MANUAL FOR THE INSTALLATION, USE AND MAINTENANCE OF FANS

Warning: Operators are obliged to read the manual and to follow the instructions scrupulously contained therein.
The Manufacturer is not liable for damage caused to persons and/or property or suffered by the product, if the conditions described below are not respected.

The manual is an integral part of the product and should be available to users at all times.
The manual must always accompany the product, even if it is passed on to another user.
Keep the manual until the fan is dismantled.

You should read all instructions in this manual carefully.

This manual is valid for all C.G.N. fans, with **the exception of ATEX fans**, and is completed by the "Final book" manual, specific for the fan supplied.
If this manual is lost or illegible, it is necessary to request a copy from C.G.N. and, once received, make sure that the date of modification of the same is earlier than that on which the fan was supplied/produced.

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1. INTRODUCTION

Centrifugal fans are devices designed to move air or other gases by centrifugal force, offering high performance in industrial and civil applications. These fans consist of an impeller that, by rotating, draws air through a central opening and expels it outwards, increasing pressure and speed. Due to their ability to generate higher pressures than axial fans, centrifugal fans are ideal for systems that require air to be moved through long ducts or against high resistances, such as in ventilation, fume extraction, HVAC systems, and for transporting gases or dusts.

Characterized by high efficiency, robustness and reliability, centrifugal fans are designed to ensure safe and continuous operation even in demanding environments.

The **UNI EN ISO 13349/2009** standard defines the fan as "a machine with rotating blades that receives mechanical energy and uses it by means of one or more impellers equipped with blades to maintain a continuous flow of air or other gases that pass through it and whose work per unit mass normally does not exceed the value of 25 KJ/kg" (equivalent to 30 kPa at the inlet density of 1.2 kg/m3). Specifically, a centrifugal fan is defined as "a fan in which the air meets the impeller in an axial direction with it and leaves it in a direction perpendicular to this axis".

The blades can have the following different conformations: negative (the blade processes the fluid with the rear or convex part), positive (the blade processes the fluid with the front or concave part), radial (straight, the blade can process the fluid indiscriminately with the rear or front, if there are no reinforcements on one side or the other of the blade).

The fundamental quantities that characterize a fan are the following:

- Volume flow rate: This is the volume of fluid that passes through the fan over a certain period of time. It is measured in m3/h.
- Static pressure: this is the energy that the impeller provides to overcome the resistances opposed by the circuit to the passage of the fluid. It is measured in mmH2O or Pa.
- Dynamic pressure: this is the energy possessed by the fluid as a result of the speed imparted by the impeller at the outlet of the fan pressure inlet. It is measured in mmH2O or Pa.
- Total pressure: is the algebraic sum of static pressure and dynamic pressure It is measured in mmH2O or Pa.
- Rotational speed: This is the speed of the impeller and is measured in revolutions per minute (rpm).
- Efficiency: it is the percentage ratio between the energy that the fan is able to transmit to the fluid and the energy supplied by the motor to the impeller, it depends on the shape of the impeller and is dimensionless.
- Power consumption: this is the power required (supplied by the motor) to the fan for its operation. It is measured in kW.
- Motor nameplate power: it is the nominal power that the motor is able to provide, it must always be greater than the power absorbed by the fan. It is measured in kW.
- Sound pressure level: this is the energy that propagates in the external ear canal and generates vibrations in the eardrum. This is the noise level of the fan and is evaluated in decibels according to the A scale (a scale that allows you to assess the impact of noise on the human ear in relation to the frequency of the same).
- Acoustic power: it is the acoustic energy emission index and constitutes an intrinsic and invariant characteristic of a source. The sound power is expressed in Watts.

All C.G.N fans comply with the Machinery Directive 2006/42/EC.

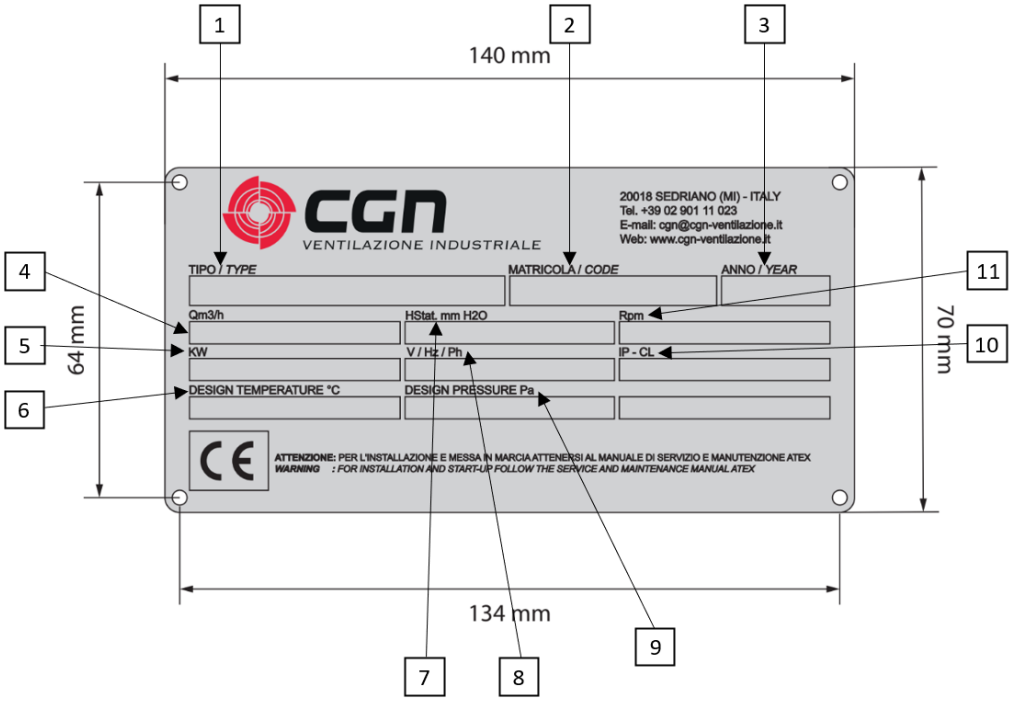
2. GENERAL

2.1. Conditions of installation and use

The operating conditions of the fan, unless otherwise indicated, are:
- Ambient temperature ranging from -20 °C to + 40 °C
- Absolute pressure ranging from 0.8 bar to 1.1 bar
- Maximum volume fraction of 21% oxygen content
- Maximum thermodynamic energy increase of 25 kJ/Kg (equivalent to 30 kPa at the input density of 1.2 kg/m3)

