Ruwac USA Industrial Vacuums

Compact Vac Series

Installation, Operation, Maintenance & Service

Model No.	
Serial No.	
Filter No.	
Start-Up Date	

MADE IN THE USA

54 Winter St. • Holyoke, MA 01040 • (413) 532-4030 • info@ruwac.com

COMPACT-VAC

1. COMPACT-VAC Overview

POWERFUL POINT OF SOURCE EXTRACTION FOR PROCESSING

COLLECT, CONTAIN AND SEPARATE!

The Compact-Vac by Ruwac offers continuous duty operation and highly efficient filtered separation that makes removing fine dust particles during processing easier than ever! This system is completely portable and can be placed just about anywhere in your facility or lab. Thanks to its quiet operation, you won't have to worry about it becoming a distraction as it collects dust into a solid all-metal container for quick and clean collection. Add to this its efficient filtration system, and the Compact-Vac is perfect for collecting dust particles for re-use without the worries of cross-contamination!

Features & Benefits

- 24/7 continuous duty operation
- Point of source extraction
- Keeps your workplace sanitary and clean
- Collects dust particles for re-use without cross-contamination
- Can be used as a filtered separator alongside pre-exisitng vacuum systems
- Solid all-metal construction ensures durability and longevity
- Extremely portable low profile design fits any setting and is highly accessible
- Easy to use, easy to empty
- Quiet operation
- 4 Gallon collection capacity
- Fully adjustable to 1.25" - 2" hose adapters
- Thermally protected motor starter w/ power cord

Ideal Applications

- Nutraceuticals
- Pharmaceuticals
- Food packaging
- Cosmetics
- Plastics
- Stamping

HEPA option available for absolute filtration

Easy access lid for quick, sanitary material removal

1 Micron primary filter for efficient fine dust collection

Options & Accesories

To maximize filtration and extend hosing options, Ruwac's Compact-Vac is available with an assortment of tools and accessories so that you can get the most efficient cleaning experience from your system!

Part No.	Description
423743	Paper Bag Filter (5 Micron) - Package of 5
35196A	HEPA Filter (0.3 Micron)
909825	1.25" Hose Adapter
909850	1.5" Hose Adapter
909820	2" Hose Adapter

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CROSS-CONTAMINATION-FREE FILTERED SEPARATION

CONTINUOUS DUTY OPERATION

Simple in design, our Compact-Vacs use VPK Series vacuum producers that provide ultimate performance in a compact design. Featuring air flow rates up to 216 CFM, the VPK Series is capable of handling multiple operators and long lengths of hose. Each VPK vacuum producer is equipped with a TEFC (Totally Enclosed Fan Cooled) continuous duty motor and mounted on a stand to ensure stability. An automatic relief valve protects the vacuum system from overheating if air-flow is stopped due to blockage. Ruwac specifically engineers each VPK system to include a custom silencer to diffuse air and suppress sound without interfering with the performance of the system.

Total enclosure of the system is also available for increased sound suppression as well as protection from weather or other destructive elements that maybe present in a facility. By separating motor intake air from any hot air radiating off of the vacuum producer, the enclosure allows added motor cooling and enhances system operation.

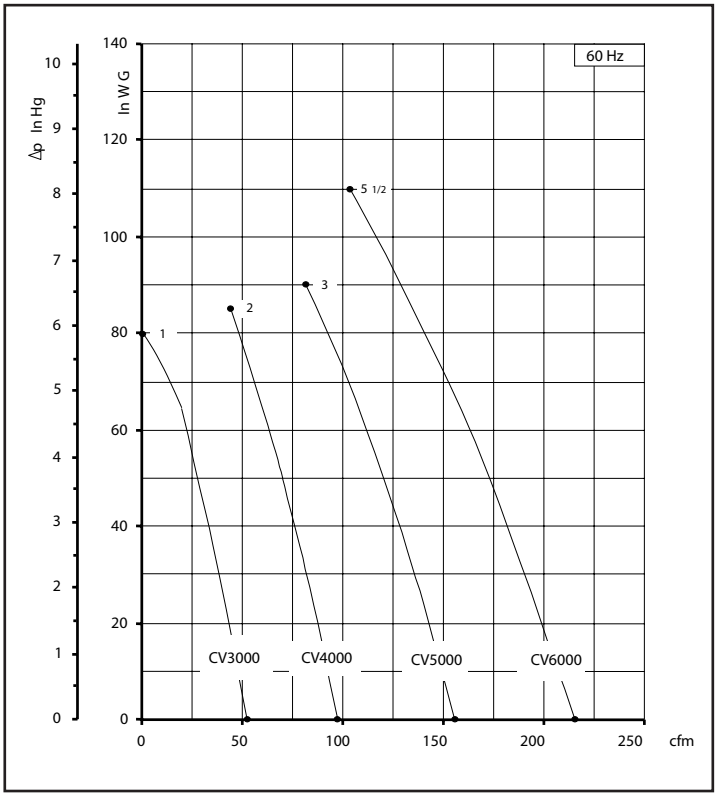
Delivering power and performance for a range of applications, these Compact-Vacs are ideal for portable continuous use.

VACUUM SYSTEM SPECIFICATIONS

Model	HP	CFM	Hg"	H_2O"	Power	dBa
CV3000	1	52	5.9	80.2	115 / 208-230-60-1	61
CV4000	2	98	7.4	100.6	230 / 460-60-3*	64
CV5000	3	156	6.6	89.7	230 / 460-60-3*	70
CV6000	5.5	216	8.1	110.1	230 / 460-60-3	73

*Single phase 115 / 230-60-1 motor option available

COMPACT VAC VACUUM CURVE



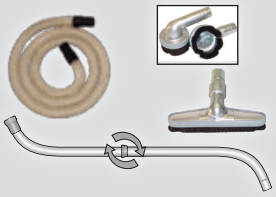
COMPACT-VAC

THE MOST COMPACT EXTRACTION SYSTEM FOR PROCESS

ACCESSORIES & MORE!

Food Grade Accessory Kit

Ruwac's food grade accessory kit are ideal for applications where eliminating cross-contamination during the handling of food particles is needed. This kit is FDA compliant.



Stainless Steel Option

A stainless steel canister option is also available for food processing applications where use of this material is required to comply with FDA guidelines in particle handling.

Fume Extraction Swing Arm

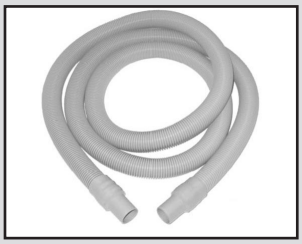
The Fume Extraction Swing Arm safely remove gases, airborne dusts and smoke emitted during the manufacturing process. These assemblies are fully mobile and retractable mounted onto a pivot arm extension. Adaptable to CV5000 and CV6000 models only.

HEC Pre-Separators

Collect 97% of debris before reaching the vacuum with Ruwac's HEC pre-separators. Increases filter life. 30 & 55 gallon drum. Features such as direct bagging, tipping drum and lifting assembly makes emptying easy. Very portable.

Additional Hose Lengths

Do you need a longer or wider hose? Ruwac offers a selection of hoses in all sizes and materials to ensure your vacuum system can handle removing any material!



More Accessories!

Don't see what you want here? Ruwac offers a wide selection of accessories to fulfill your vacuum needs! Contact us today to receive your very own copy of our Accessory Catalog!

Ruwac

MADE IN THE USA

CERTIFIED QUALITY MANAGEMENT SYSTEM ISO 9001:2008 ANAB DNV

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2. Safety, Instructions & Parts

IMPORTANT SAFETY INSTRUCTIONS

WARNING :

To Reduce the Risk of Fire, Electric Shock or Injury:

Dry Vacuums

Electric shock could occur if used on wet surfaces.
DO NOT expose to rain - Store Indoors

Wet Vacuums

To avoid electric shock DO NOT expose to rain. Store Indoors
Electric shock could occur if power nozzle is used on wet surfaces.

When using this electric vacuum, basic precautions should always be followed, including the following:

1] DO NOT leave the vacuum when plugged in. Unplug it from the outlet when not in use and before servicing.

2] This is NOT a toy. Close attention is necessary when used around or near children.

3] Use only as described in this safety manual. Use only the manufacturer's recommended attachments and accessories.

4] DO NOT use this vacuum with damaged cord or plug. If the vacuum is not working as it should, because it has been dropped, damaged, left outdoors or dropped into water, contact an authorized service center or factory.

5] DO NOT pull the vacuum by the cord, use cord as a handle, close a door on the cord or pull cord around sharp edges and corners. DO NOT run vacuum over the cord. Keep the cord away from heated surfaces.

6] DO NOT unplug the vacuum by pulling on the cord. To unplug, grasp the plug, not the cord.

7] DO NOT handle the vacuum plug or vacuum with wet hands.

8] DO NOT put any objects into openings. DO NOT use with any openings blocked; keep free of dust, lint, hair, and anything that may reduce air flow.

9] Keep hair, loose clothing, fingers, and all parts of body away from openings and moving parts.

10] DO NOT pick up anything that is smoking or burning such as cigarettes, matches, or hot ashes.

11] DO NOT use without dust bag and/or filters in place for dry operation and wet adaptor for wet operation.

12] Turn OFF all the controls before unplugging.

13] Use extra care when cleaning on stairs.

14] DO NOT use this vacuum to pick up flammable or combustible liquids such as gasoline or use in areas where they may be present.

