

Installation, Operation & Maintenance Instructions



Halifax Fan Limited is registered to BS EN ISO 9001

Halifax Fans are designed with Quality and Safety in mind. In addition, they are:

Tested and Performance Rated to ISO 13348:2007 : Type D.

Balanced to within the limits of:
BS ISO 21940-11:2016, Grade G6.3 or better.

Vibration levels conform to BS 848-7:2003/ BS ISO 14694:2003



Machinery Directive 2006/42/EC
EMC Directive 2014/30/EU
ATEX Directive 2014/34/EU
Eco-Design Directive 2009/125/EC



GENERAL NOTES

This document should be read in full, by the appropriate personnel prior to installation/commissioning.

It is assumed that the fan is installed and commissioned upon receipt. If this is not the case and the fan is put into storage, ensure that section 8 is adhered to with respect to the fan storage.

Please be aware that your fan is bespoke and therefore there will be sections in this manual which are not specifically applicable to your fan.

DISCLAIMER

Every care has been taken in the preparation of the instructions and information given on the following pages. However, it is the responsibility of the company installing the fan to ensure the system complies with the relevant national and international laws.

Halifax Fan Ltd, Installation, Operation & Maintenance Manual

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1. Contact Details

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Note: To assist in handling of any request for information or assistance, prior to contacting Halifax Fan, please obtain the fan serial number and fan type from the fan nameplate.



HALIFAX FAN UK CONTACT NUMBER: +44 1484 475 123



HALIFAX FAN CHINA CONTACT NUMBER: +86 755 8149 0039

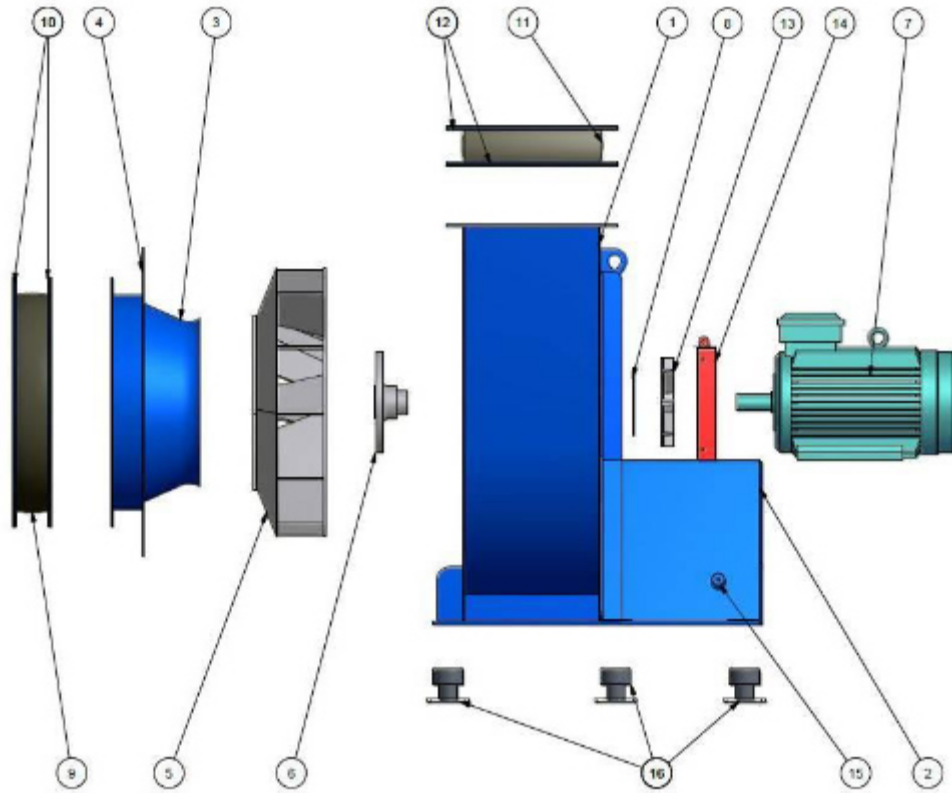


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HALIFAX FAN THAILAND CONTACT NUMBER: +66 2744 3193 – 4

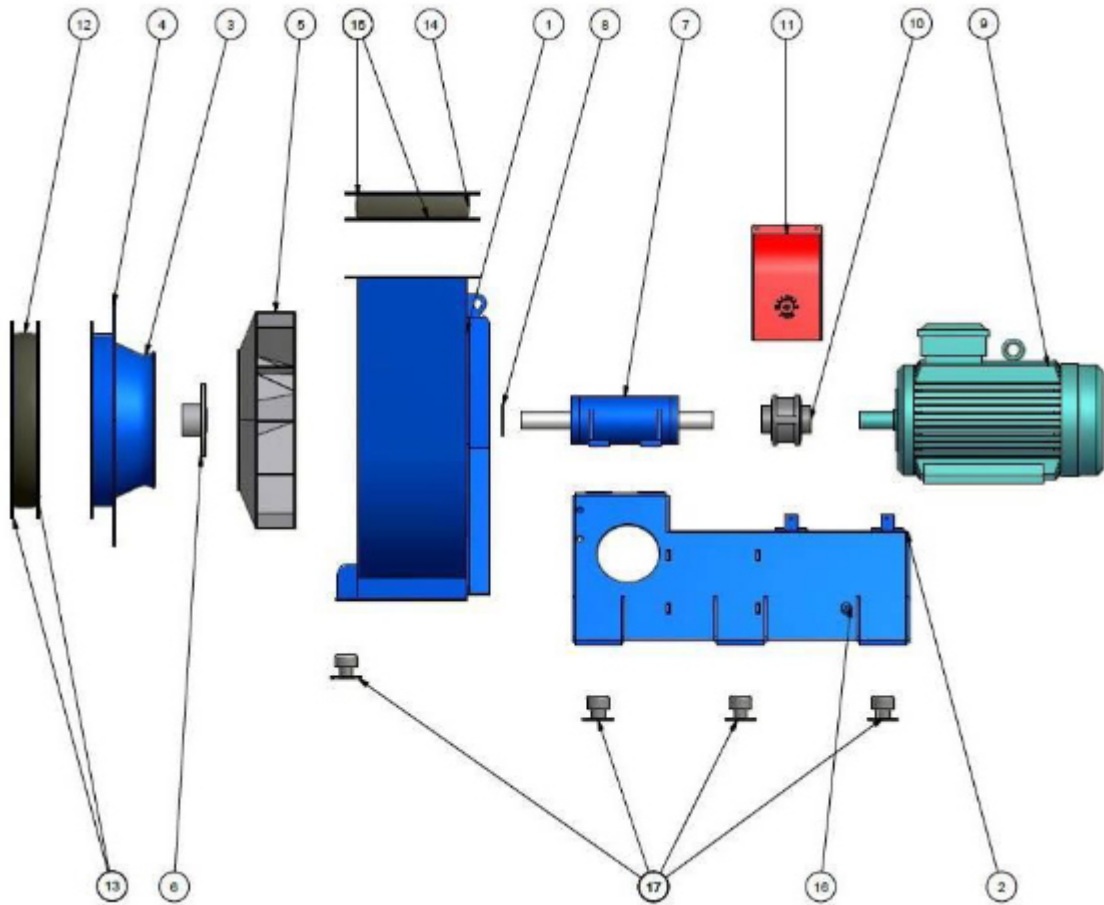
2. Typical Arrangements 2.1 Direct Drive



ARRANGEMENT 3 FAN	
PART	DESCRIPTION
1	Fan Casing
2	Fan Pedestal
3	Inlet Cone
4	Front Plate
5	Impeller
6	Impeller Centre Boss
7	Motor

9	Inlet Flexible Connection (Opt.)
10	Inlet Flexible Backing Flange (Opt.)
11	Outlet Flexible Connection (Opt.)
12	Outlet Flexible Backing Flange (Opt.)
13	Cooling Disc (Opt.)
14	Cooling Disc Guard (Opt.)
15	Earthing Boss (Opt.)
16	AV Mount (Opt.)

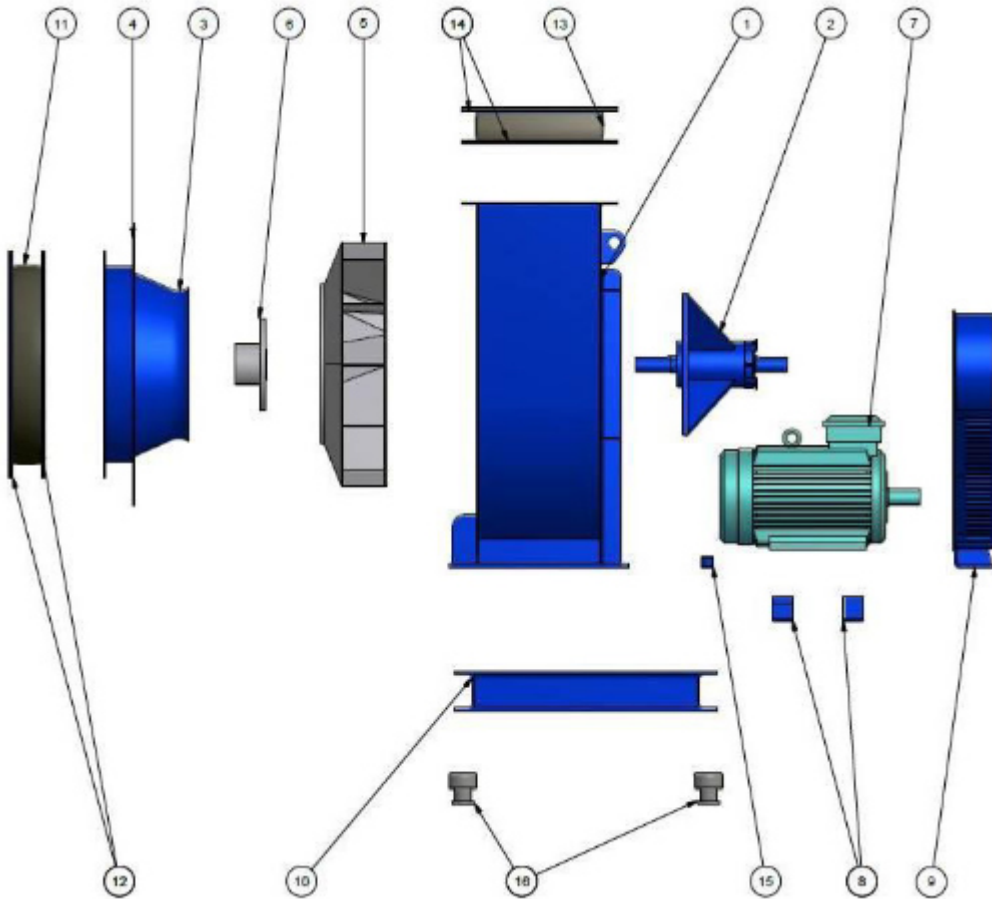
2.2 Direct In-Line



ARRANGEMENT 2A/3 FAN	
PART	DESCRIPTION
1	Fan Casing
2	Fan Stool
3	Inlet Cone
4	Front Plate
5	Impeller
6	Impeller Centre Boss
7	M Bearing Unit
8	Shaft Seal
9	Motor

10	Flexible Coupling
11	Coupling Guard
12	Inlet Flexible Connection (Opt.)
13	Inlet Flexible Backing Flange (Opt.)
14	Outlet Flexible Connection (Opt.)
15	Outlet Flexible Backing Flange (Opt.)
16	Earthing Boss (Opt.)
17	AV Mount (Opt.)

