Air Conditioning Division

OPERATING AND MAINTENANCE INSTRUCTIONS OF RADIAL FANS TZAF FF – VTZ – NTHZ - THLZ FF – MAZ – MHZ – TLZ – TLI – TZAF - THLZ* - HLZ* - TLE – THLE – KHLE AND PLENUM FANS

NPL – NPL ALU – NPA – NPA ALU – TE – PEAF* – NPE*

(This manual includes the fan and plenum fan arrangement according to standard EN 14986 to comply with "ATEX" Directive 94/9/EC)

* THLZ sizes over 450, HLZ, PEAF, NPE series currently not in production but available for spare parts in compliance with this manual.

1 FOREWORD

All Comefri fans and plenum fans are manufactured according to our Quality Assurance System, in compliance with BS EN ISO 9001; since 1987 our Quality System is certified by BSI (certificate n° FM 01403). Moreover all fans and plenum fans equipped with motor are tested accurately before leaving the factory.

Comefri fans and plenum fans are placed on the market in conformity with the requirements of "ErP" Directive 2009/125/EC and its relevant Regulation N° 327/2011 implementing the Directive in regard with the different product characteristics in terms of manufacturing and supplying (see par.8);
they are of the state of the art design and comply with the requirements for health and safety of the Machinery Directive 2006/42/EC.
Comefri defines:
Machine
All fans and plenum fans equipped with connected motor and drive, provided with all the protections necessary to meet the requirements of the Machinery Directive 2006/42/EC.
Partly Completed Machinery
All other fans and plenum fans which are not included in the previous definition.

This Operating &Maintenance manual (which can be downloaded on www.comefri.com):

- describes the applications for the fans and plenum fans according to the national Standards, Regulations and Directives, which must be closely observed to avoid possible damage caused by incorrect installation or mishandling;
- contains notes for health and safety;
- warns of danger which can even occur with correct applications;
- must be read and observed by all personnel. These indications are not the only safety procedure: any operations made on moving and/or electrical parts, such as installation and maintenance, require special attention guaranteed only by skilled staff familiar with safety rules. Besides observance of these instructions, local laws must also be respected.
- must be accompanied by the relative technical catalogue of the individual product which must be consulted for all specific information not included in this manual.

The warranty is valid for one year from the delivery date unless otherwise agreed prior to placing the order. The warranty is only applicable to manufacturing defects, which must be immediately reported to the manufacturer. A precondition of the warranty is the observance of the operating instructions. Damage which can be traced back to improper installation procedures, to the use of damaged fan or plenum fans or unauthorized alterations to it, such as repairs, are not covered by the Comefri warranty and Comefri is not liable for resulting damage and costs.

2 TECHNICAL DESCRIPTION

2.1 Fan description

The Comefri fan series TZAF FF, VTZ, NTHZ, THLZ FF, MAZ, MHZ, TLZ, TLI, TZAF, THLZ, HLZ, TLE, THLE, KHLE (i) are centrifugal fans where the air flows axially into the wheel and is discharged radially in the volute. The performances allow medium and low air deliveries and medium and high pressures. See the technical documentation in the relative technical catalogue for the performance of the specific fan. The impellers of our centrifugal fans can be fitted with forward-curved blades, backward-curved blades or airfoil backward-curved blades.
The MAZ and MHZ series have more solid features than the TZAF FF and NTHZ series which makes them specific for heavy-duty air conditioning and industrial applications where reliability, solidity and easy maintenance play a vital role.
(i) The KHLE series is a "kompakt" version of THLE series with the casing sideplates of rectangular shape, available in settings 4 or 5, with the same performances of THLE.
The features of each fan series are specified in the technical catalogue that must be consulted to identify the suitability of the fan for the fluid treated by the system.
Comefri centrifugal fans, with double or single inlet, can be completed with a wide range of accessories, according to application and installation requirements. The range of accessories is also completed by protection fittings, in conformity with UNI EN ISO 13857, available on demand. Comefri declines all liability for damage to persons or objects caused by absence of safety devices or by the use of devices not provided by Comefri.
Particular attention must be paid in case of direct contact with rotating parts. If this is the case, the use of specific and adequate personal protective measures (PPE) is essential.

2.2 Plenum Fan impeller description

The Comefri plenum fan series have centrifugal impeller where the air flows axially into the wheel and is discharged radially outward.
NPL, NPL ALU, TE, NPE plenum fan series have backward-curved blades while the NPA, NPA ALU, PEAF plenum fan series have airfoil backward-curved bladed impellers. The performances allow medium and low air deliveries and medium and high pressures. See the technical documentation in the relative technical catalogue for the performance of the specific plenum fan.
The features of each plenum fan series are specified in the technical catalogue that must

be consulted to identify the suitability of the plenum fan for the fluid treated by the system.
The TE impeller is manufactured in glass reinforced polyamide.
The NPL ALU and NPA ALU impellers are manufactured in aluminium. The lower weight means less load on the bearings (longer bearing-life), lower extra-load added on the structures concerned by installation, also contributing to a reduction on self-induced vibrations. The aluminium alloy used has excellent resistance to corrosion and is non-toxic, non-magnetic and easy to clean.
Comefri impellers for plenum can be provided as a kit consisting of impeller and inlet-cone or according to the settings summarized in the Appendix.
Standard setting provided by Comefri is setting 4 which must be installed with horizontal shaft.
Comefri impellers can be completed with a wide range of accessories, according to application and installation requirements. The range of accessories is also completed by protection fittings for the inlet-cone and for settings 4 in conformity with UNI EN ISO 13857, available on demand.
Comefri declines all liability for any damage to persons or objects caused by absence of safety devices or by the use of devices not provided by Comefri. Particular attention must be paid in case of direct contact with rotating parts: plenum fans do not meet the provisions of the CE labelling (e.g. they have an impeller without guards). The plenum fan must nevertheless be installed in accordance with CE requirements.
Plenum fans in ATEX execution provided by factory with all safety devices meet the CE labelling.
Particular attention must be paid in case of direct contact with rotating parts. If this is the case, the use of specific and adequate personal protective measures (PPE) is essential.

2.3 Technical data

The technical data and the permissible limits are clearly listed on the fan and plenum fan label. They can be taken from the appropriate technical catalogue. It is absolutely forbidden to exceed the machine limits.
For some fans, a part of the catalogue curve is drawn as a dashed line to warn that the use of the fan in these conditions could generate instability and vibrations due to the presence of inlet obstructions (like pulley, etc). (For spark-proof execution, see par. 4.5).
For particular executions not foreseen in the catalogue, please contact Comefri.
Noise has been measured according to ISO, DIN, UNI and ANSI-AMCA standards, by means of a frequency analyzer in real time.
See the appropriate technical catalogue for sound power levels, determined according to standards DIN 45635 Part38 / ISO 5136 / ANSI-AMCA 330 for in-duct method and according to ANSI-AMCA 300 for reverberant room method. Values detected by the final user can be different from those detected during testing since they are affected by specific installation and environmental and structural factors near the fan or plenum fan and system.

2.4 Applications

The fans and plenum fans are intended to move dust-free air or slightly dusty air. They are not suitable for aggressive gases, vapours or dusty air. Improper use may cause damage to the bearings, corrosion, unbalancing of the impeller and vibrations.
The features of each product series are specified in the technical catalogue that must be consulted to identify the suitability of the fan or plenum fan for the fluid treated by the system.
Permissible operational temperature range for all fans: -20 °C to +60 °C.
Permissible operational temperature range for impellers of plenum fans (except TE) : -20 °C to +85 °C; operational temperature range for TE impellers : -20 °C to +60 °C.
For temperatures outside of this range, kindly contact us in order to define the most appropriate execution.
The maximum ambient temperature of the standard motor is + 40°C.
Consequently plenum fan wheels in all settings where motor is in the flow of the conveyed fluid, due to temperature limit of motor, operational temperature range is from –20°C to +40°C according to the motor model and brand.

2.5 Fans and Plenum Fans with spark-proof execution according to ATEX 94/9/EC

The special TZAF FF Atex, VTZ Atex, NTHZ Atex, THLZ FF Atex, MAZ Atex, MHZ Atex, TLZ Atex, TLI Atex, TZAF Atex, THLZ Atex, HLZ Atex, TLE Atex, THLE Atex, KHLE Atex, NPL Atex, NPA Atex, TE (in steel) Atex executions are available for spark-proof applications according to the ATEX Directive 94/9/EC Group II Category 3G.
TZAF FF Atex, NTHZ Atex, MAZ Atex, MHZ Atex, NPL Atex and NPA Atex are Atex certified to be used in Group II Category 2G.
THLZ FF and TE series with standard polyamide impellers cannot be in Atex execution; they can be in Atex execution ONLY with special steel impellers (see par. 2.5.3.1).
Plenum fan series NPL ALU and NPA ALU which are with aluminium wheel cannot be in Atex execution (see par. 2.5.3.1).

2.5.1 Applications

Fan and plenum fan operating in areas with combustible gases, vapors, mist, dust and fumes or with a possible danger of explosion must adhere to explosion-proof guidelines. From July 1, 2003 it is necessary for fans and plenum fans intended for use in potentially explosive atmospheres to comply with the ATEX Directive 94/9/EC.
The ATEX Directive identifies two groups of fan and plenum fan equipment.
Group I: fan and plenum fan equipment intended for use in mining applications (Out of Comefri production)
Group II: intended for all other situations.
Fans and plenum fans in Group II are divided into three categories, depending on whether explosion-proof safety has to be assured only under normal operation (Category 3) or also when malfunctioning or faults occur (Categories 2 and 1).

Fans and plenum fans classification:

GROUP II *	Category 1	Equipment designed to be capable of functioning in conformity with the operational parameters established by the manufacturer and ensuring a very high level of protection. Equipment in this category is intended for use in areas in which explosive atmospheres caused by mixtures of air and gases, vapours or mists or by air/dusts mixtures are present continuously, for long periods or frequently.
GROUP II	Category 2	Equipment designed to be capable of functioning in conformity with the operational parameters established by the manufacturer and ensuring a high level of protection. Equipment in this category is intended for use in areas in which explosive atmospheres caused by mixtures of air and gases, vapours or mists or by air/dusts mixtures are likely to occur. The means of protection relating to equipment in this category shall ensure the required level of protection, even in the event of frequently occurring disturbances or equipment faults which normally have to be taken into account.
GROUP II	Category 3	Equipment designed to be capable of functioning in conformity with the operational parameters established by the manufacturer and ensuring a normal level of protection. Equipment in this category is intended for use in areas in which explosive atmospheres caused by mixtures of air and gases, vapours or mists or by air/dusts mixtures are unlikely to occur or, if they do occur, are likely to do so only infrequently and for a short period only.

* Group II, Category 1 (1G, 1D) – fans and plenum fans out of Comefri production.

This fan and plenum fan classification is due to the application of fans and plenum fans in areas of different explosion danger, where there is a different risk of flammable material being released to the atmosphere. The areas are classified in Zones: 0, 20, 1, 21, 2, 22.
Codes without prefix "2" refer to an atmosphere containing gas, vapor and mist. Codes with prefix "2" refer to air containing gas, vapor and also dust. Codes 0, 1 and 2 describe the likelihood of flammable material being released into the air in explosive concentrations. Zone 0 is the highest risk zone where an explosive atmosphere is expected to exist continuously or for very long periods of time. Zone 1 is an area where an explosive atmosphere is expected to exist only for short periods of time. Zone 2 is an area where an explosive concentration of flammable material is not expected and should it be released it will only exist for a very short period of time.

Pay attention that the presence of dust increases ignition risks and needs further means of protection (see the following). Please note that Comefri TZAF FF Atex, VTZ Atex, NTHZ Atex, THLZ FF Atex, MAZ Atex, MHZ Atex, TLZ Atex, TLI Atex, TZAF Atex, THLZ Atex, HLZ Atex, TLE Atex, THLE Atex, KHLE Atex fans and NPL Atex, NPA Atex, TE (in steel) Atex plenum fans are intended to move dust-free air or slightly dusty air.

Zone	*Explosive Atmosphere*	*Dangerous concentration*	*Potential spark source must be avoided*
0 **	Gas, vapour, mist (G)	Constant or for a long time	Even where few shutdowns are expected
20 **	Dust (D)	Constant or for a long time	Even where few shutdowns are expected
1	Gas, vapour, mist (G)	Likely to occur	More frequent shutdowns are expected
21 **	Dust (D)	Likely to occur	More frequent shutdowns are expected
2	Gas, vapour, mist (G)	Rarely or for short time	In normal operation
22 **	Dust (D)	Rarely or for short time	In normal operation

** Out of TZAF FF Atex, VTZ Atex, NTHZ Atex, THLZ FF Atex, MAZ Atex, MHZ Atex, TLZ Atex, TLI Atex, TZAF Atex, THLZ Atex, HLZ Atex, TLE Atex, THLE Atex, KHLE Atex, NPL Atex, NPA Atex, TE (in steel) Atex range of application.

As a consequence, the allowed use of the different category fans and plenum fans depending on the different zones is:

Fan Category	Designed for zone	Also applicable in zones
1 G ***	0	1, 2
1 D ***	20	21 , 22
2 G ****	1	2
2 D *****	21	22
3 G	2	-
3 D *****	22	-

*** Group II, Category 1 fans and plenum fans are out of Comefri production.
**** Only for TZAF FF Atex, NTHZ Atex, MAZ Atex, MHZ Atex fan series and NPL Atex, NPA Atex plenum fan series.
***** The use of the fan and plenum fans in dusty environments is out of the range of application of TZAF FF Atex, VTZ Atex, NTHZ Atex, THLZ FF Atex, MAZ Atex, MHZ Atex, TLZ Atex, TLI Atex, TZAF Atex, THLZ Atex, HLZ Atex, TLE Atex, THLE Atex, KHLE Atex, NPL Atex, NPA Atex, TE (in steel) Atex.

Comefri TZAF FF Atex, VTZ Atex, NTHZ Atex, THLZ FF Atex, MAZ Atex, MHZ Atex, TLZ Atex, TLI Atex, TZAF Atex, THLZ Atex, HLZ Atex, TLE Atex, THLE Atex, KHLE Atex fans and NPL Atex, NPA Atex, TE (in steel) Atex plenum fans in no-sparking execution are suitable for atmospheres with a maximum 21 vol% oxygen content, absolute pressure from 0.8 bar to 1.1 bar and gas explosion Groups IIA and IIB.

Correspondence of the fan category to the inside/outside hazardous zone.
The explosion risk occurs either due to the explosive gas moved by the fan or due to the presence of explosive gas in the areas where the fan is placed. The risk analysis must therefore consider both outside and inside the fan.
TZAF FF Atex, VTZ Atex, NTHZ Atex, THLZ FF Atex, MAZ Atex, MHZ Atex, TLZ Atex, TLI Atex,

TZAF Atex, THLZ Atex, HLZ Atex, TLE Atex, THLE Atex, KHLE Atex fans can be installed (according to DIN EN ISO 5801) in mode A (without inlet and outlet duct) or mode B (without inlet duct and with outlet duct). Therefore they have the same explosive atmosphere and require the same equipment category inside and outside.
TLE Atex, THLE Atex, KHLE Atex fans must have the same requirements as above when installed in mode A and B. Installation in mode C (with inlet duct and without outlet duct) has the same requirements as needed for modes A and B. TLE Atex, THLE Atex, and KHLE Atex fans can also be installed in mode D (with inlet and outlet ducts). In this case, provided the fan has been requested in leak proof execution, the fan has to be designed for different category inside and outside as indicated in the table below and according to the following: if the fan is placed in open field or in a well ventilated room and considering that the leak proof execution is not absolutely gas tight, then there is never more than one category of difference between the highest category and the lowest category inside and outside.
This means for instance that an internal hazard 2 G automatically requires that the outside of the fan is considered hazard Category 3 G.

Category outside the fan enclosure \ Category inside the fan enclosure	Non-explosive atmosphere	Category 3 gas	Category 2 gas
Non-explosive atmosphere	No requirements	inside: cat. 3 outside: no requirements	inside: cat. 2 outside: cat. 3
Category 3 gas	inside: no requirements outside: cat. 3	inside: cat. 3 outside: cat. 3	Inside: cat. 2 outside: cat. 3
Category 2 gas	inside: cat. 3 outside: cat. 2	inside: cat. 3 outside: cat. 2	inside: cat. 2 outside: cat. 2

If the fan is placed in a closed unventilated room, the category selected for the more restrictive hazardous zone must be applied for both the outside and inside of the fan casing. This means for instance that an internal hazard 2 G will require that the outside of the fan is considered 2 G hazard Category.

2.5.2 Temperature

The user must choose the appropriate temperature class consistent with the minimum ignition temperature of the gas, mist or dust (see table below). The temperature class indicates the maximum surface temperature reached by the fan and plenum fan during operation in which the temperature of the inlet fluid is inside the permissible Atex temperature range **(standard permissible Atex temperature range is from –20 to +60 °C)**.
Generally the maximum temperature rise will occur at minimum flow and maximum density. If the system designer is unable to guarantee the safe minimum or maximum air flow, for Category 2 fans, temperature monitoring devices have to be installed, which in case of a dangerous temperature rise will automatically activate emergency functions, e.g. fan shut down or bypassing, e.g. with dampers.
In case of presence of lightly dusty air, the ignition risk assessment shall consider the temperature raising of dust or other material trapped between two moving parts or a moving part and a fixed part, especially if material remains in contact with the same moving part for a long period.
NOTE: the maximum temperature indicated on the fan and plenum fans label refers to operating conditions without dust.
The user must evaluate the relation between the maximum surface temperature and the minimum ignition temperature of the dust according to operating conditions.
For dust problems, also see standard EN 1127-1 which has indications concerning protective measures to be taken.

Temperature class	Maximum surface temperature [°C]
T1 ******	450
T2	300
T3	200
T4	135
T5	100
T6	85

****** Generally for mining applications.
The temperature class is indicated in the fan and plenum fans label (see par. 2.5.5).
The temperature class for double inlet fan series in Group II Category 3G (TZAF FF Atex, VTZ Atex, NTHZ Atex, THLZ FF Atex, MAZ Atex, MHZ Atex, TLZ Atex, TLI Atex, TZAF Atex, THLZ Atex, HLZ Atex) is T4.
For double inlet fan series in Group II Category 2G see par. 2.5.3.3.
The temperature class for single inlet fan series (TLE Atex, THLE Atex) and plenum fan series in setting 11 (NPL Atex arr.11, NPA Atex arr.11) is T3.
NOTE for settings 4 and 5. For single inlet fan series TLE Atex, THLE Atex, KHLE Atex achieved in settings 4 and 5 and for plenum fan series NPL Atex, NPA Atex, TE (in steel) Atex achieved in settings 4 and 5 the temperature class corresponds with the temperature class of the installed motor.
The difference between double and inlet fans is mainly due to the bearing, which is the most critical element concerning heating.
NOTE: for plenum fans in settings with impeller installed on the motor shaft, as a rule the temperature class is set equal to the motor temperature class and is quoted also on the plenum fan label.

2.5.3 Spark protection measures and mechanical design criteria

2.5.3.1 CRITERIA FOR BOTH CATEGORY 2 AND 3 - Gas

-- General
Comefri fans and plenum fans (casings, supporting structures, guards, protective enclosure and other external parts) are of a rigid design. Deformation resulting from a single impact at the

most vulnerable point is so small that the moving parts do not come into contact with the casing or the protective enclosure. For this reason the impact test is considered unnecessary.

-- Casing
When the fan is driven by a motor of more than 11kW, then the casing is continuously welded. For MAZ Atex and MHZ Atex fans, the casing is continuously welded as per standard. The fan is equipped with an inspection door. It is held in position by bolts and sealed.

-- Impellers
Comefri TZAF FF Atex, VTZ Atex, NTHZ Atex, THLZ FF Atex, MAZ Atex, MHZ Atex, TLZ Atex, TLI Atex, TZAF Atex, THLZ Atex, HLZ Atex, TLE Atex, THLE Atex, KHLE Atex, NPL Atex, NPA Atex, TE (in steel) Atex impellers are of a rigid design.
For Atex execution, the impeller of THLZ and THLZ FF from 180 to 450 and the TE series must be manufactured in steel, NOT in glass reinforced polyamide as in the standard execution.
NPL ALU e NPA ALU cannot be used in Atex applications.

The impeller shaft must be installed in a horizontal position.

-- Materials for rotating and stationary parts
In view of misuse, due to rare or even very rare malfunctioning, potential areas of contact between the rotating elements and fixed components have been manufactured from materials in which the risk of ignition through friction and friction-impact sparks is minimized as EN 14986 par. 4.8.2.
The material pairings chosen for Comefri fans and plenum fans for the stationary rubbing part and the rotating rubbing part are as in the table below. The material of the rotating part assures the mechanical stress performance.

Stationary part	Moving part
Copper	Steel, stainless steel or cast-iron

This material combination is accomplished making the whole component from that material or using tip extensions and linings of that material.
Tip extensions and linings have a minimum thickness as given in the table below in order to withstand impact or abrasion for an appreciable time:

Motor power [kW]	Thickness of copper tips [mm]
=< 11	2
> 11 to 90	3
> 90 to 250	4
> 250	5

The tips are securely attached to the base material by welding.

