



## VL Airlock

### Operators Manual

Special execution, intended for use in potentially explosive atmosphere (zone 22) in conformity with category 3 of group II, according to the European ATEX Directive 94/9/EC. The equipment has the following marking:



Inside: II 2D c / Outside: II 3D c

# 1. INTRODUCTION

When you purchased your new Kice Rotary Airlock, you bought a dependable and quality-built product. The range of options and materials of airlocks manufactured by Kice should satisfy nearly every conceivable industrial airlock need.

We are proud of our products and the people at Kice who build them. At Kice, we start in our own foundry and follow the design and manufacturing standards that have proven superior for more than 60 years.

This owner's manual is intended as a guide for proper installation, operation and maintenance to keep your Kice airlock operating safely and efficiently on the job. Service and factory reconditioning information is also included for your benefit.

Sincerely,

Drew Kice  
President  
Kice Industries, Inc.

## Warranty

The Company (Kice Industries, Inc.) warrants the equipment manufactured by the Company to be free of defects in material and workmanship for a period of one year from the date of shipment. Company agrees to repair or replace, at its option, any parts found to be defective in the opinion of the Company. Company is not liable for any costs in connection with the removal, shipment or reinstallation of said parts. This warranty does not apply to abrasion, corrosion, or erosion.

Purchaser agrees to look to the warranty, if any, of the manufacturer or supplier of equipment manufactured by others and supplied to the Company for any alleged defects in such equipment and for any damages or injuries caused thereby or as a result thereof.

### **PURCHASER SHALL BE RESPONSIBLE FOR COMPLIANCE WITH ELECTRICAL COMPONENT MANUFACTURER'S RECOMMENDATIONS, UNDERWRITERS CODE AND ALL SAFETY PRECAUTIONS.**

The only warranty extended under this agreement is the above express warranty and there are no other warranties, express or implied, including warranties of merchantability, fitness for a particular purpose or otherwise which extends beyond the face hereof. The Company and its dealers shall not in any event be liable for consequential or incidental damages and this agreement provides purchaser's sole and exclusive remedy. Any actions for breach of this agreement or warranty must be commenced within one year after the cause of action has occurred.

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## 2. IMPORTANT AIRLOCK INFORMATION

### Important Airlock Information

Write down the MODEL and SERIAL NUMBER of the Kice Rotary Airlock, along with the same information for the auxiliary equipment. (Airlock valves, fans, speed reducers, motors, and sheaves size, type and any special modifications to standard).

For additional information, application assistance or special service, please contact us by phone at 316-744-7151 or email at sales@kice.com. We'll need to know the MODEL and SERIAL NUMBER of your Kice Rotary Airlock. For ready reference, please record this information and the date of delivery or installation on the lines below. See the General Information section for the location of model and serial number.

Model \_\_\_\_\_

Serial Number \_\_\_\_\_

Date of Delivery or Installation \_\_\_\_/\_\_\_\_/\_\_\_\_

Additional Notes:

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### 3. GENERAL INFORMATION

#### To The Owner

The purpose of this manual is to assist owners and operators in maintaining and operating the Kice airlock. Please read it carefully; information and instructions furnished can help you achieve years of dependable performance. A separate gearmotor or speed reducer manual is included with your owner's packet. It contains additional information that may not be repeated in this manual. You are urged to read it before attempting any operation or repair of the gearmotor or speed reducer. If the manual is not included in your owner's packet, please contact our Customer Service Department.

#### Using This Manual

General operation and maintenance guidelines are outlined for owners and operators of Kice airlocks. Operating conditions vary considerably and cannot be addressed individually. Through experience however, operators should have no difficulty in developing good operating, safety and monitoring skills.

The terms “**disconnect and lockout**” or “**lockout/tagout**” as used in this manual means that power to the airlock has been disconnected through the use of a padlockable, manual power cutoff or power lockout switch pursuant to 29CFR1910.147.

Directions used in this manual, for example **RIGHT** or **LEFT**, **CLOCKWISE** or **COUNTERCLOCKWISE**, refer to directions when facing the endplate of the airlock to which the equipment tag containing the model and serial number is attached unless otherwise specified.

Photographs and illustrations were current at the time of printing but subsequent production changes may cause your airlock to vary slightly in detail. Kice Industries, Inc. reserves the right to redesign and change the airlock as deemed necessary, without notification. If a change has been made to your airlock that is not reflected in this owner's manual or the Illustrated Parts Lists, write or call Kice Industries, Inc. for current information and parts.

#### Model and Serial Number

The airlock model and serial number can be found on the equipment tag (Figure 1) on the airlock end plate with the drive mechanism (Figure 2).

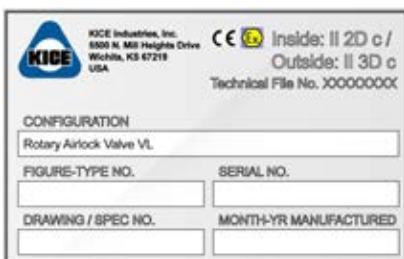


Figure 1

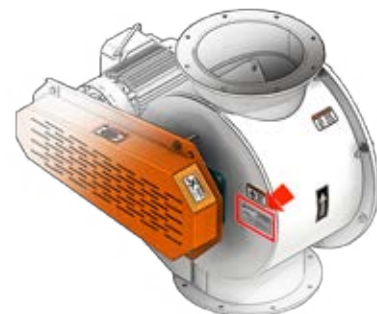


Figure 2

## **Airlock Parts and Service**

Use original Kice rotary airlock replacement parts only. These parts are available from Kice Industries, Inc. only. To obtain prompt, efficient service always provide the following information when ordering parts:

1. Correct part description and number as shown in the appropriate exploded view.
2. Correct model number.
3. Correct serial number.

For service or assistance ordering parts, contact the Customer Service Department or Quick Ship Department.

**Kice Industries, Inc.  
5500 Mill Heights Drive  
Wichita, Kansas 67219-2358  
Toll Free: (877) 289-5423  
Main Phone: (316) 744-7151  
Fax: (316) 744-7355**

**IMPORTANT:** Any unauthorized modification, alteration or use of non-approved attachments or drive units voids the warranty and releases Kice Industries, Inc. from any liability arising from subsequent use of this equipment. Each airlock is configured to be used in specific situations, handling particular types of material. Using an airlock for any purpose other than that for which it was designed could result in personal injury as well as product or property damage.

**NOTICE:** Kice Industries, Inc. is the only authorized rebuilder of Kice rotary airlocks.

## **Gearmotor/Speed Reducer Parts and Service**

The gearmotor or speed reducer is covered by the manufacturer's warranty. If there is a question or issue concerning the gearmotor or speed reducer please contact your local supplier or service representative.

## 4. SAFETY PRECAUTIONS

### Safety Symbols



This safety alert symbol is used to call your attention to an important safety message on equipment, safety decals and in manuals, to warn you of possible danger to your personal safety. When you see this symbol, be alert. Your personal safety or the safety of others may be affected. Follow the instructions in the safety message.

### Hazard Levels

The following definitions are used to identify hazard levels:



**DANGER (RED)** – Danger is used to indicate the presence of a hazard that **WILL** cause **SEVERE** personal injury, death or substantial property damage if the warning is ignored.



**WARNING (ORANGE)** – Warning is used to indicate the presence of a hazard that **CAN** cause **SEVERE** personal injury, death or substantial property damage if the warning is ignored.



**CAUTION (YELLOW)** – Caution is used to indicate the presence of a hazard that **WILL** or **CAN** cause **MINOR** personal injury or property damage if the warning is ignored.

### Safety Decals

The airlock safety decals should not be removed, covered, painted or otherwise become illegible. If this occurs they should be replaced immediately. Contact Kice Industries, Inc. Customer Service Department for replacements.

The following safety decals will be located on the airlock body, chain guard or motor. Look for them!





**WARNING:** All owners and operators should read this manual and be instructed in safe operating and maintenance procedures before attempting to uncrate, install, operate, adjust or service this equipment.

## SAFETY PRECAUTIONS

### WORK SAFELY AT ALL TIMES

- All energy sources associated with the airlock must be locked and tagged out in compliance with 29CFR1910.147, local enforcement authorities, OSHA, and facility safety practices, before removing any protective cover, guard, grate or maintenance gate. Removal of transitions which expose hazards such as nip points of an airlock rotor also require lockout and tagout precautions be employed.
- Do not attempt to install, connect power, operate or service an airlock without proper instruction and until you have been thoroughly trained in its use by your employer.
- It is the owner's and employer's responsibility to adequately train each operator in the proper and safe use of airlocks. Written safety programs and formal instruction are essential. All new employees must be made aware of company policies, standard operating procedures (SOPs) and established health and safety procedures. Experienced employees should receive refresher training for potential hazards and up to date training records should be maintained at the job site.
- Assume at all times that power is "on". Treat all conditions as live. This practice ensures a cautious approach that may prevent an accident or injury.
- Before applying power to any equipment, make certain that all personnel are clear of the machine.
- Do not attempt to open, work on, clean or service an airlock until it has been locked and tagged out and the rotor has come to a complete stop. It is especially important to verify the airlock cannot be started in environments in which equipment is configured to be started remotely.
- Do not connect power to or operate an airlock unless all moving parts are covered and all covers, guards, grates, and maintenance panels are in place and securely fastened. If an airlock is not equipped with a factory supplied chain guard, make sure rotating members and moving parts are completely enclosed before connecting power and starting operation.
- All protective covers, guards, grates, maintenance panels, switches and warning decals must be kept in place and in good repair. Any airlock with a damaged, malfunctioning, defective, or missing protective device must be taken out of service until the protective device can be repaired or replaced.
- Do not attempt to start an airlock when loaded.
- Do not abuse, overload, or misuse an airlock or attempt to operate the equipment if in need of service, lubrication, maintenance or repair. Free outlet of the product must be guaranteed at all times. Blockage and severe damage may result, or a dangerous situation may occur.
- Never place any part of your body under or near rotating members or moving parts of an airlock.
- Never allow any kind of metal or other foreign objects to enter an airlock.
- The rotor of the airlock is built into a housing which has connection flanges for product inlet and product outlet. All airlock inlet and discharge openings must be completely enclosed, or closed to an adequate length, to prevent human access to the rotor when the airlock is operating. They must remain enclosed until POWER IS TURNED OFF AND LOCKED OUT. Keep away from an airlock when it is running.