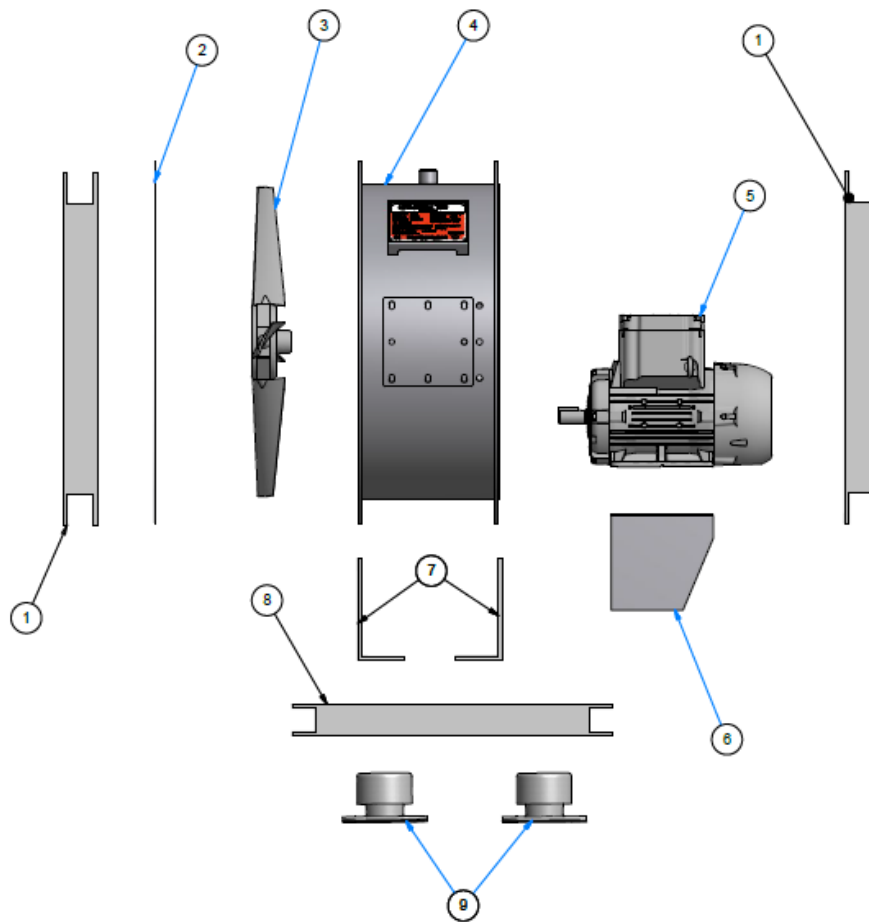
2.3 Belt Driven



ARRANGEMENT 1 FAN	
PART	DESCRIPTION
1	Fan Casing
2	V Bearing Unit
3	Inlet Cone
4	Front Plate
5	Impeller
6	Impeller Centre Boss
7	Motor
8	Motor Slide Rails

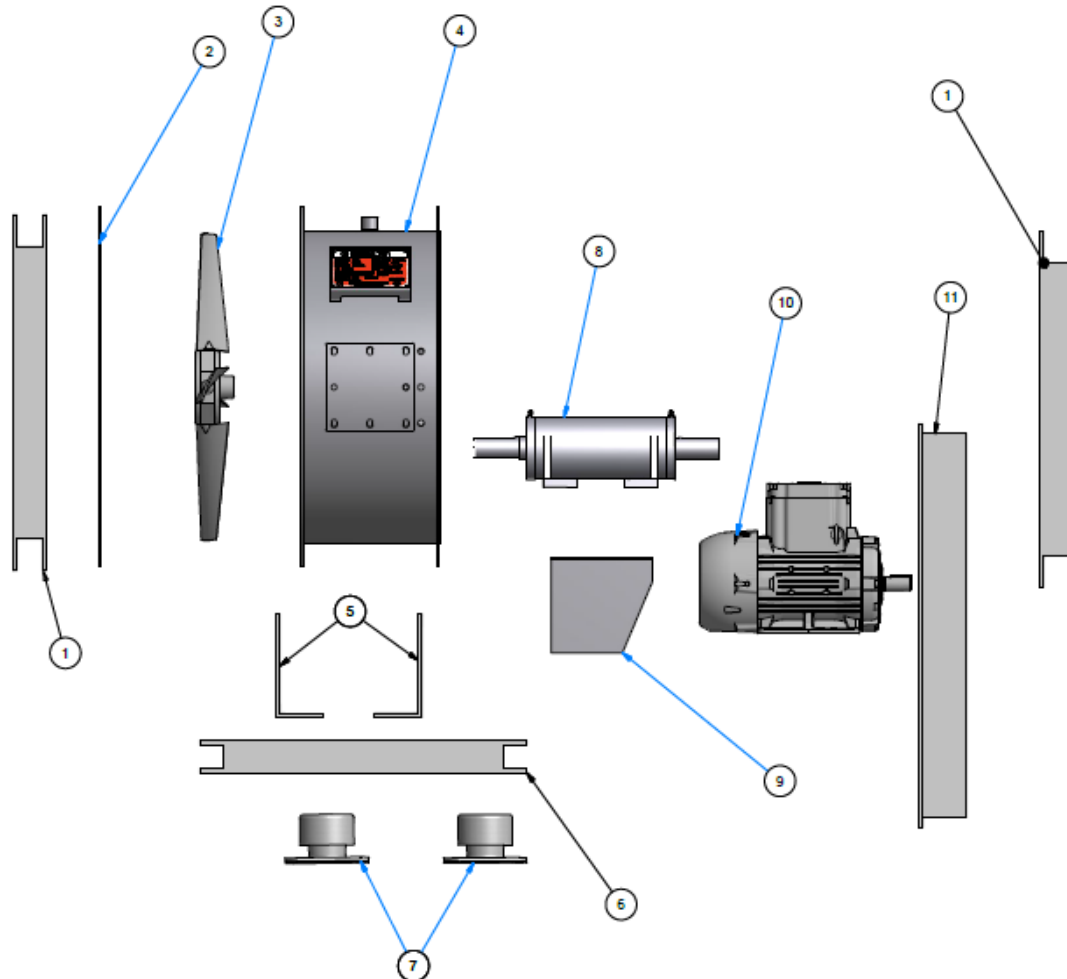
9	V Belt Drive Assembly & Guard
10	Base Frame
11	Inlet Flexible Connection (Opt.)
12	Inlet Flexible Backing Flange (Opt.)
13	Outlet Flexible Connection (Opt.)
14	Outlet Flexible Backing Flange (Opt.)
15	Earthing Boss (Opt.)
16	AV Mount (Opt.)

2.4 Direct Drive Axial Flow Fan



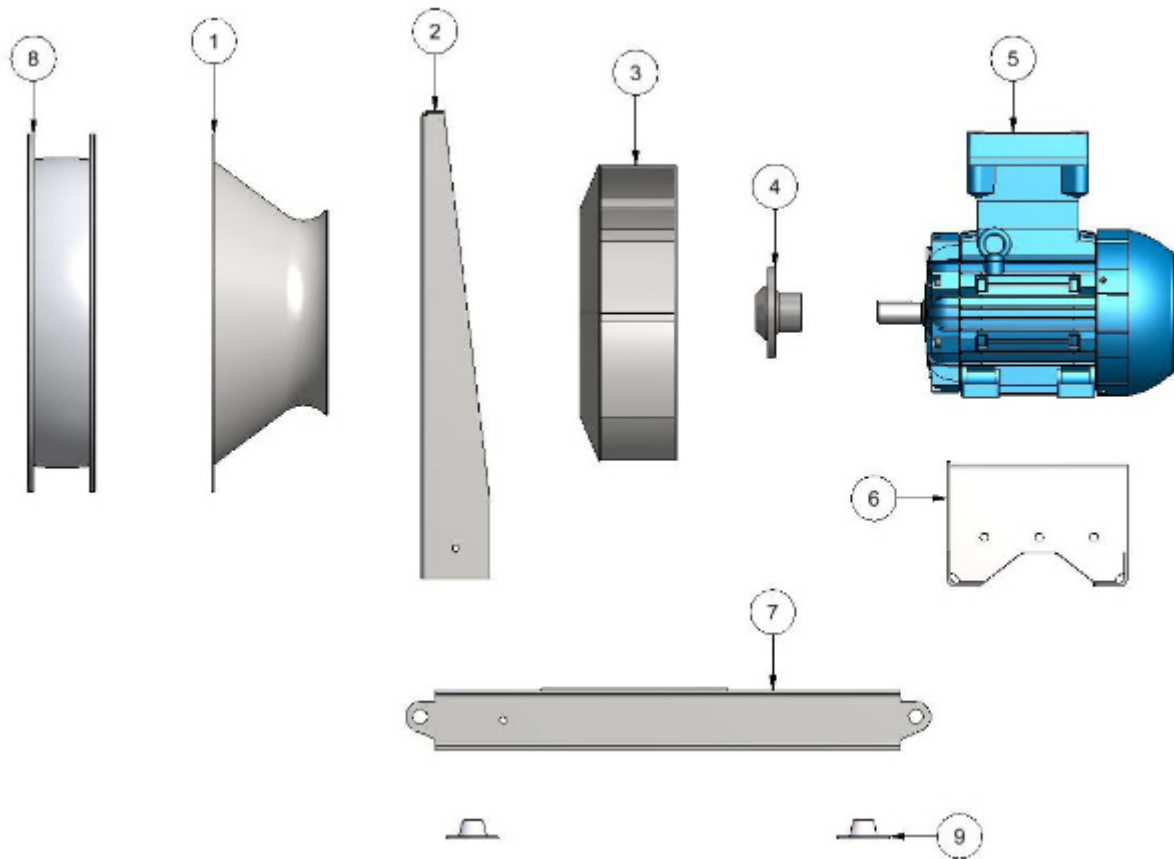
Arrangement 3	
PART	DESCRIPTION
1	Inlet and Outer Flexibles
2	Inlet Guard
3	Impeller
4	Fan Case
5	Motor
6	Fan Stool
7	Brackets
8	Baseframe
9	AV Mounts

2.5 Belt Driven Axial Flow Fan



Arrangement 2A	
PART	DESCRIPTION
1	Inlet and Outlet Flexibles
2	Inlet Guard
3	Impeller
4	Fan Case
5	Brackets
6	Baseframe
7	AV Mounts
8	Bearing Housing
9	Fan Stool
10	Motor
11	V Belt Drive Assembly & Guard
12	Outlet Flexible

2.6 Direct Drive Plenum Fan



ARRANGEMENT 3PL FAN	
PART	DESCRIPTION
1	Inlet Cone
2	Inlet Cone Mounting Frame
3	Impeller
4	Centre Boss
5	Motor
6	Motor Pedestal
7	Base Frame
8	Inlet Flexible Connection (Opt.)
9	Anti-Vibration Mounts (Opt.)

