comefri

Air Conditioning Division

OPERATING AND MAINTENANCE INSTRUCTIONS RADIAL FANS TZAF FF – VTZ – NTHZ - THLZ FF – TLZ – TLI – TZAF - THLZ - HLZ - TLE – THLE AND CENTRIFUGAL WHEELS FOR PLUG FANS NPE – PEAF - TE

(THIS HANDBOOK INCLUDES ALSO THE FAN ARRANGEMENT ACCORDING TO ANTISPARK "ATEX" STANDARD 94/9/CE)

1.0 FOREWORD

All Comefri Fans are manufactured according to our Quality Assurance System, in accordance with BS EN ISO 9001:2000; since 1987 our Quality System is certified by BSI (certificate no. 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 98/37/CE.

The Operating Instructions

- describe the applications for the fans, according to the national Standards, Regulations and Directives, which must be closely observed to avoid possible damages caused by uncorrect installation or mishandling;
- contain notes for health and safe;
- warn for danger which can even happen with correct applications;
- must be read and observed by all personell engaged on works involving fans. These advices aren't the only procedure for safely: each operation made on moving and/or electric part as installation and maintenance, requires particular caution guaranteed only by competent staff, familiar with the safety regulations. Further to observance of these instructions, conformity to local laws must be assured.

The warranty is valid for one year from the delivery date unless otherwise agreed prior to placing the order. The warranty is only applicable to manufacturing defects, which must immediatly be notified to the manufacturer. A precondition of the warranty is the observance of the operating instructions.
Failures which can be traced back to improper Installation Procedures, to the use of damaged fans or unauthorised alterations to the fan, such as repairs are not coverd by Comefri warrant and resultant damages and costs are not Comefri responsibility.

2.0 TECHNICAL DESCRIPTION

2.1.1 Fan description

The Comefri fan series TZAF FF, VTZ, NTHZ, THLZ FF, TLZ, TLI, TZAF, THLZ, HLZ, TLE, THLE are centrifugal fans, where the air flows axially into the wheel and it is discharged radially in a volute. The performances allow medium or low air deliveries and medium or high pressures. See technical sheet for each fan performance. The wheel of our centrifugal fans can be fitted with forward-curved blades, backward-curved blades or airfoil backward-curved blades.
The characteristics are specified on technical catalogue, that must be consulted to identify the suitability of the fan for the fluid treated by the system.
Comefri's centrifugal fans, double or single inlet type, can be completed with a wide range of accessories, according to application and installation requirements. The range of accessories is completed also of protection fittings, in conformity with UNI EN 294, available on request. We decline all responsibility for any damage on persons or things caused by the absence of safety devices.
Particular attention must be paid in case of direct contact with rotating parts. If this is the case, kindly ask for specific protection measures.

2.1.2 Centrifugal wheels for plug fans description

The Comefri series NPE, TE are backward-curved bladed wheels, the Comefri serie PEAF is airfoil backward-curved bladed wheel. The performances allow medium or low air deliveries and medium or high pressures. See technical sheet for each fan performance.
The characteristics are specified on technical catalogue, that must be consulted to identify the suitability of the impeller fan for the fluid treated by the system.
Comefri wheels for plug fans can be provided as set wheel + inlet-cone or as the arrangements sketched in the Appendix.
Comefri wheel series can be completed with a wide range of accessories, according to application and installation requirements. The range of accessories is completed also with protection fittings for the inlet-cone or for the arrangements 4, 5S, 11, in conformity with UNI EN 294, available on request. We decline all responsibility for any damage on persons or things caused by the absence of safety devices.
Particular attention must be paid in case of direct contact with rotating parts. If this is the case, kindly ask for specific protection measures.

2.2 Technical data

The technical data and the permissible limits have to be clearly listed on fan plate (see also 2.4.5). They can be taken from the appropriate technical catalogue. It's absolutely not allowed 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 this conditions, due to the presence of inlet obstructions (like pulley, etc) could generate instability and vibrations. (if anti-spark execution see 4.5)
For particular executions not foreseen in the catalogues, kindly contact *Comefri*

2.3 Application

The fans are intended to move dust-free air or lightly dusty air. They are not suitable for aggressive gases, vapours or dusty air. The improper use may cause damages to bearings, corrosion, unbalancing of the impeller and vibrations.
Permissible operating temperature range for all fan and free wheels is - 20 °C to + 60 °C.
For temperatures outside of this range, kindly contact Comefri in order to define the appropriate execution.
The max. ambient temperature of the standard drive motor is + 40 °C.

2.4 Fans with spark-proof execution according to DIRECTIVE 94/9/CE ATEX

The special TZAF FF Atex, VTZ Atex, NTHZ Atex, THLZ FF Atex, TLZ Atex, TLI Atex, TZAF Atex, THLZ Atex, HLZ Atex, TLE Atex, THLE Atex executions are available for spark-proof application in accord with directive ATEX 94/9/CE Group II, Category 3G. The NPE, PEAF series in ATEX execution on request (for the sake of shortness in the following these two series are not quoted in the ATEX reference).
THLZ FF and TE fan serie with standard polyamid impeller can NOT be in Atex execution; they can be in Atex execution ONLY with special steel impeller (see par. 2.4.3)
Only TZAF fan serie is ATEX certified to be used in Group II, Category 2G

2.4.1 Application

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. From July 1, 2003 it is necessary for fans intendet for use in potentially explosive atmosphere placed on the market or put into use, to comply with the ATEX Directive 94/9/CE.
The ATEX Directive identifies two groups of fan equipment.
Group I fan equipment is intended for use in mining applications. (Out of Comefri production)
Group II is intended for all other situations.
Fans in Group II are divided into three categories, depending if explosion-proof safety has to be assured only under normal operation (category 3) or also by occuring of disturbances or equipement faults (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 requisite level of protection, even in the event of frequenlly 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 are 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 atmosphere. The areas are classified in Zones: 0, 20, 1, 21, 2, 22.
Codes without prefix "2" refer to atmosphere containing gas, vapour, mist; codes with prefix "2" refer to atmosphere containing besides gas, vapour, mist also dust.
The subscripts 0, 1 and 2 describe the probability of a flammable material being released to atmosphere 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 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 fan series TZAF FF Atex, VTZ Atex, NTHZ Atex, THLZ FF Atex, TLZ Atex, TLI Atex, TZAF Atex, THLZ Atex, HLZ Atex, TLE Atex, THLE Atex are intended to move dust-free air or lightly dusty air.

Zone	*Explosive atmosphere*	*Dangerous concentration*	*Potential spark source must be avoided*
0 **	Gas, vapor, mist (G)	Constant, or for long time	even where few shutdowns are expected
20 **	Dust (D)	Constant, or for long time	even where few shutdowns are expected
1	Gas, vapor, mist (G)	Likely to occur	more frequent shutdowns are expected
21 **	Dust (D)	Likely to occur	more frequent shutdowns are expected
2	Gas, vapor, 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, TLZ Atex, TLI Atex, TZAF Atex, THLZ Atex, HLZ Atex, TLE Atex, THLE Atex application

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

Fan category	is designed for zone	is also applicable in zone
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 fan serie
***** Fan for dust are out of TZAF FF Atex, VTZ Atex, NTHZ Atex, THLZ FF Atex, TLZ Atex, TLI Atex, TZAF Atex, THLZ Atex, HLZ Atex, TLE Atex, THLE Atex application

Application of Comefri fans TZAF FF Atex, VTZ Atex, NTHZ Atex, THLZ FF Atex, TLZ Atex, TLI Atex, TZAF Atex, THLZ Atex, HLZ Atex, TLE Atex, THLE Atex in anti-spark execution is for atmosphere with maximum 21 vol. % oxygen content, absolute pressures from 0,8 bar to 1,1 bar and gas explosion groups II A.

