



5412 SERIES ENCLOSED  
BRAKE  
AIR APPLIED VERSION

*Owner's Operation, Installation &  
Maintenance Manual*



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# 1 INTRODUCTION

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## 1.1 CONTACT INFORMATION

### **Kobelt Manufacturing Co LTD.**

*8238 129TH Street  
Surrey, British Columbia  
Canada, V3W 0A6*

Sales Tel:	604-572-3935
Fax:	604-590-8313
Email:	<a href="mailto:sales@kobelt.com">sales@kobelt.com</a>
Website:	<a href="http://www.kobelt.com">www.kobelt.com</a>

For further instructions, please contact our distributors or visit our website.

## 1.2 SAFETY INFORMATION

### 1.2.1 Safety Instructions


Notice to Installer:


Disregarding the following safety measures can result in an accident causing severe injury to personnel and damage to material assets:


- Only use the product as directed in this manual.
- Never put the product into service if there is evidence of visible damage.
- Never put the product into service before fully completing installation and commissioning.
- Do not carry out any modifications to the product.
- Only use authentic Kobelt spare parts.
- Observe all local regulations, directives and laws during the installation of this product.
- All installation, commissioning and maintenance work must only be conducted by qualified personnel. (For the purpose of this manual, qualified personnel are persons who are familiar with the assembly, installation, commissioning, and operation of the product and who have the qualifications necessary for their occupation.)
- Observe all specifications in this manual. If these guidelines are not followed and damage occurs, the warranty will be voided.


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### 1.2.2 Hazards

Throughout this publication, Warnings and Cautions accompanied by the International Hazard Symbol  is used to alert the user to special instructions concerning a particular service or operation that may be hazardous if performed incorrectly or carelessly.

 <b>DANGER</b>	<b>Equipment Starts Automatically:</b> Brake systems frequently are controlled remotely and may activate suddenly causing bodily harm. Ensure all power sources are locked out prior to performing work.
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 <b>WARNING</b>	<b>Pinch Points:</b> Brakes contain numerous pinch points which can cause serious injury. Ensure all power sources are locked out prior to performing work.
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 <b>WARNING</b>	<b>High Pressure Fluids:</b> Kobelt brakes use compressed air. Ensure all pressure is exhausted and the pressure source locked out prior to performing work.
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 <b>WARNING</b>	<b>Hot Surfaces:</b> Disc brakes are capable of making the surfaces of the brake disc dangerously hot when burnishing or during braking events. Ensure the disc is adequately guarded to prevent inadvertent contact with the disc.
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<b>SAFETY INSTRUCTIONS</b>	<b>Airborne Dust:</b> Brake linings contain fibers that may become airborne during cutting or sanding operations. Over exposure to these dusts should be considered hazardous. Use NIOSH approved respirators when working with brake linings. Request a MSDS for further information.
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### 1.3 PRODUCT DESCRIPTION

The diagram below shows a typical Kobelt caliper brake with all the major components identified. All of the Kobelt caliper brakes can be fitted with either air applied, hydraulic applied, spring applied with air released or spring applied with hydraulic released actuators depending on the required service.

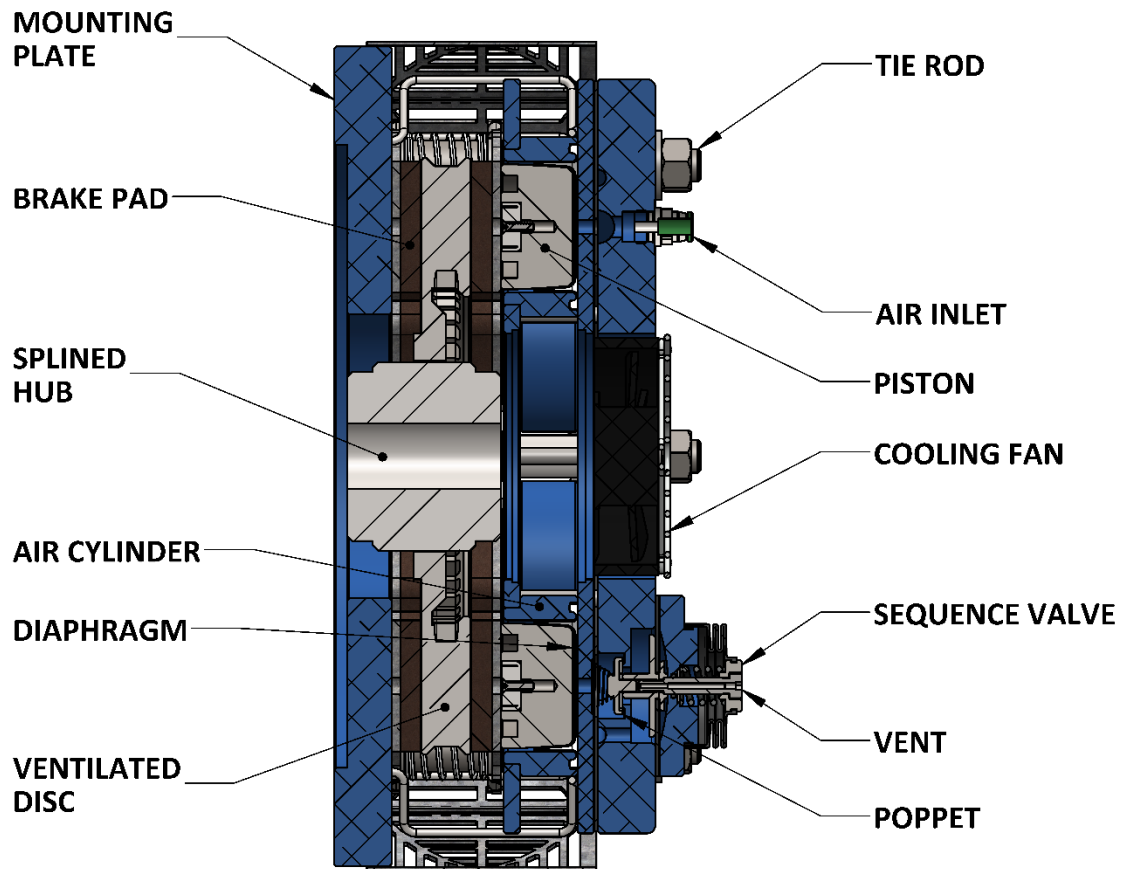
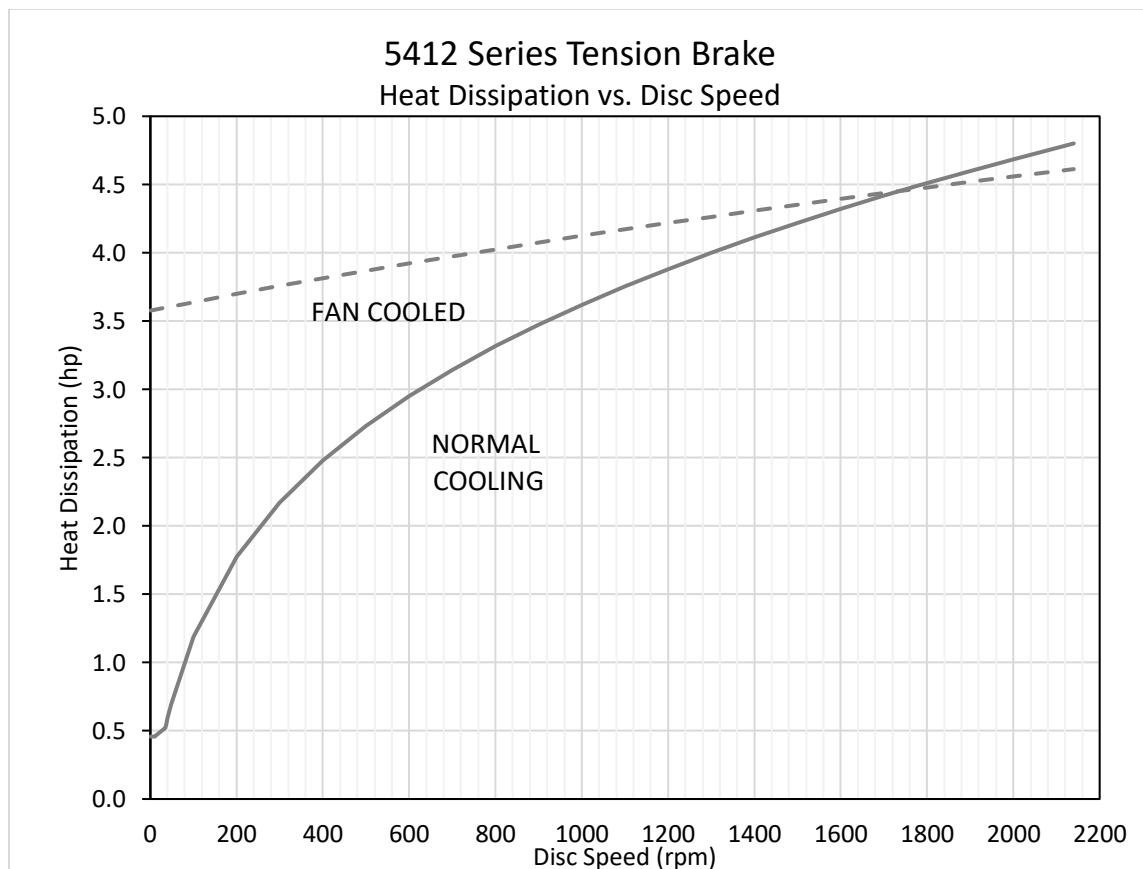