3. Unpacking & Lifting Advice

3.1 Unpacking

Fans are typically delivered shrink wrapped to a pallet. The fan is not bolted to the pallet. Removal of the shrink will require the fan being removed from the pallet.

Unpacking should be carried out when unpacking ensure you check for boxed loose items including anti vibration mounts, flexible connections and any other ancillaries. If you are missing any ancillaries please notify us immediately.

3.2 Damaged Goods

Check for any damage which may have occurred during transit straight after unpacking the fan. Please report any damage immediately.

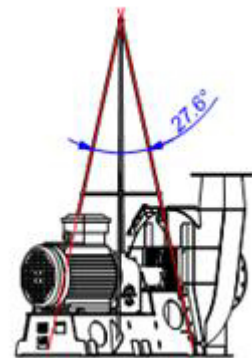
3.3 Lifting

Lifting should only be carried out by a competent person who has adequate training and is using tested and certified equipment. Access under the load should be restricted and lifting equipment such as chain blocks and pulleys should be attached to structural beams and other points which have been assessed for their load bearing capacity.

Ensure that the shrink wrap has been removed and identify the main lifting lug points, the points provided are suitable for lifting with cranes. Where multiple lifting lugs exist on a fan, ones which are marked are for lifting the fan assembly only. Ensure proper lifting equipment is used and that the size of hooks used are suitable for the lifting lugs. Hooks should be attached to the lifting lugs and safe connection between fan and hoisting device is to be established before commencing lifting. Pay attention to the centre of gravity, do not tilt the load. Do not step under the load. Final lowering of the fan is to be carried out with the lowest possible speed. Shocks, shaking or dropping may lead to imbalances and deformation or even damage to the bearings.

Where multiple lifting lugs exist, ones which are marked are for lifting the fan assembly only

Four point lift



4. Installation & Commissioning

4.1 General Installation Instructions

- Check the fan for any damage which may have occurred during positioning.
- If the fan has been on a prolonged standstill or stored, ensure the requirements of section 8 are met.
- Ensure that the foundations on which the fan is to be fitted has been properly prepared, that they are level and is sufficiently strong/rigid for the fan.
- Place the fan in position and check for clearances at the points of fixing. Shim if necessary with a piece of steel plate or sheet steel so that any gap is no more than 1mm.
- All anti-vibration mounts
When installing the machine, raise the machine and position the mounts under the base as per the relevant layout drawing.
- Spring anti-vibration mount adjustment
Spring AV mounts are adjustable. For these fit the set screw through clearance hole in machine base & insert into mount finger tight. Adjust the set screw accordingly to bring the spring isolator to its normal working height, then check that the machine is level adjust accordingly, when level tighten the locknut. (Drawings and complete instruction are available on request)
- Secure the fan in position using suitable fasteners for your chosen foundation/structure and rated for a minimum of twice (2x) fan net weight. It is important to use all the base holes provided and ensure bolts are tightened in accordance with the bolt manufacturer's instructions
- Check that the impeller and drive assembly rotate freely. For belt driven fans see section 4.4, for direct in line fans see section 4.5.
- ATEX Fans see section 6 and ensure the ATEX installation check sheet, Appendix A is completed and returned.
- Connect ducting taking care to avoid additional loads being placed on the fan inlet and outlet. (The ductwork must be adequately supported).

Note : Any distortions in the fan base could result in reducing the working life of the bearings and of the coupling. Severe distortion could result in the impeller fouling the inlet cone.

- Check the inside of the fan casing and the connecting ductwork to ensure that nothing has been left inside. (Nuts, bolts and tools etc.).

ATEX Fans : Under NO circumstances should an ATEX certified fan be modified by anyone other than a Halifax Fan approved engineer/technician working in accordance with Halifax Fan approval/instruction.

Start motor as in section 4.2.

Note : Once running check direction of rotation (in accordance with name-plate), bearing temperatures and vibration levels as per sections 4.7.

4.2 Motor Installation & Start Up

The instructions and wiring diagram for connecting the electric motor up to the power supply are to be found attached to the motor (Usually in the terminal box).

Fans should not be started without adequate guarding to the inlet, outlet and the drive-train. This is the responsibility of the fan installation engineer (normally the company completing the installation) to ensure that the fan is adequately guarded to the relevant European standards.

Ensure that adequate motor overload protection is provided and enabled.

The fan should be run for a short period 3-4 seconds to check that the rotation is correct. This is done by checking the rotation of the shaft against the direction indicated on the fan nameplate. Should it be necessary to reverse rotation, this can be done by changing over two of the supply leads in the motor terminal box.

When all the ductwork is in place, the installation is complete and the fan is powered up, a final check should be made with an ammeter, to establish that the motor running current does not exceed the full load current (FLC). The full load current is that shown on the motor nameplate. The running current is measured at the terminals at the motor terminal box with an ammeter.

Motor Starting Methods:

Direct-On-Line (DOL)

If a motor is wired for direct on line start-up there will be three connections plus one earth connection. The motor running current can be taken as an average of the readings over the 3 connections (ensure readings are approximately the same). This arrangement causes the motor stator to draw high initial current (approximately 7x FLC) that can damage the windings, it is essential that adequate protection is in place.

Star-Delta

If a motor is wired for star delta start-up there will be six wires plus an earth connection. The running current is the average readings at all connections multiplied by $\sqrt{3}$. (1.732). A drawback with this method of starting is the low starting voltage and consequently low start-up torque. This needs to be considered when sizing motors for use on high inertia applications such as fans.

Inverter (VSD)

Generally wired as per DOL. An inverter or variable frequency drive (VSD) starts a motor at low frequency whilst making full rated torque available without high start-up currents. Starting current should not go above the motor FLC if the inverter is correctly set-up to protect the motor against winding damage. Consult the VSD manufacturer's instructions.

Soft Starters

The use of soft starts on fan drives should be fully investigated to obtain correct sizing of motor starter. Please consult our technical department for further details.

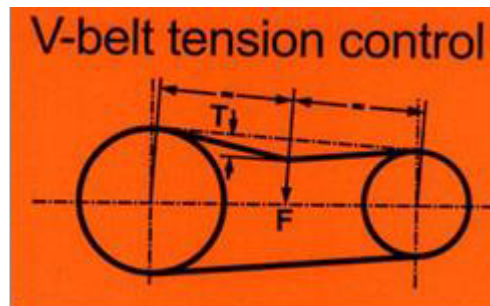
In the event of a claim under warranty, we would require evidence in the form of a commissioning certificate (See Appendix A as a guide) that a qualified engineer had carried out the necessary procedures and established that the fan bearings and grease, belts and motors were in a satisfactory condition on commissioning.

4.3 Component Installation

For Installation of Fan Components e.g. Coupling, Anti-Vibration Mounts, refer to the specific product literature which can be supplied on request.

4.4 Belt Drive Alignment

For belt driven fans ensure your belt is aligned & tensioned correctly. Look for a tension control diagram as below and as completed inside the drive guard



Deflection forces of the V-Belt

Belt Section	a of small pulley	Force (N)
SPZ	67-95	10-15
	100-140	15-20
SPA	100-132	20-27
	140-200	28-35
SPB	160-224	35-50
	236-315	50-65
SPC	224-355	60-90
	375-560	90-120

T = 16mm per 1 metre of span.

After Installation check the belt is still fitted correctly after 30 minutes, 8 hours and 16 hours operation.

If the belt is installed and maintained correctly, the expected belt life is 25,000 hours

For belt driven fans with a motor power of 30kW and above we recommend that the motor is fitted with a roller bearing unless advised otherwise by the motor manufacturer.

4.5 Coupling Alignment

All drive trains with couplings are laser aligned at our factory but must be re-checked during installation. Our most commonly used couplings are Dodge D-Flex and Steelflex couplings.

For these couplings the parallel alignment tolerance given is the offset tolerance, the angular alignment tolerance is the face to face tolerance.

D-Flex Type Coupling Installation Alignment Table

Sleeve Size	Face to Face	Type E, JE, JES & JN, JNS		Type H & HS	
		Parallel (mm)	Angular (mm)	Parallel (mm)	Angular (mm)
3	30.18	0.06	0.11	-	-
4	38.10	0.06	0.14	-	-
5	49.23	0.10	0.18	-	-
6	60.33*	0.10	0.22	0.06	0.10
7	65.10	0.13	0.26	0.08	0.13
8	74.63	0.13	0.30	0.10	0.16
9	88.90	0.16	0.35	0.11	0.18
10	103.20	0.16	0.41	0.13	0.20
11	123.83	0.20	0.48	0.14	0.24
12	144.48	0.20	0.56	0.16	0.27
13	168.28	0.26	0.62	0.19	0.32
14	196.85	0.29	0.77	0.22	0.38
16	260.35	0.39	1.05	-	-

*53.98 with 6J flanges

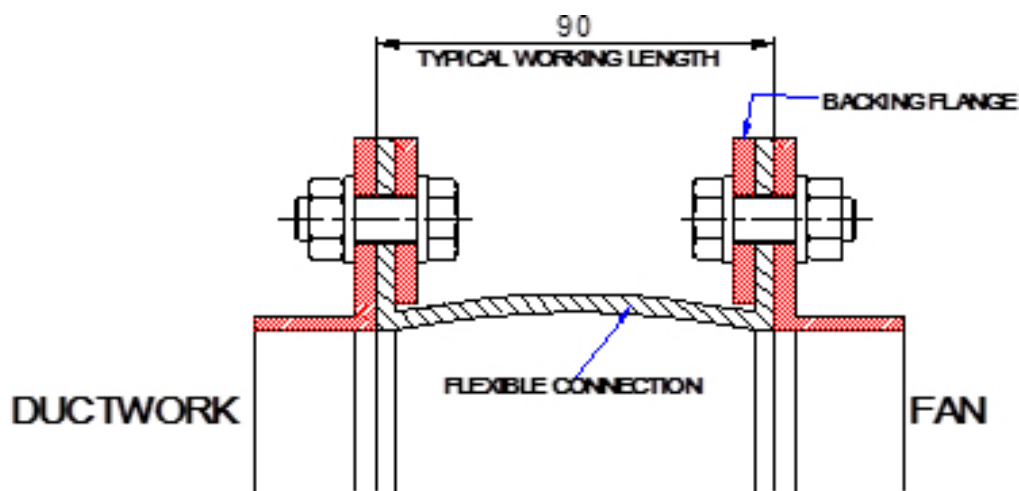
Dodge Grid-Lign and Falk Steelflex Type Coupling Alignment Table

Type	Gap +/- 10%	Installation		Axial Sliding 2 x F (min)
		Parallel P (max)	Angular x-y (max)	
1020	3	0,15	0,06	5,33
1030			0,07	5,33
1040			0,08	5,36
1050		0,20	0,1	5,38
1060			0,11	6,55
1070			0,12	6,58
1080			0,15	7,32
1090			0,17	7,26
1100	4,5	0,25	0,20	10,9
1110			0,22	
1120	6	0,28	0,25	14,2
1130			0,30	14
1140			0,33	15,5

The operating parallel alignment tolerance can be twice the installation alignment. The operating angular alignment tolerance can be four times the installation alignment.

