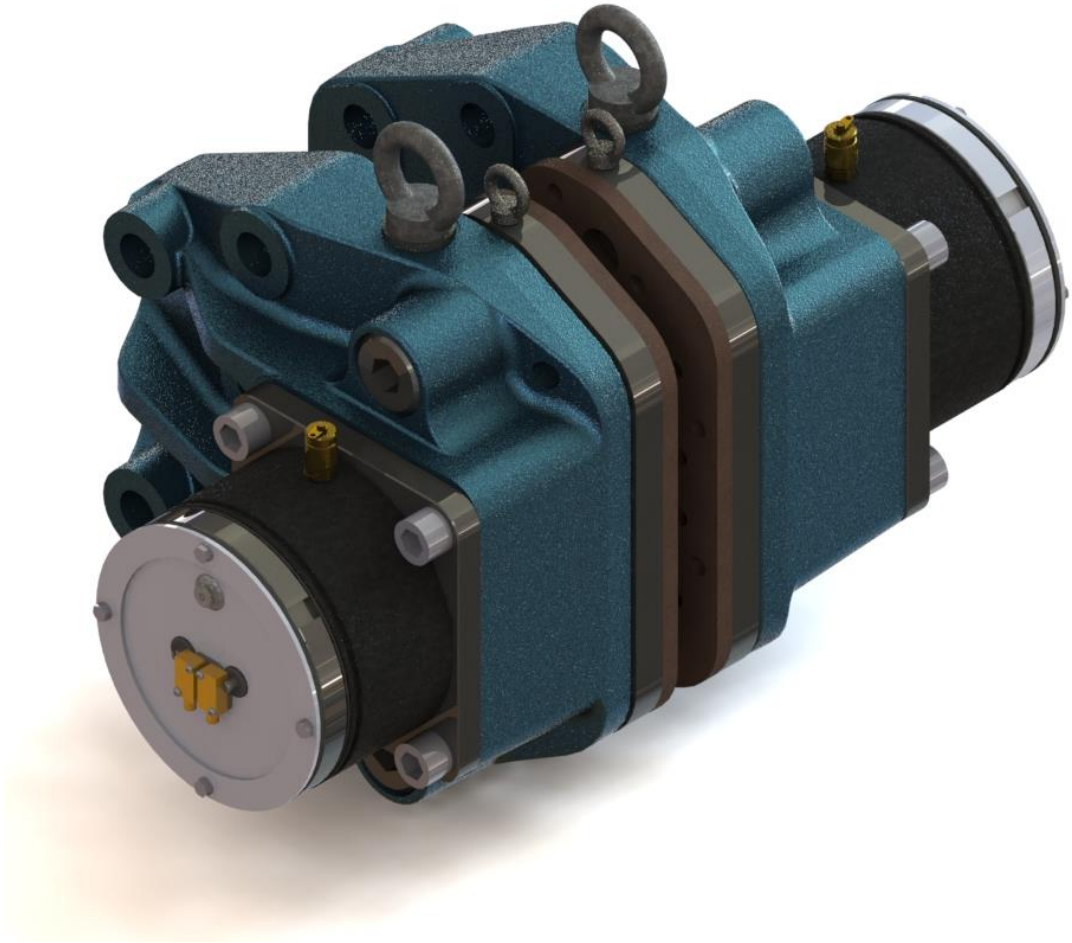
KOBELT

DISC BRAKES, 5300-SH SERIES

Owner's Operation, Installation & Maintenance Manual



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1 INTRODUCTION

1.1 CONTACT INFORMATION

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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.

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.

EQUIPMENT STARTS AUTOMATICALLY

Brake systems frequently are controlled remotely and may activate suddenly causing bodily harm. Ensure all power sources are locked out prior to performing work.

BRAKE ACTUATORS CONTAIN COMPRESSED SPRINGS

The brake actuators contain springs that are under compression even when the brakes are not pressurized. The springs will release suddenly if disassembled incorrectly posing a risk of serious injury or death. Do not attempt to disassemble the actuators without clear work instructions and training.

PINCH POINTS

Brakes contain numerous pinch points which can cause serious injury. Ensure all power sources are locked out prior to performing work.

HIGH PRESSURE FLUIDS

Kobelt brakes use high pressure hydraulics. Ensure all pressure is exhausted and the pressure source locked out prior to performing work.

HOT SURFACES

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.

AIRBORNE DUST

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.

