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 AND CENTRIFUGAL IMPELLERS FOR PLENUM FANS NPL – NPA – TE – PEAF* – NPE*

(This manual includes the fan arrangement according to "Atex" and anti-spark standard 94/9/EC)

* Series currently not in production but available for spare parts in compliance with this manual.

1 FOREWORD

All Comefri 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 equipped with motor and belt drive are tested accurately before leaving the factory.

Comefri fans 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 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 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, 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 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 fans or unauthorized alterations to the fans, 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 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.

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.

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 Description of centrifugal impellers for plenum

The Comefri NPL, NPE, TE series have backward-curved blades while the NPA, PEAF 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 to make sure the fan is suitable for the fluid treated by the system.

Comefri impellers for plenum can be provided as an impeller unit + inlet-cone or according to the arrangements summarized in the Appendix.

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 arrangements 4, 5S, 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. 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 fan must nevertheless be installed in accordance with CE requirements.

2.3 Technical Data

The technical data and the permissible limits have to be clearly listed on the fan plate (see also 2.4.5). 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; this means 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 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 / BS EN ISO 5136 / ANSI-AMCA 330 in-duct 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 and system.

2.4 Applications

The 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 permissible operating temperature range for all fans and free wheels is: - 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 drive motor is + 40°C.

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

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 executions are available for spark-proof applications according to the ATEX Directive 94/9/EC Group II, Category 3G. The NPL, NPA, NPE, NPEAF are available in ATEX execution on demand (for the sake of shortness these three series will no longer be quoted in reference to Atex execution). Only TZAF and NTHZ fans are Atex certified to be used in Group II, Category 2G.
THLZ FF and TE fans with standard polyamide impellers cannot be in Atex execution; they can be in Atex execution ONLY with special steel impellers (see par. 2.4.3) .

2.5.1 Applications

Fan operation in areas with combustible gases, vapours, mist, dust and fumes or with a possible danger of explosion must adhere to explosion-proof guidelines. Since July 1, 2003 it is necessary for 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 equipment.
Group I: fan equipment intended for use in mining applications (Out of Comefri production)
Group II: intended for all other situations.
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 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 out of Comefri production.

This fan classification is due to the application of 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, vapour and mist. Codes with prefix “2” refer to air containing gas, vapour 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 fans 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 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 range of application.

As a consequence, the allowed use of the different category 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 are out of Comefri production.
**** Only for TZAF Atex and NTHZ Atex fan series
***** The use of the fan 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.

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 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 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 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 and THLE 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 than according to 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 during operation in which the temperature of the inlet fluid reaches 60°C (as indicated in 2.3).
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 plate 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 plate (see 2.4.5).
The temperature class for double inlet fan series (TZAF FF Atex, VTZ Atex, NTHZ Atex, THLZ FF Atex, TLZ Atex, TLI Atex, TZAF Atex, THLZ Atex, MAZ Atex, MHZ Atex, HLZ Atex, TLE Atex, THLE Atex) is T4.
The temperature class for single inlet and series (TLE Atex, THLE Atex) is T3.
The difference is mainly due to the bearing, which is the most critical element concerning heating.

2.5.3 Spark protection measures and mechanical design criteria

CRITERIA FOR BOTH CATEGORY 2 AND 3

-- General
Comefri fans (casings, supporting structures, guards, protective devices 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. 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 sealed. For MAZ Atex and MHZ Atex fans, the casing is continuously sealed as per standard. The fan is equipped with an inspection door. It is held in position by bolts and sealed. The fan shaft must be installed in a horizontal position.

-- 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 fans 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.

-- Materials for rotating and stationary parts of fans
In view of misuse, due to rare or even very rare malfunctioning, potential areas of contact between the rotating elements and fixed components (e.g. INLET CONE and SHROUD, FOREFINGER® (Forefinger® is manufactured in copper), SHAFT and the HOLE EDGE for the shaft in the transmission guard) 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 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 of that material. Tip extensions 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.

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

-- Vibrations
The impeller or the complete rotating assembly is balanced according to ISO 1940-1 and ISO 14694, grade 2.5. If the fan is driven through belts, then the pulleys are also balanced.
The completed fan meets the vibration levels recommended in ISO 10816 and ISO 14694.

FURTHER CRITERIA FOR CATEGORY 3 – Gas

-- Deposits inside the fan
The 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 series fans 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 fans are provided with an inspection door, so that inspection and cleaning operations can be easily carried out.

-- Clearance between rotating parts and the fan casing
The clearance between rotating elements and the fan casing 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. Shaft seals are not subject to this provision.
NOTE The clearance may change with rotation, temperature, and due to vibrations and belt drive tension. For this reason the installer and the user must assure the correct belt tension (see 6.4) in order to get final clearance required which has to be measured (see 4.5).

-- 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 4.3)

-- Power transmission systems
V-belts must be electrostatically conductive.

-- 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.

-- 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 permissible rotation velocity, indicated in the fan plate. For single inlet fans directly coupled to the motor, positive locking is performed with 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.

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

-- Fire resistance
The materials used for the impeller and 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 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
The fan has to be protected against the entry of foreign particles according to grade IP20 of EN 60529. The inlet and outlet guards have to be installed. They can be provided by the installer, user or requested from Comefri.

FURTHER CRITERIA FOR CATEGORY 2 – Gas
The TZAF Atex and NTHZ Atex fan series are the only ones among the fan series in the present catalogue that are certified to be used also in CATEGORY 2 Atex of fans. All characteristics explained for category 3 are valid also for category 2 with the further ATEX requirements detailed below.