Potential areas of contact between the rotating elements and fixed components and relative provisions adopted to satisfy requirement of EN 14986 par. 4.8.2:

INLET-CONE and SHROUD Inlet-cones are provided in the proximity of the wheel with an extension made of copper or are completely made of copper

FOREFINGER® and SHROUD Forefinger® is manufactured in copper for Atex applications

SINGLE INLET WHEEL BACKPLATE – CASING SIDEPLATE There is a risk of contact between wheel backplate and/or hub and the casing sideplate and therefore a copper plate is installed internally of the sideplate.

TRANSMISSION GUARD There is a risk of contact between guard and pulleys and motor / fan shafts and therefore a copper plate is installed in the internal side of the guard in front of the pulleys.
These protections are fixed with brass screws.

PROTECTIVE ENCLOSURE FOR PLENUM FANS For plenum fans it is necessary a protective enclosure around the wheel (see in the following). A potential explosion risk can come from an accidental contact between rotating parts as wheel back-plate and/or wheel hub (depending on which one is the most protuberant to enclosure), the passing motor shaft and closest stationary parts as the enclosure wall, the outward frame supporting the enclosure if the wheel diameter is up to it, the motor-support wall facing the wheel or the clearance hole in the enclosure for the passing motor shaft.
To satisfy Atex requirements a copper plate is fixed on the guard in front of the wheel or for small sizes the guard wall in front of the wheel is completely manufactured in copper.
All screws used for fixing these copper anti-spark protections are of brass.

Paints do not contain more than 10 % aluminium per unit mass and do not contain iron oxides, which can cause aluminothermic sparks.

NOTE: cooling wheel is a rotating part that shall satisfy Atex requirement of EN 14986 par. 4.8.2. Because in Atex application max temperature of input air is +60 °C, cooling wheel is not necessary and therefore it must not be used.

-- Vibrations
The impeller or the complete rotating assembly is balanced according to ISO 1940-1 and ISO 14694, grade 2.5. In case of belt transmission the pulleys are also balanced.
The completed fan and plenum fan meet the vibration levels recommended in ISO 10816 and ISO 14694.

2.5.3.2 FURTHER CRITERIA FOR CATEGORY 3 – Gas

-- Deposits inside the fan
TZAF FF Atex, VTZ Atex, NTHZ Atex, THLZ FF Atex, MAZ Atex, MHZ Atex, TLZ Atex, TLI Atex, TZAF Atex, THLZ Atex, HLZ Atex, TLE Atex, THLE Atex, KHLE Atex fan series and NPL Atex, NPA Atex, TE (in steel) Atex plenum fan series treated in this manual are intended to move dust-free air or slightly dusty air, as already mentioned. Many types of dust, mist and droplets may be in suspension in the air flow. Even small quantities of impurities may in time form layers of combustible or non-combustible material within the fan and adhere to rotating parts. Even normal ambient air may contain sufficient airborne particles to form layers, which may increase

the risk of ignition. For no-spark execution, TZAF FF Atex, VTZ Atex, NTHZ Atex, THLZ FF Atex, MAZ Atex, MHZ Atex, TLZ Atex, TLI Atex, TZAF Atex, THLZ Atex, HLZ Atex, TLE Atex, THLE Atex, KHLE Atex fans are provided with an inspection door, so that inspection and cleaning operations can be easily carried out.

-- Clearance between rotating parts and the stationary parts
The clearance between rotating elements and the fan casing / stationary parts is the most important safety feature of ignition minimizing fans. The minimum clearances between rotating components such as the impeller and fixed components e.g. the fan casing are at least 1 % of the relevant contact diameters of the finished component, but are not less than 2 mm in the axial or radial directions nor need to be more than 20 mm.
This clearance may be reduced to 10 % of the shaft diameter (minimum 2 mm and maximum 13 mm). Shaft seals are not subject to this provision.

Comefri provisions satisfy this requirement for all potential areas of contact listed in the previous paragraph “Materials for rotating and stationary parts”.

Clearance between inlet-cone and shroud is indicated in the Appendix for each Comefri fan and plenum fan series.

NOTE: the clearance may change with rotation, temperature, and due to vibrations and belt drive tension. For this reason the installer / user must assure the correct belt tension (see par. 6.5) and check the final clearance after tensioning (see par. 4.5).

Copper plates in front of rotating parts (pulleys, hubs, back-plate, etc.) have an outer dimension at least from 5 to 10 mm greater than rotating part dimension; clearance between the motor or fan shaft and the edge of the passage hole is designed as indicated here above.

In case of plenum fans provided as loose components (i.e. wheel and inlet-cone) it is duty of the installer / user to adjust the centring between inlet-cone and shroud in order to achieve a constant clearance all around the circumference that must comply with the value indicated in the Appendix.

-- Bearings
Bearings are designed for an L_{10} life of at least 20000 hours in accordance with ISO 281. This requirement is guaranteed only if the diameter of the pulley respects a minimal value according to our fan-selection program *Aeolus* (see par. 4.3)

-- Power transmission systems
V-belts must be electrostatically conductive and must withstand short-term exposure to flames (see par. “Fire resistance” here following). They must be declared by manufacturer to be compliant with Atex requirements.

-- Couplings
Couplings are arranged so that the rotating part that is exposed to the potentially explosive atmosphere does not exceed the maximum surface temperature of the fan. Couplings shall be in compliance with Atex Directive.

-- Impeller - shaft attachment
For motor powers in excess of 15 kW a positive locking is arranged using seeger rings on the shaft for single and double inlet fans; the use of the seeger rings at the fan shaft restricts the maximal rotational speed: the maximal permissible rotational speed is indicated in the label. For single inlet wheels directly coupled to the motor, positive locking is performed with a locking screw and washer at the tapped shaft.
NOTE: special execution with a taper-bushed connection of the impeller to the shaft is used for fans with motor power not exceeding 15 kW.
For plenum fans in setting 4 impeller hub is positive locked to motor shaft between the shaft shoulder, with eventually a washer in front of the shoulder (ex. in case of hub in aluminum), and a locking screw and washer at the tapped shaft end.
In case of plenum fans provided as loose components, i.e. wheel and inlet-cone, a positive locking of impeller hub is duty of the customer.

-- Corrosion
Corrosion of fan and plenum fan components can in several ways lead to an ignition risk. The materials used for Comefri fans and plenum fans are therefore corrosion protected by paint or zinc-coating or manufactured in stainless steel.
The possibility of the fan and plenum fan being exposed to other corrosive chemical constituents of the gas shall be identified by the customer and communicated to Comefri in order to get approval or indications for special settings to be carried out.

-- Fire resistance
The materials used for the impeller, fan casing of Comefri TZAF FF Atex, VTZ Atex, NTHZ Atex, THLZ FF Atex, MAZ Atex, MHZ Atex, TLZ Atex, TLI Atex, TZAF Atex, THLZ Atex, HLZ Atex, TLE Atex, THLE Atex, KHLE Atex fan series and for the impeller, structure of Comefri NPL Atex, NPA Atex, TE (in steel) Atex plenum fan series withstand short-term exposure to flames. (The requirement is met if the components are only partly destroyed without the onset of a self-sustaining combustion when exposed to a (propane) Bunsen burner flame approximately 150 mm long for 30 seconds without additional air supply).

-- Protection against foreign particles
As required by Standard EN 14986, the fan and plenum fan shall be protected against the entry of foreign particles according to grade IP20 of EN 60529.
Fans:
Comefri fans are provided with proper inlet and outlet protective guards according to grade IP20 compliant with the Standard requirement.
Plenum fans:
Comefri standard Atex execution provides plenum fans in setting 4 equipped with the proper protection guard at the inlet and the protective enclosure at the outlet according to grade IP20 compliant with the Standard requirement. The guard of the protection enclosure is fixed at the front panel of the structure and at an auxiliary frame provided between motor and wheel (see sketch in the appendix).

These guards and protective enclosures shall not be tampered, nor substituted with others of different type, causing the decay of the Comefri certification for Atex execution.

As exception fan or plenum fan can be supplied without protections provided both the following conditions are respected:
- the customer has produced a written declaration where he states that upon analysis the kind of installation has proved to be itself a guarantee of IP20 protection and
- the customer requires by writing in the commercial order not to supply the protections.
As warned in the Standard EN 14986, the presence of inlet and/or outlet duct is not itself a guarantee of IP 20 protection, but the risk of entry of foreign particles is to be analyzed anyway.

2.5.3.3 FURTHER CRITERIA FOR CATEGORY 2 – Gas

The TZAF FF Atex, NTHZ Atex, MAZ Atex, MHZ Atex fan and NPL Atex, NPA Atex plenum fan series are the only ones among the fan series in the present catalogue that are certified to be used also in Atex Group II Category 2G. All characteristics explained for Category 3 are valid also for Category 2 with the further additional and/or predominant Atex Category 2 requirements detailed here following.

TZAF FF Atex, NTHZ Atex

-- Bearings
The L_{10} minimum life shall not be less than 40000 hours. This requirement is guaranteed only if the diameter of the pulley respects a minimal value according to our fan-selection program *Aeolus* (see par. 4.3)

-- Impeller - shaft attachment
Fan series TZAF FF Atex.and NTHZ Atex
For motor powers in excess of 5.5 kW a positive locking is achieved for the fixing of hub on the shaft with the use of the key and relative safe grub screw and arranging a couple of seeger rings or stop bushings on the shaft between the hub for single and double inlet fans. For single inlet fans directly coupled to the motor, positive locking is performed with a locking screw and washer at the tapped shaft end. The use of the seeger rings on the fan shaft restricts the maximal permissible rotational speed of the standard catalogue limits to the rotational speed limits reported in the following tables.
For motor powers less than 5.5 kW the fixing of the hub on the shaft can be achieved also the use of the key and relative safe grub screw

Rotational speed limit is indicated in the fan label.

Fan Model	Arr.	Max RPM		Arr.	Max RPM		Arr.	Max RPM		Arr.	Max RPM	
		Stop bushing	Seeger ring		Stop bushing	Seeger ring		Stop bushing	Seeger ring		Stop bushing	Seeger ring
TZAF 315 FF	R	3350	2730	T1	4000	3000	-	-	-	T2	4000	3700
TZAF 355 FF	R	3000	3000	T1	3650	3200	-	-	-	T2	4000	3770
TZAF 400 FF	R	2700	2700	T1	3200	2750	T2L	3215	3000	T2	3700	3200
TZAF 450 FF	R	2400	2400	T1	2850	2650	T2L	2950	2750	T2	3300	2900
TZAF 500 FF	R	2100	1850	T1	2300	1960	T2L	2500	2210	T2	2820	2400
TZAF 560 FF	R	1950	1820	T1	2200	1870	T2L	2650	2350	T2	2700	2350
TZAF 630 FF	R	1550	1400	T1	1700	1450	T2L	2250	1920	T2	2350	2000
TZAF 710 FF	R	1370	1350	T1	1700	1450	T2L	1850	1800	T2	2100	1850
TZAF 800 FF	-	-	-	T1	1300	1120	T2L	1650	1470	T2	1800	1550
TZAF 900 FF	-	-	-	T1	1300	1200	T2L	1450	1300	T2	1600	1450
TZAF 1000 FF	-	-	-	T1	1050	900	T2L	1250	1120	T2	1400	1270
TZAF 1120 FF	-	-	-	T1	850	770	-	-	-	T2	1200	1150
TZAF 1250 FF	-	-	-	T1	800	700	-	-	-	T2	1100	1070

AISI 304 and AISI 304 L EXECUTION
Max RPM limits are the same for execution with stop bushing and with seeger ring

Fan model	arr.	Max RPM	arr.	Max RPM	arr.	Max RPM	arr.	Max RPM
TZAF 315 FF	R	2730	T1	3000	-	-	T2	3400
TZAF 355 FF	R	2550	T1	3100	-	-	T2	3400
TZAF 400 FF	R	2295	T1	2720	T2L	2735	T2	3145
TZAF 450 FF	R	2040	T1	2425	T2L	2510	T2	2805
TZAF 500 FF	R	1785	T1	1955	T2L	2125	T2	2400
TZAF 560 FF	R	1660	T1	1870	T2L	2255	T2	2295
TZAF 630 FF	R	1320	T1	1445	T2L	1915	T2	2000
TZAF 710 FF	R	1165	T1	1445	T2L	1575	T2	1785
TZAF 800 FF	-	-	T1	1105	T2L	1405	T2	1530
TZAF 900 FF	-	-	T1	1105	T2L	1235	T2	1360
TZAF 1000 FF	-	-	T1	895	T2L	1065	T2	1190
TZAF 1120 FF	-	-	T1	720	-	-	T2	1020
TZAF 1250 FF	-	-	T1	680	-	-	T2	935

AISI 316 and AISI 316 L EXECUTION
Max RPM limits are the same for execution with stop bushing and with seeger ring

Fan model	arr.	Max RPM	arr.	Max RPM	arr.	Max RPM	arr.	Max RPM
TZAF 315 FF	R	2510	T1	3000	-	-	T2	3000
TZAF 355 FF	R	2250	T1	2740	-	-	T2	3000
TZAF 400 FF	R	2025	T1	2400	T2L	2410	T2	2275
TZAF 450 FF	R	1800	T1	2140	T2L	2215	T2	2475
TZAF 500 FF	R	1575	T1	1725	T2L	1875	T2	2115
TZAF 560 FF	R	1465	T1	1650	T2L	1990	T2	2025
TZAF 630 FF	R	1165	T1	1275	T2L	1690	T2	1765
TZAF 710 FF	R	1030	T1	1275	T2L	1390	T2	1575
TZAF 800 FF	-	-	T1	975	T2L	1240	T2	1350
TZAF 900 FF	-	-	T1	975	T2L	1090	T2	1200
TZAF 1000 FF	-	-	T1	790	T2L	940	T2	1050
TZAF 1120 FF	-	-	T1	640	-	-	T2	900
TZAF 1250 FF	-	-	T1	600	-	-	T2	825

Duplex EXECUTION

Fan Model	Arr.	Max RPM		Arr.	Max RPM		Arr.	Max RPM		Arr.	Max RPM	
		Stop bushing	Seeger ring		Stop bushing	Seeger ring		Stop bushing	Seeger ring		Stop bushing	Seeger ring
TZAF 315 FF	R	3350	2730	T1	4000	3000	-	-	-	T2	4000	3700
TZAF 355 FF	R	3000	3000	T1	3650	3200	-	-	-	T2	4000	3770
TZAF 400 FF	R	2700	2700	T1	3200	2750	T2L	3215	3000	T2	3700	3200
TZAF 450 FF	R	2400	2400	T1	2850	2650	T2L	2950	2750	T2	3300	2900
TZAF 500 FF	R	2100	1850	T1	2300	1960	T2L	2500	2210	T2	2820	2400
TZAF 560 FF	R	1950	1820	T1	2200	1870	T2L	2650	2350	T2	2700	2350
TZAF 630 FF	R	1550	1400	T1	1700	1450	T2L	2250	1920	T2	2350	2000
TZAF 710 FF	R	1370	1350	T1	1700	1450	T2L	1850	1800	T2	2100	1850
TZAF 800 FF	-	-	-	T1	1300	1120	T2L	1650	1470	T2	1800	1550
TZAF 900 FF	-	-	-	T1	1300	1200	T2L	1450	1300	T2	1600	1450
TZAF 1000 FF	-	-	-	T1	1050	900	T2L	1250	1120	T2	1400	1270
TZAF 1120 FF	-	-	-	T1	850	770	-	-	-	T2	1200	1150
TZAF 1250 FF	-	-	-	T1	800	700	-	-	-	T2	1100	1070

Fan Model	Arr.	Max RPM		Arr.	Max RPM		Arr.	Max RPM		Arr.	Max RPM	
		Stop bushing	Seeger ring		Stop bushing	Seeger ring		Stop bushing	Seeger ring		Stop bushing	Seeger ring
NTHZ 315	R	3550	3150	T1	3700	3150	-	-	-	T2	3900	3650
NTHZ 355	R	3150	3150	T1	3400	3200	-	-	-	T2	3850	3600
NTHZ 400	R	2800	2380	T1	2950	2400	T2L	3200	2700	T2	3600	2900
NTHZ 450	R	2400	2380	T1	2650	2400	T2L	2950	2700	T2	3230	2750
NTHZ 500	R	2100	1850	T1	2200	1870	T2L	2500	2215	T2	2720	2275
NTHZ 560	R	1950	1790	T1	2050	1800	T2L	2400	2200	T2	2600	2200
NTHZ 630	R	1550	1370	T1	1650	1400	T2L	2100	1800	T2	2275	1850
NTHZ 710	R	1350	1350	T1	1500	1350	T2L	1850	1750	T2	2015	1820
NTHZ 800	-	-	-	T1	1200	1050	T2L	1500	1325	T2	1700	1425
NTHZ 900	-	-	-	T1	1200	1050	T2L	1350	1250	T2	1500	1350
NTHZ 1000	-	-	-	T1	1050	850	T2L	1150	1050	T2	1260	1150
NTHZ 1120	-	-	-	T1	825	750	-	-	-	T2	1175	1100
NTHZ 1250	-	-	-	T1	765	650	-	-	-	T2	1050	1000

AISI 304 and AISI 304 L EXECUTION

Max RPM limits are the same for execution with stop bushing and with seeger ring

Fan model	arr.	Max RPM	arr.	Max RPM	arr.	Max RPM	arr.	Max RPM
NTHZ 315	R	3020	T1	3145	-	-	T2	3315
NTHZ 355	R	2680	T1	2890	-	-	T2	3275
NTHZ 400	R	2380	T1	2400	T2L	2700	T2	2900
NTHZ 450	R	2040	T1	2255	T2L	2510	T2	2750
NTHZ 500	R	1785	T1	1870	T2L	2125	T2	2275
NTHZ 560	R	1660	T1	1745	T2L	2040	T2	2200
NTHZ 630	R	1320	T1	1400	T2L	1785	T2	1850
NTHZ 710	R	1150	T1	1275	T2L	1575	T2	1715
NTHZ 800	-	-	T1	1020	T2L	1275	T2	1425
NTHZ 900	-	-	T1	1020	T2L	1150	T2	1275
NTHZ 1000	-	-	T1	850	T2L	980	T2	1070
NTHZ 1120	-	-	T1	700	-	-	T2	1000
NTHZ 1250	-	-	T1	650	-	-	T2	895

AISI 316 and AISI 316 L EXECUTION

Max RPM limits are the same for execution with stop bushing and with seeger ring

Fan model	arr.	Max RPM	arr.	Max RPM	arr.	Max RPM	arr.	Max RPM
NTHZ 315	R	2665	T1	2775	-	-	T2	2925
NTHZ 355	R	2365	T1	2550	-	-	T2	2890
NTHZ 400	R	2100	T1	2215	T2L	2400	T2	2700
NTHZ 450	R	1800	T1	1990	T2L	2215	T2	2425
NTHZ 500	R	1575	T1	1650	T2L	1875	T2	2040
NTHZ 560	R	1465	T1	1540	T2L	1800	T2	1950
NTHZ 630	R	1165	T1	1240	T2L	1575	T2	1705
NTHZ 710	R	1015	T1	1125	T2L	1390	T2	1510
NTHZ 800	-	-	T1	900	T2L	1125	T2	1275
NTHZ 900	-	-	T1	900	T2L	1015	T2	1125
NTHZ 1000	-	-	T1	790	T2L	865	T2	945
NTHZ 1120	-	-	T1	620	-	-	T2	880
NTHZ 1250	-	-	T1	575	-	-	T2	790

Duplex EXECUTION

Fan Model	Arr.	Max RPM		Arr.	Max RPM		Arr.	Max RPM		Arr.	Max RPM	
		Stop bushing	Seeger ring		Stop bushing	Seeger ring		Stop bushing	Seeger ring		Stop bushing	Seeger ring
NTHZ 315	R	3550	3150	T1	3700	3150	-	-	-	T2	3900	3650
NTHZ 355	R	3150	3150	T1	3400	3200	-	-	-	T2	3850	3600
NTHZ 400	R	2800	2380	T1	2950	2400	T2L	3200	2700	T2	3600	2900
NTHZ 450	R	2400	2380	T1	2650	2400	T2L	2950	2700	T2	3230	2750
NTHZ 500	R	2100	1850	T1	2200	1870	T2L	2500	2215	T2	2720	2275
NTHZ 560	R	1950	1790	T1	2050	1800	T2L	2400	2200	T2	2600	2200
NTHZ 630	R	1550	1370	T1	1650	1400	T2L	2100	1800	T2	2275	1850
NTHZ 710	R	1350	1350	T1	1500	1350	T2L	1850	1750	T2	2015	1820
NTHZ 800	-	-	-	T1	1200	1050	T2L	1500	1325	T2	1700	1425
NTHZ 900	-	-	-	T1	1200	1050	T2L	1350	1250	T2	1500	1350
NTHZ 1000	-	-	-	T1	1050	850	T2L	1150	1050	T2	1260	1150
NTHZ 1120	-	-	-	T1	825	750	-	-	-	T2	1175	1100
NTHZ 1250	-	-	-	T1	765	650	-	-	-	T2	1050	1000

-- Casing

According to TZAF FF Atex and NTHZ Atex Technical Documentation deposited by the Notified Body, casing of TZAF FF Atex and NTHZ Atex fans are manufactured in galvanized and painted steel up to size 1000 and in black and painted steel over size 1000 or in AISI 304, in AISI 304L, in AISI 316, in AISI 316L or in Duplex SS2205.
Casing is continuously welded.
Casing is provided with inspection door.
The standard EN 14986 requires that the inspection door, outlet and inlet joints and the eventual holes in the casing for the fixing screws shall be sealed. As a consequence the casing can be considered as gas tight without release (or with reduced release); this could be an aim in the single inlet fan series, but it is out of application in the double inlet fan series, as for the

TZAF FF Atex, NTHZ Atex object of the Category 2G certification.