Correspondence of the fan category to the outside / inside hazardous zone
The explosion risk occures either due to the conveyed explosive gas or due to the presence of explosive gas in the areas where the fan is collocated. So that both the outside and the inside of the fan has to be considered.
Fans TZAF FF Atex, VTZ Atex, NTHZ Atex, THLZ FF Atex, TLZ Atex, TLI Atex, TZAF Atex, THLZ Atex, HLZ Atex, TLE Atex, THLE Atex can be installed according to ISO 5801 in mode A (without inlet and outlet duct) or B (without inlet duct and with outlet duct), therefore they have the same explosive atmosphere and require the same equipement category inside and outside.
Fans TLE Atex, THLE Atex must have the same requirements as above when installed in mode A and B. In installation mode C (with inlet duct and without outlet duct) for these fans the same requirement is needed as for mode A and B. Fans TLE Atex and THLE Atex can be installed also in mode D (with inlet duct and with outlet duct). 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: provided the fan is placed in free field or in a well ventilated room and considering that the leak proof execution is not absolutely gas tight, than between the highest category and the lowest category inside and outside is considered to be never more than one category step.
This means that for instance an internal hazard 2 G will automatically require that the outside of the fan is considered a category 3 G hazard.

		Category inside the fan enclosure		
		Non explosive atmosphere	Category 3 gas	Category 2 gas
Category outside the fan enclosure	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 that for instance an internal hazard 2 G will require that also the outside of the fan is considered a category 2 G hazard.

2.4.2 Temperature

The user has to chose the appropriate temperature class for the fan, 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 with inlet medium temperature up to 60 °C (as indicated in 2.3).
Generally 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 dust air, the ignition hazard 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.
PLS NOTE: the maximum temperature indicated on fan plate refers to operating conditions without dust.
It is task of the user to evaluate the relation between the maximum surface temperature and the minimum ignition temperature of the dust, according to the operation conditions.

For dust problems see also standard EN 1127-1 where there are indications about protective measures to be used.

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 class temperature for double inlet fan series (TZAF FF Atex, VTZ Atex, NTHZ Atex, THLZ FF Atex, TLZ Atex, TLI Atex, TZAF Atex, THLZ Atex, HLZ Atex, TLE Atex, THLE Atex) is T4.
The class temperature for single inlet fan series (TLE Atex, THLE Atex) is T3.

This differentiation is mainly due to the bearing, which is the most critical element concerning the heating.

2.4.3 Means of spark-protection 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 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 not necessary to be carried out.

-- Casing
When the fan is driven by a motor of more than 11 kW, then the casing is continuously welded.
The fan is equipped with a inspection door; it is held in position by bolts and sealed.
The fan shaft must be installed in horizontal position.

-- Impellers
Comefri TZAF FF Atex, VTZ Atex, NTHZ Atex, THLZ FF Atex, TLZ Atex, TLI Atex, TZAF Atex, THLZ Atex, HLZ Atex, TLE Atex, THLE Atex impellers are of rigid design.
For Atex execution the impeller of THLZ and THLZ FF from 180 to 450 and of TE serie must be manufactured specially in steel, NOT in glass reinforced polyamid as in the standard execution.

-- Materials for rotating and stationary parts of fans
In view of misuse, which can be reasonably expected only due to rare or even very rare malfunction, 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 minimised as prEN 14986 4.8.2.
The material pairings choosen 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	Carbon or 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

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 thermite sparks.

-- Vibration
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 fan series TZAF FF Atex, VTZ Atex, NTHZ Atex, THLZ FF Atex, TLZ Atex, TLI Atex, TZAF Atex, THLZ Atex, HLZ Atex, TLE Atex, THLE Atex object of this handbook are intended to move dust-free air or lightly dust air, as said before. Many types of dust, mist and droplets may be in suspension in the air stream. 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.
The fan series TZAF FF Atex, VTZ Atex, NTHZ Atex, THLZ FF Atex, TLZ Atex, TLI Atex, TZAF Atex, THLZ Atex, HLZ Atex, TLE Atex, THLE Atex for anti-spark execution are provided with inspection door, so that inspection and cleaning operations can be easily carried out.

-- Clearance between rotating elements and the fan casing
The clearance between rotating elements and the fan casing is the most important safety feature of ignition minimising 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 seagers on the shaft for single and double inlet fans; the use of the seegers at the fan shaft restricts the maximal permissible rotation velocity, indicated in the fan plate. For single inlet fan direct coupled to the motor positive locking 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 of construction of Comefri fans are therefore corrosion protected by paint or zinc-coating.
The possibility on the fan being exposed to other corrosive chemical constituents of the gas shall be identified by the user and communicated to the Comefri in order to get the approval or indication for special arrangement 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, 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 since 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 ingress of foreign particles to grade IP20 of EN 60529.

The inlet and outlet guards have to be installed; they can be provided by the installer / user or required to Comefri.

FURTHER CRITERIA FOR CATEGORY 2 – Gas
The fan serie TZAF Atex is the only one among the fan series in the present catalogue that is certified to be used in CATEGORY 2 Atex fan. All caratteristics explained for category 3 are valid also for category 2 with the further ATEX requirements detailed below.

-- Bearings
The L_{10} life shall be not less than 40 000 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 seagers on the shaft for single and double inlet fans; for single inlet fan direct coupled to the motor positive locking with tapped shaft. The use of the seegers at 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

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.

-- Casings
Casing is continuously welded.
The standard prEN 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 serie, object of the CATEGORY 2G certification.

2.4.4 Explosion Risks

Follows the list of explosion risks which Comefri has evaluated for the fan series object of this handbook. The subdivision in “normal operation” and “ expected malfunction” is due to the different fan category 3 and 2: for category 3 they are considered only the ignition risks which can happen during the normal operation, for category 2 also malfunctions must be considered and consequently the ignition protection.

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

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 pressurised 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

* The most of the ignition protections for the fan serires TZAF FF Atex, VTZ Atex, NTHZ Atex, THLZ FF Atex, TLZ Atex, TLI Atex, TZAF Atex, THLZ Atex, HLZ Atex, TLE Atex, THLE Atex are of type “c”.

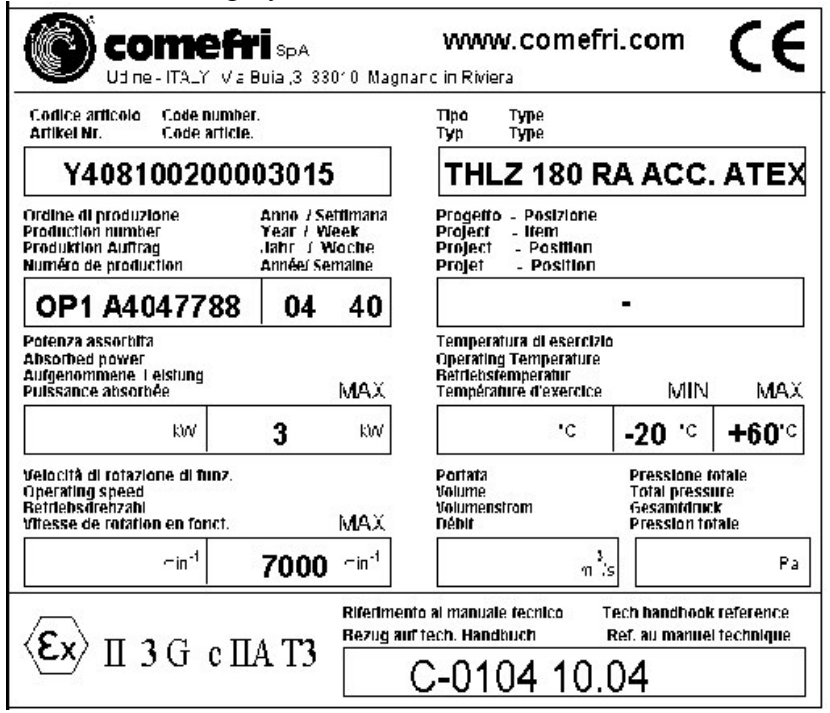
Follows the Ignition hazard assessment report