## SAFETY PRECAUTIONS CONTINUED

- Do not manually override or electrically bypass any protective device.
- High voltage and rotating parts can cause serious or fatal injury. Only qualified, trained, and experienced personnel should perform installation, operation, and maintenance of electrical machinery. Make sure the motor and frame of each airlock is grounded in accordance with OSHA, National Electric Code, and all other applicable regulatory bodies, including local codes and EN ISO 60204-1 as required for the classified area.
- Operator/installer must ensure that all piping and connections are laid away from equipment access routes and steps.
- If an airlock is equipped with a maintenance panel incorporating any Protective Interlocking Limit Switch (PLS), the PLS must be interlocked with all electrical controls so that all motors or powered devices on the unit will be de-energized if any protected cover, guard, grate, or maintenance panel is open or removed. Never attempt to manually override or electrically bypass the PLS safety device. Interlock function of the PLS must be tested and logged daily by supervisory personnel.
- Any device powered by air or hydraulic pressure must be equipped with a properly functioning Padlockable Manual Pressure Lockout and Internal Pressure Relief Valve (PLV) capable of safely relieving motive pressure between the isolation valve and device.
- Any airlocks used in the processing of combustible materials or in hazardous environments require evaluation by the owner and regulatory bodies to determine appropriate airlock monitoring equipment, dust control, explosion protection and electrical equipment enclosures. Do not use an airlock in hazardous environments unless properly equipped for the hazard.
- Operate safely at all times. Use personal protective equipment (PPE) such as hard hats, helmets, gloves, earplugs, protective eyewear, etcetera when and where appropriate. Keep PPE in good repair and accessible to affected personnel.
- Keep the workplace clean and free of dirt and dust at all times. Do not attempt to work on slippery or unsafe surfaces, ladders or work platforms when maintenance or repair work is being performed on an airlock.
- The Operator must ensure that all piping and connections are laid away from access routes, ladders and steps.
- Adequate and proper lighting must be provided at the equipment location.
- During the course of regular service and maintenance activity, all parts of the drive chain, including the guard, must be checked. This is to verify that they are secure and functioning properly.
- During the course of regular service and maintenance activity, the drive chain must be checked for wear and replaced if necessary.
- Do not use a ladder or work platform unless it is in good repair and rated for the load required to complete required airlock service. Do not exceed maximum load ratings when installing or servicing an airlock.
- Never stand under any kind of hoists or lifting mechanisms whether or not it is loaded or in operation. Never stand under or near an airlock or component when it is being lifted.
- All airlock lifting devices must be inspected by qualified personnel before each use. Do not use a lifting device to transport an airlock. Never use a lifting device that is damaged, deteriorated or in need of repair.
- The rotary airlock valve has attachment points where a lifting device can be attached. The airlock must be lifted by a means with sufficient capacity.
- Special attention must be devoted to outside contractors engaged to enter and perform work on an airlock or in the workplace. Special care must be exercised to ensure all such personnel are fully informed of potential hazards and plant safety procedures. Special emphasis should be placed on the use of explosion proof electrical, cutting, or welding tools where required.
- It is ultimately the operator's responsibility to apply the above listed precautions and ensure proper airlock use, maintenance and lubrication. Keep these instructions and list of warnings with your machine at all times.
- It cannot be assumed that every acceptable safety procedure is contained herein or that abnormal or unusual circumstances may not warrant or require additional procedures.

**WORK SAFELY AT ALL TIMES**

### 3. DELIVERY INSPECTION AND INSTALLATION PREPARATION

The airlock has been inspected at Kice and should be in excellent condition upon delivery. A thorough customer inspection of the airlock should be completed upon receipt to verify its condition.

**NOTICE:** Delivery inspection should be completed before signing carrier's release.

When a carrier signs the Kice Industries, Inc. bill of lading, the carrier accepts responsibility for any subsequent shortages or damage, evident or concealed. Therefore any resulting claim must be made against the carrier by the purchaser. Evident shortage or damage should be noted on the carrier's delivery document before signature of acceptance. Inspection by the carrier for damage, evident or concealed, must be requested.

1. Complete a visual inspection paying particular attention to guards, protrusions (i.e. gearmotor or speed reducer, airlock corners, shaft, etc.) and safety decals while the airlock is still secure to the shipping pallet.

2. Inspect the airlock shaft:

- Remove the shaft cover located on the non-drive end of the shaft and the chain guard (Figure 3).
- Check both ends of the shaft to see if either end has been bent or damaged. If this is the case, file a claim with the freight company for damages and contact Kice Customer Service Department.
- Replace the shaft cover and chain guard.
- Be sure that the cover is firmly in place.



**CAUTION:** The shaft cover must be in place at all times. If the cover is lost in shipment or during airlock operation, contact Kice Customer Service Department for replacement.

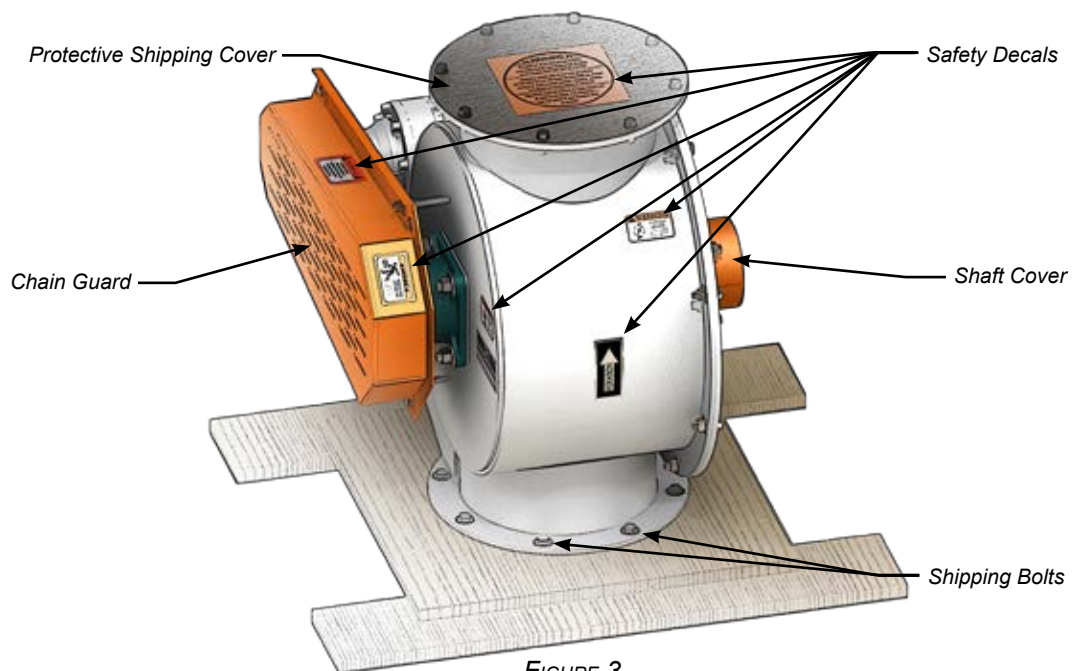


FIGURE 3

## DELIVERY INSPECTION AND INSTALLATION CONTINUED

### 3. Remove the airlock from the shipping pallet.

- Remove shipping bolts securing airlock to the shipping pallet (Figure 3).
- Lift the airlock from the pallet using a tool truck, forklift or lifting gear with sufficient lifting capacity. The airlock should be lifted carefully by the body inlet and/or outlet flange.
- Set the airlock on a clean, smooth level surface.
- Check all bolts to be sure they are installed securely.

### 4. Inspect the Rotor.

- Locate and read all safety decals (Figure 3).
- Remove the protective shipping cover (Figure 3).



**DANGER:** When the protective shipping cover is removed from the airlock, do not place hands in the airlock or attempt to turn the rotor by hand. Personal injury could occur. Ensure all personal and foreign objects are clear of the inlet before attempting to turn rotor.

- Verify that the rotor rotates freely and check to make sure each rotor pocket and the interior of the airlock is free of foreign material.
- For airlocks without the drive motor attached, use a soft probe (wood block or brass rod) and mallet to turn the rotor (Figure 4). If the rotor turns freely, the inspection is complete.
- For airlocks with the drive motor attached, connect the airlock motor to the power source. If the rotor turns freely, disconnect the power source, the inspection is complete.
- If the rotor does not turn freely or the rotor turns but squeals loudly, refer to the Maintenance section of this manual.



**WARNING:** Always wear proper eye protection and other PPE as required.



**CAUTION:** If the gearmotor or speed reducer produces an unusual noise, disconnect the power and lockout. Then check rotation to be sure the motor is not wired backwards.

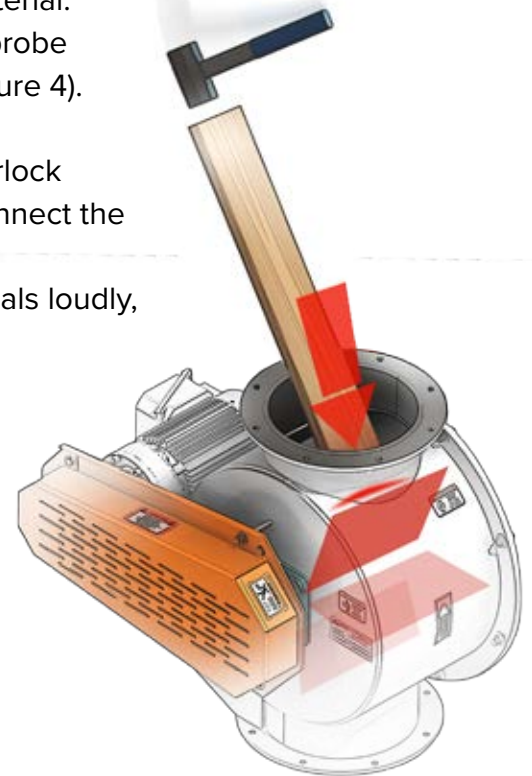


FIGURE 4

### 5. Inspect the gearmotor or speed reducer if supplied.

- Read all the materials supplied with the airlock concerning the gearmotor or speed reducer.
- Be sure that the drive is securely mounted to the airlock.
- Kice standard gearmotors will be grease lubricated and require no further action.
- If the speed reducer is oil lubricated, add the appropriate oil as specified by the manufacturer.