Unless otherwise indicated, fluids with the following characteristics may not be transported inside the fan:
- For powders: abrasive fluids
- Fluids with suction temperature greater than 80°C

2.2. Reading the tag plate



1	**TYPE**	Fan model
2	**TAG**	Unique serial number of the ventilator (to be communicated for any requests for information/spare parts)
3	**YEAR**	Year of production of the fan
4	**Qm3/h**	Flow rate expressed in m3/h
5	**KW**	Installed power (electric motor) expressed in kW
6	**DESIGN TEMPERATURE**	Design temperature in °C
7	**HStat. mm H2O**	Static pressure at design temperature, expressed in mmH2O
8	**V/Hz/Ph**	Volts, Herz and electric motor phases
9	**DESIGN PRESSURE Pa**	Total pressure at design temperature, expressed in Pa
10	**IP-CL**	Protection method and class of the electric motor (data present only if the motor is supplied by us)
11	**Rpm**	Fan rotation speed

2.3. Warranty

For each fan or spare part, unless otherwise agreed, the warranty starts from the date indicated on the transport document accompanying the material.

WARNING: In the event of any repair/maintenance/tampering with the fan not previously authorised by C.G.N., the warranty will be considered extinguished.

C.G.N. does not recognize any compensation for damage caused by its machinery, even if defective, or for the suspension of work caused by the malfunction of its products.

2.4. Transport and storage

The blower cannot be lifted by the shaft, motor, or impeller.

The transport position of the device or individual components must be observed as defined by the manufacturer.

It is forbidden to stack the goods during transport or to apply loads not foreseen by the Manufacturer.

For lifting, it is mandatory to use only the attachment points provided.

Use only lifting systems suitable for the weight and size of the fan.

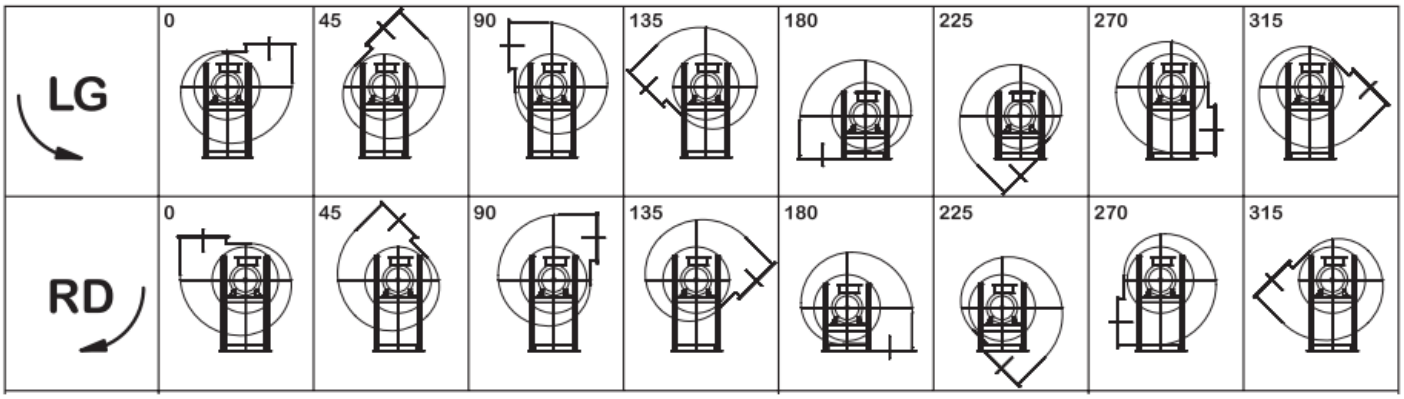
Use tie rods of appropriate length and quantity and hook into the appropriate slots on the fan structures.
If necessary, use the lifting rings of the motor in the event of load imbalance caused by any considerable weight of the same.

It is absolutely forbidden to lift the entire fan using only the motor attachment points.

In case of non-immediate use, the fan must be stored in a cool, dry place.
It is necessary to prevent the impeller from remaining stationary for long periods, both during warehouse downtime and during the construction time of the system in which the fan will be inserted. During these periods, the fan should be checked periodically by rotating it by hand to avoid damage to the bearings.

3. CHARACTERISTICS

3.1. Rotation



3.2. Types of installation

The fans can be installed in different working conditions:

- **Free suction and delivery** (not ducted): It is **necessary to install protective nets** compliant with the UNI 9219-8 standard on both mouths
- **Free suction and ducted delivery**: It is **necessary to install a protective net** compliant with the UNI 9219-8 standard on the suction mouth
- **Ducted suction and free delivery**: It is **necessary to install a protective net** compliant with the UNI 9219-8 standard on the pressing mouth.
- **Ducted suction and delivery**

WARNING: The presence of protection nets increases the pressure drops to be considered during the design phase of the fan/system.

