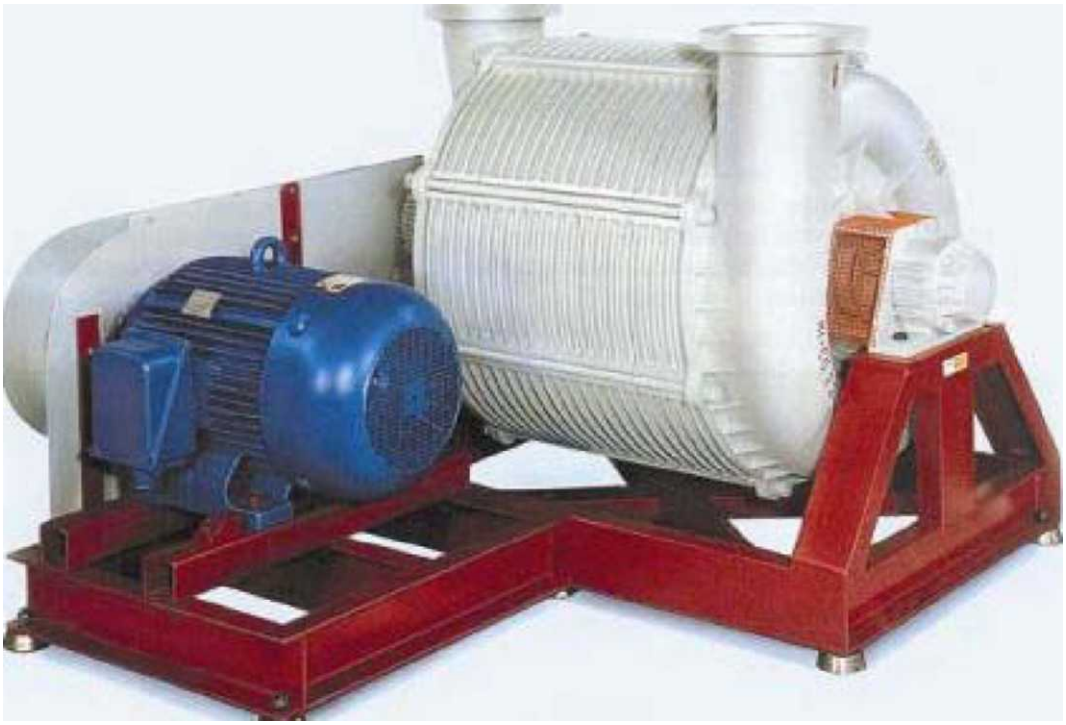
Via Reggio Calabria, 13- 10090 Cascine Vica Rivoli (TO) - ITALIA
Tel. (0039) 011.959.16.01 Fax (0039) 011.959.29.62
E-mail: savio@savioclima.it



Use & Maintenance Handbook MICO

Ed. 04/2013

INDEX

1.0 General information

SAVIO blowers are built in accordance with current regulations. Quality control and checks involve every production hase in order to guarantee the absence of defects of both materials and assembly. Every single machine is mechanically tested prior to shipment.

1.1 General machine description

MICO blowers are centrifugal machines with coaxial impellers, finalized to move the air.
MICO blowers create a change of pressure between the inlet mouth and the outlet mouth and a consequent movement of the air.
In order to obtain the performance in pressure and capacity, MICO blowers take the energy from an electrical motor directly coupled to the impeller through belts-pulleys or directly coupled to the motor.

1.2 Limitation of liability

Every machine shall be employed for its specific use. Any other use will be improper and out of contract for the manufacturer in case of damages caused by mistakes in installation, use, maintenance and repair of the machine and in any case by non compliance with the instructions provided by the manufacturer.
SAVIO liability on any claim will not in any case exceed the purchase price of the machine and/or plant generating the claim and will end at the expiry of the warranty period as defined here below.
In no case, both as result of breach of warranty, and due to obvious negligence, will SAVIO be liable for damages including, but not limited to, losses of profit or income, use of the machines and/or plants or related machinery, cost of capital, cost of the replacing machines and/or plants, equipment

1.3 Conditions of use

Blowers are generally installed on anti-vibrating bases and linked through anti-vibration joints to the outlet ducts and (if they are present) to the inlet ducts.
In every type of installation the blowers provide a smooth electrical starting, with delta-star connection systems, soft-starter, inverter, ecc
The smooth starting avoids violent stress on the bearings and mechanical parts.
The blower should be placed on a flat basement so that the load of the blower is uniformly distributed on anti-vibrating bases.
The anti-vibrating bases have to be fixed properly to the basements.
In connecting blowers and ducts, anti-vibration joints are always interjected.

1.4 Guarantee

SAVIO blowers are guaranteed twelve months from the date of shipment of the material, unless otherwise specified in the order. During this period SAVIO will repair or replace –free of charge- any damaged part due to defects of material or manufacturing at its premises. Any expense for the transport, including insurance expenses, of the faulty parts to and from SAVIO plant will be at the Buyer's charge.
Warranty will cover no damage due to negligence, misuse or improper use and however not included in the SAVIO instructions. Any repair, replacement or modification to the machine or plant carried out by any third party will invalidate warranty unless authorized by SAVIO which however will take no charge or liability for such repair or replacement.

1.5 Safety

During handling, installation, use and maintenance of the machine, the common sense and the strict compliance with general safety rules and with particular rules, if any, for that specific installation shall be applied. No operation or maneuver shall be carried out by not sufficiently skilled personnel.
In particular the following actions shall be avoided:
1) work on high voltage electric components without specific knowledge;
2) work on energized electric circuits or with loaded condensers;
3) think that the measures taken are undoubtedly sufficient and require no further check, e.g. when a work is continued after a break;
4) operate machines with uninstalled protections for couplings or bearing supports;
5) operate machines with free suction mouth.

2.0 RECEPTION & INSTALLATION

2.1 Collection & Packing

Upon collection of the machine, first of all it is necessary to check the compliance between ordered material and delivery and/or shipping documents. Then the conditions of the packing, or of the machine if this is visible, are checked. If the box shows some damages, check the contents and make a written reservation on the carrier's packing list. Any complaint for damages shall be notified to the carrier within 24 hours.

2.2 Handling

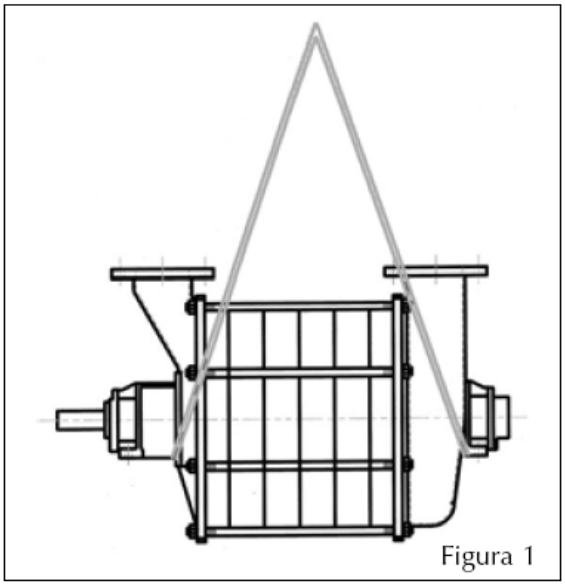


Figura 1

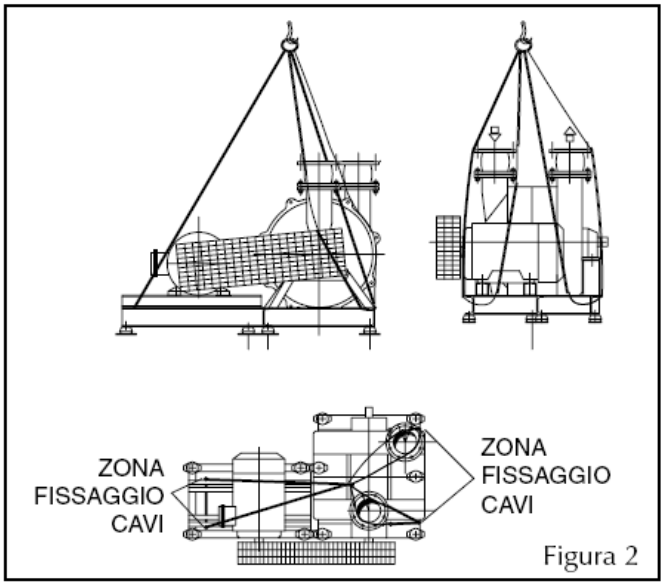


Figura 2

If the machine is with bare shaft, use a sling wrapping the blower box as shown in the figure 1 "MICO bare shaft placed in a sling on the box".
If the blower is equipped with base, fix the ropes directly to it as per figure 2 "MICO with base, placed in a sling with cables anchored to the base".
In both cases the load distribution shall be uniform.
Neither the flanges of the blower suction/delivery mouths nor the blower supports shall be used for handling.

2.3 Storage

Avoid storage in wet premises and near machines generating vibrations. Always protect the machine against rain and excessive heat by carefully covering motor, bearings, shafts, transmissions, and electric accessories, if any.
For a storage longer than 60 days, the following procedure shall be followed:
1) loosen any driving belt;
2) rotate machine and motor shafts by hand with some revolutions every 30 days approx.
3) replace bearing grease once a year.

2.4 Foundations

SAVIO blowers can be installed by interposing antivibration shock absorbers between base and face.
These shock absorbers absorb the vibrations generated by the rotating parts of the blower and insulate it against any vibration present in the surrounding environment.
For a proper operation of the machine, it is necessary that all antivibrating shock absorbers are evenly loaded and the base shall be flat.
Due to the irregularities of the face and the size tolerances of base and shock absorbers, it is often necessary to make some corrections by interposing thin plate shims between the shock absorber base and the face.

2.5 Fixing

Use all fixing points and make sure that, with all bolts completely tightened, the blower structure is not deformed.

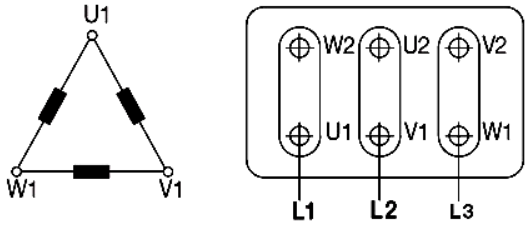
2.6 Connection to the utilities

It shall be made by means of antivibration joints preventing the transmission of any vibration from and to the blower and absorbing any thermal expansion.

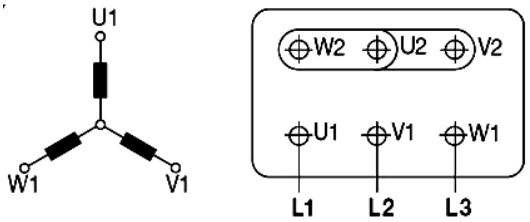
3.0 START UP

3.1 Electric connection to the three-phase motor

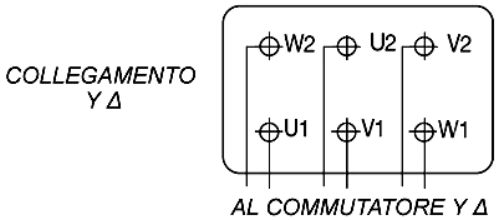
The following figure shows the different types of connection.



Connection Δ



Connection Y



CAUTION: In accordance with CEI 17-7 regulation, it is indispensable to use differential thermal relays sensitive to phase difference (Note: in this case the word differential is to be referred to the mechanical device causing the accelerated intervention in case of phase lack and is not at all referred to the same adjective relevant to the "safety" automatic switches). The mechanical overload, turning into an electric overload balanced on the three phases, can be controlled by the ordinary thermal relay. The failure, such as single-phase operation, can be controlled by the "differential" thermal relay sensitive to the phase lack.
As information, in case of cut-off of one of the three conductors, a three-phase asynchronous motor, if already started, can go on working. As a matter of fact the magnetic field generated by the stator windings creates a torque, although of reduced value, and the motor temperature remarkably increases.
If the single-phase operation is not interrupted within a few minutes, there will be irreversible damages to the motor due to deterioration of insulation. The single-phase operation can be caused by a failure on the main (loosened terminal, broken conductor, bad connection, etc.), but more often it is due to the blowing of only one of the three fuses installed before the motor against short circuits.

Therefore the first and most important thing to do against single-phase operation is to avoid installation of fuses.
Please remember that for the dimensioning of the thermal magnetic switch, in case of direct start up, the peak current can be 6.5 times higher than the rated current. For example, a 7.5 KW motor with 15.5 A (V 380) rated current reaches a peak of 100 a with a direct start up (6.5 x 15.5) With a delta-star start up the current input is limited to 2.2 higher than the rated current. When shifting to delta, a current peak takes place which is 4.5 higher than the rated current.