-- 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 4.3)

-- Impeller - shaft attachment
For motor powers in excess of 5.5 kW a positive locking is arranged using seeger rings on the shaft for single and double inlet fans. For single inlet fans directly coupled to the motor, positive locking is performed with tapped shaft. The use of the seeger rings on the fan shaft restricts the maximal permissible rotation velocity of the standard catalogue limits to the new values as follows:

Fan model	arr.	Max RPM	arr.	Max RPM	arr.	Max RPM	arr.	Max RPM
TZAF 355	R	3000	T1	3200	-	-	T2	3770
TZAF 400	R	2700	T1	2750	T2L	3000	T2	3200
TZAF 450	R	2400	T1	2650	T2L	2750	T2	2900
TZAF 500	R	1850	T1	1960	T2L	2210	T2	2400
TZAF 560	R	1820	T1	1870	T2L	2350	T2	2350
TZAF 630	R	1400	T1	1450	T2L	1920	T2	2000
TZAF 710	R	1350	T1	1450	T2L	1800	T2	1850
TZAF 800	-	-	T1	1120	T2L	1470	T2	1550
TZAF 900	-	-	T1	1200	T2L	1300	T2	1450
TZAF 1000	-	-	T1	900	T2L	1120	T2	1270

TZAF 1120	-	-	T1	770	-	-	T2	1030
TZAF 1250	-	-	T1	700	-	-	T2	935

Fan model	arr.	Max RPM	arr.	Max RPM	arr.	Max RPM	arr.	Max RPM
NTHZ 315	R	3150	T1	3150	-	-	T2	3650
NTHZ 355	R	3150	T1	3200	-	-	T2	3600
NTHZ 400	R	2380	T1	2400	T2L	2700	T2	2900
NTHZ 450	R	2380	T1	2400	T2L	2700	T2	2750
NTHZ 500	R	1850	T1	1870	T2L	2215	T2	2275
NTHZ 560	R	1790	T1	1800	T2L	2200	T2	2200
NTHZ 630	R	1370	T1	1400	T2L	1800	T2	1850
NTHZ 710	R	1350	T1	1350	T2L	1750	T2	1820
NTHZ 800	-	-	T1	1050	T2L	1325	T2	1425
NTHZ 900	-	-	T1	1050	T2L	1250	T2	1350
NTHZ 1000	-	-	T1	850	T2L	1050	T2	1150
NTHZ 1120	-	-	T1	750	-	-	T2	1100
NTHZ 1250	-	-	T1	650	-	-	T2	1000

AISI 304 EXECUTION

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 EXECUTION

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

NOTE Special execution with a taper-bushed connection of the impeller to the shaft is used for fans with motor power not exceeding 5.5 kW.

-- Casing
Casing is continuously sealed.
The standard EN 14986 requires that the inspection door, outlet and inlet joints, the casing gaps 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 Atex and NTHZ Atex series, object of the CATEGORY 2G certification.

2.5.4 EXPLOSION RISKS

The following is the list of explosion risks which has been assessed for the fan series dealt with in this manual. The division in “normal operation” and “expected malfunction” is due to the different fan category 2 and 3: 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 plate.

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
f	where appropriate, the symbol of the explosion group of the equipment: "II" or "IIA" or "IIB" or "IIC" for equipment intended for places with a potentially explosive atmosphere other than mines susceptible to fire damp.

* 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 are type “c”.

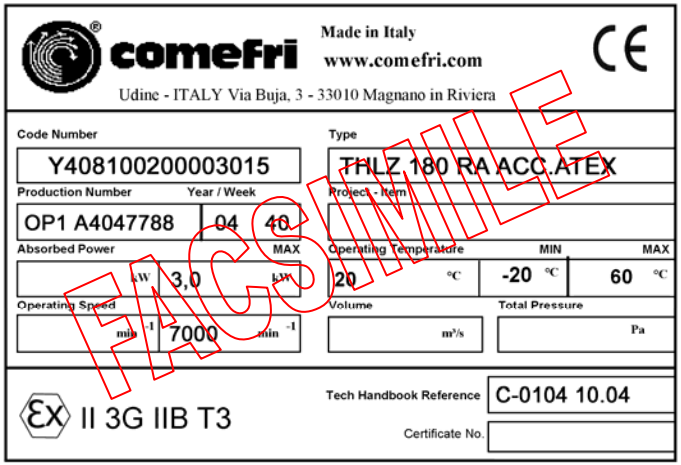
Ignition risk assessment

Potential ignition source		Measures applied to prevent the source from becoming effective	Ignition protection used
Normal operation	Expected malfunction		
Selection of unsuitable fan		Compare process requirements with fan plate data	EN 14986 7.3; Operating and maintenance manual par.2.2, 5.3
Transportation damage		Manufacturer's instructions for transport	EN 14986 7.2; Operating and maintenance manual par.3.0
Storage damage		Manufacturer's instructions for storage	EN 14986 7.2; Operating and maintenance manual par.3.0
General environmental influences		Manufacturer's instructions concerning: environmental temperature, humidity, environmental corrosivity	EN 13463-1; Operating and maintenance manual and constructional safety 'c' (painting and zinc-coating)
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.2.3
Minimum fluid temperature -40°C		Use of appropriate supports, guards, seals and grease	Bearing manufacturer's manual and specifications
	Contact between static and moving components caused by 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.4.2, 4.5.1, 6.4
	Contact between static and moving components caused by thermal deformation	Operating temperature limits	EN 14986 1; Operating and maintenance manual par.2.3
	Contact between static and moving components caused by impeller deformation or fault	Rigid impeller design, decrease of maximal revolving velocity	EN 14986 4.7; constructional safety 'c'; Operating and maintenance manual par.2.4.3
	Contact between static and moving components caused by loosened impeller	Locking of the hub on the shaft	EN 14986 4.21, 5.3; constructional safety 'c'; Operating and maintenance manual par.2.4.3
	Contact between static and moving components caused by misalignment and wear and tear	Minimum clearance Suitable material pairings	EN 14986 4.15, 4.8.2; constructional safety 'c'; Operating and maintenance manual par.2.4.3
	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		Belt tensioning	Operating and maintenance manual par.6.4
Bearing failure		Bearings lubrication, check the operating condition of the bearing	Operating and maintenance manual par.6.5
Bearing failure		Bearings replacement (Safe operational life depending on fan category, see 2.4.2)	EN 14986 4.17, 5.2; Operating and maintenance manual
	Mechanical faults and fatigue	Vibration control in order to avoid abnormal conditions	EN 13463-1, EN 14986; Operating and maintenance Manual par.3.3, 4.2, 4.5.1, 6.1
	Weakening of materials and bridging of gaps due to corrosion	Corrosion protection	EN 14986; constructional safety 'c'; Operating and maintenance manual see 2.4.3, 3.2, 4.1