3.3. Types of arrangements

Arrangement	Description	Notes
1	Shaft-mounted cantilever-mounted impeller, one-piece bracket or separate chair-mounted brackets	
4	Impeller mounted on motor shaft; motor fixed on chair	Impeller max ø 1000 mm, T max= 80°C
5	Impeller mounted on motor shaft; motor not fixed on chair	Impeller max ø 1000 mm, T max= 80°C
8	Impeller mounted cantilevered to shaft, monobloc support or separate chair-mounted supports, motor mounted in line with coupling	
9	Shaft cantilevered impeller, one-piece support or separate chair-mounted supports, chair-mounted motor	
12	Impeller mounted cantilevered to the shaft, monobloc support or separate chair-mounted supports, motor mounted on a base common to the fan	

4. SECURITY

4.1. General safety warnings

The following warnings are to be considered general. For further information, please refer to the legal regulations and the rules dictated by the company where the fan is installed.

During ordinary or extraordinary maintenance operations, it is necessary to operate safely.
It is mandatory to operate the fan only after disconnecting or isolating it from the power line.
It is necessary to periodically check the efficiency of the protections (transmission casing, protection nets, etc.). It is mandatory to replace what is malfunctioning or worn.

It is forbidden to remove and/or tamper with the safety protections provided by C.G.N.

4.2. Risks due to misuse

- Do not introduce any part of the body near moving parts or in addition to safety guards.
- Do not remove and/or tamper with the safety guards provided and/or any control devices. If these guards need to be removed, they must be reset before starting the machine.
- Do not use the fan in explosive environments or under conditions other than those indicated in the design phase (this practice immediately voids the warranty).
- Any intervention by unauthorized personnel or by personnel not equipped with the mandatory safety devices is prohibited.
- Keep all the plates on the machine in excellent condition.
- Do not approach the fan with bulky clothing.
- Only the lifting points on the fan must be used for handling.

4.3. Fan Hazards

- Dragging caused by suction or moving parts.
- Burns caused by the high temperature of the external surfaces.

4.4. Installation

IT IS STRICTLY FORBIDDEN TO START THE FAN WITHOUT EXAMINING THE CORRECT INTEGRITY OF THE MACHINE

Before starting any installation operation, check that the machine is safe.
The fan must be installed with sufficient surrounding space to carry out normal assembly or disassembly, cleaning and maintenance operations.
The installation of the product must be carried out knowing the purpose of the installation and the problems related to the operations that will be performed.
The personnel involved in all phases of the life of the fan and/or equipment must be aware of the risk deriving from working with the machinery, must have previously read and understood what is indicated in this manual and must operate in accordance with the regulations in force relating to safety standards.

4.4.1 Preliminary checks

- Make sure that the machine is disconnected from all electrical supplies.
- Make sure that all moving parts are completely stopped.
- Wait until the internal and external temperature of the machine has reached a value that is not dangerous to the touch.
- Ensure that the area surrounding the machine is properly illuminated (possibly by equipping operators with electric lamps).
- Wait until any mixture inside the machine is completely deposited.
- Mechanically lock all moving parts.

Below are the main checks to be carried out:
- Impeller/nozzle distance control
- vibration control
- Bearing temperature control
- measurement of the rotation speed
- measurement of earth resistance

4.4.2 Controls with Fan Standstill

- Verification of the tightness of all the bolts, with particular regard to the locking screws of the impeller on the shaft, the motor and the supports.

- Check by rotating the impeller manually, very slowly, that there is no interference between the impeller and the nozzle.

- Inspect the fan both outside and inside in order to check for integrity, absence of foreign bodies, dirt, anomalies, etc.

- Check the position of any dampers or flow regulators: open for axial fans, closed for centrifugal fans (during start-up this operation avoids dangerous overloads to the motor).

- Check the integrity of the seals, both near the passage of the motor shaft and on the ducts adjacent to the fan.

- Check the correct lubrication of the rotating parts.

- Connect the temperature, vibration and rotational speed control devices where provided, as indicated in this manual and in the reference technical documentation, in particular correctly set the control thresholds.

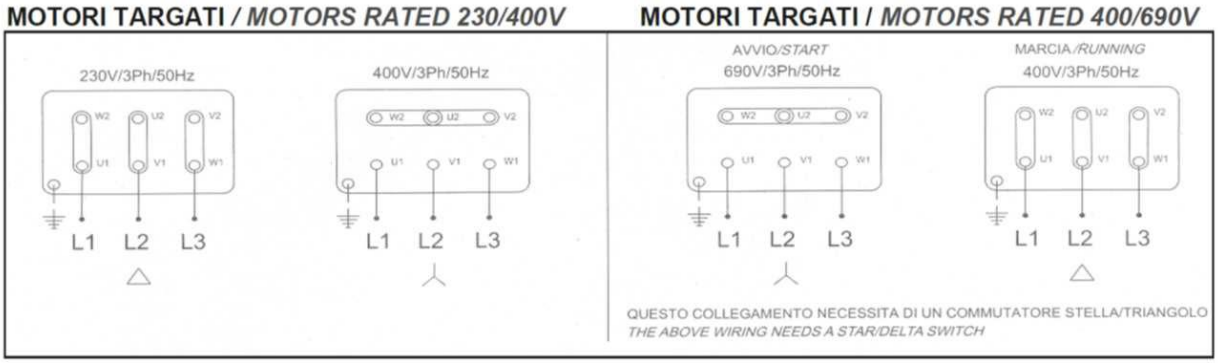
- Make sure that all possible earthing of the fan and its accessories is properly connected. Once this operation has been carried out, measure the earth resistance.

4.5. Electrical connection

THE ELECTRICAL CONNECTION MUST BE MADE BY QUALIFIED PERSONNEL. ALWAYS CONSULT THE USE AND MAINTENANCE MANUAL OF THE ELECTRIC MOTOR.