3.2 Prior to start up

Prior to the motor start up, the following safety checks shall be carried out:
1) Make sure that the anchor bolts of the base, blower, and motor are securely and correctly fastened;
2) Check that all moving parts (impeller, transmission, driving shaft) have no obstacle;
3) Before connecting the motor to the power supply line, check that the connection between the terminals is set for the line voltage;
4) Connect the screw on the terminal board and also on the motor base to the ground clamp.

It is advisable to carry out the start up with damper or delivery regulator completely closed. This precaution decreases the input and therefore the thermal overload.
Repetitive and consecutive motor starts up should be avoided as much as possible. No absolute indication about the max. number of starts up/hour can be provided as these depend on different factors such as: power, number of revolutions, PD2, installation conditions, etc.

3.3 After start up check

1) That the anchor bolts of the base, blower, and motor are securely and correctly fastened.
2) That the direction of rotation is the one shown by the camber, the absorbed current is not higher than the rated one for the motor, and the blower shows no anomalous vibration.
3) Also check that the temperature of the support bearings is regular (after a temporary increase during first start up, a following decrease in temperature takes place over a few hours).
4) After a few hours check that the belts are properly tightened and rectify accordingly, if necessary; check bolt tightening again.
5) Measure the absorbed current on one of the three line conductors. In the Y connection, reading shall be made before the commutator; if this is not possible, measure the phase current on any of the 6 conductors to the terminal board and multiply this value by 1.73.

3.4 Safety information

The blower during its working time create a high level of acoustic pressure.
The acoustic pressure of the blower is not valuable before the installation.
The acoustic pressure is related to the installation type, to the rpm, air speed in the ducts, drops pressure in the ducts, reverberation of the room where the blower is installed, ecc.
Generally the blower connected to the ducts, and in extreme conditions, could have levels of acoustic pressure around 100 dBA in a band from 500 to 1500 Hz.
Those who work in the immediate closeness of the blower must wear protective earphones.

3.5 Operative method in case of shutdown, failure, ecc…

The possible breakdown of a bearing or the entry of external parts in the impellers (stones, metal parts, bolts, etc.) may lead to the locking of the blower. In this case it is necessary to operate in the following way:

1) Disconnect the power supply acting on the isolators.
2) Check that the defective parts are not overheated.
3) Disconnect the connecting belt pulleys as per chapter.
4) Ask for intervention of maintenance mechanics or our assistance.

3.6 Belts replacement

1) Stop the blower, interrupting the power supply from the electrical panel.
2) Pull the front of the belts carter protection working with the appropriate keys.
3) Loosen the locking bolts of the motor binding the feet of the motor.
4) Acting on registering the belt stretchers, unscrew them, reducing the tension of the belts.
5) Remove the belts eventually worn.
6) Put the new belt in the pulley grooves.
7) Put the belts in tension acting on screwing down the belt stretchers.
8) Check the alignment of the pulleys, with the help of a laser device or at least with alignment rod.
9) Block the motor by adjusting the bolts of the feet.
10) Replace the belts carter protection screwing constraint bolts.

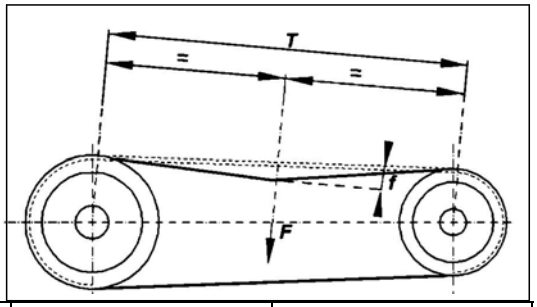
3.7 Belt tightening

Coupling by means of belts and pulleys is largely used as it allows to choose the most favorable revolving speed and to employ the blower near the best performance point.

3.8 Working method

The proper operation of a transmission depends on the correct assembly tightening. The following procedure shall therefore be followed by acting on the tightener:

1) Measure free section **T**..
2) For every belt apply, by means of a dynamometer, a perpendicular force capable of creating a camber **f** equal to 1.5 mm every 100 mm of **T**.
3) Check value **F** provided by the dynamometer with values **F'** and **F''** shown in the table.



Belt section	Ext.dia of pulley min., mm	RPM pulley min.	Minimum F' [newton]	Max. F'' [newton]
SPZ	50 ÷ 90	1200 ÷ 5000	10	15
	100 ÷ 150	900 ÷ 1800	20	30
	155 ÷ 180	600 ÷ 1200	25	35
SPA	90 ÷ 145	900 ÷ 1800	25	35
	150 ÷ 195	600 ÷ 1200	30	45
	200 ÷ 250	400 ÷ 900	45	65
SPB	170 ÷ 235	900 ÷ 1800	35	45
	250 ÷ 320	600 ÷ 1500	40	60
	330 ÷ 400	400 ÷ 900	45	65
SPC	250 ÷ 320	900 ÷ 1800	70	100
	330 ÷ 400	600 ÷ 1200	80	115
	440 ÷ 520	400 ÷ 900	90	130

N. B.

1) The table regards transmissions with ratios from 2 to 4. For **F**<**F'** the belt shall be further tightened. For **F**>**F''** the belt is too tightened.
2) During the running in of transmissions, tightening rapidly decreases. During assembly it is therefore necessary to tighten the belts so that the force generating camber **F** is 1.3 higher than the one shown in the table. It is necessary to often check belt tightening.

For other types of coupling, please call our Technical Department.

4.0 OPERATION ANOMALIES

The following table includes the causes and remedies to operation anomalies, if any.

ANOMALY	CAUSE	REMEDY
Difficult start up (Static torque not sufficient to reach rated revolutions with subsequent disconnection of thermal relay).	1) Supply voltage reduced.	Check and rectify.
	2) Lack of a phase of supply.	Check supply line and relevant electric connections.
	3) Disconnection of remote control switch (in case of delta star start up).	a) Check the insertion time of first connection; b) Check that the direction of rotation is the same for both connections (please remember that the delta star passage shall take place when, after the current peak at insertion, current stabilizes at a lower value).
	4) Motor torque insufficient to overcome the moment of inertia of the motor impeller.	Call our Technical Dept. The installed motor is probably under dimensioned.
	5) Remote overload cutout under dimensioned in comparison with the input..	Replace remote overload cutout.
	NOTE: The load at start up can be limited by closing the suction mouth.	
Reduced performance (Shown through a reduction in capacity and therefore of differential pressure through the machine)	1)Suction filter (if installed) is dirty.	Replace filtering elements.
	2) Valves before and/or after the machine not properly adjusted.	Check and rectify.
	3) Ducts of impellers or diffusers partially clogged due to the presence in the transported fluidof components causing deposits.	A general overhaul of the machine may be required.
	4) Clogged ducts before and/or after the machine.	Check and rectify.
	5) Reversed direction of rotation due to interventions on the motor or on electric equipment.	Check and rectify.
	6) Distribution system with not perfectly sealed flanges.	Check and rectify.
Altered noise (The noise of the blower is higher in comparison with the values of a new machine).	1) The machine is working under pumping condition.	Aumentare la portata.
	2) Bearings are deteriorated (components with high noise frequency).	Sostituire i cuscinetti.
	3) Damage due to rubbing of the impellers working at excessive temperatures, failure of a bearing, or presence of foreign matters in in the transported fluid.	Arrange for a general overhaul.
	4) Further to maintenance interventions, a correct alignment may not have been carried out, the machine may not have been properly positioned on the base.	Check and rectify.
Excessive delivery or discharge temperatures	1) Increased suction temperature	Check and rectify.
	2) Blower base not properly laying on foundation.	Increase delivery.
Excessive vibrations	1) Bearing deterioration.	Replace bearings
	2) Blower base not properly laying on foundation.	Check contact.
	3) Soffiante che non poggia correttamente sul basamento.	Check contact.
	4) Driving belts excessively tightened.	Restore correct tightening.
	5) Rotor unbalance due to deposits on impellers.	A general overhaul of the machine may be required.
	6) Rotor unbalance due to impeller corrosion.	Arrange for a general overhaul
	7) Rotor unbalance due to impeller breakage.	Arrange for a general overhaul
	8) Transmission through foundations further to the start up of adjacent machines.	Check and improve insulation
	9) Deterioration of the electric motor bearings with transmission of vibrations to the blower through belts and base.	Replace bearings and check dynamic balancing of the motor.

5.0 MAINTENANCE & REPLACEMENTS

5.1 Pulleys & Belts

They shall be carefully balanced in order to avoid annoying vibrations that rapidly damage bearings. Check that the alignment is correct or is carefully carried out. Clean grooves. Clean every face of the belts. Measure tightening and if necessary restore it according to the method set forth in section 3.7.
The belts should be replaced every 10.000 operating hours

5.2 Filter

It is not possible to previously indicate the replacement cycle of filters as the operation and environmental conditions may be the most different ones. The replacement intervention is however necessary when the load loss due to the filter reaches a value of 30 ÷ 50 mmH_2O in addition to the regular loss when the filter is new.

5.3 Grease supports

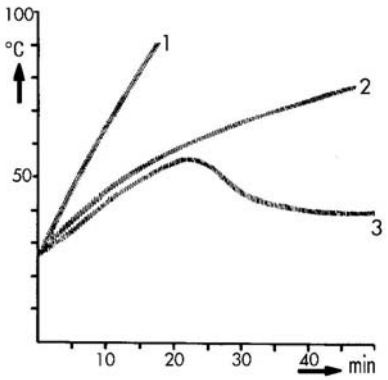
The type of grease used, unless otherwise required, is **SKF LGHP2.**
This is a grease for high temperatures with the following features:

DIN 51825 code	K2N-40
NLGI consistency class	2–3
Soap type	Di–urea
Colour	Blue
Base oil type	Mineral
Operating temperature range	–40 to +150 °C (–40 to +300 °F)
Dropping point DIN ISO 2176	>240 °C (>465 °F)
Base oil viscosity	
40 °C, mm²/s	96
100 °C, mm²/s	10,5
Penetration DIN ISO 2137	
60 strokes, 10^{-1} mm	245–275
100 000 strokes, 10^{-1} mm	365 max.
Mechanical stability	
Roll stability, 50 hrs at 80 °C, 10^{-1} mm	365 max.
Corrosion protection	
Emcor:	
– standard ISO 11007	0–0
– water washout test	0–0
– salt water test (100% seawater)	0–0
Water resistance DIN 51 807/1, 3 hrs at 90 °C	1 max.
Oil separation DIN 51 817, 7 days at 40 °C, static, %	1–5
Lubrication ability R2F, running test B at 120 °C	Pass
Copper corrosion	
DIN 51 811, 110 °C	1 max. at 150 °C (300 °F)
Rolling bearing grease life R0F test L50 life at 10 000 r/min., hrs	1 000 min. at 150 °C (300 °F)
Fretting corrosion ASTM D4170 (mg)	7