1.3 PRODUCT DESCRIPTION

1.3.1 Overview

The diagram below shows a 5300 series Kobelt caliper brake with all the major components identified. All of the 5300 series brakes can also be fitted with pressure applied actuators for service braking applications. Each caliper consists of two halves which are mounted on either side of a mounting plate or pedestal using specified mounting hardware. The 5300 disc brake calipers can be used on any disc having a minimum diameter specified in Table 1, with no upper limit on disc diameter or thickness.

The braking force is applied by the disc springs through the spring guide and wear adjustment screws to the brake shoe and thus to the friction pads. The brake shoes are kept in position by shoe pins and braking force is transmitted to the main housing through the reaction pin.

The caliper housing contains the spring chamber. The hydraulic cylinder is spigoted to the actuator base plate and can be positioned to orient the air bleeder and inlet port in any position. The cylinder assembly is held onto the spring guide using a bearing locknut.

The air gap is adjusted manually by turning the hexagonal adjustment spindle. 1/12 turns in adjustment of the spindle can be obtained by inverting the spindle locking plate. Nominal gaps are as given in Table 1.

Optional instrumentation units are available to indicate: full retraction of the brake, need for air gap adjustment, and disc temperature.

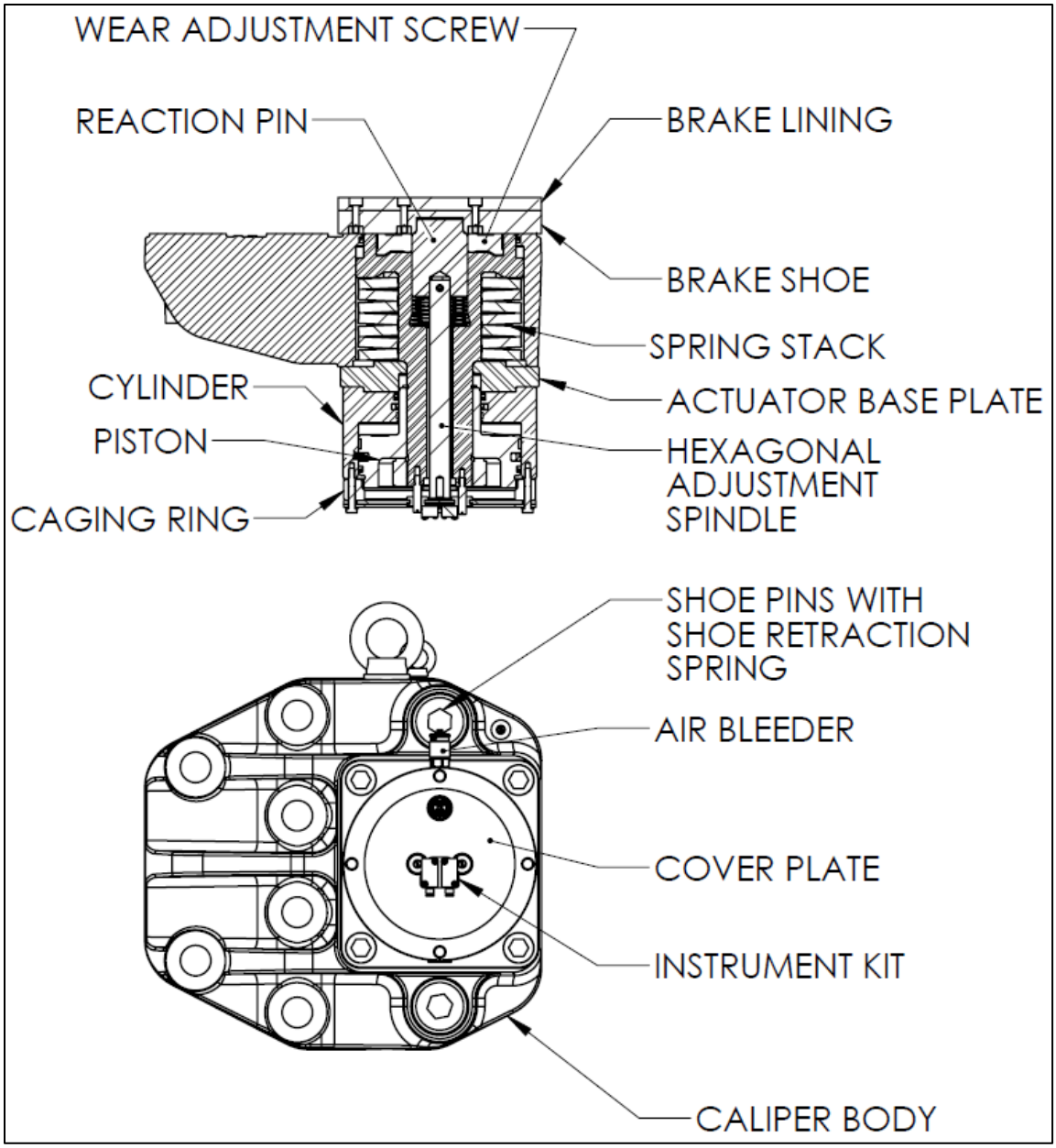


Figure 1- Caliper Brake Nomenclature

1.4 TECHNICAL DATA

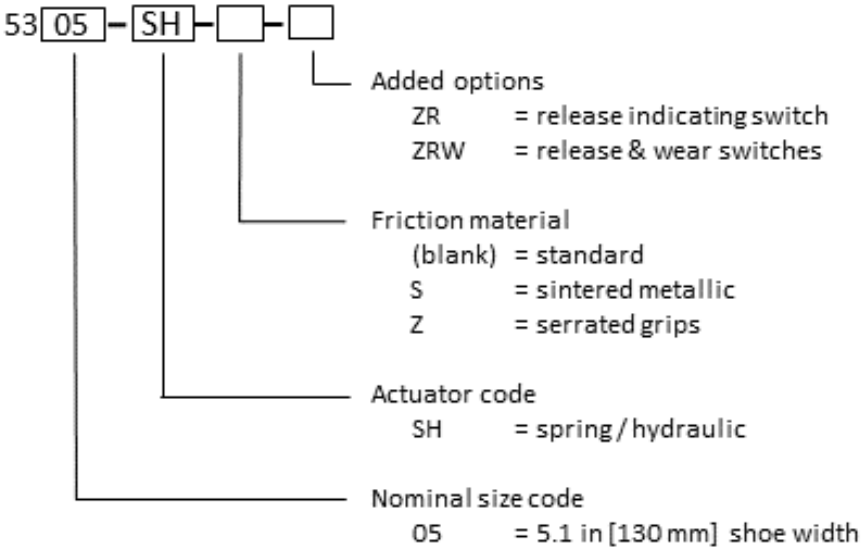