## 6. STORAGE

If the airlock will not be installed promptly, certain procedures should be followed to ensure acceptable function upon installation. Below are guidelines which are applicable for standard airlocks. Included manuals for vendor supplied components supersede the guidelines listed below.

Store in a clean, dry location to prevent rust formation or deterioration.

If the airlock must be stored outdoors, the following precautions should be followed.

- Protect from environment as well as possible by covering to keep out dirt and moisture.
- Store on a skid with a fully covered deck to keep the airlock from resting directly on the ground while covering the outlet.

**NOTICE:** The outlet is not covered when shipped from the factory.

- Securely cover inlet using the steps below.
  - Remove shipping cover plate.
  - Transfer the position of the airlock flange's corner holes to the shipping cover plate and drill through holes.
  - Place a gasket on the airlock inlet.
- Bolt shipping cover plate in place.
- Cover motor and drives to prevent ingress of water, dirt and pests.

**NOTICE:** Turn the rotor a minimum of five revolutions monthly to maintain grease distribution within the bearings.

## 7. INSTALLATION



**WARNING:** Use appropriate equipment when lifting or moving the airlock. Make sure all persons and obstructions are clear from the path and installation area. When installing the equipment, make sure the moving parts inside the equipment are not accessible. This also fulfills EN ISO 13857-1 where required.

1. Move the airlock to the installation area using proper equipment. The airlock should be lifted carefully by the body inlet and/or outlet flange.
2. Prepare the mounting surfaces to accept the airlock. Equipment should be securely positioned before accepting an airlock. All mating surfaces should be free of debris, rust and foreign materials.

## INSTALLATION CONTINUED

### 3. Mount airlock in place.

- a. If the airlock will be floor mounted, secure to the floor using approved anchors and then attach the airlock mounting flange to the system flange using fasteners and supplied gasket(s) (Figure 5).

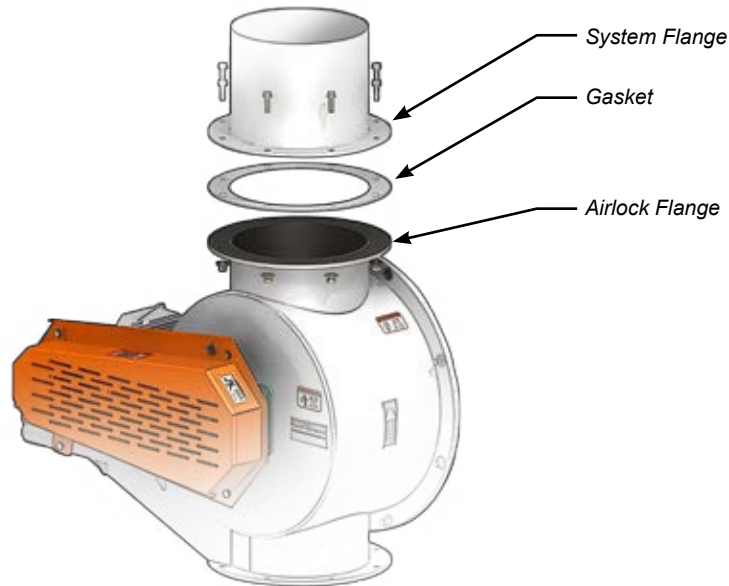


FIGURE 5

- b. If the airlock connects between two pieces of equipment, and is not floor mounted, attach the airlock flanges to system flanges using fasteners and supplied gaskets as shown (Figure 5). The airlock should be attached to the sturdiest equipment first.

### 4. Tighten all mounting fasteners securely.



**WARNING:** High voltage and rotating equipment can cause serious or fatal injury. Only qualified, trained and experienced personnel should perform installation, operation and maintenance of electrical machinery. Ensure the motor and frame of each airlock is grounded in accordance with OSHA, National Electric Code and all other applicable regulatory bodies and local codes.

### 6. Connect motor to power source.



**WARNING:** Verify rotation, failure to verify rotation prior to connecting chain may result in damage to the drive chain.

## INSTALLATION CONTINUED

7. Test run the airlock. If any unusual noises occur, disconnect and lockout the power source. If the airlock was turning the wrong direction, correct wiring and retest. Refer to Maintenance section below if the problem persists.
8. Disconnect and lockout power.
9. Connect chain.
10. Connect the power source to the airlock motor.
11. Verify the airlock is properly grounded to mitigate the risk of electrostatic discharge.

## 8. MAINTENANCE

The key to long and trouble-free airlock operation is good maintenance practices. Periodically inspect the rotor for damage caused by foreign material and for proper rotor placement within the airlock body. Inspect the bearings and the drive chain for excessive wear. Finally, service the gearmotor or speed reducer as specified by the manufacturer.

The majority of airlock operating problems can be traced to improper adjustments and delayed or neglected maintenance. A consistently applied maintenance program will prevent many problems.

A thorough understanding of the system is required if the operating problems are to be corrected satisfactorily. A good rule to follow when troubleshooting a problem is to never make more than one adjustment at a time, thereby isolating the problem by a process of elimination. The cause of a problem is usually simple and is easy to pinpoint if you systematically check each system and function.

### General Motor Service

**NOTICE:** Not all airlocks use the same motor model. Service instructions and repair components may vary between models.

Safety, service and repair information for the gearmotor or speed reducer is provided by the manufacturer. To obtain parts or service for the gearmotor or speed reducer, contact the local dealer or service representative. If difficulty obtaining service or repair components is encountered, please contact the Kice Customer Service Department for assistance.

### General Rotor Maintenance

If the rotor becomes blocked, does not turn freely, or begins to squeal, the rotor should be inspected. The following steps describe the process required to complete an inspection.



**WARNING:** When performing maintenance, all energy sources associated with the airlock must be locked and tagged out in compliance with 29CFR1910.147, local enforcement authorities, OSHA, and facility safety practices, before removing any protective cover, guard, grate or maintenance gate. Removal of transitions which expose hazards such as nip points of an airlock rotor also require lockout and tagout precautions be employed.



**WARNING:** Review all Safety Precautions noted in the manual before performing maintenance on equipment.



**DANGER:** Never place hands or fingers in an airlock, unless it has been disconnected and locked out and a wooden block has been placed in the airlock to prevent the rotor from turning.



## MAINTENANCE AND SERVICE CONTINUED

1. Turn off the airlock and remove all potential energy sources following SOPs and lockout/tagout procedures.
2. Remove the airlock from system to obtain unobstructed access to rotor.
3. Place a block in the airlock to prevent the rotor from turning unexpectedly (Figure 6).
4. Remove rotor blockage
  - a. Using a probe, dislodge the obstruction from the rotor and discard.
  - b. Remove safety block.
  - c. Turn the rotor using the probe to inspect for additional foreign material.
5. Check for rotor damage. If rotor does not turn freely:
  - a. Locate rotor damage such as burrs or dents on rotor blades.
  - b. Remove any burrs using a file or emery cloth.
6. Rotor still does not turn freely:
  - a. Remove rotor from housing.
  - b. Remove wipers from rotor.
  - c. Repair rotor weldment if required.
  - d. Replace wipers with new (parts section).
  - e. If beyond repair order new rotor (parts section).

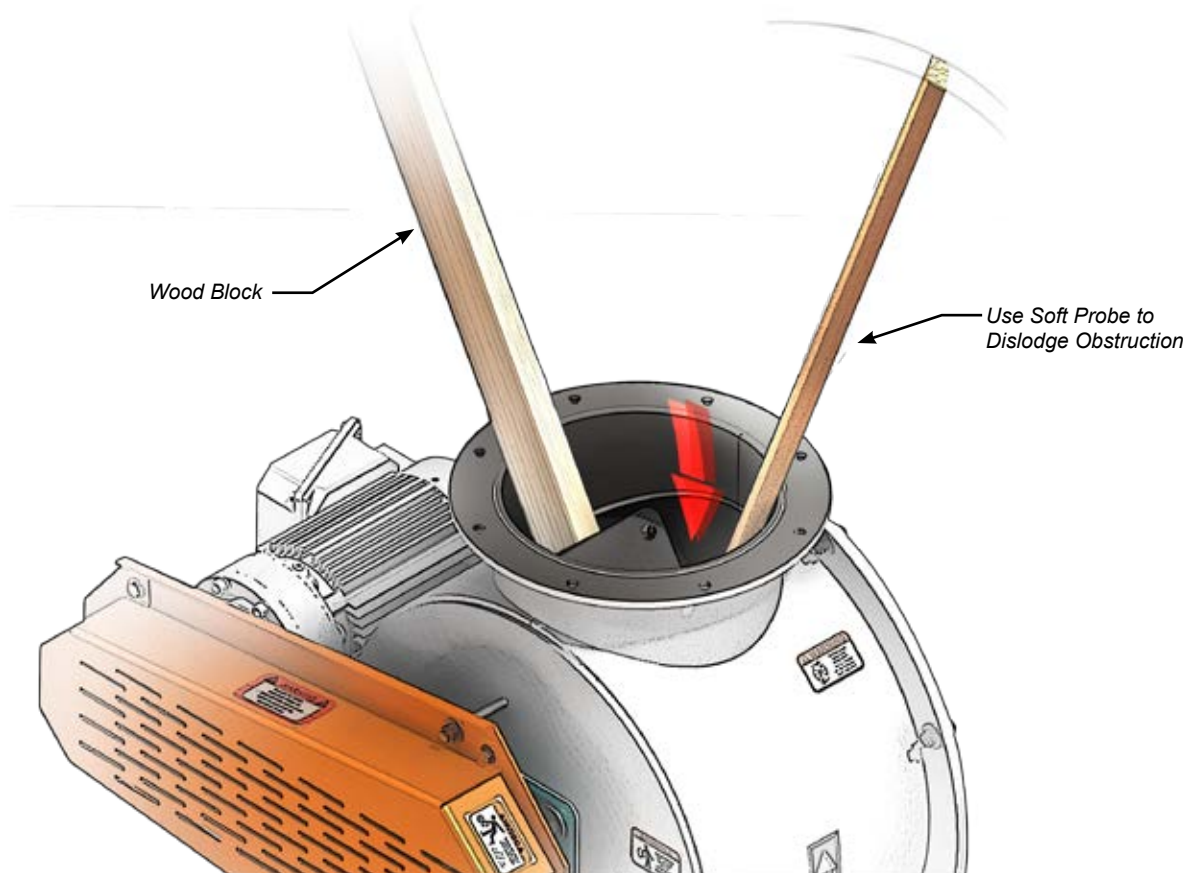


FIGURE 6



## Remove Rotor

To remove rotor:

1. Turn off the airlock and remove all potential energy sources following SOPs and lockout/tagout procedures.
2. Scribe horizontal and vertical reference marks along wiper cover plate and onto housing or mark bearing position on shaft using a permanent marker.
3. Remove the chain guard and shaft cover.
4. Remove the drive chain.
5. Remove the sprockets and bushing and the chain guard backplate.
6. Remove both lock collars and dress the shaft using a file and emery cloth.