Potential ignition source		Measures applied to prevent the source becoming effective	Ignition protection used
Normal operation	Expected malfunction		
Selection of unsuitable fan		Compare local process requirements with fan sign plate	prEN 14986 7.3; Operating and maintenance manual par.2.2, 5.3
Transportation damage		Manufacturers instructions for transport	prEN 14986 7.2; Operating and maintenance mnanual par.3.0
Storage damage		Manufacturers instructions for storage	prEN 14986 7.2; Operating and maintenance manual par.3.0
General environmental influences		Manufacturers instructions concerning: environmental temperature, humidity, environmental corrosivity	EN 13463-1; Operating and maintenance manual and costructional safety 'c' (paintings and zinc-coating)
Excessive medium temperature		Inlet temperature and heating limitation of the gas handled, check the field of application	prEN 14986 1; Operating and maintenance manual par.2.3
	Contact between static and moving components caused by housing deformation	Rigid housing design, separation of ductwork by elastic joints, correct belt tensioning	prEN 14986 4.6; costructional safety 'c'; Operating and maintenance manual par.4.2, 4.5.1, 6.4
	Contact between rotating and static components caused by thermal deformation	Temperature limits of operation	prEN 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	prEN 14986 4.7; costructional safety 'c'; Operating and maintenance Manual par.2.4.3
	Contact between static and moving components caused by loosening impellers	Locking of the hub on the shaft	prEN 14986 4.21, 5.3; costructional 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	prEN 14986 4.15, 4.8.2; costructional safety 'c'; Operating and maintenance Manual par.2.4.3
	Contact between static and moving components due to shafts gliding in bearings	Bearing locking on the shaft	Bearing manufacturer handbooh; Operating and maintenance Manual par.6.6
	Radial displacement of bearing respect the inlet cone centerline	Tighting torques; elastic pin in bearings with pillow block	Costructional 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 substitution (Safe operational life depending on fan category, see 2.4.2)	prEN 14986 4.17, 5.2; Operating and maintenance Manual
	Mechanical faults and fatigue	Vibration control in order to avoid abnormal conditions	EN 13463-1, prEN 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	prEN 14986; costructional 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 flied, manufacturers instruction concerning inspection, cleaning	prEN 14986 4.4.2; costructional 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 table indication	prEN 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 trasmission guard	Manufacturing trasmission guard from material pairings permitted	EN 13463-5, prEN 14986 4.8; costructional safety 'c'; Operating and maintenance Manual par.4.5.1
Contact with foreign particles which can cause sparks or damage to the protection device		Protection against foreign particles	prEN 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 istruction of electric equipment	See reference manuals of electric devices

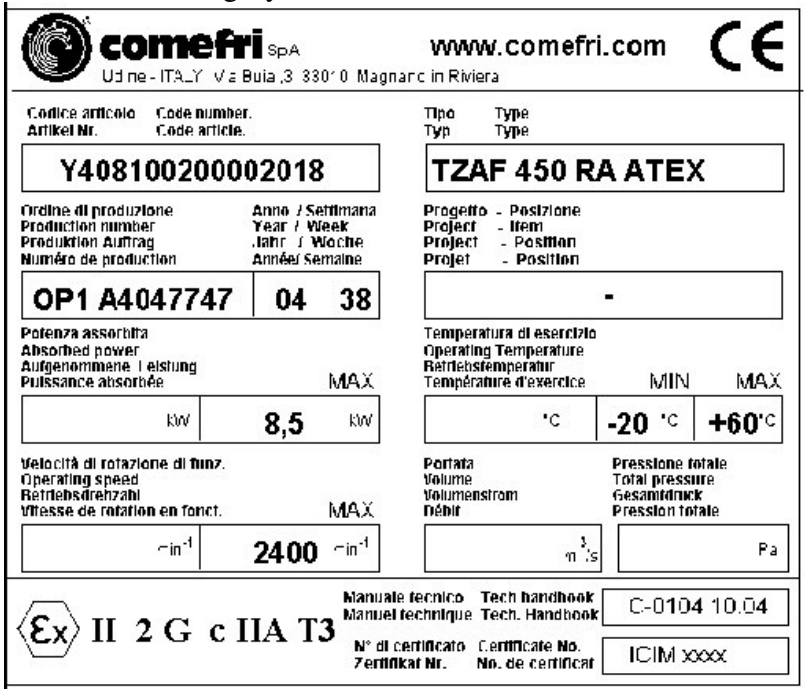
2.4.5 Caption of fan plate for anti-spark execution

GROUP II, Category 3



Code nummer: code of the fan type
Type: fan description
Production number + year + week: serial number
Project – Item: customer project reference
Absorbed power: operating shaft power
Absorbed power MAX: 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 [round per minute]
Operating speed MAX: maximum permissible operating fan speed [round per minute]
Volume: operating airflow
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 adopted, IIA is fluid type class, T3 the temperature class
Tech. handbook reference: code and version of the "OPERATING AND MAINTENANCE INSTRUCTIONS" handbook. This handbook code is input in software "Galileo" where the version in force can be checked in form "Anagrafica Articoli" in the field "Disegno"

GROUP II, Category 2



This fan plate has the same fields as the fan plate of category 3 (for explanation see above), in addition there is the further field:
Certificate No.: is the deposit number of technical documentation by accreditation institute – required for Group II, Category 2

2.5 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

IEC 79-10 International Standard, , defines three zones of danger, according to the frequency and period of time that a dangerous concentration of an explosive mixture can occurr.

Zone	*Dangerous concentration*	*Potential spark source must be avoided*
0	Constant, or for 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 againts static parts of the fan;

All Comefri fans are suitable for operating in **Zone 2**. German Standard VDE 0165 and VDE 0171 applies for the motor and their 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 following material-coupling 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 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 ingestion of foreign elements inside the fan, protections according to the safety regulations should be provided.

Fan operation is not allowed in Zone 0.

3.0 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-complying fans. Furthermore it is necessary to verify that is has not been damaged during the transport, especially onto the rotating and the electric parts. In case of damage, they must be immediately noticed out 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 take any responsability for the transport and the handling of the fan at the customer's premises.

3.2 Handling

The handling of the fan requires adequate care and lifting tools as foreseen by 98/37/CE rule and subsequent 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 eyes, bearing supports and inlet or outlet flanges.
Fixing points of the fans are the baseframe, housing frames or lifting eyes, if available.
Never stack fans that have been removed from their carton on top of one another.
Note that any improper handling, even though not damaging the fan, often produces the necessity to re-balance the impeller.
Particular care must be taken in handling fans provided either of special paintings or special protective coatings and treatments for which a slight damage not detected will always consist of the absence of protection above the metal surface and therefore it might be cause of very serious failures during the operation. Whatever damage at the protective coatings caused during the transport is not covered by Comefri guarantee.

3.3 Storage

Adequate storage must be provided to protect the fans from dirt and moisture. Corrosive atmosphere is to 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, specially in hot and umid environments. Permissible storage temperature range is -20 °C and +45 °C.
With a storage time longer than 6 months, release the tension of the belts and rotate manually the shaft from time to time in order to allow a better distribution of the grease inside the bearings. Keep the fan far from machinery producing vibrations, as the bearings could be stressed in the same way.

4.0 INSTALLATION

Installation has only to be carried out by trained personnel in observance of these Operating Instructions.