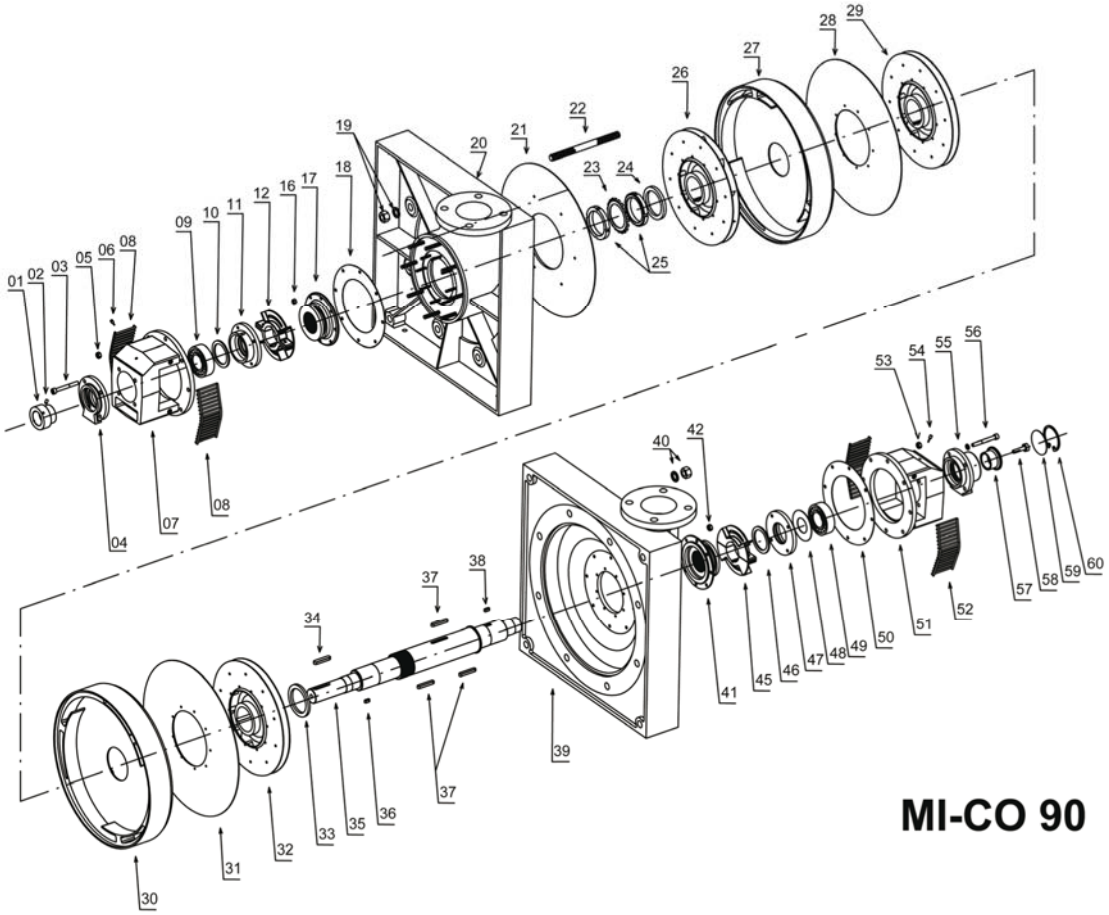
As the grease used lasts for ever it is not necessary to replace it completely, but it is sufficient to add the lacking quantity. The quantity of grease to be added cannot be exactly specified as grease consumption depends on the operation conditions of the machine and on the environmental conditions that may be the most different ones. To be noted however that the filling quantity depends on the number of revolutions of the bearing; in slow bearings the free volume can be fully filled, while fast bearings should be filled up to 1/3 of the free volume that is calculated as follows:

D• B• 0,01 = cm^3
(where D = bearing hole diameter, B = bearing width, in mm.)

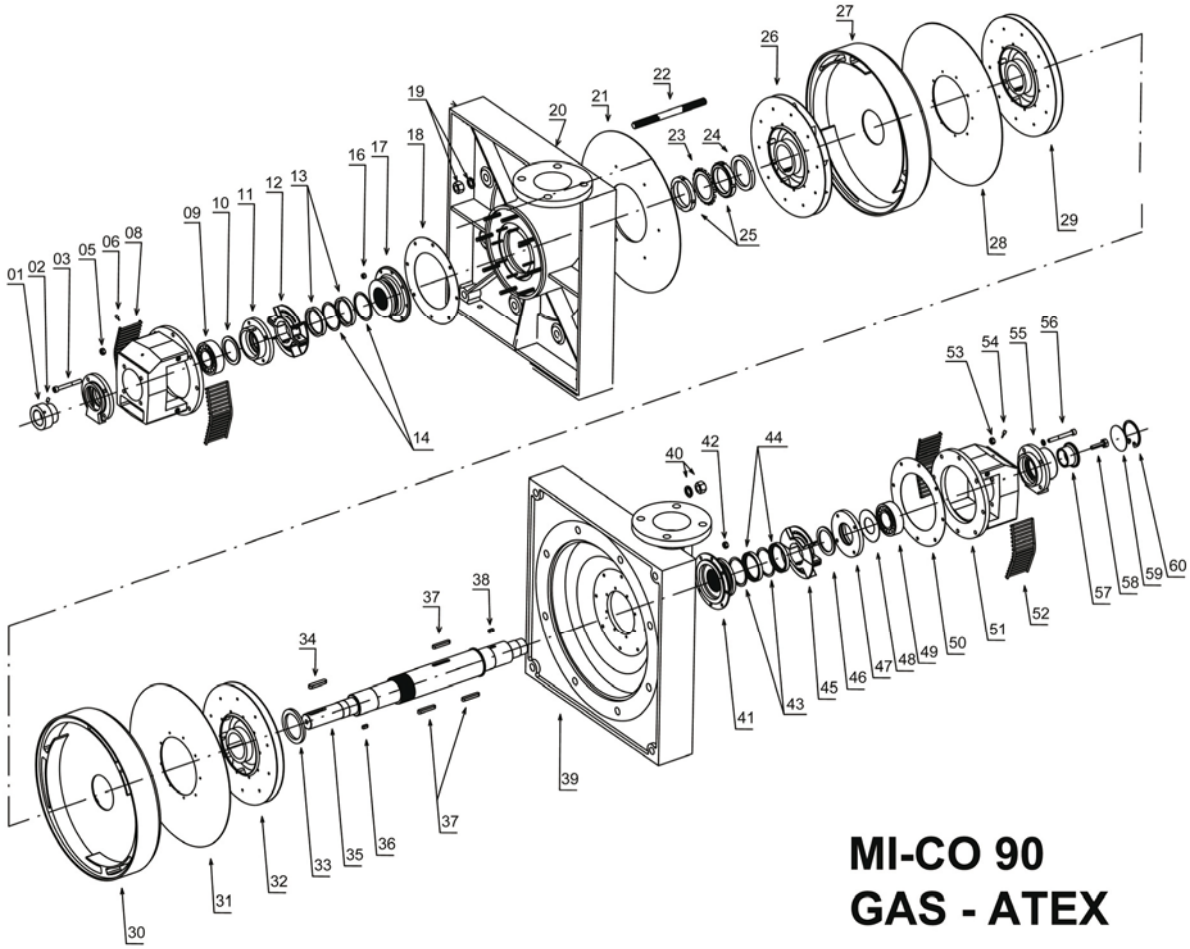
To be noted that if lubrication is excessive, a bearing self-heating takes place with an increasing temperature over time. If lubrication is correct, after an initial increase, temperature decreases over time. Diagram shows the possible temperature trends in roller bearings. You should check and re-grease the bearings every 2500 hours adding up to about 10 grams of grease.



Possible temperatures of the ball bearing
1 = too much lubrication, and inappropriate lubricating grease
2 = too much lubrication, and inappropriate lubricating grease
3 = normal temperature



MI-CO 90



MI-CO 90
GAS - ATEX

LEGEND MICO 90 - MICO 90ATEX

POS.	DESCRIPTION	
01	Inlet Suction side lid	
02	Grub- screw M6x10	
03	Hexagonal head screw M8x75	
04	Inlet side grease lid	
05	Hexagonal nut M8	
06	Lubricator	
07	Support	
08	Protection case	
09	Radial ball bearing 6208 E-C3	
10	Felt seal	
11	Inlet side support lid	
12	Cooling fan	
13	Gas seal ring	(Atex only)
14	Spacer ring	(Atex only) Inox x Atex
16	Hexagonal nut M6	
17	Suction side lid seal	
18	Gasket	
19	Hexagonal nut M16	
20	Inlet casing	
21	Inlet casing wall	
22	Tie rod M16	
23	Safety washer	Inox x Atex
24	Sealing ring	Inox x Atex
25	Ring nut KM13	Inox x Atex
26	Impeller	
27	Drum	
28	Drum wall	
29	Impeller	
30	Drum	
31	Drum wall	
32	Impeller	
33	Spacer	Inox x Atex
34	Key 10x50xH7	
35	Shaft	Inox x Atex
36	Key 06x20xH7	Inox x Atex
37	Key 08x50xH7	Inox x Atex
38	Key 06x20xH7	Inox x Atex
39	Outlet casing	
40	Hexagonal nut M6	
41	Outlet side lid seal	
42	Hexagonal nut M6	
43	Gas seal ring	(Atex only)
44	Spacer ring	(Atex only) Inox x Atex
45	Cooling fan	
46	Gasket	
47	Outlet side support lid	
48	Felt seal	
49	Radial ball bearing NU2208 E-C3	
50	Compensator ring	
51	Support	
52	Protection case	
53	Hexagonal nut M8	
54	Lubricator	
55	Outlet side grease lid	
56	Hexagonal head screw M8x75	
57	Outlet side lid	
58	Hexagonal head screw M12x35	
59	Protection disk	
60	Snap ring	

5.4 Replacing MICO 90 bearings

The maximum duration of the bearings is approximately 25.000 hours of operation.

Replacing the bearing on the pulley side.

Remove the pulley and the relative key. Then, with reference to the exploded view of the blower, proceed as follows:

1. Remove the protective guards (**8**) by unscrewing the four hexagonal-head screws (**PHOTO A**).
2. Unscrew the socket grub screw (**2**), and remove the Inlet side lid (1) (**PHOTO B**).
3. Unscrew the four hexagonal-head screws (**3**) so that you can pull out the Inlet side grease lid (**4**) (**PHOTO C**).
4. Unscrew the eight hex nuts screws (**5**), and pull out, using the extractor, the support (**7**) (**PHOTO D and PHOTO E**).
5. Move the sealing cover on the sealing lid **11** so that you can insert the extractor, and pull out the ball bearing (**9**) (**PHOTO F**).
6. Clean all the mechanical parts carefully.
7. Change the felt (**10**) of the sealing lid (**11**) (**PHOTO G**), and refit it on the shaft.
8. Fit the support (**7**) on the Inlet casing (**20**), and screw the eight nut (**5**) (**PHOTO D**).
9. Refit any shims in their original position.
10. Fit the ball bearing (**9**) making it slide on the shaft with a bushing operated by one screws screwed onto the head of the shaft (**PHOTO H**). Grease.
11. Insert the Inlet side grease lid (**4**), and screw the four hexagonal-head screws (**3**). Make sure that there are no undesirable clearances (**PHOTO C**).
12. Refit the protective guards (**8**), and screw the four hexagonal-head screws (**PHOTO A**).
13. Fit the Inlet side lid (**1**), and shut it tightly. Screw the socket grub screw (**2**) (**PHOTO B**).

Replacing the bearing on the opposed side

Proceed as follows:

1. Remove the snap ring **60**and the protective disk (**59**) (**PHOTO I**).
2. Remove the protective case (**52**) by unscrewing the four hexagonal-head screws (**PHOTO L**).
3. Unscrew the screw (**58**) of the outlet side grease lid (**57**) (**PHOTO M**)
4. Unscrew the four screws (**56**) of the outlet side grease lid (**55**) (**PHOTO N**), and the eight hexagon nuts (**53**) that connect the support (**51**) to the outlet casing (**39**) (**PHOTO O**).
5. Insert the extractor to pull out the support (**51**) – (**PHOTO T**).
6. Again, use the extractor to pull out the ball bearing (**49**) and the outlet side support lid (**47**) together (**PHOTO P**).
7. Clean all the mechanical parts accurately, and grease. Change the felt (**46**) of the felt seal (**48**) (**PHOTO R**).
8. Refit the support (**51**) on the outlet casing (**39**), and screw the eight nuts (**53**) (**PHOTO O**).
9. Refit any shims in their original position.
10. Refit the ball bearing (**49**) making it slide on the shaft with a bushing operated by one screw screwed onto the head of the shaft (**PHOTO S**). Grease.
11. Fasten the outlet side grease lid (**55**) with the four screws (**56**) (**PHOTO N**). Insert the outlet side lid (**57**), tighten the screw (**58**)
    (**PHOTO M**).
12. Reinsert the protective case (**52**), and screw the four hexagonal-head screws (**PHOTO L**).
13. Insert the protective disk (**59**), and the snap ring (**38**) (**PHOTO I**).

CAUTION

Before re-starting the blower, check, by manually rotating the shaft, that there is no rubbing of the impellers against nozzles (no scraping noise should be heard). Check pulley alignment and belt tightening. Re-install all cases and after carrying out all safety controls, start the blower. Despite the bearing replacement, should the vibrations remain above normal, arrange for a general overhaul.