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, manufacturer's instructions concerning inspection, cleaning	EN 14986 4.4.2; constructional safety 'c'; Operating and maintenance manual par.2.3, 2.4.1, 2.4.3, 6.7
Surface temperature		Maximum surface temperature as defined for fan temperature class; check the fan plate indication	EN 14986 4.4.2; Operating and maintenance manual par.2.4.1, 2.4.2
	Slippage of belts causing temperature increase	Correct belt tensioning	EN 13463-5 7.2; Operating and maintenance manual par.6.4
	Pulley or pulley shaft rubbing on transmission guard	Manufacturing transmission guard from material pairings permitted	EN 13463-5, EN 14986 4.8; constructional safety 'c'; Operating and maintenance manual par.4.5.1
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.4.5
Electrostatic ignition		Electrostatic discharges by earthing	EN 13463-1 11; Operating and maintenance manual par.4.5.1
Electrostatic discharges in connection with belts		Belt drive rules	EN 13463-1 (Operating and maintenance manual see 4.5)
Electrical components		Electric installation instructions of electric equipment	See reference manuals of electric devices

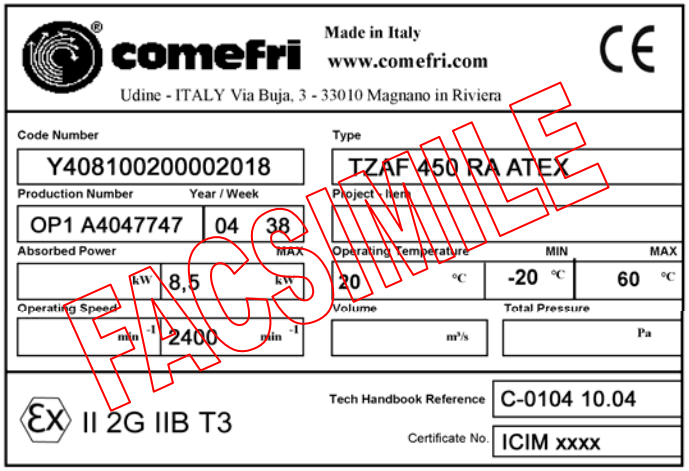
2.5.5 Caption of fan plate for anti-spark execution

GROUP II, Category 3



Code number: fan type 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 IIA T3 : 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, IIA is fluid type class, T3 the temperature class
Technical handbook reference: code inversion of "OPERATING AND MAINTENANCE MANUAL". This handbook code is input in "Galileo" software where the current version can be checked in the "Article Records" form in the "Drawing" field.

GROUP II, Category 2



For a fan in Category 2, respect to the label of a fan in Category 3 (to witch refer for the detailed fields description), is compiled also the further field “Certificate No.” ie the deposit number of technical documentation by accreditation institute (notified body), required for Group II, Category 2.

Note: 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

2.6 Fans with spark-proof execution according to Standard VDMA 24169

Fan operation in areas with combustible gases, vapours, fumes or with a possible danger of explosion must adhere to explosion-proof guidelines.
These fans can be supplied in a spark-proof version conforming to the provisions of German Standard VDMA 24 169, 3.1- 3.2 and 3.4.
The International Standard IEC 79-10 defines three danger zones, according to the frequency and period of time that a dangerous concentration of an explosive mixture can occur.

Zone	*Dangerous concentration*	*Potential spark source must be avoided*
0	Constant or for a long time	even where few shutdowns are expected
1	Likely to occur	where more frequent shutdowns are expected
2	Rarely or for short time	In normal operation

The customer should check whether the requested execution meets the requirements of the installation zone and the site regulations.

Possible explosion sources in a fan that must be taken in consideration are:

- hot surfaces, for example, owing to grease-deficiency in the bearings or seizing-up of the same;
- sparks due to friction, impact or rubbing of impellers against static parts of the fan.

All Comefri fans are suitable for operating in **Zone 2**. The German standards VDE 0165 and VDE 0171 apply to the motor and relative control elements.

In **Zone 1** (Temperature class T1 – T3 according to DIN 50014) fan operation is still possible under the following conditions:

1. For material types
In order to avoid spark-formation, the following material pairings are recommended:
- steel or cast-iron combined with bronze, brass or copper;
- stainless steel combined with stainless steel
- the Forefinger® must be manufactured in copper

2. For bearings
Theoretical bearing-operating life L_{10} should be 40,000 hours minimum (the bearings should possibly be installed outside the air flow).

3. Fan shaft
The fan shaft must be installed in a horizontal position.

4. Maximum speed
The maximum admitted operating speed must be reduced by 20% in comparison with the catalogue data.

5. Pulleys
The allowable shaft power for the chosen pulleys must be reduced by 30%.

6. V-belts
V-belts must be electrostatically conductive; at least three belts must be used.

7. Protection
To prevent any possible entry of foreign elements inside the fan, protections according to the safety regulations should be provided.

Fan operation is not allowed in Zone 0.

3 HANDLING AND STORAGE

3.1 Receiving

Each fan is carefully checked before shipment.
When receiving a fan it is necessary to check the conformity of the fan with the order (execution, rotation, power and polarity of installed motor, fittings, etc.); after installation we do not accept returns of non-compliant fans. 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 fan at the customer's premises.

3.2 Handling

The handling of the 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 fan. Special care must be taken to ensure that the fan will never be lifted by the shaft ends, motor transport eyebolts, bearing supports and inlet or outlet flanges.
Fixing 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.
Never stack fans one on top of the other after they have been removed from the box.
Be careful of improper handling, though not damaging the fan, often leads to the need to rebalance the impeller.
Particular care must be taken in handling 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 fans properly to protect them against filth and moisture. Corrosive atmospheres must be avoided. Use of a tarpaulin to cover the unit 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.
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 fans 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 2.2) 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 the bolts of properly tightened. Tightening torques for bearings shall be according to the manufacturer catalogue; the tightening torques for all the bolts on the fan 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.

THLZ, HLZ, THLE, VTZ, NTHZ, MHZ fans have the impeller with backward-curved blades; TZAF, TZAF FF, MAZ fans have the impeller with backward-curved airfoil blades; both these types of 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 which are to be installed in atmospheres with a high humidity and critical temperature level.
The fan must be firmly fixed to a foundation or steel base frame. It 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 and its base frame. Otherwise misalignment or bending

moments could occur inducing anomalous vibrations during fan operation. A reinforced concrete foundation is considered ideal for mounting the fan. When installing on steel structures or racks, the design must consider both the weight of the 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 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 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 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 are designed to work with the shaft in a horizontal position. If the fan has 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)

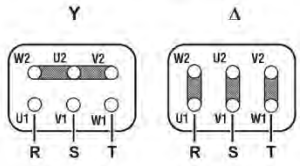
For impellers of the NPL, NPA, TE, NPE, PEAF series, when supplied as impeller + inlet cone unit or in the arrangement 5, check the correct overlapping of the inlet cone and impeller according to the catalogue of reference.
Plenum fans do not meet the provisions of the CE labelling (e.g. they have an impeller without guards). Kindly request specific protective measures if appropriate. The fan must nevertheless be installed in accordance with CE requirements.