The fan shaft must be installed in a horizontal position.

-- Application limits as declared in the Technical Documentation deposited by the Notified Body.

Fans shall operate inside the field covered by the catalogue curves, the use of the fan outside this field could generate instability and vibrations;
for some fans, a part of the catalogue curve is drawn as a dashed line; this means that the use of the fan in these conditions could generate instability and vibrations, due to the presence of inlet obstructions (pulley, etc):
therefore in Atex application the fan must absolutely NOT be used outside catalogue field and in the zone of dashed-line curves.

TZAF FF Atex and NTHZ Atex:

absolute pressure from 0.8 bar to 1.1 bar;
aerodynamic energy increase of less than 25 kJ/kg;
atmospheres with a maximum 21 vol% oxygen content;
maximal temperature range of conveyed fluid between -20 and +60 °C
(except. from more stringent limits according to the motor model and brand installed);
gas explosion Groups IIA and IIB;
temperature class T3

As already declared for all fans of this handbook: no for conveying fluids containing dust.

MAZ Atex, MHZ Atex

-- Bearings
The L_{10} minimum life shall not be less than 40000 hours. This requirement is guaranteed only if the diameter of the pulley respects a minimal value according to our fan-selection program *Aeolus* (see par. 4.3)

-- Impeller - shaft attachment
Fan series MAZ Atex and MHZ Atex.
For motor powers in excess of 5.5 kW a positive locking is achieved for the fixing of hub on the shaft with the use of the key and relative safe grub screw and arranging a couple of seeger rings or stop bushings on the shaft between the hub for single and double inlet fans. For single inlet fans directly coupled to the motor, positive locking is performed with a locking screw and washer at the tapped shaft end. The use of the seeger rings on the fan shaft restricts the maximal permissible rotational speed of the standard catalogue limits to the rotational speed limits reported in the following tables.
For motor powers less than 5.5 kW the fixing of the hub on the shaft can be achieved also with the use of the key and relative safe grub screw

Rotational speed limit is indicated in the fan label.

Fan Model	arr	Max RPM		arr	Max RPM		arr	Max RPM	
		Stop bushing	Seeger ring		Stop bushing	Seeger ring		Stop bushing	Seeger ring
MAZ 315	T1	4000	3000	-	-	-	T2	4000	3700
MAZ 355	T1	3650	3200	-	-	-	T2	4000	3770
MAZ 400	T1	3200	2750	T2L	3215	3000	T2	3700	3200
MAZ 450	T1	2850	2650	T2L	2950	2750	T2	3300	2900
MAZ 500	T1	2300	1960	T2L	2500	2210	T2	2820	2400
MAZ 560	T1	2200	1870	T2L	2650	2350	T2	2700	2350
MAZ 630	T1	1700	1450	T2L	2250	1920	T2	2350	2000
MAZ 710	T1	1700	1450	T2L	1850	1800	T2	2100	1850
MAZ 800	T1	1300	1120	T2L	1650	1470	T2	1800	1550
MAZ 900	T1	1300	1200	T2L	1450	1300	T2	1600	1450
MAZ 1000	T1	1050	900	T2L	1250	1120	T2	1400	1270
MAZ 1120	T1	850	770	-	-	-	T2	1200	1150
MAZ 1250	T1	800	700	-	-	-	T2	1100	1070

AISI 304 and AISI 304 L EXECUTION

Max RPM limits are the same for execution with stop bushing and with seeger ring

Fan model	arr.	Max RPM	arr.	Max RPM	arr.	Max RPM
MAZ 315	T1	3400	-	-	T2	3400
MAZ 355	T1	3100	-	-	T2	3400
MAZ 400	T1	2720	T2L	2735	T2	3145
MAZ 450	T1	2425	T2L	2510	T2	2805
MAZ 500	T1	1955	T2L	2125	T2	2400
MAZ 560	T1	1870	T2L	2255	T2	2295
MAZ 630	T1	1445	T2L	1915	T2	2000
MAZ 710	T1	1445	T2L	1575	T2	1785
MAZ 800	T1	1105	T2L	1405	T2	1530
MAZ 900	T1	1105	T2L	1235	T2	1360
MAZ 1000	T1	895	T2L	1065	T2	1190
MAZ 1120	T1	720	-	-	T2	1020
MAZ 1250	T1	680	-	-	T2	935

AISI 316 and AISI 316 L EXECUTION

Max RPM limits are the same for execution with stop bushing and with seeger ring

Fan model	arr.	Max RPM	arr.	Max RPM	arr.	Max RPM
MAZ 315	T1	3000	-	-	T2	3000
MAZ 355	T1	2740	-	-	T2	3000
MAZ 400	T1	2400	T2L	2410	T2	2775
MAZ 450	T1	2140	T2L	2215	T2	2475
MAZ 500	T1	1725	T2L	1875	T2	2115
MAZ 560	T1	1650	T2L	1990	T2	2025
MAZ 630	T1	1275	T2L	1690	T2	1765
MAZ 710	T1	1275	T2L	1390	T2	1575
MAZ 800	T1	975	T2L	1240	T2	1350
MAZ 900	T1	975	T2L	1090	T2	1200
MAZ 1000	T1	790	T2L	940	T2	1050
MAZ 1120	T1	640	-	-	T2	900
MAZ 1250	T1	600	-	-	T2	825

Duplex

Fan Model	arr	Max RPM		arr	Max RPM		arr	Max RPM	
		Stop bushing	Seeger ring		Stop bushing	Seeger ring		Stop bushing	Seeger ring
MAZ 315	T1	4000	3000	-	-	-	T2	4000	3770
MAZ 355	T1	3650	3200	-	-	-	T2	4000	3770
MAZ 400	T1	3200	2750	T2L	3215	3000	T2	3700	3200
MAZ 450	T1	2850	2650	T2L	2950	2750	T2	3300	2900
MAZ 500	T1	2300	1960	T2L	2500	2210	T2	2820	2400
MAZ 560	T1	2200	1870	T2L	2650	2350	T2	2700	2350
MAZ 630	T1	1700	1450	T2L	2250	1920	T2	2350	2000
MAZ 710	T1	1700	1450	T2L	1850	1800	T2	2100	1850
MAZ 800	T1	1300	1120	T2L	1650	1470	T2	1800	1550
MAZ 900	T1	1300	1200	T2L	1450	1300	T2	1600	1450
MAZ 1000	T1	1050	900	T2L	1250	1120	T2	1400	1270
MAZ 1120	T1	850	770	-	-	-	T2	1200	1150
MAZ 1250	T1	800	700	-	-	-	T2	1100	1070

Fan Model	arr	Max RPM		arr	Max RPM		arr	Max RPM	
		Stop bushing	Seeger ring		Stop bushing	Seeger ring		Stop bushing	Seeger ring
MHZ 315	T1	3700	3150	-	-	-	T2	3900	3650
MHZ 355	T1	3400	3200	-	-	-	T2	3850	3600
MHZ 400	T1	2950	2400	T2L	3200	2700	T2	3600	2900
MHZ 450	T1	2650	2400	T2L	2950	2700	T2	3230	2750
MHZ 500	T1	2200	1870	T2L	2500	2215	T2	2720	2275
MHZ 560	T1	2050	1800	T2L	2400	2200	T2	2600	2200
MHZ 630	T1	1650	1400	T2L	2100	1800	T2	2275	1850
MHZ 710	T1	1500	1350	T2L	1850	1750	T2	2015	1820
MHZ 800	T1	1200	1050	T2L	1500	1325	T2	1700	1425
MHZ 900	T1	1200	1050	T2L	1350	1250	T2	1500	1350
MHZ 1000	T1	1050	850	T2L	1150	1050	T2	1260	1150
MHZ 1120	T1	825	750	-	-	-	T2	1175	1100
MHZ 1250	T1	765	650	-	-	-	T2	1050	1000

AISI 304 and AISI 304 L EXECUTION

Max RPM limits are the same for execution with stop bushing and with seeger ring

Fan model	arr.	Max RPM	arr.	Max RPM	arr.	Max RPM
MHZ 315	T1	3145	-	-	T2	3315
MHZ 355	T1	2890	-	-	T2	3275
MHZ 400	T1	2510	T2L	2700	T2	3060
MHZ 450	T1	2255	T2L	2510	T2	2745
MHZ 500	T1	1870	T2L	2125	T2	2310
MHZ 560	T1	1745	T2L	2040	T2	2210
MHZ 630	T1	1405	T2L	1785	T2	1935
MHZ 710	T1	1275	T2L	1575	T2	1710
MHZ 800	T1	1020	T2L	1275	T2	1445
MHZ 900	T1	1020	T2L	1150	T2	1275
MHZ 1000	T1	895	T2L	980	T2	1070
MHZ 1120	T1	700	-	-	T2	1000
MHZ 1250	T1	650	-	-	T2	895

AISI 316 and AISI 316 L EXECUTION

Max RPM limits are the same for execution with stop bushing and with seeger ring

Fan model	arr.	Max RPM	arr.	Max RPM	arr.	Max RPM
MHZ 315	T1	2775	-	-	T2	2925
MHZ 355	T1	2550	-	-	T2	2890
MHZ 400	T1	2215	T2L	2400	T2	2700
MHZ 450	T1	1990	T2L	2215	T2	2425
MHZ 500	T1	1650	T2L	1875	T2	2040
MHZ 560	T1	1540	T2L	1800	T2	1950
MHZ 630	T1	1240	T2L	1575	T2	1705
MHZ 710	T1	1125	T2L	1390	T2	1510
MHZ 800	T1	900	T2L	1125	T2	1275
MHZ 900	T1	900	T2L	1015	T2	1125
MHZ 1000	T1	790	T2L	865	T2	945
MHZ 1120	T1	620	-	-	T2	880
MHZ 1250	T1	575	-	-	T2	790

Duplex

Fan Model	arr	Max RPM		arr	Max RPM		arr	Max RPM	
		Stop bushing	Seeger ring		Stop bushing	Seeger ring		Stop bushing	Seeger ring
MHZ 315	T1	3700	3150	-	-	-	T2	3900	3650
MHZ 355	T1	3400	3200	-	-	-	T2	3850	3600
MHZ 400	T1	2950	2400	T2L	3200	2700	T2	3600	2900
MHZ 450	T1	2650	2400	T2L	2950	2700	T2	3230	2750
MHZ 500	T1	2200	1870	T2L	2500	2215	T2	2720	2275
MHZ 560	T1	2050	1800	T2L	2400	2200	T2	2600	2200
MHZ 630	T1	1650	1400	T2L	2100	1800	T2	2275	1850
MHZ 710	T1	1500	1350	T2L	1850	1750	T2	2015	1820
MHZ 800	T1	1200	1050	T2L	1500	1325	T2	1700	1425
MHZ 900	T1	1200	1050	T2L	1350	1250	T2	1500	1350
MHZ 1000	T1	1050	850	T2L	1150	1050	T2	1260	1150
MHZ 1120	T1	825	750	-	-	-	T2	1175	1100
MHZ 1250	T1	765	650	-	-	-	T2	1050	1000

-- Casing
According to MAZ and MHZ Technical Documentation deposited by the Notified Body, casing of MAZ and MHZ fans are manufactured in black steel and painted or in AISI 304, in AISI 304 L, in AISI 316, in AISI 316 L or in Duplex SS2205.
Casing is continuously welded and reiforced with stiffeners intermittent welded.
Casing is provided with inspection door.
The standard EN 14986 requires that the inspection door, outlet and inlet joints and eventual holes in the casing for the fixing screws shall be sealed. As a consequence the casing can be considered as gas tight without release (or with reduced release); this could be an aim in the single inlet fan series, but it is out of application in the double inlet fan series, as for the MAZ Atex and MHZ Atex series, object of the Category 2G certification.

The fan shaft must be installed in a horizontal position.

-- Application limits as declared in the Technical Documentation deposited by the Notified Body.

Fans shall operate inside the field covered by the catalogue curves, the use of the fan outside this field could generate instability and vibrations;
for some fans, a part of the catalogue curve is drawn as a dashed line; this means that the use of the fan in these conditions could generate instability and vibrations, due to the presence of inlet obstructions (pulley, etc):
therefore in Atex application the fan must absolutely NOT be used outside catalogue field and in the zone of dashed-line curves.

MAZ Atex, MHZ Atex.
absolute pressure from 0.8 bar to 1.1 bar;
aerodynamic energy increase of less than 25 kJ/kg;
atmospheres with a maximum 21 vol% oxygen content;
maximal temperature range of conveyed fluid between -20 and +60 °C
(except. from more stringent limits according to the motor model and brand installed);
gas explosion Groups IIA and IIB;
temperature class T3

As already declared for all fans of this handbook: no for conveying fluids containing dust.

NPL Atex, NPA Atex

-- Structure with motor support base
NPL Atex and NPA Atex plenum fans for application in Group II Category 2G are in setting 4, with structure supporting the motor and wheel installed on the motor shaft and are supplied complete with all features and devices necessary to comply with the ATEX directive requirements: no modifications are allowed because plenum fan must correspond with the technical specification declared in the documentation deposited by the Notified Body.

Structure is manufactured in steel S235JR, AISI 304, AISI 304L, AISI 316, AISI 316L or Duplex. Fixing screws and rivets are in steel 8.8, in AISI 304, AISI 304L, AISI 316, AISI 316L; screws and rivets for fixing the copper linings are in brass.
Plenums are provided with inlet guards and protective enclosure at outlet side.
Inlet guard:
- where customer gives no specification the guard is positioned between inlet-cone and panel; if guard is outside it is of flat-surface type. In both cases the inlet surface of the structure is level to allow any connection to plant ducting;
- where there is the inlet flexible connection, guard can be installed in every position: between inlet-cone and structure, between structure and flexible connection or upstream the flexible connection.
  NOTE: positioning of the guard upstream of the flexible connection allows better air performances

Protective enclosure:
for size 250, 280 and 315 rear guard wall in front of the wheel is completely manufactured in copper; for other sizes a copper plate is fixed inside the enclosure in front of the back-plate / hub; a copper lining is fixed on the outward frame supporting the enclosure for sizes 400, 500 because wheel diameter is up to the frame dimensions. For NPA 630 plenum fan a copper lining is fixed on the motor-support wall facing the wheel.
All screws used for fixing these copper anti-spark protections are of brass.

The protection is of rigid design in order to avoid risk of rubbing on the wheel, due to the use of an appropriate thickness for the guard, stiffeners or by splitting the guard in smaller pieces (the joints between pieces increase the rigidity).

-- Impeller - shaft attachment
All NPL Atex and NPA Atex plenum fans have impeller hub positive locked between the shaft shoulder and a locking screw and washer at the tapped shaft end. The impeller shaft must be installed in a horizontal position.

-- Operational limits

Maximal permissible rotational speed of NPL Atex plenum fan series in dependence of the wheel material:

Fan model	Max RPM			
	Standard material (S275JR, DC04, S355JOWP)	AISI 304, AISI 304 L	AISI 316, AISI 316 L	Duplex
NPL 250	5200	4420	3900	5200
NPL 280	4735	4025	3551	4735
NPL 315	4315	3668	3236	4315
NPL 355	3825	3251	2869	3825
NPL 400	3400	2890	2550	3400
NPL 450	3025	2571	2269	3025
NPL 500	2720	2312	2040	2720
NPL 560	2430	2065	1822	2430
NPL 630	2150	1827	1612	2150
NPL 710 Cl.1	1600	1360	1200	1600
NPL 710 Cl.2	1915	1628	1436	1915
NPL 800 Cl.1	1400	1190	1050	1400
NPL 800 Cl.2	1700	1445	1275	1700
NPL 900 Cl.1	1250	1062	938	1250
NPL 900 Cl.2	1500	1275	1125	1500
NPL 1000 Cl.1	1050	893	788	1050
NPL 1000 Cl.2	1350	1148	1013	1350
NPL 1120 Cl.1	900	765	675	900
NPL 1120 Cl.2	1150	978	863	1150
NPL 1250 Cl.1	765	650	574	765
NPL 1250 Cl.2	1085	893	814	1085

Maximal permissible rotational speed of NPA Atex plenum fan series in dependence of the wheel material:

Fan model	Max RPM			
	Standard material (S275JR, DC04, S355JOWP)	AISI 304, AISI 304 L	AISI 316, AISI 316 L	Duplex
NPA 315	4500	3825	3375	4500
NPA 355	4000	3400	3000	4000
NPA 400	3700	3145	2775	3700
NPA 450	3300	2805	2475	3300
NPA 500	2850	2423	2138	2850
NPA 560	2650	2253	1988	2650
NPA 630	2350	1998	1763	2350
NPA 710	2100	1785	1575	2100
NPA 800	1800	1530	1350	1800
NPA 900	1600	1360	1200	1600
NPA 1000	1400	1190	1050	1400
NPA 1120	1200	1020	900	1200
NPA 1250	1100	935	825	1100

-- Application limits as declared in the Technical Documentation deposited by the Notified Body

- absolute pressure from 0.8 to 1.1 bar;
- aerodynamic energy increase of less than 25 kJ/kg;
- maximal temperature range of conveyed fluid between -20 and +40 °C
(except. from more stringent limits according to the motor model and brand)
- maximum oxygen content both in the conveyed fluid and in the installation environment: 21 vol%;
gas explosion Groups IIA and IIB;
temperature class: the same as motor temperature class and quoted also on the plenum fan label

As already declared for all fans and plenum fans of this handbook: no for conveying fluids containing dust

2.5.4 Explosion risks

The following is the list of explosion risks which has been assessed for the fan and plenum fan series dealt with in this manual. The division in “normal operation” and “expected malfunction” is due to the different fan Category 3 and 2: for Category 3 only the ignition risks which can take place during normal operation are considered; for Category 2 malfunctions must also be considered and consequently the ignition protection.

Every type of ignition protection has a symbol (see table below), which is reported on the fan label.

symbol	Type of ignition protection
fr	for a flow restricting enclosure
d	for a flameproof enclosure
c *	for constructional safety
b	for control of ignition source
p	for pressurized equipment
k	for liquid immersion
g	for inherent safety

* Most of the ignition protections for the fan series TZAF FF Atex, VTZ Atex, NTHZ Atex, THLZ FF Atex, MAZ Atex, MHZ Atex, TLZ Atex, TLI Atex, TZAF Atex, THLZ Atex, HLZ Atex, TLE Atex, THLE Atex, KHLE Atex, NPL Atex, NPA Atex, TE (in steel) Atex are type “c”.