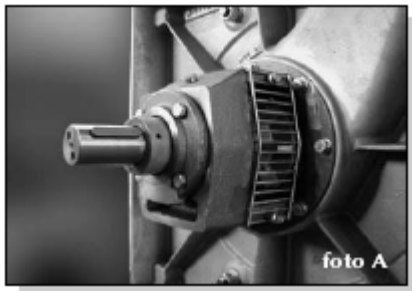


foto A


foto G

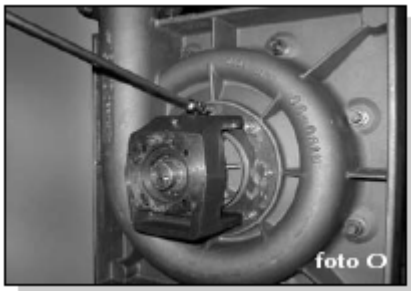


foto O


foto B


foto H


foto P

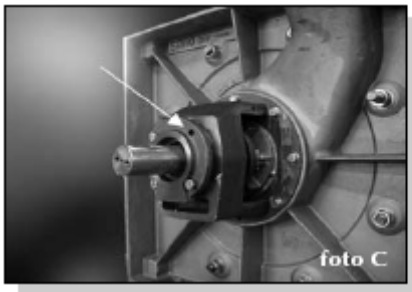


foto C

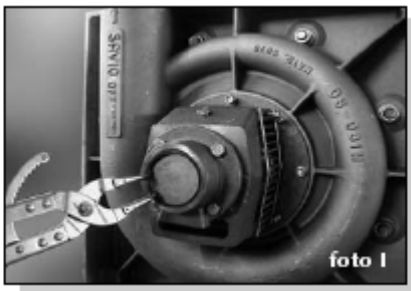


foto I

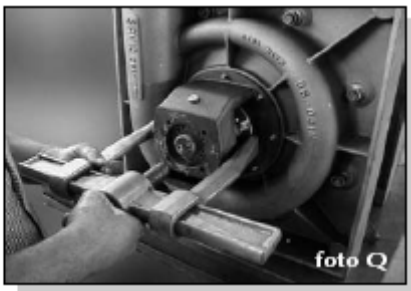


foto Q


foto D

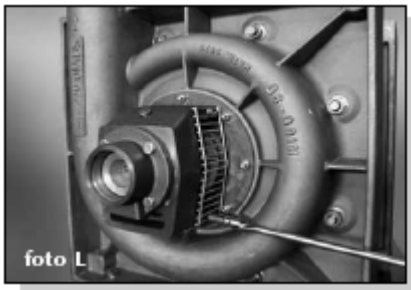


foto L

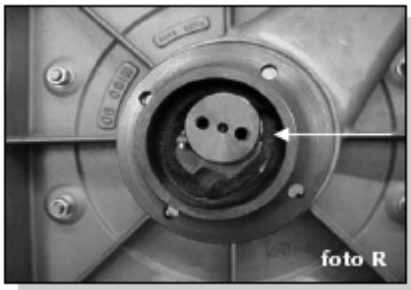


foto R

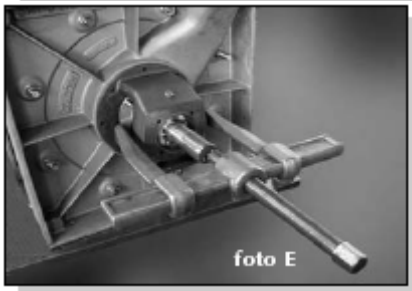


foto E

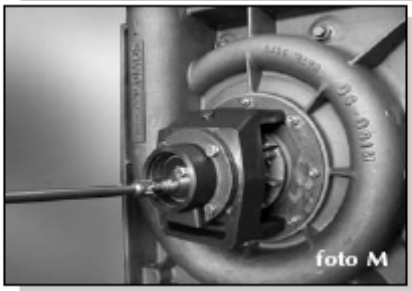
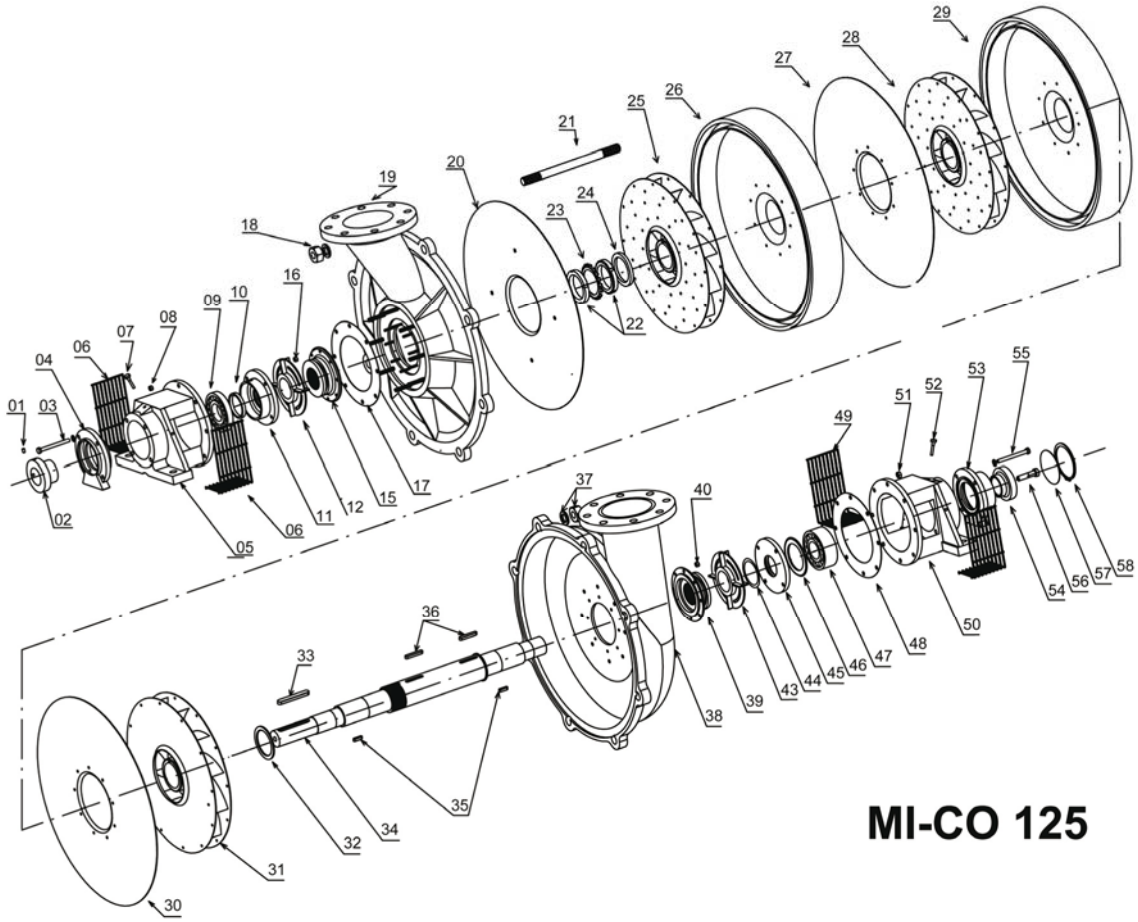