A wide variety of couplings may be used depending on customer requirements and specifications. The manufacturer's alignment information is available on request.

4.6 Flexible Connections (if fitted) Measurements



For actual working lengths please refer to your GA drawing.

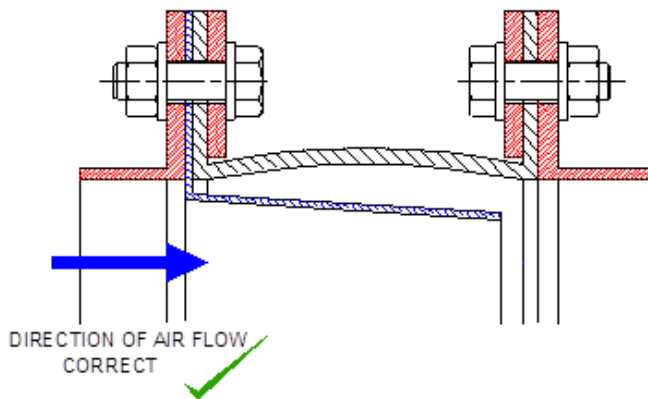
Fitting

Ensure that the flexible connection is not twisted and that the fixing holes of all flanges and the flexible connection are in line. Insert the fixings through the backing flange, flexible connection & fan/duct flange with the screw ends pointing outwards, away from the flexible connection, to ensure that the material is not damaged by the screws.

It is important to ensure that once fitted, the flexible connection is not under tension. The flange to flange dimension on the GA drawing must be adhered to.

Flexible connections must be protected against damage, e.g. from welding, being stepped on, sharp objects, chemical substances and ensure that the backing flanges are not rubbing against the flexible connection.

Flow Sleeves (if fitted for high flow velocity / dust applications)



When flow sleeves are fitted, ensure they are positioned correctly relative to the air flow direction. Air must flow into the sleeve as shown.

4.7 Vibration

The following table is a guide to the correct vibration limits once fans are installed. They are based on BS 848-7:2003 and BS ISO 14694:2003.

Application		Start Up	Alarm	Shutdown
		r.m.s	r.m.s	r.m.s
Industrial Processes	Rigidly Mounted (mm/s)	4.5	7.1	9.0
	Flexibly Mounted (mm/s)	6.3	11.8	12.5
Petrochemical & Marine < 37kW	Rigidly Mounted (mm/s)	4.5	7.1	9.0
	Flexibly Mounted (mm/s)	6.3	11.8	12.5
Petrochemical & Marine > 37kW	Rigidly Mounted (mm/s)	2.8	4.5	7.1
	Flexibly Mounted (mm/s)	4.5	7.1	11.2

Please refer to Appendix C Commissioning Record sheet.

4.8 Bearing Temperature

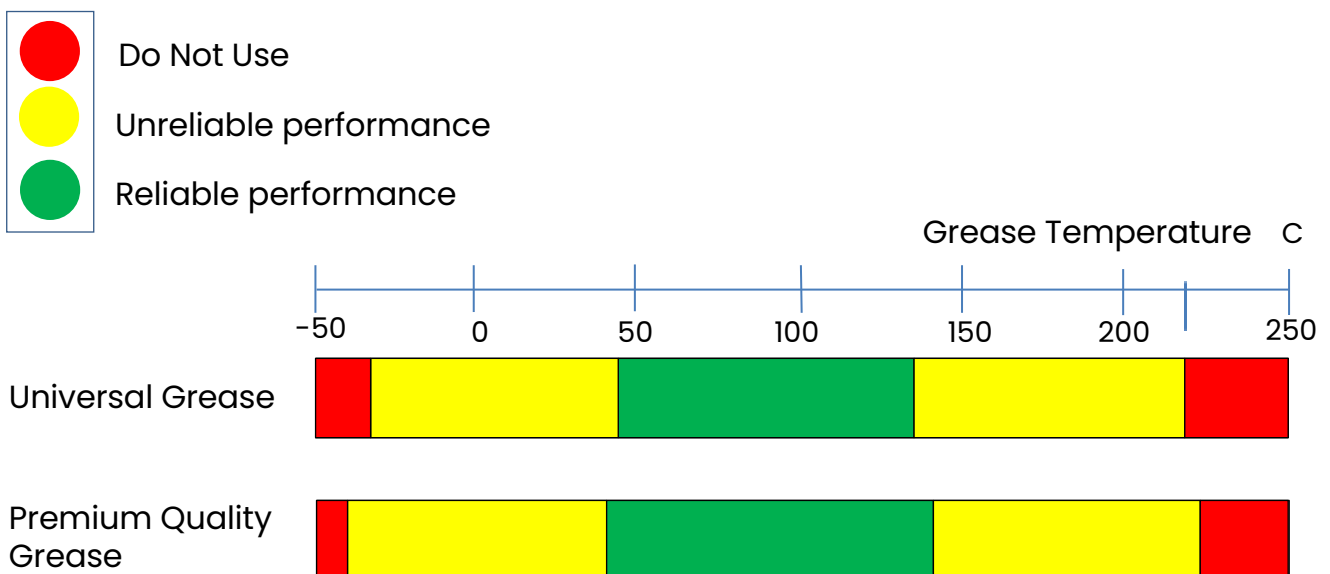
Fans are used in many different types of applications ranging from high temperature industrial process fans, fans exposed to either high or very low ambient temperatures, as well as, what might be defined as 'normal' conditions i.e. zero to 40 °C ambient, standard air handling. We also produce fans ranging from less than 1000rpm to over 4000rpm, 0.55kW to over 1MW in power.

As such, the expected bearing operating temperatures will vary, taking into account speed, power transmitted, vibration, ambient temperature and fan process air temperature. Both the Mobilith SHC100 and GULF Crown LC2 greases have been selected for their excellent lubrication performance over a wide temperature range.

It is not possible to accurately define expected bearing operating temperatures. We adopt the industry recognised SKF traffic light concept for operational temperature limits of the lubricant.

In all cases it is important to ensure vibration is within the limits recommended and that for high temperature fans, the method of bearing temperature protection is satisfactory (this is generally an aluminium cooling impeller mounted on the fan shaft between the in-board bearing and the fan side).

4.8.1 SKF traffic light concept



A universal grease combines a mineral oil base fluid with a lithium complex soap thickener. It is excellent at temperature, has good corrosion protection and good mechanical stability combined with high load carrying capacity.

A premium quality grease which combines a synthetic base fluid with a lithium complex soap thickener. This is particularly suited for higher speed bearing applications.

4.8.2 Expect bearing operating temperatures

It is normal for bearing operating temperature to be up to 60°C above ambient.

Initial operating conditions should be well within the green bands. Over 100°C operating temperature the grease life may be reduced.

4.8.3 Bearing Temperature Alarm and Shutdown settings

New bearings generally go through a 'bedding in' process where temperatures gradually rise, peak and stabilise. This process generally lasts between 1 and 4 hours. It is recommended that once each bearing has stabilised and 'normal running' temperature values have been established for the entire fan operation cycle, that these readings are recorded and used as a base for alarm and shutdown settings. It is important that during the 'bedding in process' and subsequent trip settings, that the operational temperature limits of the lubricant are not exceeded.

Alarm : set at 10°C above 'normal running' temperature value

Shutdown : set at 20°C above 'normal running' temperature value

Note : 'Normal running' temperature should allow for variations in ambient conditions.

5. Maintenance

5.1 Routine

Do not attempt any maintenance on a fan unless the electrical supply has been locked out or tagged out and the impeller has been secured.

Maintenance should always be performed by experienced and trained personnel.

The bearing life of the fan will be extended if the impeller is kept clean. Any build-up of dirt on the impeller will eventually create a degree of imbalance. This causing vibration which indicates that dynamic load is being applied to the bearings and impeller. The service period between cleaning shut downs will vary depending upon the fan application, but a regular maintenance program should be established, as required, to prevent any dirt accumulating on the impeller.

Periodic inspection (depending on the level of instrumentation and process conditions) of rotating components must be made to detect any indication of weakening of the rotor because of corrosion, erosion, or metal fatigue. A preventive maintenance program is an important aspect of an effective safety program. Investigate any changes to the fan. Consult our technical department with any questions concerning changes observed during periodic inspections.

5.2 Component Maintenance

We use a variety of bought out components, including anti-vibration mounts, couplings, motors, seals, acoustic enclosures etc. We will make all our suppliers IOM manuals available on request, please ensure you refer to the specific manufacturer's literature before undertaking any maintenance.

Shaft Seals

Halifax Fans standard shaft seal is a compressed fibre rubbing seal which requires minimal maintenance. You should check the seal every 12 months to ensure it is clean and if damaged it should be replaced.

We do however use a wide variety of shaft seals, please contact our technical department for further information.

Belts

If your fan is belt driven you should regularly check the belts for wear, slipping and re-tension when necessary. Belts have an expected life of 25,000 hours, if you require replacement belts please contact our sales team.

Belt Tension Adjustment

If the belts require tensioning, the tensioning must be carried out by a competent person to ensure that the motor pulley stays aligned with the fan pulley.

The motor holding down bolts must be loosened.

The minimum requirement is that both fan side slide rail adjustment screws should be turned by the same amount until the correct belt tension is obtained. If there is any doubt, a motor/fan alignment check is carried after re-tensioning.

The motor holding down bolts must be re-tightened.
Excessive adjustment indicates belts that require replacement.
Under no circumstances is visual misalignment of the belts on the pulleys acceptable.

Coupling

Couplings should be periodically checked for correct alignment, they should also be regularly inspected for any wear or damage. If you require spares or a replacement coupling please contact our sales team.

Anti-Vibration Mounts

We supply various types of anti-vibration mounts with our fan sets, it is important you check their function if you become concerned about excessive vibration or noise.