The control panel and the electrical system must comply with the provisions of current legislation.
The housing and base of the fan must be electrically connected to the earthing system by means of a conductor of suitable cross-section.
All equipotential bonding and earthing conductors must be connected to the same earthing system
The motor must not be installed in an area with impeded ventilation to prevent the temperature from exceeding the expected temperature.

Below is the diagram showing the most common engine connections:



IF IN DOUBT, DO NOT PROCEED AND CONTACT THE MANUFACTURER OF THE ELECTRIC MOTOR.

5. FIRST START

5.1 Controls with the engine running

5.1.2 Checks to be carried out when the fan is started

In the initial start-up phase, it is necessary to:

- Carry out a thorough visual inspection of the fan + motor + any accessories system

- Check that the direction and speed of rotation of the impeller comply with the indications (indications on the motor and/or product nameplate). If the direction of rotation needs to be changed, after removing the power supply and securing the fan, proceed in the following ways:
a) in the case of a three-phase motor, it is sufficient to invert two electrical phases between them.
b) in the case of a single-phase motor, follow the connection diagram indicated.

- Check that the current consumption does not exceed that indicated on the motor plate. To have reliable data, consider a reasonable stabilization time. In the star/delta connection, the reading must be carried out upstream of the switch; If this is not possible, measure the phase current on any of the six conductors at the terminal block and multiply this value by 1.73. Avoid consecutive engine starts; This leads to continuous overloads that overheat the electrical parts. Before restarting, allow sufficient cooling.

- Check, using a thermometer, that the temperature of the bearings is regular, a momentary increase in the same followed by a subsequent decrease is considered normal. The operating temperature must not be higher than that of the engine class.

- Verify, using a vibrometer, that the vibrations are not excessive and that they fall within the limits of the ISO 14694:2003 standard (category BV-3).

IF ABNORMAL VALUES ARE FOUND, STOP THE MACHINE AND CONTACT THE MANUFACTURER.

5.1.3 Checks to be carried out a few hours after starting the fan

- Carry out a thorough visual inspection of the fan + motor + any accessory system.

- Check that the vibrations have not loosened the tightening of all the bolts or changed the tension of the belts. If necessary, repeat tightening.

IF ABNORMAL VALUES ARE FOUND, STOP THE MACHINE AND CONTACT THE MANUFACTURER.

6. MAINTENANCE

Before starting maintenance operations, stop and empty the fan and make the machine safe.

The fan needs cleaning and maintenance at regular intervals to maintain its efficiency and prevent damage that would compromise the integrity and safety of people.

6.1 Stopping and emptying

- In the case of transporting fluids at high temperatures, the fan must be cooled or the contents mixed with cold air before carrying out any operation: the operator could be burned by touching parts of the fan or coming into contact with the fluid left inside it;
- In the event of transporting chemical agents that may settle on the bottom, drain plugs must be provided under the fan and emptied before opening it.

6.2 Cleaning

Before starting cleaning, stop the fan and secure the machine

When removing any dust present in the machine, take care not to disperse it into the surrounding environment.

Use only cleaning products and machinery suitable for the environment.

Before starting, make sure that no metal foreign objects are left inside the fan body.

Once the cleaning operations are complete, restart the fan by carrying out the same checks indicated for the first start.

It is necessary to check with particular care that after restarting the vibrations generated by the fan have not increased: if the cleaning has not been thorough, it may have generated imbalances such as to affect the balancing of the impeller. In this case, the cleaning operation must be repeated more rigorously.

6.3 Routine Maintenance

In order to maintain the correct operation of the fan in potentially explosive atmospheres, the following activities must be carried out in addition to what is already indicated in the standard basic use and maintenance manual.
The control frequencies may be intensified at the discretion of the user/customer in the event of special needs or suspected anomalies.
Below is a summary of the necessary maintenance activities.

ACTIVITIES	CADENCE	NOTES
GENERAL FAN STATUS CHECK	DAILY	Visual inspection
CONTROL OF MINIMUM DISTANCES	150 HOURS	The minimum distances between a fixed and a mobile part, both radially and axially, must always be greater than 1% of the diameter of the impeller and in any case never less than 2 mm and never more than 20 mm
CLEANLINESS	TO BE DEFINED	The cleaning intervals are closely related to the type of fluid transported and its concentration, it is therefore necessary for the end user to determine a cleaning frequency such that the impeller is always perfectly clean (accumulations of materials on the rotating parts cause imbalance) and that on the fixed parts there are no accumulations of stratified material for more than 1 mm thick.
CHECKING THE TIGHTNESS OF THE BOLTS	150 HOURS	Check Manual
CHECKING THE CONDITION OF SEALS AND GASKETS	150 HOURS	Visual inspection
VIBROMETRIC CONTROL	MANUAL: 150 HOURS SENSORS: CONTINUOUS	For directly coupled fans, the vibrometric verification must be carried out by means of instrumentation every 150 hours maximum; for return fans, it must be carried out by means of a sensor or, by way of derogation, by means of instrumentation every 100 hours maximum and at each start-up. In the case of stainless steel fans, the presence of a sensor connected to an electric release device is required.
THERMAL CONTROL	MANUAL: 100 HOURS SENSORS: CONTINUOUS	It is necessary to monitor the temperatures that develop inside and at the outlet of the fan, when these frequently reach 40°C it is necessary to provide a system of thermal probes connected to an electric release device, otherwise a periodic check is sufficient as per the table above.
LUBRICATION	TO BE DEFINED	
BEARING REPLACEMENT	40000 HOURS	
BELT TENSIONING	300 HOURS	The first tensioning of the belts must be carried out after 20 hours of operation.