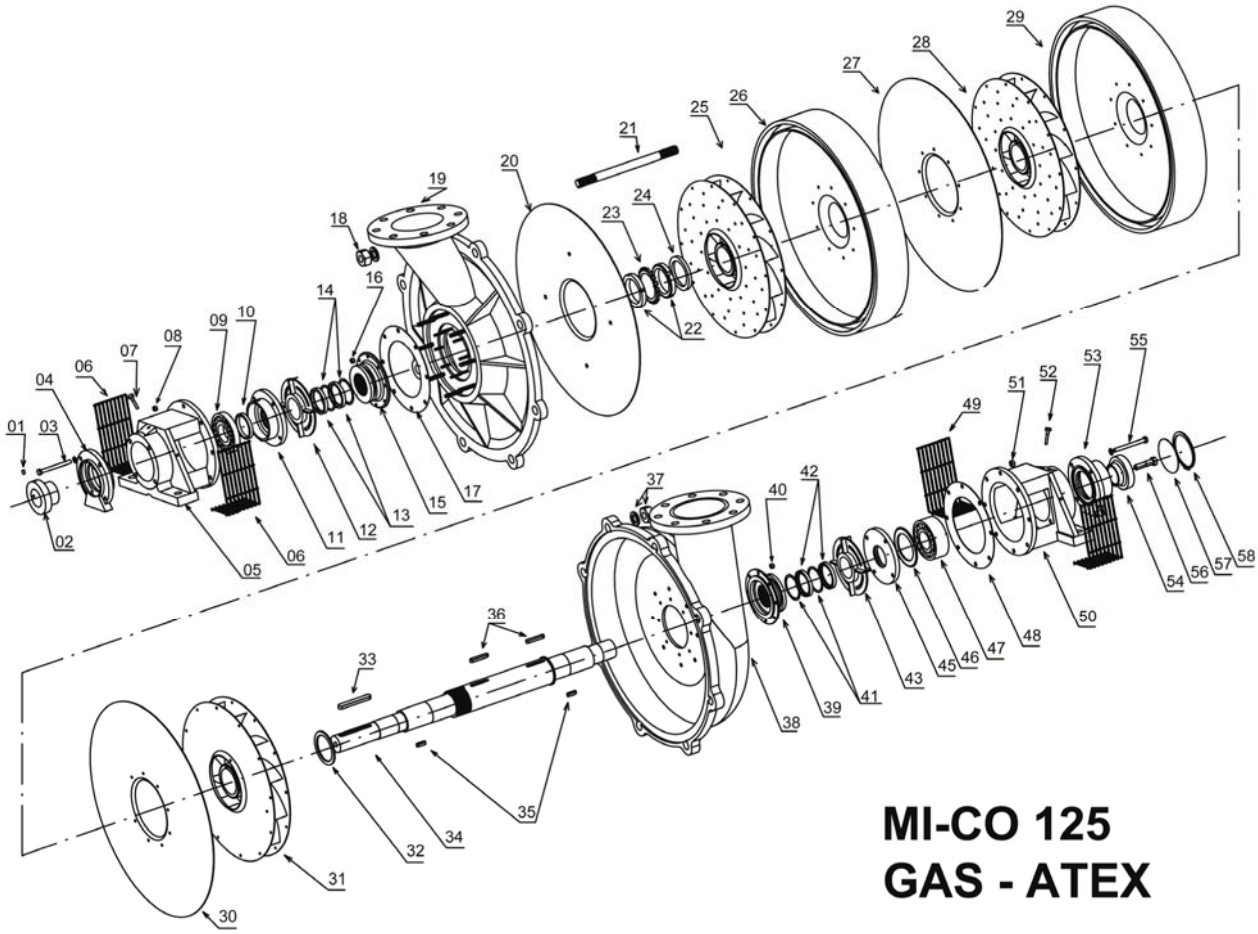
foto M


foto S


foto F

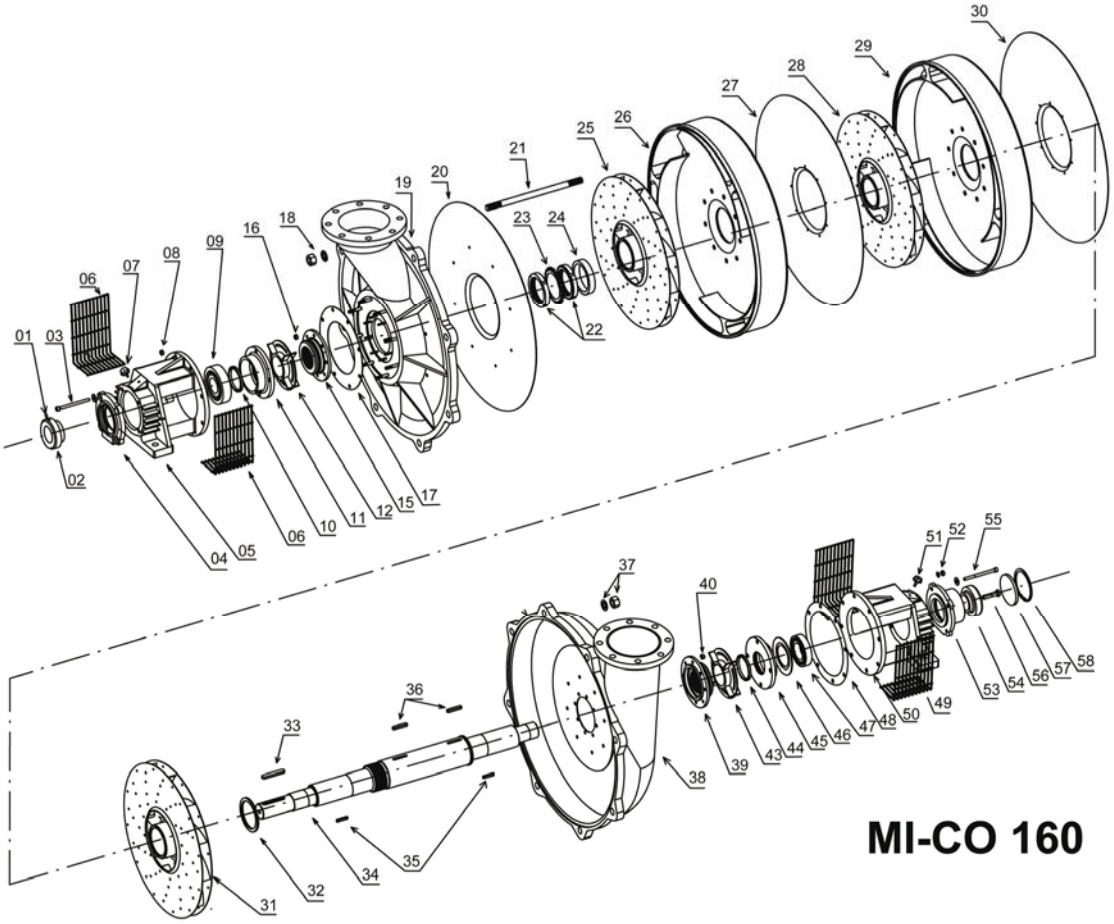

foto N

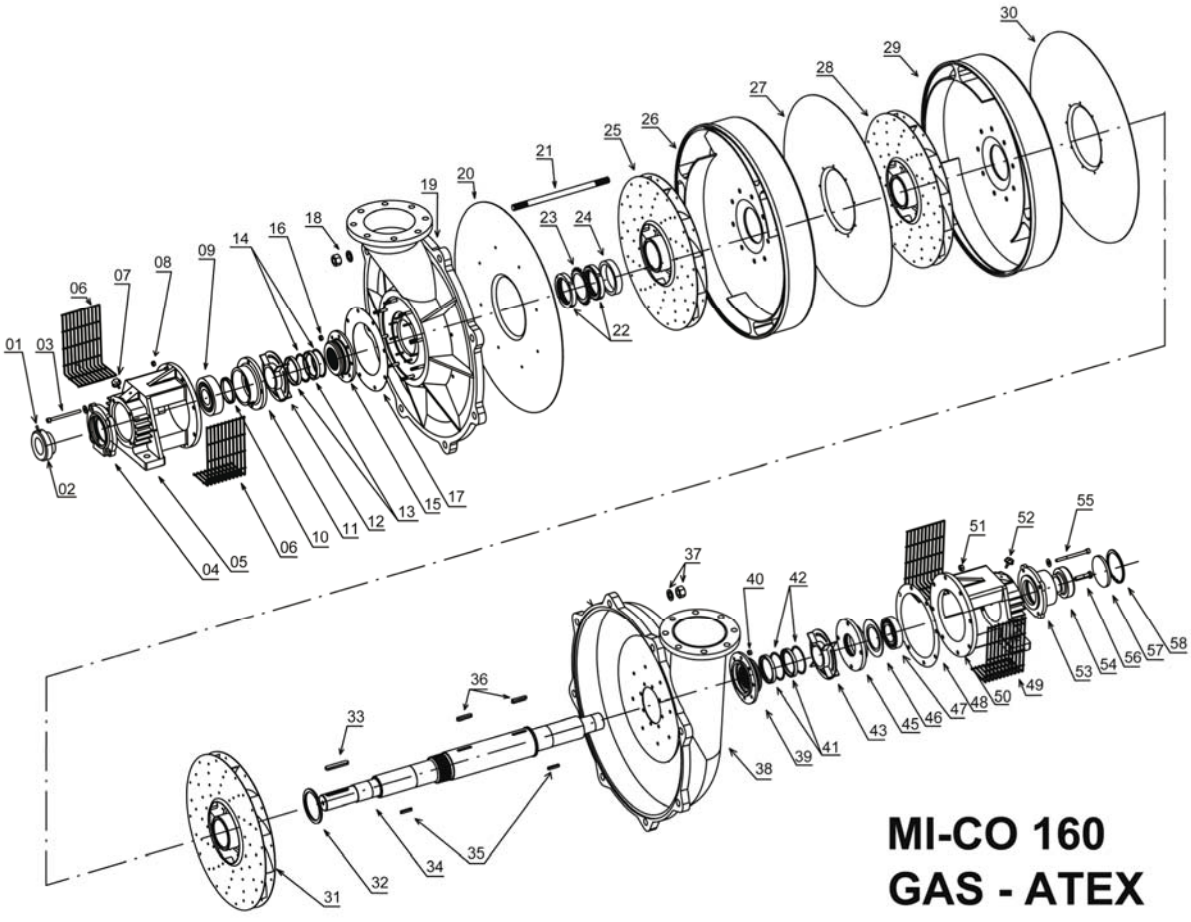

MI-CO 125


MI-CO 125
GAS - ATEX

LEGEND MICO 125 - MICO 125ATEX

POS.	DESCRIPTION	
01	Grub- screw M6x10	
02	Inlet side lid	
03	Hexagonal head screw M8x85	
04	Inlet side grease lid	
05	Support	
06	Protection case	
07	Lubricator	
08	Hexagonal nut M8	
09	Radial ball bearing 2309 E-C3	
10	Felt seal	
11	Inlet side support lid	
12	Cooling fan	
13	Gas seal ring	(Atex only)
14	Spacer ring	(Atex only) Inox x Atex
15	Inlet side lid seal	
16	Hexagonal nut M6	
17	Gasket	
18	Hexagonal nut M20	
19	Inlet casing	
20	Inlet casing wall	
21	Tie rod M20	
22	Ring nut KM13	Inox x Atex
23	Safety washer MB13	Inox x Atex
24	Sealing ring	Inox x Atex
25	Impeller	
26	Drum	
27	Drum wall	
28	Impeller	
29	Drum	
30	Drum wall	
31	Reduced hub Impeller	
32	Spacer	Inox x Atex
33	Key 12x90xH7	
34	Shaft	Inox x Atex
35	Key 06x25xH7	Inox x Atex
36	Key 08x50xH7	Inox x Atex
37	Hexagonal nut M20	
38	Outlet casing	
39	Outlet side lid seal	
40	Hexagonal nut M6	
41	Gas seal ring	(Atex only)
42	Spacer ring	(Atex only) Inox x Atex
43	Cooling fan	
44	Felt seal	
45	Outlet side support lid	
46	Compensator ring	
47	Radial ball bearing 2309E-C3	
48	Gasket	
49	Protection case	
50	Support	
51	Hexagonal nut M8	
52	Lubricator	
53	Outlet side grease lid	
54	Outlet side lid	
55	Hexagonal head screw M8x85	
56	Hexagonal head screw M12x30	
57	Protection disk	
58	Snap ring	


MI-CO 160


MI-CO 160
GAS - ATEX

LEGEND MICO 160 - MICO 160ATEX

POS.	DESCRIPTION	
1	Grub- screw M6x10	
2	Inlet side lid	
3	Hexagonal head screw M10x110	
4	Inlet side grease lid	
5	Support	
6	Protection case	
7	Lubricator	
8	Hexagonal nut M10	
9	Radial ball bearing 6311 E-C3	
10	Felt seal	
11	Inlet side support lid	
12	Cooling fan	
13	Gas seal ring	(Atex only)
14	Spacer ring	(Atex only) Inox x Atex
15	Inlet side lid seal	
16	Hexagonal nut M6	
17	Gasket	
18	Hexagonal nut M20	
19	Inlet casing	
20	Inlet casing wall	
21	Tie rod M20	
22	Ring nut KM17	Inox x Atex
23	Safety washer MB17	Inox x Atex
24	Sealing ring	Inox x Atex
25	Impeller	
26	Drum	
27	Drum wall	
28	Impeller	
29	Drum	
30	Drum wall	
31	Reduced hub Impeller hub	
32	Spacer	Inox x Atex
33	Key 14x80xH7	
34	Shaft	Inox x Atex
35	Key 06x25xH7	Inox x Atex
36	Key 10x50xH7	Inox x Atex
37	Hexagonal nut M20	
38	Outlet casing	
39	Outlet side lid seal	
40	Hexagonal nut M6	
41	Gas seal ring	(Atex only)
42	Spacer ring	(Atex only) Inox x Atex
43	Cooling fan	
44	Felt seal	
45	Outlet side support lid	
46	Compensator ring	
47	Radial ball bearing 2310E-C3	
48	Gasket	
49	Protection case	
50	Support	
51	Lubricator	
52	Hexagonal nut M8	
53	Outlet side grease lid	
54	Outlet side lid	
55	Hexagonal head screw M10x110	
56	Hexagonal head screw M12x35	
57	Protection disk	
58	Snap ring	

5.6 Replacing MICO 125 - 160 bearings

The maximum duration of the bearings is approximately 25.000 hours of operation.

Replacing the bearing on the pulley side.

Remove the pulley and the relative key. Then, with reference to the exploded view of the blower, proceed as follows:

1. Unscrew the socket grub screw (**1**), and remove the Inlet side lid (**2**) (**PHOTO A**).
2. Unscrew the four hexagonal-head screws (**3**) so that you can pull out the Inlet side grease lid (**4**) (**PHOTO A**).
3. Remove the protective case (**6**) by unscrewing the four hexagonal-head screws
4. Unscrew the eight nut (**8**), and pull out, using the extractor, the support (**5**) (**PHOTO B**).
5. Move the Inlet side support lid (**11**) so that you can insert the extractor, and pull out the ball bearing (**9**) (**PHOTO C**).
6. Clean all the mechanical parts carefully.
7. Change the felt (**10**) of the Inlet side support lid (**11**) (**PHOTO D**), and refit it on the shaft.
8. Fit the support (**5**) on the inlet casing (**19**), and screw the eight screws (**8**) (**PHOTO E**).
9. Refit any shims in their original position.
10. Fit the ball bearing (**9**) making it slide on the shaft with a bushing operated by screw screwed on to the head of the shaft (**PHOTO F**). Grease.
11. Insert the Inlet side grease lid (**4**), and screw the four hexagonal-head screws. Make sure that there are no undesirable clearances.
12. Refit the protective case (**6**), and screw the four hexagonal-head screws
13. Fit the Inlet side lid (**2**), and shut it tightly. Screw the socket grub screw (**1**) (**PHOTO G**).

Replacing the bearing on the opposed side

Proceed as follows:

1. Remove the snap ring (58), and the protective disk (57) (PHOTO H).
2. Remove the protective case by unscrewing the four hexagonal-head screws.
3. Unscrew the screw (56) of the outlet side lid (54) (PHOTO I), unscrew the four screws (55) of the Inlet side grease lid (53) and the eight hexagon nuts (51) that connect the support (50) to the inlet casing (38).
4. Insert the extractor to pull out the support (50) – (PHOTO B).
5. Again, use the extractor to pull out the ball bearing (47) and the outlet side support lid (PHOTO C).
6. Clean all the mechanical parts accurately, and grease. Change the outlet side support lid (45) (PHOTO D).
7. Refit the support (50) on the outlet casing, and screw the eight nuts (51).
8. Refit any shims in their original position.
9. Refit the ball bearing (47) making it slide on the shaft with a bushing operated by screw screwed onto the head of the shaft (34) (PHOTO J). Grease.
10. Fasten the outlet side grease lid (53) with the four screws (55). Insert the outlet side lid (54) Tighten the screw (56).
11. Reinsert the protective case (49), and screw the four hexagonal-head
12. Insert the protective disk (**57**), and the snap ring (**58**) (**PHOTO K**).

CAUTION

Before re-starting the blower, check, by manually rotating the shaft, that there is no rubbing of the impellers against nozzles (no scraping noise should be heard).Check pulley alignment and belt tightening. Re-install all cases and after carrying out all safety controls, start the blower. Despite the bearing replacement, should the vibrations remain above normal, arrange for a general overhaul.