4.1 Checks prior to installation

- Check the maximum performance data (see 2.2) and rotation direction indicated on the fan plate, comparing these with the impeller rotation and rotating field of the motor, especially in presence of an anti-rotation device.

- Check that all the bolts are properly tightened. Tightening torques for bearings shall be according to manufacturer catalogue; the tightening torques for all the bolts on the fan shall be according to the prescriptions of the technical handbooks.

- Check the integrity of the fan painting and of all the sealed parts. In case of necessity take the corrective action (i.e. retouch of painting before go ahead with other preparation phases).

- Rotate manually the impeller and verify that it does not touch the inlet cone or the Forefinger device. Verify also that, during this operation, the bearings don't show any sign of irregular friction.

TLZ, TLI, TLE fans have the impeller with forward-curved blades, for these types of fans make sure that it has been connected to ducting that conforms to the design pressure drop so that the motor will not be overloaded.
THLZ, HLZ, THLE, VTZ, NTHZ fans have the impeller with backward-curved blades; TZAF, TZAF FF 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 Installing / fixing

By choosing the fan you must consider the type of installation. Particular attention must be paid to fans which have to be installed in atmosphere with humidity and critical temperatures.
The fans must be firmly fixed on a foundation or steel baseframes. The fixing must be made avoiding any stress or deformation at the supporting structure. When using foundation and fixing bolts, use spacers to ensure the perfect contact between the fan and its basement. Otherwise it might occur that misalignments and bending moments will induce anomalous vibrations during the fan operation. A reinforced concrete foundation is considered optimal for mounting fans. In case of installation above steel structures or racks the design must take in consideration both the weight of the fans and the dynamic forces due to the electric motor/wheel rotation and it is absolutely necessary that these structures have the minimum resonance frequency higher than 50% of fan rotation frequency. In case of installation on concrete foundation its weight should be four times the rotating group one added of the electric motor (almost two times the weight of the complete fan group).
No forces or vibrations must be transferred at the supporting structure. To this purpose use adequate antivibration dampers and flexible connections for ducting.
An uncorrect fixing of the fan may affect the fan operation and generate dangerous situations.

Safety devices which have been removed from the machine must be re-installed before the electrical connections are made.

The standard Comefri fans are suitable to work with horizontal placed shaft; if the fan has to be used with vertical shaft, it is necessary to specify it at the order and ask the specific special version (for spark-proof execution only horizontal shaft is allowed)

For NPE, PEAF, TE wheel series, when provided as set wheel + inlet-cone or in arrangement 5 check the correct overlapping inlet-cone and wheel according to the reference catalogue.

4.3 Belt drive and belt drive guard

Minimal pulley diameter. The theoretical life L_{10} can be guaranteed only if the diameter of the pulley respects a minimal value, i.e. if the permissible bearing loads are not exceeded.
The belt selection should be done by using our fan-selection program *Aeolus*. If not, do refer to the technical catalogues of the manufactures of pulley / transmission.
Ensure that the motor pulley and the fan drive pulley are accurately aligned. Fit and tension the belt in accordance with instructions (see. 6.4)
If the fan is in spark-proof execution see par. 4.5 regarding belt drive and drive guard

4.4 Electrical wiring

The connection of the motor terminal box must be made in accordance with the information given by the motor manufacturer. Motors with a nominal rating of 4kW can generally be direct started while motors with a nominal rating > 4kW are usually star-delta of soft started.

The motor must be protected against overloading and particular care is required when using motors with explosion protection or provided with thermistors. Damages due to insufficient motor protection invalides the manufacturer's guarantee.

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

The fan is of rigid design and this reduces the risk of deformation resulting from accidental impacts to cause the impeller or revolving parts to come into contact with the casing. Nevertheless depending on operating condition, care is necessary to avoid accidental impacts expecially on the weakest parts as the scroll plate. If necessary protection devices have to be arranged.
A potential explosion risk can come from accidental contact between stationary and revolving parts facing at a close distance:

INLET CONE and SHROUD
FOREFINGER and SHROUD

The fan can be installed only with horizontal shaft.

Fan is protected with inlet and/or outlet guards according to IP20 of EN60529 against ingress of foreign particles. If the installer take these protections off for installing inlet / outlet duct, then he has to set protection guards in a duct section in order to avoid ingress of foreign particles toward the fan.

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

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

Stationary and revolving parts
Stationary parts facing revolving parts (INLET CONE – SHROUD and FOREFINGER – SHROUD) have been made of material pairing as stated in par. 2.4.3 and observing the clearance required by ATEX standards.
The clearance values for item couples inlet-cone / shroud are given in appendix.
The clearance are to be checked before commisioning, after belt tensioning.
Due attention shall be paid to possible axial movement of all rotating elements: pulley, cooling disks etc shall be maintained in position, or protected against displacement.

Vibrations
The completed fan shall meet the vibration levels recommended in ISO 10816 and ISO 14694 as appropriate for its size and application. Vibration velocities shall preferably be measured at the bearing caps.
For the correct installation avoiding vibrations, see 4.2. Furthermore the following has to 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 this conditions, due to the presence of inlet obstructions (like pulley, etc) could generate instability and vibrations. Comefri recommends to not use the fan in this operation zone, but it must NOT be used in these operating zone when the anti-spark execution is required.
The standards such as ISO 5801 and ISO 5802 prescribe the type of inlet and outlet ducting connections, which ensure a uniform velocity profile at the fan inlet and consequently a low degree of vibration. The installation of the fan must be done in such a way that avoids perturbations or building up of vibrations at the fan itself. As examples of bad installations: sharp bends in the ducting in the proximity of the inlet and outlet opening, unit walls too much near to the fan sideplates, obstruction as drive guard uncorrect. These installation errors must be absolutely avoided in ATEX application.
Casing
For single inlet fans in category 2, the inspection door is sealed; it is task of the installer to seal the inlet, outlet and all other joints with a suitable sealing material or provided with gaskets.
It is out of application then for TZAF Atex double inlet fan serie.

Power drive
If the fan is driven through belts, they must be electrically conductive, in order to be incapable of devoloping an incendive electrostatic discharge during operation according to ISO 1813. The drive guard must be of electrically conducting material so that, due to the electrical earthing (as in the following paragraph), every part (guard, pulley, belts) are electrically equipotential.
The transmission guard is critical due to the risk of contact between the rotating and the fixed components and for this reason a disc of material according to the standard prEN 14986 4.8.2 is to be installed in the internal side of the guard in front of the pulleys with an outer diameter sufficient greater than the pulley diameter; the clearance between the motor and fan shafts and the interior hole of the disc must be at least 2 mm.
The material used in the construction of the belts shall not readily support combustion when a naked flame is applied to it. The material used to meet this requirement shall be tested according to the method described in ISO 1210 and the test piece shall neither be completely burnt during the duration of the test, nor shall it continue to burn for a period exceeding 15s after removal of the test flame.
The pulleys shall also be balanced according to ISO 10816 and ISO 14694 as appropriate for its size

Earthing conducting parts
Comefri assures that all parts of the fan are electrically equipotential; the earthing of the fan is duty of the installer. Trasmission and coupling guards are to be manufactured with conductive material.

Electrical equipment
All electrical equipment, (i.e. drive motors and any monitoring equipment) shall comply with an ignition protection “ATEX” category that is appropriate for the fan it is driving/monitoring.
The motor shall comply with “ATEX” standards and its “ATEX” field of application shall agree with the field of application of the fan: this means that it must be provided for the same Group, Cartegory, type of explosive atmosphere and maximum surface temperature class as the fan.
For Group II and Category 2, the certification for the machine (assembly of fan + motor) must be deposited by a notified body. Check with Comefri about the certification of your motor.
Electrical installation on the fan shall comply with the relevant requirements of EN 60079-14 and EN 50281-1-2.
The motor shall be positioned to ensure that adequate cooling air is available and that ventilation openings cannot be blocked. Overheat protection shall preferably be fitted.
The max. ambient temperature of the motor is +40 °C, as stated in par. 2.3.