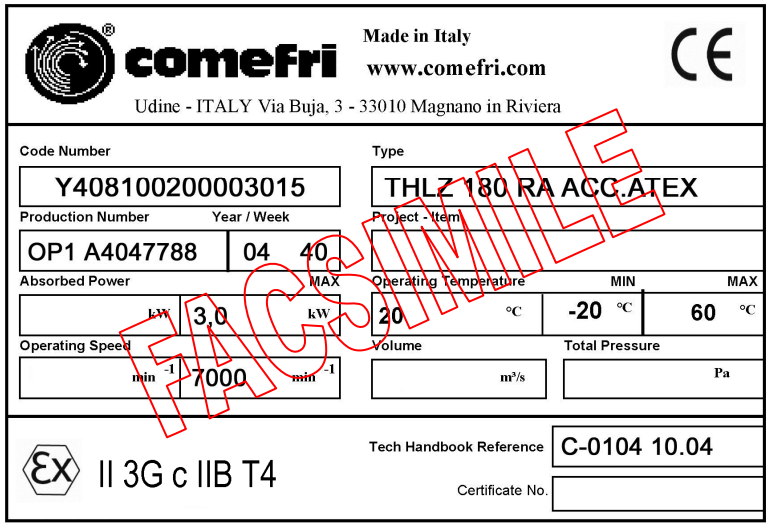
Ignition risk assessment

Potential ignition source		Measures applied to prevent the source from becoming effective	Ignition protection used
Normal operation	Expected malfunction		
Selection of unsuitable fan / plenum fan		Compare process requirements with fan label data	EN 14986 7.3; Operating and maintenance manual par.2.3, 2.4, 2.5.1, 2.5.3.3.
Transportation damage		Instructions for transport	EN 14986 7.2; Operating and maintenance manual par.3.
Storage damage		Instructions for storage	EN 14986 7.2; Operating and maintenance manual par.3.1.
General environmental influences		Instructions concerning: environmental temperature, humidity, environmental corrosiveness. Ex. painting, zinc-coating, stainless steel	EN 13463-1. Constructional safety 'c'; Operating and maintenance manual par. 2.4, 2.5.3.2, 3.3.
Excessive fluid temperature		Inlet temperature and heating limitation of the gas handled, check the field of application	EN 14986 1; Operating and maintenance manual par.2.4, 2.5.2, 2.5.3.3.
Maximal fluid temperature +60°C		If motor is in the flow of the conveyed fluid, it is necessary the application of a specific motor allowed to operate at the fluid temperature.	See motor and fan / plenum fan labels.
	Contact between static and moving components caused by fan casing deformation	Rigid housing design, separation of ductwork by elastic joints, correct belt tensioning.	EN 14986 4.6. Constructional safety 'c'; Operating and maintenance manual par. 2.5.3, 4.5, 6.4, 6.5.
	Contact between static and moving components caused of plenum fan protective enclosure deformation	Rigid design of protective enclosure through appropriate structure, guard thickness and rigidity achieved through the use of stiffeners or by splitting the guard into smaller pieces	EN 14986 par. 4.6; constructional safety 'c'; Operating and maintenance manual.
	Contact between static and moving components caused by thermal deformation	Operating temperature limits	EN 14986 1; See fan or plenum fan label.
	Contact between static and moving components caused by impeller deformation or fault	Rigid impeller design, decrease of maximal revolving velocity	EN 14986 par. 4.7; constructional safety 'c'; Operating and maintenance manual par. 2.3, 2.5.3.1, see fan or plenum fan label.
	Contact between static and moving components caused by loosened impeller	Locking of the hub on the shaft	EN 14986 par. 4.21, 5.2; constructional safety 'c'; Operating and maintenance manual par.2.5.3.
	Contact between static and moving components caused by misalignment and wear and tear	Minimum clearance guaranteed by the use of a check template at the assembling. Suitable material pairings	EN 14986 par. 4.15, 4.8.2. Constructional safety 'c'; Operating and maintenance manual par.2.5.3, 4.5, 6.8.
	Contact between static and moving components due to shafts gliding in bearings	Locking of the bearing on the shaft	Bearing manufacturer manual; Operating and maintenance Manual par. 6.6.
	Radial displacement of bearing respect to the inlet-cone centerline	Tightening torques; elastic pin in bearings with pillow block	Constructional safety 'c'; Operating and maintenance manual par. 6.6.
	Bearing failure	Bearing specification	Operating and maintenance manual Appendix.
	Bearing failure	Correct belt tensioning	Operating and maintenance manual par.6.5.
	Bearing failure	Bearings lubrication, check the operating condition of the bearing	Operating and maintenance manual par.6.6.

Potential ignition source		Measures applied to prevent the source from becoming effective	Ignition protection used
Normal operation	Expected malfunction		
	Bearing failure	Bearings replacement (Safe operational life depending on fan category, see 2.5.3.2 and 2.5.3.3)	EN 14986 4.17; Operating and maintenance manual par.2.5.3.2, 2.5.3.3, 3.3, 4.1, 4.3, 4.5, 5.1, 6.
	Motor bearing failure with wheel directly installed at motor shaft	Correct dimensioning of maximal applicable radial and axial load of the motor	Manual / technical specifications of motor manufacturer.
	Mechanical faults and fatigue	Vibration control in order to avoid abnormal conditions	EN 13463-1, EN 14986; Operating and maintenance Manual par.2.3, 2.4, 2.5.3.1, 4.2, 4.5, 5.4, 6.
	Weakening of materials and bridging of gaps due to corrosion	Corrosion protection	EN 14986; constructional safety 'c'; Operating and maintenance manual see par. 2.4, 2.5.3, 3.3, 4.1, 6.8.
Explosive atmosphere with low ignition temperature due to dust deposits		Check the ignition temperature of dust in comparison to temperature class; application field of fan, instructions concerning inspection, cleaning	EN 14986 4.14; constructional safety 'c'; Operating and maintenance manual par.2.4, 2.5.1, 2.5.3, 6.2, 6.8.
Surface temperature		Maximum surface temperature as defined for fan /plenum fan temperature class; check the label indication	EN 14986 4.4.2; Operating and maintenance manual par.2.5.2, 2.5.3.3.
	Slippage of belts causing temperature increase	Correct belt tensioning	EN 13463-5 7.2; Operating and maintenance manual par.6.5.
	Pulley, fan shaft, motor shaft, wheel back-plate, wheel hub rubbing on transmission guard / protective enclosure	Applying tip extensions / linings or manufacturing transmission guard / protective enclosure from material pairings permitted	EN 13463-5, EN 14986 4.8; constructional safety 'c'; Operating and maintenance manual par.2.5.3, 4.5.
	Contact between static and moving components caused by breakage of pipe ring of airflow measurement device	Use of proper connections joining pipe pieces firmly inserted and secure multipoint fixing of pipe ring on inlet-cone	Constructional drawings and operating instructions.
Contact with foreign particles which can cause sparks or damage to the protective devices		Protection against foreign particles	EN 14986 4.24; constructional safety 'c'; Operating and maintenance manual par.2.5.3, 4.5.
Electrostatic ignition		Electrostatic discharges by earthing	EN 13463-1 11; Operating and maintenance manual par. 4.4, 4.5.
Electrostatic discharges in connection with belts		Belt drive rules	EN 13463-5; Operating and maintenance manual par. 2.5.3, 4.5.
Electrical components		Electric installation instructions of electric equipment	See reference manuals of electric devices.

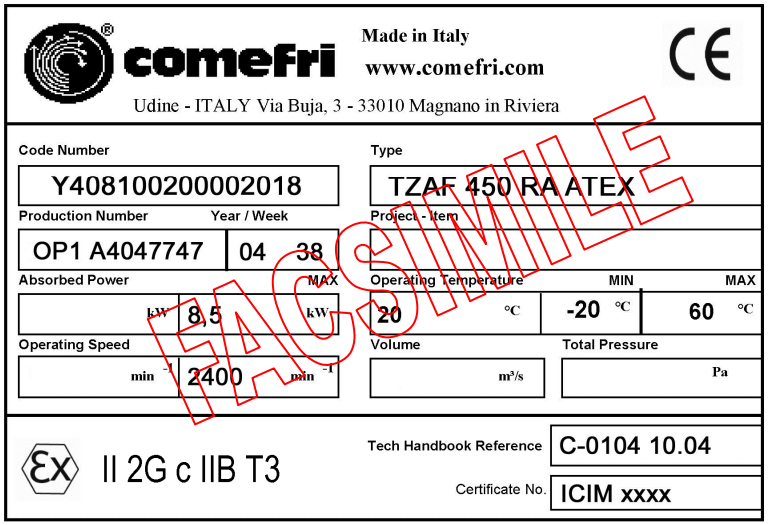
2.5.5 Caption of fan label for anti-spark execution

GROUP II, Category 3



Code number: fan code
Type: fan description
Production number + year + week: serial number
Project – item: customer project reference
Absorbed power: operating shaft power
MAX absorbed power: maximum permissible shaft power
Operating temperature: operating temperature of the fan
Operating temperature MIN: minimum permissible entrance temperature of the fluid
Operating temperature MAX: maximum permissible entrance temperature of the fluid
Operating speed: operating fan speed [RPM]
Operating speed MAX: maximum operating fan speed [RPM]
Volume: operating air flow
Total pressure: operating total fan pressure
Ex II 3 G c IIB T4 : II indicates the group, 3 the Category, G means that the fan can move dust- free air or lightly dusty air, c indicates the type of safety measure adopted, IIB is fluid type class, T4 the temperature class. NOTE: IIB indication means that application extends to both IIA and IIB fluid classes.
Technical handbook reference: code and version of "OPERATING AND MAINTENANCE MANUAL".

GROUP II, Category 2



For a fan in Category 2, respect to the label of a fan in Category 3 (to which refer for the detailed fields description), is compiled also the further field "Certificate No." i.e. the deposit number of technical documentation by the Accreditation Institute (notified body), required for Group II, Category 2.

Note 1: The examples shows a generic label in English; the label applied on the specific fan, will be printed in the language requested by the customer choose from: Italian, English, German, French.

Note 2: In case of the peculiar indication for the fluid type class as **IIB + H**, it means that fan / plenum fan is suitable for application with the gases of class IIA, IIB and also for hydrogen.
To be remarked: NOT for the other gases belonging to class IIC, but ONLY for hydrogen.

2.6 Fans and Plenum Fans with spark-proof execution according to VDMA 24169

From the 1st July 2003 the entry in force of ATEX Directive 94/4/EC repealed every other directives and national standards concerning the matter of potentially explosive atmospheres in all Countries belonging to EU.
Specifically for fans and plenum fans, VDMA 24169 has to be considered not more in force in the EU market and superseded by standard EN 14986, which is the harmonized standard related to ATEX Directive within the scope of design of fans and plenum fans working in potentially explosive atmospheres, so that fans and plenum fans put on the market or put into service inside the EU must comply with EN 14986.
Note: EN 14986 includes the requirements of VDMA 24169 and therefore covers and stands in for the whole application scope of VDMA 24169.

3 HANDLING AND STORAGE

3.1 Receiving

Each fan and plenum fan is carefully checked before shipment.
When receiving a fan or plenum fan it is necessary to check the conformity of the fan or plenum fan with the order (execution, rotation, power and polarity of installed motor, fittings, etc.); after installation we do not accept returns of non-compliant devices.
Furthermore it is necessary to verify that it has not been damaged during the transport, especially the rotating and the electric parts. In case of damage, they must be immediately noted on the delivery note and communicated to the forwarding agent. The lorry driver must countersign the document so that any damage which occurred during the transport can be reported to the insurance company. Comefri will not be responsible for the transport and the handling of the device at the customer's premises.

3.2 Handling

The handling of the fans and plenum fans requires adequate care and lifting tools as foreseen by Directive 2006/42/EC and subsequent amendments according to the weight and packaging of the device. Special care must be taken to ensure that the fan and the plenum fan will never be lifted by the shaft ends, motor transport eyebolts, bearing supports and inlet or outlet flanges.
Lifting points of the fans are the base frame, housing frames or lifting eyebolts, if available.
Before handling the fan, release the tension of the belts or completely remove the belts.
Lifting points of the plenum fans are the holes in the base plate of the structure (for middle sizes) or the holes in the side bars of the base frame of the structure (for bigger sizes).
Never stack devices one on top of the other after they have been removed from the box.
Be careful of improper handling, though not damaging the device, often leads to the need to rebalance the impeller.
Particular care must be taken in handling fans and plenum fans provided either with special painting or special protective coatings and treatments for which a slight undetected damage will always entail the absence of protection above the metal surface and therefore it might be cause of very serious failures during operation. Any damage to protective coatings caused during the transport is not covered by Comefri warranty.
The fan weights are indicated in the technical catalogue.

3.3 Storage

Store the fan or plenum fan properly to protect them against filth and moisture. Corrosive atmospheres must be avoided. Use of a tarpaulin to cover the device will aid in keeping it clean and dry. Do not use plastic sheets, as they will promote condensation, especially in hot and humid environments.
Permissible storage temperature range is between -20ºC and +45ºC.
Fans and/or plenum fans manufactured in special execution for low temperature, as exception from the previous storage temperature range, can be stored down to a minimal temperature of -50 °C; before start-up they shall be warmed-up gradually and slowly to the operating temperature.
If the fans are stored for over 6 months, you must release the tension of the belts (or completely remove the belts) and rotate the shaft manually from time to time in order to allow better distribution of the grease inside the bearings. Keep the fan or plenum fan away from machinery producing vibrations as it could stress the bearings.

4 INSTALLATION

Installation must be carried out by trained personnel in compliance with these operating instructions.
See the technical documentation in the relative technical catalogue for additional information (characteristic dimensions, distance and diameter fixing holes, weight, etc…)

4.1 Checks prior to installation

- Check the maximum performance data (see par.2.3, 2.4) and the rotation direction indicated on the fan plate, comparing these with the impeller rotation and the rotating field of the motor, especially in the presence of an anti-rotation device.
- Check that all bolts are properly tightened. Tightening torques for bearings shall be according to the manufacturer catalogue; the tightening torques for all the bolts on the fan and plenum fans shall be according to the prescriptions of the technical bolt handbooks.
- Check the integrity of the fan painting and of all the sealed parts. Take corrective actions if necessary (i.e. retouching painting before going ahead with further preparation phases).
- Rotate the impeller manually and make sure that is does not touch the inlet-cone or the Forefinger® device. During this operation, check that the bearings do not show any sign of irregular friction.

TLZ, TLI, TLE fans have the impeller with forward-curved blades. For these types of fan, make sure that connection to the duct is in accordance with the requirements to be respected in order to obtained the correct resistance of the circuit (considered in the design phase for the selection of the fan) so that the motor will not be overloaded.

NTHZ, VTZ, THLZ FF, MHZ, THLZ, HLZ, THLE, KHLE fans, NPL, NPL ALU, TE, NPE plenum fans have the impeller with backward-curved blades; TZAF FF, MAZ, TZAF fans, NPA, NPA ALU, PEAF plenum fans have the impeller with backward-curved airfoil blades; both these types of fans and plenum fans can work also with circuits showing a flow resistance lower than expected without having the risk of burning the motor.

4.2 Installation / Fixing

The type of installation must be considered when choosing the fan. Special attention must be paid to fans and plenum fans which are to be installed in atmospheres with a high humidity and critical temperature level.
The fan and plenum fan must be firmly fixed to a foundation or steel base frame. They must be fixed while avoiding any strain and deformation to the support structure. When using a foundation and fixing bolts, spacers should be added to ensure perfect contact between the fan or plenum fan and its base frame. Otherwise misalignment or bending moments could occur inducing anomalous vibrations during operation. A reinforced concrete foundation is considered ideal for mounting the fan and plenum fan. When installing on steel structures or racks, the design must consider both the weight of the fan or plenum fan and the dynamic forces generated by the electric motor/impeller rotation. It is absolutely necessary that these structures have a minimum resonance frequency higher than 50% of the fan or plenum fan rotation frequency. When installing on a concrete foundation, its weight should be four times that of the rotating group in addition to that of the electric motor (almost twice the weight of the complete fan or plenum fan unit).
No force or vibration must be transmitted to the support structure. To this purpose, use adequate anti-vibration dampers and flexible couplings for ducting.
Incorrect fixing of the fan or plenum fan can affect its operation and generate dangerous situations.

Safety devices removed from the machine must be reinstalled before the electrical connections are made.

Standard Comefri fans and plenum fans are designed to work with the shaft in a horizontal position. If the fan and plenum fan have to be used with a vertical shaft, it must be specified when placing the order and the specific special version must be requested (for spark-proof execution only the horizontal shaft is allowed)

For impellers of the plenum fan series NPL, NPL ALU, NPA, NPA ALU, TE, NPE, PEAF when supplied as impeller and inlet-cone unit as loose components check the correct overlapping of the inlet-cone and impeller according to the catalogue of reference.

Plenum fans do not meet the provisions of the CE labelling (e.g. they have an impeller without guards).
The fan and plenum fan must nevertheless be installed in accordance with CE requirements.
It is available a series of protective devices, inlet and outlet guards, protective enclosures for plenum fans in setting 4, which can be requested at the order confirmation in function of the installation type and according to standard UNI EN ISO 13857. For NPL, NPL ALU, NPA, NPA ALU, TE, NPE, PEAF plenum fan series, when provided as impeller and inlet-cone loose components, due to the unknown final installation, outlet protections have to be manufactured by the customer. As indicated in the relevant Catalogue can be ordered a prearrangement for the outlet protection, consisting of a supporting frame, fixed to the plenum main structure.

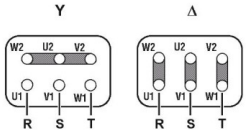
For plenum fans in Atex execution look up at par. 2.5.3

4.3 Motor and Belt Drive

A baseframe shall be arranged, provided by Comefri or by customer/user to allow a common base for motor and fan. It shall be of rigid design to assure the relative positioning of the components and to withstand stresses as vibrations and belt tension, which is function of motor power (see also par. 4.2).
Motor should be install to baseframe by means of a motor rail which allows belt tensioning and proper alignment.
Minimum pulley diameter. The theoretical life L_{10} can only be guaranteed if the diameter of the pulley corresponds to a minimum value, e.g. if the permissible load of the bearings is not exceeded.
Use our fan selection program *Aeolus* to choose the transmission. Otherwise refer to the technical catalogues of the pulley/transmission manufacturers.
Make sure that the pulleys are properly aligned. Fit the belts and tension them according to instructions (see 6.5)
If the fan is in spark-proof execution, see par. 4.5.

4.4 Electric wiring

The motor must be connected to the terminal board according to the information provided by the manufacturer of the motor.



Motors with rated power up to 4kW can be direct started, while for those with rated power beyond 4kW star/delta soft starting is normally used.

The motor must be protected against overloading and particular care is required when using motors with spark-proof protection or equipped with thermistors. Damage caused by insufficient motor protection makes the manufacturer's warranty null and void. The customer is responsible for earthing the fan and plenum fan.

4.5 Spark-proof execution according to ATEX 94/9/CE for Fans and Plenum Fans

Fans and plenum fans in Atex execution are declared by Comefri to be in compliance with Atex requirements: if alterations are made to the machinery without prior consultations with Comefri, the declaration becomes invalid.
Devices in Group II Category 2G must be in agreement with Technical Documentation deposited with the Notified Body.

CHECK that the spark-proof category of the fan corresponds to the hazardous zone (see 2.5.1).

Fans

The fan is of a rigid design and this reduces the risk of deformation from accidental impacts which could cause the impeller or rotating parts to come into contact with the casing. Nevertheless depending on operating conditions, be careful to avoid accidental impacts especially with the weaker parts of the casing. Arrange protective devices if necessary.

Casing for single inlet fans in Category 2. The inspection door is sealed; the installer must seal the inlet, outlet and all other couplings with a suitable sealing material or apply gaskets. This does not apply for TZAF FF Atex, NTHZ Atex, MAZ Atex, MHZ Atex double inlet fans with Atex Category 2 execution.

Plenum Fans

Plenum fans shall be protected by the inlet grid and by the protective enclosure around the impeller as indicated in par. 2.5.3. The enclosure around the plenum fan is of a rigid design and this reduces the risk of deformation from accidental impacts which could cause the impeller or rotating parts to come into contact with the enclosure parts. Nevertheless depending on operating conditions, be careful to avoid accidental impacts; arrange protective devices if necessary.

Horizontal installation

Fans and plenum fans in Atex execution must be installed with the shaft horizontal.

Stationary and rotating parts

A potential explosion risk can come from an accidental contact between stationary and rotating parts placed close one to another:

INLET-CONE and SHROUD
FOREFINGER® and SHROUD
SINGLE INLET WHEEL BACKPLATE and CASING SIDEPLATE
MOTOR SHAFT and PROTECTIVE ENCLOSURE OF PLENUM FAN
PLENUM FAN WHEEL (e.g. hub, back-plate) and PROTECTIVE ENCLOSURE
FAN SHAFT / MOTOR SHAFT / PULLEYS and TRANSMISSION GUARD

In par.2.5.3 are indicated the provisions arranged to prevent risk from accidental contact as required by the relevant Standard.

Stationary parts facing rotating parts have been made of material pairings as described in paragraph 2.5.3.1 and observing the clearance as described in par. 2.5.3.2 to satisfy Atex Standard requirements.

The clearance values between inlet-cone and shroud are provided in the Appendix.
The clearance must be checked before commissioning after having tensioned the belt.

Due attention must be paid to possible axial movements of all rotating elements (for ex. pulley), that must be kept in position or protected against displacement.

NOTE: in Atex application cooling fans shall not be used (see par. 2.5.3.1).

Protections against foreign particles

As required by Standard EN 14986, the fan and plenum fan shall be protected against the entry of foreign particles according to grade IP20 of EN 60529.
Fans:
fans are provided with proper inlet and outlet protective guards according to grade IP20 compliant with the Standard requirement.
Plenum fans:
Comefri standard Atex execution provides plenum fans in setting 4 equipped with the proper protection guard at the inlet and the protective enclosure at the outlet according to grade IP20 compliant with the Standard requirement. The guard of the protection enclosure is fixed at the front panel of the structure and at an auxiliary frame provided between motor and wheel (see sketch in the appendix).

These guards and protective enclosures shall not be tampered, nor substituted with others of different type, causing the decay of the Comefri certification for Atex execution.
As exception fan or plenum fan can be supplied without protections provided both the following conditions are respected:
- the customer has produced a written declaration where he states that upon analysis the kind of installation has proved to be itself a guarantee of IP20 protection:
- the customer requires by writing in the commercial order not to supply the protections.
As warned in the Standard EN 14986, the presence of inlet and/or outlet duct is not itself a guarantee of IP 20 protection, but the risk of entry of foreign particles is to be analyzed anyway.