6.3.1 Lubrication

In all cases where lubrication is required, together with the final documentation, instructions will be delivered including recommended lubricant and intervals for checking its condition.

6.3.2 Cleaning the impeller

It is recommended to constantly check the state of cleanliness of the impeller. Any stratification of the material on the impeller causes its imbalance with consequent damage to the transmission parts and/or the electric motor. During cleaning operations, it is necessary to completely clean every part of the rotary, any residue in limited points can lead to more imbalance than a uniform patina of dirt, so cleaning must be thorough.

In the specific case of impellers with curved blades, the transport of materials that are electrostatically charged or that contain glues or resins can cause a deposit in the back of the blades.
Deep cleaning is therefore recommended to make any residual dirt uniform and thus avoid the occurrence of imbalances. If this cleaning is necessary too frequently, it is preferable to replace the impeller with one with a special blade profile.

6.3.3 Belt transmission and tensioning maintenance

For all transmission fans, together with the final documentation, instructions relating to the maintenance of the transmission and the correct tensioning of the belts will be delivered.

6.3.4 Checking the minimum safety distances

At each maintenance operation, it is necessary to check that the minimum distances between impeller and nozzle, rear impeller and wall, seal and shaft have not changed.
To check the impeller/nozzle distance, proceed as shown below.

1) Stop the fan and disconnect it from any power source.
2) If necessary, remediate the surrounding environment from possible toxic substances.
3) Remove the protection on the fan suction mouth and/or any ducting.
4) Check that the distance complies with the values below under "*Minimum safety distances between moving parts*".
5) Warning: if in doubt or if the distance does not comply, contact the Manufacturer.
6) If the check is successful, refit the protection on the fan suction mouth and/or any ducts and restore the correct operating conditions.

6.3.4.1 Minimum safety distances between moving parts

The distance between the rotating and fixed parts must be equal to 1% of the value of the diameter of the possible contact and in any case never less than 2 mm or not necessarily more than 20 mm. Gaskets are not subject to this rule.
Below is a summary of the minimum distances.

DIAMETER	MINIMUM DISTANCE
Less than 200 mm	2 mm
Between 200 mm and 2000 mm	1% of contact diameter
Above 2000 mm	20 mm

6.3.5 Vibrometric control

If there are no sensors for vibrometric measurements, equip yourself with a vibrometer and check that the measured values comply with the maximum parameters identified by the ISO 14694:2003 Cat.BV-3 standard:

CONDITION	RIGIDLY MOUNTED FAN mm/s r.m.s.	FLEXIBLY MOUNTED FAN mm/s r.m.s.
NORMAL OPERATION	4.5	6.3
ALARM	7.1	11.8
IMMEDIATE SHUTDOWN	9	12.5

If these parameters are not respected, it is possible that the bearings are worn (maximum 40000 working hours) or that the impeller is unbalanced. Stop the fan and contact the manufacturer for assistance.

6.3.6 Checking the Seal Condition

It is necessary to check the condition of the seal at each scheduled maintenance and, if it is not in optimal condition, replace it.
If replacement is required, contact the manufacturer for instructions.

6.4 Extraordinary maintenance

Depending on the various conditions of use of the fan, it is sometimes necessary to intervene with the following extraordinary maintenance activities.

6.4.1 Impeller Maintenance

Especially necessary if the fan operates in the presence of dust or if it is used for pneumatic conveying. Check the condition of the impeller using the inspection door and, if removal is necessary, contact the manufacturer for instructions.
WARNING: Any dents or falls, even if they do not cause cosmetic damage, can cause imbalance to the impeller. In this case, it will be necessary to rebalance this impeller by contacting the Manufacturer.

6.4.2 Replacing bearings or cylinder block

Contact the manufacturer for assistance.

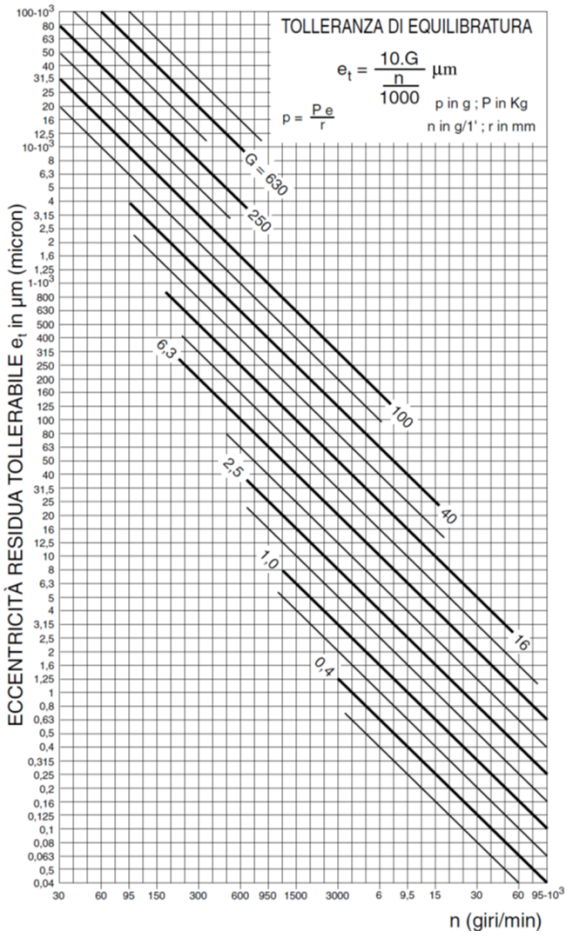
6.4.3 Replacing the Electric Motor

If the electric motor needs to be replaced, do the following:

1- Secure the fan
2- Disconnect any electrical connections
3- Disassemble the fan parts needed to remove the motor from the impeller
4- Fit the new engine, making sure that the characteristics are the same as the one to be replaced
5- Centre the impeller for direct designs or align drives and couplings for drive or coupling designs
6- Proceed with the first start checks (CHAP. 5)

7. BALANCING THE IMPELLER

All impellers produced by C.G.N are subjected to static and dynamic electronic balancing in accordance with ISO 21940-11, balancing degree 6.3.
The tolerable residual eccentricity values shown below in the graph refer to the entire impeller and must be equally divided on both correction planes to have the right dynamic tolerances.
From the residual eccentricity values, it is easy to derive the value of the maximum allowable unbalance weight with the formula shown in the table below.