4.3 Belt drive and protective guard

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 belt. Otherwise refer to the technical catalogues of the pulley/transmission manufacturers.
Make sure that the pulley of the fan and that of the motor are properly aligned. Fit the belts and tension them according to instructions (see 6.4)
If the fan is in spark-proof execution, see par. 4.5 regarding the belt drive and protective guard.

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.

4.5 Spark-proof execution according to ATEX 94/9/CE or VDMA 24169

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.
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

The fan can only be installed with the shaft in the horizontal position.
The fan is protected with inlet and/or outlet grids against the entrance of foreign particles according to IP20 of standard EN60529. If the installer removes these guards to install the inlet or outlet ducts, then he must be install protective grids in one section of the duct in order to avoid entrance of foreign particles in the fan.

4.5.1 Spark-proof execution according to ATEX 94/9/CE

CHECK that the spark-proof category of the fan corresponds to the hazardous zone (see 2.4.1).

Stationary and rotating parts
Stationary parts facing rotating parts (INLET CONE – SHROUD and FOREFINGER® – SHROUD) have been made of material pairings as described in paragraph 2.4.3 and observing the clearance required by ATEX standards.
The clearance values for the inlet cone/casing pairings 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: pulley, cooling fan, etc. must be kept in position or protected against displacement.

Vibrations
The completed 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 the correct installation avoiding vibrations, see 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 DIN EN 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 must be installed in a way which avoids disturbances or building up vibrations in the 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 ATEX applications.

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 and NTHZ double inlet fans with ATEX execution.

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 drive guard is critical due to the risk of contact between the rotating and fixed components. 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 sufficiently larger than that of the pulley. The clearance between the motor shaft and the edge of the passage hole of the disc must be at least 2 mm.
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.
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. Transmission and coupling guards must be manufactured with conductive material.

Electrical equipment
All electrical equipment (such as drive motors and monitoring equipment) must comply with an 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: this means that it must be provided with the same group, category, type of explosive atmosphere and maximum surface temperature as the fan. For Group II and Category 2, the certification for the machine (fan + motor assembly) must be deposited with a notified body. Check the certification of your motor with Comefri.
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.
The maximum ambient temperature of the motor is +40 °C, as indicated in paragr. 2.3.

4.5.2 Spark-proof execution according to VDMA 24169

CHECK that the spark-proof category of the fan corresponds to the hazardous zone (see 2.5).

Stationary parts facing rotating parts (INLET CONE – SHROUD and FOREFINGER® – SHROUD) have been made of material pairings as described in paragraph 2.5.

Due attention must be paid to possible axial movements of all rotating elements:
pulley, cooling fan, etc. must be kept in position or protected against displacement.

If the fan is driven through belts, they must be electrically conductive. At least three belts must be used.

Electrical equipment
The German standards VDE 0165 and VDE 0171 apply to the motor and relative control elements.

5 START-UP

5.1 Safety checks

- Disconnect and secure all fan power connections at OFF.
- Check whether all the mechanical and electrical safety devices have been installed and connected. Appropriate protective guards are available (for NPL, NPA, TE, NPE, PEAF series, when provided as impeller + inlet-cone units, due to the unknown final installation, outlet protective grids are not available and have to be manufactured by the customer) and must be expressly ordered according to the type of fan installation and standard UNI EN ISO 13857.
- 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 tension of the belts.
- Power, voltage and frequency must be checked referring to the electric motor plate of the fan.
- Inspection openings (if they exist) must be closed.
- If storing the fan for over six months, it will be necessary to remove the old grease and proceed with regreasing according to the quantities and types reported on the Technical Data Sheets.

5.2 Test run

The 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 the motor off 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. 6.4 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 is indicated on the fan plate:
maximum operating temperature, maximum shaft power, maximum rotation 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, NPA, TE, NPE, PEAF series, when supplied as impeller + 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 electric terminal board
- 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 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 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.

6.5 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.
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

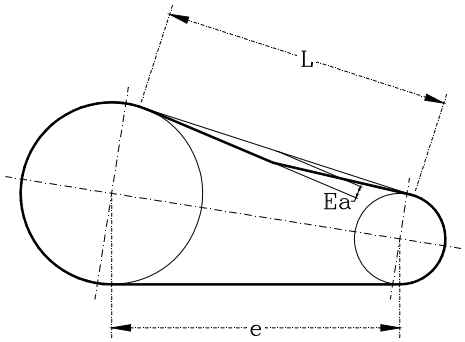
For example: profile SPZ
d_K = 100mm (diameter of smaller pulley)
e=380mm (distance between pulleys)

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.

fig.1 (Belt-Drive scheme)



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.

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.6.4.
Observe that provided 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

Like 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.
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 4.3). 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 size 560, TZAF 1250 T1, TZAF 1250 FF T1, NTHZ 1250 T1 fans, MAZ and MHZ fans, NPL, NPA, NPE and PEAF arr 11 T2 fans with free impeller, are supplied with ball bearings or rollers with split cast-iron housing. These bearings are regreasable 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 RPM. 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 but 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 cross arms:

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 cross arms from the side plates of the fan and extract them from the shaft. Replace the bearings and rubber rings. Mount new bearings on the cross arms.

3. Mount the cross-bearings on the side-plates making sure to centre the impeller on the inlet cone. Fix the cross-bearings 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 by mounting new ones on the cast-iron pillow blocks.

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.

6.6.1.3 Replacing bearings mounted on SKF single cast-iron pillow block model SNL:

1. Disassemble all accessories mounted on the shaft which can get in the way of bearing replacement. Unscrew the cover 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 bottom and upper part of the bearing housing after having cleaned the grease.

3. From both sides of the fan: 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 clarence, 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 bottom part of the block. Grease the seal ring and arrange the greased shaft/bearing group on the base support. 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 upper part of the block. Grease the whole group taking care to fill the available space one third with grease.
Placed the upper part of the block above the bottom part and tighten the bolts. Fill the bearing with proper grease.
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 the motor terminal board. Then you must disconnect the plenum fan from the unit before the motor can be replaced and disassemble it from the unit (including the anti-vibration dampers, if installed). Unbolt the motor from its support and remove the impeller from the motor shaft by removing the locking screw.