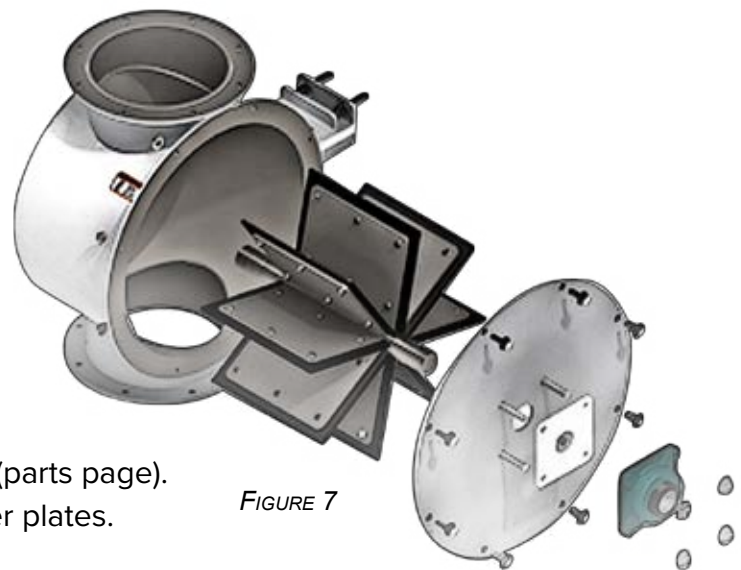
**CAUTION:** Burrs or dents must be removed from the rotor shaft before attempting bearing removal to prevent scoring of inner race.

7. Remove the bolts on plate (see Figure 7).
8. Tap on the rotor shaft using a soft hammer
9. Remove the end plate (see Figure 7).
10. Remove the rotor by pulling it out of the airlock body.
11. To replace or reinstall the rotor, follow the above steps in reverse order. Ensure wipers are deflected in correct direction when placing rotor in housing.

## Wipers

To remove wipers:

1. Follow rotor removal instructions.
2. Unbolt wiper cover plates and remove bolts (parts page).
3. Using new bolts align wipers with wiper cover plates.
4. Fasten with new lock nuts.
5. Complete installation by following rotor removal steps in reverse.



## MAINTENANCE AND SERVICE CONTINUED



**WARNING:** When performing maintenance, all energy sources associated with the airlock must be locked and tagged out in compliance with 29CFR1910.147, local enforcement authorities, OSHA, and facility safety practices, before removing any protective cover, guard, grate or maintenance gate. Removal of transitions which expose hazards such as nip points of an airlock rotor also require lockout and tagout precautions be employed.



**WARNING:** Review all Safety Precautions noted in the manual before performing maintenance on equipment.



**DANGER:** Never place hands or fingers in an airlock, unless it has been disconnected and locked out and a wooden block has been placed in the airlock to prevent the rotor from turning.

## Chain Maintenance

The chain tension should be checked after 48 hours of operation and at regular monthly intervals in the schedule of maintenance or service activity. The chain and drive sprockets should also be inspected for wear, looseness or damage at these regular intervals. Refer to the appropriate Maintenance section for recommended chain tensioning procedures. Repeat this step again after two to three weeks of operation.

Chain service life will be maximized when installed and maintained properly. Most chains require regular lubrication. However, the chain supplied by Kice is factory lubricated and further lubrication is not needed except in extreme applications. Follow the recommend chain maintenance guidelines below.

1. Turn off airlock and remove all potential energy sources following SOPs and lockout/tagout procedures before removing chain guard cover.
2. Confirm the sprockets are in good condition and teeth are not excessively worn.
3. Confirm the chain is free of grit and debris and is in good condition. Pins and bushings should not have flat surfaces and should release smoothly from each sprocket while in motion.
4. Verify all three sprockets are aligned in the same plane. The idler sprocket will determine the axial alignment plane.



**CAUTION:** Kice Industries, Inc. supplies self-lubricated chain on airlocks. Do not oil or otherwise lubricate.

## MAINTENANCE AND SERVICE CONTINUED

5. Adjust chain tension to allow chain deflection equal to 2% to 3% of shaft center distance.

*Example: Shaft center distance=7 inches → Chain deflection  $\approx$  .175 inches*

- a. Disconnect and lock out power.
- b. Remove the chain guard.
- c. Loosen the mounting bolts.

**NOTICE:** If the drive chain is to be replaced, remove it at this time by removing the connecting link and install a new drive chain. Then proceed with the remaining procedures.

- d. Tighten the drive chain by turning the jack bolts clockwise (see Figure 8).
- e. When proper chain tension is achieved, retighten the mounting bolts.
- f. Reinstall the chain guard.
- g. Reconnect power.

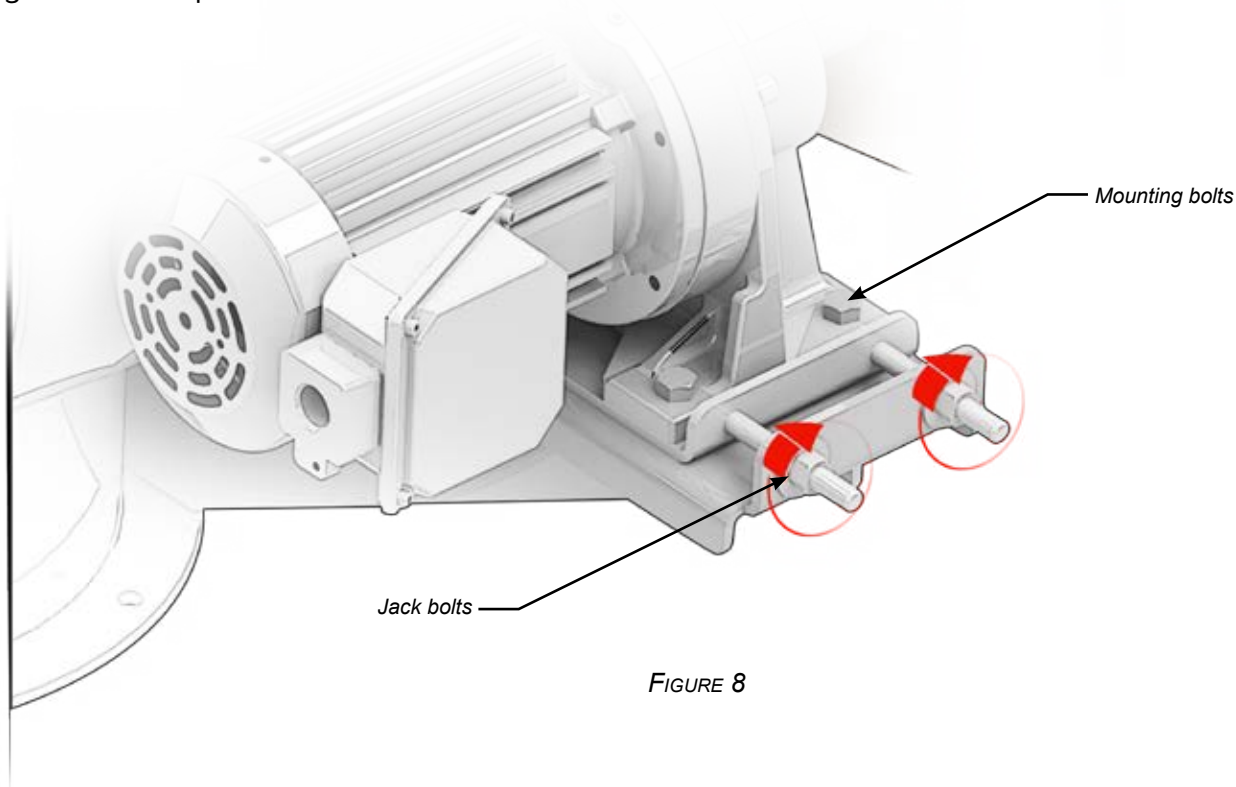


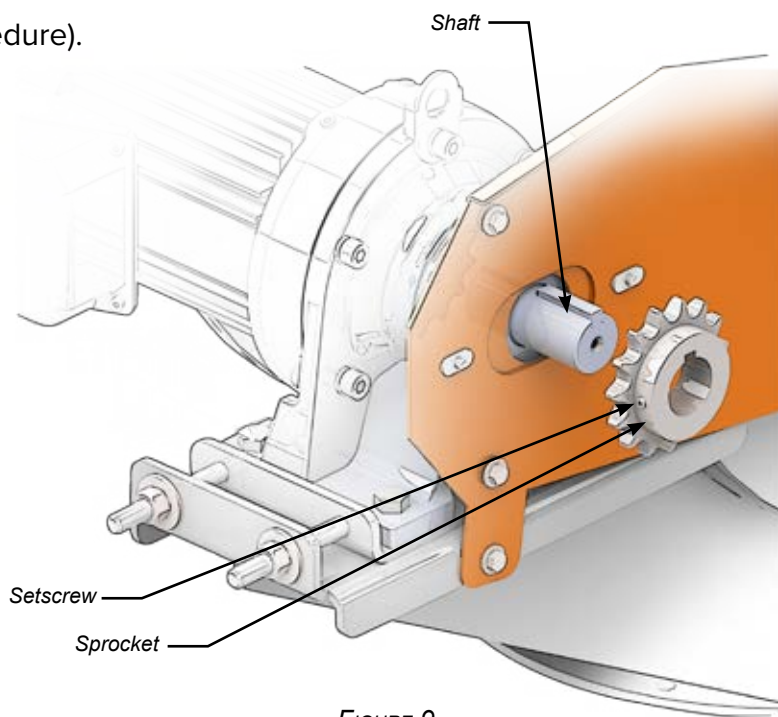
FIGURE 8

## **Drive Chain Sprockets**

If a sprocket becomes worn, it will need to be replaced.