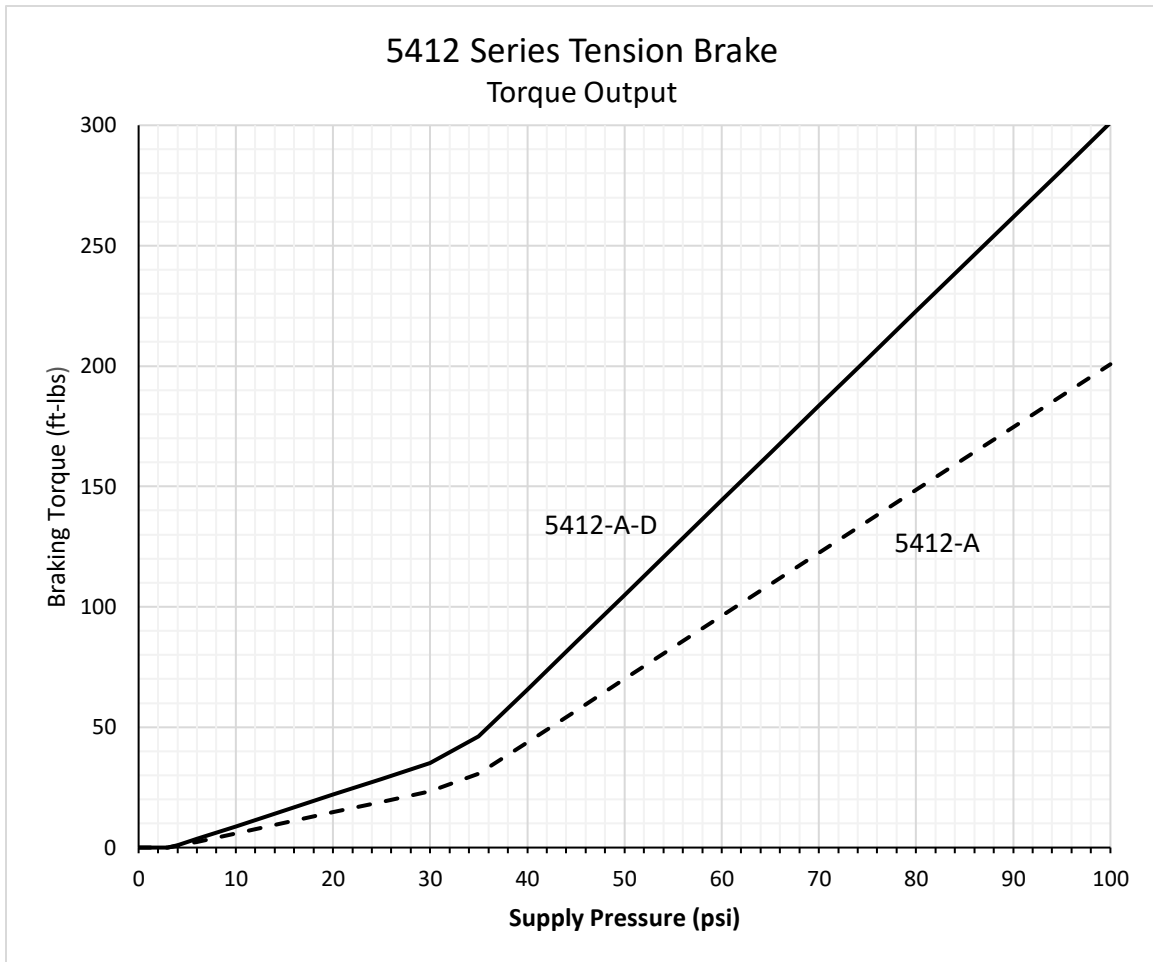
Figure 1: Tension Brake Nomenclature

## 1.4 TECHNICAL DATA

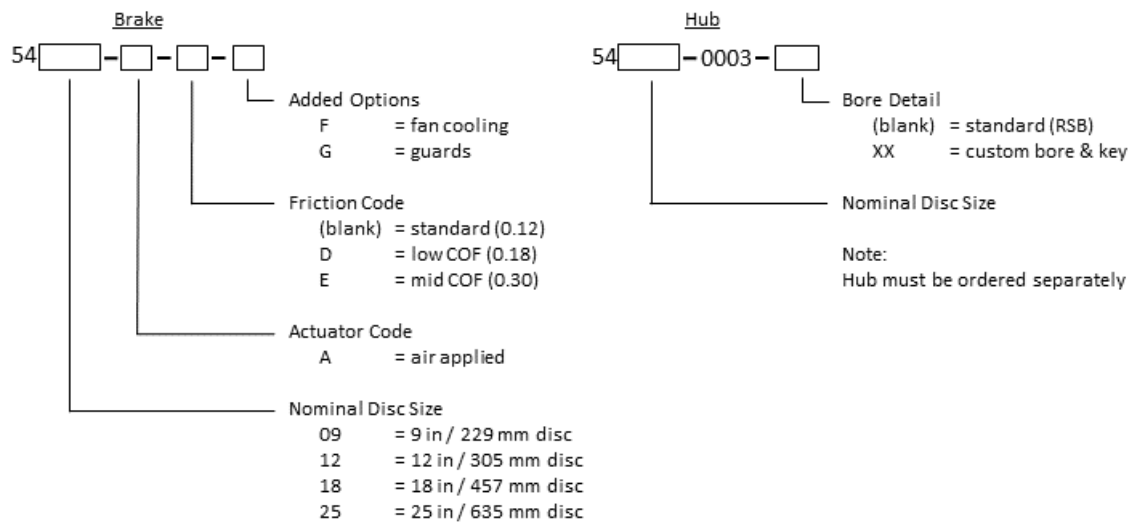
For technical data and specifications refer to the relevant data sheets from [www.kobelt.com](http://www.kobelt.com) or the technical drawings in Appendix A if provided.