Vibrations (fans and plenum fans)

The completed fan and plenum fan must meet the vibration levels recommended by ISO 10816 and ISO 14694 as appropriate for its size and application. Vibration speed should preferably be measured at the bearing cap for fans and at the motor for plenum fan.
For the correct installation avoiding vibrations, see par.4.2. Furthermore the following must be considered.
For some fans, a part of the catalogue curve is drawn as a dashed line; this means that the use of the fan in these conditions could generate instability and vibrations, due to the presence of inlet obstructions (pulley, etc). Comefri recommends not to use the fan in this zone, but it must absolutely NOT be used in this zone when spark-proof execution is required.
Standards such as ISO 5801 and ISO 5802 prescribe the type of inlet and outlet ducting connections which ensure a uniform speed at the fan inlet and consequently a low degree of vibration. The fan and plenum fan must be installed in a way which avoids disturbances or building up vibrations in the fan, plenum fan. Examples of improper installations:
sharp bends in the ducting near the inlet or outlet, unit walls too close to the fan sideplates, obstructions due to unsuitable guards. These installation errors must absolutely be avoided in anti-spark applications according to ATEX Directive.

Power drive

If the fan is driven through belts, they must be electrically conductive, in order to be incapable of developing an incendiary electrostatic discharge during operation according to ISO 1813. The drive guard must be made of electrically conductive material so that, according to the electrical earthing (described in the following paragraph), every part (guard, pulley, belts) is electrically equipotential.
The material used in the construction of the belts must not allow combustion when a naked flame is applied to it. In order for this material to meet requirements of the standard, it must be tested according to the method described in ISO 1210. The piece must not be completely burnt during the test nor continue to burn for longer than 15 s after removal of the test flame.
V-belts must be declared by manufacturer to be compliant with Atex requirements.
The drive guard is critical due to the risk of contact between the rotating and fixed components: see par. 2.5.3. For this reason a disc of material according to the standard EN 14986 4.8.2 must be installed in the internal side of the guard in front of the pulleys with an outside diameter at least from 5 to 10 mm greater than rotating part dimension; clearance between the motor or fan shaft and the edge of the passage hole shall be 10 % of the shaft diameter (minimum 2 mm and maximum 13 mm) (see par. 2.5.3.2).

The pulleys must be balanced according to ISO 10816 and ISO 14694 depending on their size.

Earthing conductive parts

Comefri guarantees that all parts of the fan are electrically equipotential; the fan must be earthed by the installer. Guards for transmission devices and for coupling must be manufactured with conductive material.

Electrical equipment

All electrical equipment (such as drive motors and monitoring equipment) must comply with Atex protective category appropriate for the fan.
The motor must comply with Atex standards and its Atex field of application must correspond with the field of application of the fan or plenum fan: this means that it must be provided with the same group, category, type of explosive atmosphere or superior and guarantee the maximum surface temperature as the fan or plenum fan.

Group II Category 2.
It is duty of Comefri to install the motor on fans of Group II Category 2 before putting the fan in the market. This allows that Atex execution complies with Comefri Atex certification and these Atex execution features must be respected during successive maintenance process.
In detail, Comefri certification for Group II Category 2 applies when motor is installed by Comefri, both if motor is provided by Comefri or supplied by the customer to Comefri, provided motor has the proper ATEX 2G certification and/or motor label with relevant indications attesting the compliance with Directive 94/9/CE “Atex” Group II Category 2G.
NOTE: Comefri certification does NOT apply when customer install the motor or the motor supplied to Comefri does not comply with Directive 94/9/CE “Atex” Group II Category 2G; in this case therefore it is duty of the customer to deposit his own complete and specific documentation to apply for the “ATEX 2G” certification of his so obtained final machinery, with the issue of his own new certification number.
In the operational life, maintence which requires motor substitution can be carried on by the customer/user without decay of Comefri Atex certification, provided maintenance is performed according the proper prescriptions (see par. 6.8)

Electrical installation of the fans must comply with the requirements of standards EN 60079-14 and EN 50281-1-2.
The motor must be positioned so as to assure that adequate cooling air is available and that the ventilation inlets cannot be blocked. We recommend installing circuit breakers.
Operation temperature range of the motor is generally from –20°C to +40°C according to the motor model and brand, which is more restrictive than Atex Application temperature range.
Particular care for plenum fans and fans where motor is installed in the airstream.
Motor temperature limits must comply temperature condition of the zone where motor is installed.

5 START-UP

5.1 Safety checks

- Disconnect and secure all fan power connections at OFF.
- Check that all the mechanical and electrical safety devices have been installed and connected.
- Check that protective devices as inlet and outlet guards, protective enclosures, shaft guards, transmission guard are fitted.
- Check that no foreign bodies are in the ducts and in the fan (tools, small components etc.).
- Rotate the impeller by hand and make sure no parts rub.
- Check the alignment and parallelism of the pulleys and the tension of the belts.
- Power, voltage and frequency must be checked referring to the electric motor plate of the fan.
- Inspection openings (if present) must be closed.
- If storing the fan for over six months, it will be necessary to remove the old grease and proceed with re-lubrication according to the quantities and types reported on the Technical Data Sheets or in Appendix.
- When fan and/or plenum fan have been stored at temperature lower than normal storage temperature shall be let warming-up gradually and slowly before start-up (see also par.3.3).

5.2 Test run

The fan and plenum fan should be switched on briefly to verify the direction of rotation of the impeller which should correspond to that indicated by the arrow.
Should the motor run in the wrong direction, swap any two of the three electrical leads. Rotation direction of single phase motors can be swapped

by exchanging internal connections, as described on the motor plate or wiring diagram.
Always observe the electrical safety instructions.

5.3 Checking current consumption

Upon reaching the operating speed of the fan, immediately measure the absorbed current and compare it with the rated current indicated on the motor plate. In case of abnormal current consumption, switch off the motor immediately.

5.4 Checking for smooth running

Check the smooth running of the fan. There should be no unusual oscillations or vibrations. Check for unusual noise of the bearings.

5.5 Checking V-belt drive

After one hour of continuous run, stop the fan and check that belt tensioning is in accordance with par. 6.5 and, if necessary, re-tension the belts; after 3-4 days of operation check the V-belt tension once again.

6 MAINTENANCE

Operational performance data are indicated on the fan label:
maximum operating temperature, maximum shaft power, maximum rotational speed, and, if required, operating data for the specific application - rated speed, volume, total pressure, rated temperature and absorbed power.
For impellers of the NPL, NPL ALU, NPA, NPA ALU, TE, NPE, PEAF plenum fan series, when supplied as loose components, impeller and inlet-cone unit, do not exceed the maximum speed provided in the catalogue of reference.

6.1 Safety information

Before any maintenance operation on the fan, it is necessary to make sure that:
- the motor is disconnected from the mains
- the impeller is stopped
- the surface temperature be checked to prevent burning
- uncontrolled running of the fan during maintenance is impossible
- no hazardous debris or materials are inside the fan.

Only limited work may be carried out while the fans are in operating conditions and in compliance with safety and accident prevention regulations (e.g. measuring vibrations).

Failure to comply with these points endangers the life of maintenance personnel.

6.2 Casing and impeller

Even with slightly dusty fluids, wear and filth can also be expected inside the casing and on the impeller (corrosion, abrasions, stuck materials) which can cause vibrations. Inspections and cleaning must be performed regularly. Their frequency must be fixed by the operator according to individual operating conditions.
Do not use high pressure cleaners (steam cleaners).

6.3 Accessories

Flexible connections between the fan and plenum fan and parts of the installation must be checked regularly. Unsealed couplings lead to breakdowns and danger due to leaking fluid and must be replaced.

6.4 Checking rotating parts

Periodically check the alignment of the impeller on the shaft as well as fixing conditions of the bolts. Make sure all the bolts on the fan are tightened. The tightening torques must be according to the prescriptions of bolt technical manuals. For bearing bolts the tightening torque values must comply with the bearing manufacturer's catalogue.

6.5 Belt drive

Depending on the installation site and type of fan operation, it is recommended to check the belt tension and their alignment regularly.
This is compulsory for Atex spark-proof applications according to EN 14986.
Operate only by means of the motor rails, if present.
Belt displacement E_a (see scheme in fig.1) must be calculated according to the *formula* (1) and the values mentioned in table 1 in the Appendix:

$$E_a \cong (E * e) / 100 \qquad (1)$$

where:
e = distance between shaft centers
E = belt bending for distance between shaft centers of 100mm
Ea = belt bending

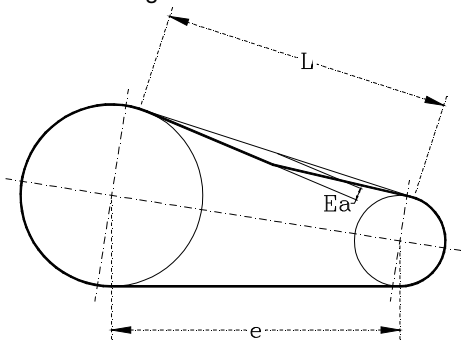


Fig.1 (Belt-Drive scheme)

Example: profile SPZ
dκ = 100mm (diameter of smaller pulley)
e=380mm (distance between pulleys)

from the table f (test load)=25 N E=2.05mm

Ea ≅ (2.05 * 380) / ≅ 7.7mm

Use our fan selection program *Aeolus* to choose the belt. Otherwise refer to technical catalogues.

6.5.1 Minimum pulley diameters

The theoretical life L_{10} can only be guaranteed if the diameter of the pulley corresponds to a minimum value, e.g. if the permissible load of the bearings is not exceeded. Always replace damaged/worn pulleys with new ones of the same diameter and type.

6.5.2 Belt replacement

The axle spacing should be reduced until the new belt/s can be easily fitted by hand. Re-tensioning of the belts should be done in accordance with par.6.5.
Observe what prescribed in Chapter 5.0. Replace the whole set of belts.
For spark-proof execution, the belt must be elettrostatically conductive.

6.5.3 Taperlock pulley replacement

To release the pulley
1. Unscrew the bolts
2. Tighten the socket head cap screw in the threaded holes
3. Pull the clamping bush out of the tapered hole
4. The pulley can now be easily slid off the shaft

To fix the pulley
1. Insert the pulley and the bush on the shaft and fix them with the specific screws

Make sure that the two pulleys are properly aligned one to another. Fit and tension the belts according to instructions.

6.6 Bearings

As all components, the bearings must be checked periodically and cleaned and re-greased if required.
The re-lubrication intervals indicated in Appendix 1 apply to fans with horizontal shaft and temperatures not exceeding +60°C.
To consider the accelerated ageing of the grease at high temperatures, the re-lubrication intervals shown in the diagram should be cut in half for each 15° C of temperature increase above +70° C (the maximum admissible temperature for the grease must in no case be exceeded - see Table in Appendix). For temperatures below +70°C, lubrication intervals can be lengthened accordingly (the interval should never be more than doubled and at least once a year – see diagram).
These must be considered general instructions and must be adapted to each individual application.
Use type of grease and seals consistent with the type originally supplied, defined as appropriate for the temperature range of functioning.

The bearings mounted on the fans are of different types according to the fan size and absorbed power.
The base and R-version types are supplied with permanently-greased ball bearings. Together with a correct choice of pulley diameter, these bearings guarantee a life L_{10} of at least 20,000 hours at maximum performance (for fans in spark-proof execution Group II, Category 2, a life L_{10} of 40,000 hours is guaranteed, see 2.5.3.3). When changing the bearings, the rubber ring must be changed as well. Maintenance of this type of bearings consists in cleaning the outside surfaces and inspection of possible gasket defects. If the latter is detected, the bearing must be replaced.
The T-version fans are supplied with re-lubricating ball bearings with cast-iron support.

THLZ fans size 1120, HLZ, TZAF T2, TZAF FF T2, NTHZ T2 fans above size 500, TZAF 1250 T1, TZAF 1250 FF T1, NTHZ 1250 T1 fans, MAZ T1, MHZ T1 fans above size 1000, MAZ T2 and MHZ T2 fans, plenum fans with free impeller NPL, NPA, NPE and PEAF in setting 11 T2 are supplied with ball bearings or rollers with split cast-iron housing. These bearings are re-lubricable and we recommend changing grease fully after 2 re-lubrications. The amount of grease and re-lubrication intervals depend on the type of bearing and operational rotational speed. They are indicated in the tables and figures in the Appendix. Grease must be introduced through the specific grease nipple after it has been cleaned, turning the shaft slowly during this operation.

The above data (especially the interval), though calculated with a safety factor, is purely theoretical due to uncertainties on the actual operating conditions of the fan.
Therefore Comefri strongly recommends performing periodical controls on the bearings even before the lubrication deadline.

In most cases, any flaws in the bearings can be detected by listening to them. When they work properly, they generate a smooth and uniform sound. A loud and squeaking noise or any other abnormal sounds imply that the bearings are worn out. A squeaking noise may also be caused by insufficient lubrication. Too small bearing cross-gap can cause a metallic noise. Dents on the outer track of the bearing can cause vibrations which in turn cause a clear sound. Intermittent sounds imply a defective rolling surface. High temperatures of the bearing are a sign that it is working abnormally. High temperatures are harmful to the grease and the bearing itself. High temperatures could be caused by insufficient or excessive lubrication, impurities in the grease, overloading, damage or insufficient bearing cross-gap. Even a slight temperature variation can be a sign of impaired operation if the operating conditions have not changed. Refilling the bearing with grease will cause its temperature to rise for a couple of days. Check the grease. If the grease changes color or darkens it is usually a sign that it contains impurities. The grease

must be changed after the bearing has been re-lubricated a number of times or if the grease is caked, darkened or faded (compared to its original color).

6.6.1 Replacing bearings

The tightening torques must respect the values provided in the bearing manufacturer's catalogue. The same rules apply for all bolts on the fan according to the prescriptions of technical manuals.

6.6.1.1 Replacing bearings on bearing-brackets

1. Loosen the grain and remove the locking ring from the bearings using a punch and hammer. Unscrew the locking ring from the shaft. Use an appropriate tool to hold the shaft to keep from damaging the impeller and inlet-cone.

2. Remove the bearing-brackets from the side plates of the fan and extract them from the shaft. Replace the bearings and rubber rings. Mount new bearings on the bearing-brackets.

3. Mount the bearing-brackets on the side-plates making sure to centre the impeller on the inlet-cone. Fix the bearing-brackets on the side-plates and tighten the bolts. Screw and tighten the locking rings on the bearings. Then tighten the grains on the locking rings. Turn the impeller to check correct rotation and to detect any malfunctioning of the bearing or rotary parts.

6.6.1.2 Replacing bearings on cast-iron pillow blocks:

1. Loosen the grains and remove the locking rings from the bearings using a punch and hammer. Remove the pins from the cast-iron pillow block and loosen the bolts. Remove cast-iron pillow blocks from the shaft. Use an appropriate tool to hold the shaft to keep from damaging the impeller and inlet-cone.

2. Replace the bearings.

3. Mount the cast-iron pillow blocks on the frames making sure to centre the impeller on the inlet-cone. Fix the cast-iron pillow blocks to the frames by tightening the bolts. Screw and tighten the locking rings on the bearings. Then tighten the grains on the locking rings. Turn the impeller to check correct rotation and to detect any malfunctioning of the bearings or rotary parts. Put the elastic pin back on. If present in the substituited bearing, put the elastic pin (normally elastic pin is provided from size 500 and above).
NOTE: in ATEX execution elastic pins are always necessary.

6.6.1.3 Replacing bearings mounted on SKF split cast-iron pillow block SNL / SE:

1. Disassemble all accessories mounted on the shaft which can get in the way of bearing replacement. Unscrew the cap of the bearing housing by loosening the bolts on both sides. Use an appropriate tool to hold the shaft to keep from damaging the impeller and inlet-cone.

2. Remove the locking rings from the bearing side (note that only one bearing is equipped with locking rings) and the half sealing rings from the base and cap part of the bearing housing after having cleaned the grease.

3. Lift the safety tab folded into the groove of the nut; unscrew the nut using punch and hammer; remove the old bearing; install the new bearing; tighten the nut on the threaded bush until a consistent resistance; run the final tightening of the nut making with the proper key, or by acting on the grooves, the relative angle of torque provided by the manufacturer of the bearings verifying then, with the use of a feeler gauge, the final radial internal clearance, which must be compliant as indicated by the manufacturer; then bend one of the locking washer tabs down into one of the slots in the nut. Do not bend it to the bottom of the slot. (for detailed specifications / parameters and operational instructions regarding the assembly / disassembly of bearings, refer to the technical publications of its constructors)

4. Mount the new seal ring in the grooves on the base of the bearing housing. Grease the seal ring and arrange the greased shaft/bearing group on the base. Mount one or more locking rings on one bearing only (the other bearing will not be locked). Insert the other seal ring, with the lips already greased, inside the cap of the bearing housing. Grease the whole group taking care to fill the available space one third with grease.
Install the cap onto the base and tighten the cap bolts to the torque specified by bearing manufacturer. Fill the bearing with proper type and quantity of grease as indicated in the Appendix.
Turn the impeller to check correct rotation and to detect any malfunctioning of the bearings or rotary parts.
Please note that an excessive amount of grease can cause a temperature peak in the bearing, which in turn can damage the lubrication properties of the grease and lead to bearing damage.

6.7 Replacing the motor and impeller in Plenum Fans

- Disconnect the electric cables from mains;
- disconnect the plenum fan from the unit before the motor can be replaced;
- disassemble the plenum fan from the unit (including the anti-vibration dampers, if installed);
- unbolt the motor from its support and unbolt the locking screw at the motor shaft and the safe grub screw at the hub key;
- for wheels made of steel: if wheels are provided with two nuts welded on the back-plate in correspondence with two opposite holes of the fixing hub-wheel, apply to these nuts the hub puller (extractor) to push the impeller off the shaft; If wheel does not have the welded nuts, unscrew two opposite screw and pass the thread bars of the hub puller through the holes.
Wheels made of aluminum are usually taken off by hand and therefore no nuts are welded on the back-plate;
- the motor can be moved backwards if needed, being careful that it does not drop;

- mount a new motor on the support without tightening it;
- mount the fan impeller on the motor shaft (clean the shaft and the interior of the hub if necessary);
- tighten the support bars (when provided on the plenum fans);
- fix the impeller to the motor, align it assuring the gap between the impeller and the inlet-cone is according to the technical catalogue;
- tighten the motor to its support and check the gap between impeller and inlet-cone is correct.

In case of special execution with a taper-bushed connection, after the installation must be done the "Running Test" with the vibration analysis.

6.8 Spark-proof execution

This paragraph underlines maintenance prescriptions of particular importance for fans and plenum fans intended for use in potentially explosive atmospheres according to the ATEX Directive 94/9/EC.
Prescriptions are exposed here in form of check list to sum-up the relevant actions to carry out and the main components and devices to keep under control to guarantee a correct functioning anti-explosion safe. Every item is explained and detailed in its specific relevant paragraph of this handbook.
The ATEX Directive 94/9/EC prescribes the use of a logbook where to define the maintenance intervals and where to record maintenance and replacement interventions. All measurements must be recorded and compared with previous measurements. Any sudden change of the values of any parameters must be regarded as a sign of danger and requires more specific controls

- Inspections
It should be defined a periodical program of visual and acoustic checks on significant components in dependence of the operating conditions, such as
  - ▸ blade inspection for damage (which can cause unbalance)
  - ▸ integrity of painting and protective coatings
  - ▸ integrity of inlet and/or outlet guards and respective fixing
  - ▸ integrity of flexible inlet and/or outlet joints and respective fixing
  - ▸ bearing seals to prevent grease leakage
  - ▸ monitoring the noise level can be a way of assessing proper operation of the fan (see par. 6.6)

- Bearing Lubrication See par. 6.6.

- Bearing Grease Level
When the sufficient level of grease cannot be assured while servicing the bearing, the temperature of the bearing must be monitored as required in clause 6 of the standard EN 13463-5. A temporary increase of temperature at the start-up followed by a subsequent decrease during steady functioning is normally expected. Therefore correct temperature must be measured at steady condition.

- Bearing Vibration
Beyond the defined maintenance program on bearings, vibrations on bearing shall be kept under control as it is a prediction of malfunctioning to be checked.

- Check critical surface temperature, such as motor and bearing surface temperature.

- Bolt Tightening Torques (see par. 6.4)

- Impeller-Shaft attachment
Check screws fixing hub to shaft (grub screw, tapped shaft-end screw, stop bushing screws) are properly tightened

- Belt tensioning control (see par. 6.5)

- Cleaning of Casing and impeller
In all applications where dust can be expected to form layers on surfaces of the fan and/or plenum fan, regular cleaning must be carried out at appropriate intervals, fixed by the operator according to individual operating conditions (see also 6.2).