Table 1-Technical Data

CALIPER	5303-SH	5305-SH	5308-SH	5310-SH	5312-SH
Weight	36 lbs [16 kg]	514 lbs [233 kg]	726 lbs [329 kg]	1064 lbs [483 kg]	1214 lbs [550 kg]
Lining Thickness	0.25 in [6.4 mm]	0.375 in [9.5 mm]	0.50 in [12.7 mm]	0.625 in [15.9 mm]	0.75 in [19.1 mm]
Minimum Disc Diameter	9.84 in [250 mm]	19.69 in [500 mm]	39.37 in [1000 mm]	49.21 in [1250 mm]	59.06 in [1500 mm]
Disc Rubbing Face Width	2.95 in [75 mm]	5.12 in [130 mm]	7.87 in [200 mm]	9.84 in [250 mm]	11.81 in [300 mm]
Air Gap per side (min/max)	.02/.04 in [0.5/1.0 mm]	.02/.04 in [0.5/1.0 mm]	.04/.08 in [1.0/2.0 mm]	.06/.12 in [1.5/3.0 mm]	.06/.12 in [1.5/3.0 mm]
Fluid Supply Port (SAE J1926)	-2	-6	-8	-8	-12
Volume Maximum	0.7 in^3 [11 cc]	4 in^3 [66 cc]	11 in^3 [180 cc]	25 in^3 [410 cc]	34 in^3 [557 cc]

Note: other spring stacks are available.

1.5 MODEL CODE KEY

Below is a break down of the model code. It is recommended to record the model of your particular brake as it has a bearing on spare parts. Reference section 5.7 for assignment of spare parts in relation to the model code.



2 INSTALLATION

2.1 PREPARATION

The mounting bracket to support the brake caliper must be designed to withstand the maximum braking forces generated by the brake caliper.

The mounting surface must be flat to ISO tolerance grade IT8 and parallel to the brake disc. Reference the diagram on the right for the required form tolerances. See Appendix A for a complete set of dimensions.

Sufficient space should be allowed for routine inspection of the calipers and also for cylinder and pad replacement.