Model no.:	<b>5412-A</b>		<b>5412-A-D</b>	
1. Maximum Torque:	200 ft-lbs	[272 Nm]	300 ft-lbs	[408 Nm]
Torque Range:	2.5% - 100%			
2. Pad Life:	8000 hp-hr	[5978 kw-hr]		
3. Maximum Speed:	2140 rpm			
4. Thermal Performance:				
4.1. Cooling:	See chart			
4.2. Heat Sinking:	3.1 hp-sec/F	[4.2 KJ/C]		
5. Maximum pressure:	100 psi	[6.9 bar]		
6. Volume:				
6.1. Normal:	6 in <sup>3</sup>	[101 cc]		
6.2. Maximum:	22 in <sup>3</sup>	[362 cc]		
7. Weight:	87 lbs	[40 kg]		
8. Rotating Inertia:	3.2 lbs-ft <sup>2</sup>	[.1 kgm <sup>2</sup> ]		





## 1.5 MODEL CODE KEY





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## 2 INSTALLATION

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### 2.1 PREPARATION

The mounting bracket to support the brake must be designed to withstand the maximum braking forces generated by the brake. The bracket must meet the following requirements:

Flatness:	.004 in [.1 mm] <sup>(1)</sup>
Pilot fit:	10.995/10.990 in [279.3/279.1 mm] <sup>2</sup>

- (1) Allowable deviation from flatness is proportional to the pilot diameter with an IT8 tolerance grade. See Appendix A for key installation dimensions.
- (2) The locating pilot on the mounting plate should provide the brake with an LC7 fit (H10/e9).

The rotating element should have bearings suitably rated to carry the weight of the disc and hub. The run-out of the shaft must not exceed .012 in [.30 mm] TIR.

Actuator ports are plugged to prevent contamination of the seals. Remove the plugs prior to connection to the piping.

For cases where a guard or some protective cover is required ensure that the guard does not compromise the performance. An improperly designed cover or shield may cause air recirculation through the disc or radiant heat reflection, which could result in the disc overheating. The cooling air pumped through the disc must be exhausted away from the outer diameter of the disc to allow fresh, cool air to enter the inner vent opening of the disc.

### 2.2 BRAKE HUB

The brake hub must be installed onto the rotating element before installing the caliper. Insert the shaft key and tighten the two set screws to 64 in-lbs [7.2 Nm] using a 1/8 inch hexagon key.

### 2.3 CALIPER BRAKES

#### 2.3.1 Mechanical

Perform the following steps to properly install a caliper brake:

1. Ensure that both mounting faces of the brake and the mating surfaces on the bracket are clean.
2. Align the splines on the disc with those on the hub and insert the brake over the hub.
3. Install of SAE grade 5 mounting bolts. It is recommended to use a thread locking product such as Loctite® to ensure a vibration resistant and secure joint.
4. Tighten the mounting bolts to 37 ft-lbs [50 Nm].

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### 2.3.2 Piping

The piping to the brakes must be adequately sized to ensure appropriate response times. The piping must be selected to safely withstand the pressures required to operate the brakes. Secure the piping every 3 ft [0.9 m] against vibration with pipe clamp.

All piping must be cleaned prior to connection to the brake. Welded carbon steel piping must be pickled to remove the scale produced by welding.

The brake is equipped with a 3/8 NPT pressure port. The connections to the brake actuators must be made by hoses of a suitable rating to accommodate deflection of the brake.

#### **NOTICE**

Do not over tighten the fitting in the actuator port as damage to the actuator may occur.

For operation in sub-zero temperatures down to a minimum of 0°F [-20°C] the air must be dried to a dew point of -50°F [-44°F]



#### **WARNING**

Failure to adequately dry the compressed air supply may result in the brake valve freezing and rendering the brakes inoperable in sub-zero weather conditions.

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## 3 COMMISSIONING

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### 3.1 FUNCTION TEST

Before burnishing the brakes perform a quick inspection and function test of the brakes:


- (1) Ensure that all mounting bolts are properly installed.
- (2) Ensure the brake disc surface is clean. Remove all contamination from the disc with cleaning solvent.
- (5) Check that the pressure source is within the specified pressure range.
- (6) Check that all bolts are tight.
- (7) Cycle the brakes and ensure that the brakes are operational

### 3.2 BURNISHING

Burnishing is required in order to achieve rated brake torque. The process of burnishing removes minor contaminants from the rubbing surfaces and improves the degree of contact between the brake pad and disc.

If present, safety interlocks of the drive mechanism should be temporarily defeated to allow the disc to be driven with the brake partially applied.

Extreme care must be taken not to overheat the disc during the process.

 <b>WARNING</b>	Disc temperature must not exceed 700°F (371°C) or permanent degradation of the lining may occur.
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Burnishing is best achieved by applying the maximum torque and minimum speed that the drive can tolerate. Depending on the configuration of the brake system it may be necessary to reduce the burnishing torque by;

- a) Partially applying the brake with fluid pressure to a level that the drive can tolerate, or
- b) In systems with more than one brake, isolate all but one brake and burnish one brake at a time.

Three important points to consider when burnishing is;

- i. The temperature of the disc must be closely monitored. Excessive heat will damage the friction linings.
- ii. The duration of burnishing varies with each application.
- iii. Burnishing is not complete until the brake is producing rated torque. This will be indicated by the motor current while burnishing.



Failure to properly burnish will not allow the brake to produce adequate torque for the intended duty.

### 3.3 TORQUE TEST

Before putting equipment into service, confirm that full rated braking torque has been achieved through load testing or a torque test against the drive motors. If full brake torque has not been achieved, continue burnishing.

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## 4 OPERATION

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### 4.1 FUNCTIONAL REQUIREMENTS

#### 4.1.1 Pressure Supply

It is necessary to size air compressors and storage tanks to provide sufficient air for the intended duty of the brakes.

The main supply line to the brake system should be equipped with a filter, and regulator. The filter's function is to remove moisture and dirt in the system and the regulator will provide a constant air pressure to the control system. If the brake system is operating in sub-zero temperatures, it is recommended to have an air dryer in the system to remove all moisture. Alternatively, a lubricator can be filled with methyl hydrate (wood alcohol) to prevent freezing of the air system.

### 4.2 SERVICE LIMITS

#### 4.2.1 Disc Temperature

The Kobelt brake lining achieves maximum friction at 300°F. Over 300°F the brake begins to fade or experience diminishing friction. The maximum operating temperature of the brake linings is 700 °F [371° C]. Temperatures in excess of this limit will permanently damage the linings and require replacement.

#### 4.2.2 Ambient Temperature

The maximum operating temperature of the brake is -35°C [-31°F] to 50°C [122°F]

#### 4.2.3 Pressure

Do not allow the supply pressure to exceed 100 psi. If the available supply pressure exceeds the maximum allowable working pressure, then some form of a pressure regulator is required. The pressure supply system must be equipped with a safety relief valve.