To replace:

1. Turn off the airlock and remove all potential energy sources following SOPs and lockout/tagout procedures.
2. Remove the chain guard.
3. Remove the drive chain (see above procedure).
4. Loosen sprocket setscrews.
5. Remove the sprocket (see Figure 9).
6. Remove the sprocket by slipping it off the shaft.
7. Install a new sprocket onto the airlock shaft.
8. Align the driver sprocket on the speed reducer shaft with the driven sprocket on the airlock shaft.
9. Reinstall the drive chain.
10. Reinstall the chain guard.
11. Reconnect power.



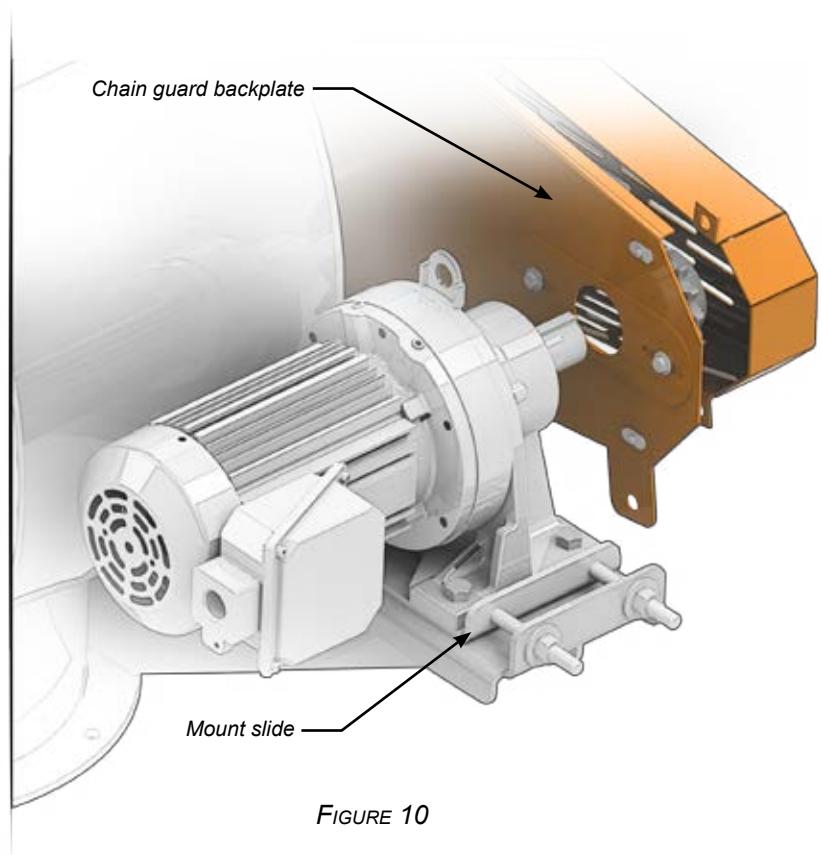
**FIGURE 9**

## **Gearmotor Service**

To obtain parts or service for the airlock gearmotor, contact the local dealer or service representative for the particular make of gearmotor used on the airlock. Not all airlocks use the same make. The manufacturer has supplied you with safety, service, and repair information. If you have difficulty obtaining service or repair parts, contact our customer service department. For service, maintenance and replacement of drive motor bearings, please refer to the operator's manual from the motor manufacturer. Service and maintenance of the drive coupling (if provided) must be carried out according to the manufacturer. The coupling can be taken into operation only after properly filled with oil.

To remove gearmotor:

1. Turn off airlock and remove all potential energy sources following SOPs and lockout/tagout procedures.
2. Remove chain guard cover.
3. Remove chain.
4. Remove chain guard backplate.
5. Disconnect electrical wiring from gearmotor.
6. Remove gearmotor from gearmotor mount slide.
7. Remove sprocket.
8. To install, follow above steps in reverse order being sure to verify rotation prior to connecting chain.



*FIGURE 10*

### Bearing Replacement

When replacing bearings, use Kice replacement parts from parts page. In average operation under normal conditions, bearings are expected to last approximately 10 years. Bearings must be exchanged after 90% of their service life.

To remove bearings:

1. Turn off airlock and remove all potential energy sources following SOPs and lockout/tagout procedures.
2. Scribe horizontal and vertical reference marks along wiper cover plate and onto housing or mark bearing position on shaft using a permanent marker.
3. Remove chain guard cover.
4. Remove chain.
5. Remove sprockets.
6. Remove chain guard backplate.
7. Loosen bearing eccentric lock collar.
8. Unbolt bearing.
9. Remove shaft seal (parts page) - Kice recommends replacing the shaft seal while it is readily accessible.
10. To replace or install bearings, follow the above steps in reverse order.

**NOTICE:** The bearing does not require the assistance of tools to install when properly aligned. Please refrain from striking the bearing to prevent bearing damage which will decrease service life.

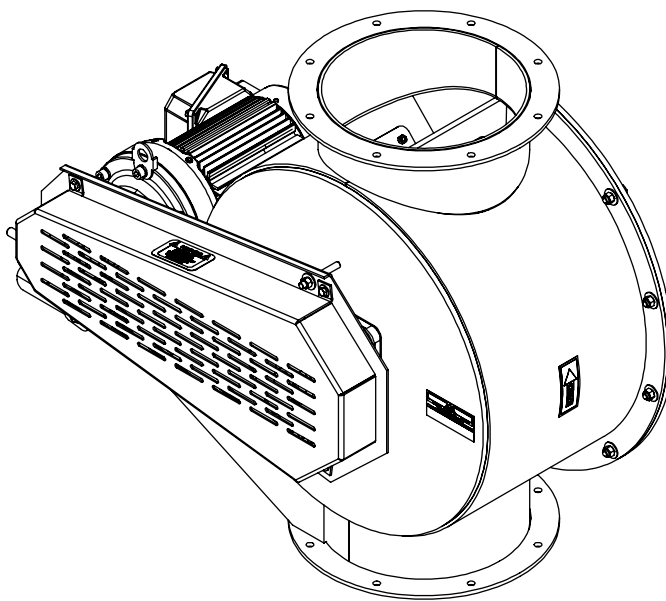
### Shaft Seal

To remove shaft seals:

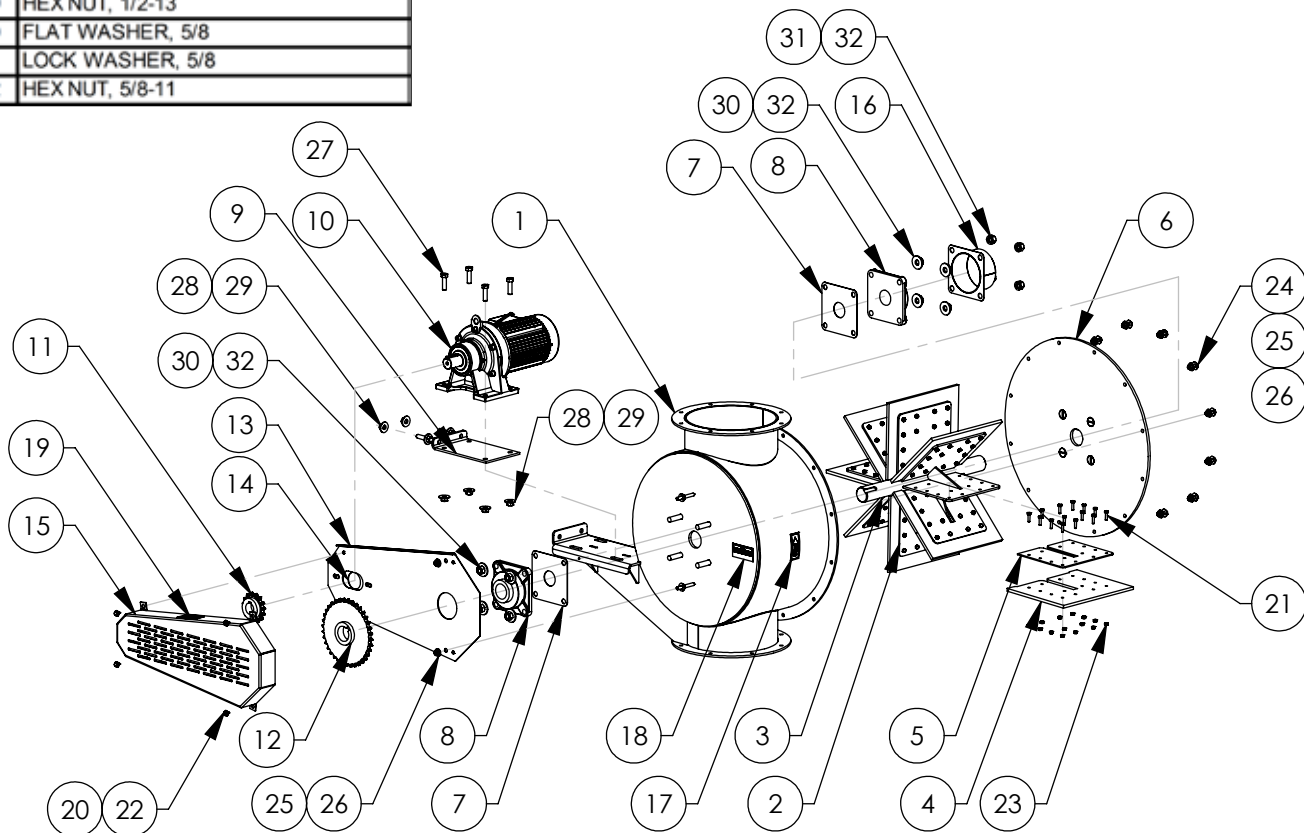
1. Follow steps to remove bearings.
2. Remove shaft seal.
3. To replace or install seals, follow the above steps in reverse order.

