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Operation and Maintenance Manual

EXPLOSION-PROOF CENTRIFUGAL FANS



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1. INTRODUCTION

The present Operation and Maintenance Manual is intended for a prospect buyer and user of the explosion-proof centrifugal fan. It contains instructions for intended use and safe transport, handing over for operation, operation, assembly, disassembly and repairs, maintenance and cleaning. Each worker performing the above mentioned activities and equipping the fan with accessories shall carefully read the manual.

The failure-free operation of the fan as well as the workers' safety at the work stations where the potentially explosive atmosphere may be present can be provided only if workers observe the guidelines listed below.

Note:

Failure to observe the instructions listed below can cause serious accidents leading to death, serious injury or material damages as a result of:

- Ignition hazards, i.e. fire, explosion.
- Mechanical hazards, i.e. crumpling, entanglement, catching, striking.
- Electrical hazards, i.e. electric shock as a result of direct or indirect contact.
- Thermal hazards, i.e. burn, frostbite.
- Noise hazards, i.e. loss of hearing, balance disorders.

Never use the explosion-proof centrifugal fan without reading the present Operation and Maintenance Manual.

1.1. Electrical Motor Operation Manual

The present Operation and Maintenance Manual is accompanied by the Electric Motor Operation Manual. The Electrical Motor Operation Manual which is intended for a prospect buyer and user of the explosion-proof centrifugal fan shall be considered an integral part of the present Operation and Maintenance Manual. Any instructions contained therein but not contained in the present Operation and Maintenance Manual shall be considered applicable for the explosion-proof centrifugal fan.

Note:

Failure to meet the instructions contained in the Electric Motor Operation Manual can cause serious accidents leading to death, serious injury or material damages as a result of:

- Ignition hazards, i.e. fire, explosion.
- Electrical hazards, i.e. electric shock as a result of direct or indirect contact.

Never use the explosion-proof centrifugal fan without reading the Electrical Motor Operation Manual.

1.2. User Guidelines

An explosion-proof centrifugal fan meets the requirements of equipment classified in the group, see appendix II, in accordance with the regulation of the Ministry of Development dated 6 June 2016 on *fundamental requirements for protective devices and systems intended for use in potentially explosive areas (2014/34/EU directive)*.

An explosion-proof centrifugal fan was designed by NM Design Office or Nyborg–Mawent S.A. and manufactured by Nyborg–Mawent S.A. in accordance with the currently applicable regulations, harmonized standards as well as technical standards and specifications.

1.3. Marking

For the safety of workers employed at work stations where potentially explosive atmosphere may occur, the information contained in the marking, i.e. fan's nameplate, electrical motor nameplate, direction plate marked on the explosion-proof

centrifugal fan (drawing 1, table 1, 2; 3, 4, 5) as well as safety signs i.e. warning signs, injunction signs stipulated in the operation and maintenance manual (table 6) must be observed.

Quality Control Certificate containing technical parameters of the fan is attached to the manual.

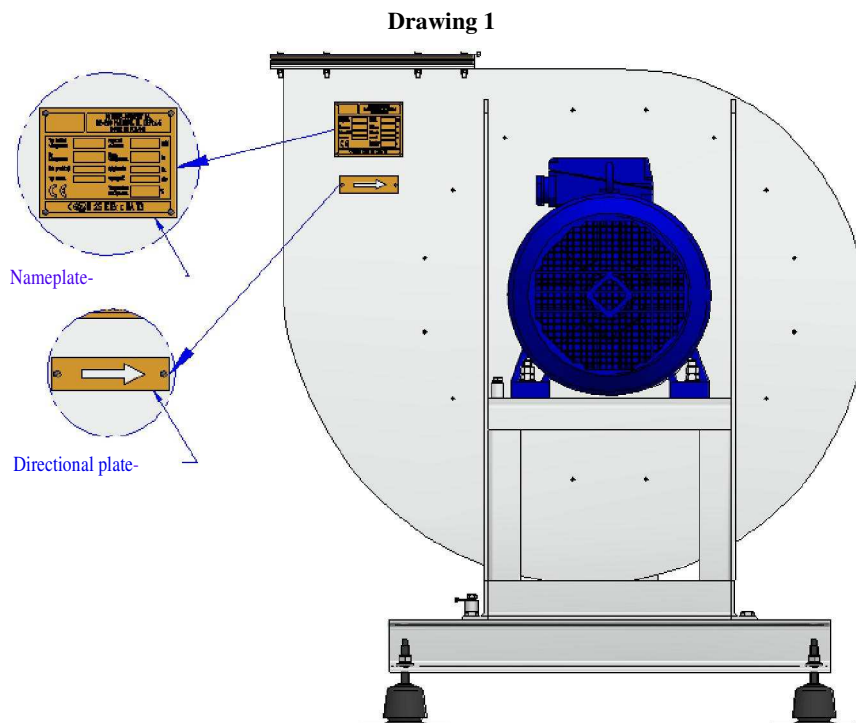
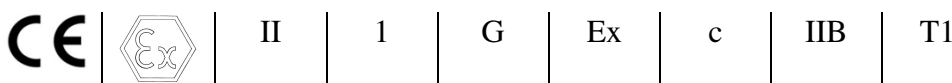


Table 1 – IDENTIFICATION OF INFORMATION CONTAINED IN THE NAMEPLATE

MARKING	UNIT	DESCRIPTION
Fan type and arrangement	-	Type and arrangement of the fan is determined by the location of the fan's outlet in accordance with PN-EN ISO 13349:2010.
Fan number	-	Fan number/subsequent factory number is assigned in order to facilitate fan's identification.
Year of production	-	Year, in which the fan was introduced for sale.
Motor type	-	Type of applied electric motor, the same data on type, power and frequency as contained on the electric motor nameplate.
Rotational speed	[min ⁻¹]	Maximum allowable rotational speed of impeller.
Fan's weight	[kg]	Total weight of fan.
Pressure increase	[Pa]	Pressure of medium (mixture) pressed by the fan at defined output.
Output	[m ³ /s]	Amount of medium (mixture) pressed by the fan at defined pressure increase.
Max. temperature	[°C]	Maximum temperature of medium (mixture) pressed by the fan.

Table 2 – SAMPLE MARKINGS ON THE NAMEPLATE



Conformity marking
Special marking of explosion-proof protection
Marking of equipment/fan group in an explosion-proof version
Marking of equipment/fan category in an explosion-proof version
Marking of explosive atmosphere caused by the mixture of air with gas, vapour and mist.
EXPLOSION-PROOF FANS
Marking of explosion-proof protection type – protection through constructional safety
Marking of explosiveness sub-group
Marking of temperature class

where:

-marking of equipment/fan category in an explosion-proof version and marking of explosiveness sub-group is presented in Table 3.

Table 3 – Groups of equipment/fan in an explosion-proof version and explosiveness sub-groups

Group	Group description	Sub-group	Sub-group description
II	Plants other than mining plants (devices operating aboveground in explosion hazard areas)	IIA	Propane group
		IIB	Ethylene group
		IIB + H ₂	Ethylene group with hydrogen
		IIIA	Group of agglomerates of volatile combustible fibres
		IIIB	Group of non-conductive dust
		IIIC	Group of conductive dust

-marking of equipment/fan category in an explosion-proof version and marking of explosive atmosphere caused by the mixture of air with gas, vapour and mist is presented in Table 4.

Table 4 – categories of equipment/fan in an explosion-proof version and marking of explosive atmosphere caused by the mixture of air with gas, vapour and mist










Type of hazard	Description of hazard	Equipment category	Zone	Presence of explosive atmosphere
G	Gasses, liquids and their vapours	1G	0	Permanent, maintaining for long time or frequently occurring
		2G	1	Occasional, may occur in normal conditions
		3G	2	Rare, non-occurring in normal conditions, if occurs, it will be present for short time only.
D	Combustible dusts	1D	20	Permanent, maintaining for long time
		2D	21	Occasional, may occur in normal conditions
		3D	22	Rare, non-occurring in normal conditions, if occurs, it will be present for short time only.

-Temperature class marking is presented in Table 5.

Table 5 - Marking of temperature class

Temperature class	Max temperature of surface [°C]	Gas ignition temperature [°C]
T1	450	>450
T2	300	300÷450
T3	200	200÷300
T4	135	135÷200

Table 6 – Safety symbols

SYMBOL	DESCRIPTION
	Important safety guidelines and instructions!
	Beware of danger, hazard!
	Mechanical hazard – striking, crushing, crumpling!
	Mechanical hazard – striking, crushing, crumpling!
	Mechanical hazard – striking, puncture, abrasion!
	Mechanical hazard – entanglement, catching!
	Mechanical hazard – striking, high pressure liquid ejection!
	Electric hazard - short-circuit, sparks, ignition, electric shock!
	Thermal hazard – hot surfaces, temperature increase, ignition, burns!



Thermal hazard – cold surfaces, frostbites!



Noise hazards - loss of hearing, balance disorders!



Pressed substances hazard – intoxication, disease, i.e. cancer!



Laser equipment hazard – hot surfaces, ignition!



Fire, explosion hazard!

1.4. Warranty and responsibility

Nyborg–Mawent S.A. undertakes to provide a warranty pursuant to applicable law. For a fan which was properly transported, handed over for use, operated and the following operations were performed properly: assembly, disassembly, repairs, maintenance and cleaning in accordance with the instructions described below.

Nyborg–Mawent S.A. shall not be held liable for any consequences resulting from the misuse of explosion-proof centrifugal fan in the potentially explosive zone.

Nyborg–Mawent S.A. shall not be held liable for any consequences resulting from the misuse of explosion-proof centrifugal fan.

Note:

The equipment's user is obliged to observe the requirements contained in the regulation of the Minister of Labour and Social Policy (MGPiPS) dated 8th July 2008 on minimal requirements related to work safety and hygiene at work positions where potentially explosive atmosphere may be present (J/L No. 138, item 931. With regard to the above the user is obliged to classify potentially explosive areas and perform risk assessment caused by explosive atmospheres (1999/92/EC directive – the so called ATEX USER'S).

2. Safety

The fan shall be used in compliance with its intended use (see **appendix no. II**).

2.1. Construction, list of subassemblies and parts

The fan is built of a casing with a motor frame to which an electric motor is assembled. Inside the casing there is an impeller fixed on the motor shaft/ bearing-mounted and protected against loosening with washers and screw. Suction stub with Ex throttle is fixed to the casing (see appendix I)..

In standard, the fan is equipped with inlet guard fixed to a suction stub and outlet guard fixed to a casing - with a sealing in between guards and suction stub. In special cases, inlet/outlet guards are allowed to be omitted, directly on the fan. In such a case the buyer is obliged to install guards on its own.

The fan is equipped with electrostatic discharge protection system. The fan has a protective earthing (PE) cable connected to the load-bearing casing, which shall be connected to the electrical bonding system.

The fan can be placed on a frame with vibration insulators.

The construction contains elements made of brass metal plates that minimise sparking hazard (if it results from the applied material conditions). No alterations and modifications are allowed.

2.2. Use – Receipt/Storage.

The proper failure-free operation of the fan as well as the workers' safety at the work stations where the potentially explosive atmosphere may be present can be provided only if the user observes the safety guidelines listed below.