#### 4.2.4 Disc speed

The potential imbalance in the ventilated disc could be detrimental to rotating equipment at high speeds. For running speeds greater than the values listed in the technical data section the discs must be balanced. Under no circumstances must the running speed exceed this value.

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## 5 MAINTENANCE

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### 5.1 PREVENTATIVE MAINTENANCE

#### Maintenance Schedule

Maintenance Item	Daily	Monthly	Annually	5 years
Inspect for leaks		✓		
Determine pad life		✓		
Inspect brake disc				✓
Service Actuators				✓

### 5.2 INSPECTION

#### 5.2.1 Pad Wear

The maximum allowable pad life has been reached when the brake pad has worn down to 1/16" [1.5 mm] thick. The lining must be replaced before the backing plate makes contact with the brake disc.

#### 5.2.2 Seals

The actuator seals should be inspected on a periodic basis. Apply air pressure to the actuators and listen for any hissing sound that would indicate a torn or ruptured diaphragm.

#### 5.2.3 Brake Disc

The brake disc must be inspected periodically to monitor the condition of the braking surface. When the condition of the braking surface has deteriorated to the point that the quality requirements below are no longer met the disc must be removed and resurfaced or replaced.

Axial Run out:	.012 in [.30 mm] TIR
Flatness:	.004 in [.1 mm]
Surface Finish:	63 micro inches [1.6 micrometers] RMS

Follow the minimum thickness allowances in the table below as a guideline for when a disc must be replaced.

*Table 1: Brake Disc Minimum Thickness Allowances*

Brake Disc Minimum Thickness		
Disc Series	Original Thickness in [mm]	Minimum Thickness in [mm]
1.25-2.5-XX	1.25 [31.8]	1.18 [30.0]

#### NOTICE

When re-machining the disc surface, equal amounts must be taken off of each face.

---

## 5.3 SERVICE

### 5.3.1 Tool List

The following tools are required for servicing the 5412-A tension brake:

- |                             |                                    |
|-----------------------------|------------------------------------|
| 1. ¾ inch socket or wrench  | actuator removal / installation    |
| 2. Pliers                   | brake pad removal / installation   |
| 3. 7/32 inch hex bit        | actuator disassembly / assembly    |
| 4. 5/32 inch hex bit        | brake valve removal / installation |
| 5. 1/8 inch hex bit         | brake valve disassembly / assembly |
|                             | Diaphragm removal / installation   |
| 6. Philip's screw driver    | fan kit removal / installation     |
| 7. Torque wrench, 50 ft-lbs | brake assembly                     |

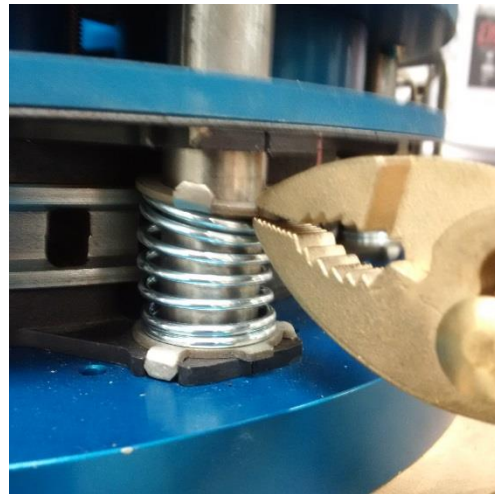
### 5.3.2 Brake Linings

The linings must be replaced before the backing plate makes contact with the disc. When replacing the brake pads follow these steps;

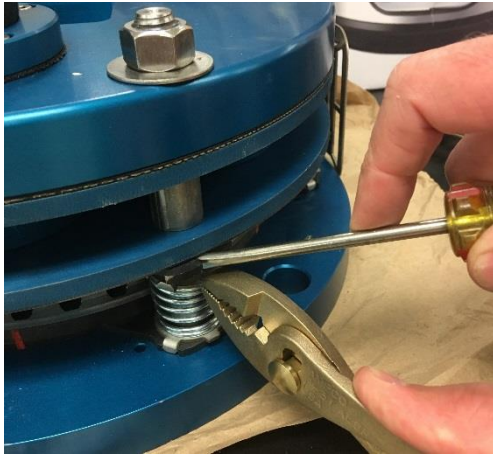
1. Remove the guards by removing the thumb screws.



2. Starting with the mounting flange side pads first, push the pad retainer out of engagement with the backing plate. It may be necessary to use a brake spring plier or a screw driver.



3. While holding the return spring compressed, slide the shoe radially outward. Repeat with the other retainer and lift the pad away.

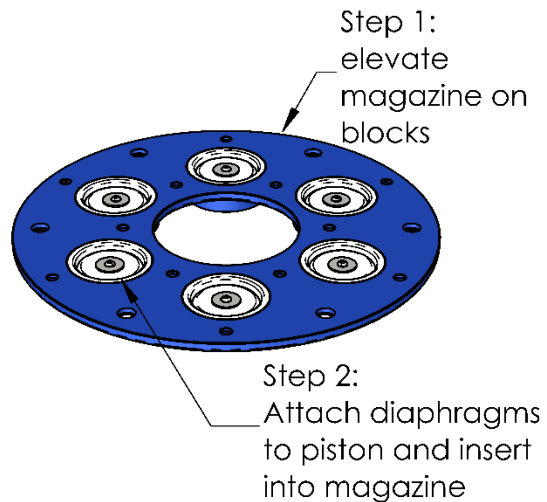


4. Remove all six pads on the mounting flange side.
5. Slide the disc towards the mounting face of the brake.
6. Repeat steps 2 & 3 with the actuator side pads.
7. Install the new brake pads by starting with the actuator side first. Ensure that all pad retainers are engaged with the backing plate.

### 5.3.3 Actuators

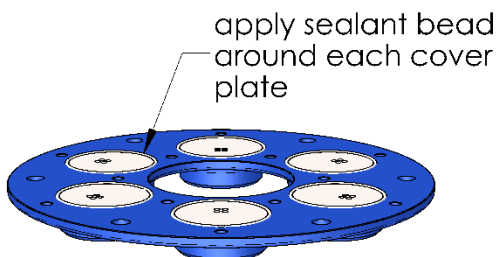
To replace the actuator diaphragms and gasket the actuator sub-assembly must be removed from the brake assembly. Follow the steps below:

1. Elevate the diaphragm magazine on blocks.
2. Secure the diaphragms to the pistons with the fender washers and button head screws. Use Loctite 243. Insert into the magazine as shown.



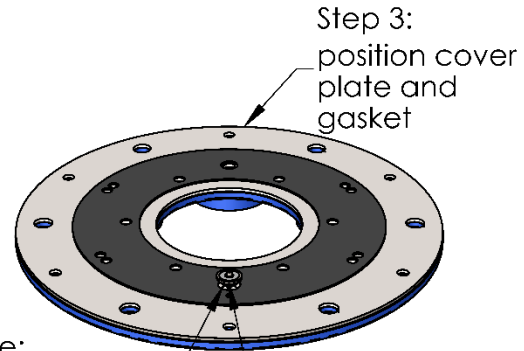
#### Note:

The first generation of 5412 brakes had six individual actuator covers versus one single piece. For these models apply a 1/8 in [3 mm] bead of sealant around each cover before positioning gasket and shims.