## RECOMMENDED SPARE PARTS

BILL OF MATERIAL	
ITEM	DESCRIPTION
1	HOUSING (WM)
2	ROTOR ASSEMBLY
3	(1) - ROTOR (WM)
4	(8) - ROTOR WIPER
5	(8) - ROTOR WIPER COVER PLATE
6	REMOVABLE SIDE PLATE
7	SHAFT SEAL
8	BEARING
9	MOTOR MOUNT SLIDE
10	GEARMOTOR
11	DR SPROCKET
12	DN SPROCKET
13	CHAIN GUARD BACK PLATE
14	CHAIN GUARD SLIDING PLATE
15	CHAIN GUARD COVER
16	SHAFT GUARD
17	ROTATION ARROW DECAL
18	NAMEPLATE
19	WARNING, FAILURE TO VERIFY
20	HEX CAP SCREW, 1/4-20 x 1/2" LG
21	HEX CAP SCREW, 1/4-20 x 1 1/4" LG
22	FLAT WASHER, 1/4
23	HEX NUT, 1/4-20, NYLOCK
24	HEX CAP SCREW, 3/8-16 x 1 1/4" LG
25	HEX NUT, 3/8-16
26	FLAT WASHER, 3/8
27	HEX CAP SCREW, 1/2-13 x 1 3/4" LG
28	FLAT WASHER, 1/2
29	HEX NUT, 1/2-13
30	FLAT WASHER, 5/8
31	LOCK WASHER, 5/8
32	HEX NUT, 5/8-11



ISOMETRIC REFERENCE VIEW









Exploded View



## RECOMMENDED SPARE PARTS CONTINUED


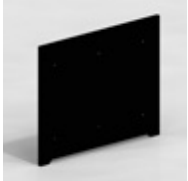
### Illustrated Parts List

Part	Airlock Size	Part Number	Picture
Bearing	VL18x10	10000984	
	VL23x12	10000985	
	VL26x14	10000985	
	VL30x16	10000985	
	VL36x20	10000986	
	VL40x24	10000986	
	VL46x30	10000986	
Connection Flange Gasket	VL18x10	GSKTA10RD.0625B	
	VL23x12	GSKTA12RD.0625B	
	VL26x14	GSKTA14RD.0625B	
	VL30x16	GSKTVLA163/16RD.0625BNW	
	VL36x20	GSKTVLA203/16RD.0625BNW	
	VL40x24	GSKTVLA243/16RD.0625BNW	
	VL46x30	GSKTVLA303/16RD.0625BNW	
Gearmotor	VL18x10	10001203	
	VL23x12	10001204	
	VL26x14	10001204	
	VL30x16	10001204	
	VL36x20	10001205	
	VL40x24	10002584	
	VL46x30	10002584	
Rotor	VL18x10	RAV-610-2200	
	VL23x12	RAV-612-2200	
	VL26x14	RAV-614-2200	
	VL30x16	RAV-616-2200	
	VL36x20	RAV-620-2200	
	VL40x24	RAV-624-2200	
	VL46x30	RAV-630-2200	
Sprockets	VL18x10 DriveR / DriveN	50BS15HT1 1/8 - 50BS36T1 3/4	
	VL23x12 DriveR / DriveN	60BS15HT 1 1/2 - 60BS36T2	
	VL26x14 DriveR / DriveN	60BS15HT1 1/2 - 60BS36T2	
	VL30x16 DriveR / DriveN	60BS15HT1 1/2 - 60BS44T2	
	VL36x20 DriveR / DriveN	80BS16HT1 1/2 - 80BS45T214	
	VL40x24 DriveR / DriveN	80BS20HT214 - 80BS30T214	
	VL46x30 DriveR / DriveN	80BS20HT214 - 80BS30T214	
Shaft Seal	VL18x10	RAV-600-3001	
	VL23x12	RAV-600-3002	
	VL26x14	RAV-600-3002	
	VL30x16	RAV-600-3002	
	VL36x20	RAV-600-3003	
	VL40x24	RAV-600-3003	
	VL46x30	RAV-600-3003	



## RECOMMENDED SPARE PARTS CONTINUED

### Illustrated Parts List Continued

Part	Airlock Size	Part Number	Picture
Wiper Cover Plate	VL18x10	RAV-610-3204	
	VL23x12	RAV-612-3204	
	VL26x14	RAV-614-3204	
	VL30x16	RAV-616-3204	
	VL36x20	RAV-620-3204	
	VL40x24	RAV-624-3204	
	VL46x30	RAV-630-3204	
Wiper (8 per airlock)	VL18x10	RAV-610-3203	
	VL23x12	RAV-612-3203	
	VL26x14	RAV-614-3203	
	VL30x16	RAV-616-3203	
	VL36x20	RAV-620-3203	
	VL40x24	RAV-624-3203	
	VL46x30	RAV-630-3203	

## 9. SPECIAL ATEX INFORMATION

### Special CE/ATEX Information

#### Installation Requirements

When installing equipment, make sure that the moving parts inside the Rotary Airlock Valve are not accessible so that EN ISO 13857-1 is fulfilled.

The VL airlock has mechanical strength limits. Equipment such as bins, hoppers, conveyors and spouting that are installed in conjunction with the VL airlock must have their own support structure, not relying on the VL airlock for support, so that the risk of mechanical failure of the unit may be mitigated.

Free outlet of the product must be guaranteed at all times, otherwise blockage and severe damage is possible.

Examined raw materials must be used; only pre-cleaned product that has passed a non-ferrous metal separator, a magnet separator and a contaminant separator may be used.

#### Electrical Requirements

Electrical installation must be executed according to EN ISO 60204-1 (a lockable all-phase power switching device must be provided, so the device can be switched off and secured before performing repair work).

Construction of the control system must be done under consideration of EN ISO 13849-1. Electrical components must be mounted by EMC skilled specialists and be properly earthed to mitigate the risk of electrostatic discharge.

When the operating company connects the device to the electrical supply, the control system must be set up so that in case of a voltage switchback after a power failure, it is necessary to re-start the drive.

## **Installation Requirements**

The operator or manufacturer of the facility must install an Emergency Stop circuit near the equipment, which is capable of turning off the machine immediately and securely under consideration of EN 13850. The safety circuit “EMERGENCY STOP button -> safety relay -> safe shut down of the drive motor (e.g. by means of motor protection switch)” must at least have performance level PL r=c according to EN ISO 13849-1.

During installation, an electrical repair switch must be installed in order to disconnect the motor, on all poles, from the power supply for service and maintenance activities to eliminate any personnel hazard. The safety circuit “repair switch -> safe shutting down of the drive motor (e.g. by means of motor protection switch)” must at least have performance level PL r=c according to EN ISO 13849-1.

Unless otherwise specified, the airlock speed sensor is provided by the customer.

## **Grounding (Earthing) of Conducting Parts**

It is normally sufficient to separately ground the static parts of the airlock when installed. If necessary, shaft grounding systems may be used. (This is to avoid any electrostatic charge and potentially dangerous situation).

## **Paint**

It is ensured via an internal instruction and after coordination with the painter that maximum thickness of paint (i.e. varnish) inside and outside does not exceed 0.2mm.

## **Markings**

The nameplate shall be fixed permanently to the airlock and indicate: Name and address of the manufacturer, date of construction, designation or type of airlock, serial or identification number, technical file number, the CE mark and classification markings.

<b>Potentially dangerous situation during installation and initial start up</b>	<b>Measures that must be applied by the user during installation and initial start up</b>
Sparking in the event of transport accidents.	The rotary airlock valve or the components of the rotary airlock valve must not be dropped during transport – not only because of the risk of personal injury but also due to the risk of sparks being produced.
Welding as a source of sparks.	Welding is not permitted in zones 0, 1 or 2. Bolted connections must be used instead.
Overheat situation of the rotary airlock valve.	The maximum permitted rotation speed of the rotary airlock valve is 30 r.p.m. (or relative contact speed must be < 1 m/s). An overheat situation due to increased friction in zone 22 must be avoided in any case.
Use of non-explosion protected tools when dismantling or assembling the rotary airlock valve.	Only explosion-protected, non-sparking tools must be used when dismantling or assembling the rotary airlock valve.
Build-up of electrostatic charges at all non-earthed (non-grounded) enclosure parts.	During on-site installation, an external grounding wire must be connected to the rotary airlock valve.
Danger of sparking inside the rotary airlock valve when foreign particles, such as stones, metal pieces enter the machine.	Only clean product may be used. Foreign particles such as stones, ferromagnetic metal pieces and nonferromagnetic metal pieces NEVER may pass the rotary airlock valve.

<b>Potentially dangerous situation during operation</b>	<b>Measures that must be applied by the user during operation</b>
In some installations where combustible dust is present, it can deposit and build up on the external surfaces or in narrow gaps of the rotary airlock valve. That can have an insulating effect and prevent heat produced inside the rotary airlock valve from adequately dissipating from its surfaces. The combustible dust could ignite as a consequence.	The exterior surfaces of the rotary airlock valve must be cleaned periodically, when it is located in a dusty environment. Cleaning is to be done either with a vacuum cleaner approved for use in explosive zones, or with a damp cloth. Solvents or dry wool cloths (risk of sparking) must never be used.

Potentially dangerous situation during maintenance and repair	Measures that must be applied by the user during maintenance and repair
<p>Hazard: When components and connecting parts fail to function properly during their expected service life. The following parts must be replaced at certain intervals:</p> <ul style="list-style-type: none"> <li>• Replacing the bearings in the rotary airlock valve.</li> <li>• Replace the bearings in the electric motor.</li> <li>• Replace the clutch between motor and rotary airlock valve (in case there is one).</li> </ul>	<p>The bearings must be replaced after having finished 90% of their lifetime: this is every 12,000 hours of operation, preferably by authorized KICE service personnel. Those exchange intervals are calculated to ensure that overheating or sparking as a result of a defective wearing part can be practically excluded. It is recommended that the User installs an operating hour counter in the control cabinet if the operating hours cannot be easily determined by other means.</p> <p>The bearings must be replaced according to the specifications of the manufacturer of the electric motor.</p> <p>The clutch must be replaced according to the specifications of the manufacturer of the clutch.</p>
<p>Danger of sparking inside the rotary airlock valve when foreign particles, such metal pieces are inside the machine.</p>	<p>When replacing parts inside the rotary airlock valve, all bolts and nuts should be locked with Loctite® or a similar adhesive.</p>

## 10. IGNITION SOURCE ANALYSIS



# Ignition source analysis for non-electrical equipment

in accordance with DIN EN 13463-1:2009 and DIN EN 13463-5:2011

## for the Rotary Airlock Valve VL

By company:  
KICE Industries, Inc.