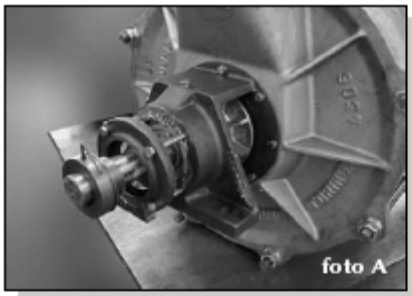


foto A

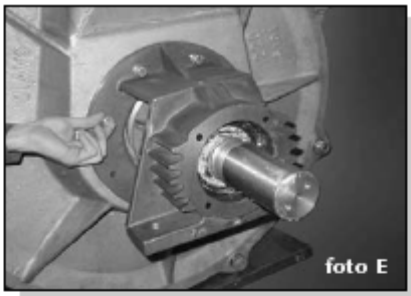


foto E


foto H

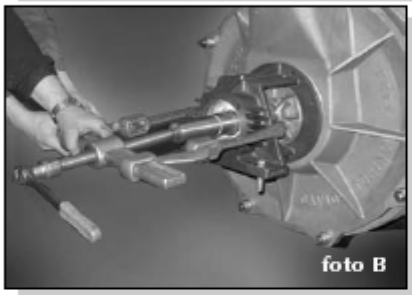


foto B


foto F


foto I

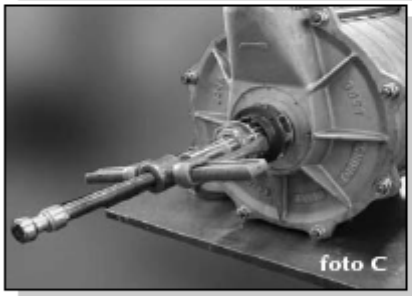


foto C

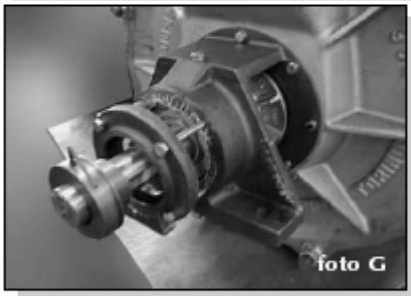
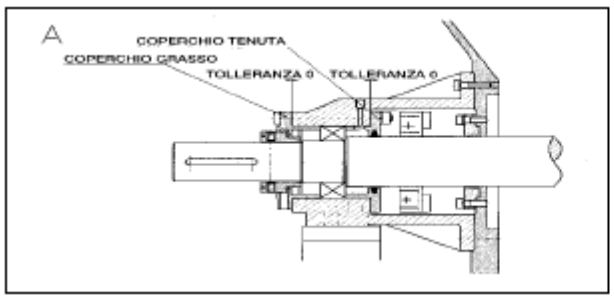


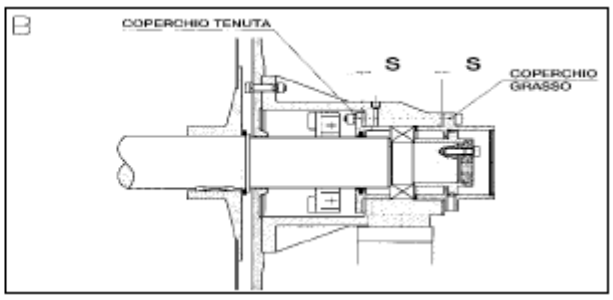
foto G


foto j


foto D

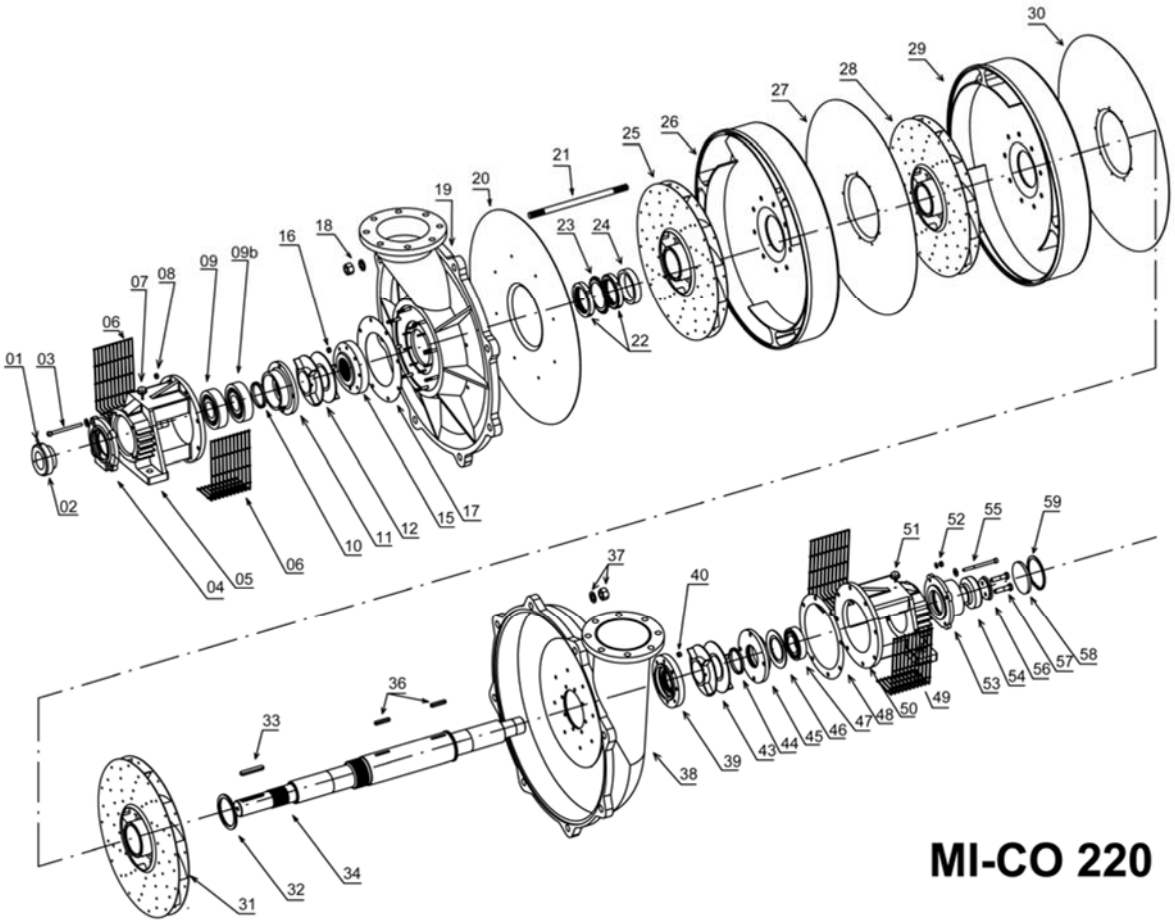

foto K



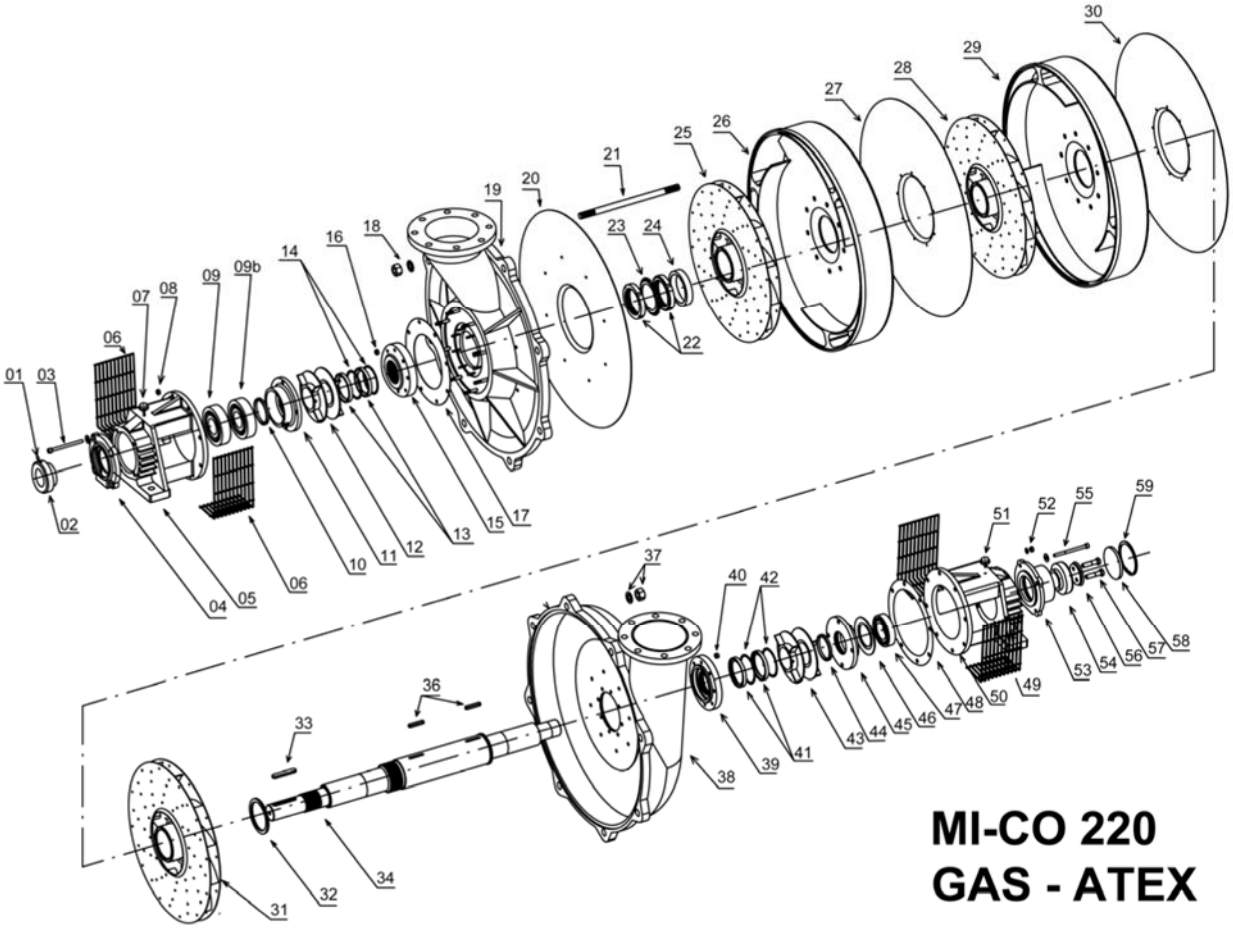


Pulley side support
The radial bearing with one ball ring shell be locked by grease lid and seal lid (as shown in figure A);

Support opposite to pulley
Il is important that during the replacement of the oscillating bearings situated in the support opposite to pulley the original allowances S are complied with (as shown in figure B); this clearance is essential to a proper expansion and sliding of the shaft bearing unit .



MI-CO 220



MI-CO 220
GAS - ATEX

LEGEND MICO 220 - MICO 220ATEX

POS.	DESCRIPTION	
01	Grub- screw M6x10	
02	Inlet side lid	
03	Hexagonal head screw M10x120	
04	Inlet side grease lid	
05	Support	
06	Protection case	
07	Lubricator	
08	Hexagonal nut M10	
09	Radial ball bearing 6215 E-C3	
09b	Radial bearing 2215 E-C3	
10	Felt seal	
11	Inlet side support lid	
12	Cooling fan x 2	
13	Gas seal ring	(Atex only)
14	Spacer ring	(Atex only) Inox x Atex
15	Inlet side lid seal	
16	Hexagonal nut M10	
17	Gasket	
18	Hexagonal nut M20	
19	Inlet casing	
20	Inlet casing wall	
21	Tie rod M20	
22	Ring nut KM17	Inox x Atex
23	Safety washer MB17	Inox x Atex
24	Sealing ring	Inox x Atex
25	Impeller	
26	Drum	
27	Drum wall	
28	Impeller	
29	Drum	
30	Drum wall	
31	Reduced hub Impeller	
32	Spacer	Inox x Atex
33	Key 14x70xH9	
34	Shaft	Inox x Atex
36	Key 08x50xH7	Inox x Atex
37	Hexagonal nut M20	
38	Outlet casing	
39	Outlet side lid seal	
40	Hexagonal nut M10	
41	Gas seal ring	(Atex only)
42	Spacer ring	(Atex only) Inox x Atex
43	Cooling fan x 2	
44	Felt seal	
45	Outlet side support lid	
46	Compensator ring	
47	Radial ball bearing 2215E-C3	
48	Gasket	
49	Protection case	
50	Support	
51	Lubricator	
52	Hexagonal nut M10	
53	Outlet side grease lid	
54	Outlet side lid	
55	Hexagonal head screw M10x120	
56	Head washer	
57	Hexagonal head screw M12x35	
58	Protection disk	
59	Snap ring	

5.6 Replacing MICO 220 bearings

The maximum duration of the bearings is approximately 25.000 hours of operation.

Replacing the bearing on the pulley side.