3. Position the actuator cover onto the magazine and align the holes. Ensure that the sealing faces are dust and oil free. Position the gasket onto the cover by carefully aligning the holes.

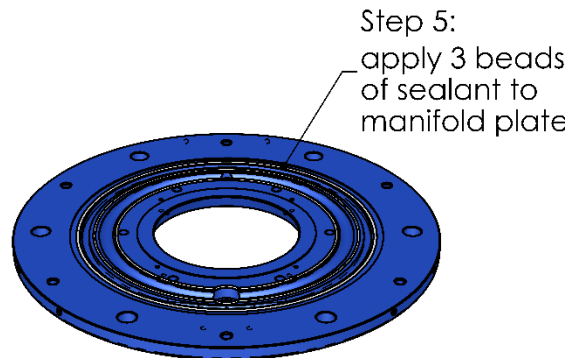


4. Place the poppet and tapered spring over top of the four small holes in the cover.

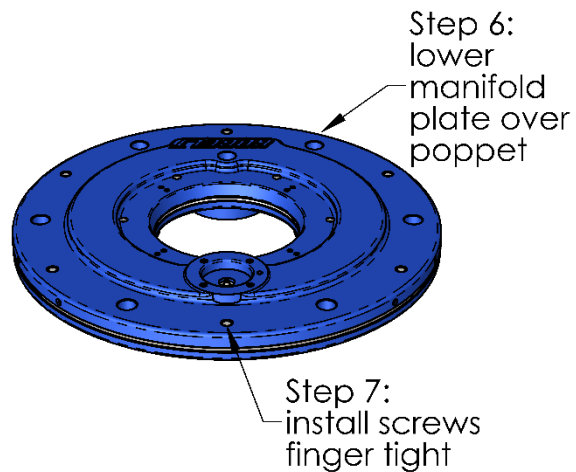
Note:  
place poppet  
over top of 4  
small holes

Step 4:  
place poppet  
and spring

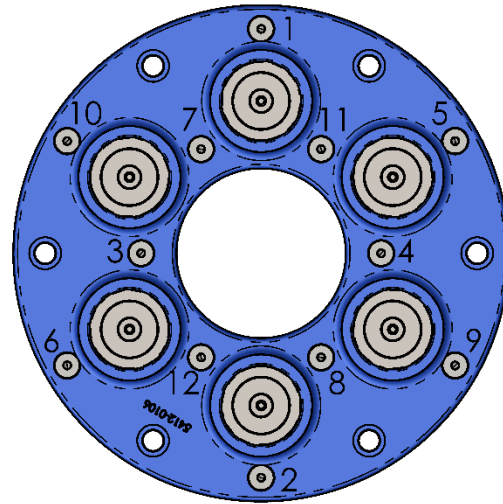
5. Prepare the manifold plate for assembly by applying a 1/8 in [3 mm] bead of Loctite SI 5900 instant gasket (or equivalent) in three rings as shown. Flatten the beads with a spatula to .04 in [1 mm] height.



6. Carefully lower the manifold plate over top of the magazine assembly ensuring that the poppet aligns correctly with the poppet seat. Ensure all the screw holes are aligned. Install the twelve flat head screws finger tight and allow the assembly to set for one hour.



7. Tighten the twelve flat head screws using a 7/32 inch hex bit;
  - a. Follow the pattern noted at right.
  - b. Progress to the final torque value in two steps starting with 10 ft-lbs [14 Nm].
  - c. Final torque value for the assembly screws is 20 ft-lbs [27 Nm].
8. Install the actuator onto the brake and tighten the six nuts to 45 ft-lbs [61 Nm].
9. Allow the sealant to cure for 24 hours before placing into service.



## 5.4 RECOMMENDED SPARES

The spare parts kept on hand will depend on the severity of the service. As a minimum Kobelt recommends keeping the following parts for each brake in service:

1. One Lined set of brake shoes
  - a. See below
2. One complete set of diaphragms and gasket
  - a. 5412-RK            see note (1)
  - b. 3340-RK
3. One sequence valve
  - a. 3340-30

Refer to the parts list drawings in [Appendix B](#) for a complete list of parts.

The table below itemizes which kit/spare part numbers change with the various brake configuration options. Please reference this table to ensure you receive the correct parts.

*Table 2: Configuration Kit Numbers*

Configuration Kit Numbers		
Friction Code	Lined Shoe	Friction Material
(blank)	5412-LSC	low COF (.12-.15)
-D	5412-LSD	low COF (.17-.20)
-E	5412-LSE	mid COF (.25-.28)

Note 1: First generation units (serial no's 0001 ...0012) require shim set no. 5412-0404

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## 6 WARRANTY

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Kobelt Manufacturing Co. Ltd. ("Kobelt") warrants the Products and Parts manufactured by Kobelt to be free from defects in workmanship or material and that said products are designed mechanically and functionally to perform to specifications.

This warranty is effective providing:

- The equipment is used within the intended operating conditions and in accordance with Kobelt recommendations
- The equipment is installed according to equipment diagrams, specifications and recommendations which Kobelt has provided

This warranty becomes invalid if the factory supplied serial number has been removed or altered on the product. This warranty does not cover cosmetic damage or damage caused by an act of God, accident, misuse, abuse, negligence or modification of any part of the product. This warranty does not cover damage due to improper operation or maintenance, connection to inappropriate equipment or attempted repair by anyone other than an authorized Kobelt representative.