Note:

The user's failure to observe the safety instructions listed below can cause serious accidents leading to death, serious injury or material damages as a result of:

- Ignition hazards, i.e. fire, explosion.



At the receipt, the user shall check the explosion-proof centrifugal fan – called hereinafter the fan – for any transportation damages and compliance of nameplate data with regulations related to equipment used in potentially explosive areas, whether the group and category of the fan's version is suitable to be used in the potentially explosive area/zone in accordance with the user's classification.

Never use the fan in case the group and category of fan's version does not correspond to the requirements of potentially explosive zone.

The fan which is not in operation shall be stored in place protected against weather conditions. The room shall be clean and dry with ambient temperature ranging from 5 to +40°C. Any vibrations and dust accumulation on the fan's surfaces shall be avoided. In case the equipment is not being used for longer than a month, it is recommended to periodically, every two weeks turn the impeller's shaft or the impeller by approx. 90° to avoid deformations of bearing races in a motor and/or fan's bearing-mounting.



All the above mentioned guidelines aim at the elimination of effects the moisture and dust accumulation may have on the fan, in the result of which heat transfer is deteriorated. It may, in consequence, cause temperature increase on the fan's surface and may create a potential ignition/explosion hazard.

Note:

In case of any doubts or questions related to the above safety guidelines concerning use – receipt/storage, please contact Nyborg–Mawent S.A.

2.3. Use - Transport/Lifting

The proper failure-free operation of the fan as well as the workers' safety at the work stations where the potentially explosive atmosphere may be present can be provided only if the user observes the safety guidelines listed below.

Note:

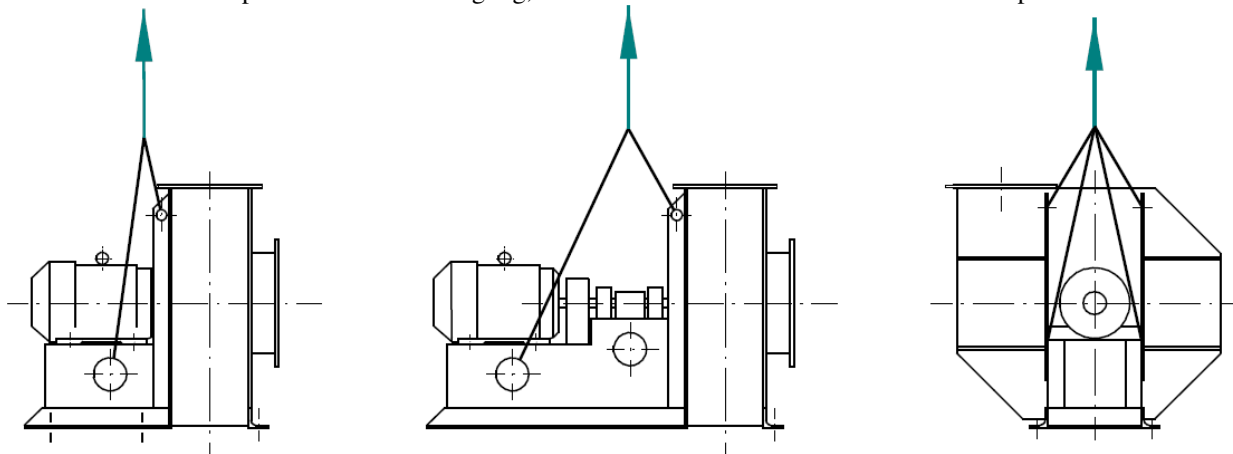
The user's failure to observe the safety instructions listed below can cause serious accidents leading to death, serious injury or material damages as a result of:

- Ignition hazards, i.e. fire, explosion.
- Mechanical hazards, i.e. crumpling, crushing, striking.



The fan is suitable for in-plant transportation – called hereinafter the transport – only in assembled state, as it was delivered from Nyborg–Mawent S.A. The fan can be transported by transportation means in accordance with work health and safety regulations stipulated in the 2007/30/EC directive.

The fan can be transported using fork-lift truck only in the fan’s working position, when packed on a pallet. The fan can be transported using a vertical lifting device in the fan’s working position only. While transporting the fan using vertical lifting device, the lifting devices/accessories shall be fastened in specially manufactured places: transportation lugs, assembly holes in a base. (drawing 2). The fan is allowed to be lifted using two transportation lugs, with lifting devices fastened diagonally, creating maximum strand’s deflection angle of 45°. Electric motor of the fan is equipped with handles/ bolts with transportation and/or lifting lug, these elements must not be used for the transportation of the fan.



Drawing 2



The purpose of all the above mentioned guidelines is to eliminate the risk of fan’s falling down which could cause injuries to the operating personnel and equipment’s deformations which would lead to the decrease of minimum allowable distance between the impeller and moving parts, creating, in turn, potential ignition hazard.

Note:

In case of any doubts or questions related to the above safety guidelines concerning the use – transport, please contact Nyborg–Mawent S.A.

2.4. Use – Handing Over for Operation

The proper failure-free operation of the fan as well as the workers’ safety at the work stations where the potentially explosive atmosphere may be present can be provided only if the user observes the safety guidelines listed below.

Note:

The user’s failure to observe the safety instructions listed below can cause serious accidents leading to death, serious injury or material damages as a result of:

- Ignition hazards, i.e. fire, explosion.
- Mechanical hazards, i.e. crumpling, entanglement, catching, striking.
- Electrical hazards, i.e. electric shock as a result of direct or indirect contact.
- Thermal hazards, i.e. burn, frostbite.
- Noise hazards, i.e. loss of hearing, balance disorders.

Note:

Safety guidelines related to handing the fan over for use are also important for operation, assembly and disassembly works, repairs, cleaning and maintenance.



The fan shall be located in the area/room with lightning security protecting against the effects of lightning stroke as well as voltage surge protection systems are recommended.

The fan must not be used when connected to mains without relevant lightning strike protection.



The purpose of all the above mentioned guidelines is to eliminate the effects of thunderbolt, resulting in flow of large currents which could cause injuries (electric shock) to the operating personnel, temperature increase of conductive surfaces of fan's parts which would lead to sparks generation in its vicinity, creating, in turn, potential ignition hazard.



The fan must be located in the area/room beyond the influence of electromagnetic waves of radio frequency $10^4 \div 3 \times 10^{12}$ Hz. Radio transmitters or industrial transmitters may be the source of the above mentioned waves. In case the devices emitting the above waves are found in the vicinity of the fan's operation, keep suitable distance from the transmitter and apply specialised protective screens.

The fan must not be used connected to mains without relevant protection against electromagnetic waves of the radio frequency $10^4 \div 3 \times 10^{12}$ Hz.



The purpose of all the aforementioned guidelines is to avoid the consequences of the above mentioned waves' influence, as conductive subassemblies and parts of the fan located in the radiation field of above waves may work as receiving antennas. In the consequence the energy received may generate sparks during connecting and disconnecting cables and create a potential ignition/explosion hazard.



The fan shall be mounted in the place ensuring free access, safe personnel operation and adequate lighting facilitating work during handing over for use, operation, assembly, disassembly works and repairs, maintenance and cleaning. Minimum required working space around the fan shall be 0.75m.



The purpose of all the guidelines mentioned above is to avoid trips or falls of operating personnel, causing injuries.



The fan shall be located in such a place in which the flow of electric motor cooling air is not hindered. Observe the instructions contained in the electric motor operating manual. Ensure that no nearby machines or direct sunlight cause the increase of the fans' surface temperature. In case the fan is located in the vicinity of the machinery emitting a substantial amount of heat, the fan shall be positioned so as hot air emitted by the machinery does not directly impact the fan and does not get into the cooling circuit of the motor.

Never use the exhaust air of other machinery.



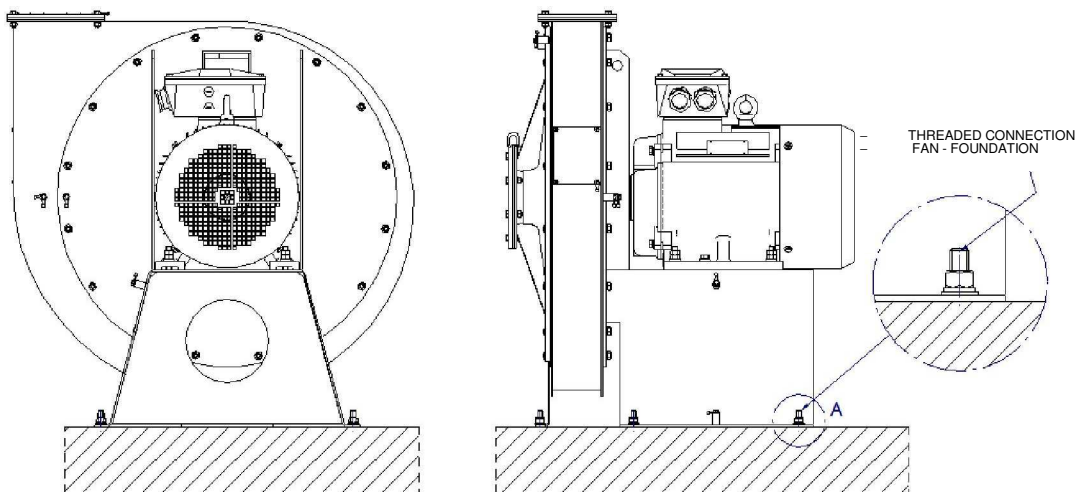
The purpose of all the aforementioned guidelines is to avoid burns caused to operating personnel and causing their injuries and to avoid temperature increase of the fan or electrical motor that may cause a potential ignition/explosion hazard.



The fan has to be placed on the foundation in the intended assembly position and fixed using the specially dedicated holes. For fan's positioning, observe the guidelines provided for in DIN 4024-1: 1988-04. In places where vibrations coming from fan's operation may cause disturbance of other devices/machines or disturb the operators present in the vicinity, it is recommended to place the fan on vibration insulators – through flexible connection. The fan can be equipped with vibration insulators (in option), disassembled for the transportation.

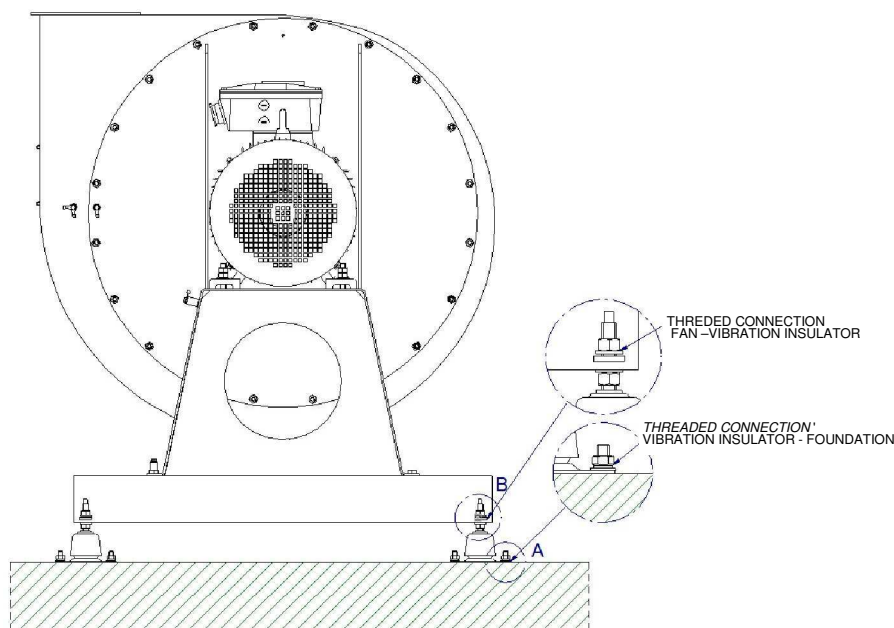
Mounting the fan to the foundation:

- Rigid: fan is directly fixed to the floor using screw connection (drawing 3, detail A) using holes in a base and a support.