15] DO NOT use where anesthetics or oxygen are used.

16] Replace damaged or worn parts immediately with genuine original equipment parts to maintain safety and to protect your limited warranty.

17] DO NOT use an extension cord unless absolutely necessary. If an extension cord is used, then wire size must be #14 gauge or larger and should not exceed 50 feet in length. The extension cord must be three-wire type to insure GROUNDING protection.

This vacuum must be connected to a properly grounded outlet only. See grounding instructions (Page 3). If your vacuum has an outlet for a motorized power noz zle, always turn the vacuum OFF before connecting or disconnecting the motorized nozzle.

SAVE THESE INSTRUCTIONS

GROUNDING INSTRUCTIONS

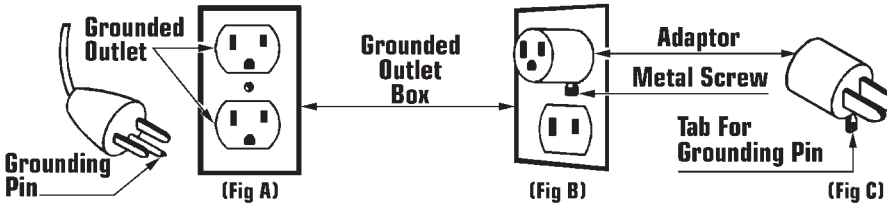
DANGER

Improper use of the grounding plug can result in a risk of electric shock.

Electrical equipment must be grounded. If it should mal-function or breakdown, grounding provides a path of least resistance for electrical current to reduce the risk of electric shock. This vacuum is equipped with a cord having an equipment-grounding conductor and grounding plug. The plug must be inserted into an appropriate outlet that is properly installed and grounded in accordance with all local codes and ordinances.

If repair or replacement of the cord or plug is necessary, DO NOT connect the grounded wire to either flat blade terminal. The wire with insulation having an outer surface that is green with or without yellow stripes is the grounding wire.

GROUNDING METHODS



This electric equipment is for use on a nominal 120 volt circuit, and has a grounded plug that looks like the plug illustrated in (Fig A). A temporary adaptor that looks like the adaptor illustrated in (Fig B & C) may be used to connect this plug to a 2-pole receptacle as shown in (Fig B) if a properly grounded outlet is not available.

The temporary adaptor should be used only until a properly grounded outlet (Fig A) can be installed by a qualified electrician. The green color rigid ear, lug or the like extending from the adaptor must be connected to a permanent ground such as a properly grounded outlet box cover. Whenever the adaptor is used, it must be held in place by a metal screw (Fig C).

WARNING :

Improper connection of the equipment-grounding conductor can result in a risk of electric shock. Check with a qualified electrician or service person if you are in doubt as to whether the outlet is properly grounded. DO NOT modify the plug provided with the equipment. If it will not fit the outlet,have a proper outlet installed by a qualified electrician.

Note: In Canada, the use of a temporary adaptor is not permitted by the Canadian Electrical Code.

CARE OF THIS VACUUM

Treat this vacuum as you would any other high grade precision made product. Dropping, unreasonable bumping across thresholds and other misuses may result in a damaged unit which will not be covered by warranty.

When not in use, the power cord should be wrapped around the motor head for storage.

Read this manual completely before operating this vacuum. It is important to follow instructions in this manual to prevent the possibility of injury or damage to the user and/or vacuum.

Lire Toutes Les Instructions Avant De Faire Fonctionner (Cet Appareil)

AVERTISSEMENT

Pour reduire les risques d'incendie, de choc electrique ou de blessure:

POUR APPAREIL SEC

Pour réduire les risques de choc électrique, ne pas aspirer de maitières humides, ne pas exposer à la pluie et garder l'aspirateur à l'intérieur.

POUR APPAREIL HUMIDE

Pour réduire les risques de choc électrique, ne pas exposer à la pluie et garder l'aspiraleur à l'intérieur.

L'utilisation d'un appareil électrique demande certaines précautions:

1] Ne pas laisser l'appareil sans surveillance lorsqu'il est branché. Débrancher lorsque l'appareil n'est pas utilise ét avant l'entretien.

2] Ne pas permettre aux enfants de jouer avec l'appareil.Une attention particulière est nécessaire lorsque l'appareil est utilisé par des enfants ou à proximité de ces derniers.

3] N'utiliser que conformément à cette notice avec les accessoires recommandés par le fabricant.

4] Ne pas utiliser si le cordon ou la fiche est endommagé. Retourner l'appareil à un atelier de réparation s'il ne fonctionne pas bien, s'il est tombé ou s'il a été endommagé, oublié à l'extérieur ou immergé.

5] Ne pas débrancher en tirant sur le cordon. Tirer plutôt la fiche.

6] Ne pas toucher la fiche ou l'appareil lorsque vos mains sont humides.

7] Ne pas tirer, soulever ou traîner l'appareil par le cordon. Ne pas utiliser le cordon comme une poignée, le coincer dans l'embrasure d'une porte ou l'appuyer contre des arêtes vives ou des coins. Ne pas faire rouler l'appareil sur le cordon. Garder le cordon à l'écarte des surfaces chaudes.

8] N'insérer aucun objet dans les ouvertures. Ne pas utiliser l'appareil lorsqu'une ouverture est bloquée. S'assurer que de la poussière, de la peluche, des cheveux ou d'autres matières ne réduisent pas le débit d'air.

9] Maintenir les cheveux, les vêtements amples, les doigtet toutes les parties du corps à l'écart des ouvertures et des pièces mobiles.

10] Ne pas apsirer de matières en combusion ou qui dégagent de la fumée, comme des cigarettes, des allumettes ou des cendres chaudes.

11] Ne pas utiliser l'appareil si le sac à poussière ou le filtre n'est pas en place.

12] Mettre toutes les commandes à la position ARRET avant dé debrancher l'appareil.

13] User de prudence lors du nettoyage des escaliers.

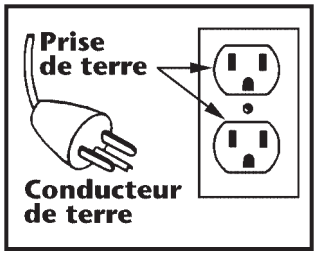
14] Ne pas aspirer des liquides inflammables ou combustibles, comme de l'essence, et ne pas faire fonctionner dans des endroits où peuvent se trouver de tels liquides.

15] Toujours mettre l'interruptuer de l'appariel à la position ARRET avant de brancher ou de débrancher la brosse à moteur.

16] Ne brancher qu'à une prise de courant avec mise àla terre. Voir les instructions visant la mise à la terre.

Instructions Visant La Mise À La Terre

Cet appareil doit être mis à la terre. En cas dé défaillance ou de panne éventuelles, la mise à la terre fournit au courant un chemin de moindre résistance qui réduit le risque de choc électrique. Cet appareil est pourvu d'un cordon muni d'un conducteur de terre et d'une fiche avec broche de terre. La fiche doit être branchée dans une prise appropriée correctement instalée et mise à la terre conformément aux règlements et ordonnances municipaux.



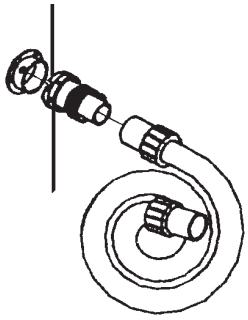
Cet appareil est destiné à un circuit de 120V et est muni d'une fiche de mise à la terre semblable à celle illustrée par le croquis A de la figure "A". S'assurer que l'appareil est branché à une prise de courant ayant la même configuration que la fiche. Aucun adaptatteur ne devrait être utilisé avec cet appareil.

AVERTISSEMENT

Un conducteur de terre mal raccordé peut entraîner un risque de choc électrique. Consulter un électricien ou un technicien d'entretien qualifié si vous n'êtes pas certain que la prise soit correctement mise à la terre. Ne pas modifier la fiche fournie avec l'appareil-si elle ne peut être inséreé dans la prise, faire installer une prise adéquate par un électricien qualifié.

Conserver Ces Instructions

HOSE, WAND & TOOL ASSEMBLY

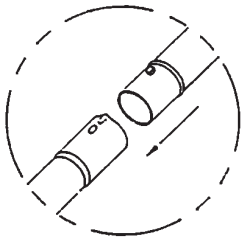


Hose & Swivel Connector

The hose and swivel connector are pre-assembled at the factory. To attach the swivel connector to intake fitting on vacuum tank:

1] Line up swivel connector slots with retaining rivets on the intake.

2] Insert swivel connector and twist clockwise until rivets reset against slot end.

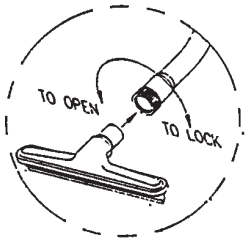


1¼ " Tool Kit Assembly

Wand Assembly: Both sections are exactly the same. Slide the tapered end of one section into the slotted end of the other wand section.

Attach Hose: Slide curved elbow on hose into wand end with slots on the side.

Install Tool: Insert tool into the tapered end of the wand.



1½ " Tool Kit Assembly

Wand Assembly: Align button lock of upper wand section with the opening for button lock in the lower wand section and push sections together.

Attach Hose: Slide free end of hose into the grooved end of upper wand.