8. VIBROMETRIC ANALYSIS

All fans produced by C.G.N. are subjected to a running test with vibrometric control in accordance with ISO 14694:2003.
This standard identifies the BV-3 category industrial fan and requires that the fan does not exceed the value of 4.5 r.m.s. if rigidly mounted or 6.3 if flexibly mounted.
The measurements on the fan at the final installation site are not the responsibility of the manufacturer: the values measured are influenced by the flatness and strength of the support surface.

9. FAILURE ANALYSIS

In the event of malfunction and/or breakdowns, it is advisable to always contact the Manufacturer.

PROBLEM	POSSIBLE CAUSE	POSSIBLE REMEDY
VIBRATIONS OUT OF PARAMETERS	Impeller imbalance	Rebalancing the impeller
	Bearing failure	Check the state of wear and lubrication of the bearings
	Unsuitable support structure	The frequency of the stand is close to that corresponding to the rotation speed of the fan. Alter the natural frequency of the support, by adding weights
	Slow screw connections	Tighten the fasteners
EXCESSIVE NOISE	High speed for the necessary performance	Use soundproof bins and/or silencers; choose a larger fan with the same performance or lower peripheral speed
	Winding vibrations	Replace electric motor
	Eccentricity between rotor and stator	Check for coaxiality
	Impeller imbalance	Rebalancing the impeller
	Placement in reverberation area	Move the fan or use soundproof bins
	Bearing failure	Check the state of wear and lubrication of the bearings
DIFFICULTY OF STARTING	Excessive power draw	Contact the manufacturer
	Low supply voltage	Check the motor nameplate data
	Fuses not suitable for the needs	Replace fuses with suitable ones
	Insufficient starting torque in the engine	Replace with a more powerful engine and/or contact the manufacturer
	Inadequate assessment of the moment of inertia	Recalculate the moment of inertia and, if necessary, replace the motor with a suitable one
POWER CONSUMPTION HIGHER THAN THAT INSTALLED	Rotation speed too high	Re-evaluate the plant design and/or contact the Manufacturer
	Air density different from fan design data	Re-evaluate the plant design and/or contact the Manufacturer
	Flow rate or pressure outside the fan design range	Re-evaluate the plant design and/or contact the Manufacturer
LACK OF FLOW RATE WITH POWER REDUCTION AT APPROPRIATE ROTATION SPEED	Clogged pipes and/or clogged suction points	Clean the pipes and hoods, check the position of the dampers
	Insufficient rotational speed	Check the supply voltage and check the connection of the motor terminals. Check if the gear ratio is correct and check that the belts are not slipping
	Working pressure higher than that fan design	Design error. Replace the motor and pulleys. Replace and/or adapt the circuit
	Clogged impeller	Clean the impeller from the inspection door when the fan is stopped
	Direction of rotation reversed	Check the winding connection on the electric motor terminal block
	Overload filter	Increase the frequency of the automatic cleaning device (where provided) or intervene manually

EXCESSIVE AIR FLOW RATE	Incorrect rotation speed	Check the direction of rotation; check for particular turbulence conditions at the intake; Check the rotational speed in the motor, the supply voltage, or if there are any defects in the winding
	Air leaks from open access doors, poorly constructed or poorly installed ductwork or components, or imperfectly closed bypass dampers	Check the system and replace what is necessary
	Overestimation of circuit pressure drops	Close the dampers, or slow down the speed until the required airflow is reached
NOT ENOUGH PRESSURE	Insufficient rotational speed	Check the supply voltage and check the connection of the motor terminals. Check if the gear ratio is correct and check that the belts are not slipping
	Flow rate higher than design values due to incorrect circuit sizing or air temperature significantly different from the fan design value	After re-evaluating the design, change the gear ratios and/or replace the fan with a suitable one
	Impeller in non-optimal condition or partially blocked	Check the condition of the impeller
	Direction of rotation reversed	Check the winding connection on the electric motor terminal block
SUDDEN DROP IN PERFORMANCE	Leak in the fan volute seal and/or leak in the suction and pressure piping	Replace the gasket and carry out a ductwork check
AIR PULSATIONS	Axial fan working in the initial area of the feature in stall conditions	Re-evaluate the system and/or replace the fan with an appropriate one
	Centrifugal fan operating in zero flow conditions	Re-evaluate the system and/or replace the fan with an appropriate one
	Instability of the suction flow with the presence of vortices	Redefinition of the inlet with insertion of deflectors

10. MECHANICAL HAZARDS

- The personnel in charge of maintaining the ventilator is obliged to use personal protective equipment, as well as devices to protect the airways and the face.

-It is forbidden to stop the fan if the fluid has a temperature above 60°C. If it is necessary to shut down with fluids at a higher temperature, provide external cooling devices.

-The suction and pressure ports must always be protected so that it is impossible to reach the moving parts.

Consult the legal and company safety regulations before handling the fan.

10.1 Noise Hazards

Please refer to the legal specifications on exposure to noise in the workplace and to the assessment of the need to provide sound pressure protection devices.

10.2 High Temperature Hazards

The fluid carried by the fan can be above 60°C. It is mandatory to intervene on the fan only when the temperature of the medium is below 60 °C. If it is impossible to decrease the temperature of the fluid, external cooling systems must be provided to be activated before maintenance.