Drawing 3

- Flexible: the fan is indirectly mounted to the ground through vibration insulators assembled to the fan's base or frame, reducing the strength of vibrations transmitted to the ground. Vibration insulators shall be fixed to the ground using screw connection (drawing 4) and holes in vibration insulators. The fan can be levelled using nuts screwed on the load bearing bolt of vibration insulator. During these activities, pay attention not to loosen the bottom counternuts of vibration insulators; therefore, while turning the other nuts, it is recommended to secure the load bearing nuts of vibration insulators against loosening. When changing the position of central levelling nuts from previously determined level, turn the all nuts by the same number of rotations in order to maintain equal load of all vibration insulators. All vibration insulators are equally loaded when the distance between the vibration insulator's base and the load bearing frame is equal.



Drawing 4

The fan delivered by Nyborg–Mawent S.A. to the user meets all the vibration level related requirements in accordance with ISO 14694:2003 for the G6.3 impeller balancing class. The fan prepared for operation shall run steadily. The fan mounted to the foundation shall not exceed allowable efficient values of vibration speed during operation (table 7).

Table 7

Status	Allowable speed of vibrations V_{ef} [mm/s]	
	Rigid fastening	Flexible fastening
Start-up	4.5	6.3
Alarm	7.1	11.8
Switch off	9.0	12.5

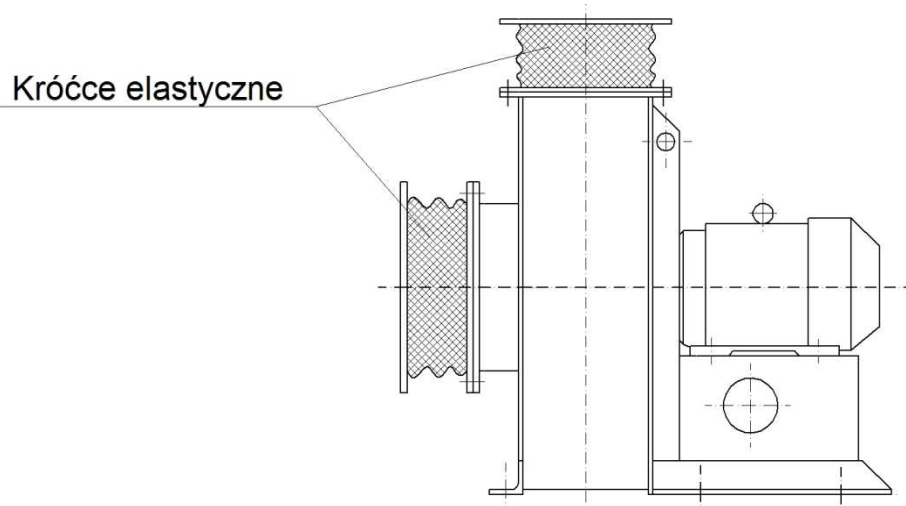
Excessive vibrations shall always be considered a sign of danger. The most often cause of vibrations level change is the accumulation of contaminations on the impeller or impeller’s wear. Monitoring of fan’s vibrations is recommended. Vibrations level shall be monitored through the measurement of efficient speed of vibrations on electric motor and fan’s bearing mounting. Changes can be easily detected by long-term comparison of the values. In case constant monitoring is applied, any exceeded allowable efficient values of vibration speed shall activate alarm and/or stop the fan. Exceeding the vibration level recommended for the fan’s operation is acceptable during the start-up (Table 7).

While connecting the fan to the pipelines, flexible stubs are recommended there (drg. 5). Flexible stubs (compensators) enable own vibrations of the fan to be transferred to the pipelines and vice versa. Compensators shall be located directly on inlet and outlet stub of the fan (except the connection of fan’s flow regulators). While assembling the fan on vibration insulators, compensators shall be applied on both, suction and pressure lines of the fan. To enable the compensator to eliminate tensioning forces present in the installation, compensator must be installed in non-tensioned condition.

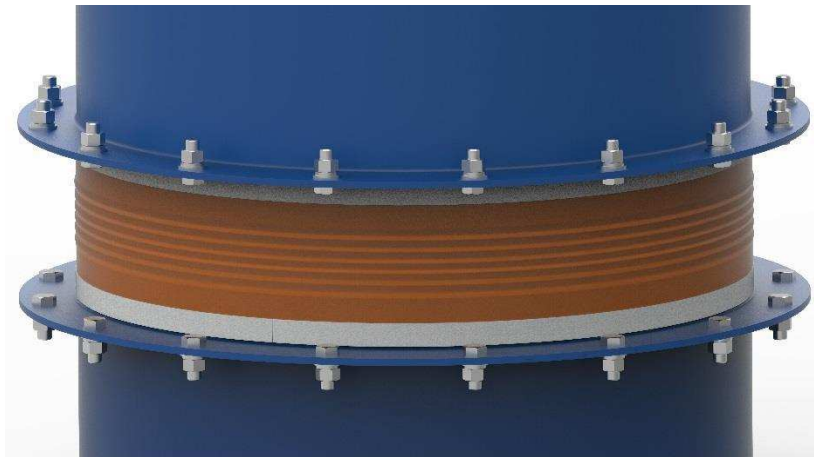


Note: Compensators shall not be installed until cables installation is finished! Compensator shall not be installed in tensioned or displaced position, ±5% displacement is allowable in relation to the compensator’s height.

Flexible stubs



Drawing 5



Drawing 6

Screw connections of flanges shall be assembled so as the heads of screws were located at the side of flexible fabrics (drg. 6).

During the assembly, gasket or packing cord shall be placed under the compensator's flange and screwed together. All fastening screws shall be screwed evenly.

Compensators shall be transported and stored only in tensioned condition. In case of prolonged storage period, without installation, compensators must be stored in a safe place.

Never use the fan failing to meet the above conditions during handing over for use and operation.



The purpose of all the guidelines mentioned above is to avoid the stroke, friction of the impeller as a result of which the minimum allowable distance between the impeller and fixed elements could be reduced, thus pose a potential ignition/explosion hazard.



Before the fan is connected to the installation/pipeline all the threaded connections shall be checked in order to eliminate possible clearance between:

- Fan – Foundation /Fan – Vibration insulator – Foundation.

- Base - Electric motor.
- Base - Bearing mounting.
- Shaft of bearing mounting / Motor shaft - Impeller.
- Electric motor - Clutch.
- Casing - Inlet stub.
- Casing - Outlet stub.
- PE terminal – Protective earthing cable.

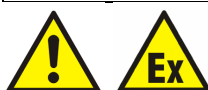
Threaded elements mentioned are presented in the appendix I.

All threaded connections shall be tightened with adequate torque and secured against loosening (Table 8).

Never use the fan with loosened threaded connections.

Table 8

Thread size	Tightening torque [Nm]	Deviation [%]	
		Lower limit	Upper limit
M5	5.9	0	+10
M6	10.6		
M8	26.9		
M10	46.3		
M12	79		
M16	169.7		
M20	331.6		
M24	575.9		
M30	1450		

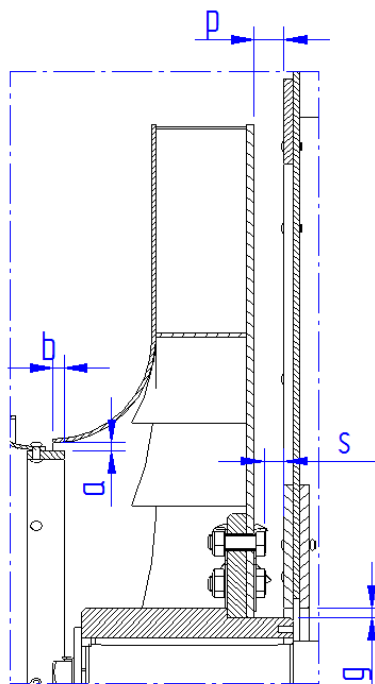


The purpose of all the guidelines mentioned above is to avoid the stroke, friction of the impeller as a result of which the minimum allowable distance between the impeller and fixed elements could be reduced, thus pose a potential ignition/explosion hazard.



Before the fan is connected to installation/pipeline check minimal distance between the impeller and fixed elements (Drawing 7). Fan delivered by Nyborg-Mawent S.A. to the user meets all requirements related to minimal distances between movable part and fixed subassemblies. Minimal allowable distances are determined in appendix I.

The distance “p” can be locally reduced as a result of fixing weights during balancing the impeller. The minimum allowable distance between the impeller and fixed assemblies must be minimum 0.5% of relevant diameter of contact, not less however than 2mm in axial and radial direction.



Drawing 7

Never use the fan failing to meet the above conditions during handing over for use and operation.



The purpose of all the guidelines mentioned above is to avoid the stroke, friction of the impeller as a result of which the minimum allowable distance between the impeller and fixed elements could be reduced, thus pose a potential ignition/explosion hazard.



Before the fan is connected to the installation/pipeline the external and connection dimensions of the installation /pipeline shall be verified for compliance with corresponding dimensions of the fan's inlet and outlet (appendix I) and whether there are no foreign objects inside the fan and in the ducts of the installation/pipeline. The fan delivered by Nyborg–Mawent S.A. to the user is equipped with inlet guard and outlet guards (appendix I) which are integral parts of the fan irrespectively of the fact whether the fan is integrated into the installation/pipeline at the inlet or outlet side only or integrated into the installation/pipeline at the inlet and outlet side at the same time.

The fan without the above guards is allowed to be used only if the installation/pipeline it is connected to is protected at the inlet and outlet side in a way ensuring minimum IP 20 protection grade in accordance with PN-EN 60529:2003.

Never use the fan without the inlet and outlet guards or protection of the installation/pipeline.

No personnel are allowed to be present in the stream of flowing medium (mixture).

Flexible stubs between inlet and outlet of the fan and installation/pipeline are recommended.



The purpose of all the guidelines above is to avoid striking with any loose foreign objects caught or thrown by the stream of flowing medium that may cause injury as well as eliminate strains, avoid reducing minimal allowable distance between the impeller and fixed parts as a result of deformations, to prevent potential ignition/ explosion hazard.