Use an extraction tool to push the impeller off the shaft (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 and check that the gap between the impeller and the inlet cone is according to the technical catalogue. Tighten the motor to its support and make sure the fan impeller does not touch the inlet cone.

6.8 Spark-proof execution

This paragraph provides additional prescriptions for centrifugal fans intended for use in potentially explosive atmospheres according to the "ATEX" Directive 94/9/EC.
They must be considered as additional prescriptions which must be observed if no other more stringent ones are defined elsewhere.
Some of them were already detailed in previous chapters. Nevertheless they are repeated here to emphasize their importance for a proper "ATEX" installation, and as a summary of the steps to be followed.

The 94/9/EC ATEX Directive prescribes the use of a logbook to record maintenance and replacement interventions.

Casing and impeller
In all applications where dust can be expected to form layers on surfaces of the fan, regular cleaning must be carried out at appropriate intervals, fixed by the operator according to individual operating conditions (see also 6.2).
After maintenance or any type of malfunctioning, check the clearance between the inlet cone and shroud (see 4.5)

The following checks must be performed:

- for checking temperatures see par. 2.4.2

- 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
When checking bearing temperature, a temporary temperature increase and subsequent decrease is normal. The correct temperature must be measured when the fan is running.

- as described in par 6.5, monitoring the noise level can be a way of assessing proper operation of the fan.

All these measurements must be recorded and compared with previous measurements. Any sudden change of the values of any of the aforementioned parameters must be regarded as a sign of danger and lead to more specific controls.

The following is a list of the main components for spark-proof safety conditions. If any of them are missing or malfunctioning, it could cause a fire hazard:
- grease in bearing
- inlet and outlet grids
- seal rings to avoid grease leakage from bearings
- Drive belts: if they are not tensioned properly, they could slip and risk increasing temperature
- Monitoring behavior of bearings to detect abnormal noise, vibrations or temperature increase in order to prevent bearing failures.

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.

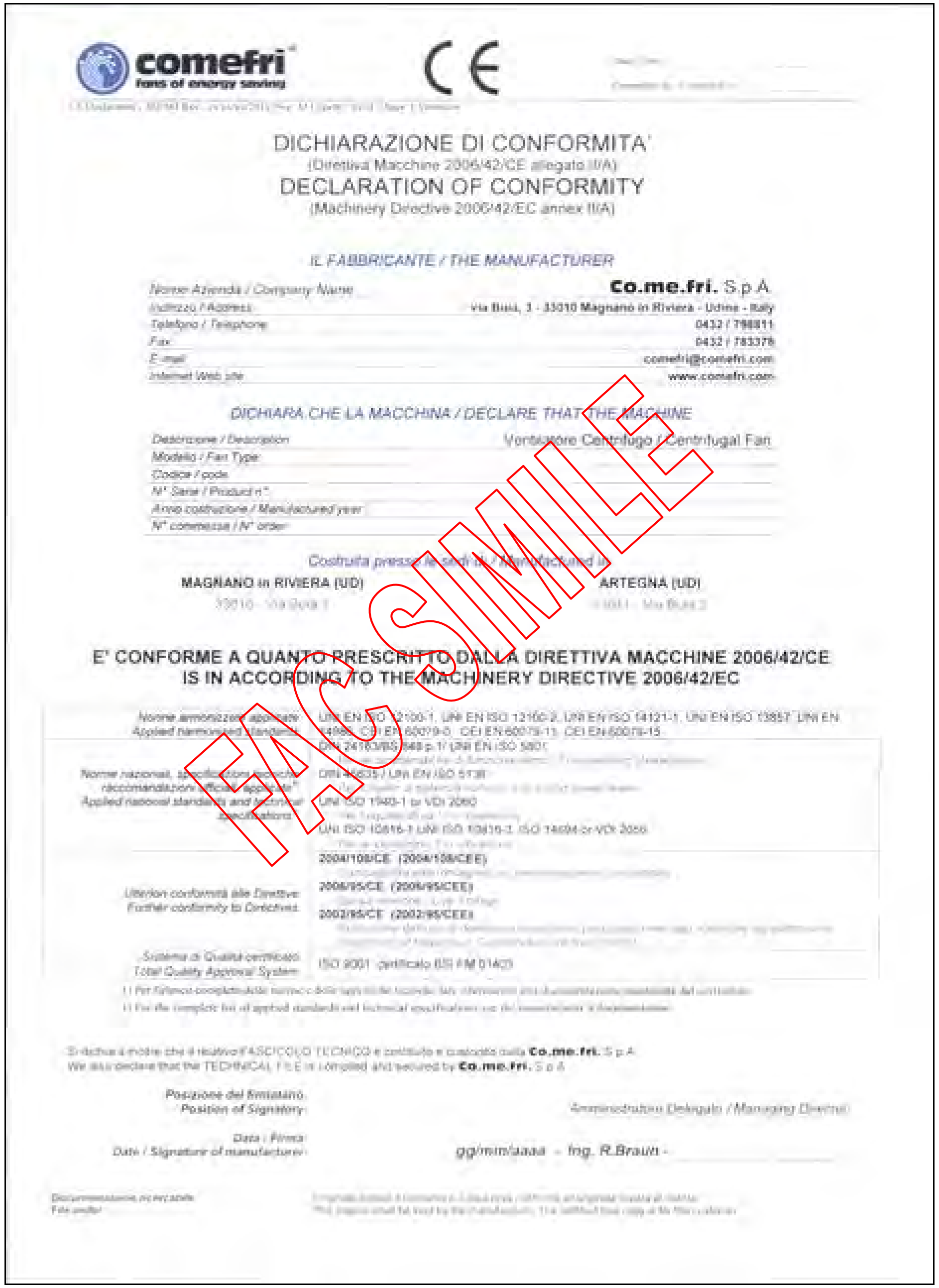
For example, "plenum" fans do not meet CE labelling requirements (i.e they have an impeller without guards). The fan must nevertheless be installed in accordance with CE requirements.