Consult the legal and company safety regulations before handling the fan.

The danger due to the presence of surfaces with high temperatures is indicated by special plates placed in strategic places, reporting this risk and the obligation for the operator to use the most appropriate personal protective equipment.
Here are some examples of license plates:

10.3 Inhalation Hazards

The fan, if intact, does not allow gases/dust to escape, but in the event of maintenance it is necessary for the operator to use airway and face protection devices such as masks. Please refer to the legal regulations and company directives on the type of mask to be used.

11. OBLIGATIONS AND RESPONSIBILITIES

This documentation is intended for qualified personnel.

Before activating and using the product, check that all the attached documentation necessary for its installation, operation and maintenance is present.

If one or more operators do not wish to take on the responsibilities deriving from the safe use of the product, they must refrain from using it and contact the Manufacturer for any clarification and/or assistance.
The Manufacturer does not accept any indemnity or exemption from liability by the Customer unless amply justified and motivated.

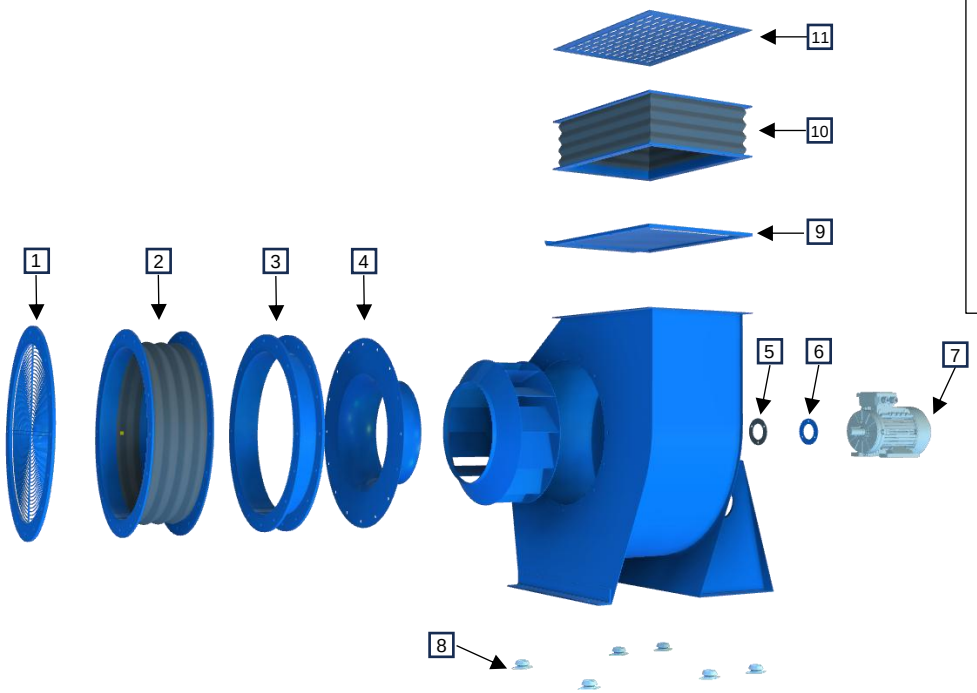
This manual is supplied with each fan and is of a general nature.
For any specific information about the fan purchased, as well as for the recommended spare parts, refer to the additional documentation provided and/or contact the Manufacturer with the serial number.

In case of need, the C.G.N. manufacturer is available for on-site interventions to assess the state of wear of the fan and its accessories. It is also possible to agree with C.G.N. on annual maintenance interventions, aimed at preserving the fan and its accessories in the best possible way.

ATTENTION: if spare parts are required, only provide original C.G.N.
If non-original spare parts are installed on the fan, any warranty and liability will be considered void.

12. SPARE PARTS

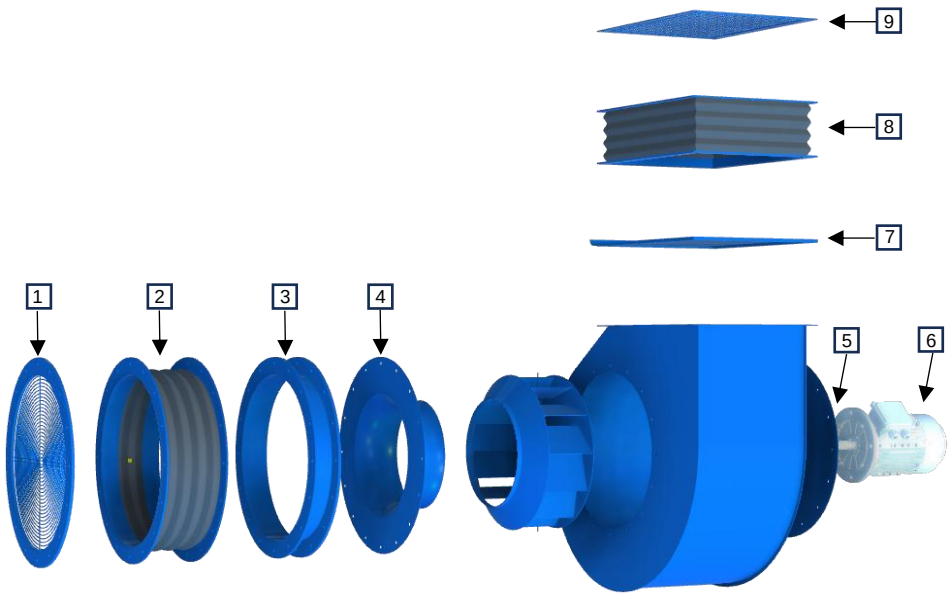
12.1 Arrangement 4



DESCRIPTION

1- SUCTION PROTECTION GRID
2- ANTI-VIBRATION SUCTION JOINT
3- SUCTION TRUNK
4- NOZZLE
5- SEALING RING
6- RING CLOSURE FLANGE
7- ELECTRIC MOTOR
8- SHOCK ABSORBERS
9- SHUTTER
10- PRESSURE ANTIVIRBATION JOINT
11- PRESSURE PROTECTION GRID