4.5.2 Spark-proof execution according VDMA 24169

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

Stationary parts facing revolving parts (INLET CONE – SHROUD and FOREFINGER – SHROUD) have been made of material pairing as stated in par. 2.5.

Due attention shall be paid to possible axial movement of all rotating elements: pulley, cooling disks etc shall be maintained 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
German Standard VDE 0165 and VDE 0171 applies for the motor and their control elements.

5.0 START-UP

5.1 Safety checks

- Disconnect and secure at the "Off" position all electrical power to the fan.
- Check whether all mechanical and electrical safety devices have been fitted and connected. The appropriate protection grids are available (for NPE, PEAF, TE series, when provided as set wheel + inlet-cone, due to the unknown final installation, outlet protection grids are not available and have to be manufactured by the customer) and must be expressly ordered according to the type of installation of the fan and the DIN EN 294.
- Check the ducts and the fan for foreign bodies (tools, small components,etc.)
- Rotate the impeller by hand and assure no parts are rubbing
- Check the alignment and parallelism of the pulleys and the V-belt tension
- Power setting, voltage and frequency for the main connections must be checked against the fan or motor type plate
- Inspection openings (if they exist) must be closed
- In case of a storage period over six months it will be necessary to clean the old grease and proceed with a regreasing operation according to the quantities and types as reported on the Technical Data Sheets

5.2 Test run

The fan should be switched on briefly to check the direction of rotation of the impeller, which should correspond to the one indicated by the arrow. Should the motor run in the wrong direction, interchange any two of the three electrical leads. Single phase motors can be reversed by chanching internal connections, as described on the motor label or wiring diagram. Always observe the electrical safety instructions.

5.3 Checking the current consumption

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

5.4 Check for smooth running

Check fan smooth running. There should be no unusual oscillation or vibration.
Check for unusual bearings noise.

5.5 Check the 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 again the V-belt tension.

6.0 MAINTENANCE

Operational performance data are indicatated on the fan plate:
max operation temperature, max shaft power, max rotational velocity,
and, if required, operating data for the specific application, - operating speed, volume, total pressure, operating temperature, absorbed power.
For NPE, PEAF, TE wheel series, when provided as set wheel + inlet-cone do not exceed the max revolution speed indicated in the reference catalogue.

6.1 Safety notes

Before doing any maintenance operation on the fan it's imperative to ensure that:
- the drive motor is disconnected from all electric terminals
- the impeller has come to rest
- the surface temperature has been checked to prevent burning
- the impossibility of an uncontrolled running of the fan during the maintenance works
- no debris of damage or dangerous materials are inside the fan.

Only limited works may be carried out while in the operating condition and in observance of the safety and accident prevention regulations (for ex. measurement of vibration).

The non-observance of these points endangers life for the maintenance personnel.

6.2 Fan housing and impeller

Also for lightly dust media, wear and dirt can be expected inside the housing and on the impeller (corrosion, abrasions, sticked materials), which can cause vibrations. Regular inspection and cleaning must take place. The intervals between them is to be fixed by the operator on accordance with individual operating conditions.
No high pressure cleaners (steam rod cleaners) are to be used.

Accessories
Flexible connections between fan and plant parts are to be checked at regular intervals.

Unsealed connection leads to breakdowns and danger from escaping transported medium and must be replaced

6.3 Chech of the rotating parts

Check periodically the alignment of the wheel against the shaft and the conditions of the fixing bolts. Check the tightening of all the bolts over the whole fan. Tightening torques shall be according to bearing manufacturer catalogue. The same rules shall be followed for all the bolts on the fan according to the prescriptions of the technical handbooks.

6.4 Belt drive

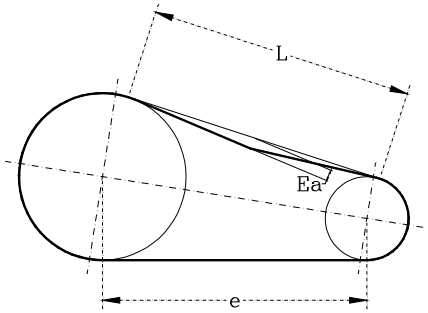
It's recommended, depending on the installation site and type of fan-operation, to check regularly the belt tension and the alignment of the V-belts.
This is conpulsory in ATEX anti-spark applications according to prEN 14986.
Operate only by mean of the motor rails.
The test force must be calculated in accordance with the *formula* (1) and the values mentionned on the table 1 in Appendix:

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

where:
e = distance between shaft centres
E = test force for distance between shaft centres of 100mm
Ea = test force

For example:.	profile SPZ
	dκ = 100mm (diameter of smaller pulley)
	e=380mm (distance between pulleys)
from the table	f=25 N E=2,05mm
	Ea ≅ (2.05 * 380) / ≅ 7.7mm

The belt selection should be done by using our fan-selection program *Aeolus*. If not, do refer to the technical catalogues.



6.4.1 Minimal pulley diameters

The theoretical life L_{10} can be guaranteed only if the diametre of the pulley respects a minimal value, i.e. if the permissible bearing loads are not exceeded. Always replace damaged / worn pulleys with new one of the same diameter.

6.4.2 Belt replacement

The axle spacing should be reduced until the new belt/s can be easily fitted by hand. The re-tensioning of the belts should be done in accordance with par.6.4.
It's necessary to observe what stated out on chapter 5.0. Substitute the whole set of belts.
If spark-proof execution, the belt must be electrically conductive.

6.4.3 Taperlock pulley replacement

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

To fix the pulley
1. Pull the pulley wheel and the clamping bush together by means of the socket head cap screw

Ensure that the motor pulley and the fan drive pulley are accurately aligned. Fit and tension the belt in accordance with instructions.

6.5 Bearings

Like all components, the bearings must be periodically checked and if required cleaned and re-lubrificated.
The re-lubrification intervals indicated on Appendix. 1 apply for fans with horizontal shaft and with temperature which do not exceed +60°C.
To consider the accelerated ageing of the grease by high temperatures, it's opportune to reduce by half the re-lubrification interval you can desume from the diagram for each 15°C of operating temperature augmentation of the bearing over +70°C (the max. admissible temperature for the grease musn't in any case be exceeded - see Table 8 in appendix). By temperatures below +70°C, the re-lubrification interval can be lengthened correspondingly (the re-lubrification interval should never be more than doubled and at least once yearly - see diagram).
These instructions are to be considered a general reference and must be adapted to each single fan application.

The bearings mounted on the fans are of different types according to the fans size and the absorbed power.
The base and R-version are supplied with pre-greased sealed for life ball bearings. These bearings and the correct choose of the pulleys with a minimum diameter that guarantees a L_{10} life of 20.000 hours at peak performance (for fans in anti-spark execution group II, category 2 a L_{10} life of 40.000 hours is guaranteed) (see 4.3). By changing the bearings it's necessary to change the rubber too. The maintenance of this type of bearing consists of cleaning its external surfaces and inspection to detect any possible abnormal operation or defective gaskets. If the latter is detected, the bearings have to be replaced.
The T-version fans are supplied with re-greasable ball bearings with plummer block.
The THLZ fans from size 1120, the HLZ, TZAF T2, TZAF FF T2, NTHZ T2 fans from size 560, the TZAF 1250 T1, TZAF 1250 FF T1, NTHZ 1250 T1 fans, the plug fans NPE and PEAF arr. 11 T2 by the transmission side are supplied with splitted housing ball or roller bearing type. These bearings are regreasable and we recommend to substitute completely the grease after 2 re-lubrifications.
The grease quantity and regreasing interval depends from bearing type and rpm and are indicated in the tables and figures in appendix. Grease must be introduced through the grease nipple, after cleaning it, making the shaft rotate slowly during this operation.