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

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

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, 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	UNI 10531, BS 848 – 1, DIN EN ISO 5801, AMCA STD 210 fig.14, DIN 25136, BS EN ISO 5136

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

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.
Indirizzo / Address	Via Bisa, 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 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	

Costruita presso le sedi di / Manufactured in
MAGNANO in RIVIERA (UD) ARTEGNA (UD)

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 12100-1, UNI EN ISO 12100-2, UNI EN ISO 14121-1, UNI EN ISO 13857, UNI EN 14986, CEI EN 60079-0, CEI EN 60079-11, CEI EN 60079-15
Norme nazionali, specifiche tecniche, raccomandazioni ufficiali applicate / Applied national standards and technical specifications	DIN 24163/BS 848 p.1/ UNI EN ISO 5801; DIN 45635 / UNI EN ISO 5136; UNI ISO 1940-1 or VDI 2060; UNI ISO 10816-1 UNI ISO 10816-3, ISO 14694 or VDI 2056
Ulteriori conformità alle Direttive / Further conformity to Directives	2004/108/CE (2004/108/CEE); 2006/95/CE (2006/95/CEE); 2002/95/CE (2002/95/CEE)
Sistema di Qualità certificato / Total Quality Approval System	ISO 9001 certificato BSI FM 01403

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 -


comefri fans of energy saving

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)	ARTEGNA (UD)

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 I / annex I)
Norme armonizzate applicate / Applied harmonised standards	UNI EN ISO 12100-1, UNI EN ISO 12100-2, UNI EN ISO 14121-1, UNI EN ISO 13857, UNI EN 14986, CEI EN 60079-0, CEI EN 60079-11, CEI EN 60079-15
Norme nazionali, specificazioni tecniche, raccomandazioni ufficiali applicate / Applied national standards and technical specifications	DIN 24163/ISO 5801 ; UNI EN ISO 5801 ; UNI EN ISO 5136 ; UNI ISO 1940-1 ; VDI 2060 ; UNI ISO 10816-1 ; UNI ISO 10816-3, ISO 14694 or VDI 2056
(Se del caso / Where appropriate) Ulteriori conformità alle Direttive / Further conformity to Directives	2004/108/CE (2004/108/CEE) ; 2006/95/CE (2006/95/CEE) ; 2002/95/CE (2002/95/CEE)
Sistema di Qualità certificato / Total Quality Approval System	ISO 9001 certificato BSI FM 01403

Si dichiara inoltre che / We also declare that:

- La relativa DOCUMENTAZIONE TECNICA PERTINENTE, in conformità all'allegato VII/B, è costituita e custodita dalla co.me.fri. S.p.A. / The TECHNICAL DOCUMENTATION, according to annex VII/B, 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 questa quasi-macchina. 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, information about these incomplete machines. The commitment is also on mode of trasmission and does not affect on intellectual property rights of the manufacturer.
- 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. / This 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 -

FAC SIMILE

9 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, 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 also report the data on the drawing related to your fan. The components of the drive units, such as pulleys, bushes, V-belts -V 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.

COMEFRI SERVICE (for spare parts / technical assistance)
Note: When requesting spare parts or information, always provide the type of model and serial number of the unit.

10 PLACING OUT OF SERVICE AND SCRAPPING

- disconnect the electric cables from the motor terminal board.
- remove the fan from the site, paying the utmost 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.

11 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:

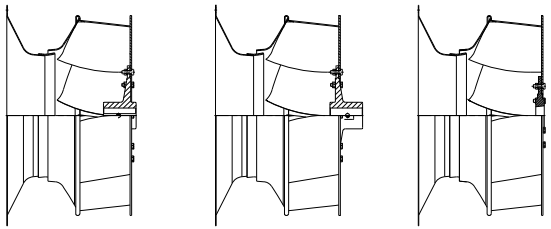
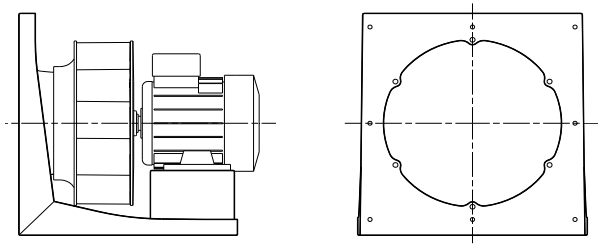
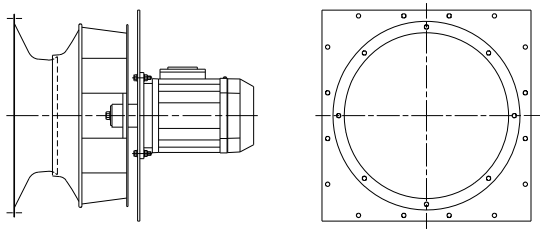
- by specialised and qualified personnel
- in compliance with the procedures indicated in this manual
- wearing and using suitable PPE during each operation

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 centrifugal fans for "plenum" (figures from reference catalogue)

AVAILABLE SETTING 	**Set** **Impeller + inlet cone**
AVAILABLE SETTING 	**Setting 4** - Dimensions: NPL 250 to 1400, NPA 315 to 1400, TE 180 to 450 - Direct drive - Impeller mounted on motor shaft - Motor mounted on a support base.
SPECIAL SETTING 	**Setting 5** - Dimensions: NPL 250 to 1400, NPA 315 to 1400, TE 180 to 450 - Direct drive - Impeller mounted on motor shaft - Motor flanged on a backplate

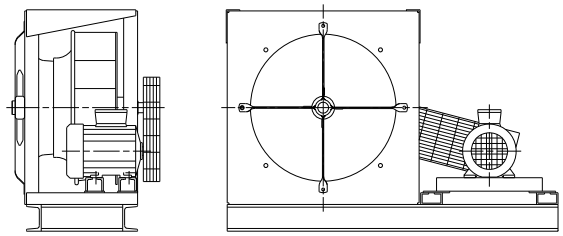
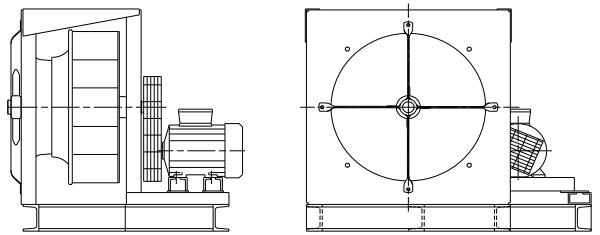
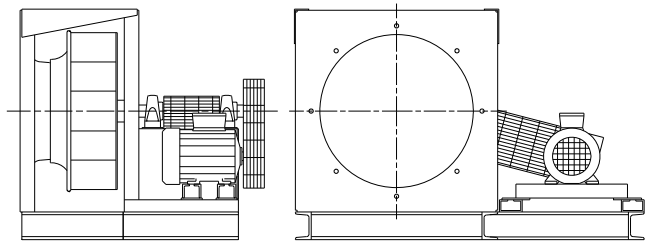
SPECIAL SETTING 	**Setting 11** - Dimensions: NPL 250 to 1400, NPA 315 to 1400 - Belt drive - Motor layout W or Z
SPECIAL SETTING 	**Setting 11S** - Dimensions: NPL 250 to 1400, NPA 315 to 1400 - Belt drive - Motor layout X or Y
SPECIAL SETTING 	**Setting 12** - Dimensions: NPL 250 to 1400, NPA 315 to 1400 - Belt drive - Motor layout W or Z