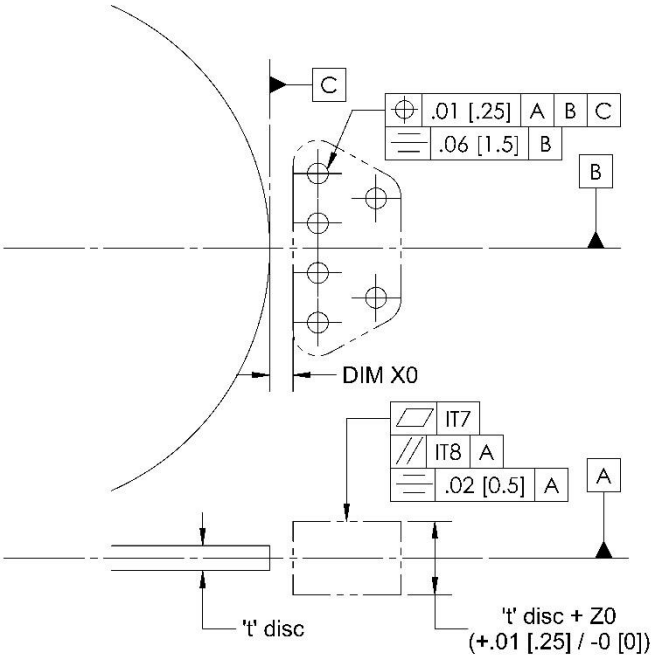


Figure 2- Brake bracket form requirements

(1) The disc thickness must be added to the Z0 dimension

Each caliper is secured by six bolts which should be tightened to the torque value specified in this manual. The bolted connection between the caliper and the brake bracket is designed as a friction connection. The faying surfaces must be solvent cleaned in order to remove all visible oil, grease, soil, and other soluble contaminants from the surfaces.

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

Brake discs are shipped with a light rust inhibitor applied to the surfaces. Remove the rust inhibitor using solvent and a cloth prior to installation.

2.2 BRAKE DISCS

The brake disc must be installed onto the rotating element before installing the caliper. Brake discs must meet the following requirements:

Axial Run out:	IT9 (TIR) [1]	
Radial Run out:	IT11 (TIR) [1]	
Flatness:	IT8 [2]	
Spigot fit:	H8/f7	
Surface Finish:	63 micro inches RMS	
Surface Hardness:	Light Duty [3]	HB135 minimum
	Heavy Duty	HB235 minimum

(1) International tolerance class. Allowable run out is proportional disc O.D.
(2) Allowable deviation from flatness is proportional to shoe width
(3) Parking brakes and emergency brakes with stopping times of 10 seconds or less are considered light duty.

To achieve the run out tolerance the mounting face on the rotating element must be machined flat. Excessive run-out of the disc could cause premature wear of the linings.

The disc mounting bolts used must be of a suitable size and grade to safely resist the brake torque plus the stresses induced from thermal expansion of the disc.

WARNING!

Do not use fitted bolts for installing brake discs. The bolt holes must be over sized to permit uninhibited expansion.

WARNING!

Do not secure a brake disc to a rotating element by welding.

2.3 CALIPER BRAKES

2.3.1 Caliper to Bracket

Once the brake bracket has been properly prepared as described in Section 2.1, take the following steps to install the brake caliper onto the mounting pedestal.

1. Ensure that the wear adjustment screw is fully retracted on both halves of the caliper.
2. Mount calipers to the brake pedestal using appropriate flat washers, nuts, and bolts. It is recommended to use a thread locking product such as Loctite® to ensure a vibration resistant and secure joint.
3. Tighten the mounting bolts to the torque value listed in Table 4 (section 5.5)

2.3.2 Caliper Brake + Pedestal Assemblies

Perform the following steps to properly install a caliper brake with pedestal assembly:

1. Ensure that the brake caliper is properly installed onto the bracket per section 2.3.1
2. Lower the brake pedestal onto the mounting surface and center over the mounting holes.
3. Using feeler gauges to ensure that the brake air gap is equal on both sides of the disc.
4. Position the brake so that the outer radius of the brake shoe is in full contact with the Disc. Ensure proper radial clearance per Table 2.
5. Uncage the brake by following the steps in Section 3.1. Apply the brake onto the disc by releasing the hydraulic pressure. The brake shoes will naturally align with the disc.
6. Probe under the pedestal base with feeler gauges to determine the shimming requirement.
7. Manually release the brake again and lift the brake up approximately two inches.
8. Insert the shims determined from step 6. Use ANSI shims that straddle the mounting bolts.
9. Insert the mounting bolts using appropriate flat washers. It is recommended to use a thread locking product such as Loctite® to ensure a vibration resistant and secure joint.
10. Lower the brake down and tighten the mounting bolts to the preload as specified by any local governing standards [(2)].