- Clearance between the Inlet-cone and Shroud
After maintenance or any type of malfunctioning, check the correct value of the clearance between Inlet-cone and Shroud (see 4.5)

- Motor maintenance according to manufacturer's prescriptions

- Motor Replacement
If damaged, motor can be substituted by the customer and/or user maintaining the Comefri Atex certification provided that:

  - ▸ new motor complies and is certified to the same Atex application scope (Atex Group and Category, surface temperature class etc.) as the one substituted;
  - ▸ the motor mounting complies with manufacturer's prescriptions and respects instructions of this handbook (as motor fixing, pulley and belts mounting, transmission guard requirements, etc.)
  - ▸ motor replacement intervention is recorded in the logbook

7 TROUBLESHOOTING

Problem	Cause	Corrective action
Excessive noise	Impeller rubs against inlet-cone or casing	Adjust impeller and/or inlet-cone Tighten hub of impeller or bearing collars on shaft
	Power drive	Tighten pulleys on motor/fan shaft Adjust belt tension Align pulleys properly Replace worn belts and pulleys
	Bearings	Replace defective bearings Lubricate bearings Tighten collars and fasteners
	Impeller unbalance	Clean filth from impeller Check impeller balancing Rebalance and other on-site if necessary
Low airflow	Fan	Check correct rotation of impeller Check for inlet and outlet obstructions Increase fan speed
	Circuit	Check circuit loss calculations
High airflow	Fan	Decrease fan speed
	Circuit	Resize ductwork Inspection door, grids and filters not installed
Incorrect static pressure	The circuit has more or less obstructions than expected	Change obstructions in system. Use correction factors to adjust temperature/position Resize ductwork Clean filters/coils
High absorption	Fan	Check correct rotation of impeller Decrease fan speed
	Circuit	Resize ductwork Check proper functioning of dampers, coils and bypass Check filters and inspection doors
The fan does not work	Electrical supply	Check fuses/circuit breakers Make sure circuit is connected Check correct power supply voltage
	Power drive	Check for broken belts Tighten slack pulleys
	Motor	Make sure the motor has necessary horsepower and does not trip overload protectors
Overheated bearings	Lubrication	Make sure there is neither too much nor too little grease in bearings.
	Mechanical causes	Replace damaged bearings Loosen excessive belt tension Align bearings Make sure shaft is straight

8 MANUFACTURER'S DECLARATIONS

We hereby declare that the following machinery or partly completed machinery or parts of machinery are built to be assembled with other machinery, partly completed machinery or parts of machinery to make up one unit.
The final unit will not be put into service until it has been declared in conformity with the provisions of the machinery directive 2006/42/EC.
It is not allowed to put the fan, referred to in this declaration, into service before it is in conformity, on-site, with the Directive 2006/42/EC.
For example, “plenum” fans do not meet CE labelling requirements (i.e they have an impeller without guards). The fan must nevertheless be installed in accordance with CE requirements.

CENTRIFUGAL FANS FOR BELT DRIVE
OR DIRECT DRIVE
(object of declarations)

Type	Size	Type	Size
TZAF FF	315 - 1250	TLE	200 - 1000
VTZ	315 - 1000	THLE	200 - 1000
NTHZ	315 - 1250	KHLE *	200 - 1000
THLZ FF	180 - 450	NPL	250 - 1400
MAZ	315 - 1250	NPL ALU	200 - 500
MHZ	315 - 1250	NPA	315 - 1600
TLZ	160 - 1000	NPA ALU	250 - 710
TLI	7/7 – 18/18	TE	180 - 450
TZAF	355 - 1250	PEAF	315 - 1600
THLZ	180 – 1250	NPE	315 - 1400
HLZ	400 – 1250		

* KHLE series is as THLE series with rectangular shaped casing

Pertinent EC directives applied	Machinery directive 2006/42/EC and subsequent amendments
Harmonized standards applied 1)	EN ISO 12100-1, EN ISO 12100-2, EN ISO 13857, ISO 281, ISO 1940-1, ISO 10816, ISO 14694, ISO 1813, ISO 1210, EN 60529, EN 13463-1, EN 13463-5, EN 14986
National standards and technical specifications 2) applied, in particular	ISO 5801, BS 848 – 1, AMCA 210, ISO 5136, ANSI/AMCA 330, ANSI/AMCA 300

1) For the complete list of standards and technical specifications, see the manufacturer's documentation.
2) The technical specifications are used if no relevant harmonized standards exist.

comefri fans of energy saving

CE

Data / Date:

Compilato da / Compiled by :

CE Declaration - AQ 041 Rev. Feb.2013 Prep. / Verif. / Appr. R&S dep

DICHIARAZIONE DI CONFORMITA'

(Direttiva Macchine 2006/42/CE allegato II/A)

DECLARATION OF CONFORMITY

(Machinery Directive 2006/42/EC annex II/A)

IL FABBRICANTE / THE MANUFACTURER

Nome Azienda / Company Name:	**Co.me.fri.** S.p.A.
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Internet Web site:	**www.comefri.com**

DICHIARA CHE LA MACCHINA / DECLARE THAT THE MACHINE

Descrizione / Description:	Ventilatore Centrifugo / Centrifugal Fan
Modello / Fan Type:	
Codice / code:	
N° Serie / Product n°:	
Anno costruzione / Manufactured year:	
N° commessa / N° order	

FAC SIMILE

Costruita presso le sedi di / Manufactured in:

MAGNANO in RIVIERA (UD) 33010 - Via Buia,3

ARTEGNA (UD) 33011 - Via Buia,2

E' CONFORME A QUANTO PRESCRITTO DALLA DIRETTIVA MACCHINE 2006/42/CE
IS IN ACCORDING TO THE MACHINERY DIRECTIVE 2006/42/EC

Norme armonizzate applicate: *Applied harmonised standards:*	UNI EN ISO 12100, UNI EN ISO 13857, UNI EN ISO 12499, UNI EN 14986, CEI EN 60079-0, CEI EN 60079-11, CEI EN 60079-15
Norme nazionali, specificazioni tecniche, raccomandazioni ufficiali, applicate[1]: *Applied national standards and technical specifications[1]:*	UNI EN ISO 5801 / BS 848 p.1 Per le caratteristiche di funzionamento / For operating characteristic UNI EN ISO 5136 / DIN 45635 Per il livello di potenza sonora / For sound power levels UNI ISO 1940-1 or VDI 2060 Per l'equilibratura / For balancing UNI ISO 10816-1,UNI ISO 10816-3, ISO 14694 Per le vibrazioni / For vibrations
Ulteriori conformità alle Direttive: *Further conformity to Directives:*	**2004/108/CE (2004/108/EC)** Compatibilità elettromagnetica / electromagnetic compatibility **2006/95/CE (2006/95/EC)** Bassa tensione / Low Voltage **2011/65/CE (2012/65/UE)** Restrizione dell'uso di determinate sostanze pericolose nelle app. elettriche ed elettroniche *Restriction of Hazardous Substances Directive (RoHS)*
Sistema di Qualità certificato: *Total Quality Approval System:*	ISO 9001 certificato BSI FM 01403

1) Per l'elenco completo delle norme e delle specifiche tecniche fare riferimento alla documentazione mantenuta dal costruttore

1) For the complete list of applied standards and technical specifications see the manufacturer's documentation

Si dichiara inoltre che il relativo FASCICOLO TECNICO è costituito e custodito dalla **Co.me.fri.** S.p.A.
We also declare that the TECHNICAL FILE is compiled and secured by **Co.me.fri.** S.p.A.

Posizione del firmatario: ***Position of Signatory:*** *Amministratore Delegato / Managing Director*

Data / Firma: ***Date / Signature of manufacturer:*** *gg/mm/aaaa - Ing. R.Braun -*

Documentazione ricercabile: ***File under:*** Originale presso il costruttore; Copia resa conforme all'originale inviata al cliente
The original shall be kept by the manufacturer; The certified true copy is for the customer

comefri fans of energy saving

Data / Date:

Compilato da / Compiled by :

CE incorporation - AQ 0xx Rev. Feb.2013 Prep. / Verif. / Appr. R&S dep

DICHIARAZIONE DI INCORPORAZIONE

(Direttiva Macchine 2006/42/CE allegato II/B)

DECLARATION OF INCORPORATION

(Machinery Directive 2006/42/EC annex II/B)

Il Fabbricante: *The Manufacturer:*	*Nome Azienda / Company Name:*	**Co.me.fri.** S.p.A.
	Indirizzo / Address:	**via Buia, 3 - 33010 Magnano in Riviera - Udine - Italy**
	Telefono / Telephone:	**0432 / 798811**
	Fax:	**0432 / 783378**
	E-mail:	**comefri@comefri.com**
	Internet Web site:	**www.comefri.com**
Dichiara che la QUASI-MACCHINA: *Declare that the INCOMPLETE-MACHINE:*	*Descrizione / Description:*	Ventilatore Centrifugo / Centrifugal Fan
	Modello / Fan Type:	
	Codice / code:	
	N° Serie / Product n°:	
	Anno costruzione / Manufactured year:	
	N° commessa / N° order:	

Costruita nelle sedi di: Manufactured in: **MAGNANO in RIVIERA (UD)** 33010 - Via Buia,3 **ARTEGNA (UD)** 33011 - Via Buia,2

FAC SIMILE

E' CONFORME AI REQUISITI ESSENZIALI DELLA DIRETTIVA MACCHINE 2006/42/CE
IS IN ACCORDING WITH THE ESSENTIAL REQUIREMENTS
OF THE MACHINERY DIRECTIVE 2006/42/EC

In particolare: In particular: 1.1.2 ; 1.1.3 ; 1.1.5 ; 1.3.1 ; 1.3.2 ; 1.5.7 ; 1.5.8 ; 1.5.9 ; 1.7.4.3 (allegato II / annex II)

Norme armonizzate applicate: Applied harmonised standards:	UNI EN ISO 12100, UNI EN ISO 13857, UNI EN ISO 12499, UNI EN 14986, CEI EN 60079-0, CEI EN 60079-11, CEI EN 60079-15
Norme nazionali, specificazioni tecniche, raccomandazioni ufficiali, applicate[1]: Applied national standards and technical specifications[1]:	UNI EN ISO 5801 / BS 848 p.1 - Per le caratteristiche di funzionamento / For operating characteristic UNI EN ISO 5136 / DIN 45635 - Per il livello di potenza sonora / For sound power levels UNI ISO 1940-1 or VDI 2060 - Per l'equilibratura / For balancing UNI ISO 10816-1 / UNI ISO 10816-3, ISO 14694 - Per le vibrazioni / For vibrations
(Se del caso / Where appropriate) Ulteriori conformità alle Direttive: Further conformity to Directives:	**2004/108/CE (2004/108/EC)** - Compatibilità elettromagnetica / electromagnetic compatibility **2006/95/CE (2006/95/EC)** - Bassa tensione / Low Voltage **2011/65/UE (2011/65/UE)** - Restrizione dell'uso di determinate sostanze pericolose / RoHS
Sistema di Qualità certificato: Total Quality Approval System:	ISO 9001 certificato BSI FM 01403

1) Per l'elenco completo delle norme e delle specifiche tecniche fare riferimento alla documentazione mantenuta dal costruttore

1) For the complete list of applied standards and technical specifications see the manufacturer's documentation

Si dichiara inoltre che / We also declare that:

- La relativa DOCUMENTAZIONE TECNICA PERTINENTE, in conformità all'allegato VIIB, è costituita e custodita dalla **Co.me.fri.** S.p.A.
  The TECHNICAL DOCUMENTATION, according to annex VIIB, is compiled and secured by **Co.me.fri.** S.p.A.
- La **Co.me.fri.** S.p.A. si impegna a trasmettere, a seguito di una richiesta adeguatamente motivata dalle autorità nazionali, informazioni su queste quasi-macchine. L'impegno è relativo alle modalità di trasmissione e lascia impregiudicati i diritti di proprietà intellettuale del fabbricante.
- **Co.me.fri.** S.p.A undertakes to provide, following a reasoned request by national authorities, informations about these incomplete-machines. The commitment is also on mode of trasmission and does not affect on intellectual property rights of the manufaturer .
- la quasi-macchina non deve essere messa in servizio finché la macchina finale in cui deve essere incorporata non sia stata dichiarata conforme alle disposizioni della direttiva macchine 2006/42/CE.
  The incomplete-machine must not be put into service until the final machinery, which is to be incorporated, has been declared in conformity with the machinery directive 2006/42/EC.

Posizione del firmatario: ***Position of Signatory:*** *Amministratore Delegato / Managing Director*

Data / Firma: ***Date / Signature of manufacturer:*** *gg/mm/aaaa - Ing. R.Braun -*

Documentazione ricercabile: ***File under:*** Originale presso il costruttore; Copia resa conforme all'originale inviata al cliente
The original shall be kept by the manufacturer; The certified true copy is for the customer

9 'ErP' SPECIFICATIONS

From the 1st January 2013 every fan and plenum fan placed on the market or put into service inside the EU must comply with 'Erp' Directive 2009/125/EC and relevant implementing Regulation (EU) N° 327/2011.

Through the algorithms of calculation prescribed by Regulation (EU) N° 327/2011 in reference to the different types of fans in different configurations as they are supplied, it is compulsory that the so calculated overall efficiency is equal or greater than a minimal calculated efficiency (target efficiency) in order to let the fan comply with the 'ErP' Directive and can be placed on the market or put into service inside the EU market and/or EC labeled.

Regulation (EU) N° 327/2011 prescribes two steps to enter into force, the first within the 1st January 2013 and the 2nd within the 1st January 2015, the latter with target efficiencies greater than those of the first step

From the 1st January 2013 on every Comefri fan and plenum fan is sticked a 'ErP' label that lists clearly product data and informations required by Regulation (EU) N° 327/2011 and states the conformity of the product with 'ErP' Directive.

EXAMPLE OF COMEFRI ErP LABEL

ErP compliant

Year of manufacture = **2015**

Data in accordance to ErP Directive 2009/125/CE with IE2 motor+VSD or IE3 motor

Product's model number = **-**
Flow rate at optimum energy efficiency = **4,5 m3/s**
Pressure at optimum energy efficiency = **1727 Pa**
Overall efficiency ηe = **68,0%**
Efficiency grade at optimum energy efficiency point ηtarget = **62,1%**
Calculation of fan efficiency assumed use of a VSD = **YES**
Rated motor power input at optimum energy efficiency = **12 kW**
Rotations per minute at the optimum energy efficiency point = **1827**
A variable speed drive must be installed with this fan
Measurement category = **A** Efficiency category = **Static** Specific ratio = **1,02**

Note: for all the other information requested refers to its Operating & Maintenance Manual and Technical Catalogue

LOGO 'ErP compliant'
It states that the fan or free wheel complies with the 'ErP' Directive (Regulation (EU) N° 327/2011) and therefore it can be EC labeled, in case of need, in its final installation 'on site'.
Year of manufacture:
Year of production/placement on the market
Product's model number:
Fan type code
Flow rate at optimum energy efficiency:
Volumetric airflow at the point of optimal energy efficiency at the rotational speed indicated in the following relevant field
Pressure at optimum energy efficiency:
Pressure at the point of optimal energy efficiency at the rotational speed indicated in the following relevant field
Overall efficiency ηe:
Overall efficiency calculated according to Regulation (EU) N° 327/2011
Efficiency grade at optimum energy efficiency point [ηtarget]:
Efficiency grade calculated at the point of optimal energy efficiency
Calculation of fan efficiency assumed use of a VSD:
It indicates if the overall efficiency calculation (ηe) presupposes or do not presuppose the use of a variable speed drive, it can be alternatively: NO, YES, YES* (see 'variable caption' in the following)
Rated motor power input at optimum energy efficiency:
Electric power absorbed at the mains at the point of optimal energy efficiency
Rotations per minute at the optimum energy efficiency point:
Rotational speed at which the overall efficiency and the target efficiency are calculated: - Catalogue maximal rotational speed for fans put on the market as 'not final assembly' - Rotational speed of functioning/selection for fans put on the market as 'final assembly'
A variable speed drive must be installed with this fan:
Variable caption that means the criterion for conformity in the final assembly "on-site" and that can be alternatively: - a high-efficiency drive must be installed with this fan - a variable speed drive must be installed with this fan - a variable speed drive is integrated with the fan
Measurement category:
Installation category (A-B-C-D) taken into consideration for the calculation of the overall efficiency
Efficiency category:
It indicates if the calculated overall efficiency is Static or Total
Specific ratio:
The 'specific ratio' means the stagnation pressure measured at the fan outlet divided by the stagnation pressure at the fan inlet at the optimal energy efficiency point of the fan.

10 SPARE PARTS

Only original Comefri spare parts can be used according to the spare parts list. Comefri will not be held liable for damage resulting from use of other spare parts.
Appropriate spare parts can be requested from COMEFRI SERVICE, indicating the manufacturing number and fan number when placing the order. To be able to identify the spare parts you are requesting and to supply them as soon as possible, it would be helpful to report also the data on the drawing related to your fan. The components of the drive units, such as pulleys, bushes, V-belts and bearings are normally available on the market and the manufacturers are highlighted by Comefri. The user can order spare parts directly from the original manufacturer. However our Assistance Service is always available to supply parts directly from our stock. The routine maintenance operations indicated above can be performed without the intervention of Comefri personnel. When replacing parts, follow the precise instructions provided by the manufacturer. For heavy-duty applications or when a machine stoppage time for repairs would entail large costs for your business, Comefri suggests keeping the following spare parts available on stock:

- impeller
- shaft
- bearing block set or single block (if applicable).
- bearing set
- pulleys
- V-belts set.
- couplings (if applicable)

The list of special spare parts for industrial applications is available at Comefri on demand.

Note: when requesting spare parts or information, always provide the type of model and serial number of the unit.

11 PLACING OUT OF SERVICE AND SCRAPPING

- disconnect the electric cables from the motor terminal board.
- remove the fan from the site, paying the upmost attention to all parts which can be a source of danger (especially free rotating parts).

if the fan is without a drive guard, remove the belts (potential sources of dragging danger).

Do not release waste into the environment!
Proceed with differentiated separation of materials such as:

- electrical components
- lubricating fluids
- materials (copper, steel, plastic, etc)

in compliance with standards or procedures in force in the relative Country.

12 RESIDUAL RISKS

- Comefri fans have been designed and developed in compliance with design criteria defined by standards UNI EN ISO 12100-1&2.
- Safety protections (guards) have been designed and developed in compliance with design criteria defined by standards UNI EN ISO 12100-1&2, in conformity with standards ISO 13857 requirements.
- The Comefri ISO 9001 certification guarantees the systematic application of all the procedures foreseen in the entire production process.

