by a trained technician.

- Never chip, grind or drill a Jitamitra impeller to balance it in the field. Add clip or welded weights where the balancer specifies, and re-verify the grade.
- Balance the impeller on its own shaft wherever possible — a mandrel adds its own eccentricity and a loose fit gives a false reading.
- Field balancing trims an assembled fan that meets the works grade but not the site start-up level once drive and motor are on it. It does not correct a bent shaft, a loose hub or a cracked blade.

6.5 Belts, couplings and accessories

Belts

- Monthly: measure the span, apply the deflection force from §3.5 at mid-span with a spring balance, and confirm 16 mm deflection per metre of span. More deflection means too loose — move the motor away and lock the slide bolts. Less means too tight — reduce, and re-check bearing temperature after running, because over-tension overheats bearings. Re-check alignment after any tension change.
- Every 6 months: pulley alignment, laser or straight-edge — maximum 3 mm per metre of centre distance.
- Replace ALL belts of a matched set together, same manufacturer, same length code. Mismatched lengths load unevenly and the shorter belt wears out fast. Fit by hand by reducing the centre distance — never lever them on. Re-check tension after 1 hour of running.
- Annually, with the belts off: inspect the pulley grooves. A worn groove has a smooth polished bottom instead of a distinct V. Replace the pulley if the groove-bottom contact area exceeds 10% of the groove depth (the belt is bottoming), or if there is any crack in a spoke or hub.

Couplings

- Quarterly, and after any work that moved the motor or fan shaft: alignment check, laser or dial indicator. Offset = rim TIR ÷ 2; angularity = face TIR ÷ the dial-reading diameter — the face reading is not halved. Both within the §3.6 table, and never outside the coupling maker's limits. Correct by shimming the motor — never the fan.
- Every 6 months: inspect the flexible element for cracking, splitting, hardening or compression set. Replace if any crack is visible, if it has compressed more than 20% of its original thickness, or if the material has gone hard or brittle. Replace with OEM elements of the same shore hardness — harder transmits more vibration, softer may not carry the starting torque.
- Gear couplings: check quarterly for lubricant leakage and re-lubricate on the coupling maker's schedule. Spring-grid couplings: re-grease on their schedule and check the grid for wear or fracture at each lubrication.

Accessories

- Inlet guide vanes: actuate through full travel weekly to stop pivot seizure. At annual overhaul inspect linkage pins and vane-pivot bushes for wear and apply an anti-seize spray. Replace any pin or bush with visible wear or play — loose linkage gives unequal blade positions, uneven flow, noise and vibration. Do not apply heavy grease to blade pivots; it attracts dust and causes seizure.
- Dampers and louvres: 2–3 shots of multi-purpose grease to each pivot bearing monthly; verify full-open and full-closed quarterly; inspect blades annually for deformation, corrosion or erosion — a deformed blade will not close fully and leaks past the damper.
- Flexible bellows: quarterly, inspect for tears, holes, abrasion, mould, deformation or material sticking, inside where accessible. Replace immediately on any damage. Never paint over a bellow — paint bridges the fabric and cracks with movement — and never tape a repair.

- Inlet filters: clean on the service schedule. Rinse from the CLEAN side, never with a high-pressure jet (which drives particles into the media and blocks it permanently), and dry completely before refitting — wet media restricts airflow more than a dirty filter. Replace a damaged element, or one whose pressure drop stays high after cleaning.
- Silencers: every 6 months inspect the baffle or splitter packs through the access flanges for degraded material, blockage or displacement. Loose baffle material reaches the impeller and unbalances it.
- Actuators: every 6 months re-verify both limit-switch positions and the manual override; annually inspect electrical connections and cable glands for corrosion and tighten the terminals.

6.6 Motor

- Follow the motor manufacturer's manual for anything motor-specific. Greaseable bearings: lubricate at the interval, and with the grease and quantity, the motor maker specifies. Sealed bearings need no re-lubrication and are replaced as a unit at end of life.
- Insulation resistance (500 V DC megger): every 6 months for standard applications, quarterly for critical or high-humidity ones. Minimum 1 MΩ per kV of rated voltage, absolute minimum 1 MΩ. The TREND matters more than any single reading — a 50% fall between successive tests means deterioration; plan an overhaul or replacement. Record every reading with its date.
- Monthly: check the cooling-air inlet grille is clear. Annually, or sooner on an elevated temperature, clean the cooling fins with dry compressed air along the fin direction — not water. On a TEFC motor make sure the cooling-fan cover at the non-drive end is undamaged and unblocked.
- A VFD-driven motor above 11 kW must have an insulated NDE bearing or a shaft-earthing ring. Uninsulated NDE bearings on VFD drives suffer bearing currents and need more frequent inspection.

⚠ WARNING

Isolate and lock out the motor, and discharge the windings to earth before AND after a megger test — the test applies 500 V DC and the windings hold a dangerous charge afterwards. Qualified electrician only.