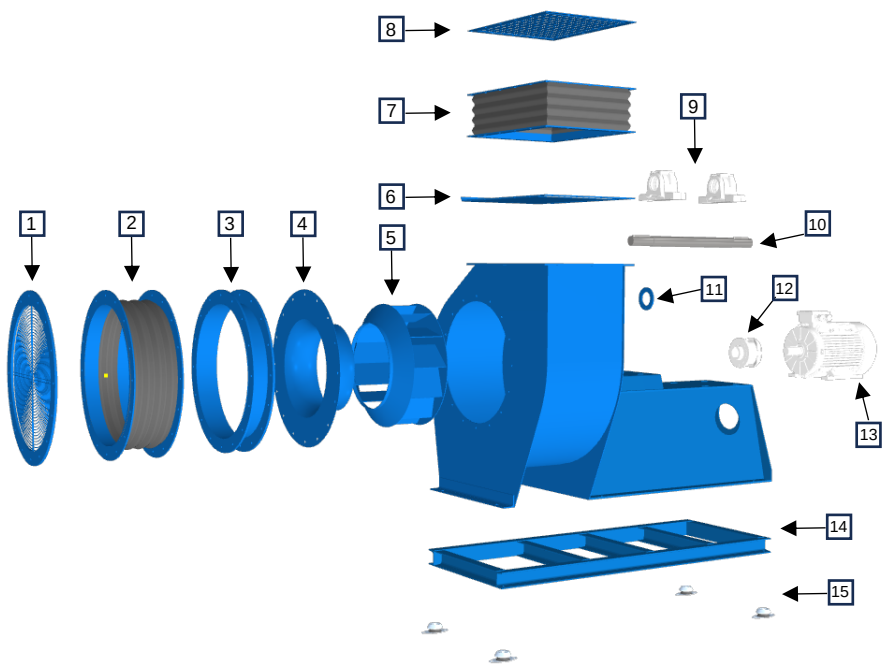
12.2 Arrangement 5



DESCRIPTION

1- SUCTION PROTECTION GRID
2- ANTI-VIBRATION SUCTION JOINT
3- SUCTION TRUNK
4- NOZZLE
5- FLANGE FOR MOTOR FIXING
6- ELECTRIC MOTOR
7- SHUTTER
8- ANTI-VIBRATION PRESSING JOINT
9- PRESSURE PROTECTION GRID

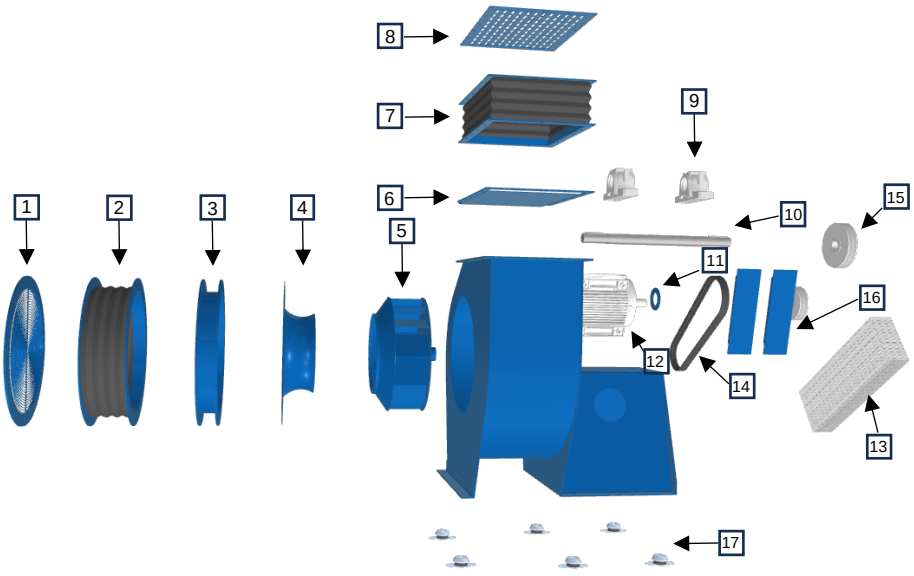
12.3 Arrangement 8



DESCRIPTION

1- SUCTION PROTECTION GRID
2- ANTI-VIBRATION SUCTION JOINT
3- SUCTION TRUNK
4- NOZZLE
5- IMPELLER
6- SHUTTER
7- ANTI-VIBRATION PRESSING JOINT
8- PRESSURE PROTECTION GRID
9- TRANSMISSION SUPPORTS
10- TRANSMISSION HUB
11- SEAL
12- JOINT
13- ELECTRIC MOTOR
14- FRAME
15- SHOCK ABSORBERS

12.4 Arrangement 9



DECRIPTION

1- SUCTION PROTECTION GRID
2- ANTI-VIBRATION SUCTION JOINT
3- SUCTION TRUNK
4- NOZZLE
5- IMPELLER
6- SHUTTER
7- ANTI-VIBRATION PRESSING JOINT
8- PRESSURE PROTECTION GRID
9- TRANSMISSION SUPPORTS
10- TRANSMISSION HUB
11- SEAL
12- ELECTRIC MOTOR
13- CARTER
14- TRANSMISSION BELTS
15- PULLEYS
16- BELT TENSIONING SLIDES
17- SHOCK ABSORBERS