These conditions guarantee the absence of dangers of a mechanical nature. However, some “residual risks” still exist (highlighted by the relative symbols in the various chapters of this manual) which, according to the “risk assessment” carried out, do not constitute a personal danger if the fan is approached:

- by specialised and qualified personnel
- in compliance with the procedures indicated in this manual
- wearing and using suitable PPE during each operation

The main RESIDUAL RISKS are:

RESIDUAL RISK	RISK REDUCTION
Sharp edges	Use of suitable PPE: gloves, goggles, helmets
Moving parts (impeller and/or transmission devices)	Use of suitable PPE: gloves, goggles, shoes, overalls. Compliance with procedures
Relevant sound emissions	Use of suitable PPE: earmuffs
Possible high temperatures of components	Use of suitable PPE: gloves
Possible projection of small “foreign bodies” or dust in treated fluid	Use of suitable PPE: gloves, shoes, overalls, goggles, mask
Presence of electrical voltage	Use of suitable PPE: Compliance with procedures
(if relevant) Possible leakage of hazardous gases/vapours	Use of suitable PPE: gloves, shoes, overalls, goggles, mask

APPENDIX

Settings for Plenum Fans (figures from reference catalogue)

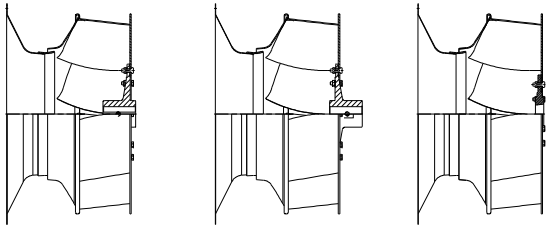
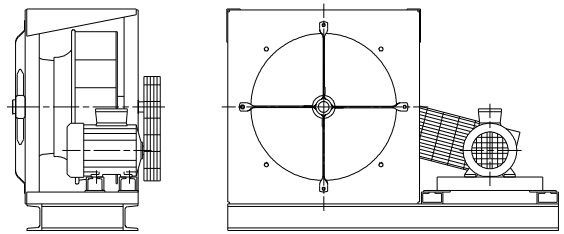
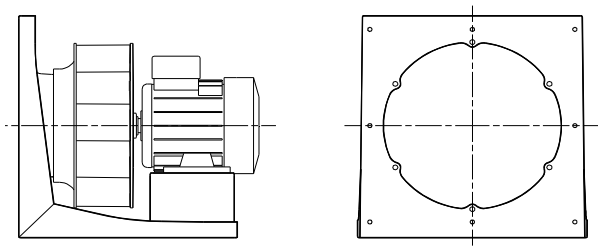
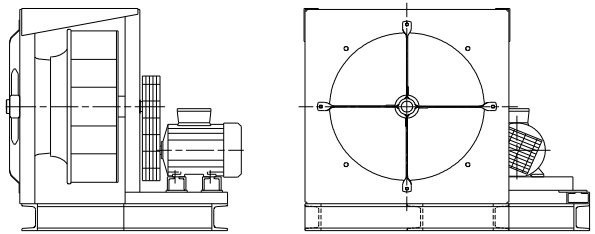
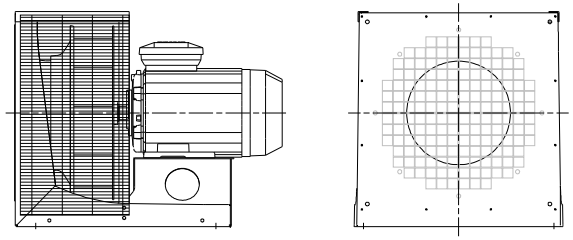
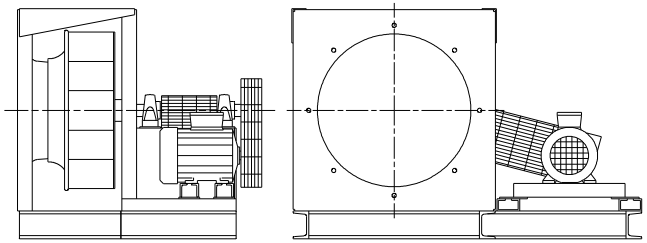
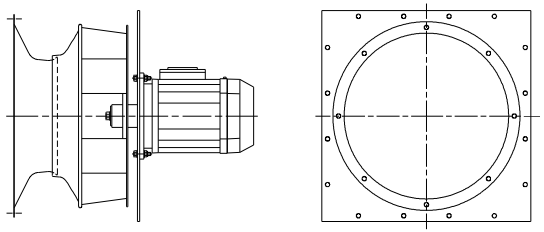
<table>
<tr>
<td>AVAILABLE SETTING
  </td>
<td>Set
Impeller and inlet-cone</td>
<td></td>
<td>SPECIAL SETTING
  </td>
<td>Setting 11
- Dimensions:
NPL 250 to 1400,
NPL ALU 200 to 500,
NPA 315 to 1600,
NPA ALU 250 to 710
- Belt drive
- Motor layout W or Z</td>
</tr>
<tr>
<td>AVAILABLE SETTING
  </td>
<td>Setting 4
- Dimensions:
NPL 250 to 1400,
NPL ALU 200 to 500,
NPA 315 to 1600,
NPA ALU 250 to 710,
TE 180 to 450
- Direct drive
- Impeller mounted on motor shaft
- Motor mounted on a support base.</td>
<td></td>
<td>SPECIAL SETTING
  </td>
<td>Setting 11S
- Dimensions:
NPL 250 to 1400,
NPL ALU 200 to 500,
NPA 315 to 1600,
NPA ALU 250 to 710
- Belt drive
- Motor layout X or Y</td>
</tr>
<tr>
<td>AVAILABLE SETTING
  </td>
<td>Setting 4 for Atex execution
- Dimensions:
NPL 250 to 1400,
NPA 315 to 1600
- Direct drive
- Impeller mounted on motor shaft
- Motor mounted on a support base.</td>
<td></td>
<td>SPECIAL SETTING
  </td>
<td>Setting 12
- Dimensions:
NPL 250 to 1400,
NPL ALU 200 to 500,
NPA 315 to 1600,
NPA ALU 250 to 710
- Belt drive
- Motor layout W or Z</td>
</tr>
<tr>
<td>SPECIAL SETTING
  </td>
<td>Setting 5
- Dimensions:
NPL 250 to 1400,
NPL ALU 200 to 500,
NPA 315 to 1600,
NPA ALU 250 to 710,
TE 180 to 450
- Direct drive
- Impeller mounted on motor shaft
- Motor flanged on a backplate</td>
<td></td>
<td></td>
<td></td>
</tr>
</table>

Table 1 Belt transmission

Belt type	Test load for each belt **f** (N)	Smaller pulley diameter d_k (mm)	Belt bending for distance between shaft centres of 100mm **E** (mm)
SPZ	**25**	56 ≤ 71 < 71 ≤ 90 < 90 ≤ 125 125	2,45 2,20 2,05 1,90
SPA	**50**	71 ≤ 100 < 100 ≤ 140 < 140 ≤ 200 < 200	3,20 2,75 2,55 2,45
SPB	**75**	112 ≤ 160 < 160 ≤ 224 < 224 ≤ 355 < 355	3,00 2,55 2,22 2,10
SPC	**125**	180 ≤ 250 < 250 ≤ 355 < 355 ≤ 560 < 560	2,55 2,20 2,00 1,90

Tables 2 - Types of Bearings

General note relevant to SKF split bearing blocks.

SKF has announced the issue of new versions for split bearing blocks: in the table here aside the list of the new SE block codes that at the current date of release of the present handbook have substituted the old SNL block code. The new SE block codes guarantee the interchangeability with the previous corresponding SNL codes,. For a transition time they can be alternatively supplied.

New Block code	Previous Block code
SE 507-606	SNL 507-606
SE 508-607	SNL 508-607
SE 509	SNL 509
SE 510-608	SNL 510-608
SE 511-609	SNL 511-609
SE 513-611	SNL 513-611

Table 2.1 - THLZ FF B / R, TLZ B / R, TLI B / R, THLZ B / R, TLE B / R, THLE B / R

		INA			**SKF**			**NTN**	
Fan size	*Bore (mm)*	*Unit*	*Rubber ring*	*Bearing*	*Unit*	*Rubber ring*	*Bearing*	*Unit (with rubber ring)*	*Bearing*
160, 180, 200, 225, 250, 7-7, 9-7, 9-9, 10-8, 10-10	20	RABR-B 20/52	RABR 47/52	RAE 20 NPPB	CYS 20 FM	RIS 204	YET 204	AELR204W3	AEL204W3
280, 315, 12-9, 12-12, 15-11, 15-15, 18-13, 18-18	25	RABR-B 25/62	RABR 52/62	RAE 25 NPPB	CYS 25 FM	RIS 205	YET 205	AELR205W3	AEL205W3
355, 400	30	RABR-B 30/72	RABR 62/72	RAE 30 NPPB	CYS 30 FM	RIS 206 A	YET 206	AELR206W3	AEL206W3
450, 500	35	RABR-B 35/80	RABR 72/80	RAE 35 NPPB	CYS 35 FM	RIS 207 A	YET 207	AELR207W3	AEL207W3
560, 630	40	RABR-B 40/85	RABR 80/85	RAE 40 NPPB	CYS 40 FM	RIS 208 A	YET 208	AELR208W3	AEL208W3
710	50	RABR-B 50/100	RABR 90/100	RAE 50 NPPB	CYS 50 FM	RIS 210 A	YET 210	AELR210D1W3	AEL210D1W3

Table 2.2 - THLZ FF T1, TLZ T, TLI T, THLZ T, TLE T, THLE T

		INA			SKF			NTN		
Fan size	*Bore (mm)*	*Unit*	*Non-split bearing block*	*Bearing*	*Unit*	*Non-split bearing block*	*Bearing*	*Unit*	*Non-split bearing block*	*Bearing*
160, 180, 200, 225, 250, 7-7, 9-7, 9-9	20	PASE 20 N	GG ASE 04 N	GRAE 20 NPPB	SY 20 FM	SY 504 M	YET 204	M-AELP204D1W3	P204D1	M-AEL204D1W3
280, 315, 10-8, 10-10	25	PASE 25 N	GG ASE 05 N	GRAE 25 NPPB	SY 25 FM	SY 505 M	YET 205	M-AELP205D1W3	P205D1	M-AEL205D1W3
355, 400, 12-9, 12-12, 15-11, 15-15	30	PASE 30 N	GG ASE 06 N	GRAE 30 NPPB	SY 30 FM	SY 506 M	YET 206	M-AELP206D1W3	P206D1	M-AEL206D1W3
450, 500, 18-13, 18-18	35	PASE 35 N	GG ASE 07 N	GRAE 35 NPPB	SY 35 FM	SY 507 M	YET 207	M-AELP207D1W3	P207D1	M-AEL207D1W3
560, 630	40	PASE 40 N	GG ASE/AK 08 N	GRAE 40 NPPB	SY 40 FM	SY 508 M	YET 208	M-AELP208D1W3	P208D1	M-AEL208D1W3
710, 800	50	PASE 50 N	GG ASE 10 N	GRAE 50 NPPB	SY 50 FM	SY 510 M	YET 210	M-AELP210D1W3	P210D1	M-AEL210D1W3
900, 1000	60	PASE 60 N	GG ASE 12 N	GRAE 60 NPPB	-	-	-	M-AELP212D1W3	P212D1	M-AEL212D1W3

Table 2.3 - THLZ T

Fan size	*Bore (mm)*	*Split bearing block*	*Bearing*	*Locking ring*	*Bush*	*Sealing ring*
1120, 1250	70	SNL 516-613	* 22216 EK	FRB 12.5/140	H 316	TSN 516 L

* Roller bearing

Table 2.4 - HLZ B / R

		HLZ - R version INA			HLZ - R version SKF			HLZ - R version NTN	
Fan size	*Bore (mm)*	*Unit*	*Rubber ring*	*Bearing*	*Unit*	*Rubber ring*	*Bearing*	*Unit (with rubber ring)*	*Bearing*
400	35	RABR-B 35/80	RABR 72/80	RAE 35 NPPB	CYS 35 FM	RIS 207	YET 207	AELR207W3	AEL207W3
450, 500	40	RABR-B 40/85	RABR 80/85	RAE 40 NPPB	CYS 40 FM	RIS 208	YET 208	AELR208W3	AEL208W3

Table 2.5 - HLZ T

		INA			SKF			NTN		
Fan size	*Bore (mm)*	*Unit*	*Non-split bearing block*	*Bearing*	*Unit*	*Non-split bearing block*	*Bearing*	*Unit*	*Non-split bearing block*	*Bearing*
400	35	PASE 35 N	GG ASE 07 N	GRAE 35 NPPB	SY 35 FM	SY 507 M	YET 207	M-AELP207D1W3	P207D1	M-AEL207D1W3
450, 500	40	PASE 40 N	GG ASE/AK 08 N	GRAE 40 NPPB	SY 40 FM	SY 508 M	YET 208	M-AELP208D1W3	P208D1	M-AEL208D1W3

		SKF				
Fan size	*Bore (mm)*	*Split bearing block*	*Bearing*	*Locking ring*	*Bush*	*Sealing ring*
560, 630	50	SE 513-611[1)]	1311 EK	FRB 11/120	H 311	TSN 611 L
710, 800	60	SNL 516-613	1313 EK	FRB 12.5/140	H 313	TSN 613 L
900, 1000	60	SNL 516-613	2313 K	FRB 5/140	H 2313	TSN 613 L
1120, 1250	80	SNL 518-615	* 22218 EK	FRB 12.5/160	H 318	TSN 518 L

* Roller bearing; 1) Previous code: SNL 513-611

Table 2.6 - TZAF FF B / R, VTZ B / R, NTHZ B / R, TZAF B / R

		INA			SKF			NTN	
Fan size	*Bore (mm)*	*Unit*	*Rubber ring*	*Bearing*	*Unit*	*Rubber ring*	*Bearing*	*Unit (with rubber ring)*	*Bearing*
315	25	RABR-B 25/62	RABR 52/62	RAE 25 NPPB	CYS 25 FM	RIS 205	YET 205	AELR205W3	AEL205W3
355, 400	30	RABR-B 30/72	RABR 62/72	RAE 30 NPPB	CYS 30 FM	RIS 206 A	YET 206	AELR206W3	AEL206W3
450, 500	35	RABR-B 35/80	RABR 72/80	RAE 35 NPPB	CYS 35 FM	RIS 207 A	YET 207	AELR207W3	AEL207W3
560, 630	40	RABR-B 40/85	RABR 80/85	RAE 40 NPPB	CYS 40 FM	RIS 208 A	YET 208	AELR208W3	AEL208W3
710	50	RABR-B 50/100	RABR 90/100	RAE 50 NPPB	CYS 50 FM	RIS 210 A	YET 210	AELR210D1W3	AEL210D1W3

Table 2.7 - TZAF FF T1, VTZ T1, NTHZ T1, TZAF T1

		INA			SKF			NTN		
Fan size	*Bore (mm)*	*Unit*	*Non-split bearing block*	*Bearing*	*Unit*	*Non-split bearing block*	*Bearing*	*Unit*	*Non-split bearing block*	*Bearing*
315	25	PASE 25 N	GG ASE 05 N	GRAE 25 NPPB	SY 25 FM	SY 505 M	YET 205	M-AELP205D1W3	P205D1	M-AEL205D1W3
355, 400	30	PASE 30 N	GG ASE 06 N	GRAE 30 NPPB	SY 30 FM	SY 506 M	YET 206	M-AELP206D1W3	P206D1	M-AEL206D1W3
450, 500	35	PASE 35 N	GG ASE 07 N	GRAE 35 NPPB	SY 35 FM	SY 507 M	YET 207	M-AELP207D1W3	P207D1	M-AEL207D1W3
560, 630	40	PASE 40 N	GG ASE/AK 08 N	GRAE 40 NPPB	SY 40 FM	SY 508 M	YET 208	M-AELP208D1W3	P208D1	M-AEL208D1W3
710, 800	50	PASE 50 N	GG ASE 10 N	GRAE 50 NPPB	SY 50 FM	SY 510 M	YET 210	M-AELP210D1W3	P210D1	M-AEL210D1W3
900, 1000	60	PASE 60 N	GG ASE 12 N	GRAE 60 NPPB	--	--	--	M-AELP212D1W3	P212D1	M-AEL212D1W3
1120	70	RASE 70	GG ASE 14	GE 70 KRRB	--	--	--			

		SKF				
Fan size	*Bore (mm)*	*Split bearing block*	*Bearing*	*Locking ring*	*Bush*	*Sealing ring*
1250	70	SNL 516-613	* 22216 EK	FRB 12.5/140	H 316	TSN 516 L

* Roller bearing

Table 2.8 - TZAF FF T2L, NTHZ T2L, TZAF T2L

		INA			SKF			NTN		
Fan size	*Bore (mm)*	*Unit*	*Rubber ring*	*Bearing*	*Unit*	*Rubber ring*	*Bearing*	*Unit (with rubber ring)*	--	*Bearing*
400	35	RABR-B 35/80	RABR 72/80	RAE 35 NPPB	CYS 35 FM	RIS 207 A	YET 207	AELR207W3	--	AEL207W3
450, 500	40	RABR-B 40/85	RABR 80/85	RAE 40 NPPB	CYS 40 FM	RIS 208 A	YET 208	AELR208W3	--	AEL208W3
		Unit	*Non-split bearing block*	*Bearing*	--	--	--	*Unit*	*Non-split bearing block*	*Bearing*
560, 630	50	RSAO 50	GG SAO 10	GNE 50 KRRB	--	--	--	UELP310D1W3	P310D1	UEL310D1W3
710, 800, 900, 1000	60	RSAO 60	GG SAO 12	GNE 60 KRRB	--	--	--	UELP312D1W3	P312D1	UEL312D1W3

Table 2.9 - TZAF FF T2, NTHZ T2, TZAF T2

		INA			SKF			NTN		
Fan size	*Bore (mm)*	*Unit*	*Non-split bearing block*	*Bearing*	*Unit*	*Non-split bearing block*	*Bearing*	*Unit*	*Non-split bearing block*	*Bearing*
315	30	PASE 30 N	GG ASE 06 N	GRAE 30 NPPB	SY 30 FM	SY 506 M	YET 206	M-AELP206D1W3	P206D1	M-AEL206D1W3
355, 400	35	PASE 35 N	GG ASE 07 N	GRAE 35 NPPB	SY 35 FM	SY 507 M	YET 207	M-AELP207D1W3	P207D1	M-AEL207D1W3
450, 500	40	PASE 40 N	GG ASE/AK 08 N	GRAE 40 NPPB	SY 40 FM	SY 508 M	YET 208	M-AELP208D1W3	P208D1	M-AEL208D1W3

		SKF				
Fan size	*Bore (mm)*	*Split bearing block*	*Bearing*	*Locking ring*	*Bush*	*Sealing ring*
560, 630	50	SNL 513-611[1)]	1311 EKTN9	FRB 11/120	H 311	TSN 611 G
710, 800, 900, 1000	60	SNL 513-611[1)]	* 22213 EK	FRB 10/120	H 313	TSN 513 L
1120, 1250	75	SNL 517	* 22217 EK	FRB 12.5/150	H 317	TSN 517 L

* Roller bearing; 1) Previous code: SNL 513-611

Table 2.10 - MAZ T1, MHZ T1

		INA			SKF			NTN		
Fan size	*Bore (mm)*	*Unit*	*Non-split bearing block*	*Bearing*	*Unit*	*Non-split bearing block*	*Bearing*	*Unit*	*Non-split bearing block*	*Bearing*
315	25	PASE 25 N	GG ASE 05 N	GRAE 25 NPPB	SY 25 FM	SY 505 M	YET 205	M-AELP205D1W3	P205D1	M-AEL205D1W3
355, 400	30	PASE 30 N	GG ASE 06 N	GRAE 30 NPPB	SY 30 FM	SY 506 M	YET 206	M-AELP206D1W3	P206D1	M-AEL206D1W3
450, 500	35	PASE 35 N	GG ASE 07 N	GRAE 35 NPPB	SY 35 FM	SY 507 M	YET 207	M-AELP207D1W3	P207D1	M-AEL207D1W3
560, 630	40	PASE 40 N	GG ASE/AK 08 N	GRAE 40 NPPB	SY 40 FM	SY 508 M	YET 208	M-AELP208D1W3	P208D1	M-AEL208D1W3
710, 800	50	PASE 50 N	GG ASE 10 N	GRAE 50 NPPB	SY 50 FM	SY 510 M	YET 210	M-AELP210D1W3	P210D1	M-AEL210D1W3
900, 1000	60	PASE 60 N	GG ASE 12 N	GRAE 60 NPPB	--	--	--	M-AELP212D1W3	P212D1	M-AEL212D1W3
1120	70	RASE 70	GG ASE 14	GE 70 KRRB	--	--	--			

		SKF				
Fan size	*Bore (mm)*	*Split bearing block*	*Bearing*	*Locking ring*	*Bush*	*Sealing ring*
1250	70	SNL 516-613	* 22216 EK	FRB 12.5/140	H 316	TSN 516 L

* Roller bearing

Table 2.11 - MAZ T2L, MHZ T2L

		INA			SKF			NTN		
Fan size	*Bore (mm)*	*Unit*	*Non-split bearing block*	*Bearing*	*Unit*	*Non-split bearing block*	*Bearing*	*Unit*	*Non-split bearing block*	*Bearing*
400	35	PASE 35 N	GG ASE 07 N	GRAE 35 NPPB	SY 35 FM	SY 507 M	YET 207	M-AELP207D1W3	P207D1	M-AEL207D1W3
450, 500	40	PASE 40 N	GG ASE/AK 08 N	GRAE 40 NPPB	SY 40 FM	SY 508 M	YET 208	M-AELP208D1W3	P208D1	M-AEL208D1W3
560, 630	50	RSAO 50	GG SAO 10	GNE 50 KRRB	--	--	--	UELP310D1W3	P310D1	UEL310D1W3
710, 800, 900, 1000	60	RSAO 60	GG SAO 12	GNE 60 KRRB	--	--	--	UELP312D1W3	P312D1	UEL312D1W3

Table 2.12 - MAZ T2, MHZ T2

		SKF				
Fan size	*Bore (mm)*	*Split bearing block*	*Bearing*	*Locking ring*	*Bush*	*Sealing ring*
315	25	SNL 506-605	2206 EK	FRB 6/62	H 306	TSN 506 L
355, 400	35	SE 510-608 [1)]	1308 EK	FRB 9/90	H 308	TSN 608 L
450, 500	40	SE 511-609 [2)]	1309 EK	FRB 9.5/100	H 309	TSN 609 L
560, 630	50	SE 511-609 [2)]	* 22211 EK	FRB 9.5/100	H 311	TSN 511 L
710, 800, 900, 1000	60	SE 513-611 [3)]	* 22213 EK	FRB 10/120	H 313	TSN 513 L
1120, 1250	75	SNL 517	* 22217 EK	FRB 12.5/150	H 317	TSN 517 L

* Roller bearing; 1) Previous code: SNL 510-608; 2) Previous code: SNL 511-609; 1) Previous code: SNL 513-611