With reference to the exploded view of the blower, proceed as follows (N.B. The numbers between brackets refer to the exploded view and to the assembly diagram)

1. Remove pulley and relevant key.
2. Loosen and take out the four screws (**03**) connecting supports (**6**) to the base and then lift the machine (**PHOTO A**).
3. Loosen the two grub screws with built in hexagon (**5**) (**PHOTO B**) so that drive side ring nut (**4**) can be loosened.
4. Loosen the four screws (**1**) of grease valve lid (**3**) (**PHOTO C**) and the eight screws (**13**) of support (**6**) on suction side (**PHOTO D**).
5. Remove support (**6**) by means of an extractor (**PHOTO E**).
6. Move sealing lid on suction side (**17**) towards suction casing (**23**) of the blower to allow the extractor insertion and remove ball bearing (**14**) and roller bearing (**16**) at the same time (**PHOTO F**).
7. By means of the extractor remove the fifth wheel of the roller bearing (**PHOTO G**).
8. Carefully clean all mechanical parts.
9. Change felt of sealing lid on suction side (**17**) and re-insert it (**PHOTO H**).
10. Refit the fifth wheel of the ball bearing making it slide on the shaft with a coupling and the head washer (**42**). Screw the two screws (**22**) onto the head of the shaft (**PHOTO I**). Lubricate.
11. Insert support (**6**), containing roller bearing (**16**) on suction casing (**23**) by tightening the eight screws (**13**) (**PHOTO J**).
12. Assemble ball bearing (**14**) (**PHOTO K**) following the procedure mentioned in item **10**, insert grease valve lid (**3**) and tighten the four screws (**1**) making sure there is no anomalous backlash (**PHOTO L**).
13. Screw drive side ring nut (**4**) (**PHOTO M**) up to beat by tightening the two grub screws with built-in hexagon (**5**) (**PHOTO B**).

Replacement of bearing on opposite side, sequence of operations:

1. Loosen and remove the four screws (**10**) connecting supports (**6**) to base and then lift the machine (**PHOTO A**).
2. Remove snap ring (**44**) (**PHOTO N**) and protection disk (**43**) (**PHOTO O**).
3. Loosen the two screws (**22**) of head washer (**42**) (**PHOTO P**), the four screws (**1**) of grease lid (**40**) (**PHOTO Q**) and the eight nuts (**18**) connecting support (**6**) to delivery casing (**39**) (**PHOTO D**).
4. Insert extractor to take out support (**6**) (**PHOTO E**) containing roller bearing (**16**) and then its plate (**PHOTO C**).
5. Carefully clean all mechanical parts and grease. Change felt of sealing lid (**17**).
6. Refit the plate of the ball bearing making it slide on the shaft with a coupling and the head washer (**42**). Screw the two screws (**22**) onto the head of the shaft (**PHOTO I**). Re-assemble support (**6**) complete with new roller bearing (**16**) on delivery casing (**39**) by tightening the eight nuts (**18**) (**PHOTO D**).
7. Re-install shims (**15**) if any, in their original position.
8. Lock grease lid (**40**) by means of the four screws (**1**) (**PHOTO Q**). Insert free support lid (**41**), head washer (**42**) by tightening the two screws (**22**) (**PHOTO P**).
9. Insert protection disk (**43**) (**PHOTO O**) and snap ring (**44**) (**PHOTO N**).
10. Re-install the blower on the base.Rectify any disalignment by loosening screws (**13**) and nuts (**18**) of every support (**6**).
11. After rectifying alignment, tighten screws (**13**) and nuts (**18**) and then the four screws (**10**) connecting supports (**6**) with the base.

CAUTION

Before re-starting the blower, check, by manually rotating the shaft, that there is no rubbing of the impellers against nozzles (no scraping noise should be heard).Check pulley alignment and belt tightening. Re-install all cases and after carrying out all safety controls, start the blower. Despite the bearing replacement, should the vibrations remain above normal, arrange for a general overhaul.


photo A

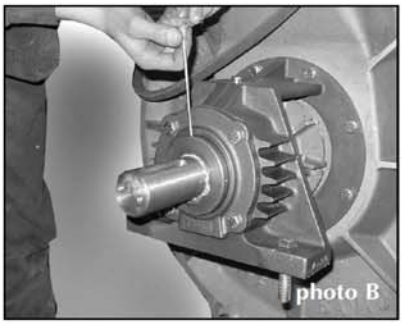


photo B

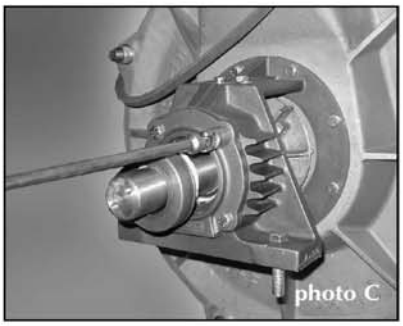


photo C

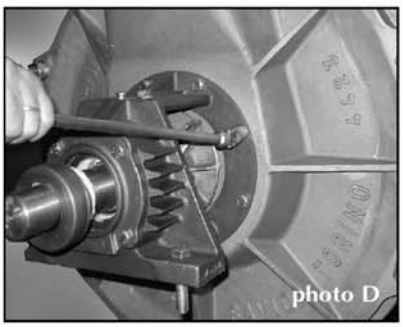


photo D

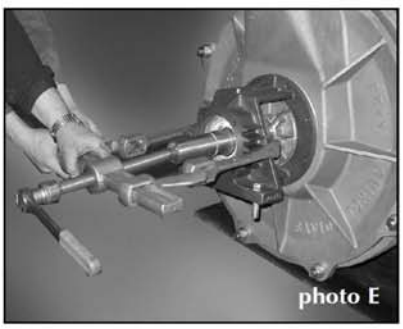


photo E

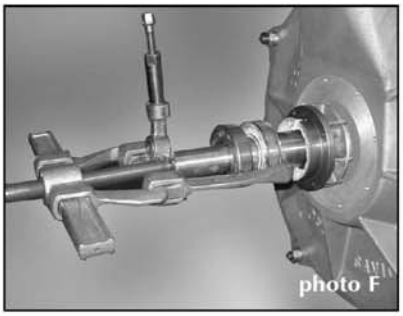


photo F


photo G


photo H


photo I

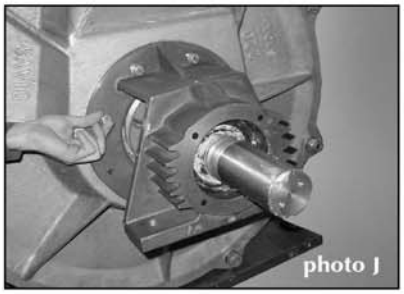


photo J

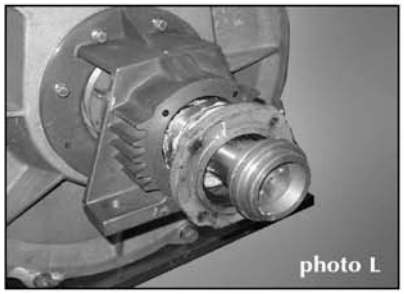


photo L

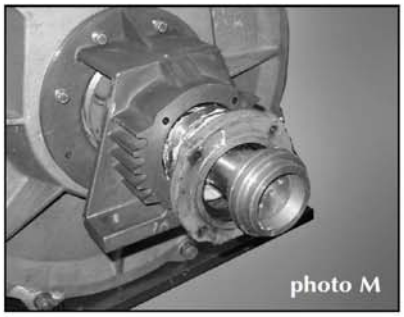


photo M


photo N

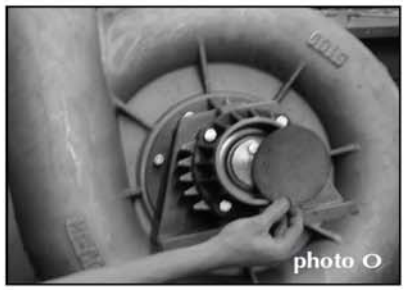


photo O

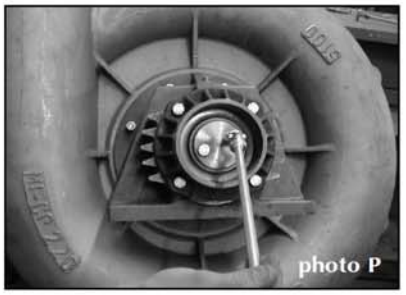


photo P


photo Q


photo R

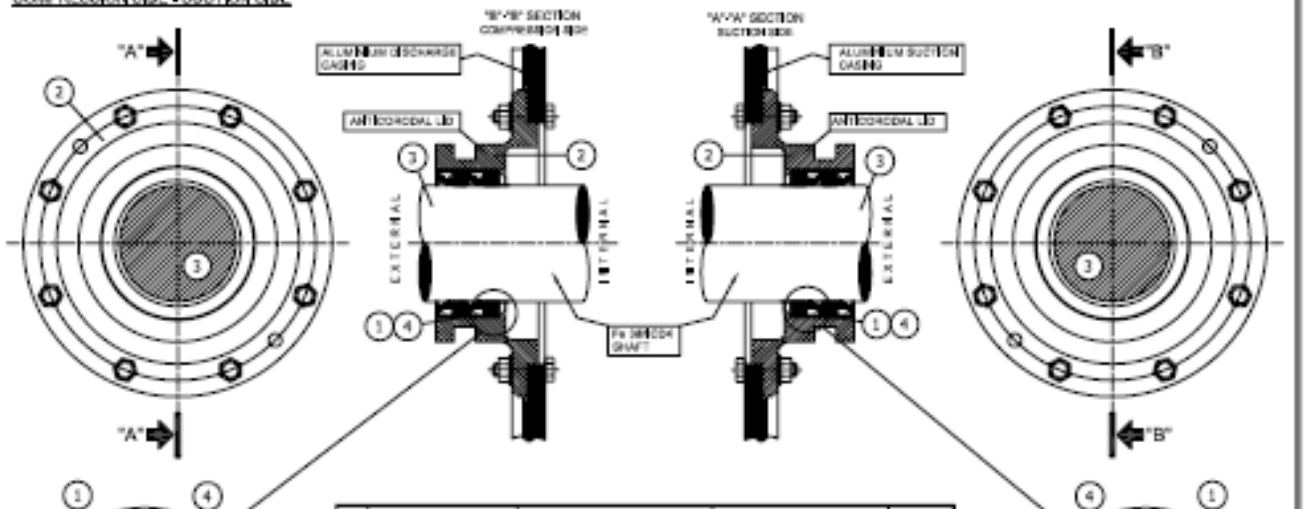
5.7 Replacement of MICO 90/125/160/220 gas seal door lids

1. Unscrew n° 8 hexagonal head screws so that the gas seal lid can be removed (Photo A)
2. Completely remove gas seal door lid
3. Insert a bush with the hole diameter corresponding to the last shaft shoulder
4. Insert the new gas seal door lid by means of a rubber hammer
5. Screw the 8 hexagonal head screws again

NB. The two gas seal door lids, although they have the same geometry and sizes, are different and therefore they have to be installed in their correct position (see drawing page 20).

MECHANICAL SEALS GAS VERSION

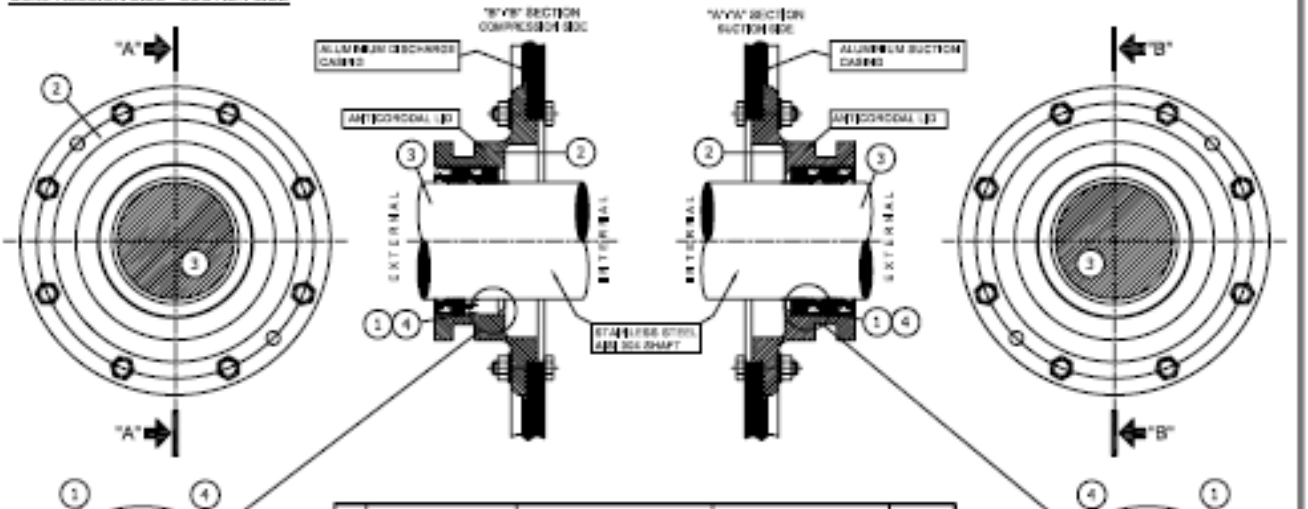
COMPRESSION SIDE - SUCTION SIDE



N°	DESCRIPTION	MI-CO BLOWER	SPARE PART CODE	Q.TY
1	SEAL RING	MI-CO 90 GAS MI-CO 125 GAS	ANGO M090	2
		MI-CO 160 GAS	ANGO M161	
		MI-CO 220 GAS	ANGO M220	
2	LID	MI-CO 90 GAS MI-CO 125 GAS	M39 13274	2
		MI-CO 160 GAS	M16 13829	
		MI-CO 220 GAS	M22 14482	
3	SHAFT	MI-CO 90 GAS	M90 AL3....85	1
		MI-CO 125 GAS	M12 AL3....85	
		MI-CO 160 GAS	M16 AL3....85	
		MI-CO 220 GAS	M22 AL3....85	
4	SPACER RING	MI-CO 90 GAS MI-CO 125 GAS	M12 13276	24
		MI-CO 160 GAS	M16 13518	
		MI-CO 220 GAS	M22 14483	