Flexible Connections

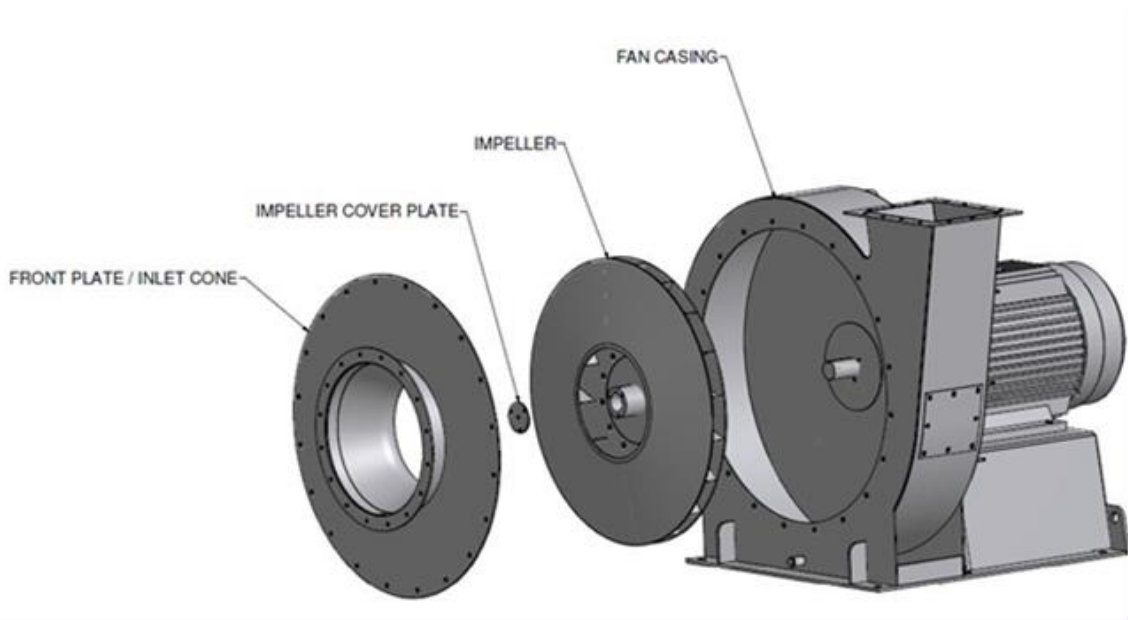
If the fan is supplied with flexible connections between the inlet/outlet and ducting, regular visual checks of their condition should be carried out. If they are torn or split please contact our sales team for replacements.

5.3 Impeller Removal

To investigate problems with your fan it may be necessary to remove the impeller. This can be done by following the steps below. The impeller is fixed to the shaft with either a parallel key and cover plate or a taper key.

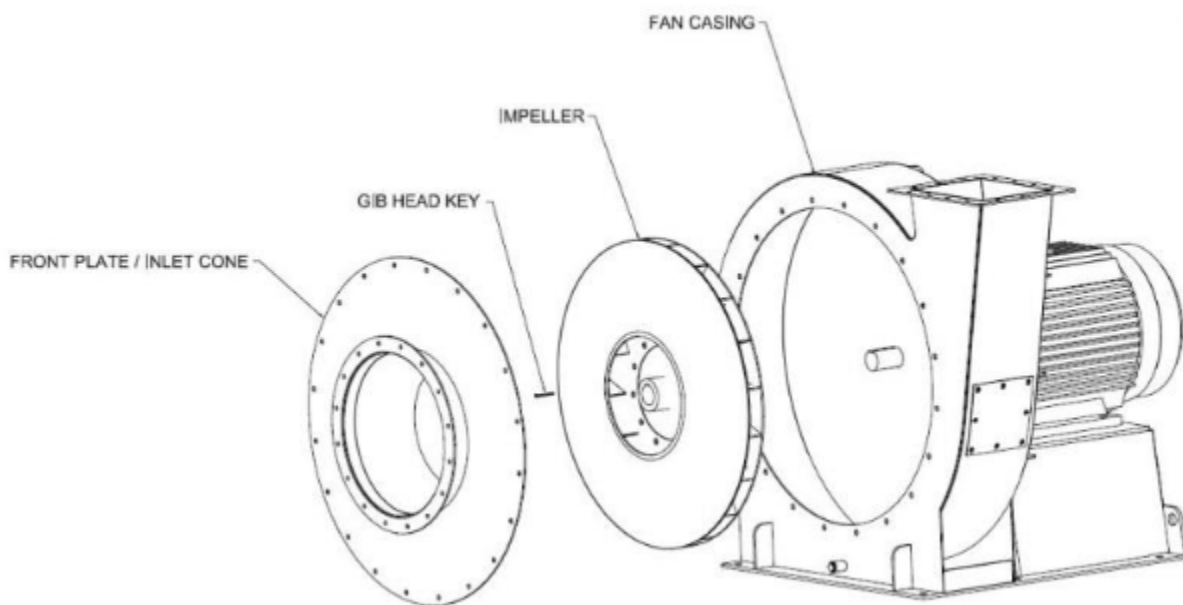
5.3.1 Impeller removal for fans with a parallel key and cover plate:

- Isolate and lock off power to the fan.
- Remove adjacent ductwork to allow access to the fan inlet.
- Mark existing position then remove front plate/inlet cone assembly.
- The impeller can now be pulled off the motor shaft and withdrawn from the fan casing.
- Reverse the process for assembly, fixing the front-plate back in its original position.
- Carefully spin the impeller by hand to check for fouling.



5.3.1 Impeller removal for fans with a parallel key and cover plate:

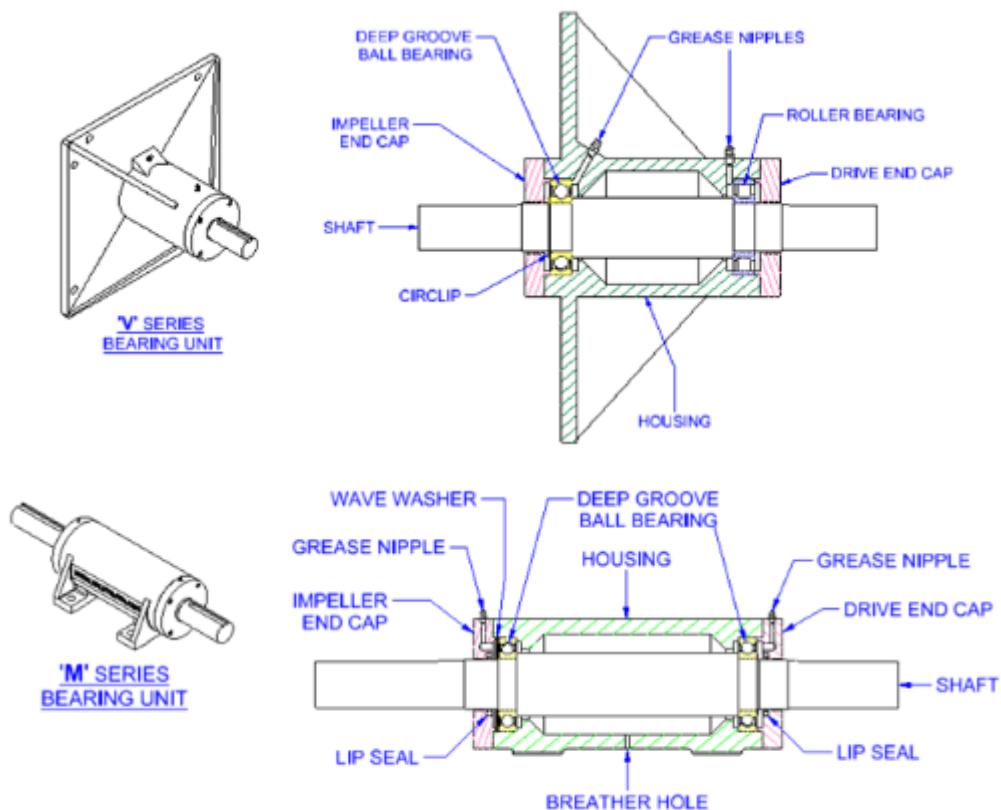
- Isolate and lock off power to the fan.
- Remove adjacent ductwork to allow access to the fan inlet.
- Mark existing position then remove front plate/inlet cone assembly.
- Remove the taper key with a slide hammer (a video showing the taper key removal is available via our website, on our You Tube channel).
- The impeller can now be pulled off the motor shaft and withdrawn from the fan casing.
- Reverse the process for assembly, fixing the front-plate back in its original position.
- Carefully spin the impeller by hand to check for fouling.



5.4 Lubrication

The lubrication instructions in this section are only applicable to the bearings in the Halifax Fan bearing housings provided with our belt driven & direct in line fans. For direct drive fans and for lubrication of different bearings and motor bearings please consult the respective supplier's manual.

Halifax Fan bearing units come in a 'V' Series and an 'M' series; both are fitted with 2 grease nipples, one for each bearing, and can be re-greased while the fan is running. See the typical diagrams below to identify the location of the grease nipples.



Depending on the fan application, bearing units can be fitted with either two deep groove ball bearings or a deep groove ball bearing and a roller bearing. When replacing, fit like for like, if unsure of which bearing unit/ bearings the fan has then contact our technical department quoting the serial number and fan type.

For Oil lubricated bearing units see section 5.4.3

5.4.1 Grease Selection

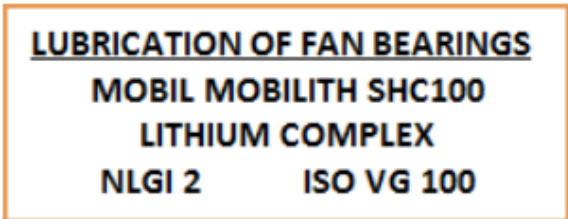
We typically use one of four greases for our fans depending on the application and factory. On customers request different greases can be used.

For high speed and/or light bearing load applications we use MOBILITH SHC100 (UK/USA) or MOBILTEMP SHC 100 (China) combining a synthetic base with high quality thickener.

For low/mid speed and medium to heavy bearing load applications we use GULF CROWN LC2 (UK/USA) or CASTROL SPHEEROL EPLX 200-2 (China) which are based on a mineral oil with lithium complex thickening.

Mixing of incompatible greases will cause a loss of bearing lubrication properties and premature bearing failure.

You must check the Lubrication plate on your fan to be sure of which type of grease to use The lubrication plate will be fitted on or close to the bearing unit. Examples of Lubrication plates are below:



Some equivalent greases are as follows:

	GULF Crown LC2 Equivalents		MOBIL Mobilith SHC100 Equivalents		MOBIL MobilTemp SHC 100 Equivalents	
	Type	ISO VG	Type	ISO VG	Type	ISO VG
Castrol	Spheerol EPLX 200-2	200	Longtime PD2	95		
FAG			Arcanol TEMP 110	68		
Gulf	Crown LC2	200				
Kluber			Kluberplex BEM41-132	120		
Mobil	Mobilgrease XHP 222	220	Mobilith SHC100	100	MobilTemp SHC 100	100
Shell	Gadus S3 V220C	220	Alvania RL	98		
SKF	LGEP2	200	LGMT2	110		
Total	Multis EP2	200				

Warning:

Do not mix different types of grease. Mixing of incompatible greases will cause a loss of bearing lubrication properties and premature bearing failure.