Install Tool: Turn wand nut counter-clockwise approximately (4) complete turns. Insert the tool into wand nut and coupling. While holding tool in place, turn nut clockwise until wand nut is fully locked.

CAUTION :

Exercise caution when handling the motor head.
Dropping the motor head may cause permanent damage to internal components.

Dry Operation

Warning :

Electric shock could occur if used on wet surfaces
DO NOT expose to rain - Store Indoors.

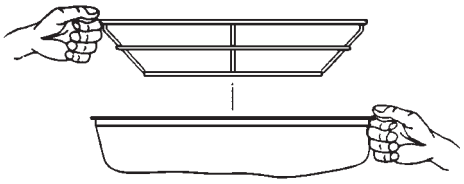
Dry (only) vacuums are equipped with an continuous duty motor are designed for dry pick-up only.

Wet/dry vacuums are equipped with a by-pass motor can be used for dry and wet pick-up. When ordered to be used as a dry vacuum, the unit is shipped with a dry filter only.

Dry Filter Installation

1] Disconnect the vacuum producer connection. Empty filters, hose and other attachments that may be packed in the tank.

2] Install a disposable paper filter bag as illustrated on the bag, attach cloth filter to wire filter frame, set filter assembly on tank, replace the lid and snap down holddown clamps.



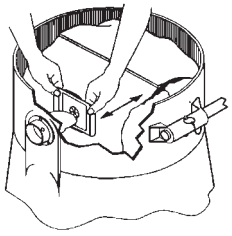
Dry Filter Maintenance

In order to maintain maximum vacuum cleaner efficiency it is important to clean the cloth filter each time the tank is emptied. To clean the cloth filter, shake off loose particles and brush exposed surface with a soft bristle brush.

NOTE: DO NOT WASH, shrinkage to the cloth and damage to the gasket can occur.

Filter Installation & Removal

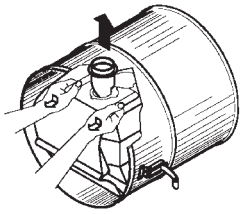
Paper Bag & Cloth Filters Installation



1] Expand paper filter bag pleats, then grasp scored ends of cardboard and pull forward completely onto inlet tube as close to tank wall as possible.

2] Position cloth filter assembly on the tank, then place motor head on tank and close clamps.

Loaded Filter Bag Removal



1] Remove motor head and cloth filter assembly and lay cleaner on its side with inlet tube on top.

2] Remove filter bag from inlet and pull bag out of tank, using care not to puncture bag with inlet tube.

3] Reseal cardboard flap that covered filter bag opening. Install a new paper filter bag.

TROUBLE SHOOTING GUIDE

CAUTION :

Always disconnect power cord before servicing vacuum.

PROBLEM: Loss of Vacuum.

CAUSE:	SOLUTION:
1] Full disposable paper filter bag.	1] Replace disposable paper filter bag.
2] Dry filter assembly clogged.	2] Clean cloth filter.
3] Clogged hose or wand.	3] Remove obstruction.
4] Tank rim damaged.	4] Replace tank.
5] Motor not working.	5] Contact manufacturer or authorized service center.
6] Gasket worn.	6] Contact manufacturer or authorized service center.
	7] Check to see if ball on rod moves freely or tank is full.
	8] Replace gasket.

PROBLEM: Motor is not running.

CAUSE:	SOLUTION:
1] Broken switch.	1] Contact manufacturer or authorized service center.
2] Power cord defective.	2] Contact manufacturer or authorized service center.
3] Motor defective.	3] Contact manufacturer or authorized service center.
4] Blown fuse or tripped circuit breaker.	4] Replace fuse or reset circuit breaker.

WARNING :

Repairs should only be performed by an authorized service center.

3. Vacuum Producer Instructions

Index

1 SAFETY STANDARDS

This operating manual:

- Applies to "K" series side channel compressors-vacuum pumps in an "MOR" single block version.
- Contains instructions for transporting, installation, commissioning, operating, storing, and maintenance of "K" series side channel compressors-vacuum pumps in an "MOR" format.
- Must be read carefully and understood fully before doing any work using the unit.
- Must be complied with fully.
- Must be to hand at all times at the workstation at which the unit is used.

Failure to comply with the safety standards may result in serious injury to people – even with fatal consequences – as well as damage to materials and the environment.

1.1 NOTES FOR THE USER'S SAFETY

The safety standards referred to in this operating manual are marked by a danger symbol. Next to this symbol there is wording indicating the seriousness of the danger. You are kindly requested to fully comply with the procedures described in order to avoid any danger to people or property!

This **Danger** symbol indicates dangers that may result in **injury to people** with consequences including **death or serious injury** if the necessary precautions are not taken.

The term "**WARNING**" indicates dangers that may result in **damage to property**.

"**USER'S NOTES**" are intended to allow the unit to be used in the best way to achieve best performance, in safety and respecting the environment.

1.2 GENERAL SAFETY WARNINGS

WARNING!

The "K" series of side channel compressors-vacuum pumps in an "MOR" format are designed and built for use in industrial plants are fitted with three-phase or single-phase electric motors of an asynchronous bipolar type, in compliance with IEC 34-1.

Any use other than the intended use of the unit may cause serious injury and even death!

- The unit may only be started:
  In conformity with the use, transport, and handling purposes indicated in "INTENDED USE".
  According to the values indicated in the "CHARACTERISTIC DATA" table on page 3.
- All transportation, assembly, installation, starting up, and maintenance operations are only to be carried out by qualified personnel, that is, personnel whose training, instruction, experience, knowledge of standards, regulations, accident prevention procedures, and operating and service conditions, makes them capable of carrying out all the works necessary, while being aware of and avoiding any possible danger and/or damage.

When the unit us working there is a danger of injury due to shearing, crushing, entanglement, and burns!

Transportation, assembly, installation, starting up, and maintenance operations are to be carried out wearing adequate **personal protective clothing** (protective gloves and safety glasses, safety shoes, and a hardhat).

Do not wear loose-fitting garments, long laces, or other items that may get entangled in the machine.

Long hair must be gathered up.

Electrical danger!

Inappropriate behaviour may result in serious injury and even death!

Work on electrical equipment (installation and maintenance) is only to be done by qualified, authorised electricians!

Before starting to work on the unit or plant, the following precautions must be taken:

Switch off the mains power supply.

Adopt measures to prevent it being switched on again.

Only open the terminal box after checking that the power is off altogether!

Danger due to rotating components (cooling fan for the electric motor, impeller, and shaft): Cutting or shearing of limbs, entanglement or trapping of hair or clothing.

Danger due to excess pressure and vacuum: Sudden ejection of process gases (injury to the skin and eyes), and sudden sucking in of hair and clothing!

Danger due to process gases that come out and cause burns!

- The unit may only be started and operated under the following conditions:

  The unit must be fully assembled and whole (not damaged).

  Piping must be connected to the silencers using fixings, connections, pipes, pipe fittings, and tanks that are watertight and sufficiently strong to withstand the pressures that develop.

  Connections to the suction and delivery silencers must not be closed, clogged, or dirty.

  Regularly check that the seatings for fixings, connections, piping, pipe fittings, and tanks are firmly secured!
- Before starting maintenance work on the unit, the following safety precautions must be taken:

  Put the unit out of order and ensure that it cannot be switched on again.

  Put a sign on the plant's controls and on the control units that reads: "DANGER! Maintenance work on the compressor-vacuum pump in progress! Do not switch on!"

  Wait until the unit has stopped completely, that is, until the impeller has stopped rotating.

  Allow the unit to cool down!

  Make sure that there is no pressure or vacuum in the unit or in the piping to be disconnected.

  Make sure that no fluid can flow out of the unit and/or plant!

Danger due to rotating impeller: Cutting or shearing of limbs!

The impeller can be accessed while it is rotating by opening the suction and delivery silencers!

Never put your hands or any item into these openings.

Fit the suction and/or delivery silencers with additional silencers or additional pipes sufficiently long to prevent access to the impeller.

Danger due to burns caused by contact with hot surfaces on the unit!

When operating in compliance with the values indicated in the "CHARACTERISTIC DATA" table on page 3 the compressors-vacuum pumps can reach high surface temperatures of up to 160°C (+320°F).

Fit the unit with adequate protection against the risks of involuntary contact with hot surfaces.

Do not touch the unit's surfaces on purpose when it is running!

Before doing any work after having switched off the unit, allow it to cool!

Danger resulting from the impeller seizing due to the performance values being exceeded: Vacuum and/or pressure exceeding the declared values!

Do not allow the unit to operate with the suction and/or delivery openings obscured for any reason.

Install a safety valve that can prevent excessive vacuum and/or pressure, and that makes it possible to comply with the values indicated among the "CHARACTERISTIC DATA" given on page 3 of this manual.

In order to limit the formation of layers of dust on the surfaces, which may compromise natural exchanging of heat between the unit and the environment, regularly clean and remove all dust using suitable equipment.

Suction and/or delivery piping must not be dirty or clogged!

If any anomalous noises are heard, which may be a warning that the impeller is about to seize, switch off the unit and move away from it immediately.

Danger due to the impeller seizing due to use in an unsuitable place and/or due to conveying fluids that are not suitable: Unsuitable ambient and suction temperatures!

Check that the ambient and suction temperatures for the gas conveyed are between: -15°C (+5°F) and +40°C (+104°F).

Check that good ventilation is provided for the unit.