MECHANICAL SEALS ATEX VERSION

COMPRESSION SIDE - SUCTION SIDE



N°	DESCRIPTION	MI-CO BLOWER	SPARE PART CODE	Q.TY
1	SEAL RING	MI-CO 90 GAS MI-CO 125 GAS	ANGO M090	2
		MI-CO 160 GAS	ANGO M161	
		MI-CO 220 GAS	ANGO M220	
2	LID	MI-CO 90 GAS MI-CO 125 GAS	M39 13274	2
		MI-CO 160 GAS	M16 13829	
		MI-CO 220 GAS	M22 14482	
3	SHAFT	MI-CO 90 GAS	M90 AL3....8A	1
		MI-CO 125 GAS	M12 AL3....8A	
		MI-CO 160 GAS	M16 AL3....8A	
		MI-CO 220 GAS	M22 AL3....8A	
4	SPACER RING	MI-CO 90 GAS MI-CO 125 GAS	M12 13276	24
		MI-CO 160 GAS	M16 13518	
		MI-CO 220 GAS	M22 14483	

TENUTA ATEX !

GAS
- ZONA 1 - II G
- ZONA 2 - II G

POLVERI
- ZONA 21 - II D
- ZONA22 - II D

6.0 SPARE PARTS

Thanks to their simplicity and reliability SAVIO blowers can work over extremely long periods before the use of any spare part is required. It is however advisable to keep the following spare parts available in store:

1. Bearings
2. Bearing blocking ring nu
3. Driving belts

Consumables are limited to filters and grease for bearings

The blower legends show the code of the spare part to be ordered to:

SAVIO S.r.l.
Via Reggio Calabria 13
10098 Cascine Vica Rivoli (TO) ITALIA
Tel. 0039.011.9591601 Fax 0039.011.9592962
E-mail: savio@savioclima.it

7.0 ASSISTENCE

The requests for technical assistance shall be sent to:

SAVIO S.r.l.
Via Reggio Calabria 13
10098 Cascine Vica Rivoli (TO) ITALIA
Tel. 0039.011.9591601 Fax 0039.011.9592962
E-mail: savio@savioclima.it

7.1 Repairs

If the repair concerns the shaft, the impeller or the drum, the blower shall be sent to SAVIO to be overhauled after acceptance by the customer of the relevant quotation.
During overhaul the machine is completely disassembled, all parts are cleaned, checked and replaced if necessary, the rotor is dynamically re-balanced, and the overhauled machine is submitted to mechanical testing and re-painted.A 6-month guarantee covers overhauled machines.
All current repairs, i.e. the repairs not requiring the replacement of impellers, shaft or drum can be conveniently carried out on site by maintenance personnel or personnel from external workshops.
Obviously it is also possible to obtain services on site by SAVIO skilled personnel; the services will be provided according to the A.N.I.M.A. rates in force on the date of the intervention and shall be requested by written order.

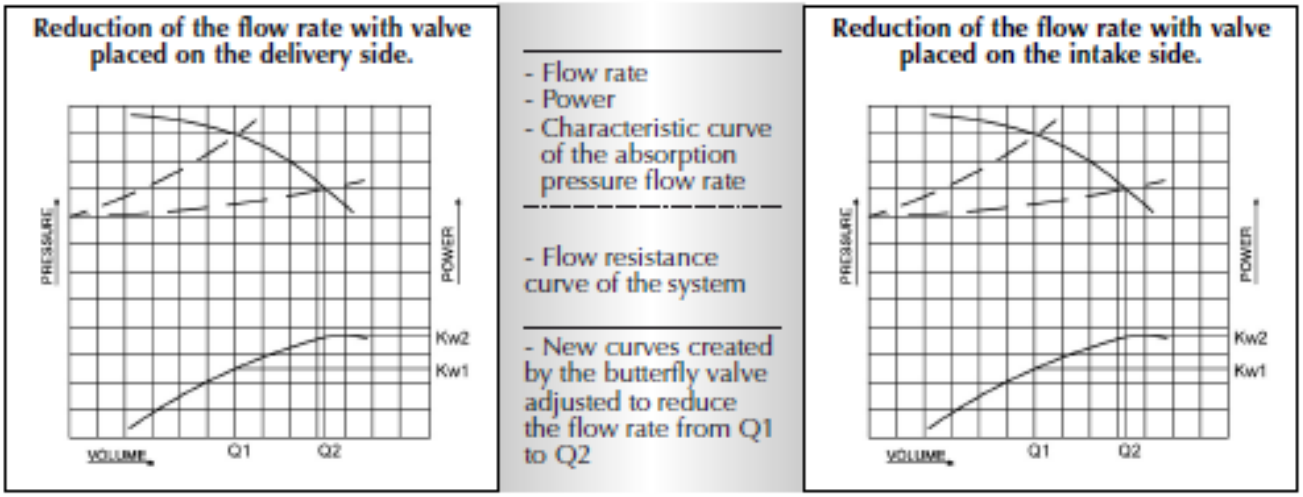
8.0 OPERATION & PERFORMANCE

SAVIO blowers are machines that carry out a variation of the status of the treated fluid by taking from a motor the energy necessary to this transformation.
The fluid is sucked from an environment at a given pressure and transferred to another environment with higher pressure.
Turbo blowers are defined in terms of volume capacity, head (difference of pressure between up stream and down-stream) and input.
The machine performance is affected by the conditions of the suction environment and the delivery environment as well as by the variations in the molecular weight of the treated fluid. For this reason it is very important during dimensioning to take account of the border conditions within which rated performance shall be guaranteed.
As in the blowers there is no wear contact part that may affect the volumetric capacity, their performance is absolutely constant over their whole life. Reduced performance may be caused by accumulated deposits decreasing the passage distances. Original performance can be restored through a simple cleaning.

8.1 Delivery operation

Delivery operation is carried out by varying pressure after the blower. This variation is obtained by choking the fluid capacity on the machine delivery.
The lower limit of the machine capacity is defined by the pumping limit, more seldom by the temperature limit at discharge, while the upper limit is provided by the size of the motor which can-not be overloaded.
The diagram in the figure shows that when delivery increases, the obtained head decreases; conversely input increases if capacity decreases.
To be noted that lamination regulation at delivery generates no variation of the fluid density at suction. It is also possible to have a fluid regulation at suction. In this case the suction pressure is reduced and becomes variable according to the capacity at suction. Also the density of the sucked fluid depends on capacity and, with equal capacity in terms of volume, a reduced capacity is obtained in terms of mass.
By introducing a load loss at suction also the delivery pressure will be lower. A new throttling curve is therefore generated, the origin of which is close to the previous one but it gets further and further from this one as capacity increases.

The higher this deviation, the higher the load loss introduced.
The type of adjustment to be used, regulation at suction or at delivery, is determined by the operation features required; however, whenever possible, regulation at suction is better as it allows a higher energy saving.
As a matter of fact with regulation at suction, a new capacity head curve is gene-rated as well as a new capacity-input curve which is lower than the basic curve.



8.2 Suction operation

The suction operation is characterized by a regulation of the blower suction capacity. If the delivery varies, the suction pressure varies while the counter pressure at discharge remains constant.
The lower capacity limit is usually defined by the pumping limit, more seldom by the temperature limit at discharge, while the upper limit is provided by the size of the motor which can-not be overloaded.
When capacity increases, vacuum decreases at suction and viceversa power increases if capacity decreases. Density depends on capacity. Increases of counter pressure at discharge, obtained for example by means of a butterfly valve, reduce machine performance both in terms of vacuum at suction and delivery.
The choice of the type of regulation depends on the type of application; nevertheless also in this case regulation is preferable to suction as it allows a higher energy saving.

8.3 Pumping limit

Centrifugal machines below a given capacity, called pumping limit, are no longer able to develop the pressure or vacuum necessary to transfer the fluid from an environment with lower pressure to the one with higher pressure.
Pumping is a phenomenon that causes backflow, by modifying the pressures of the two environments so that the machine can work again as long as a similar situation takes place.
The phenomenon occurs cyclically, with a usually very low frequency (a few Hz) which is affected by regulation at suction or delivery, by the installation features (capacity of the ductworks) until an intervention is carried out to increase capacity.
The operation under these conditions shall be avoided as the cyclic backflow generates acyclic reversal of the thrust on bearings which are submitted to fatigue. In some cases, in particular for large-sized blowers, backflow can be so violent to damage the impellers.
It is advisable to use relief (safety) valves intervening to prevent the pumping condition.

SAVIO S.r.l.
TECNOLOGIA DELL'ARIA

M 32 7.5.1 Rev.01 03/03/10

DICHIARAZIONE CE DI CONFORMITÀ

EC Declaration of conformity / Déclaration de conformité CE / EG Konformitätserklärung

SAVIO S.r.l.

10098 CASCINE VICA Rivoli (To) - Italy - Via Reggio Calabria, 13

Dichiara, con il presente, che le macchine appartenenti alla seguente serie:

Declares hereby that the machines pertaining to the following series: Déclare par la présente que les machines faisant partie des Séries suivantes: - Erklärt mit vorliegendem Schreiben, dass die Maschinen der folgenden Baureihen:

Tipo-Type-Typ-Type **MICO 90/.. - 125/.. - 160/.. - 220/..**

è conforme alle seguenti direttive

comply with the following directive – sont conformes auxsuivant directive – entsprechen den folgenden Richtlinie

2006/42/CE Direttiva machine - Machinery Directive - Directive Machine - Maschinenrichtlinie

*2004/108/CE Direttiva Bassa Tensione– Low Voltage Directive – Directive Basse Tension - Niederspannungsrichtlinie

*2006/95//CE Direttiva EMC – EMC Directive – Directive EMC – EMC Richtlinie

* Se il prodotto è completo di motore elettrico

* If the product is complete of electric motor - si le produit est complet avec le moteur électrique - wenn das Produkt mit Elektromotor komplett ist

Normative applicate : EN12100-1-2:2005 EN294:1993 UNI10615:1997 UNI60240-1:2006
Normes applied : EN12100-1-2:2005 EN294:1993 UNI10615:1997 UNI60240-1:2006

E' comunque espressamente vietato procedere all'avviamento della ns. macchina prima che il sistema o l'impianto che la incorpora sia dichiarato conforme alle vigenti direttive CE

However it is expressly forbidden to proceed with the start up of our machines before the system or the plant that incorporates one is declared to be in conformity with the CE directives in force

De toute façon il est expressément interdit del la mettre en route tant que la système ou installation dans la quelle elle sera incorporée ne soit déclarée conforme aux Directives CE en vigueur

Es ist jedoch ausdrücklich verboten, unsere Maschine in Betrieb zu nehmen, bevor das System oder Betrieb, an dem sie angeschlossen ist, als den Richtlinien in Kraft entsprechend erklaert worden ist.

Rivoli, 03 Marzo 2010

Ing. Pier Carlo Savio
Rappresentante Legale
Legal Representative Représentant Légal
Rechtsvertreter

SAVIO S.r.l.
TECNOLOGIA DELL'ARIA
Via Reggio Calabria,13 – Cascine Vica Rivoli (TO) Italia
Tel: (+39) 011. 959.16.01 Fax: (+39) 011. 959.29.62
E-mail : savio@savioclima.it http:// www.savioclima.it

Ed. Aprile 2013