Rev. 2 dated 08.09.2015

## IGNITION SOURCE ANALYSIS CONTINUED

The assessment of generation of an explosive atmosphere to categorise into different explosive zones was based on the following considerations:

- Since the case of the Rotary Airlock Valve is almost always completely filled with product, there is little air so that the risk of generating an explosive dust/air mix does not always exist.
- If there is no product in the cell wheel gate during certain discharge stages, the risk of generating an explosive dust/air mix does not occur either (only air and very little or no product, therefore no explosive dust/air mix possible).
- On-site the area outside the device is defined as Zone 22 or as "no zone".

Therefore the following zoning applies:

Zone 20: non-existent

Zone 21: Area inside the case

(Definition zone 21: During normal operation a dangerous explosive atmosphere in the form of a cloud of flammable dust contained in the air may form sometimes).

Zone 22: Area outside the case

(Definition zone 22: During normal operation a dangerous explosive atmosphere in the form of a cloud of flammable dust contained in the air should normally not or very briefly occur).

In zone 21 only such equipment may be used that does not cause ignitable ignition sources during normal operation or in case of expected errors (according to equipment category 2 or 3).

In zone 22 only such equipment may be used that does not cause ignitable ignition sources during normal operation (equipment category 2 or 3).

## IGNITION SOURCE ANALYSIS CONTINUED

### Possible ignition sources according to EN 1127-1

The serial numbers in the table below correspond to the serial numbers in the table "report of the ignition source analysis"

In the tables below, the following marking applies:



- Ignition sources that can **exclusively** cause an explosive atmosphere **outside a case** to ignite: **no marking**
- Ignition sources that can cause an explosive atmosphere **outside or inside a case** to ignite: **light grey background of the line in the table**
- Ignition sources that can **exclusively** cause an explosive atmosphere **inside a case** to ignite: **dark grey background of the line in the table**

Seq. no.	Possible ignition sources	Appliance-related yes/no	In what situation? (before realisation of the measure)	Cause
1	Hot surfaces	Yes	Expected error	Heating up of the rotor bearing (cell wheel bearing) due to wear
2	Hot surfaces	Yes	Expected error	Heating up of the motor bearing due to wear
3	Hot surfaces	Yes	Expected error	Heating up of the coupling (connection motor shaft - rotor shaft) due to wear
4	Hot surfaces	Yes	Normal operation	Heating up of the coupling (connection motor shaft - rotor shaft) due to wear cause by an alignment error
5	Hot surfaces	Yes	Normal operation	Heating up of the gear unit due to dry running
6	Hot surfaces	Yes	Normal operation	Hot surfaces caused by rotating shafts grinding against fixed components.
7	Hot surfaces	Yes	Normal operation	Losses cannot be dissipated as heat if an insulating dust layer prevents this. Additional frictional heat is generated by dust deposits (especially in case of sticky material).
8	Mechanically generated sparks	Yes	Normal operation	Spark formation as a result of friction between the chain and the chain guard when the chain snaps, slackens or no longer grips.
9	Mechanically generated sparks	Yes	Rare malfunction	Spark formation as a result of friction between a pinion and the chain guard when the connection between a pinion and the motor shaft or the rotor shaft loosens.
10	Mechanically generated sparks	Yes	Normal operation	Formation of sparks caused by objects (e.g. stones, screws) inside the device
	Flames, hot gases	No		non-existent
11	Electrical sparks	Yes	Normal operation	Formation of sparks in connection with the drive motor

Seq. no.	Possible ignition sources	Appliance-related yes/no	In what situation? (before realisation of the measure)	Cause
12	Electrical sparks	Yes	Normal operation	Formation of sparks in connection with the rotational speed sensor
	Electrical stray currents and cathodic corrosion protection	No		non-existent
13	Static electricity	Yes	Expected error	Electro-static charging of the rotor
14	Static electricity	Yes	Expected error	Electro-static charging of the coupling and of the varnished surfaces of the case
	Lightning	No		non-existent
	Electromagnetic waves	No		non-existent
	Ionizing radiation	No		non-existent
	High frequency radiation	No		non-existent
	Ultrasound	No		non-existent
	Adiabatic pressure	No		non-existent
	Chemical reaction	No		non-existent



# IGNITION SOURCE ANALYSIS CONTINUED

## Report on the ignition source analysis for the Rotary Airlock Valve VL

Seq. no.	1		2					3			4					
	Ignition hazard		Assessment of the frequency of occurrence without introducing an additional measure					Introduced measures to prevent effectiveness of the ignition source			Frequency of occurrence including the introduced measures					
	a	b	a	b	c	d	e	a	b	c	a	b	c	d	e	f
	Potential ignition source	Description/ primary cause  (Under what circumstances does the ignition hazard occur?)	In normal operation	In case of an expected malfunction	In case of a rare malfunction	Not to be considered	Reasons for the assessment	Description of the introduced measures	Fundamentals  (Quotation of standards, technical rules and experimental results)  Chapter numbers refer to EN 13463-5:2011	Technical documentation  (Proof including the relevant properties listed in column 1)	In normal operation	In case of an expected malfunction	In case of a rare malfunction	Not to be considered	The resulting equipment category with reference to this ignition hazard	Necessary restrictions
1	Hot surfaces	Frictional losses due to worn roller bearings or corroded mechanical components on the rotor shaft are dissipated as heat.		x			Heating up of the bearing due to illegal friction caused by worn roller bearings.	The roller bearings of the rotor shaft must be exchanged after 90% of their service life.	6	Include information in the operators manual that the bearings must be exchanged after 90% of their service life. State service life in the operators manual.			x		2D (inside and outside)	
2	Hot surfaces	Frictional losses due to worn roller bearings or corroded mechanical components on the motor shaft are dissipated as heat.		x			Heating up of the bearing due to illegal friction caused by worn roller bearings.	The roller bearings of the motor must be exchanged according to the information of the motor manufacturer with consideration of the category 3 requirements (explosion zone 22).	6	Include note in the operators manual that the information of the motor manufacturer concerning exchanging the bearings must be observed.			x		2D	
3	Hot surfaces	Only applies to devices with direct drive: Losses due to dynamic deformation of the coupling are dissipated as heat.	x				Heating up of the coupling between motor shaft and rotor shaft due to wear.	The coupling is ATEX-certified (cat. 3 GD for zone 22). Since the maximum rotational speed is only ca. 30 rpm it can be assumed that dangerous heating of the coupling cannot occur. In addition, the service activities prescribed by the manufacturer of the coupling are carried out according to schedule.	7.3	ATEX certificate for the coupling is added to the documentation. Include note in the operators manual that the service activities prescribed by the manufacturer of the coupling must be carried out according to schedule.		x			3D	

Seq. no.	1		2					3			4					
	Ignition hazard		Assessment of the frequency of occurrence without introducing an additional measure					Introduced measures to prevent effectiveness of the ignition source			Frequency of occurrence including the introduced measures					
	a	b	a	b	c	d	e	a	b	c	a	b	c	d	e	f
	Potential ignition source	Description/ primary cause  (Under what circumstances does the ignition hazard occur?)	In normal operation	In case of an expected malfunction	In case of a rare malfunction	Not to be considered	Reasons for the assessment	Description of the introduced measures	Fundamentals  (Quotation of standards, technical rules and experimental results)  Chapter numbers refer to EN 13463-5:2011	Technical documentation  (Proof including the relevant properties listed in column 1)	In normal operation	In case of an expected malfunction	In case of a rare malfunction	Not to be considered	The resulting equipment category with reference to this ignition hazard	Necessary restrictions
4	Hot surfaces	Only applies to devices with direct drive: Losses due to dynamic deformation of the coupling are dissipated as heat.	x				Heating up of the power transmission between motor shaft and rotor shaft due to incorrect alignment (misalignment).	Incorrect alignment of motor shaft and rotor shaft may cause increased wear of the coupling and heat generation and must therefore be avoided.	7.3	Include note in the operating manual that when exchanging motor and coupling as well as in a case of repair, exact alignment of the two shafts must be ensured. Assembly must be described in detail and with pictures.		x			3D	
5	Hot surfaces	Frictional losses due to insufficient lubrication of the coupling are dissipated as heat.	x				Operation without oil in the gear unit	The gear unit is ATEX-certified (cat. 3 GD for zone 22). The appliance can only be taken into operation when the gear unit has been filled with oil. The service activities prescribed by the manufacturer of the gear unit are carried out according to schedule.	6.2	The ATEX certificate for the gear unit is added to the documentation. Include the following notes in the operators manual: - The appliance can only be taken into operation when the gear unit has been filled with oil. - The service activities prescribed by the manufacturer of the gear unit must be carried out according to schedule.		x			3D	