Use a filter on the suction side to filter particles 25 µm or larger, which will make it possible to limit the entry of any solids into the unit, thereby avoiding possible breakage of the impeller blades, making the fragments projected out of the delivery opening dangerous!

During installation and when the unit is running, check for load losses due to the use of this filter: The maximum load loss allowed is 30 mbar. This value must be subtracted from the maximum admissible pressure indicated in the "CHARACTERISTIC DATA" table on page 3 of this manual.

If any anomalous noises are heard, which may be a warning that the impeller is about to seize, switch off the unit and move away from it immediately.

1.3 OTHER HAZARDS

Danger due to rotating components: Cooling fan for the electric motor!

There is an immediate danger of hair and clothing becoming entangled in the cooling fan in the electric motor's cowling via the cowling itself!

Protective steps to be taken:

Do not wear loose-fitting garments, long laces, or other items that may get entangled in the machine.

Long hair must be gathered up.

Danger due to hot surfaces – up to 160°C (+320°F)!

Under operating conditions there is a possibility of burns due to contact with the unit's surfaces.

Protective steps to be taken:

Fit the unit with adequate protection against the risks of involuntary contact with hot surfaces.

Do not touch the unit's surfaces on purpose when it is running!

Before starting with any work, wait for the unit to cool down after switching it off!

Danger due to noise emitted by the unit!

When the compressors-vacuum pumps are running they emit noise that may exceed 80 dB(A)!

Protective steps to be taken:

Mark the area around the unit using warning signs.

Wear personal protective equipment for hearing.

If necessary, fit additional silencers on the suction and/or delivery silencers.

From time to time use noise tests to check the efficiency of the soundproofing panels in the suction and delivery silencers. The reference values are indicated in the "CHARACTERISTIC DATA" table on page 3 of this manual.

2 INTENDED USE

The "K" series of side channel compressors-vacuum pumps in an "MOR" format are made to generate vacuums and pressures, and for conveying air and gas that is not explosive, not inflammable, not poisonous, and not aggressive, for continuous operation in a non-explosive environment.

The "K" series of side channel compressors-vacuum pumps in an "MOR" format are designed and built for use in industrial plants are fitted with three-phase or single-phase electric motors of an asynchronous bipolar type, in compliance with IEC 34-1.

2.1 TYPICAL EXAMPLES OF IMPROPER USE

Any use other than the intended use of the unit may cause serious injury and even death!

Failure to comply with the prohibitions / obligations indicated may result in technical faults, damage to the plant, or injury!

Danger of very serious injury!

THE FOLLOWING ARE STRICTLY FORBIDDEN:

- Using the unit in non-industrial installations, unless all the necessary precautions or protective measures have been taken (e.g. protection against contact to safeguard children).
- Using the unit in places in which there are explosive dust and/or gas or where these may form.
- Sucking up and conveying explosive, inflammable, aggressive, corrosive, and/or harmful fluids.
- Using the unit under conditions that differ from those indicated in the "CHARACTERISTIC DATA" table on page 3.
- Using the unit without having installed a suction filter.
- Operating with the suction and/or delivery openings closed.

- Making modifications to the unit or transforming it, or making repairs or doing maintenance based on your own initiative. Maintenance works are only to be carried out as described in this operating manual by qualified personnel, that is, personnel whose training, instruction, experience, knowledge of standards, regulations, accident prevention procedures, and operating and service conditions, makes them capable of carrying out all the works necessary, while being aware of and avoiding any possible danger and/or damage.
- Starting the unit up again after a fault, unless it has been repaired by qualified personnel.

THE FOLLOWING ARE OBLIGATORY:

- Doing maintenance work as indicated in chapter 6.
- Carrying out preliminary and periodic checks as indicated in the "STARTING UP" chapter.

3 STORAGE AND TRANSPORT

Danger due to loads that fall over or fall down!

Heavy loads that fall over or down may cause crushing, resulting in injuries to people and even death!

Do not put loads on top of the packing.

Danger due to lifting heavy loads!

Heavy loads that fall over or down may cause crushing, resulting in injuries to people and even death!

Before undertaking handling operations (lifting, moving, transporting, and putting down) look at the unit's mass (M) shown in the "CHARACTERISTIC DATA" table on page 3 and determine the best way to work in maximum safety.

In this regard all the prevention measures must be applied, including any local and/or specific regulations that make it possible to carry out the handling operations:

Using qualified personnel that have specific skills and adequate training, using suitable equipment.

Organising the work in such a way that it poses the least risk possible and is done under safe, healthy, conditions.

Using safe, stable support surfaces.

Use of suitable working clothes and adequate personal protective equipment (protective gloves and safety glasses, safety shoes and a hardhat).

Working in an area with sufficient space, level floors, no obstructions.

Avoiding impacts, jolting, and shaking.

Units with a mass that exceeds 25 kg (55 lbs) are fitted with lugs to be used for handling.

WARNING!

Lifting the unit is any way other than that indicated is strictly forbidden. Use the lug provided on the blower unit or motor.

Store in a dry place, keeping the packing if possible. Do not remove the covers over the openings.

4 INSTALLATION

4.1 SCL K COMPRESSOR – VACUUM PUMP

Any use other than the intended use of the unit may cause serious injury and even death!

- This operating manual:

  MUST be read carefully and understood fully before doing any work using the unit.

  MUST be complied with fully.

  MUST be to hand at all times at the workstation at which the unit is used.

- Remember that installation operations are only to be carried out by qualified personnel, that is, personnel whose training, instruction, experience, knowledge of standards, regulations, accident prevention procedures, and operating and service conditions, makes them capable of carrying out all the works necessary, while being aware of and avoiding any possible danger and/or damage.

Danger due to a lack of a clear view of the place in which the unit is installed!

Make sure that the unit installed is always under control when doing anything in the installation area.

The controls must be positioned in such a way as to be able to see the unit installed.

Danger of very serious injury!

WARNING!

If the flow rate has to be reduced, use a draw-off valve rather than throttling back the suction or delivery lines.

4.1.1 WORKING CONDITIONS

The "K" series of side channel compressors-vacuum pumps in an "MOR" format are made to generate vacuums and pressures, and for conveying air and gas that is not explosive, not inflammable, not poisonous, and not aggressive, for continuous operation in a non-explosive environment.

If installed outdoors, protect the unit against exposure to sunlight.

The maximum pressure differentials allowed are indicated in the "CHARACTERISTIC DATA" table on page 3 of this manual and must never be exceeded. Only the following conditions are valid:

As a compressor:
Gas intake temperature 20°C (+68°F) and atmospheric pressure 1013 mbar (abs) (29,92 in Hg) measured at the suction opening.

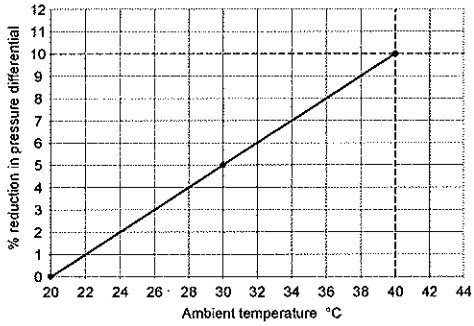
As a vacuum pump:
Gas intake temperature 20°C (+68°F) measured at the suction opening and atmospheric back pressure 1013 mbar (abs) (29,92 in Hg).

The ambient temperature and the intake temperature of the gas conveyed is allowed within the -15°C (+5°F) to + 40°C (+104°F) range, with the following provisions:

- If the ambient temperature is +30°C (+86°F) **reduce** the maximum pressure differentials indicated in the "CHARACTERISTIC DATA" table on page 3 by 5%.

- If the ambient temperature is +40°C (+104°F) **reduce** the maximum pressure differentials indicated in the "CHARACTERISTIC DATA" table on page 3 by 10%.

The graph to be used to reduce the maximum pressure differentials when the ambient temperature is between +21°C (+70°F) and +40°C (+104°F) is given below.



4.1.2 INSTALLATION CONDITIONS

For installation exceeding 1000 m (3300 ft) contact FPZ for assistance as installations at higher altitudes will affect blower performance.

The support surfaces for the unit must be flat, strong, stable, and as level as possible.

It is important that the unit be installed on a structure that does not transmit significant vibrations back to the blower.

Under all conditions, do not install units on structures that can transmit or amplify noise (tanks, steel plating, etc.).

The unit must always be installed using anti-vibration supports.

Danger due to vibrations!

Regularly check that the points at which the unit is fixed to the support structure are tight.

Excess vibration of the unit can cause damage to balance, resulting in injury to people and even death!

The unit must be installed in such a way that the motor's ventilation is not impeded by obstacles put in the immediate vicinity.
To this end a minimum gap must be kept between the motor's fan guard and any other structure of at least 50 mm (2 in.).

WARNING!

To guarantee that the unit is well ventilated after installation, proceed as follows:

The air intake on the motor's fan guard must be kept free.

Intake fresh air only. Avoid recirculation and / or ingestion of contaminated / hot air from other sources.

If the unit is installed in a closed space, guarantee a good flow of cooling air by using an extractor / fan and correct air intake for cooling the motor.

Any use other than the intended use of the unit may cause serious injury and even death!

To avoid overloading due to pressure fluctuations, fit a safety valve on the suction pipe if used as a vacuum pump and on the delivery pipe if used as a compressor.

Danger due to foreign bodies and dirt getting into the unit!