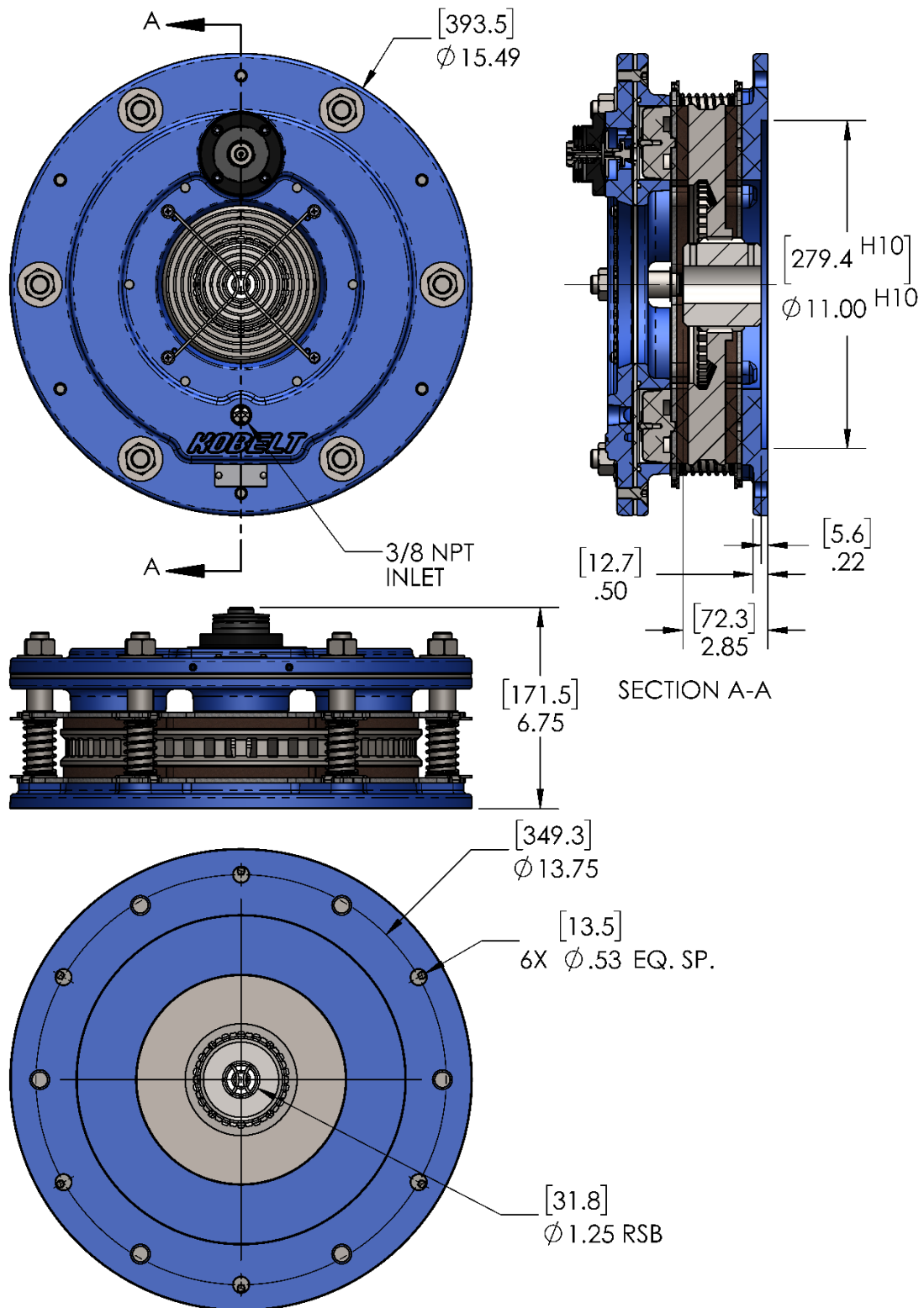
Upon identification of a potential issue or defect with a Kobelt Product or Part, the Warranty Applicant ("Applicant") must immediately contact Kobelt and describe the issue in writing, by letter, fax, email or other electronic conveyance. Kobelt will then assess the cause of the defect, and determine warranty applicability and appropriate remediation.

If any part is found to be defective, Kobelt will replace said part FOB the Kobelt factory provided that any such defective part is returned by the Buyer with freight and applicable forwarding charges prepaid by the Buyer. Kobelt's sole obligation to the Applicant will be to repair or replace the defective part with same or similar product, to a maximum value of the list price of the product or part. The Kobelt warranty does not cover labour charges, travel or any other associated expenses.

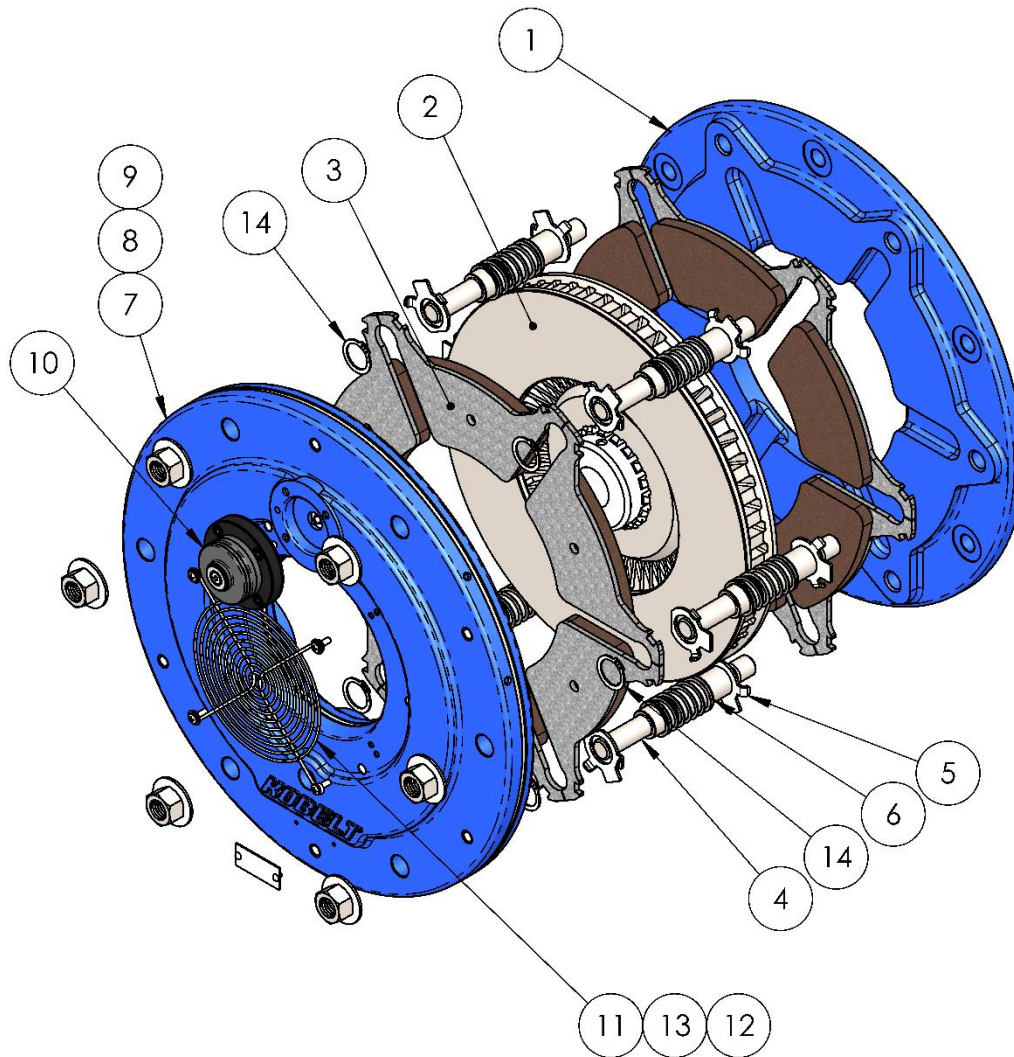
All Products and Parts manufactured by Kobelt, with the exception of brake discs and pads, are subject to a warranty against manufacturer's defects in materials or workmanship for a period of two (2) years from the date of purchase. Brake discs are subject to a one (1) year warranty period, and brake pads and linings are not covered by warranty.

Kobelt will be responsible for all Products or Parts sold by Kobelt but manufactured by 3<sup>rd</sup> party manufacturing companies. However, these products and parts are subject to applicable 3<sup>rd</sup> party warranties, and may not be the same as the Kobelt warranty.