6.7 Casing, structure and fasteners

- Annually, internally: corrosion, coating loss, metal thinning, debris, and unusual wear on the back plate — which means the impeller is running eccentric.
- Annually, externally: rust, paint damage and cracking at weld seams, particularly at duct-flange welds and casing reinforcement ribs.
- Base frame: cracking at weld joints, corrosion of structural members, integrity of the hold-down bolt holes. Re-torque the hold-down bolts.
- Foundation: check the grout. Cracked grout means foundation movement or inadequate rigidity — re-grout.
- Tighten any loose bolt found — casing bolts, bearing-cap bolts, guard fasteners, duct-flange bolts.

Bolt torque — three different cases, not interchangeable

NOTICE

Which torque applies depends on what the bolt clamps. A bearing-housing cap bolt tightened to a holding-down value will distort the bore and can crack the cap. Where the GA drawing or a component datasheet states a torque, that value governs over every table here. Never apply any of these values to ordinary commercial-grade (4.6) fasteners.

Bolt size	A — Holding-down (attachment) bolts, class 8.8, N·m	B — Bearing-housing cap and cover bolts, N·m	C — Structural steel-to-steel friction grip, 8.8 lubricated, N·m
M8	—	Cover bolt 24	25
M10	50	Cover bolt 47	51
M12	80	—	91
M16	200	—	227
M20	385	—	441
M24	665	Cap bolt 350 — roughly half the holding-down value	763
M30	1310	Cap bolt 400	1515
M36	—	Cap bolt 600	2645

- Column A is the bearing-housing manufacturer's published attachment-bolt torque and is the working number for the bolts that hold the fan down. Use it unless the GA drawing says otherwise.
- Column B: read the cap-bolt torque for YOUR housing from the housing maker's catalogue against the designation on the GA drawing. Small end-cover fixings M5 / M6 are 6 and 10 N·m — hand torque wrench only.
- Column C is a designed friction-grip preload between STEEL members. Do not use it for a bolt threaded into or clamping cast iron, and never on a bought-out component.
- Clean the threads and nut face, apply a light film of anti-seize or oil, and use the lubricated values. Applying a DRY-column value to a lubricated thread produces roughly 1.7 times the intended tension and can yield or snap the bolt.
- A rusty or damaged thread will not reach the target tension at any sensible torque. Clean and lubricate it, or replace the fastener. Never raise the torque to compensate for corrosion.
- Tighten in at least three stages — about 30%, 70%, then 100% — working diagonally across the pattern, then make a final pass at full value in the same order.
- Re-check holding-down and pedestal bolts after the first 24 hours of running, at every quarterly check and at overhaul. A loosening holding-down bolt is a common root cause of rising vibration.
- There is NO tightening torque for an adapter-sleeve lock nut — that bearing is set by clearance reduction, measured with a feeler gauge to the bearing maker's data.
- Anti-seize: nickel-based on stainless, nickel alloys and high-temperature joints (copper-free); copper-based on carbon steel, chrome steel and brass. Apply sparingly to the thread flanks.

6.8 The maintenance log

Every activity in this chapter goes in the log, which stays at the fan for its service life. It is how you catch a missed interval, how a trend becomes visible, the evidence a warranty claim is assessed on, and what an ATEX, API 673 or quality audit will ask for.

Record for each entry	Date | Task performed | Findings | Parts replaced (with part number or description) | Grease quantity added | Belt-tension reading | Vibration reading | Technician name and signature

NOTE ATEX fans additionally: record the impeller-to-casing and inlet-cone clearances at every impeller inspection and at least every 6 months, confirm earth-bonding continuity (1 Ω maximum) after any work that disturbed a joint, and check the shaft seal and casing joints for gas-tightness on a flammable gas. Retain ATEX maintenance records for a minimum of 10 years.

7 Every limit on one page

The numeric limits this manual sets, for the engineer who needs the number now. Values on your fan's own GA drawing, nameplate or test certificate always take precedence over a range-wide figure here.