Any foreign bodies, even very small in size, getting into the unit causes serious damage and probable breakage of the impeller, and a danger that broken bits may be projected outwards!

Foreign bodies include: Dust, sand, lime scale, impurities in the pipes, cutting or threading burrs, welding drops or slag, metal burrs or residue of sealing products used when connecting up the pipework.

Protect the suction pipe using a suitable filter with a maximum degree of filtration of 25µm and a maximum load loss of ΔP=20mbar (8" wg).

Replace filters regularly!

WARNING!

Size piping and choose accessories that cause the minimum load losses, and so:

Do not fit pipes of a diameter smaller than that of the machine's openings.

When installing a number of machines in parallel, size the manifold and main line accordingly.

Do not use elbows, but large radius bends.

Do not fit valves with a passage smaller than the nominal size and non-return valves with a spring-loaded shutter (the non-return valve that causes the smallest load loss is one with a lightened shutter).

When using for aeration, choose diffusers with a low passage resistance (low load loss) and do not forget that the diffusers and porous sieves can clog over time and increases load.

WARNING!

Avoid the possibility of standing water, especially when installing the unit with its axis vertical .

See the INSTALLATION DIAGRAMS in chapter 8.

4.1.3 HORIZONTAL INSTALLATION

The unit is ready for installation in a horizontal position, suitably fixed to the bracket / brackets.

The bracket has fixing holes. Use all the holes and suitable bolt types.

See point 4.1.2 for the INSTALLATION CONDITIONS.

Remove the covers over the openings before checking the direction of rotation and before final connection.

WARNING!

Check the direction of rotation in the motor.
(See point 4.2.3 ROTATION DIRECTION)

When connecting the unit cabin to the ducting, do so using the flanges on the silencer housings and form suitable connections using flexible hoses. Avoid rigid connections that may impose loads and give rise to harmful vibrations.

Fit the flanges on the silencer housings complete with gaskets again, and tighten.

4.1.4 INSTRUCTIONS FOR REPOSITIONING THE SILENCER HOUSINGS

Danger due to rotating components: Impeller!

There may be a danger of shearing due to the impeller rotating even when the machine is switched off, if it is started manually.

Suitable working clothes and personal protective equipment must therefore be used.

The SCL K-MS series is designed to provide maximum flexibility in positioning the silencer housings, to allow for various installation configurations.

The blower comes with the silencers positioned as shown in fig 1.

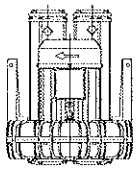


fig.1

If this layout has to be modified, proceed to identify the layout of the silencer housings required.
The possible solutions are shown in fig 2, fig 3, and fig 4 below.

fig 2

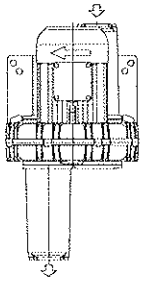


fig 2 with 90° manifold

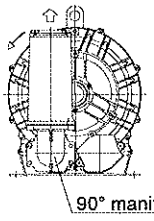


fig 3

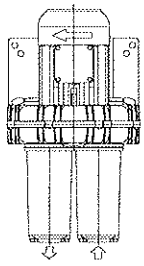


fig 3 with 90° manifolds

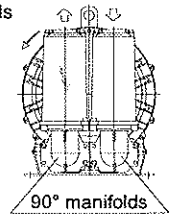


fig 4

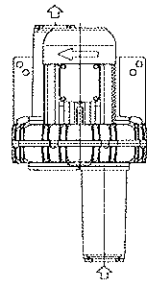
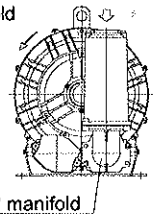


fig 4 with 90° manifold



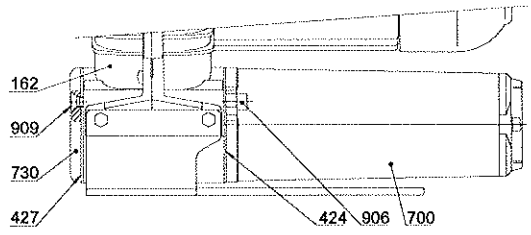
Position the unit in a horizontal position with the bracket on a flat, stable surface.

Disassembling the silencer housing:

- Remove the bolts (906).
- Remove the silencer (700) with its gasket (424).

Fitting the blank flange (730):

- Remove the bolts (909) and the flange (730) with the O-Ring (427).



Fit everything again in reverse order, not forgetting gaskets (424), and (427).

USING THE (accessory) CK TYPE 90° MANIFOLD KIT

The 90° manifold can only be fitted for (162) cover openings and as shown in fig 2, fig 3, and fig 4 above there are a number of installation configurations that are possible.

The CK type 90° manifold kit comprises:

N° 1 manifold
N° 1 gasket (427) and
N° 2 M8x25 UNI 5739 bolts

To assemble the 90° manifold proceed as follows:

- Remove the silencer housing as described before.
- Put the gasket between the cover (162) and the 90° manifold, and tighten the M8x25 UNI 5739 bolts.
- Assemble the silencer housing, following the instructions in reverse order and not forgetting gasket (424).

4.1.5 VERTICAL INSTALLATION ON THE COVER

For installing in a vertical position, fit the anti-vibration supports supplied with the unit on the cover, and then fix the whole structure to the support.

See point 4.1.2 for the INSTALLATION CONDITIONS.

Any use other than the intended use of the unit may cause serious injury and even death!

When installing vertically DO NOT use the bracket supplied with the unit as this is only suitable for horizontal installations.

Remove the covers over the openings before checking the direction of rotation and before final connection.

NOTE FOR THE USER

A bracket for fitting the unit in a vertical position on the cover is available as an accessory.

The bracket has fixing holes. Use all the holes and suitable bolt types.

WARNING!

Check the direction of rotation in the motor.

(See point 4.2.1 ROTATION DIRECTION)

When connecting the unit to the ducting, do so using the flanges on the silencer housings and form suitable connections using flexible hoses. Avoid rigid connections that may impose loads and give rise to harmful vibrations.

Fit the flanges on the silencer housings complete with gaskets again, and tighten.

4.2 ELECTRIC MOTOR

Electrical danger!

- Improper installation may result in serious injury and even death!
- Work on electrical equipment (installation and maintenance) is only to be done by qualified, authorised electricians!
- Before starting to work on the unit or plant, the following precautions must be taken:

  Make sure that the line is NOT switched on.

  Adopt measures to prevent it being switched on again.

  Only open the terminal box after checking that the power is off altogether!
- The terminal box must not contain:

  Foreign bodies

  Impurities

  Moisture.

Close the cover on the terminal box and seal the openings in the cable glands in order to prevent dust, water, and moisture to penetrate.

Check the seals periodically.

- Should you touch a defective unit there may be a danger of electric shock!

  Fit a motor trip-switch.

  Have the unit's electrical system checked by an electrician on a regular basis.

The electric motor is sized to work at an ambient temperature between -15°C (+5°F) and +40°C (+104°F), and a maximum altitude of 1000 m (3300 ft) above sea level.

Under other conditions the motor cannot be used at full load and so difficulties may arise for starting, particularly with a single-phase power supply for the motors.

WARNING!

A maximum of n° 6 evenly distributed starts per hour, is allowed.

Failure to comply with this may seriously damage the unit.

4.2.1 CONNECTION

WARNING!

Connecting the motor incorrectly may seriously damage the unit.

The power supply for the motor and any auxiliary equipment must be provided using cables of suitable section to avoid abnormal overheating and great voltage drops.

Check that the details on the nameplate are compatible with the line voltage and frequency.

A voltage tolerance of ±10% compared to the nominal value is admissible.

Connect the motor's earth cable to the relevant terminal marked with this symbol ⏚ always before connecting to the mains supply and check the dispersion capacity.

The earth cable can be recognised by its colour (yellow/green).

This connection to the main supply must be formed as shown in the wiring diagram contained in the terminal box.

Use the cable gland openings to allow power supply cables to pass into the terminal box.

Proceed to tighten the power supply cables, taking the section of the electrical cables into account each time.

The terminal block connections must be tightened properly to avoid high contact resistances and resulting overheating.

Check that the insulation gaps between the various conductors are not in contact with other surfaces, as indicated in the standards.

All the screws used to close the terminal board must be tightened properly. Damaged screws must be replaced immediately, using screws of the same or better quality.

The connection must guarantee:

- that it will maintain integrity over time.
- that no wire ends are sticking out.

Fuses do not constitute protection for the motor, but merely protect against short-circuits.

Size the fuses according to the peak currents, especially when using direct starting.

Protection with a (thermal or amperometric) trip switches is essential to deal with risks of overloading, a loss of one phase in the mains supply, excessive voltage fluctuations, or the rotor getting stuck.

Set the motor trip switch using the current value shown on the nameplate as a maximum.

4.2.2 INVERTER POWERED ELECTRIC MOTOR

WARNING!

A maximum of n° 6 evenly distributed starts per hour, is allowed.

Failure to comply with this may seriously damage the unit.

WARNING!

The unit's nominal pressure or vacuum characteristics for service at mains frequency cannot be maintained if the unit is powered via an inverter.

If an inverter is used for the power supply the installer is responsible for the checks and any steps necessary to comply with the immunity and emission limits laid down by the standards.

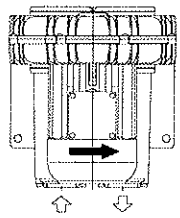
When using the unit with a motor powered via an inverter, follow the wiring instructions supplied by the inverter manufacturer carefully.