## IGNITION SOURCE ANALYSIS CONTINUED

Seq. no.	1		2					3			4					
	Ignition hazard		Assessment of the frequency of occurrence without introducing an additional measure					Introduced measures to prevent effectiveness of the ignition source			Frequency of occurrence including the introduced measures					
	a	b	a	b	c	d	e	a	b	c	a	b	c	d	e	f
	Potential ignition source	Description/ primary cause <i>(Under what circumstances does the ignition hazard occur?)</i>	In normal operation	In case of an expected malfunction	In case of a rare malfunction	Not to be considered	Reasons for the assessment	Description of the introduced measures	Fundamentals  <i>(Quotation of standards, technical rules and experimental results)</i>  Chapter numbers refer to EN 13463-5:2011	Technical documentation  <i>(Proof including the relevant properties listed in column 1)</i>	In normal operation	In case of an expected malfunction	In case of a rare malfunction	Not to be considered	The resulting equipment category with reference to this ignition hazard	Necessary restrictions
6	Hot surfaces	<i>Applies only to devices with chain drive:</i> Prohibited warming outside of the device as a result of the rotating shafts of the motor or rotor grinding against the chain guard back plate.	x				Hot surfaces caused by a rotating shaft grinding against the fixed back plate.	The gap between the rotating and the fixed parts is so big that even in the case of a rare error, the parts will not come into contact.  In addition, the speed of rotation of both shafts is only very low (max. 60 rpm for the motor shaft, max. 30 rpm for the rotor shaft).  Therefore this error is not to be taken into account.	5.2	Diagrams of the individual parts as well as a construction drawing for the chain drive.  – The operating manual contains a note that these connections must be checked for firm seating in the scope of regular service activities.				x	1D	
7	Hot surfaces	Losses cannot be dissipated if an insulating dust layer prevents this. Additional frictional heat is generated by dust deposits (especially in case of sticky material).	x				Hazards caused by possibly caked dust deposits in gaps of moving parts by heating and formation of smouldering spots.	Dust deposits must be removed regularly by the operator.	13463-1, 7.1	Include note in the operators manual that such spots must also be removed regularly. This must be done by means of vacuuming and with an anti-static cloth.			x		2D (inside and outside)	
8	Mechanical sparks	<i>Applies only to devices with chain drive:</i> Spark formation as a result of friction between chain and chain guard when the chain breaks, slackens or no longer grips.	x				Danger from spark formation if the drive chain snaps, loosens or breaks and as a result knocks against the inner side of the chain guard.	The maximum peripheral speed of the chain drive is ca. 0.47 m/s.  The basis of the calculation was that the large pinion (on the rotor shaft) on the largest version of the device (Airlock VL 40x24) has a diameter of about 300mm and the maximum speed of rotation of the rotor is 30 rpm.  Therefore a mechanism for separating the drive power from the drive wheel is not required if one of the errors mentioned on the left occurs (EN 13463-4 demands this only at speeds of >1 m/s).	7.4	Diagrams of the individual parts as well as a construction drawing for the chain drive.  Datasheet for the drive motor.  The operating manual states that the chain must be checked regularly for wear and tear.				x	1D	

Seq. no.	1		2					3			4					
	Ignition hazard		Assessment of the frequency of occurrence without introducing an additional measure					Introduced measures to prevent effectiveness of the ignition source			Frequency of occurrence including the introduced measures					
	a	b	a	b	c	d	e	a	b	c	a	b	c	d	e	f
	Potential ignition source	Description/ primary cause <i>(Under what circumstances does the ignition hazard occur?)</i>	In normal operation	In case of an expected malfunction	In case of a rare malfunction	Not to be considered	Reasons for the assessment	Description of the introduced measures	Fundamentals  <i>(Quotation of standards, technical rules and experimental results)</i>  Chapter numbers refer to EN 13463-5:2011	Technical documentation  <i>(Proof including the relevant properties listed in column 1)</i>	In normal operation	In case of an expected malfunction	In case of a rare malfunction	Not to be considered	The resulting equipment category with reference to this ignition hazard	Necessary restrictions
9	Mechanically generated sparks	<i>Applies only to devices with chain drive:</i> Spark formation as a result of friction between pinion and chain guard due to a loosened connection between the pinion and the motor shaft or rotor shaft.	x				Danger from spark formation, the fixing between a pinion and the motor shaft or the rotor shaft loosens and the pinion or the chain knocks against the inner side of the chain guard.	The pinion and the motor shaft or rotor shaft are linked by a positive connection (slotted feather key connection with square feather key). For fastening, suitable securing elements are used (e.g. self-securing nuts, lock washers), so that a loosened connection can be categorised as rare malfunction.  In addition, as the maximum motor capacity is only ca. 3.6 kW, this type of fixing is sufficient.	14986, 4.21	Construction drawing for the chain drive.  The operating manual contains a note that these connections must be checked for firm seating in the scope of regular service activities.			x		2D (inside)	
10	Mechanical sparks	Formation of sparks caused by objects (e.g. stones, screws) inside the device	x				If screws loosen or objects are introduced.	Secure all screws with Loctite®.	13463-1, 6.4	Include the following notes in the operators manual: – When parts in the inside of the equipment are exchanged, the screws must be secured again with Loctite®. – Only pre-cleaned product may be used that has passed a non-ferrous metal separator and a magnet separator and a contaminant separator.			x		2D (inside)	
11, 12	Electrical sparks	Formation of sparks caused by electrical appliances (drive motor, rotational speed sensor (option))	x				Electrical appliances are a potential ignition source.	The drive motor (including gear unit) and the rotational speed sensor are ATEX-certified (cat. 3GD for zone 22).	EN 60079-0	ATEX certificate for – Drive motor/gear unit combination and – rotational speed sensor are included in documentation.		x			3D	

## IGNITION SOURCE ANALYSIS CONTINUED

Seq. no.	1		2					3			4					
	Ignition hazard		Assessment of the frequency of occurrence without introducing an additional measure					Introduced measures to prevent effectiveness of the ignition source			Frequency of occurrence including the introduced measures					
	a	b	a	b	c	d	e	a	b	c	a	b	c	d	e	f
	Potential ignition source	Description/ primary cause  (Under what circumstances does the ignition hazard occur?)	In normal operation	In case of an expected malfunction	In case of a rare malfunction	Not to be considered	Reasons for the assessment	Description of the introduced measures	Fundamentals  (Quotation of standards, technical rules and experimental results)  Chapter numbers refer to EN 13463-5:2011	Technical documentation  (Proof including the relevant properties listed in column 1)	In normal operation	In case of an expected malfunction	In case of a rare malfunction	Not to be considered	The resulting equipment category with reference to this ignition hazard	Necessary restrictions
13	Static electricity	Electro-static charging of the rotor		x			Electrostatic charging of the rotor or the casing.	<p>The casing of the device is made of sheet steel and is earthed.</p> <p>The rotor blades inside the device are made of rubber. Depending on the device type, these components have the following projected areas:</p> <ul style="list-style-type: none"><li>- VL 18x10 276.713 cm²</li><li>- VL 23x12 356.400 cm²</li><li>- VL 26x14 398.235 cm²</li><li>- VL 30x16 397.580 cm²</li><li>- VL 36x20 394.908 cm²</li></ul> <p>Therefore in the case of cat. 2 (zone 1 inside the casing) or cat. 3 (zone 2 inside the casing), the requirements of EN 13463-1:2009, ch. 6.7.5 c) are fulfilled (max. size of the projected area 400 cm²).</p> <p>For the device types VL 40x24 and VL 46x30, the width of the area of the isolated component is 3.0 cm.</p> <p>Therefore in the case of cat. 2 (zone 1 inside the casing) or cat. 3 (zone 2 inside the casing), the requirements of CLC/TR 504040:2003, ch. 4.4.3 c), table 1 b) are fulfilled.</p> <p>The occurrence of propagating brush discharges can be excluded.</p>	13463-1, 6.7.5 CLC/TR 504040 chap. 4.4.3	The relevant diagrams and datasheets are attached to the documentation.						2D (inside) 3D (outside)

Seq. no.	1		2					3			4					
	Ignition hazard		Assessment of the frequency of occurrence without introducing an additional measure					Introduced measures to prevent effectiveness of the ignition source			Frequency of occurrence including the introduced measures					
	a	b	a	b	c	d	e	a	b	c	a	b	c	d	e	f
	Potential ignition source	Description/ primary cause  (Under what circumstances does the ignition hazard occur?)	In normal operation	In case of an expected malfunction	In case of a rare malfunction	Not to be considered	Reasons for the assessment	Description of the introduced measures	Fundamentals  (Quotation of standards, technical rules and experimental results)  Chapter numbers refer to EN 13463-5:2011	Technical documentation  (Proof including the relevant properties listed in column 1)	In normal operation	In case of an expected malfunction	In case of a rare malfunction	Not to be considered	The resulting equipment category with reference to this ignition hazard	Necessary restrictions
14	Static electricity	Only applies to devices with direct drive: Electro-static charging of the coupling		x			Electro-static charging of the coupling and of the case (insulating layer of varnish)	<p>The coupling is ATEX-certified (cat. 3 GD for zone 22).</p> <p>The case has a thin layer of varnish of about 0.2mm and is connected to the grounding system of the building with a separate grounding connection.</p>	8 13463-1, 6.7.3, 6.7.5	<p>ATEX certificate for the coupling is added to the documentation.</p> <p>It is ensured via an internal instruction and after coordination with the painter that the max. thickness of varnish inside and outside does not exceed 0.2mm.</p> <p>Include note in the operators manual that the device must be grounded separately when assembled.</p>					2D (inside) 3D (outside)	
Resulting equipment category including all existing ignition sources:											Outside: 3D Inside: 2D			-		

## 11. TORQUE VALUES FOR MAINTENANCE AND INSTALLATION

Recommended U.S. BOLT TORQUE* Coarse thread only							
		SAE Grade 5	SAE Grade 5	SAE Grade 8	SAE Grade 8	Socket head cap screw	Socket head cap screw
Bolt Dia.	Thread Size	lb – ft	N – m	lb – ft	N – m	lb – ft	N – m
1/4	20	8.4	11	12	16	11	15
5/16	18	17	24	25	33	23	31
3/8	16	31	42	44	59	41	55
7/16	14	49	67	70	95	65	89
1/2	13	74	100	110	140	100	140
9/16	12	100	140	150	210	140	200
5/8	11	140	190	210	290	200	270
3/4	10	240	330	380	510	350	480
7/8	9	390	520	610	820	570	770
1	8	570	780	910	1100	850	1200
1-1/8	7	790	1100	1300	1700		
1-1/4	7	1100	1500	1800	2500		
1-3/8	6	1500	2000	2400	3200		
1-1/2	6	1900	2600	3200	4300		
1-5/8	5.5	2400	3300	4300	5900		
1-3/4	5	3000	4100	5000	6800		
2	4.5	4500	6100	7500	10000		

\*Values above are approximations; consult with the manufacturer for torque data.  
Significant variation may exist within the same grade and size between manufacturers.

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