## 7 APPENDIX A: TECHNICAL DRAWINGS



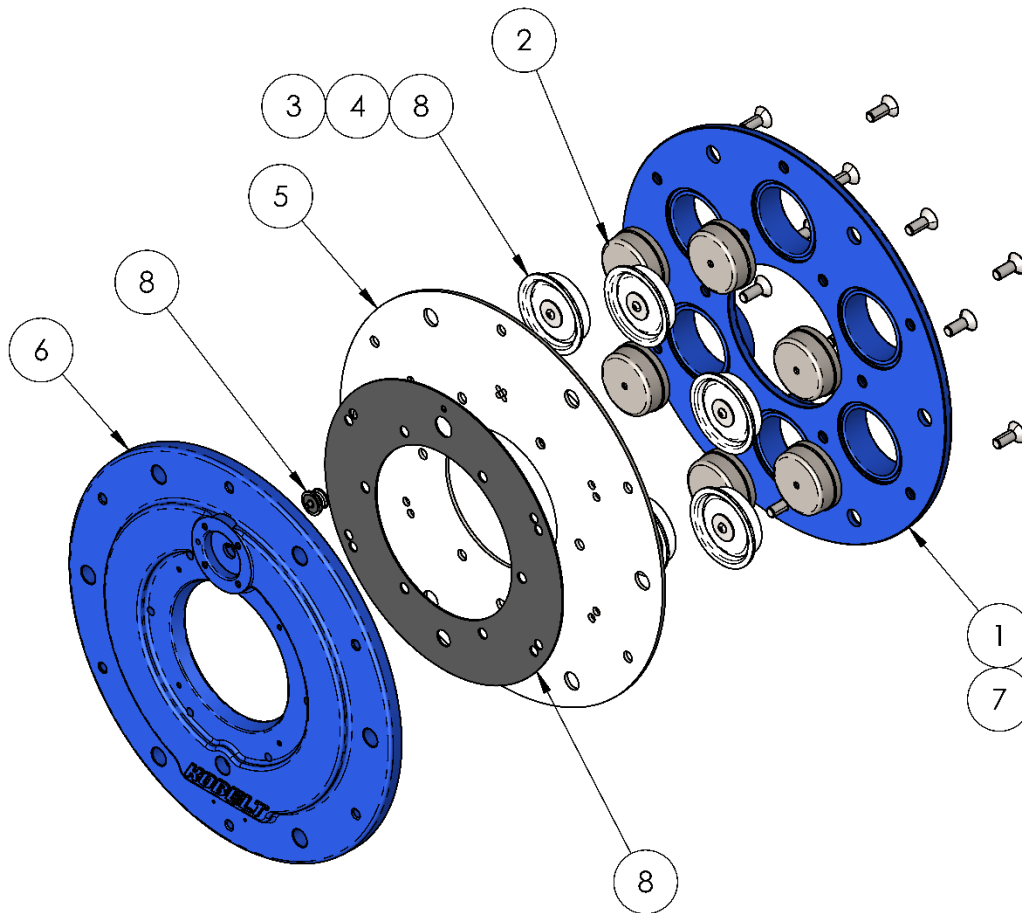
## 8 APPENDIX B: PARTS LIST DRAWINGS



### ITEM QTY. PART NUMBER DESCRIPTION

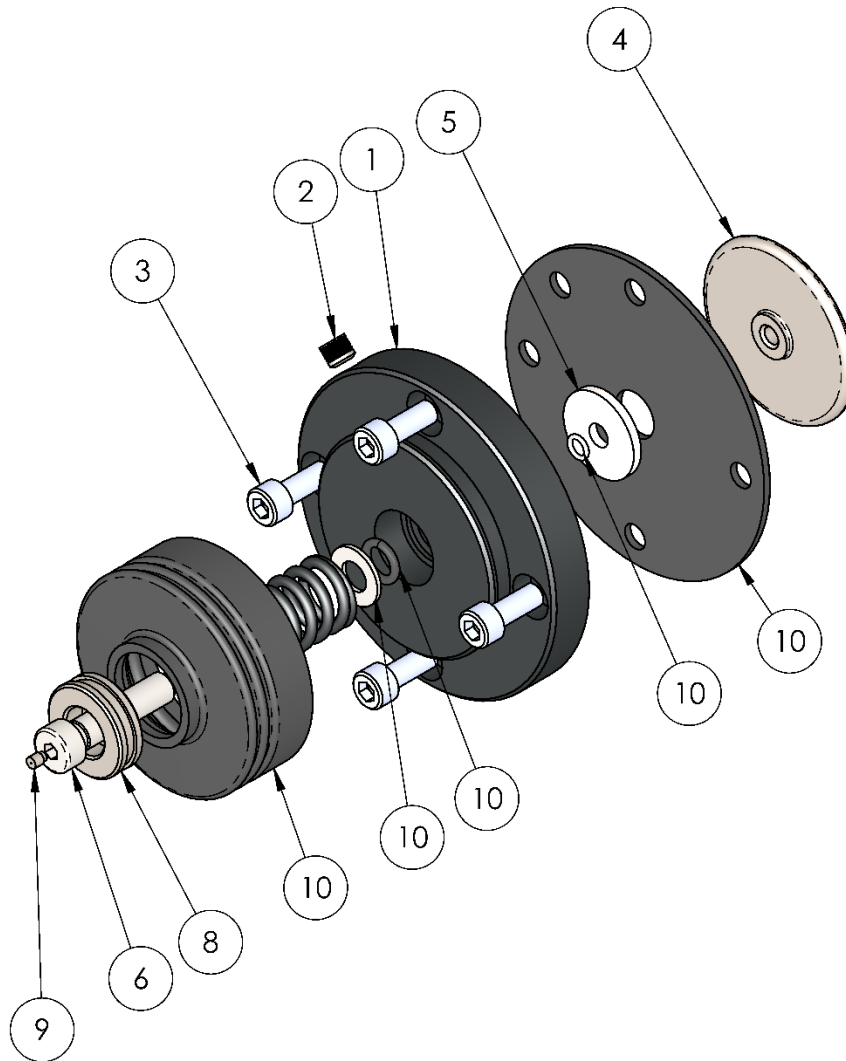
1	1	5412-0201	MOUNTING FLANGE, 12 in BRAKE
2	1	1.25-2.5-12-18T	DISC, VENTILATED, 18T SPLINE
3	12	5412-LSD	BRAKE PAD, 0.18 COF, 12 in. BRAKE
4	6	5412-0123	REACTION PIN, 12 in BRAKE
5	12	5412-0013	PAD RETAINER, 12 in BRAKE
6	6	1201-0270	SPRING, COMP, 1.10D X .9 ID X .09 WIRE
7	1	5412-1001	SUB-ASSEMBLY, FACE MOUNTED BRAKE ACTUATOR
8	6	1022-0116	HEX NUT - REGULAR; 5/8-11 UNC GR 18-8
9	6	1023-0116	WASHER, FLAT, 5/8 IN., 18-8
10	1	3340-30	BRAKE VALVE, 30 PSI
11	1	9899-0051	GRILLE, 140MM FAN
12	4	1023-0107	WASHER, FLAT, #8, 18-8
13	4	1012-0708	SCREW, PAN HEAD, PHILLIPS, 8-32 x 1/2, 18-8
14	6	1029-1087	RETAINING RING, EXTERNAL, 7/8 DIA, SS

## 5412-1001



ITEM	QTY.	PART NUMBER	DESCRIPTION
1	1	5412-0206	DIAPHRAGM MAGAZINE, 12 in BRAKE, GEN 2
2	6	5412-0012	PISTON, 12 in BRAKE
3	6	1023-0708	WASHER, FENDER, #10 X 1 OD, 18-8
4	6	1014-0806	SCREW, BTN HD CAP, 10-24 X 3/8, 18-8 SS, ASTM F879
5	1	5412-0304	ACTUATOR COVER, 12 IN BRAKE
6	1	5412-0102	MANIFOLD, 12 in BRAKE
7	12	1015-1216	CAP SCREW - BH SKT; 3/8 UNC X 1, 18-8
8	1	5412-RK	REPAIR KIT, ENCLOSED BRAKE, AIR APPLIED