The above data (expecially the interval), even though calculated with a safety factor, are in principle pure theoretical because of the eventual discrepancies between the input data and the actual conditions during the fan operation. For this reason, Comefri strongly recommend to make periodical controls on the bearings even though before the theoretical time of relubrication.

In most cases, any flaws in the bearings can be detected by listening. When the bearings are normal, they generate a smooth and uniform sound. Loud and squeaking noise or other abnormal sounds imply that the bearings are worn out. A squeaking noise may also be caused by insufficient lubrication. Too small bearing cross-gap can cause a metallic noise. Dents on the outer race of the bearing can cause vibration, which in turn causes a smooth and clear sound. Intermittent sound implies a defective rolling surface. High bearing temperatures are usually a sign that the bearings are running abnormally. Too high temperature is harmful to the grease and bearing itself. High bearing temperature may be due to insufficient or excessive lubrication, impurities in the grease, overloading, bearing damage or too small a bearing cross-gap. Even a slight temperature change can be a sign of impaired operation if the operating conditions have not changed. Refilling with lubricant will normally cause a rise in bearing temperature lasting one or two days. Check the grease. A change of colour or darkening is usually a sign that there are impurities in the grease.

After the bearing has been relubricated a number of times or if the grease has become caked, darkened or faded (compare with its original colour), the grease should be replaced.

6.6 Bearing replacement

Tightening torques shall be according to bearing manufacturer catalogue. The same rules shall be followed for all the bolts on the fan according to the prescriptions of the technical handbooks.

Replacement of a bearings mounted on cross arms:

1. Release the grains and remove the locking rings from the bearings using of punch and hammer. Unthread the locking rings from the shaft. By mean of appropriate tools hold the shaft in order to avoid damages to the wheel and inlet cone.

2. Remove the bearing crosses from the side plates and unthread the cross bearings from the shaft. Replace bearings and rubber rings. Mount new bearings and new rubber rings on cross-arms.

3. Mount the cross-bearings on the side-plates having care to centre the impeller on the inlet cone. Fix the cross-bearings on the side plates tightening the bolts. Thread and tighten the locking rings on the bearings; then tighten the grains on the locking rings too. Turn the wheel in order to check the correct rotation and to detect possible bad working on bearings and rotating parts.

Replacement of a bearings mounted into cast-iron pillow block :

1. Release the grains and remove the locking rings from the bearings using of punch and hammer. Remove the pins from the cast-iron pillow block and release the bolts. Unthread the cast-iron pillow blocks from the shaft. By mean of appropriate tools hold the shaft in order to avoid damages to the wheel and inlet cone.

2. Replace bearings mounting the new bearings on the cast-iron blocks.

3. Mount the cast-iron pillow blocks on the frames having care to centre the impeller on the inlet cone. Fix the cast-iron pillow blocks on the frames tightening the bolts. Thread and tighten the locking rings on the bearings then tighten the grains on the locking rings too. Turn the wheel in

order to check the correct rotation and to detect possible bad working on bearings and rotating parts. Set the elastic pin.

Replacement of bearings mounted into single cast-iron single blocks SKF mod. SNL:

1. Dismantle all the eventual accessories mounted over the shaft which can stand the substitution of the bearings.

1. Unlock the block cover releasing the bolts located on both sides. By mean of appropriate tools hold the shaft in order to avoid damages to the wheel and inlet cone.

2. Remove the locking rings from the bearing side (note that only one bearing is equipped with the locking rings) and the half sealing rings from the bottom and upper part of the block housing after have cleaned of the grease.

3. Slide out the bearings straightening the feather key of threaded ring placed on the bush; release the threaded ring from both sides using of punch and hammer. Place the bearings; tighten the bush my mean of the threaded ring and bend the feather key.

4. Mount the new seal ring inside the grooves located on the bottom part of the block. Grease the seal ring lips and place the greased group shaft/bearing over the block basement. Place the greased group shaft/bearing over the block basement. Mount one of more locating rings on the side of one bearing only (the other bearing will not be locked). Place the other seal ring, with the lips already greased, inside the upper part of the block. Grease the whole group having care to fill 1/3 of the available room.
Place the upper part of the block over the bottom part and tighten the bolts. Fill the bearing with the proper grease.
Turn the wheel in order to check the correct rotation and to detect possible bad working on bearings and rotating 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 Spark proof execution

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

Directive 94/9/CE ATEX advises the use of a log book to record the maintenance and replacement interventions.

Fan housing and impeller
In all applications, where dust may be expected to form layers on surfaces of the fan, regular cleaning operations shall be carried out at appropriate intervals between them, fixed by the operator on accordance with individual operating conditions (see also 6.2).

After maintenance or after some occuring malfunctions, check the clearances between inlet-cone and shroud (see. 4.5)

The following monitoring is to be carried out:

- for temperature monitoring see par. 2.4.2

- when the bearing maintenance can not assure the required level of grease, it is necessary to affort a bearing temperature monitoring as required in clause 6 of EN 13463-5
In checking the temperature of bearings, a temporary increase of temperature and subsequent decrease is normal. The right temperature must be measured when the fan is running.

- as stated in par 6.5, the monitoring of the noise level can be used to check the good operation of the fan

All these measurements are to be recorded and trended by comparison with earlier measurements. Any rapid changes in the magnitude of any of the above parameters measurements shall be regarded as a danger signal and shall lead to more specific investigations.

As a checklist, here follows a list of the main anti-spark safety components, their failure causes ignition hazard:
- bearing grease
- inlet and outlet guards
- bearing seal to prevent the leaking of the grease
- V-belts: without the correct tensioning there is slippage risk with consequent temperature increase
- monitoring of the behaviour of the bearings in order to detect eventual abnormal increase of noise, vibration or temperature to prevent bearing failures

7.0 TROUBLESHOOTING

Problem	*Cause*	*Corrective action*
Excessive noise	Wheel rubbing Inlet or housing	Adjust wheel and/or inlet cone Tighten wheel hub or bearing collars on shaft
	V-belt drive	Thighten pulleys on motor / fan shaft. Adjust belt tension Align pulleys properly Replace worn belts or pulleys
	Bearings	Replace defective bearings. Lubricate bearings Tighten collars and fasteners
	Wheel unbalance	Clean all dirt off wheel Check wheel balance Rebalance in-place if necessary
Low Airflow	Fan	Check wheel for correct rotation Check outlets and inlets for obstructions Increase fan speed.
	Duct system	Check system losses calculations
	Fan	Decrease fan speed
High Airflow Wrong Static Pressure	Duct system has more or less restrictions than anticipated	Check for obstructions in system. Use correction factor to adjust for temperature and altitude Resize ductwork. Clear filters / coils
High Horsepower	Fan	Check rotation of wheel. Reduce fan speed
	Duct System	Resize ductworks. Check proper operations of dampers, coils, bypass Check filters and access doors
Fan doesn't Operate	Electrical Supply	Check fuses / circuit brekers. Check for switches off Check for correct supply voltage
	Drive	Check for broken belts Tighten loose pulleys
	Motor	Assure motor is correct horsepower and not tripping overload protectors.
Overheated Bearings	Lubrication	Check for excessive or insufficient grase in the bearing
	Mechanical	Replace damaged bearings Relieve excessive belt tension Align Bearing Check for bent shaft

8.0 MANUFACTURER'S DECLARATION

Herewith we declare that the subsequently specified machinery / machinery part is made for being assembled with other machines / machinery parts in order to constitute a unit, which will not be put into service until the assembled machinery has been declared in conformity with the provisions of the EC Council Directive on machinery:

Designation of the machinery: CENTRIFUGAL FANS FOR BELT DRIVEN OPERATION

Machinery type:

TZAF FF	315 – 1250
VTZ	315 – 1000
NTHZ	315 – 1250
THLZ FF	180 - 450
TLZ	160 – 1000
TLI	7-7 - 18-18
TZAF	355 - 1250
THLZ	180 – 1250
HLZ	400 - 1250
TLE	200 - 1000
THLE	200 – 1000
NPE	315 - 1400
PEAF	315 - 1600

	TE 180 – 450
Relevant EC Council Directives	Machinery Directive 98/37/CE and further variation
Applied harmonized standards 1)	EN 292-1, EN 292-2, EN 294, ISO 281, ISO 1940, ISO 10816, ISO 14694, ISO 1813, ISO 1210, EN 60529, EN 13463-1, EN 13463-5, prEN 14968
Applied national standards and technical specifications 2) in particular	UNI 10531, DIN 24163-1,-2,-3, BS 848 – 1, ISO 5801, AMCA STD 210 fig.14, DIN 25136, BS 848 – 2, ISO 5136

For what above:
it's not allowed to put in service the machine object of this declaration before it has been declared in accordance to the Directive 98/37/CE.

1) for the complete list of applied standards and technical specifications see the manufacturer's documentation
2) where not relevant harmonized standards exist.

SPARE PARTS
Only original Comefri spare parts in accordance with the spare parts list are to be used. Comefri accepts no responsibility for damages resulting from use of other parts
Spare parts are suitable to be requested to Comefri having care to indicate on the Order the Job and the Fan Tag numbers. Referring also to the dimensional drawings related to your fan will be of great help in order to identify and supply quickly the parts subject of your request. The components of transmission groups as pulleys, bushes, V-belts and bearings are normally available on the market and the Manufactures are highlighted by Comefri. The User can order the spare parts directly to the original producer. However our Assistance Service is always at disposal to supply parts directly from our Stock. The ordinary maintenance operation as indicated above are suitable to be performed without the intervention of Comefri personnel. When substituting some parts have care to follow the particular instructions given by the Manufacturer. In case of heavy duty application and when an eventual holding time for repair is suitable to originate major costs to your activity, Comefri suggests to keep available at your stock the following spare parts:
.Impeller.
.Shaft.
.Bearing block set or single block (if applicable).
.Bearing set.
.Pulleys.
.V-belt set.
.Couplings (if applicable).
Special spare parts list for industrial applications are suitable to be issued by Comefri upon request.

COMEFRI SERVICE (for spare parts / technical assistance)
Note: Always provide the unit model and serial number when requesting parts or service information.

NOTE:
This handbook can be subjected to updatings according to the final version of the reference ATEX directive (at the moment not definitive yet)
The following version of this handbook will contain also indications for the HLE fan series not presently included.

Appendix

Arrangements for centrifugal wheels for plug fans (figure from reference catalogue)

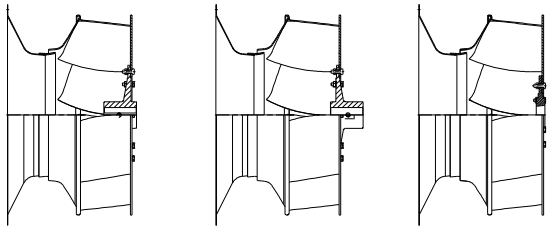
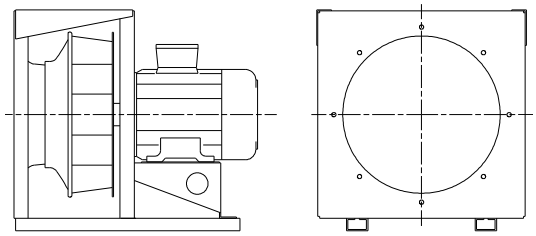
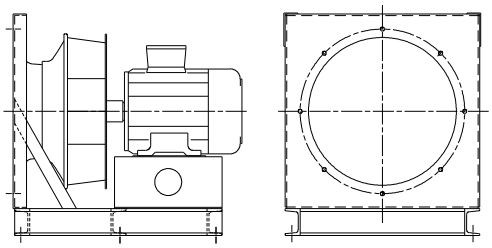
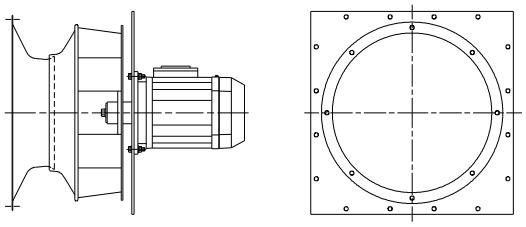
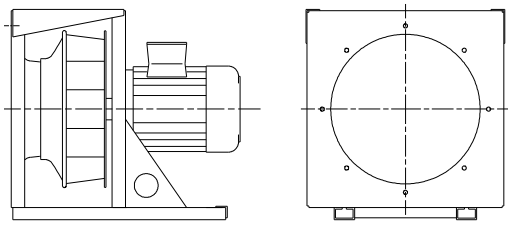
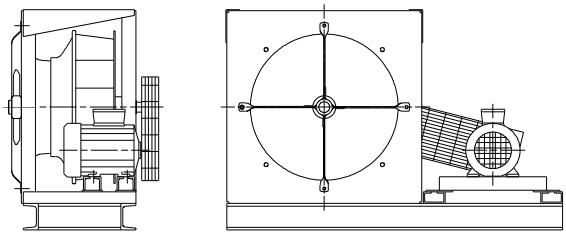
	**Set wheel + inlet cone**
	**Setting 4** - Dimensions 315 to 1400 - Direct drive - Impeller mounted on motor shaft - Motor mounted on a support base (for dimensions 560 to 1400 with reinforced basement)
	**Setting SE 4** - Dimensions 560 to 1400 - Direct drive - Impeller mounted on motor shaft - Motor mounted on a support base (for dimensions 560 to 1400 with reinforced basement)
	**Setting 5** - Dimensions 315 to 500 - Direct drive - Impeller mounted on motor shaft - Motor flanged on a backplate
	**Setting 5S** - Dimensions 315 to 710 - Direct drive - Impeller mounted on motor shaft - Motor flanged on the NPE unit backplate
	**Setting 11** - Dimensions 315 to 1400 - Belt drive - Bearings on each side of NPE units (dimensions 800 to 1400 with pillow block bearings on each side of the NPE unit) - Motor layout W or Z

Table 1

Belt Type	Test load for each belt **f** (N)	Smaller Pulley Diameter d_k (mm)	Belt displacement for 100 mm **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

Bearings type Table 2

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

THLZ FF T1, TLZ T, TLI T, THLZ T, TLE T, THLE T

		INA			**SKF**		
Fan size	*Bore (mm)*	*Unit*	*Unsplitted support*	*Bearing*	*Unit*	*Unsplitted support*	*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	-	-	-

THLZ T

Fan size	*Bore (mm)*	*Splitted 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

Bearings type Table - Fans Series HLZ

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

HLZ T

		INA			**SKF**		
Fan size	*Bore (mm)*	*Unit*	*Unsplitted support*	*Bearing*	*Unit*	*Unsplitted support*	*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)*	*Splitted 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

Bearings type Table - Fans Series TZAF FF, VTZ, NTHZ, TZAF

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

TZAF FF T1, VTZ T1, NTHZ T1, TZAF T1

		INA			SKF		
Fan size	*Bore (mm)*	*Unit*	*Unsplitted support*	*Bearing*	*Unit*	*Unsplitted support*	*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)*	*Splitted 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

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
Fan size	*Bore*	*Unit*	*Unsplitted support*	*Bearing*	*Unit*	*Unsplitted support*	*Bearing*
560, 630	50	RSAO 50	GG SAO 10	GNE 50 KRRB	--	--	--
710, 800, 900, 1000	60	RSAO 60	GG SAO 12	GNE 60 KRRB	--	--	--