WARNING!

The performance of the unit powered via an inverter is shown in the relevant tables that can be requested from FPZ's assistance service.

4.2.3 ROTATION DIRECTION

The SCL K compressors–vacuum pumps must be used with the rotation direction shown by the arrow on the fan guard for the electric motor (see figure below).



To check the direction of rotation, switch on the motor very briefly. If the rotation direction is incorrect, switch the position of two of the three power supply conductors on the terminals.

5 STARTING UP

Any use other than the intended use of the unit may cause serious injury and even death!

The unit may only be started:

After having carefully read, fully understood, and complied with this operating manual ("SAFETY STANDARDS" and "INSTALLATION").

In conformity with the purposes laid down under "INTENDED USE".

According to the values indicated in the "CHARACTERISTIC DATA" table on page 3.

Danger due to rotating components (electric motor fan, impeller, and shaft): Cutting or shearing of limbs, entanglement or trapping of hair or clothing!

Danger due to excess pressure or vacuum: Sudden ejection of process gases (injury to the skin and eyes), and sudden sucking in of hair and clothing!

Danger due to process gases that come out and cause burns!

Danger due to burns caused by contact with hot surfaces on the unit!

Electrical danger!

Danger due to the impeller seizing due to use in an unsuitable place and/or due to conveying fluids that are not suitable: Unsuitable ambient and suction temperatures!

Danger resulting from the impeller seizing due to the performance values being exceeded: Vacuum and/or pressure exceeding the declared values and/or openings closed!

Danger due to noise emitted by the unit!

- CHECK THAT ALL THE SAFETY GUARDS HAVE BEEN FITTED CORRECTLY.

WARNING!

A maximum of n° 6 evenly distributed starts per hour, is allowed.

Failure to comply with this may seriously damage the unit.

5.1 PRELIMINARY CHECKS

Before finally starting up, carry out the following preliminary checks:

- If a lot of time has passed since the unit was last started up, check its condition and check for and if necessary remove dust deposited on the external surfaces.
- Deactivate/open any closing elements on the piping (closing valves, solenoid valves, etc.) before starting the unit.

  Do not allow the unit to be started and operate with the suction and/or delivery openings obscured for any reason!
- Check that the ambient and suction temperatures for the gas conveyed are between: -15°C (+5°F) and +40°C (+104°F).
- Check the rotation direction as indicated previously in the "INSTALLATION" chapter.
- Check that the setting for the motor trip switch corresponds to the motor's nominal current shown on the nameplate.
- Check that the safety valve is working correctly.

5.2 OPERATION

Having carried out all the preliminary checks, you can start with final starting of the unit.

Start the unit by switching on the power supply to the electric motor.

Check the operating pressure or vacuum and compare them to the values indicated in the "CHARACTERISTIC DATA" table on page 3. Load losses on the pipes are often underestimated but are determining factors for the operating pressure differential.

Measure the motor's absorption and check against the nameplate value.

Any use other than the intended use of the unit may cause serious injury and even death!

The unit may only be used:

- After having carefully read, fully understood, and complied with this operating manual ("SAFETY STANDARDS" and "INSTALLATION").
- In conformity with the purposes laid down under "INTENDED USE".
- According to the values indicated in the "CHARACTERISTIC DATA" table on page 3.

5.2.1 ROUTINE CHECKS

It is important that the units be checked routinely while running by qualified personnel, using inspections to avoid faults that may cause damage directly or indirectly.

When the unit is running, routinely carry out the following checks:

- Delivery temperature
- Operating pressure and/or vacuum
- Electric motor current absorption
- Vibrations
- State of the filter and related load loss.

Variations in normal working conditions (increases in power absorbed, anomalous noise, vibrations, excess overheating of the service fluid) indicate that the unit is not working correctly.

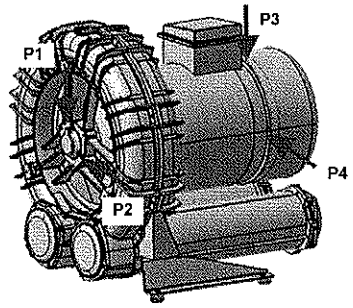
Also compare the values measured with those indicated in the "CHARACTERISTIC DATA" table on page 3.

See chapter 9 "TROUBLESHOOTING" for preventing possible breakage or faults.

Measuring vibrations

Measurements to determine vibration speed [mm/s] must be carried out using an electronic vibration meter at the points indicated below (see the figure below).

- **Points P1** and **P2 (front bearing):** The vibration meter must be put on the cover near the bearing seating, and the highest value must be recorded.
- **Points P3** and **P4 (back bearing):** The vibration meter must be put on the electric motor casing near the bearing seating (not on the fan guard), and the highest value must be recorded.



The results must be evaluated by comparing the maximum speed value measured with the limits laid down for the zones (A, B) shown in the table below, in compliance with ISO 14694.

Effective vibration speed value [mm/s]	***Class I*** (≤ 15kW)
1.8	***A***
4.5	***B***

Effective vibration speed value [mm/s]	***Class II*** (> 15kW)
2.8	***A***
7.1	***B***

Legend:

Machine classification:

Class I = SCL with electric motor power ≤ 15 kW
Class II = SCL with electric motor power > 15 kW

Evaluation zones:

Zone A = SCL with vibrations within this zone are considered acceptable for long-term service.

Zone B = SCL with vibrations within this zone are considered unsuitable for continuous long-term service. Under these conditions the machine can be operated for a limited period, until the opportunity arises for suitable corrective work to be done.

Danger resulting from the impeller seizing due to excessive vibrations!

Vibration values exceeding zone B (table of effective vibration speed values) are considered NOT admissible and may cause damage to the machine and resulting serious injury and even death!

- If any anomalous noises and/or vibrations are detected, these may be a warning that the impeller is about to seize, switch off the unit and move away from it immediately.

When the unit is stopped, routinely carry out the following checks:

- Dust deposits: Check and , if necessary, use suitable equipment to remove deposits on the external surfaces of the unit that may impede correct heat exchanging.
- Suction filter: Every 8-10 days check and if necessary clean or replace the filter cartridge. In very dusty environments, change the filter more frequently. A dirty cartridge creates extensive resistance at the suction, resulting in an increase in: the pressure differential, the power absorbed, and the operating temperature. The load loss must not exceed 30 mbar.

Electrical danger!

- Before doing anything else, make sure that the power supply is NOT switched on.

Danger due to burns caused by contact with hot surfaces on the unit!

When operating the compressors-vacuum pumps can reach high surface temperatures of up to 160°C (+320°F).

- Before starting with any work, wait for the unit to cool down after switching it off!

6 MAINTENANCE

Any use other than the intended use of the unit may cause serious injury and even death!

Maintenance may only be carried out on the unit:

If the maintenance instructions, parts list, and section/exploded view of the relevant unit are available.

After having carefully read, fully understood, and complied with this operating manual ("SAFETY STANDARDS" "STORAGE AND TRANSPORT" and "INSTALLATION").

In conformity with the purposes laid down under "INTENDED USE".

By qualified personnel, that is, personnel whose training, instruction, experience, knowledge of standards, regulations, accident prevention procedures, and operating and service conditions, makes them capable of carrying out all the works necessary, while being aware of and avoiding any possible danger and/or damage.

Danger due to burns caused by contact with hot surfaces on the unit!

When operating the compressors-vacuum pumps can reach high surface temperatures of up to 160°C (+320°F).

- Before starting with any work, wait for the unit to cool down after switching it off!

Electrical danger!

- Before doing anything else, make sure that the power supply is NOT switched on.

Any use other than the intended use of the unit may cause serious injury and even death!

The user is not authorised to make repairs or do maintenance work that involves restoring seized surfaces.

In these cases contact FPZ's assistance service or an authorised dealer.

After seizing the components involved may undergo deformation that makes the components unsuitable for being used again. Seized components must be analysed by FPZ before being reused or replaced.

- **Using unsuitable components may cause the impeller blades to break, giving rise to dangerous ejected fragments.**

Danger due to rotating components: Impeller!

There may be a danger of shearing due to the impeller rotating even when the machine is switched off, if it is started manually.

- **Suitable working clothes and personal protective equipment must therefore be used.**

6.1 INSTRUCTIONS FOR INTERNAL CLEANING

Should it be necessary to clean the inside of the unit, proceed as follows:

See fig. 1

1. Position the unit in a vertical position with the fan guard cowling on a flat, stable surface.
2. Remove the bracket (183) by removing the n° 4 bolts (920).
3. Remove screws (915) and (902) in order from the cover (162).
4. Remove the cover (162), using the 2 gaps between the body (161) and the cover (162) for leverage.
5. Remove the screws (900) and washer (365).
6. Remove the bearing (321) and bearing cover (360) working through the extractor.
7. Remove the impeller (230) through the extractor if necessary.

Clean and reassemble following the instructions in reverse order, and forming the seal (423) using Loctite 5970 or a similar product after having carefully cleaned the surfaces previously sealed.