Before the electrical motor of a fan is connected to the mains, provide a safe electrical bonding connection (appendix I). Conductive fan's subassemblies and parts have an electrostatic discharge protection system:

- Casing - Inlet stub
- Casing – Base.
- Casing - Outlet guard
- Inlet stub – Inlet guard
- Electric motor - Base
- Base – Load bearing frame
- Fan – Earth electrode – Protective earthing cable to be connected to earth electrode.

Check the connection of electrical bonding cables in terminals. The end of protective earthing (PE) cable from the inlet/outlet guards side shall be disconnected and connected to the installation/pipeline and/or the end of protective earthing (PE) cable from the inlet stub /casing side shall be disconnected and connected with electrostatic discharge protection system of the installation/pipeline ensuring proper connection of electrical bonding (earthing) cables. After the above activities are completed, check the status of electrical bonding connections through the measurement of current leakage resistance using the ohmmeter by applying one electrode to protective earthing cable/PE terminal located on a load bearing frame and another electrode, depending on the manner of connection to the installation/pipeline, to inlet guard and outlet guard. The condition of hazardous charging of the fan is not present when the resistance value is $R \leq 10^6 \Omega$.

Never use the fan without the electrical bonding (earthing) cable connected.



The purpose of all the guidelines mentioned above is to avoid electrostatic discharge as a result of which any discharge of charged, isolated conductive parts may easily result in generating sparks and pose potential ignition/explosion hazard.



Only adequately qualified personnel, aware of hazards and holding E qualification certificate - installation and repair of explosion-proof electrical equipment is allowed to connect the electric motor of the fan and manufacture electrical installation, in accordance with the requirements of the PN-EN 50281-1-2:2002, PN-EN 60079-14 standards. Make sure that the parameters of the mains correspond to the parameters marked on the electric motor nameplate. In case the fan's electric motor is not equipped with packing gland installed in the terminal box, the box shall be selected so as to correspond to the category of the equipment as marked on the fan's nameplate. The section diameter of the power supply cable entered into the terminal box and going through the packing glands shall correspond to the parameters of the fan's electric motor and start-up method and the packing gland fastening the supply cable shall ensure relevant tightness of the same IP protection grade as the electric motor.

Never use washers or nuts between terminals in the electric motor terminal box and terminals of the supply cable.

The connection of the electrical motor to the mains must be compliant with the connection diagram in the terminal box and compliant with the electric motor operation manual. It is necessary to connect protective devices corresponding to the motor's parameters, protecting against short circuits and overloads in order to protect the electric motor and power grid. Settings of the protection devices must correspond to the maximum allowable current value marked on the electric motor's nameplate. The fan shall be also protected against consequences of phase interruption or asymmetry in power supplying mains which will isolate power supply and stop the fan in case at least one of the phases is cancelled.

Never use the electric motor of the fan without connection the thermal protection device.

It is assumed that electric motor in explosion-proof fans shall have "e" ignition protection grade, T1 to minimum T3 temperature class, min. IP54 protection class and B or F insulation class.

Never use "e" ignition protection grade motors in combination with frequency inverter.



In case frequency inverters are used for rotation adjustment, use hermetically tight motors of "d" ignition protection grade.

After switching on the fan, measure electricity consumption and compare it with the data marked on the fan motor's nameplate. It is recommended to switch on the fan with fan's inlet and outlet closed as much as possible so as the power consumption was as low as possible.

Never use the fan when any discrepancy between the measured values and data marked on the fan's motor's nameplate is ascertained.

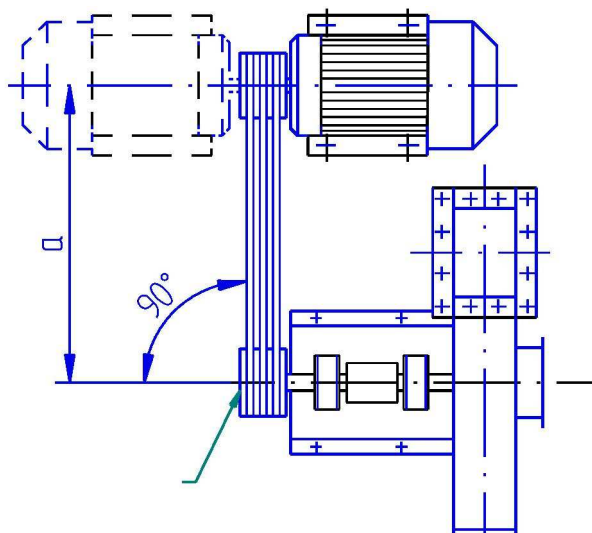
Before switching the fan on ensure by short, pulse activation of power supply that the direction of impeller rotation is compliant with the direction marked on the direction plate (drawing 1) located on the fan. The direction of impeller rotation can be changed by switching between two phase cables. Avoid separate, subsequent start-ups of the electrical motor of the fan as they may cause continuous overloads resulting in temperature increase.

Never use the fan with the rotation direction opposite to the direction marked on the direction plate.



Additional operations for belt /clutch drive.

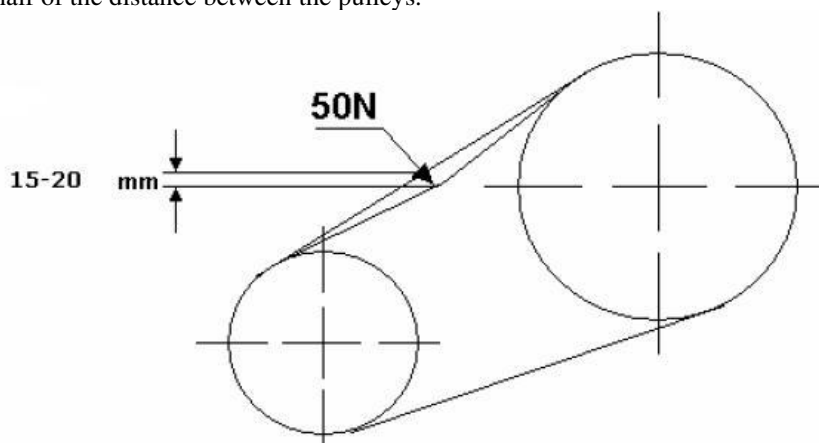
For belt drive (drive 2), check the correctness of alignment of fan and electrical motor. Axes of fan's and electrical motor's shafts shall be parallel to each other, and grooves in pulleys must match in order to locate V-belts in planes perpendicular to the axes of shafts. Allowable parallel alignment deviation of grooved pulleys faces shall not exceed 1 mm/m of distance between pulleys and the tolerance of mutual dislocation of pulleys' grooves shall not exceed 0.2 mm/m of the distance between pulleys ("a" dimension in drawing. 8).



Drawing 8

Belt tension is considered correct when under the load of 50N (thumb's pressure) onto the belt, the belt deflection of 15 ÷ 20mm (drawing 9) is reached in the half of the distance between the pulleys.

NOTE! Never exceed allowable tension of belts.



Drawing 9

After belts assembly, before the fan is switched on, check, by rotating the fan's impeller, whether elements of belt transmission operate without any friction against the transmission's cover.



The fan is equipped with non-combustible electrostatic belts, transmission cover and bearing-mounting shaft cover.

Never use the fan with different type of belts installed or without covers of transmission and bearing-mounting shaft.



Clutch manual was attached for clutch drive fan (drive 4). The clutch manual which is intended for a prospect buyer and user of the explosion-proof centrifugal fan shall be considered an integral part of the present Operation and Maintenance Manual. Any instructions contained therein but not contained in the present Operation and Maintenance Manual shall be considered applicable for the explosion-proof centrifugal fan.

Note:

Failure to observe the instructions listed in the clutch manual can cause serious accidents leading to death, serious injury or material damages as a result of:

- Ignition hazards, i.e. fire, explosion.
- Damage to the clutch or its elements.

Never use the explosion-proof centrifugal fan without reading the clutch manual.

2.5. Use - Operation

The proper and failure-free operation of the fan as well as the workers' safety at the work stations where the potentially explosive atmosphere may be present can be provided only if the user observes the safety guidelines listed below.

Note:

The user's failure to meet the safety instructions listed below can cause serious accidents leading to death, serious injury or material damages as a result of:

- Ignition hazards, i.e. fire, explosion.
- Mechanical hazards, i.e. crumpling, entanglement, catching, striking.
- Thermal hazards, i.e. burn, frostbite.
- Noise hazards, i.e. loss of hearing, balance disorders.

Note:

Safety guidelines related to the fan's operation are also important for handing over for operation, assembly and disassembly works, repairs, cleaning and maintenance.



The fan is not intended for pressing medium which may create toxic compound by its composition or concentration or which may cause serious diseases in case of prolonged exposure. The fan has no tightness grade and no maximum leakage values are determined that would correspond to the categories of PN-EN ISO 13349:2010 standard.

Never use the fan for pressing the above type of medium (mixture).



The purpose of all the guidelines mentioned above is to avoid hazards for operation personnel that may involve intoxication or diseases, such as: pneumoconiosis, cancer.



Personnel present in the vicinity of the fan shall wear personal protection measures, i.e. hearing protection selected to noise parameters and individual features. Failure to use hearing protection may result in loss of hearing, balance disorders, communicating problems. The fan does not exceed the allowable noise level value provided for in the regulation of the Ministry of Labour and Social Policy dated 06 June 2014 on the highest allowable concentrations and intensity of hazardous factors present in work environment (J/L No. 2014, item 817). However, if lower noise level is required on site, the application of suitable noise insulated chambers, noise insulated casings, screens, silencers, etc. is necessary.

Operating personnel must always wear hearing protection in the vicinity of the fan.



The purpose of all the guidelines mentioned above is to avoid hazards generated by noise which may result in loss of hearing, balance disorders, communicating difficulties.



Operating personnel present in the distance lower than 1m shall have personal protection measures protecting against thermal radiation and direct contact with hot surfaces. The temperature of the fan and its parts can exceed 70°C, but they shall not be insulated. If the fan is to be used in the temperature lower than -10°C, it should be secured by the user on site using warning signs.

Never use the fan with thermal insulation.



The purpose of all the guidelines mentioned above is to avoid thermal hazards which may cause injuries, i.e. burns, frostbites and to avoid temperature increase creating as a result a potential ignition/explosion hazard.



Operating personnel present in the vicinity of rotating parts shall wear personal protection measures, i.e. well-fitted protective clothes preventing catching and entanglement by movable parts of the fan. If operating personnel has long hair, it must, for safety reasons, tie it up at the back or otherwise secure it. Wearing jewellery may also cause injuries.

Never insert limbs in catching, entanglement zones.

Operating personnel of the fan must wear personal protective measures, i.e. overalls, hand protection. With regard to its intended use the structure of fan's subassemblies and parts may have sharp edges and corners which may cause falling and related injuries.

All persons present in the vicinity of the operating personnel must always wear personal protection measures.



The purpose of all the guidelines mentioned above is to avoid mechanical hazards which may cause injuries.



Operating personnel during the operation must not use any devices emitting electromagnetic waves of the frequency $3 \times 10^{11} \div 3 \times 10^{15}$ Hz, i.e.: lamps, laser equipment.

Never use the equipment emitting the above mentioned waves.



The purpose of all the guidelines mentioned above is to eliminate heating the fan's surface which may result in potential ignition/explosion hazard.