(2) In absence of any local governing standards the brake pedestal mounting bolts must be installed in accordance to the provisions given in section 8.2 of the Research Council on Structural Connections (RCSC) *Specification for Structural Joints Using High Strength Bolts.*

2.3.3 Piping

The piping to the brakes must be adequately sized to ensure rapid response times in all weather conditions. Long lengths of hydraulic piping systems or systems exposed to sub-zero weather conditions must be oversized. The piping must be selected to safely withstand the pressures required to operate the brakes. Secure the piping against vibration with pipe clamps per the schedule in the table below.

3/8"-½" tube	¼" – 1/2" pipe ½"-3/4" tube	¾" pipe 1"-1.25" tube	1" pipe 1.50" tube
3 ft	4 ft	5 ft	6.5 ft

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

The brake actuators are equipped with various types and sizes of pressure ports. Consult the technical data section of this manual under the relevant model code for the specific port data. Both hydraulic applied and spring applied / hydraulic released calipers have one supply port per actuator.

2.3.4 Instrumentation

Kobelt caliper disc brakes may be equipped with sensors and switches. The connection to the instruments must be made by cable.

Follow the governing electrical code for wiring practices. Use only hardware approved for the zone that the brake is installed in.

3 COMMISSIONING

3.1 CAGING

All Kobelt spring applied actuators are supplied with a caging ring.
To remove the caging ring:

1. Remove the actuator cover plate.
2. Apply hydraulic pressure to the actuator.
3. Unscrew the caging ring.

The caging ring permits manual hold-off of the brake.
To manually hold-off the brakes:

1. Apply hydraulic pressure to the actuator.
2. Remove actuator cover plate.
3. Screw caging ring onto the actuator piston until it bottoms out, then back off to align the screw holes.
4. Release hydraulic pressure.

DANGER!

The caging ring must be removed prior to putting the brakes into service. Failure to do so will result in a complete loss of brake torque.

3.2 FLUSHING

Before subjecting the brake system to full hydraulic pressure the brake lines must be flushed to an ISO 4406 cleanliness rating of 19/17/14.

3.3 PURGING

Entrapped air is a major contributor to sluggish brake operation. After the hydraulic supply has been connected and the piping flushed bleed all air from the system using the following procedure.

1. Ensure that the air bleeder is positioned in the uppermost position.
2. Operate the system at a pressure below 500 psi.
3. Remove the air bleeder protective cap.
4. Attach a M16 x 2 test hose and direct it away from the area to reduce oil spillage.
5. To bleed, slowly tighten the test hose connection until hydraulic fluid begins to run freely.
6. Cycle the pressure and repeat.

7. Detach the test hose and replace the protective cap.

3.4 AIR GAP

Prior to putting the brakes into service ensure that the airgap between the brake pads and disc when the brakes are released is equal on both sides and set to the value specified in Table 1. Adjust if necessary.

3.5 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 proper running clearance (air gap) with the disc.
3. Ensure the brake disc surface is clean. Remove all contamination from the disc with cleaning solvent.
4. Check the pressure source that it complies with the specified pressure range and that it is properly interlocked with other machinery such as clutches, electric motors, etc.
5. Check that all bolts are tight.
6. Cycle the brakes and ensure that the brakes are operational

3.6 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.

Before burnishing, the brake disc must be checked to ensure it is free from contamination and oil. Use a solvent and cloth to remove any oil residue. Slight surface rust will be removed during the burnishing process, but heavy rust should be removed prior to burnishing.

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

The temperature of the disc surface must be monitored during the burnishing process and kept between 250°F (120°C) and 450°F (230°C). If the upper temperature is reached, pause the burnishing process until the disc is cooled to the lower limit.

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

WARNING!

Disc temperature must not exceed 700°F (370°C) or permanent degradation of the lining may occur

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 releasing 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 are;

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.

3.7 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.

DANGER!

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

4 OPERATION

4.1 FUNCTIONAL REQUIREMENTS

4.1.1 Pressure Supply

The release pressures for spring applied hydraulic release actuators are approximately 2000 psi. Ensure that the system pressure is adequate to fully release the brakes.

It is necessary to the size pump, accumulator and reservoir to provide sufficient fluid for the intended duty of the brakes. The hydraulic power unit must be equipped with adequate filtration in order to ensure the required cleanliness rating in Section 3.2. Select an hydraulic fluid for the anticipated ambient temperature range such as one listed in Table 2 or an approved fire resistant type.