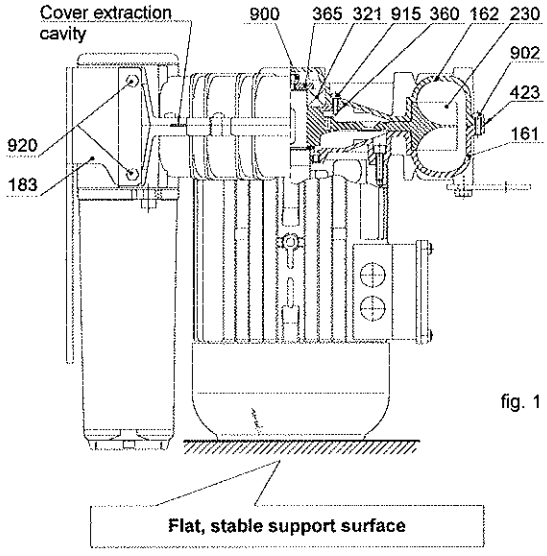


fig. 1

If it becomes necessary to replace the soundproofing in the silencers, proceed as follows:

See fig. 2

1. Position the unit in a horizontal position with its bracket on a flat, stable surface.
2. Remove the bolts (906).
3. Remove the silencers (700) from the unit, being careful not to lose the gaskets (424).
4. Remove the soundproofing (720) from the silencer housings.
5. Retrieve the support mesh (710).

Replace the soundproofing (720) and reassemble the unit following the instructions in reverse order and not forgetting the gaskets (424).

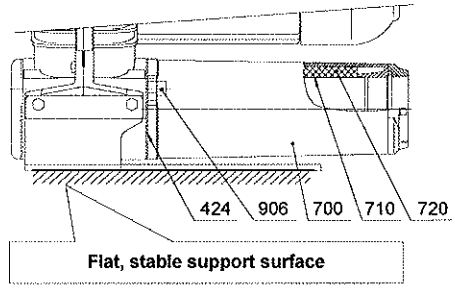


fig. 2

6.2 LIFESPAN OF BEARINGS

Under normal operating conditions (values shown in CHARACTERISTIC DATA – page 3) the machine's bearings have to be replaced after a maximum of 25,000 working hours or not more than 4 years.

Any use other than the intended use of the unit may cause serious injury and even death!

The bearings may only be replaced:

If the instructions, parts list, and section/exploded view of the relevant unit are available.

After having carefully read, fully understood, and complied with this operating manual ("SAFETY STANDARDS" "STORAGE AND TRANSPORT" and "INSTALLATION").

In conformity with the purposes laid down under "INTENDED USE".

By qualified personnel, that is, personnel whose training, instruction, experience, knowledge of standards, regulations, accident prevention procedures, and operating and service conditions, makes them capable of carrying out all the works necessary, while being aware of and avoiding any possible danger and/or damage.

7 COMMERCIAL CONDITIONS

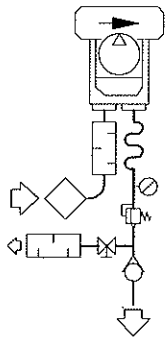
All undertakings, agreements, or legal relations are governed by the relevant sales contract. These are in no way limited by the contents of this manual.

The quality of the materials and workmanship is guaranteed, as indicated in the general sales conditions.

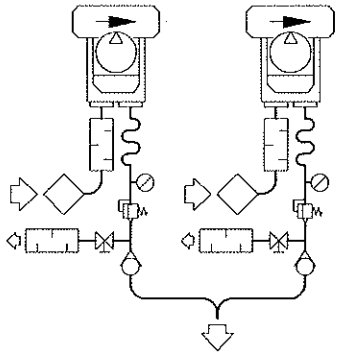
Guarantees are regulated by the general conditions of sale.

8. INSTALLATION DIAGRAMS

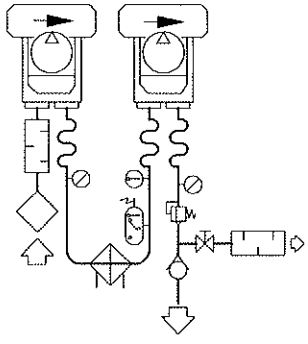
8.1 PRESSURE SERVICE



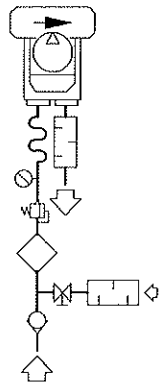
8.2 PARALLEL PRESSURE SERVICE



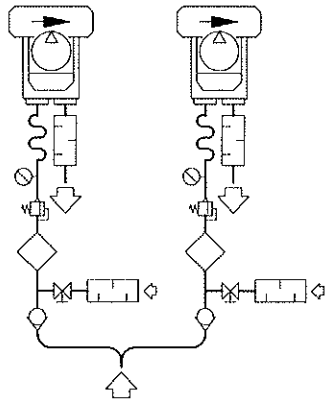
8.3 SERIES PRESSURE SERVICE



8.4 VACUUM SERVICE



8.5 PARALLEL VACUUM SERVICE



8.6 LIST ACCESSORIES

Item		Denomination	Item		Denomination
1		Filter – Inline filter	7		Non return valve
(2)		Silencer	8		Valve
3		Flexible coupling	(9)		Cooler
4		Pressure – Vacuum gauge	(10)		Thermometer
5		Pressure – Vacuum switch	(11)		Temperature switch
6		Safety valve	(x) IF NECESSARY		

9 TROUBLESHOOTING

Problem	Cause	Solution
The unit does not start	Electrical wiring incorrect	Get the operator to check the electrical connection against the wiring diagram contained in the terminal board box.
	Power supply voltage unsuitable	Check that the power supply voltage, measured at the motor's terminals, is within +/- 10% of the nominal voltage.
	The impeller is stuck	Get the operator to repair the unit
No or insufficient air flow	The suction filter is clogged	Get the operator to clean or replace the cartridge
	Frequency wrong (for units powered via an inverter)	Correct the frequency
	Profile of the impeller blades modified (due to deposits on the profile)	Get the operator to clean the impeller, check if it is worn and, if necessary, replace it.
No or insufficient pressure differential	Incorrect rotation direction	Get the operator to invert the rotation direction by switching two of the electrical power supply conductors.
	Leaks in the plant	Identify the leak and seal
Current absorption exceeding the admissible value	Electrical wiring incorrect	Get the operator to check the electrical connection against the wiring diagram contained in the terminal board box.
	Drop in mains supply voltage	Get the operator to reinstate the power supply voltage at the terminals at the admissible values
	The suction filter is clogged	Get the operator to clean or replace the cartridge
	The unit has accumulated deposits inside	Get the operator to clean the inside of the unit
	The unit is operating at a pressure and/or vacuum that exceeds the admissible value	Adjust the system and/or the regulating valve to lower pressure differentials.
High delivery air temperature	The unit is operating at a pressure and/or vacuum that exceeds the admissible value	Adjust the system and/or the regulating valve to lower pressure differentials.
	The suction filter is clogged	Get the operator to clean or replace the cartridge
	The unit has accumulated deposits inside	Get the operator to clean the inside of the unit
	Suction and/or delivery piping obstructed.	Get the operator to remove any obstructions
	Suction air temperature exceeds 40°C (+104°F)	Use heat exchangers to reduce the suction air temperature
Anomalous noise	The soundproofing is damaged	Get the operator to replace the soundproofing
	The impeller scrapes against the casing. - The unit is operating at a pressure and/or vacuum that exceeds the admissible value	Reduce the pressure differentials in the plant
	- Reduction of assembly play due to internal deposits (dust, impurities in the pipes, process residues, etc.)	Get the operator to clean the inside of the plant
	Bearing worn	Get the operator to replace the bearing
	Unit's installation position unsuitable	Do not fit structures (tanks, steel plating, etc.) on the unit that can transmit or amplify noise
Abnormal vibrations	The impeller is damaged	Get the operator to replace the impeller
	The impeller has accumulated deposits	Get the operator the unit to clean the inside of
	Unit fixing without anti-vibration supports	Get the operator to fix the unit with anti-vibration supports
	Rigid connection to the plant	Get the operator to fit flexible hoses between the unit and the piping
	Bearing on the blower or motor side defective	Get the operator to replace the bearing
Leaks in the unit	Defective silencer gaskets	Get the operator to clean or replace the gaskets
	Defective cover gaskets	Get the operator to clean or replace the gaskets

The term "operator" means: A qualified person appointed to install, operate, set, clean, repair or move a unit or to carry out maintenance work on it.

4. Terms & Conditions

Terms & Conditions

ACCEPTANCE: The terms and conditions of sale set forth herein apply to any order accepted or acknowledged by RUWAC, Inc. Buyer's acceptance of RUWAC'S proposal or delivery of all or any part of the goods covered hereunder constitutes acceptance of the terms and conditions of sale contained herein, and RUWAC hereby rejects any additions to or modification to these terms and conditions. Any representations, promises, warranties, or statements by RUWAC or its agents that differ in anyway from these terms and conditions shall be given no force or effect. No contract is final until accepted in writing by RUWAC at its corporate office in Holyoke, Massachusetts.

PRICES: Prices quoted orally expire the same day they are made unless accepted in writing on that day or confirmed by written communication by RUWAC. Written price quotations are guaranteed for thirty (30) days after the date issued, but may be terminated by written notice within that period. After thirty (30) days, any written price quotations are subject to adjustment to reflect prices in effect at the time of shipment, including any changes in packing, storage, or shipping charges. This order or proposal includes only the equipment specified herein, and does not include freight or installation of RUWAC equipment. All prices are F.O.B. RUWAC'S plant in Holyoke, Massachusetts and are exclusive of all taxes, levies, and duties that may be assessed in connection with the sale or delivery of goods, and Buyer shall be responsible for all such taxes, levies, and duties. In the event RUWAC pays any such tax, levy, or duty, Buyer shall promptly reimburse RUWAC therefor. Any packaging requirements other than RUWAC'S standard packaging and commercial container will be invoiced as an extra charge.