Only Spheerol EPLX 200-2 and GULF Crown LC2 are compatible. No other Halifax Fan standard grease combinations should be mixed

5.4.2 Manual Lubrication

- Wipe clean both the grease nipples on the bearing unit
- Use only the correct grease. Ensure the grease gun has been thoroughly cleaned out if it previously contained an unsuitable grease.
- Inject the specified amount of grease into the bearings.

It is important not to over grease the bearings since this may increase the running temperature and shorten the bearing life.

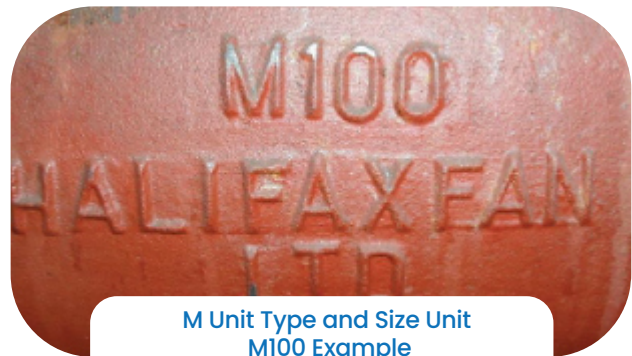
Note: Always follow the safety precautions specified in the grease manufacturer's material safety data sheet.

Lubrication intervals and grease quantities are given in the lubrication table on the next page, bearing unit type can typically be found embossed into the bearing unit (see fig. 1 & 2) and will also be indicated in the title box on the GA Drawing.

If you require clarification on which bearings are fitted please contact our technical department quoting your serial number and fan type.



V Unit Type and Size Unit
V4 Example



M Unit Type and Size Unit
M100 Example

Standard Bearing Unit Lubrication Details 1 Shot = approx. 1.2 grams

Bearing Unit Reference	Bearing Reference s	Bearing Dia (mm)	No. of Shots	Frequency (weeks) #				
				1000 rpm	1500 rpm	1800 rpm	3000 rpm	3600 rpm
V1	6304 C3 N304 ECP	20	2	238	156	129	75	61
V2	6206 C3 N206 ECP	30	2	190	123	101	57	46
V3	6307 C3 N307 ECP	35	4	173	112	91	50	40
V4	6208 C3 N208 ECP	40	3	160	102	83	45	35
V5	6309 C3 N309 ECP	45	5	148	94	76	40	31
V6	6211 C3 N211 ECP	55	5	130	81	64	31	23
L4	6208 C3 N208 ECP	40	3	160	102	83	45	35
L5	6309 C3 N309 ECP	45	5	148	94	76	40	31
LL5	6309 C3 N309 ECP	45	5	148	94	76	40	31
M6	6212 C3 N212 ECP	60	6	122	75	59	28	20
M7	6213 C3 N213 ECP	65	7	115	70	55	24	17
M8	6216 C3 N216 ECP	80	9	97	56	42	15	8
M9	6316 C3 N316 ECP	80	13	97	56	42	15	8
M11/M95	6220 C3 N220 ECP	100	15	78	41	29	5	1
M12/M100	6321 C3 N321 ECP	105	22	73	38	26	-	-
M12/M100 Hi Speed*	6221 C3 (x2)	105	22	-	-	-	2	1

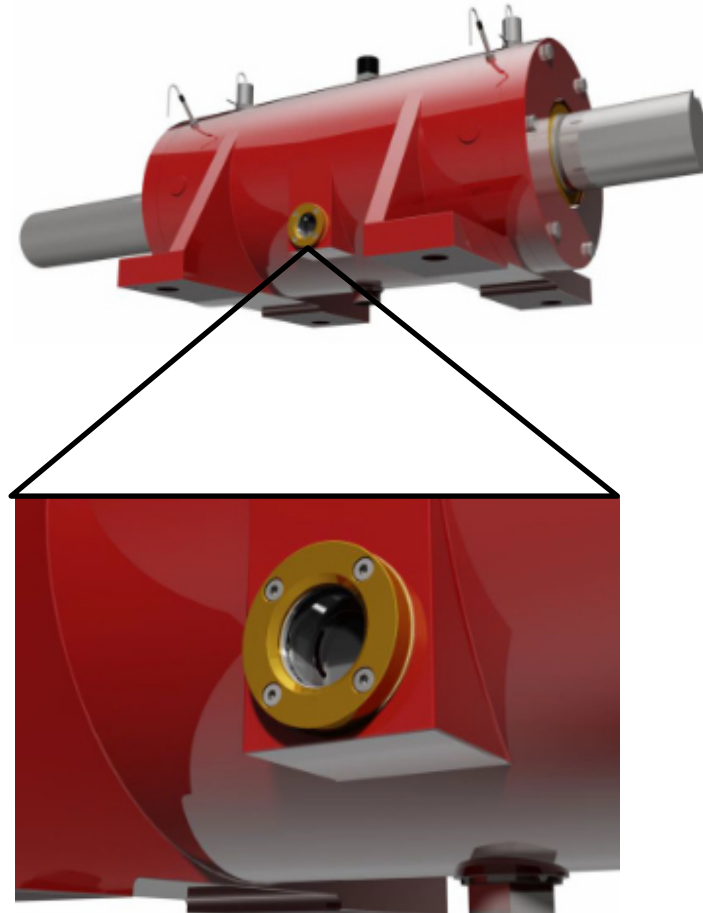
* DIRECT IN LINE DRIVE

For temperatures exceeding 65°C the frequency should be halved.
For vertical units the frequency should be halved.

All figures are for guidance only. For more specific information and for details on specials, please contact our technical dept.

5.4.3 Oil lubrication

For oil lubricated bearing units, a sight glass will be fitted as below;



The oil level should be checked with the fan stationary and should be up to the centre of the sight glass.

The oil should be replaced every 12 months (sooner if it becomes distinctly discoloured ie black) with the recommended type as per the lubrication plate fitted on or close to the bearing unit. An example of a lubrication plate:

	
www.halifax-fan.com	
OIL	<input type="text"/>
VISCOSITY @ 40°C	<input type="text"/> mm ² /s

6. Hazardous Area (ATEX Certified 2014/34/EU)

Under no circumstances should an ATEX certified fan be modified by anyone other than a Halifax Fan approved engineer/ technician working in accordance with Halifax Fan approval/ instruction. Unauthorized dismantling and assembly may introduce the risk of explosion due to incorrect assembly and could invalidate the ATEX certificate.

In order to ensure sound operation of the fan and maintain the explosion prevention and protection features provided it is essential that the fan is installed, commissioned and maintained correctly. It is a requirement that instructions below are adhered to:

- Check nameplate (see diagram/ table in section 6.1) displays correct ATEX hazardous area certification marking including Equipment Group, Category, Gas hazard with Temp Class and/or Dust hazard with maximum surface temperature.
- It is essential to check that the fan is certified and suitable for the area for which it is being installed into.
- Check the installation type (section 6.1.3).
- Check that the impeller and drive assembly rotate freely.
- Ensure direction of rotation is as per the name-plate.
- Ensure fan "RATED SPEED" is within 5% of indicated value
- Ensure running current is within Full Load Current indicated on Motor nameplate.
- Ensure vibration levels do not exceed the values given in section 4.7. Record start up vibration values, fan bearing (if applicable) and motor bearing temperatures in the "Start up" section of the Fan Commissioning Record - Appendix C.
- Fan "RATING" is given on nameplate, to maintain the maximum surface temperature rating, it is important to ensure that the installed operational "Volume" and "Pressure" being provided by the fan is within 5% of indicated values.
- Ensure "Maximum Inlet Temperature" indicated on nameplate is not exceeded.
- After 4 hours running repeat vibration and bearing temp check as previous task and record in relevant section of Appendix C. Also record fan casing surface temperature. NOTE it is important that NONE of the recorded temperatures exceed the ATEX Gas and Dust surface temperature limits indicated on the fan ATEX nameplate.

6.1 Understanding your ATEX nameplate



6.1.1 ATEX Categories

Check the table below and nameplate on the fan to ensure your fan is suitable for the area it's going into. Equipment for potentially explosive atmospheres is divided into two groups, group I equipment for mines and group II equipment for places with potentially explosive atmospheres other than mines. Group II is applicable to our fans and is split into three categories, category 1, category 2 & category 3.

Zones / Categories for Dust & Gas

Area Classification Directive 1999/92/EC	ATEX Classification Directive 2014/34/EC
Zone 0	Category 1 G (gas)
Zone 1	Category 2 G
Zone 2	Category 3 G
Zone 20	Category 1 D (dust)
Zone 21	Category 2 D
Zone 22	Category 3 D

Category 1 Equipment is intended for use in areas in which explosive atmospheres caused by mixtures of air and gases, vapours or mists or by air/dust mixtures are present continuously, for long periods or frequently. Equipment of this category shall ensure requisite level of protection even in the event of a rare malfunction.

Category 2 Equipment is intended for use in areas in which explosive atmospheres caused by mixtures of air and gases, vapours or mists or by air/dust mixtures are likely to occur. Equipment of this category shall ensure requisite level of protection in the event of normal operation and reasonably expected malfunctions.

Category 3 Equipment is intended for use in areas in which explosive atmospheres caused by mixtures of air and gases, vapours or mists or by air/dust mixtures are unlikely to occur, if they do occur, are likely to do so only infrequently and for a short period only.

6.1.2 ATEX Temperatures

Check the table below and nameplate on the fan to ensure your fan is suitable for the area it's going into.

Max Surface Temperatures for IIG equipment	
Temp Class	* Max Surface Temp (°C)
T1	450
T2	300
T3	200
T4	135
T5	100
T6	85

* includes safety margin to minimum ignition temp as per EN 1127 - 1997
For IID equipment, defined by the actual max surface temp allowed i.e. T125°C.

6.1.3 ATEX Installation Types

Please ensure you install the fan to the correct installation type as per the fan nameplate. The various types are as follows;

Type	Installation
A	Wall mounted with free inlet and outlet.
B	Open inlet with ducted outlet.
C	Ducted inlet and open outlet.
D	Ducted inlet and outlet.

6.1.4 ATEX Material Pairings and Clearances

It is normal practice for ATEX applications to pair non-ferrous tipped materials against any steel or cast iron parts. This eliminates the likelihood of sparking between rotating parts if they contact. Radial and axial clearances should be at least 2mm.

Where steel/cast iron is paired with steel/cast iron then a minimum clearance between the rotating parts should be ensured. Radial and axial clearances should be at least 1% of the impeller diameter or 2mm, whichever is the greater. The fan size is the impeller diameter in inches.

Checks should be carried out for any signs of damage/contact. Please contact the Halifax Fan technical department if in doubt.