The fan is intended for operation with parameters presented in the flow chart (drawing 1) and marked on the nameplate (drawing 1, table 1). The fan is not recommended to be used within the flow parameters stipulated on the left No. P6-362, translation of the original instruction

side of the chart from the determined operation point, as it may cause a very unstable fan's operation and inducing the so called pumping phenomena, consisting in fan's and installation's/pipeline's vibrations and noise - similar symptoms to unbalanced impeller.

Never use the fan with the rotational speed higher than the speed defined by Nyborg-Mawent S.A.

Never operate the fan with parameters beyond work performance specification.



The purpose of all the guidelines mentioned above is to eliminate temperature increase which may generate hot surfaces of the fan and to avoid impeller's vibration that may reduce minimal allowable clearance between the impeller and individual parts of the fan and, as a result, cause potential ignition/explosion hazard.



During the first start up (about 1 minute), check whether the direction of impeller's rotations complies with the direction indicated by an arrow marked on the fan's casing and assess whether the fan operates steadily - without excessive vibration and noise.

If the trial start-up is considered satisfactory, then start the fan up for the period of 8 to 12 hours. During that time the motor's temperature increase cannot exceed the allowable temperature increase for the insulation class stipulated in the motor's nameplate, and the temperature increase for rolling bearings shall not exceed 60°C in relation to ambient temperature.

Fan with belt drive shall be turned off after approx. 2 hours of operation and the tension of V-belts shall be adjusted.

After the tests of installation which was newly handed over for operation are completed, after a few hours stop the fan, open the inspection manhole and control the condition of impeller and impeller's chamber. Remove any foreign matters and contaminations from the impeller.

Steady and even whirl of fan and motor indicates their correct operation. Sounds of friction or whistling, rotation drop, excessive heating of motor or smoke escaping from motor indicate fan's malfunction. In case any of these symptoms are noticed, turn the fan off immediately. Never turn the fan on again before all the reasons of malfunction are eliminated. If the fan's commissioning proves to be satisfactory, hand the fan over for operation.

2.6. Use – Assembly and Disassembly

Works related to the assembly and disassembly can be performed in case of repairs, maintenance and cleaning only. The proper, failure-free operation of the fan as well as the workers' safety at the work stations where the potentially explosive atmosphere may be present can be provided only if the user observes the safety guidelines listed below.

Note:

The user's failure to meet the safety instructions listed below can cause serious accidents leading to death, serious injury or material damages as a result of:

- Ignition hazards, i.e. fire, explosion.
- Mechanical hazards, i.e. crumpling, entanglement, catching, striking.
- Electrical hazards, i.e. electric shock as a result of direct or indirect contact.

Note:

Safety guidelines related to the fan's assembly and disassembly are also important for handing over for operation, operation, repairs, cleaning and maintenance.



Assembly and disassembly related works shall be performed outside the potentially explosive area or when the explosive mixture is not present.

Never perform any assembly or disassembly works in the presence of explosive mixture.

Some deviation from the above condition is acceptable. Personnel performing the above mentioned activities must use tools accepted for use in potentially explosive area. After the power is off wait until the impeller completely stops. During the assembly and disassembly works, the user and operation personnel must undertake relevant measures and provide adequate equipment in order to avoid incidental powering of the fan and accessories. Isolating, connection, earthing devices as well as interlocks shall be installed. Devices protecting against incidental switching must be clearly visible. Fan's switching device must be marked and secured so as no incidental activation is possible. Impeller must be mechanically immobilised in a way preventing deformation. Apart of power supply other sources of energy can be the source of incidental powering, such as hydraulic, pneumatic sources, potential energy and draught in installation/pipeline system. For the above conditions observe the regulations provided for in PN-EN 1037+A1:2010. Assembly and disassembly works can be performed by qualified operation personnel only, dedicated to these kind of works.

Never perform assembly or disassembly works with the fan connected to the power supply.



The purpose of all the guidelines mentioned above is to avoid hazards caused by incidental switching the power supply on which may cause serious injuries and create potential ignition/explosion hazard.



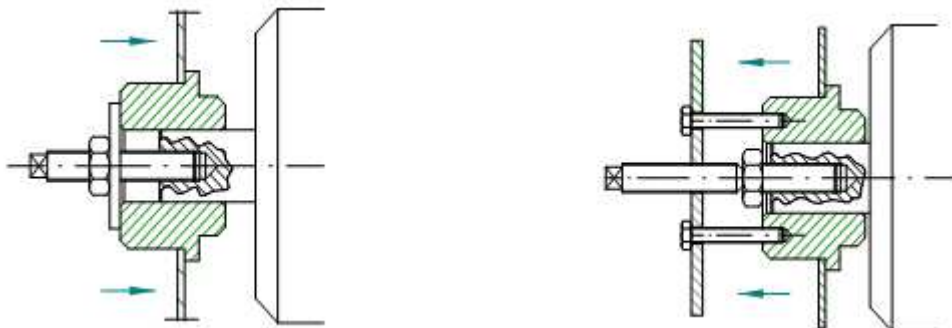
Fan's components shall be disassembled carefully, not to damage machined parts and surfaces. In order to disassemble an impeller, clutches, pulleys and bearings use a puller or other auxiliary devices (Drg. 10). Never apply one-sided levering, stroking, etc.

Never perform the assembly and disassembly works otherwise than indicated in the diagram.

For securing threaded connections only parts compliant with the list (appendix I) are allowed to be used. Incorrect assembly of threaded connections may cause their loosening as a result of fan's vibrations, reducing, in turn, the allowable clearance value between the impeller and fixed parts of the fan.



The purpose of all the guidelines mentioned above is to avoid assembly errors that may result in reducing the explosion-proof grade, thus create potential ignition/explosion hazard.



Drawing 10



During assembly and disassembly related works avoid situations in which the parts such as impeller, inlet stub and frame (housing) could be deformed, misshaped as a result of strike or drop. Parts that are deformed or misshaped and after the assembly do not meet the safety guidelines indicated in use – handing over for operation section (item 2.5.) shall be replaced with new ones in accordance with the list in the table in appendix I, ordered in Nyborg-Mawent S.A.



The purpose of all the guidelines mentioned above is to avoid assembly errors which may reduce minimal allowable clearance between the impeller and individual parts of the fan and, as a result, cause potential ignition/explosion hazard.

Note:

Each time after the fan assembly- and disassembly-related activity, the procedure of fan’s inspection before start-up shall be carried out in accordance with the safety guidelines defined in use – handing over for operation section (item 2.5.).

Never use the fan without checking it in accordance with safety guidelines indicated in the use - handing over for operation section (item 2.5.).

Note:

In case of any doubts or questions related to the above safety guidelines concerning the use – assembly and disassembly, please contact Nyborg–Mawent S.A.

2.7. Use – Repair, Maintenance, Cleaning

Works related to the repairs, maintenance and cleaning can be closely related to assembly and disassembly works. The proper failure-free operation of the fan as well as the workers’ safety at the work stations where the potentially explosive atmosphere may be present can be provided only if the user observes the safety guidelines listed below.

Note:

The user’s failure to meet the safety instructions listed below can cause serious accidents leading to death, serious injury or material damages as a result of:

- Ignition hazards, i.e. fire, explosion.
- Mechanical hazards, i.e. crumpling, entanglement, catching, striking.
- Electrical hazards, i.e. electric shock as a result of direct or indirect contact.

Note:

Safety guidelines related to the fan’s repairs, cleaning and maintenance are also important for handing over for operation, operation, assembly and disassembly works.



The scope of maintenance and cleaning works include external and internal visual inspection, cleaning the fan and electric motor from sediments, checking threaded connections.

Maintenance and cleaning of electrical motor shall be performed exactly in accordance with the electric motor operation manual.

After the first 500 hours of fan’s operation, carry out the following:

- Check the condition of impeller and clean it from possible sediments,
- Check and tighten threaded connections with the torque given in table 8,
- Check the tension of belts (drive 2),
- Check the condition of bearing-mounting (drive 4).

After the approx. 1500 hours of fan’s operation:

- Check the condition of impeller and clean it from possible sediments,
- Check and tighten threaded connections with the torque given in table 8,
- Measure the fan’s vibrations,
- Check the tension of belts (drive 2),
- Check the condition of bearing-mounting (drive 4),

- Replace lubricant in a bearing-mounting. While replacing lubricant in rolling bearings of bearing mounting, fill the whole free space between rolling parts and 1/2 to 2/3 of a free space in bearings' casings. Arcanol MULTI3 FAG lubricant is recommended.

Recommended intervals between inspections are indicated maximum periods between subsequent control of the machine's condition. If, during the operation, the conditions of fan operation require that – e.g. with regard to strong dusting of pressed medium and impeller's contamination, interval reduction is recommended.

Correctly operated fan does not require frequent repairs and replacement of parts. The repair/ major overhaul shall be carried out every 2 years, or earlier, if required by the fan's condition. Only Nyborg-Mawent S.A. is authorised to perform a major overhaul.

Major overhauls must always be performed by authorised representative.



The purpose of all the guidelines mentioned above is to avoid errors that may result in reducing the explosion-proof grade thus create potential ignition/explosion hazard.



For the fan's repair requiring the replacement of the subassemblies and/or parts use the subassemblies and/or parts accepted by Nyborg-Mawent S.A. only, presented in the table – appendix I. For the replacement of the electric motor, only the electric motor of the parameters correspondent to the equipment's category in accordance with PN-EN 60079-0: 2013-03 standard applicable to the fan on its installation site shall be used. Any possible repairs shall be performed by Nyborg-Mawent S.A.



Before starting any lubrication top up operations, lubrication nozzle and area around bearing mounting unit shall be well cleaned. For that purpose never use high pressure cleaning jets.

Roller bearing shall be lubricated during the operation through M10x1 lubrication inlet from the impeller's side and from the drive's side with the specified quantity and type of lubricant.

Top up lubrication schedule, quantity and quality of lubricant are specified in the table 9.

Waste lubricant shall be disposed of in accordance with relevant environment protection laws and regulations.

Table 9

Roller bearing	Housing	Top up lubrication schedule of bearings (manhours)			Quantity of lubricant ¹ (g)	Amount of top up lubricant per a roller bearing (g)	Lubricant
		n=3000rpm	n=1500rpm	n=1000rpm			
	SNV						
1307K-C3	080	2640	3120	3240	80	10	Arcanol MULTI3 FAG
1309K-C3	100	1680	2000	2080	180	15	
1311K-C3	120	1260	1440	1560	270	20	
1315K-C3	160	1080	1320	1440	650	40	
22218-E1-K-C3	160	800	1320	1800	650	40	Arcanol
22318-E1-K-C3	190	-	1400	1760	950	60	MULTITOP FAG

¹ Quantity of lubricant at the first installation or top up lubrication.

In order to warrant fresh lubricant reaches all rolling components of a bearing during the top up lubrication, it is necessary to use the amount of lubricant specified in the table 9.

Always perform top up lubrication:

- on warmed and rolling bearing,
- before downtime,
- before long idle periods.

Notes to the top up lubrication schedule

The schedule of top up lubrication depends on the degree of lubricant degradation through bearing friction, rotational speed, load and bearing’s temperature.