TZAF FF T2, NTHZ T2, TZAF T2

		INA			SKF		
Fan size	*Bore (mm)*	*Unit*	*Unsplitted support*	*Bearing*	*Unit*	*Unsplitted support*	*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
Fan size	*Bore*	*Unit*	*Unsplitted support*	*Bearing*	*Unit*	*Splitted bearing block*	*Bearing*
560, 630	50				SNL 611 TG	SNL 513-611	1311 EKTN9

		SKF				
Fan size	*Bore (mm)*	*Splitted 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

Bearings type Table - Plug fan series NPE, PEAF

NPE B, PEAF B ARRANGEMENT 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

NPE T1, PEAF T1 ARRANGEMENT 11

		INA			SKF		
Fan size	*Bore (mm)*	*Unit*	*Unsplitted support*	*Bearing*	*Unit*	*Unsplitted support*	*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	--	--	--

PEAF T2 ARRANGEMENT 11

INLET SIDE		INA			SKF		
Fan size	*Bore (mm)*	*Unit*	*Unsplitted support*	*Bearing*	*Unit*	*Unsplitted support*	*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)*	*Splitted 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

NPE T2, PEAF T2 ARRANGEMENT 11

INLET SIDE		INA		
	Bore (mm)	*Unit*	*Unsplitted support*	*Bearing*
900, 1000	60	PASE 60	GG ASE 12 N	GRAE 60 NPPB

TRANSMISSION SIDE		SKF				
Fan size	*Bore (mm)*	*Splitted 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 GREASE QUANTITY FOR RE-LUBRICATION AND INITIAL FILLING

1) identify the fan, TYPE and SIZE
2) in table 2 find the technical bearing specifications:
   - bore
   - unsplitted or splitted type
     if splitted, then check if it is of ball or roller type
3) with fan and bearing data, enter tables from 3 to 7, 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
From table 8 to 11: ONLY for splitted block bearing on NPE and PEAF arr.11

4) from table 12 find type and supplier of the grease
5) to determine the re-lubrication time interval:
- for unsplitted pillow block bearing see graph 1 with the correct parameters of shaft diameter and revolution velocity
- for splitted pillow block bearing with ball bearing see table 13, with roller bearing see table 14, entering the correct parameters of "bearing block" and revolution velocity

Table 3. Grease quantity for re-lubrication of unsplitted 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 TLI fan serie

Table 4. - Grease quantity for re-lubrication of SKF SNL type splitted-housing with pillow block ball bearings
EXCEPT NPE, PEAF ARR. 11

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 5. - Grease quantity for initial filling or complete re-filling for SKF SNL type splitted-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 6. - Grease quantity for re-lubrication of SKF SNL type splitted-housing with pillow block roller bearings
EXCEPT NPE, PEAF ARR. 11

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 7. - Grease quantity for initial filling or complete re-filling for SKF SNL type splitted-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 8. - Grease quantity for re-lubrication of SKF SNL type splitted-housing pillow block ball bearings

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

Table 9. - Grease quantity for initial filling or complete re-filling for SKF SNL type splitted-housing pillow block ball bearings

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

Table 10. - Grease quantity for re-lubrication of SKF SNL type splitted-housing pillow block roller bearings

	PEAF Arr.11						NPE, PEAF Arr.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 11. - Grease quantity for initial filling or complete re-filling for SKF SNL type splitted-housing pillow block roller bearings

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

Table 12. - Grease suggested brands and types

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

Graph 1. – Relubrication intervals for unsplitted bearing pillow blocks

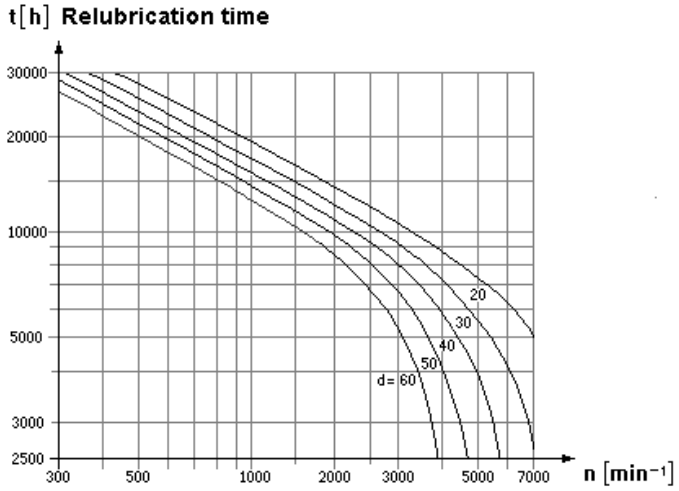


Table 13. – Relubrication intervals for splitted bearing pillow blocks with ball bearing

Bearing block type	506	507	513	516
Speed [min^{-1}]	Re-lubricating intervals [hours]			
250	34700	33400	26500	26000
500	24300	23300	23500	22500
750	19600	18700	20700	19500
1000	16800	16000	18300	16900
1250	14800	14100	16200	14600
1500	13300	12700	14300	12600
1750	12200	11500	12700	10900
2000	11200	10600	11200	9500
2500	9800	9200	8800	7100
3000	8700	8100	6900	5300

Table 14. – Relubrication intervals for splitted bearing pillow blocks with roller bearing

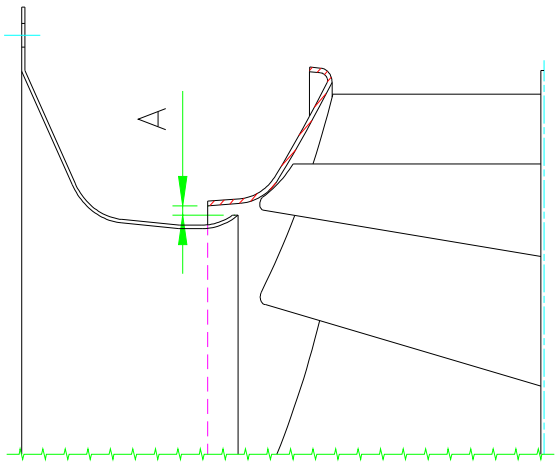
Bearing block type	508	509	511	513	516	517	518
Speed [min^{-1}]	Re-lubricating intervals [hours]						
250	16700	15800	14500	13000	13000	12500	12000
500	8100	7600	6900	5500	5250	5150	5000
750	5200	4900	4400	4000	3750	3650	3500
1000	3800	3500	3200	3250	3000	2750	2500
1250	2900	2700	2400	2000	1900	1800	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 15. – CLEARANCE BETWEEN INLET CONE AND SHROUD IN **ATEX EXECUTION**

In Atex execution the inlet-cone is completely manufactured in copper or is provided with a copper tip in the extremity entering 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 tables.

VERIFY THE RESPECT OF THE DIMENSION INDICATED IN THE TABLES BEFORE STARTING THE FAN

(In the fan series TLZ, TLI and TLE the inlet-cone does not overlap the shroud)



Fan series

TZAF FF Atex 315 – 1250
VTZ Atex 315 – 1000
THLZ Atex 315 – 1250
THLZ FF Atex 180 - 450
TZAF Atex 355 - 1250
THLZ Atex 180 – 1250
HLZ Atex 400 - 1250
TLE Atex 200 - 1000
THLE Atex 200 – 1000

SIZE	A	
	THLZ FF, THLZ, HLZ, THLE	TZAF FF, VTZ, NTHZ, 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	$2{,}65\ ^{+0{,}7}_{0}$	$^{+1.25}_{0}$
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	$2{,}25\ ^{+0{,}35}_{0}$	$11\ ^{+2}_{0}$