PAYMENT: Payment is due in full thirty (30) days after the date of invoice. All invoices paid after the due date will be assessed a late payment charge of one and half percent (1.5%) per month or any portion thereof, or the maximum amount allowed by applicable law, whichever is less. Buyer shall be responsible for all costs of collection, including reasonable legal fees. Sales on the foregoing terms are subject to the approval of RUWAC'S credit department and may be changed at any time at RUWAC'S sole discretion. If RUWAC has reasonable grounds with respect to Buyer's ability or willingness to make timely payments for the goods. RUWAC may at any time suspend performance, decline to ship, or require advance payment in cash or other adequate assurance satisfactory to RUWAC.

SHIPMENTS AND DELIVERY: RUWAC shall use its reasonable efforts to meet all shipment or delivery dates recited in RUWAC'S proposal or in Buyer's order but any such dates are estimated only and are not guaranteed. RUWAC shall have no liability to Buyer for damages or penalties, direct or indirect, for any delay in shipment or delivery, whether such delay is minor or substantial, nor shall Buyer have the right to declare a breach of contract because of any such delay. In any event, delivery schedules are based upon the effective date of the order and are subject to prompt receipt by RUWAC of all necessary down payments, information and instructions from Buyer, including any required approval of drawings. RUWAC shall have the right to make partial shipments, and invoiced covering the same shall be payment terms hereof. RUWAC will attempt to ship in accordance with Buyer's instructions, but RUWAC will make the final selection of a method of shipment and a carrier unless Buyer clearly and conspicuously specifies that shipment must be by a particular method of carrier. RUWAC is not responsible for damage or loss in transit, and all such claims must be by Buyer directly against the carrier.

CHANGE ORDERS: RUWAC shall not be obligated to make any changes in or additions to the scope of the work which are initiated by Buyer or result from circumstances beyond RUWAC'S control unless there is an equitable adjustment in price and or delivery.

CANCELLATION, SUSPENSION OR DELAY: In the event Buyer requests or causes a cancellation, suspension or delay in any RUWAC'S work under this proposal or order based thereon, Buyer shall indemnify and pay to RUWAC all appropriate charges, including but not limited to any costs, expenses, and commitments incurred by RUWAC up to the date of receipt of notice of such cancellation, suspension or delay, plus RUWAC'S overhead and reasonable profit. If shipment is delayed on account of Buyer, the purchase price shall be due and payable as if delivery had been made. Additionally, all charges related to storage, disposition and/or resumption of work, at RUWAC'S plant or elsewhere, shall be for Buyer's sole account and Buyer thereto shall assume all risks incidental.

CLAIMS: NOTICE OF DEFECTS: Buyer shall give written notice of rejection of any shipment or portion thereof within thirty (30) days after the date of shipment specifying the reasons therefor. Failure to give such notice shall be deemed a waiver of any right of rejection and any claim with respect thereto (except as to claims under the warranty) and shall be deemed an acceptance of such shipment. Buyer shall set aside and hold rejected goods without further processing until RUWAC has an opportunity to inspect and advise of the disposition, if any, to be made of such goods. In no event shall any rejected goods be returned reworked, or scrapped by Buyer without the express written authorization of RUWAC.

INSPECTION OF EQUIPMENT: RUWAC shall have the right to inspect, after prior notices, the equipment supplied by it when in operation. If Buyer requires, RUWAC shall execute an appropriate secrecy agreement.

CONFIDENTIALITY: All proposals, drawings, diagrams, specification, pricing, and other materials relating to the goods included are the property and confidential information of RUWAC. Buyer shall not disclose such material or information without the written approval of RUWAC.

BACK CHARGE: RUWAC will pay claims for expenses of Buyer relating to labor and/or material supplied by Buyer only if (a) RUWAC is advise in writing before such expenses are incurred (2) RUWAC gives Buyer its prior written consent to the supply of such labor and/or material by buyer.

LIMITED WARRANTY: RUWAC warrants that new equipment which are complete units and are sold and/or manufactured by RUWAC, Inc. will be free from defects in material and workmanship for a period of 18 months from date of shipment or 12 months from date of start-up, whichever comes first. RUWAC warrants that replacement parts sold hereunder will be free from defects in material and workmanship for a period of 120-days after the date of shipment. RUWAC machines that have been completely re-built at the factory will carry a 180-day warranty from date of shipment. All field repairs by authorized RUWAC service personnel are covered by a 120-day parts only warranty. RUWAC, Inc. will not assume any responsibility under the terms of this limited warranty on equipment, which have not been paid for in full. This warranty does not apply to any equipment that has been disassembled, repaired, or otherwise altered by any person without the written authorization of RUWAC'S service department, nor does it apply to any product that has been subject to failure due to corrosive or abrasive attack, misused, damaged, or improperly installed, nor does it apply to motors, controls, and components not manufactured by RUWAC, Inc. Motors, controls, and other Sub vendor's components therefor are warranted only to the extent of the manufacturer's warranty. All warranty work on such products must be authorized by RUWAC, Inc. and must be performed in an authorized shop as designated by the manufacturer. RUWAC sole liability and buyer's sole and exclusive remedy hereunder is the replacement or repair at RUWAC'S option of products not complying with this warranty. Such repair or replacement shall be F.O.B. RUWAC'S factory, and RUWAC reserves the right to invoice all expenses incurred when repairs are made in the field at the request of the customer, except as specifically set forth herein, RUWAC makes no warranty express or implied, with respect to the products and/or service supplied hereunder, this warranty is in lieu of and excludes all other warranties, including without limitation, any warranty of merchantability, fitness for a particular purpose, or conformance to purchaser's specifications.

LIMITATION OF LIABILITY: RUWAC'S responsibility with respect to the goods and RUWAC'S obligations related thereto should in no event exceed the purchase price of the goods. RUWAC shall not be liable to Buyer for any special incidental, indirect, or punitive damages for any reason whatsoever, including, but without limitation damages in the form of (a) loss of profits, revenues, or anticipated savings resulting from the failure of the equipment to meet specifications or warranties (b) damages suffered by Buyer as a result of loss of production facilities or equipment (c) cost of replacement equipment (d) damages suffered by customers of the Buyer (e) any fines or penalties assessed for failure to comply with any law or government regulations.

REPAIR OF GOODS EXPOSED TO HAZARDOUS, TOXIC, OR INFECTIOUS MATERIAL: Buyer shall ensure that any goods submitted by Buyer or any of its customers to RUWAC for repairs or other service have been decontaminated and cleaned (including sterilization, if appropriate) of any hazardous, toxic or infectious materials, including without limitation any materials listed by the Environmental Protection Agency, OSHA, or any applicable state law as deserving or requiring special treatment. Upon RUWAC'S request, Buyer or its customer shall certify in writing that such goods contain no such hazardous, toxic, or infectious materials, and that such decontamination has taken place in accordance with accepted parties and in accordance with all applicable laws and regulations. If special safety equipment is required to protect RUWAC'S service personnel from any such hazardous, toxic, or infectious materials during field service work or otherwise. Buyer shall ensure that such safety equipment is provided and that the personnel are properly instructed. The provision of this paragraph shall apply to all work to be performed by RUWAC'S service personnel at any time, whether or not covered by warranty. Buyer shall defend and indemnify RUWAC for any and all losses, liabilities, expenses, and damages (including attorneys' fees) arising out of any failure of buyer or its customer to comply fully with the terms of this paragraph.

BUYER SUPPLIED DATA: Buyer acknowledges that RUWAC has relied upon all specifications and other data supplied by Buyer to RUWAC in the selection and design of the equipment and the preparation of this proposal. In the event the site operating conditions differ from those represented by Buyer and relied upon by RUWAC, any warranties or performance guarantees contained herein affected by such conditions shall be null and void, unless otherwise mutually agreed upon in writing.

REMEDIES OF SELLER: In addition to any other remedies of RUWAC provided hereby or by law, in the event Buyer becomes bankrupt, insolvent, assigns assets for the benefit of creditors or its financial condition has substantially deteriorated, RUWAC may, at its sole option, declare a breach of contract, stop all work hereunder or demand payments in advance as security for its performance hereunder.

FACTIONS: GOVERNING LAW: Any dispute, controversy, or claim against RUWAC with respect to the goods or any of RUWAC'S obligations related thereto must be commenced within one year from the date of shipment. All contract between Buyer and RUWAC shall be governed by and construed in accordance with the laws of the state of Massachusetts except that body of laws controlling conflict of laws.

BONDS: In addition to the price specified herein, Buyer shall pay the cost of any bonds, which Buyer requires RUWAC to obtain.

ENTIRE AGREEMENT: These terms and conditions, together with the provisions of the proposal constitute the entire agreement between the parties pertaining to the goods, and they supersede any prior or contemporaneous agreements, representations, or understandings between the parties. No waiver or modification of these terms and conditions is binding unless such waiver or modification is set out in writing signed by an authorized manager or officer of RUWAC. RUWAC'S failure to strictly enforce any right on one occasion does not constitute a waiver of that or any on any other occasion.