The presented top up lubrication schedule refers to bearing’s temperature of 75°C. In case of any deviations, adjust the top up lubrication schedule in accordance with the table 10.

Table 10

Bearing’s temperature	Coefficient of top up lubrication schedule
75°C	x1.00
80°C	x0.8
85°C	x0.63
90°C	x0.5
95°C	x0.4
100°C	x0.32

Because of their diverse chemical composition, lubricants must not be mixed together.

Roller bearings used in Nyborg-Mawent SA’s fans are factory filled with adequate amount of lubricant and ready for use. The above mentioned types of lubricant are standard type lubricants. If any other type of lubricant has been used, it is indicated on the fan’s nameplate.

Type of lubricant – see table 9.

In general, mixing lubricants shall be avoided. In case any non-compatible lubricants are mixed together, their composition may become significantly changed. Moreover, significant softening of mixed lubricant is possible; thus, lubrication conditions may deteriorate.

In general, the applied lubricant can be stored for three years, in the following conditions:

- closed room (warehouse),
- temperature from 0°C through +40°C,
- relative air humidity below 65%,
- without any exposure to chemicals (vapours, gasses, liquids),
- sealed bearings.

Lubricants are subject to aging as a result of environmental impact and use in operation.



Use of lubricants of any other types than recommended by Nyborg- Mawent S.A. is unacceptable in the warranty period.

Limit values of bearings’ temperature

- **warning at 80°C** – reduce the intervals between top up lubrication by applying the index specified in the table 10.
- **tripping at 100°C.**

Temperature is a “long life detector” for machine load. Overload of bearing, interrupted lubrication film, changes of rotational speed cause bearing’s temperature increase. Constant bearing’s temperature will be kept in constant operational conditions, on condition that a roller bearing is used in compliance with its intended use and in accordance with design assumptions. If temperature changes without any change of rotational speed or load, it means that a bearing is improperly lubricated. Any change of load as a result of disturbed operation of loose bearing can be diagnosed based on bearing’s temperature chart. Temperature control allows early diagnose of any damages of bearing caused by interrupted lubrication film. Damages caused by ageing and fatigue cannot be detected this way.

Temperature shall be measured using electrical temperature sensor directly at external surface of bearing’s housing.

Total replacement of lubricant

In general, during installation the bearing shall be totally filled with lubricant and any free space in the housing shall be filled in amount specified in the table “Top up lubrication schedule of bearings” which corresponds to approx. 50% of free space in the housing.

The whole amount of lubricant in a bearing shall be replaced when free space in housing is not enough to embrace additional lubricant, which corresponds to more than 75% of free space of the housing.

Too high amount of lubricant causes quick increase of bearing’s operational temperature, especially at high rotational speed. If operation is started at maximum speed, wait until excess lubricant locates in housing. By the end of lubricant “running-in” process, the bearing’s temperature decreases which confirms proper location of lubricant in a bearing-mounting.

During the lubricant replacement after the calculated period of operation or after a defined number of top up lubrication operations, the whole amount of waste lubricant shall be removed and then replaced with a fresh lubricant.

The lubricant replacement depends on easy access to the housing and its opening. Covers of split housings can be removed with ease to reveal the bearing. Removable upper part of split housing aligned with the lower part using expansion pins facilitates installation and maintenance. Upper parts shall not be exchanged with each other. After removing waste lubricant, fresh lubricant shall be applied between rolling elements first. Please, pay attention not to let any contaminations to penetrate inside the bearing and keep lubricant free of any contaminations. Use of protective gloves is recommended to avoid possible allergic skin reactions to the lubricant.

In case of planned fan’s downtime shorter than 3 months, bearings’ top up lubrication is recommended during the fan’s operation or during the downtime by rotating the impeller.

For prolonged downtime periods (longer than 3 months) and in case motor is equipped with condensate drain valves, drain the accumulated water condensate and close the valves. Fill 100% of spaces between housing covers and roller bearings with lubricant and manually turn the shaft a few times. Before re-starting, remove upper covers of bearing housing and check the level of lubricant amount. If the inspection reveals any loss of lubricant or lubricant’s contamination (ingress of condensate causes change of lubricant’s consistency), the lubricant shall be replaced. In case lubricant’s consistency has not changed or no contaminations were found, remove excess lubricant before starting the fan.

Never use any other subassemblies and parts than supplied by Nyborg-Mawent S.A



The purpose of all the guidelines mentioned above is to avoid assembly errors that may result in reducing the explosion-proof grade and to avoid creating potential ignition/explosion hazard.



The fan’s design provides for almost maintenance-free continuous operation. The frequency of maintenance inspections depend mainly on operating conditions and ambient conditions. It is recommended the frequency of impeller’s maintenance inspections to be determined based on the monitoring of fan’s vibrations. Any change of vibrations indicates impeller’s wear or accumulation of contaminations on the impeller. Then, it may be necessary to clean or balance the impeller.

Never use unbalanced impeller.



The purpose of all the guidelines mentioned above is to avoid vibrations of impeller, which may reduce minimal allowable clearance between the impeller and individual parts of the fan and, as a result, cause potential ignition/explosion hazard.



During the fan’s operation avoid high temperature fluctuations that may cause moisture accumulation inside the fan. It may propagate dust accumulation.

Never use the fan at high temperature fluctuations.



The purpose of all the guidelines mentioned above is to avoid impeller vibrations which may reduce minimal allowable clearance between the impeller and individual parts of the fan and too avoid temperature increase of the fan which may, as a result, cause potential ignition/explosion hazard.

Note:

Each time after the repair, maintenance and cleaning-related activity, the procedure of fan's inspection before start-up shall be carried out in accordance with the safety guidelines defined in use – handing over for operation section (item 2.5).

Never use the fan without checking it in accordance with safety guidelines indicated in the use - handing over for operation section.

Note

In case of any doubts or questions related to the above safety guidelines concerning use – repair, maintenance and cleaning, please contact Nyborg–Mawent S.A.

3. Failures, Malfunctions and Repairs

Any malfunction of the fan, fan-pipeline installation can have various origin (table 11) that shall be detected and removed observing all the above mentioned safety guidelines.

Table 11

TYPE OF MALFUNCTION	POSSIBLE REASONS	TROUBLESHOOTING
Fan (electric motor) - cannot start	Incorrect power supply	Check whether power supply is compliant with data on the nameplate of the electric motor
	Incorrect connection to power supply	Compare the connections with the diagram delivered with electric motor
	Damaged switch	Replace the switch
	Damaged electric motor	Replace the electric motor
Fan – excessive vibration	Loose threaded connections	Tighten and secure threaded connections
	Damaged or unbalanced impeller	Replace or balance the impeller
	Contamination of impeller	Clean the impeller
	So called ‘pumping’ phenomenon	Suppress the medium (mixture) flow in the suction line
		Select suitable fan
	Damaged bearings of electric motor	Replace the bearings of electric motor
Damaged bearings of electric motor’s bearing mounting.	Replace bearings of electric motor’s bearing mounting.	
Impeller – strokes, friction against fixed elements of a fan	Loose threaded connections	Tighten and secure threaded connections
	Deformation of impeller	Replace the impeller
	Deformation of housing	Replace the housing
	Deformation of inlet stub	Replace the inlet stub
Fan – insufficient pressure and output	Incorrect direction of impeller’s rotation	Check the electrical connection in the terminal box of the electric motor
	Contaminated inlet guard	Clean the inlet guard
	Contaminated outlet guard	Clean the outlet guard
Fan – excessive surface heating	Contamination inside the fan	Clean fan’s internal surfaces

	Contamination of fan's electric motor	Clean the electric motor
Electric motor – noisy operation, high power consumption, temperature increase	Short-circuit between the winding of the electric motor's stator	Check the winding of the electric motor's stator
		Replace the electric motor
	Damaged bearings of electric motor	Replace the bearings of electric motor
Fan – excessive noise	Incorrect fan selection	–
	Damaged bearings of electric motor	Replace the bearings of electric motor
	Damaged bearings of electric motor's bearing mounting.	Replace bearings of electric motor's bearing mounting.

4. TERMS AND CONDITIONS OF WARRANTY

1. Nyborg-Mawent S.A. grants the User a guarantee for the products sold on the terms and conditions provided in detail below.
2. Nyborg-Mawent S.A. guarantees the efficient operation of the product provided that the product is installed, maintained and operated in accordance with the Nyborg-Mawent S.A. guidelines set out in this document, hereinafter referred to: the "Operation Manual".
3. The warranty period is 24 (twenty four) months, starting from the date of delivery of the product – the fan - to the User.
4. The User has the option to extend the warranty, which requires individual arrangements between Nyborg-Mawent S.A. and the User and it is effected upon concluding an appropriate agreement and paying a warranty fee.
5. The warranty is applicable at the territory of the Republic of Poland.
6. Nyborg-Mawent S.A. may perform warranty service outside the territory of the Republic of Poland. The User should note the fact (possibility) of installation and operation of the product outside the territory of the Republic of Poland in the order, otherwise the possibility of using the warranty service outside the territory of the Republic of Poland in the future shall be excluded. In this case, the User shall bear the costs of, in particular, travel, accommodation and meals of the Nyborg-Mawent S.A. service technicians. Such service shall be based on separate arrangements between Nyborg-Mawent S.A. and the User, concluded in an appropriate agreement.
7. After the expiration of the warranty period, Nyborg-Mawent S.A. may perform post-warranty maintenance services for the User. In this case the provisions of clause 6, sentence 4 above shall apply accordingly.
8. Under the warranty Nyborg-Mawent S.A. shall be liable only for defects revealed in the warranty period and arising from product-related causes. The warranty does not cover the defects of the product resulting from other causes, i.e.:
 - a) installation and use of the product which is not in accordance with the intended use and/or engineering practice and the operation manual;
 - b) installation of the product by persons who are not appropriately qualified;
 - c) installation of the product not in compliance with the wiring diagram, powering the product with a voltage other than the one specified on the nameplate and/or in the operation manual;
 - d) unauthorised repairs or changes to the product's design without the consent of Nyborg-Mawent S.A.;
 - e) damage to the product caused by external factors (mechanical, thermal, chemical, water damage, etc.);
 - f) damage caused by improper transport or storage of the product;
 - g) unauthorised use involving operation of the product under conditions inconsistent with the intended use and design of the product and inconsistent with the operating conditions laid down in the operation manual;
 - h) chemical corrosion of the product's elements, e.g. as a result of condensation of aggressive compounds from the conveyed medium;
 - i) failure to carry out the mandatory inspections described in the operating instructions;
 - j) product damage resulting from vibration caused by erosion, clogging of the impeller, damage to the impeller or any other cause;
 - k) product damage caused by ingress of any object or component likely to cause such damage into the installation;
 - l) errors in the design of the installation or incorrect selection of the product;
 - m) product damage resulting from the use of non-original parts, accessories and materials not compliant with the Nyborg-Mawent S.A. recommendations;
 - n) product damage resulting from fortuitous events, force majeure (fire, flood, lightning, etc.);
 - o) malfunction of other installations (e.g. electricity, heating, etc.) and/or equipment affecting the operation of the product (e.g. inverters, relays, humidifiers, coolers, heaters, etc.).