## 3340-30 BRAKE VALVE

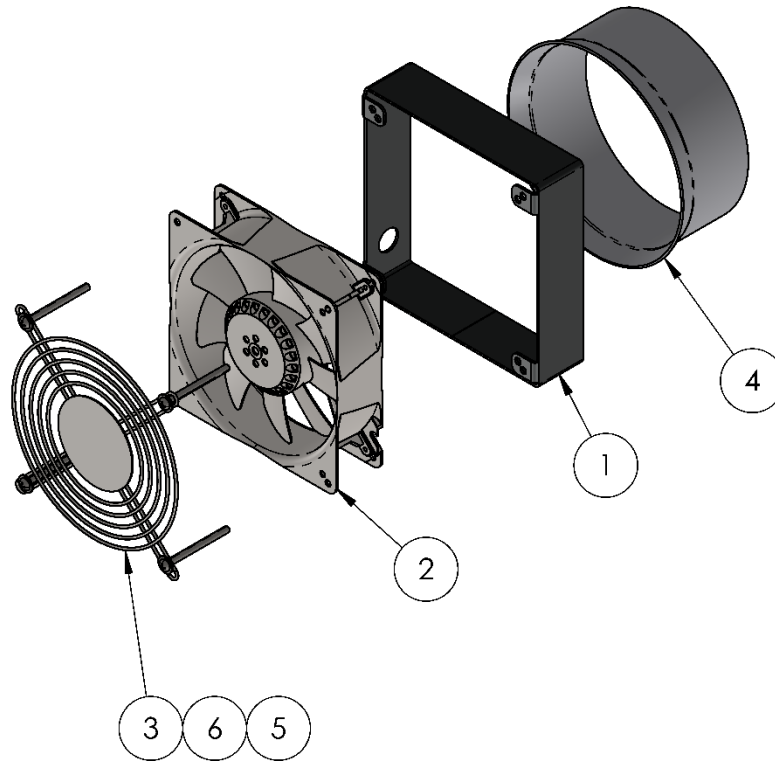


ITEM	QTY	PART NUMBER	DESCRIPTION
1	1	3340-0003	VALVE COVER
2	1	7039-3054	EXPANSION PLUG, CV173-218S
3	4	1002-0808	SCREW, SKT HEAD, 10-24 X 1/2, 18-8 SS, ASTM F837
4	1	3340-0004	PISTON, BRAKE VALVE
5	1	3340-0007	WASHER, PRECISION, 5MM ID X 19MM OD X 2MM THK, AISI 304
6	1	3340-0006	VALVE STEM, BRAKE VALVE
7	1	1201-0279	SPRING, COMPRESSION, .6IN OD X .085WIRE X 1.0IN FL, MUSIC WIRE
8	1	3340-0008	BELLOWS COLLAR, BRAKE VALVE
9	1	7039-3060	ORIFICE; INSERT, 2.5MM OD, 3000 LOHM
10	1	3340-RK	REPAIR KIT; BRAKE VALVE



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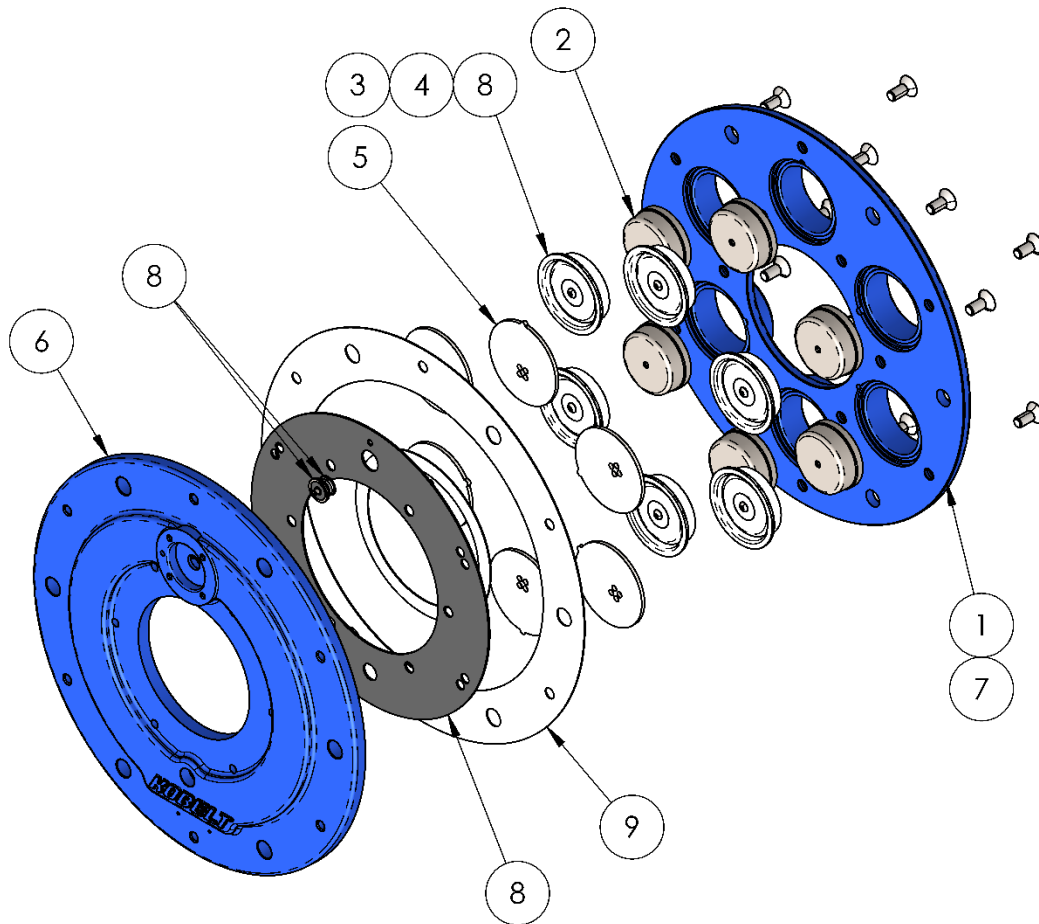
## 5412-1002 FAN KIT; 24 VDC



ITEM	QTY.	PART NUMBER	DESCRIPTION
1	1	5412-0116	FAN SHROUD, 135MM
2	1	9899-0055	FAN - AXIAL; 135MM, 24VDC
3	1	9899-0056	FAN GUARD; 135MM FAN
4	1	5412-0115	AIR DUCT; 12 IN BRAKE
5	4	1023-0107	WASHER, FLAT, #8, 18-8
6	4	1010-0732	MACHINE SCREW - RND HD; PHILLIPS, #8 UNC X 2, 18-8



## 5412-1000 ACTUATOR ASSEMBLY; GENERATION 1



ITEM	QTY	PART NUMBER	DESCRIPTION
1	1	5412-0106	DIAPHRAGM MAGAZINE, 12 in BRAKE
2	6	5412-0012	PISTON, 12 in BRAKE
3	6	1023-0708	WASHER, FENDER, #10 X 1 OD, 18-8
4	6	1014-0806	SCREW, BTN HD CAP, 10-24 X 3/8, 18-8 SS, ASTM F879
5	6	5412-0204	CYLINDER CAP
6	1	5412-0102	MANIFOLD, 12 in BRAKE
7	12	1015-1214	SCREW, SKT HD FLT, 3/8 UNC X 7/8, 18-8
8	1	5412-RK	REPAIR KIT, ENCLOSED BRAKE, AIR APPLIED
9	1	5412-0404	SHIM SET, 12 IN BRAKE