Table 1

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

Types of Bearings – Tables 2.xx

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

		INA			**SKF**		
Fan size	*Bore (mm)*	*Unit*	*Rubber ring*	*Bearing*	*Unit*	*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
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
355, 400	30	RABR-B 30/72	RABR 62/72	RAE 30 NPPB	CYS 30 FM	RIS 206 A	YET 206
450, 500	35	RABR-B 35/80	RABR 72/80	RAE 35 NPPB	CYS 35 FM	RIS 207 A	YET 207
560, 630	40	RABR-B 40/85	RABR 80/85	RAE 40 NPPB	CYS 40 FM	RIS 208 A	YET 208
710	50	RABR-B 50/100	RABR 90/100	RAE 50 NPPB	CYS 50 FM	RIS 210 A	YET 210

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

		INA			SKF		
Fan size	*Bore (mm)*	*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
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
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
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
560, 630	40	PASE 40 N	GG ASE/AK 08 N	GRAE 40 NPPB	SY 40 FM	SY 508 M	YET 208
710, 800	50	PASE 50 N	GG ASE 10 N	GRAE 50 NPPB	SY 50 FM	SY 510 M	YET 210
900, 1000	60	PASE 60 N	GG ASE 12 N	GRAE 60 NPPB	-	-	-

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**		
Fan size	*Bore (mm)*	*Unit*	*Rubber ring*	*Bearing*	*Unit*	*Rubber ring*	*Bearing*
400	35	RABR-B 35/80	RABR 72/80	RAE 35 NPPB	CYS 35 FM	RIS 207	YET 207
450, 500	40	RABR-B 40/85	RABR 80/85	RAE 40 NPPB	CYS 40 FM	RIS 208	YET 208

Table 2.5 - HLZ T

		INA			**SKF**		
Fan size	*Bore (mm)*	*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
450, 500	40	PASE 40 N	GG ASE/AK 08 N	GRAE 40 NPPB	SY 40 FM	SY 508 M	YET 208
		SKF					
Fan size	*Bore (mm)*	*Split bearing block*	*Bearing*	*Locking ring*	*Bush*	*Sealing ring*	
560, 630	50	SNL 513-611	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

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

		INA			SKF		
Fan size	*Bore (mm)*	*Unit*	*Rubber ring*	*Bearing*	*Unit*	*Rubber ring*	*Bearing*
315	25	RABR-B 25/62	RABR 52/62	RAE 25 NPPB	CYS 25 FM	RIS 205	YET 205
355, 400	30	RABR-B 30/72	RABR 62/72	RAE 30 NPPB	CYS 30 FM	RIS 206 A	YET 206
450, 500	35	RABR-B 35/80	RABR 72/80	RAE 35 NPPB	CYS 35 FM	RIS 207 A	YET 207
560, 630	40	RABR-B 40/85	RABR 80/85	RAE 40 NPPB	CYS 40 FM	RIS 208 A	YET 208
710	50	RABR-B 50/100	RABR 90/100	RAE 50 NPPB	CYS 50 FM	RIS 210 A	YET 210

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

		INA			SKF		
Fan size	*Bore (mm)*	*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
355, 400	30	PASE 30 N	GG ASE 06 N	GRAE 30 NPPB	SY 30 FM	SY 506 M	YET 206
450, 500	35	PASE 35 N	GG ASE 07 N	GRAE 35 NPPB	SY 35 FM	SY 507 M	YET 207
560, 630	40	PASE 40 N	GG ASE/AK 08 N	GRAE 40 NPPB	SY 40 FM	SY 508 M	YET 208
710, 800	50	PASE 50 N	GG ASE 10 N	GRAE 50 NPPB	SY 50 FM	SY 510 M	YET 210
900, 1000	60	PASE 60 N	GG ASE 12 N	GRAE 60 NPPB	--	--	--
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		
Fan size	*Bore (mm)*	*Unit*	*Rubber ring*	*Bearing*	*Unit*	*Rubber ring*	*Bearing*
400	35	RABR-B 35/80	RABR 72/80	RAE 35 NPPB	CYS 35 FM	RIS 207 A	YET 207
450, 500	40	RABR-B 40/85	RABR 80/85	RAE 40 NPPB	CYS 40 FM	RIS 208 A	YET 208
560, 630	50	RSAO 50	GG SAO 10	GNE 50 KRRB	--	--	--
710, 800, 900, 1000	60	RSAO 60	GG SAO 12	GNE 60 KRRB	--	--	--

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

		INA			SKF		
Fan size	*Bore (mm)*	*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
355, 400	35	PASE 35 N	GG ASE 07 N	GRAE 35 NPPB	SY 35 FM	SY 507 M	YET 207
450, 500	40	PASE 40 N	GG ASE/AK 08 N	GRAE 40 NPPB	SY 40 FM	SY 508 M	YET 208
560, 630	50				SNL 611 TG	SNL 513-611	1311 EKTN9

		SKF				
Fan size	*Bore (mm)*	*Split bearing block*	*Bearing*	*Locking ring*	*Bush*	*Sealing ring*
710, 800, 900, 1000	60	SNL 513-611	* 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

Table 2.10 - MAZ T1, MHZ T1

		INA			SKF		
Fan size	*Bore (mm)*	*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
355, 400	30	PASE 30 N	GG ASE 06 N	GRAE 30 NPPB	SY 30 FM	SY 506 M	YET 206
450, 500	35	PASE 35 N	GG ASE 07 N	GRAE 35 NPPB	SY 35 FM	SY 507 M	YET 207
560, 630	40	PASE 40 N	GG ASE/AK 08 N	GRAE 40 NPPB	SY 40 FM	SY 508 M	YET 208
710, 800	50	PASE 50 N	GG ASE 10 N	GRAE 50 NPPB	--	--	--
900, 1000	60	PASE 60 N	GG ASE 12 N	GRAE 60 NPPB	--	--	--
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		
Fan size	*Bore (mm)*	*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
355, 400	35	PASE 35 N	GG ASE 07 N	GRAE 35 NPPB	SY 35 FM	SY 507 M	YET 207
450, 500	40	PASE 40 N	GG ASE/AK 08 N	GRAE 40 NPPB	SY 40 FM	SY 508 M	YET 208
560, 630	50	RSAO 50	GG SAO 10	GNE 50 KRRB	--	--	--
710, 800, 900, 1000	60	RSAO 60	GG SAO 12	GNE 60 KRRB	--	--	--