6.2 ATEX Documentation

All ATEX fans are supplied with a Technical File containing a GA drawing, fan curve, ATEX certificate, EC Declaration of Incorporation certificate, hazardous area certificates for electrical items and the IOM manual, this will be submitted electronically to our customer. If the fan has been supplied via third party, please ensure the Technical File has been made available prior to commissioning. Further copies are available direct from Halifax Fan at an additional charge.

It is a requirement that instructions in this section are adhered to and that the ATEX Installation Checklist sheet – see appendix A – and Fan Commissioning Record – see appendix C are both completed, signed and returned to Halifax Fan Ltd. (documentcontrol@halifax-fan.com).

Returning the ATEX installation Checklist and/or Fan Commissioning Record to Halifax Fan does not relieve your responsibility nor pass on any responsibility to Halifax Fan for the safe operation of the fan unit.

6.3 ATEX Instrumentation

The instrumentation requirements for ATEX fans are below. Where the SIL rating is given as none, the instrumentation is not required;

Zone 1 Fans for use with Ethylene Oxide Sterilizers

ITEM	Location	Sensor	Protection Function	Malfunction Rating			SIL Value Required
				Malfunction 1	Malfunction 2	Malfunction 3	
1	Bearing Unit	Temp. Sensor	Overheating of bearing	Loss of Lubrication	Failure of Vibration Sensors	Failure of Seal Temperature Monitor	None
2	Bearing Unit	Vib. Sensor	High vibration of bearing unit	Mechanical (e.g. out of balance)	Fail	Fail	1
3	Seal Unit	Temp. Sensor	Overheating of seal	Loss of Liquid	Failure of liquid level switch	Fail	None
4	Seal Unit	Supply Pressure	Detection of flame arrestor blockage	Loss of Liquid	Failure of liquid level switch	Failure of Seal Temperature Monitor	None
5	Seal Unit	Liquid Level	Overheating of Carbon Ring Seal	Loss of Liquid	Fail	Fail	1
7	Pedestal	Shaft Speed	Fan Overspeed	Overspeed requirement	Failure of VSD frequency control	Fail	None

Note: The above table represents recommended safety related systems (Instrumented) and their recommended SIL. The use of Safety related systems and their SIL depends on the local site and installation. It is the responsibility of the end user to evaluate the Hazards and risks associated with the installation and determine the safety related systems required and their SIL.

For fans with water cooled mechanical seals the protection system should be capable of bringing the fan to a complete stop in 20 seconds when a trip is reached.

A liquid level protection should trip the fan when the trip level is reached. For a liquid level trip the vessel should be re-filled prior to restarting the fan.

The vibration level protection should activate a visible and audible alarm when the alarm level is reached, 7.1mm/s RMS. For a vibration alarm the fan should be inspected prior to the next sterilisation run with the fan.

The vibration level protection should trip the fan when the trip level is reached, 9mm/s RMS. For a vibration trip the fan should be inspected prior to restarting the fan.

7. Health & Safety

Guarding

Fans inherently contain rotating parts and as such must have guarding to cover against all potential hazards. All guarding should be periodically checked.

CE Marking

All our fans are covered by the CE marking for Incorporation i.e. 'partly completed machines', which declares that the product complies with the essential requirements of the relevant European health, safety and environmental protection legislation. Full CE compliance responsibility lies at the point of final installation and commissioning.

Engineers

The instructions given in this manual are intended to be followed by competent electrical and mechanical engineers only. If you are unfamiliar with the operation of fans please seek expert advice, do not guess.

COSHH

COSHH data sheets are available on request for the grease used in our bearing units and motors.

Isolation

It is essential that the correct isolation is fitted before attempting any maintenance on our fans.

8. Storage & Prolonged Standstill

Bearing- Static Indentation

The fan and motor should be stored in an area free from any source of vibration or shock loading. The tension in the belt drive should be released and the belts removed since these are the conditions that would cause premature bearing failure due to static indentation. Both the fan and motor shaft should be rotated by hand every week prior to commissioning. (See appendix B Fan Rotation Record).

Lubrication

The fan bearings (if applicable) are lubricated in the factory. For the motor bearings refer to manufacturer's documentation. Check the bearings and grease/oil in both fan and motor are in satisfactory condition and showing no signs of deterioration.

Condensation

Fans and motors should be stored in a warmed, ventilated store to minimise the risk of condensation. Fans and motors provided with drain holes should have the holes kept open and clean. In storage the motors should be stood such that the drain holes are at the lowest point. This will allow any condensation which does form to escape.

For Fans and motors without drain holes no action is necessary provided that the environment is kept warm and ventilated, although a periodic insulation test on the motor is advisable (approximately three monthly) to ensure it is maintained above 1 megohm.

If motors are to be used or stored in cold and/or damp environments, we recommend the fitting of anti-condensation heaters, the heaters should be permanently energised if stored in these conditions. Ensure the Heater circuit is isolated before inspection. Periodically, the insulation resistance to earth should be checked using a 500 volt insulation tester.

Remember the following:

- IF IN A HAZARDOUS AREA USE AN "Ex" MEGGER.
 - DO NOT USE A TEST VOLTAGE IN EXCESS OF 500 VOLTS.
 - DO NOT APPLY TEST TO THERMISTORS (IF FITTED).
- (When checking for continuity of thermistors, voltage must not exceed 6v).

9. Trouble Shooting

Bearing over-temperature

- Are bearing temperatures within the limits in section 4.8.1 and 4.8.2
- Have the fan bearings been given sufficient time to 'bed in' (Refer to section 4.8.3)
- Excessive lubricant in the bearings (Refer to section 5.4). Clean and re-grease.
- Insufficient lubricant in the bearings (Refer to section 5.4.2)
- Incorrect bearing lubricant used (Refer to section 5.4.1)
- Incorrect belt-drive/coupling set-up (tension/alignment).
Adjust drive-train set-up. (Refer to sections 4.4 and 4.5).
- Bearing unit subjected to excessive vibration (see section below).
- For fan units subjected to high temperature applications.
Ensure all bearing cooling protection is in place and operational.
- Fan unit working over capacity/speed.

Fan performance

- Identify volume, pressure and density design specification.
- Incorrect direction of rotation. Check name-plate and correct.
- Low volume. Drive speed too low. See motor section below. Check drive-train.
- Low volume. Air leakage in system. Check for gaps/leakage in ducting and joints.
Repair and re-check.
- Low volume. System resistance is higher than specification.
Check for restrictions and all dampers are open.
- High volume. Drive speed too high. See motor section below.
- High volume. System resistance is lower than specification.
Check for system integrity.
- Incorrect clearances between impeller and casing.
- Establish current fan operational duty point and consult Halifax Fan technical dept.

Drive motor over-loading

- Check motor current is within name-plate FLC.
- Motor tripping on start up. Ensure starter and/or overloads are correctly sized for motor and run up time. Due to high inertias, fans have extended run up times and require starting equipment capable of withstanding increased currents during starting whilst still protecting the motor when running.
- Ensure fan is not operating at or near free air condition i.e. No or very low system resistance.
- For high temperature fans not fitted with "cold start" motors, ensure air flow is restricted during starting/warming of fan and system. Incorrect motor wiring e.g. in Y or Δ for correct voltage. Rewire per supplier instructions.
- Motor supply phase currents not equal. Possible motor fault. Contact supplier.
- Incorrect direction of rotation. Check name-plate and correct.
- Shaft/impeller not free to rotate. Check for obstruction and remove.
- Incorrect fan operating duty conditions. Identify volume, pressure and density design specification.

Excessive fan vibration

- Are vibration readings within the limits in section 4.7
- Heavy dirt or damage on the impeller creating an imbalance. Clean/repair and re-balance impeller.
- Mechanical interference on belts/coupling/impeller. Remove interference and re-check.
- Check for impeller imbalance. Dis-engage drive-train, manually rotate the impeller. Impeller stops in same position if out of balance. Re-check for damage and re-balance.
- Loose bolts/ foundations/dampers. Tighten or replace and re-check.
- Worn coupling. Replace with new unit.
- Incorrect belt-drive/coupling set-up (tension/alignment). Adjust drive-train set-up.
- Fan operating over capacity/speed. Close dampers/reduce speed and re-check.
- Record vibration spectrum per bearing. Refer to guides in Appendices D and E.
- Worn drive bearings. Replace and grease unit.

If further assistance is required, contact the Halifax Fan technical department.

IMPORTANT : Before carrying out any physical fan checks, electrical or mechanical, it is important to ensure that the fan and its electrical supply are correctly isolated.

10. Disposal/Recycling

The following instructions are recommendations for environmentally sound disposal. They do not supersede legal, company or site specific requirements

1. Typical Material Content (excluding Motor) in descending order.

Material
Stainless Steel, Mild Steel or Plastic
Cast Iron
Brass
Plastic, rubber, insulation materials etc
Other

2. Recycling of packaging material

Once the equipment has arrived on site, the packaging will need to be removed. Wood & Plastic packaging material should be recycled if possible or disposed of in accordance with local authorities regulations

3. Dismantling of the fan.

Dismantling the fan is a basic procedure as it is assembled with bolts. However, due to the weight of certain items it requires an operator trained in handling heavy components and/or lifting equipment.

4. Separation of different materials (see section 2 typical drawings for your fan type).

Stainless Steel or Mild Steel

Bellows, Inlet Transition piece, Frontplate, Impeller, Pipework, Casing, Pedestal, Seal housing, Shaft, target & fasteners can be stripped down & recycled.

Plastic

Impeller or Casing – Polypropylene Recycling number 5 can be recycled through some curb side programs

Cast Iron

Bearing housing & End caps are assembled with fasteners. After stripping down & removal of the lubricating grease (see Hazardous Waste) can be recycled.

Brass (When anti spark features are fitted)

The Inlet cone & Case Ring require the welds to be cut away to allow them to be removed. Brass items can be recycled.

Gun Metal (4)

After separating the AV Mounts the housing & base can be recycled.

Motor (5)

See relevant Motor Recycling Instructions.

Hazardous Waste

The lubricating grease from the bearings is hazardous waste and should be handled according to local regulations

Landfill waste

Materials that are not deemed recyclable can be handled as landfill waste in accordance with local authority's regulations

APPENDIX A: ATEX Installation & Commissioning Check list

This is to be returned with a completed Appendix C form to documentcontrol@halifax-fan.com immediately after commissioning.

The general installation instructions in section 4 have been read and understood.	<input type="checkbox"/>
Clearances comply as a minimum as per section 6.1.4	<input type="checkbox"/>
No foreign objects found in the casings as per section 4.1	<input type="checkbox"/>
ATEX category marking is correct as per section 6.1	<input type="checkbox"/>
Installation type is correct as per section 6.1.3	<input type="checkbox"/>
Direction of rotation is correct as per the name-plate	<input type="checkbox"/>
Motor running current is below the full load current (FLC) as indicated on the motor name-plate	<input type="checkbox"/>
Vibration limits are within the values given in section 4.7	<input type="checkbox"/>

Note : in submitting the completed check-lists back to Halifax Fan, this does not relieve the commissioning engineer of any due responsibilities.