9. The warranty does not cover defects resulting from normal wear and tear of the product and consumable parts, i.e.: bearings, filters, V-belts, oils, greases, etc.
10. The User shall lose their warranty rights (loss of warranty), in case of:
 - a) any modification of the product;
 - b) tampering with the product by unauthorised persons;
 - c) any unauthorised attempt to repair the product;
 - d) failure to carry out mandatory periodic inspections;
 - e) failure to carry out appropriate maintenance work when required;
 - f) the payment for the product is more than 30 days overdue from the due date.
11. Product which has been found defective should be taken out of use immediately after the defect has been found, otherwise the warranty will be invalidated.
12. Warranty claims are examined based on, in particular:
 - a) a complaint filed by the User, which should include: the User's details, the description and serial number of the product and its year of manufacture indicated on the nameplate, a detailed description of the product defect and the date on which it was detected. The complaint should be sent by email to: reklamacje@nyborg-mawent.com - not later than within 5 days from the date the defect was detected;
 - b) the above mentioned complaint shall be accompanied by the invoice for the purchase of the product and the proof of timely, i.e. compliant with the operation manual, periodic inspections (a completed inspection form can be found in the operation manual).
13. Nyborg- Mawent S.A is not obliged to disassemble elements of installation inherently belonging to the product. If the aforementioned disassembly is necessary for Nyborg-Mawent S.A. to carry out service work, it should be carried out by the User.
14. After the User has carried out the activities referred to in clause 12 above, then - taking into account previous arrangements with Nyborg-Mawent S.A.:
 - a) the User shall deliver the product personally to the registered office of Nyborg-Mawent S.A. or deliver it by express delivery to the registered office address of Nyborg-Mawent S.A., shipping at the risk of the User. Nyborg-Mawent S.A. shall not be responsible for any damage or destruction of the product during transportation, in particular resulting from improper packaging or securing the product by the User.
or
 - b) Nyborg-Mawent S.A. will send its service team to the place of assembly (installation) of the product in order to diagnose the problem (ascertain the defects reported) and then, if the complaint is found to be justified, undertake further activities referred to in clause 17 below. The User is obliged to ensure free access to the product and enable the Nyborg-Mawent service team to carry out maintenance activities in accordance with any and all work health and safety regulations, and in particular to ensure adequate preparation of the place where the maintenance activities will be carried out, i.e. to organise scaffolding, platform, ladders, lifting equipment, if necessary, and to provide access to power sources etc. Otherwise, the Nyborg-Mawent S.A. service team has the right to refuse to carry out the maintenance service and the User will be charged for the costs of travel by the Nyborg-Mawent S.A. service team.
15. Nyborg-Mawent S.A. is obliged to examine the warranty complaint, respond to it within 14 (fourteen) days from the date it was filed (response to the complaint).
16. In case the complaint is found justified, Nyborg-Mawent S.A. is obliged to repair (remove quality defects of the product) or replace the product with a product free from quality defects, if the repair of the product appears to be impossible or the cost of repairing the product is disproportionately high compared to the price of a new product. Nyborg-Mawent S.A. is solely responsible for deciding how to perform the warranty obligations.
17. The time limit for repairing the defect of the product or its replacement, depending on the way the warranty is being carried out, shall not exceed 90 days, starting from the day of filing the complaint. In cases justified by technical, technological or other reasons beyond the control of Nyborg-Mawent S.A., the aforementioned time limit will be extended by the additional time needed for the removal

- of the defect or replacement of the product, but not longer than another 30 days in relation to the time limit specified in the first sentence above.
18. Replaced products and parts obtained during the repair of the product shall become the property of Nyborg-Mawent S.A.
 19. In case the complaint is found justified, Nyborg-Mawent S.A. shall bear the costs of transport, including the costs of express delivery of the defective products, as well as the costs of travel and stay of the Nyborg-Mawent S.A. service technicians at the place of installation of the product at the User's premises.
 20. In case the complaint is found unjustified, Nyborg-Mawent S.A. shall invoice the User for the costs incurred in connection with the complaint (expert opinion, travel, express delivery, etc.).
 21. Nyborg-Mawent S.A. shall not be liable for any losses incurred by the User or any third party as a result of failure or malfunction of the product, both during the warranty period and after the warranty period, except for damages caused intentionally by Nyborg-Mawent S.A.
 22. The liability of Nyborg-Mawent S.A. under statutory warranty for physical and legal defects is excluded.

5. Disassembly and disposal

If the fan's repairs are technically and economically unreasonable, the fan shall be disposed of. The unit shall be disconnected from the power grid and then dismantled in the reverse order of installation, according to the clause 2.6, 2.3.

The following information should be regarded as recommendations only and is does not apply to fan design on special order. The Customer must ensure that the local regulations are observed.

6. Warranty Card

Number of inspection	Date of inspection	Description of activities	Stamp and signature of the inspector
1 [500 mh]			
2 [1000 mh]			
3 [1500 mh]			
4 [2000 mh]			
5 [2500 mh]			
6 [3000 mh]			
7 [3500 mh]			
8 [4000 mh]			
9 [4500 mh]			
10 [5000 mh]			

Number of inspection	Date of inspection	Description of activities	Stamp and signature of the inspector
11 [5500 mh]			
12 [6000 mh]			
13 [6500 mh]			
14 [7000 mh]			
15 [7500 mh]			

continued for non-standard warranty

Number of inspection	Date of inspection	Description of activities	Stamp and signature of the inspector
16 [8000 mh]			
17 [8500 mh]			
18 [9000 mh]			
19 [9500 mh]			
20 [10000 mh]			
21 [10500 mh]			
22 [11000 mh]			
23 [12000 mh]			
24 [12500 mh]			
25 [13000 mh]			

Number of inspection	Date of inspection	Description of activities	Stamp and signature of the inspector
26 [13500 mh]			
27 [14000 mh]			
28 [14500 mh]			
29 [15000 mh]			
30 [15500 mh]			
31 [16000 mh]			

mh = manhours

7. Equipment Card

Warranty: standard/ non-standard*¹

<p>Serial no. of a fan</p> <p>.....</p>	<p>Type of a fan</p> <p>.....</p>
<p>Date of first start-up</p> <p>.....</p>	<p>Stamp of the installation company</p> <p>.....</p>

¹ * Delete as appropriate
No. P6-362, translation of the original instruction

Appendix I – Drawing / parts list

Separate page.

Appendix II - Intended Use and Restrictions - II2DExcIICT125°C fans



Intended use:

Explosion-proof fan with direct drive is intended for operation in various industries (petrochemical, chemical, etc.) in potentially explosive areas:

- in the area where, during normal operation, the presence of explosive atmosphere is hardly probable, and should it occur, it is just for a short period of time, i.e. the presence of mixture of air with flammable substances in a form of cloud of dust – potentially explosive area, zone 22.
- in the area where, during normal operation, the occurrence of explosive atmosphere is probable, i.e. the presence of mixture of air with flammable substances in a form of cloud of dust – potentially explosive area, zone 21.
- for ventilation of the above potentially explosive areas/zones.

Explosion-proof fan with direct drive is intended for:

1. Operation, where:
 - Ambient (air) temperature in the fan operation zone ranges from -20 to +40°C;
 - Temperature of pressed air and media i.e. gases, vapours and mists ranges from -20 to +60°C;
 - Self-ignition temperature of pressed media i.e. gases, vapours and mists exceeds 135°C;
2. Installation:
 - Inside potentially explosive zone;
 - Outside potentially explosive zone.



Misuse:

Explosion-proof fan with direct drive:

- Never use the fan in underground operations in mines and in on-ground mine facilities, where the risk of gas and/or dust explosion exists - potentially explosive zone, zone 0 and/or 20;
- Never press dust - potentially explosive area, zone 20;
- Never press any medium which, at defined concentration, is:
 - toxic T;
 - toxic – flammable TF; toxic – corrosive TC; toxic – oxidising TO;
 - toxic – flammable - corrosive TFC; toxic – oxidising – corrosive TOC;
- Never press any medium in combination with substances classified in IIA explosiveness sub-group:
 - Ketones;
 - Esters;
 - Amines;
 - Organic acids;
- Never press any medium in combination with substances classified in IIB and II C explosiveness sub-group;
- Never press air and medium containing viscous contaminations;
- Never press air and medium of temperature below -20°C;
- Never press air and medium of temperature above 60°C;
- Never press medium of self-ignition temperature below 135°C;
- Never operate the fan with inlet and outlet guards removed.
- Never use the fan in places where devices emitting electromagnetic waves of the radio frequency $10^4 \div 3 \times 10^{12}$ Hz are installed.
- Never use the fan in places where devices emitting electromagnetic waves of the frequency $3 \times 10^{11} \div 3 \times 10^{15}$ Hz are installed.
- Never use the fan with the impeller's rotational speed higher than maximum speed defined on the nameplate.
- Never alter or modify the fan.

Appendix II - Intended Use and Restrictions - II2GExcIIAT3 fans



Intended use:

Explosion-proof fan with direct drive is intended for operation in various industries (petrochemical, chemical, etc.) in potentially explosive areas:

- in the area where, during normal operation, the occurrence of explosive atmosphere is probable, i.e. the presence of mixture of air with flammable substances in a form of gasses, vapours and mists – potentially explosive area, zone 1.
- in the area where, during normal operation, the presence of explosive atmosphere is hardly probable, and should it occur, it is just for a short period of time, i.e. the presence of mixture of air with flammable substances in a form of cloud of dust – potentially explosive area, zone 2.
- for ventilation of the above potentially explosive areas/zones.
- in the area, where explosive atmosphere is created by substances classified in IIA explosiveness sub-group– propane group, except for substances, (see Misuse).

Explosion-proof fan with direct drive is intended for:

1. Operation, where:
 - Ambient (air) temperature in the fan operation zone ranges from -20 to +40°C;
 - Temperature of pressed air and media i.e. gases, vapours and mists ranges from -20 to +60°C;
 - Self-ignition temperature of pressed media i.e. gases, vapours and mists exceeds 135°C;
2. Installation:
 - Inside potentially explosive zone;
 - Outside potentially explosive zone.



Misuse:

Explosion-proof fan with direct drive:

- Never use the fan in underground operations in mines and in on-ground mine facilities, where the risk of gas and/or dust explosion exists - potentially explosive zone, zone 0 and/or 20;
- Never press dust - potentially explosive area, zone 20, 21, 22;
- Never press any medium which, at defined concentration, is:
 - toxic T;
 - toxic – flammable TF; toxic – corrosive TC; toxic – oxidising TO;
 - toxic – flammable - corrosive TFC; toxic – oxidising – corrosive TOC;
- Never press any medium in combination with substances classified in IIB explosiveness sub-group:
- Never press any medium in combination with substances classified in II C explosiveness sub-group:
- Never press air of dust concentration exceeding 0.1g/m³;
- Never press air and medium containing viscous contaminations;
- Never press air and medium of temperature below -20°C;
- Never press air and medium of temperature above +60°C;
- Never press medium of self-ignition temperature below +135°C;
- Never operate the fan with inlet and outlet guards removed.
- Never use the fan in places where devices emitting electromagnetic waves of the radio frequency $10^4 \div 3 \times 10^{12}$ Hz are installed.
- Never use the fan in places where devices emitting electromagnetic waves of the frequency $3 \times 10^{11} \div 3 \times 10^{15}$ Hz are installed.
- Never use the fan with the impeller's rotational speed higher than maximum speed defined on the nameplate.
- Never alter or modify the fan.