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	SNL 510-608	1308 EK	FRB 9/90	H 308	TSN 608 L
450, 500	40	SNL 511-609	1309 EK	FRB 9.5/100	H 309	TSN 609 L
560, 630	50	SNL 511-609	* 22211 EK	FRB 9.5/100	H 311	TSN 511 L
710, 800, 900, 1000	60	SNL 513-611	* 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

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

		INA			SKF		
Fan size	*Bore (mm)*	*Unit*	*Rubber ring*	*Bearing*	*Unit*	*Rubber ring*	*Bearing*
315	25	RABR-B 25/62	RABR 52/62	RAE 25 NPPB	CYS 25 FM	RIS 205	YET 205
355, 400	30	RABR-B 30/72	RABR 62/72	RAE 30 NPPB	CYS 30 FM	RIS 206 A	YET 206
450, 500	35	RABR-B 35/80	RABR 72/80	RAE 35 NPPB	CYS 35 FM	RIS 207 A	YET 207
560, 630	40	RABR-B 40/85	RABR 80/85	RAE 40 NPPB	CYS 40 FM	RIS 208 A	YET 208
710	50	RABR-B 50/100	RABR 90/100	RAE 50 NPPB	CYS 50 FM	RIS 210 A	YET 210

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

		INA			SKF		
Fan size	*Bore (mm)*	*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
355, 400	30	PASE 30	GG ASE 06 N	GRAE 30 NPPB	SY 30 FM	SY 506 M	YET 206
450, 500	35	PASE 35	GG ASE 07 N	GRAE 35 NPPB	SY 35 FM	SY 507 M	YET 207
560, 630	40	PASE 40	GG ASE/AK 08 N	GRAE 40 NPPB	SY 40 FM	SY 508 M	YET 208
710, 800	50	PASE 50	GG ASE 10 N	GRAE 50 NPPB	SY 50 FM	SY 510 M	YET 210
900, 1000	60	PASE 60	GG ASE 12 N	GRAE 60 NPPB	--	--	--

Table 2.15 - NPA T2, PEAF T2 SETTING 11

INLET SIDE		**INA**			**SKF**		
Fan size	*Bore (mm)*	*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
355, 400	30	PASE 30	GG ASE 06 N	GRAE 30 NPPB	SY 30 FM	SY 506 M	YET 206
450, 500	35	PASE 35	GG ASE 07 N	GRAE 35 NPPB	SY 35 FM	SY 507 M	YET 207
560, 630	40	PASE 40	GG ASE/AK 08 N	GRAE 40 NPPB	SY 40 FM	SY 508 M	YET 208
710, 800	50	PASE 50	GG ASE 10 N	GRAE 50 NPPB	SY 50 FM	SY 510 M	YET 210

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	SNL 507-606	2207 EK	FRB 5.5/72	H 307	TSN 507 L
450, 500	35	SNL 508-607	* 22208 EK	FRB 8/80	H 308	TSN 508 L
560, 630	40	SNL 509	* 22209CCK	FRB 3.5/85	H 309	TSN 509 L
710, 800	50	SNL 511-609	* 22211 EK	FBR 9.5/100	H 311	TSN 511 L

* Roller bearing

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

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

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

* Roller bearing

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 arrangement 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														**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; regreasing 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; regreasing 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 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 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 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 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 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 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 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 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 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 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 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

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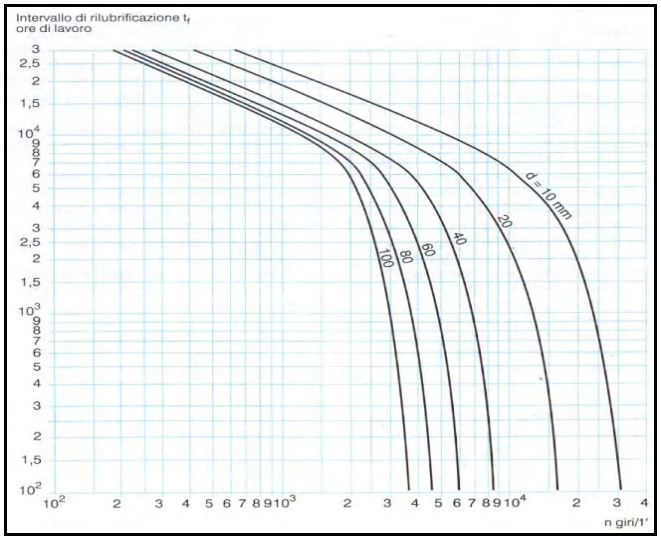
Table 17 - Suggested brands and types of grease

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

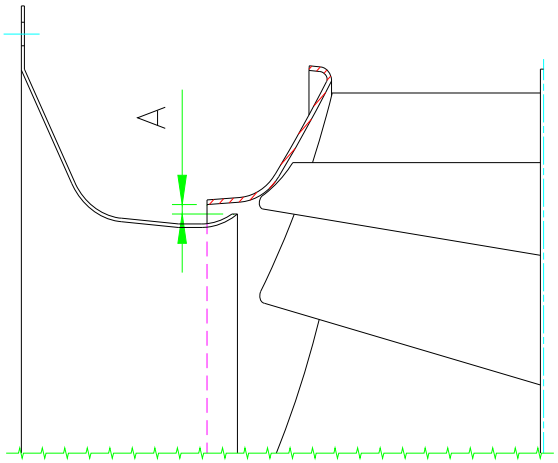
Bearing type	508	509	511	513	516	517	518
Speed [min^{-1}]	Re-lubrication intervals [hours]						
250	16700	15800	14500	13000	13000	12500	12000
500	8100	7600	6900	5500	5250	5150	5000
750	5200	4900	4400	4000	3750	3650	3500
1000	3800	3500	3200	3250	3000	2750	2500
1250	2900	2700	2400	2000	1900	1800	1700
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**

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
NHLZ 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



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

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.

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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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For further information and clarifications concerning the above contents, contact Comefri S.p.A., Air Conditioning Fans Division, Magnano in Riviera (UD).

SUMMARY