Full name: _____

Signature : _____

Company: _____

Date: _____

Fan serial number: _____

APPENDIX B: PRESERVATION OF FANS AND ELECTRIC MOTORS DURING EXTENDED STORAGE PERIODS

The fan and motor should be stored in an area free from any source of vibration, in a warmed, ventilated store to minimise the risk of condensation. Both the fan and motor shaft should be rotated by hand every week to prevent premature bearing failure due to static indentation.

Record of Fan Rotation										
Week in Storage	1	2	3	4	5	6	7	8	9	10
Date of Rotation										
Signature										
Print Name										

Record of Fan Rotation										
Week in Storage	11	12	13	14	15	16	17	18	19	20
Date of Rotation										
Signature										
Print Name										

Record of Fan Rotation										
Week in Storage	21	22	23	24	25	26	27	28	29	30
Date of Rotation										
Signature										
Print Name										

Record of Fan Rotation										
Week in Storage	31	32	33	34	35	36	37	38	39	40
Date of Rotation										
Signature										
Print Name										

Halifax Fan Ltd, Installation, Operation & Maintenance Manual

Record of Fan Rotation										
Week in Storage	41	42	43	44	45	46	47	48	49	50
Date of Rotation										
Signature										
Print Name										

Record of Fan Rotation										
Week in Storage	51	52	53	54	55	56	57	58	59	60
Date of Rotation										
Signature										
Print Name										

APPENDIX C: Fan Commissioning Record

See section 4.7 for advised in-situ vibration limits

Start-up data

	Vertical	Horizontal	Axial	Units	Temp °C
Fan D.E.				mm/sec RMS	
Fan N.D.E				mm/sec RMS	
Motor D.E.				mm/sec RMS	
Motor N.D.E				mm/sec RMS	
Fan Speed				rpm	

ATEX : Initial 4 hour running data

	Vertical	Horizontal	Axial	Units	Temp °C
Fan D.E.				mm/sec RMS	
Fan N.D.E				mm/sec RMS	
Motor D.E.				mm/sec RMS	
Motor N.D.E				mm/sec RMS	
Fan Case : max surface temperature					

APPENDIX D : Vibration trouble shooting guide

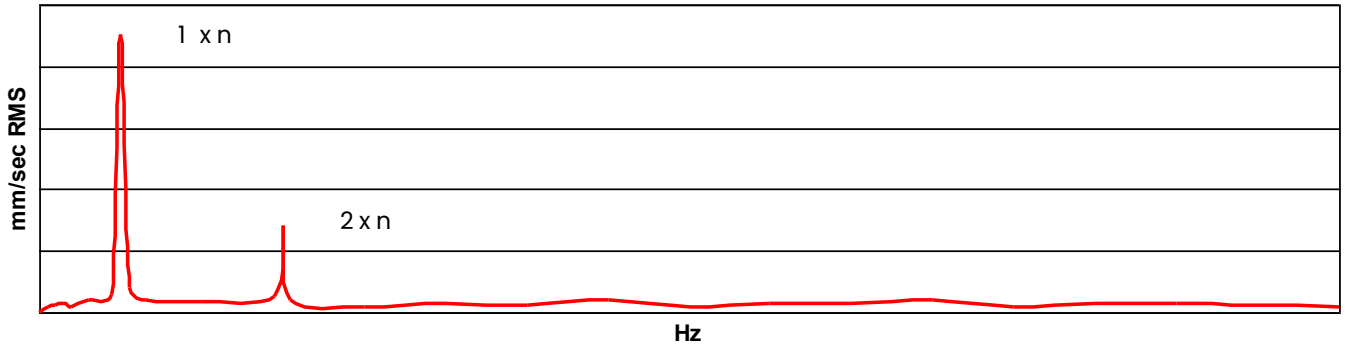
f=vibration frequency n=fan speed

f vs n	Common Causes	Comment
f = n	<ul style="list-style-type: none"> - Impeller imbalance - Other rotating component imbalance - Irregular magnetic/ electric field interference from driver - Belt length is exact multiple of pulley diameter 	<p>Filter out all other frequencies Measure in mm/sec RMS</p> <p>Try to trim balance impeller in fan case</p>
f = 2 n	<ul style="list-style-type: none"> - Misalignment - Mechanical looseness 	<p>Check coupling set up High axial vibration may be present Check for loose bolts on fan and foundations Check for mechanical play in components Is foundation structure rigid / any cracks?</p>
f = multiple of n	<ul style="list-style-type: none"> - Bearings misaligned - Bearings over constricted - Excessive Axial play 	<p>Often caused by mechanical loosening f could be n x number of ball or roller elements</p>
f > n, not exact multiple	<ul style="list-style-type: none"> - Damaged bearings - Excessive wear - Belts over tensioned - Aerodynamic instability in system 	<p>May detect unstable frequency values and phase shift Check effectiveness of lubrication Audible screeches may be heard Vibration changes with air flow at a fixed fan speed</p>
f = a natural frequency of component	<ul style="list-style-type: none"> - Critical speed of shaft - Bearings - Structural components 	<p>Check fan is not operating at or of a multiple of 1st critical shaft speed May need to do ring tests of structural components Try temporary supports</p>

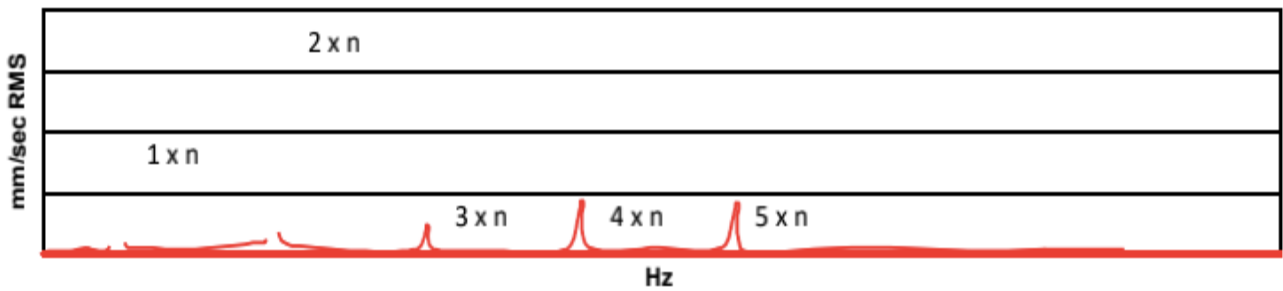
For axial vibrations greater than 15% of the transverse could typically be caused by defective thrust bearings, defective drive belts, impeller rub, seal wear, severe misalignment and foundation twist.

APPENDIX E : Examples of vibration spectrum for common issues

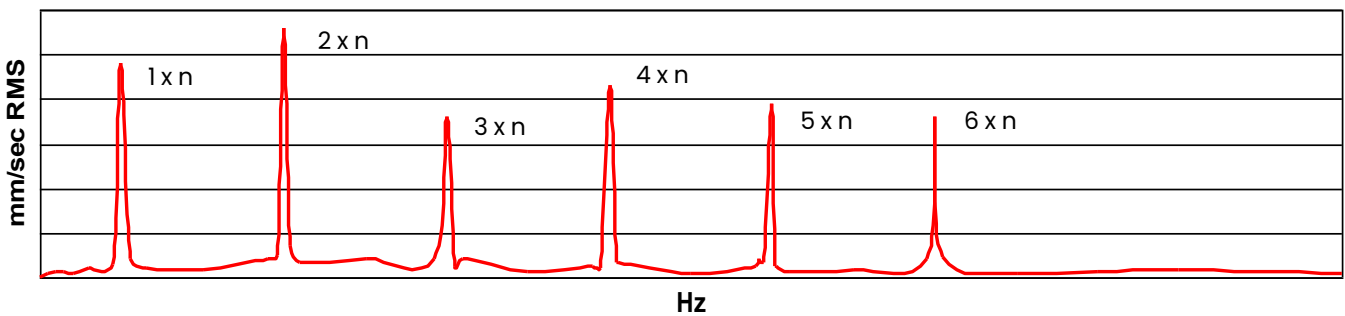
Imbalance



Misalignment



Mechanical Looseness



Typical ATEX Cert



ATEX Certificate

Certificate No.: _____
 Customer's Name: _____
 Customer Order No: _____
 Order Quantity: _____
 Fan Serial No: _____
 Fan Size: _____
 Fan Type: _____
 Category: Internal External
 Year of Manufacture: _____
 Rotation Viewed from Drive Side: _____
 Installation Type: _____
 Fan Casing Mechanical Design: Full Part
 Fan Casing and Impeller: _____
 Mechanical Design Temperature: _____
 Rated Volume: _____
 Rated Pressure: _____
 Rated Power: _____
 Maximum Inlet Temperature: _____ °C

PLEASE REFER TO HALIFAX FAN LTD. INSTALLATION, OPERATION AND MAINTENANCE MANUAL FOR FANS OPERATING IN HAZARDOUS AREAS.

Certified that the equipment/components detailed hereon conforms to the ATEX Directive 2014/34/EU and BS EN 14991: 2007 for potentially explosive

Signed: _____ Date: _____


Checked By: _____

Halifax Fan Ltd
 Moorfields, Unit 11, Brookfoot Business Park,
 Grand Road, Highgate, West Yorkshire, HD2 2SG, UK
 t: +44 (0)1484 470 120
 e: sales@halifax-fan.com w: www.halifax-fan.com
 Registration Number No. 2048271






Typical EC Declaration of Incorporation



EC Declaration of Incorporation

Certificate No.: _____

As defined by the EC Council Directives: Machinery Directive 2006/42/EC, EMC Directive 2004/108/EC and ATEX Directive 2014/34/EU

Herewith we declare that the air movement equipment designated below, on the basis of its design and construction in the form brought onto the market by us is in accordance with the essential Health and Safety requirements of the Machinery Directive 2006/42/EC.

Customer: _____ Serial: _____
 Order No: _____ Quantity: _____

Designation of Equipment: _____
 Size: _____
 Handling / Driving Arrangement: _____
 Includes Inlet Flange, Access Panel, Drive Socket, Coupling

Features: _____
 Materials: _____
 Paint: Coat Industrial

Motor: _____
 Relevant EC Directives: Machinery Directive _____ EMC Directive _____
 ATEX Directive _____

Applied standards: BS EN ISO 13857:2008, BS EN 505 090-1-A1:2008, BS EN BS EN ISO _____, BS EN 14991:2007

Applied national standards and technical specifications in BS EN 1940-1: 2007

Basis of self: Quality Assurance to BS EN ISO 9001
 BS registered firm certificate No. 196701

The equipment must be installed in accordance with our Installation and Maintenance Instructions, and must not be put into service until the machinery into which it is to be incorporated has been declared to be in conformity with the Machinery Directive.

Signed: _____ Date: _____

Position: Project Engineer

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