Parameter	Limit
Bearing temperature — normal / elevated / alarm / stop	≤ 70 · 70–85 · 85–100 · > 100 °C at the OUTER RING. The housing reads 10–15 °C lower: ≈ 58 · 73 · 88 °C.
Relubrication interval correction	Halve for every 15 °C above 70 °C; −30 to −50% for dust, ambient above 40 °C, or above 3000 rev/min.
Grease quantity per shot; housing fill	Gp = 0.005 × D × B grams; housing fill ONE THIRD of the free volume.
Grease	Shell Gadus S2 V100 2 to a 100 °C bearing; Gadus S3 T100 2 on a high-temperature build (agree with Jitamitra). No EP, no moly.
Vibration — site, BV-3 rigid: start-up / alarm / shutdown	4.5 / 7.1 / 9.0 mm/s r.m.s.
Vibration — site, BV-3 flexible	6.3 / 11.8 / 12.5 mm/s r.m.s.
Vibration — site, BV-4 rigid / flexible	2.8 / 4.5 / 7.1 · 4.5 / 7.1 / 11.2 mm/s r.m.s.
Vibration — works test on the assembled fan, BV-3	2.8 rigid / 3.5 flexible mm/s r.m.s. (filter-in at fan speed).
Balance grade	G 6.3 for BV-3; G 2.5 for BV-4 and API 673.
Inlet-cone / impeller clearance	0.5–1.5% of impeller diameter, per the GA drawing. ATEX floor: 2 mm AND 0.5% of contact diameter, need not exceed 13 mm.
Earthing	0.1 Ω works test; 1 Ω site bond; ATEX — every conductive part bonded, 1 Ω.
Motor insulation resistance	≥ 2 MΩ works test; ≥ 1 MΩ per kV in service.
Motor current — phase imbalance	Above 5% between phases: investigate.
Speed and current at commissioning	Speed within ±2%, current within ±5% of design. Beyond ±10%, call Jitamitra.
Belt tension / alignment	Deflection 16 mm per metre of span; pulley misalignment maximum 3 mm per metre of centre distance.
Coupling alignment — offset / angularity	Up to 1500 rpm: Excellent 0.05 / 0.04, Acceptable 0.09 / 0.06. Above 1500 rpm: Excellent 0.03 / 0.02, Acceptable 0.05 / 0.03 (mm / mm per 100 mm). Never outside the coupling maker's limits.
Blade erosion limit	Resurface or replace above 20% of original blade thickness.
Storage	Short-term ≤ 45 days; long-term > 45 days — full grease pack, impeller rotated fortnightly, belts slack.
Transit tilt; damage notice	≤ 15° from horizontal; written notice within 48 hours of receipt.
Sling angle	≥ 45° to the horizontal; spreader beam above 800 mm impeller; gear rated ≥ 2× fan weight.
Duct support and bellows	Independent support within 500 mm of the fan flange; flexible bellows at BOTH flanges; 3 duct diameters straight inlet run, 2 diameters outlet.
Minimum flow	Read the stall line from the fan curve — commonly 50–60% of rated flow on a backward-curved wheel.
Gas density	Within ±10% of design.
Standard air for a rating	1.2 kg/m³ at 20 °C, 760 mm Hg.
ATEX temperature class	T3 = 200 °C; T4 = 135 °C; T5 = 100 °C. ATEX records retained 10 years.
Noise — action level at the working position	85 dB(A): hearing protection.
Major overhaul	Every 3–5 years or 25,000–30,000 running hours.
Warranty	12 months from commissioning or 18 months from invoice, whichever expires first. Not commissioned in writing → the invoice limb alone. Notify a defect within 7 days of discovery.
Spares	Available 10 years from supply; ex-stock dispatched within 2 working days.
Capability envelope (per-axis maxima, never simultaneous)	2,25,000 CMH · 2,000 mmWC · 425 HP (317 kW) · 500 °C.

When to call Jitamitra

Situation	What to do
Any crack in an impeller blade, a blade-root weld or the hub disc	Stop the fan, apply LOTO, do not weld or repair in the field. Jitamitra engineering must assess the impeller before it turns again.
Vibration above 9.0 mm/s r.m.s. (rigid) or 12.5 (flexible) that you cannot trace	Stop the fan. Do not restart until the cause is found and corrected.
Bearing above 100 °C at the outer ring (about 88 °C read on the housing)	Stop immediately, apply LOTO, inspect the bearing and grease before restart.
The fan will not reach its start-up vibration level at commissioning	Do not hand it over. It has an installation fault — call us before accepting it.
Transit damage, shortage, or a tripped shock or tilt indicator	Photograph everything, do not sign a clean delivery note, notify Jitamitra and the carrier in writing within 48 hours.
Duty, gas density, temperature or speed has changed from the datasheet	Confirm the revised duty with us before running continuously.

Ordering spares and service

Quote the fan serial number and the project / tag number from the nameplate on every enquiry, order and service call — together they identify your fan uniquely and let us read the build back off our records. Have the GA drawing to hand. Spares are available for 10 years from supply; ex-stock items are dispatched within two working days.

Spares, service, breakdowns and site attendance	sales@jitamitrablowers.com
Help Desk (phone / WhatsApp)	+91 8329172325
Web	www.jitamitrablowers.com

NOTE Warranty — 12 months from the commissioning date recorded on the signed Commissioning Report, or 18 months from the date of Jitamitra's tax invoice, whichever expires first. Where no commissioning date is established in writing, the invoice limb applies alone. Notify a defect within 7 days of discovering it. Keep the commissioning record and the maintenance log — a warranty claim is assessed on that evidence.

THE FULL MANUAL This is the condensed site issue. Jitamitra also holds the Comprehensive Fan Manual JEE-MAN-001 — the full engineering handbook behind these instructions, covering fan families, troubleshooting, repair and overhaul, decommissioning, spares and certification. Ask your Jitamitra contact for the sections your team needs.