Table 2.13 - NPA B, NPE B, PEAF B SETTING 11

		INA			SKF			NTN	
Fan size	*Bore (mm)*	*Unit*	*Rubber ring*	*Bearing*	*Unit*	*Rubber ring*	*Bearing*	*Unit (with rubber ring)*	*Bearing*
315	25	RABR-B 25/62	RABR 52/62	RAE 25 NPPB	CYS 25 FM	RIS 205	YET 205	AELR205W3	AEL205W3
355, 400	30	RABR-B 30/72	RABR 62/72	RAE 30 NPPB	CYS 30 FM	RIS 206 A	YET 206	AELR206W3	AEL206W3
450, 500	35	RABR-B 35/80	RABR 72/80	RAE 35 NPPB	CYS 35 FM	RIS 207 A	YET 207	AELR207W3	AEL207W3
560, 630	40	RABR-B 40/85	RABR 80/85	RAE 40 NPPB	CYS 40 FM	RIS 208 A	YET 208	AELR208W3	AEL208W3
710	50	RABR-B 50/100	RABR 90/100	RAE 50 NPPB	CYS 50 FM	RIS 210 A	YET 210	AELR210D1W3	AEL210D1W3

Table 2.14 - NPA T1, NPE T1, PEAF T1 SETTING 11

		INA			SKF			NTN		
Fan size	*Bore (mm)*	*Unit*	*Non-split bearing block*	*Bearing*	*Unit*	*Non-split bearing block*	*Bearing*	*Unit*	*Non-split bearing block*	*Bearing*
315	25	PASE 25	GG ASE 05 N	GRAE 25 NPPB	SY 25 FM	SY 505 M	YET 205	M-AELP205D1W3	P205D1	M-AEL205D1W3
355, 400	30	PASE 30	GG ASE 06 N	GRAE 30 NPPB	SY 30 FM	SY 506 M	YET 206	M-AELP206D1W3	P206D1	M-AEL206D1W3
450, 500	35	PASE 35	GG ASE 07 N	GRAE 35 NPPB	SY 35 FM	SY 507 M	YET 207	M-AELP207D1W3	P207D1	M-AEL207D1W3
560, 630	40	PASE 40	GG ASE/AK 08 N	GRAE 40 NPPB	SY 40 FM	SY 508 M	YET 208	M-AELP208D1W3	P208D1	M-AEL208D1W3
710, 800	50	PASE 50	GG ASE 10 N	GRAE 50 NPPB	SY 50 FM	SY 510 M	YET 210	M-AELP210D1W3	P210D1	M-AEL210D1W3
900, 1000	60	PASE 60	GG ASE 12 N	GRAE 60 NPPB	--	--	--	M-AELP212D1W3	P212D1	M-AEL212D1W3

Table 2.15 - NPA T2, PEAF T2 SETTING 11

INLET SIDE		INA			SKF			NTN		
Fan size	*Bore (mm)*	*Unit*	*Non-split bearing block*	*Bearing*	*Unit*	*Non-split bearing block*	*Bearing*	*Unit*	*Non-split bearing block*	*Bearing*
315	25	PASE 25	GG ASE 05 N	GRAE 25 NPPB	SY 25 FM	SY 505 M	YET 205	M-AELP205D1W3	P205D1	M-AEL205D1W3
355, 400	30	PASE 30	GG ASE 06 N	GRAE 30 NPPB	SY 30 FM	SY 506 M	YET 206	M-AELP206D1W3	P206D1	M-AEL206D1W3
450, 500	35	PASE 35	GG ASE 07 N	GRAE 35 NPPB	SY 35 FM	SY 507 M	YET 207	M-AELP207D1W3	P207D1	M-AEL207D1W3
560, 630	40	PASE 40	GG ASE/AK 08 N	GRAE 40 NPPB	SY 40 FM	SY 508 M	YET 208	M-AELP208D1W3	P208D1	M-AEL208D1W3
710, 800	50	PASE 50	GG ASE 10 N	GRAE 50 NPPB	SY 50 FM	SY 510 M	YET 210	M-AELP210D1W3	P210D1	M-AEL210D1W3

TRANSMISSION SIDE		SKF				
Fan size	*Bore (mm)*	*Split bearing block*	*Bearing*	*Locking ring*	*Bush*	*Sealing ring*
315	25	SNL 506-605	2206 EKTN9	FRB 6/62	H 306	TSN 506 L
355, 400	30	SE 507-606 [1)]	2207 EK	FRB 5.5/72	H 307	TSN 507 L
450, 500	35	SE 508-607 [2)]	* 22208 EK	FRB 8/80	H 308	TSN 508 L
560, 630	40	SE 509 [3)]	* 22209CCK	FRB 3.5/85	H 309	TSN 509 L
710, 800	50	SE 511-609 [4)]	* 22211 EK	FBR 9.5/100	H 311	TSN 511 L

* Roller bearing; 1) Previous code SNL 507-606; 2) Previous code SNL 508-607; 3) Previous code SNL 509; 4) Previous code SNL 511-609

Table 2.16 - NPA T2, NPE T2, PEAF T2 SETTING 11

INLET SIDE		INA			NTN		
Fan size	*Bore (mm)*	*Unit*	*Non-split bearing block*	*Bearing*	*Unit*	*Non-split bearing block*	*Bearing*
900, 1000	60	PASE 60	GG ASE 12 N	GRAE 60 NPPB	M-AELP212D1W3	P212D1	M-AEL212D1W3

TRANSMISSION SIDE		SKF				
Fan size	*Bore (mm)*	*Split bearing block*	*Bearing*	*Locking ring*	*Bush*	*Sealing ring*
900, 1000	60	SE 513-611 [1)]	* 22213 EK	FRB 10/120	H 313	TSN 513 A

* Roller bearing; 1) Previous code SNL 513-611

HOW TO ESTABLISH THE AMOUNT OF GREASE FOR RE-LUBRICATION AND INITIAL FILLING

1) identify the fan TYPE and SIZE
2) in table 2 find the technical bearing specifications:
   - bore
   - split or non-split type; if split, then check whether it is ball or roller type
3) with fan and bearing data, enter tables from 3 to 16, where Ød corresponds to bore (internal bearing bore equal to shaft diameter where the bearing is set) to find the grease quantity for re-lubrication and 1st filling
   NOTE: bearings on fans in version B or R are life-lubricated
   Tables 9 to 12: ONLY for split block bearing on MAZ T2 and MAZ 1250 T1 and MHZ T2 and MHZ 1250 T1
   Tables 13 to 16: ONLY for split block bearing on NPA, NPE and PEAF arr.11
4) from table 17 find type and supplier of the grease
5) to determine the re-lubrication time interval:
   - for non-split pillow block bearing see graph 1 with the correct parameters of shaft diameter and rev speed
   - for split pillow block bearing with ball bearing see table 18, with roller bearing see table 19, entering the correct parameters of "bearing block" and rev speed

Table 3 - Grease quantity for re-lubrication of non-split pillow block bearings **

	THLZ FF T1, TLZ T, TLI T, THLZ T, TLE T, THLE T, TZAF FF T1, VTZ T1, NTHZ T1, TZAF T1; NPA T1, NPE T1 e PEAF T1 in Sist.11; NPA T2, NPE T2 e PEAF T2 lato aspirazione in Sist.11														**TZAF, TZAF FF, NTHZ T1**	
Fan size	**160-250, 7-7 - 9-9 *****		**280-315, 10-8 – 10-10**		**355-400, 12-9 – 15-15**		**450-500, 18-13 – 18-18**		**560-630**		**710-800**		**900-1000**		**1120**	
	M (g)	Ød (mm)	M (g)	Ød (mm)	M (g)	Ød (mm)	M (g)	Ød (mm)	M (g)	Ød (mm)	M (g)	Ød (mm)	M (g)	Ød (mm)	M (g)	Ød (mm)
	3,3	20	3,9	25	5,6	30	6,8	35	8,4	40	9,9	50	13,2	60	21,4	70

	HLZ T, TZAF FF T2L, NTHZ T2L, TZAF T2L, TZAF FF T2, NTHZ T2, TZAF T2									
Fan size	**315**		**355, 400**		**450, 500**		**560, 630**		**710, 800, 900, 1000**	
	M (g)	Ød (mm)	M (g)	Ød (mm)	M (g)	Ød (mm)	M (g)	Ød (mm)	M (g)	Ød (mm)
	5,6	30	6,8	35	8,4	40	9,9	50	13,2	60

** A general rule for defining the re-lubrication grease quantity according to the manufacturer bearing catalogue is the following: the grease quantity depends on the speed, from 20% to 80% of the initial grease quantity; re-lubrication should be carried out until fresh grease appears at the seal gap; the old grease must be allowed to flow out unhindered

*** NOTE: Fan sizes expressed in inches refer to the TLI fan series

Table 4 - Grease quantity for re-lubrication of non-split pillow block bearings **

	MAZ T1, MHZ T1													
Fan size	315		355-400		450-500		560-630		710-800		900-1000		1120	
	M (g)	Ød (mm)	M (g)	Ød (mm)	M (g)	Ød (mm)	M (g)	Ød (mm)	M (g)	Ød (mm)	M (g)	Ød (mm)	M (g)	Ød (mm)
	3,9	25	5,6	30	6,8	35	8,4	40	9,9	50	13,2	60	21,4	70

	MAZ T2L, MHZ T2L									
Fan size	315		355, 400		450, 500		560, 630		710, 800, 900, 1000	
	M (g)	Ød (mm)	M (g)	Ød (mm)	M (g)	Ød (mm)	M (g)	Ød (mm)	M (g)	Ød (mm)
	5,6	30	6,8	35	8,4	40	9,9	50	13,2	60

** A general rule for defining the re-lubrication grease quantity according to the manufacturer bearing catalogue is the following: the grease quantity depends on the speed, from 20% to 80% of the initial grease quantity; re-lubrication should be carried out until fresh grease appears at the seal gap; the old grease must be allowed to flow out unhindered

Table 5 - Grease quantity for re-lubrication of SKF SNL/SE type split-housing with pillow block ball bearings EXCEPT NPA, NPE, PEAF ARR. 11, MAZ, MHZ

Fan size	560		630		710		800		900		1000	
	M (g)	Ød (mm)	M (g)	Ød (mm)	M (g)	Ød (mm)	M (g)	Ød (mm)	M (g)	Ød (mm)	M (g)	Ød (mm)
	20	50	20	50	25	60	25	60	25	60	25	60

Table 6 - Grease quantity for initial filling or complete re-filling for SKF SNL type split-housing with pillow block ball bearings

Fan size	560		630		710		800		900		1000	
	M (g)	Ød (mm)	M (g)	Ød (mm)	M (g)	Ød (mm)	M (g)	Ød (mm)	M (g)	Ød (mm)	M (g)	Ød (mm)
	180	50	180	50	280	60	280	60	280	60	280	60

Table 7 - Grease quantity for re-lubrication of SKF SNL/SE type split-housing with pillow block roller bearings EXCEPT NPA, NPE, PEAF ARR. 11, MAZ, MHZ

Fan size	710, 800, 900, 1000		THLZ 1120, 1250; TZAF, TZAF FF, NTHZ 1250 T1		HLZ 1120, 1250		TZAF, TZAF FF, NTHZ 1120 T2, 1250 T2	
	M (g)	Ød (mm)	M (g)	Ød (mm)	M (g)	Ød (mm)	M (g)	Ød (mm)
	20	60	25	70	40	80	25	75

Table 8 - Grease quantity for initial filling or complete re-filling for SKF SNL/SE type split-housing with pillow block roller bearings

Fan size	**710, 800, 900, 1000**		**THLZ 1120, 1250; TZAF 1250 T1**		**HLZ 1120, 1250**		**TZAF, TZAF FF, NTHZ 1120 T2, 1250 T2**	
	M (g)	Ød (mm)	M (g)	Ød (mm)	M (g)	Ød (mm)	M (g)	Ød (mm)
	180	60	280	70	430	80	330	75

Table 9 - Grease quantity for re-lubrication of SKF SNL/SE type split-housing with pillow block ball bearings

	MAZ T2, MHZ T2					
Fan size	**315**		**355, 400**		**450, 500**	
	M (g)	Ød (mm)	M (g)	Ød (mm)	M (g)	Ød (mm)
	5	25	10	35	15	40

Table 10 - Grease quantity for initial filling or complete re-filling for SKF SNL/SE type split-housing with pillow block ball bearings

	MAZ T2, MHZ T2					
Fan size	**315**		**355, 400**		**450, 500**	
	M (g)	Ød (mm)	M (g)	Ød (mm)	M (g)	Ød (mm)
	40	25	75	35	100	40

Table 11 - Grease quantity for re-lubrication of SKF SNL/SE type split-housing with pillow block roller bearings

	MAZ T1, MHZ T1		**MAZ T2, MHZ T2**					
Fan size	**1250**		**560, 630**		**710, 800, 900, 1000**		**1120, 1250**	
	M (g)	Ød (mm)	M (g)	Ød (mm)	M (g)	Ød (mm)	M (g)	Ød (mm)
	25	70	15	50	20	60	25	75

Table 12 - Grease quantity for initial filling or complete re-filling for SKF SNL/SE type split-housing with pillow block roller bearings

	MAZ T1, MHZ T1		**MAZ T2, MHZ T2**					
Fan size	**1250**		**560, 630**		**710, 800, 900, 1000**		**1120, 1250**	
	M (g)	Ød (mm)	M (g)	Ød (mm)	M (g)	Ød (mm)	M (g)	Ød (mm)
	280	70	100	50	180	60	330	75

Table 13 - Grease quantity for re-lubrication of SKF SNL/SE type split-housing with pillow block ball bearings

	NPA, NPE, PEAF Setting 11			
Fan size	315		355, 400	
	M (g)	Ød (mm)	M (g)	Ød (mm)
	5	25	10	30

Table 14 - Grease quantity for initial filling or complete re-filling for SKF SNL/SE type split-housing with pillow block ball bearings

	NPA, NPE, PEAF Setting 11			
Fan size	315		355, 400	
	M (g)	Ød (mm)	M (g)	Ød (mm)
	40	25	50	30

Table 15 - Grease quantity for re-lubrication of SKF SNL/SE type split-housing with pillow block roller bearings

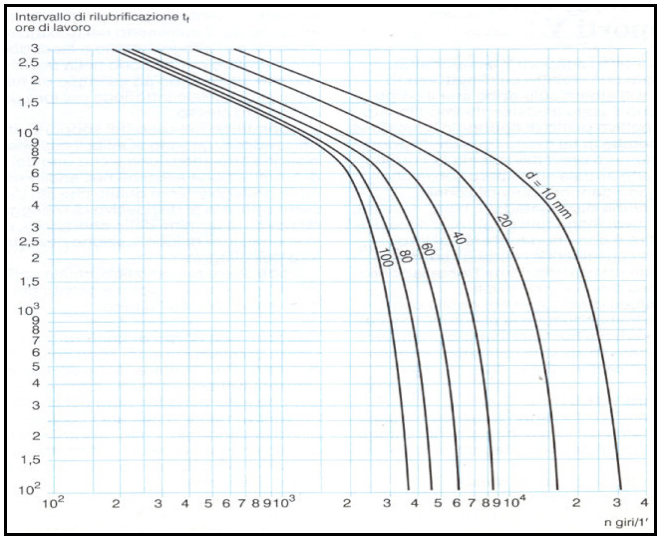
	NPA, PEAF Setting 11						NPA, NPE, PEAF Setting 11	
Fan size	450, 500		560, 630		710, 800		900, 1000	
	M (g)	Ød (mm)	M (g)	Ød (mm)	M (g)	Ød (mm)	M (g)	Ød (mm)
	10	35	10	40	15	50	20	60

Table 16 - Grease quantity for initial filling or complete re-filling for SKF SNL/SE type split-housing with pillow block roller bearings

	NPA, PEAF Setting11						NPA, NPE, PEAF Setting 11	
Fan size	450, 500		560, 630		710, 800		900, 1000	
	M (g)	Ød (mm)	M (g)	Ød (mm)	M (g)	Ød (mm)	M (g)	Ød (mm)
	60	35	65	40	100	50	180	60

Table 17 - Suggested brands and types of grease

Supplier	Type	Base	Temperature range (min - max)
FINA	Marson HTL 3	Lithium	-30°C / +120°C
SHELL	Alvania Fett 3	Lithium	-20°C / + 130°C
ESSO	Beacon 3	Lithium	-20°C / + 130°C
MOBIL	Mobilux EP3	Lithium	-30°C / + 130°C



Graph 1. – Re-lubrication intervals t [h] for non-split bearing pillow blocks

Table 18
Re-lubrication intervals with split bearing pillow blocks with ball bearing

Bearing type	506	507	510	511	513	516
Speed [min^{-1}]	Re-lubrication intervals [hours]					
250	34700	33400	29900	28800	26500	26000
500	24300	23300	23000	23400	23500	22500
750	19600	18700	19700	20000	20700	19500
1000	16800	16000	17000	17500	18300	16900
1250	14800	14100	15000	15500	16200	14600
1500	13300	12700	13500	13700	14300	12600
1750	12200	11500	12000	12000	12700	10900
2000	11200	10600	10900	11000	11200	9500
2500	9800	9200	9000	8900	8800	7100
3000	8700	8100	7500	7300	6900	5300

Table 19
Re-lubrication intervals with split bearing pillow blocks with roller bearing

Bearing type	508	509	511	513	516	517	518
Speed [min^{-1}]	Re-lubrication intervals [hours]						
250	16700	15800	14500	13000	13000	12500	12000
500	8100	7600	6900	5500	5250	5150	5000
750	5200	4900	4400	4000	3750	3650	3500
1000	3800	3500	3200	3250	3000	2750	2500
1250	2900	2700	2400	2000	1900	1800	1700
1500	2400	2200	1900	1500	1400	1350	1300
1750	1900	1800	1500	1100	1000	950	900
2000	1600	1500	1300	1000	800	750	700
2500	1200	1100	900	750	500	450	
3000	900	800	600	480	320		

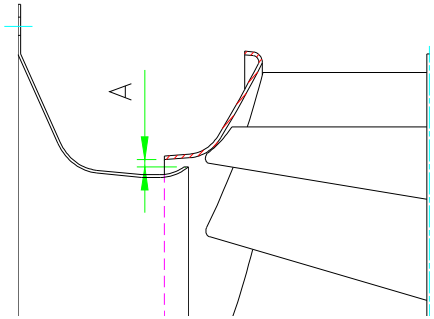
Table 20 - Clearance between inlet-cone and shroud in Atex execution

In Atex execution the inlet-cone is completely manufactured in copper or is provided with a copper tip at the end, fully overlapping the shroud. Besides this, the clearance between inlet-cone and shroud (indicated here in the sketch) is not as in the standard execution to comply with the Atex standard requirements, but it must be as in the following table.

VERIFY THE RESPECT OF THE DIMENSION "A" INDICATED IN THE TABLE (RELATIVE TO THE SERIES MENTIONED ABOVE) BEFORE STARTING THE FAN.

NOTE: in the TLZ, TLI and TLE fan series, the inlet-cone does not overlap the shroud

TZAF FF Atex 315 – 1250
VTZ Atex 315 – 1000
NTHZ Atex 315 – 1250
THLZ FF Atex 180 – 450
MAZ Atex 315 –1250
MHZ Atex 315 –1250
TZAF Atex 355 - 1250
THLZ Atex 180 – 1250
HLZ Atex 400 – 1250
THLE Atex 200 – 1000
KHLE Atex 200 – 1000
NPA Atex 315 – 1250
NPL Atex 250 – 1400
TE (in steel) Atex 180 - 450



SIZE	A		
	NPL	THLZ FF, THLZ, HLZ, THLE, KHLE, TE	TZAF FF, VTZ, NTHZ, MAZ, MHZ, TZAF, NPA
180	---	2,25 +0,35 0	---
200	---	2,65 +0,7 0	---
225	---	2,65 +0,7 0	---
250	2,25 +1 0	2,65 +0,7 0	---
280	2 +1 0	2,65 +0,7 0	---
315	3 +1 0	2,65 +0,7 0	3 +1.25 0
355	3,5 +1.25 0	3 +0,85 -0,1	3,5 +1.25 0
400	4 +1.25 0	4 +1,25 0	4 +1.25 0
450	5 +1.25 0	4 +1,25 0	5 +1.25 0
500	5 +1.25 0	5 +1,5 0	5 +1.25 0
560	6,5 +1.25 0	5 +1,5 0	6,5 +1.25 0
630	6,5 +1.25 0	6,5 +2 0	6,5 +1.25 0
710	6,5 +1,5 0	6,5 +1,75 0	7,5 +1,75 0
800	7,5 +2 0	7,5 +2 0	8,5 +1,75 0
900	8,5 +2 0	8,5 +2 0	8,5 +1,75 0
1000	8,5 +2 0	8,5 +2 0	8,5 +1,75 0
1120	8,5 +2 0	8,5 +2 0	10 +2 0
1250	10 +2 0	9 +2 0	11 +2 0
1400	11 +2 0	---	---

SUMMARY

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NOTE:
This manual can be subject to variations depending on possible updates of the "Atex" standard of reference.
The following versions of this manual will also contain indications for the HLE fan series, currently excluded.

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