Appendix II - Intended Use and Restrictions - II2GExcIIBT3 fans



Intended use:

Explosion-proof fan with direct drive is intended for operation in various industries (petrochemical, chemical, etc.) in potentially explosive areas:

- in the area where, during normal operation, the occurrence of explosive atmosphere is probable, i.e. the presence of mixture of air with flammable substances in a form of gasses, vapours and mists – potentially explosive area, zone 1.
- in the area where, during normal operation, the presence of explosive atmosphere is hardly probable, and should it occur, it is just for a short period of time, i.e. the presence of mixture of air with flammable substances in a form of cloud of dust – potentially explosive area, zone 2.
- for ventilation of the above potentially explosive areas/zones.
- in the area, where explosive atmosphere is created by substances classified in IIA explosiveness sub-group– propane group, except for substances, (see Misuse).
- in the area, where explosive atmosphere is created by substances classified in IIB explosiveness sub-group– ethylene group, except for substances, (see Misuse).

Explosion-proof fan with direct drive is intended for:

1. Operation, where:
 - Ambient (air) temperature in the fan operation zone ranges from -20 to +40°C;
 - Temperature of pressed air and media i.e. gases, vapours and mists ranges from -20 to +60°C;
 - Self-ignition temperature of pressed media i.e. gases, vapours and mists exceeds 135°C;
2. Installation:
 - Inside potentially explosive zone;
 - Outside potentially explosive zone.



Misuse:

Explosion-proof fan with direct drive:

- Never use the fan in underground operations in mines and in on-ground mine facilities, where the risk of gas and/or dust explosion exists - potentially explosive zone, zone 0 and/or 20;
- Never press dust - potentially explosive area, zone 20, 21, 22;
- Never press any medium which, at defined concentration, is:
 - toxic T;
 - toxic – flammable TF; toxic – corrosive TC; toxic – oxidising TO;
 - toxic – flammable - corrosive TFC; toxic – oxidising – corrosive TOC;
- Never press any medium in combination with substances classified in II C explosiveness sub-group:
- Never press air of dust concentration exceeding 0.1g/m³;
- Never press air and medium containing viscous contaminations;
- Never press air and medium of temperature below -20°C;
- Never press air and medium of temperature above 60°C;
- Never press medium of self-ignition temperature below 135°C;
- Never operate the fan with inlet and outlet guards removed.
- Never use the fan in places where devices emitting electromagnetic waves of the radio frequency $10^4 \div 3 \times 10^{12}$ Hz are installed.
- Never use the fan in places where devices emitting electromagnetic waves of the frequency $3 \times 10^{11} \div 3 \times 10^{15}$ Hz are installed.
- Never use the fan with the impeller's rotational speed higher than maximum speed defined on the nameplate.
- Never alter or modify the fan.

Appendix II - Intended Use and Restrictions - II2GExcIIB+H₂T3 fans



Intended use:

Explosion-proof fan with direct drive is intended for operation in various industries (petrochemical, chemical, etc.) in potentially explosive areas:

- in the area where, during normal operation, the occurrence of explosive atmosphere is probable, i.e. the presence of mixture of air with flammable substances in a form of gasses, vapours and mists – potentially explosive area, zone 1.
- in the area where, during normal operation, the presence of explosive atmosphere is hardly probable, and should it occur, it is just for a short period of time, i.e. the presence of mixture of air with flammable substances in a form of cloud of dust – potentially explosive area, zone 2.
- for ventilation of the above potentially explosive areas/zones.
- in the area, where explosive atmosphere is created by substances classified in IIA explosiveness sub-group– propane group, except for substances, (see Misuse).
- in the area, where explosive atmosphere is created by substances classified in IIB explosiveness sub-group– ethylene group, except for substances, (see Misuse).
- in the area, where explosive atmosphere is created by hydrogen;

Explosion-proof fan with direct drive is intended for:

3. Operation, where:

- Ambient (air) temperature in the fan operation zone ranges from -20 to +40°C;
- Temperature of pressed air and media i.e. gases, vapours and mists ranges from -20 to +60°C;
- Self-ignition temperature of pressed media i.e. gases, vapours and mists exceeds 135°C;

4. Installation:

- Inside potentially explosive zone;
- Outside potentially explosive zone.



Misuse:

Explosion-proof fan with direct drive:

- Never use the fan in underground operations in mines and in on-ground mine facilities, where the risk of gas and/or dust explosion exists - potentially explosive zone, zone 0 and/or 20;
- Never press dust - potentially explosive area, zone 20, 21, 22;
- Never press any medium which, at defined concentration, is:
 - toxic T;
 - toxic – flammable TF; toxic – corrosive TC; toxic – oxidising TO;
 - toxic – flammable - corrosive TFC; toxic – oxidising – corrosive TOC;
- Never press any medium in combination with substances classified in II C explosiveness sub-group, except for hydrogen:
- Never press air of dust concentration exceeding 0.1g/m³;
- Never press air and medium containing viscous contaminations;
- Never press air and medium of temperature below -20°C;
- Never press air and medium of temperature above 60°C;
- Never press medium of self-ignition temperature below 135°C;
- Never operate the fan with inlet and outlet guards removed.
- Never use the fan in places where devices emitting electromagnetic waves of the radio frequency $10^4 \div 3 \times 10^{12}$ Hz are installed.
- Never use the fan in places where devices emitting electromagnetic waves of the frequency $3 \times 10^{11} \div 3 \times 10^{15}$ Hz are installed.
- Never use the fan with the impeller's rotational speed higher than maximum speed defined on the nameplate.
- Never alter or modify the fan.

Appendix II - Intended Use and Restrictions - II3DExcIICT125°C fans



Intended use:

Explosion-proof fan with direct drive is intended for operation in various industries (grain and milling, lumber and paper industry, confectionery, food processing, etc.) in potentially explosive areas:

- in the area where, during normal operation, the presence of explosive atmosphere is hardly probable, and should it occur, it is just for a short period of time, i.e. the presence of mixture of air with flammable substances in a form of cloud of dust – potentially explosive area, zone 22.
- for ventilation of the above potentially explosive areas/zones.

Explosion-proof fan with direct drive is intended for:

1. Operation, where:
 - Ambient (air) temperature in the fan operation zone ranges from -20 to +40°C;
 - Temperature of pressed air and media i.e. gases, vapours and mists ranges from -20 to +60°C;
 - Self-ignition temperature of pressed media i.e. gases, vapours and mists exceeds 135°C;
2. Installation:
 - Inside potentially explosive zone;
 - Outside potentially explosive zone.



Misuse:

Explosion-proof fan with direct drive:

- Never use the fan in underground operations in mines and in on-ground mine facilities, where the risk of gas and/or dust explosion exists - potentially explosive zone, zone 0 and/or 20;
- in the area where, during normal operation, the occurrence of explosive atmosphere is probable, i.e. the presence of mixture of air with flammable substances in a form of gasses, vapours and clouds of dust – potentially explosive area, zone 1.
- Never press dust - potentially explosive area, zone 20, 21;
- Never press any medium which, at defined concentration, is:
 - toxic T;
 - toxic – flammable TF; toxic – corrosive TC; toxic – oxidising TO;
 - toxic – flammable - corrosive TFC; toxic – oxidising – corrosive TOC;
- Never press any medium in combination with substances classified in IIA explosiveness sub-group:
 - Ketones;
 - Esters;
 - Amines;
 - Organic acids;
- Never press any medium in combination with substances classified in IIB and II C explosiveness sub-group;
- Never press air and medium containing viscous contaminations;
- Never press air and medium of temperature below -20°C;
- Never press air and medium of temperature above 60°C;
- Never press medium of self-ignition temperature below 135°C;
- Never operate the fan with inlet and outlet guards removed.
- Never use the fan in places where devices emitting electromagnetic waves of the radio frequency $10^4 \div 3 \times 10^{12}$ Hz are installed.
- Never use the fan in places where devices emitting electromagnetic waves of the frequency $3 \times 10^{11} \div 3 \times 10^{15}$ Hz are installed.
- Never use the fan with the impeller's rotational speed higher than maximum speed defined on the nameplate.
- Never alter or modify the fan.

Appendix II - Intended Use and Restrictions - II3GExcT3 fans



Intended use:

Explosion-proof fan with direct drive is intended for operation in various industries (petrochemical, chemical, etc.) in potentially explosive areas:

- in the area where, during normal operation, the presence of explosive atmosphere is hardly probable, and should it occur, it is just for a short period of time, i.e. the presence of mixture of air with flammable substances in a form of gases, vapours and mists– potentially explosive area, zone 2.
- for ventilation of the above potentially explosive areas/zones.

Explosion-proof fan with direct drive is intended for:

1. Operation, where:
 - Ambient (air) temperature in the fan operation zone ranges from -20 to +40°C;
 - Temperature of pressed air and media i.e. gases, vapours and mists ranges from -20 to +60°C;
 - Self-ignition temperature of pressed media i.e. gases, vapours and mists exceeds 135°C;
2. Installation:
 - Inside potentially explosive zone;
 - Outside potentially explosive zone.



Misuse:

Explosion-proof fan with direct drive:

- Never use the fan in underground operations in mines and in on-ground mine facilities, where the risk of gas and/or dust explosion exists - potentially explosive zone, zone 0 and/or 20;
- Never press dust - potentially explosive area, zone 20, 21, 22;
- Never press any medium which, at defined concentration, is:
 - toxic T;
 - toxic – flammable TF; toxic – corrosive TC; toxic – oxidising TO;
 - toxic – flammable - corrosive TFC; toxic – oxidising – corrosive TOC;
- Never press any medium in combination with substances classified in IIA explosiveness sub-group:
 - Ketones;
 - Esters;
 - Amines;
 - Organic acids;
- Never press any medium in combination with substances classified in IIB explosiveness sub-group:
 - Hydrogen sulphide;
 - Chemical compounds containing oxygen: ethyl oxide, etc.
- Never press any medium in combination with substances classified in II C explosiveness sub-group;
- Never press air of dust concentration exceeding 0.1g/m³;
- Never press air and medium containing viscous contaminations;
- Never press air and medium of temperature below -20°C;
- Never press air and medium of temperature above 60°C;
- Never press medium of self-ignition temperature below 135°C;
- Never operate the fan with inlet and outlet guards removed.
- Never use the fan in places where devices emitting electromagnetic waves of the radio frequency 10⁴ ÷ 3x10¹² Hz are installed.
- Never use the fan in places where devices emitting electromagnetic waves of the frequency 3x10¹¹ ÷ 3x10¹⁵ Hz are installed.
- Never use the fan with the impeller's rotational speed higher than maximum speed defined on the nameplate.
- Never alter or modify the fan.

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Appendix III – EC Declaration of Compliance

Separate page