Table 2- Recommended Hydraulic Fluid

Ambient Temperature Range	Approved Oil	Approved Brands
0…+40 °C [+32…+104 °F]	ISO VG 32, VI 60	Rando HD32, Mobil DTE, Tellus S2 V 32
-20….+20 °C [-4…+68 °F]	ISO VG 22, VI 150	Rando HDZ22, Mobil DTE10
+40….+80 °C [+104…+176 °F]	ISO VG 68, VI 60	Rando HD68, Mobil DTE, Tellus S2 V 68
-40 …-20 °C [-40…-4 °F]	ISO VG 26, VI 300	Univis HVI 26, Tellus S4 VX, Hydrex MV Arctic

In all cases hydraulic circuits must have a relief valve that is set to limit the system pressure to a maximum of 3000 psi. In applications where the brakes cycle infrequently with significant changes in ambient temperature it may be necessary to provide a thermal relief to protect the actuators from over pressurization due to thermal expansion.

4.1.2 Power Supply

For brakes equipped with electronic sensors it is necessary to protect the devices against voltage surges of up to 2 kV (class 3). An appropriate device is rated to protect against 8/20 microsecond surges in accordance with IEC 61000-4-5.

4.1.3 Control

Emergency brakes must be controlled by a system adhering to a “fail safe” methodology. Relays, contacts and valves must be “normally open”. The use of detented, manual or spool valves is strongly discouraged as these devices can either be inadvertently closed or fail closed.

4.2 SERVICE LIMITS

4.2.1 Disc Temperature

The Kobelt brake lining achieves maximum friction between 200 and 400°F. Over 400°F the brake begins to fade or experience diminishing friction. The maximum operating temperature of the brake linings is 700 ^{0}F [371^0 C]. Temperatures in excess of this limit will permanently damage the linings and require replacement.

4.2.2 Ambient Temperature

Operating temperature of standard brake actuators is -25°C [-13°F] to 55°C [131°F]. The cold weather limit is governed by the instrumentation. Brakes without instrumentation can go as low as -30°C [-22°F]

4.2.3 Pressure

Hydraulic Actuators

Do not allow the supply pressure to exceed 3000 psi. The pressure supply system must be equipped with a safety relief valve.

5 MAINTENANCE

5.1 RUNNING-IN PERIOD

Daily checks should be made during the first full week of operation. These checks include the following:

1. Hydraulic fluid leakage. Note any fluid leakage and tighten pipe connections as required.
2. Observe that the brake is operating as intended for the smooth retraction and application of the brake pads
3. Check the condition of the brake path for any contaminants, including rope grease.
4. Check all bolted connections and hydraulic connections at the end of the running-in period.

5.2 PREVENTATIVE MAINTENANCE

Maintenance Schedule

Maintenance Item	Daily	Monthly	Annually	5 years
Torque Test	✓			
Inspect for leaks	✓			
Measure air gap		✓		
Determine pad life		✓		
Lubricate shoe pins			✓	
Perform actuator test			✓	
Service actuators				✓

5.3 INSPECTION

5.3.1 Pad Wear

The running clearance (air gap) between lining and disc must be maintained within the specified limits. Failure to do so will result in the brake not capable of producing rated torque. When the running clearance has reached maximum specified air gap, which can be measured with the use of feeler gauges, the brake must be adjusted back to minimum air gap per shoe. Refer to section 5.4.1.

The maximum allowable pad life has been reached when the brake pad has worn down to 3/16" [4.8 mm] thick. The lining must be replaced before the rivets start making contact with the brake disc.

5.3.2 Seals

The actuator seals should be inspected on a periodic basis. Actuators can be checked for seal failure by visually inspecting the rod and piston for evidence of oil accumulation.

5.3.3 Actuator Test

Occasionally it may be necessary to test the actuator springs as a means of trouble shooting. The easiest method is to measure the hold-off and release pressure of the actuator. The release pressure is defined as the minimum pressure required to fully retract the actuator whereas hold-off pressure is defined as the pressure at which the actuator begins to extend. Both of these pressures give an indication of the condition of the actuator.

To conduct this test a dial indicator or depth micrometer is required as well as a pressure source with a calibrated gauge. The pressure source must have a means of accurately controlling the pressure. Follow these steps to perform the test:

1. Connect the pressure source to the actuator and fully retract the actuator. Be careful not to exceed the MAWP of the actuator.
2. Install the dial indicator to sense the piston movement and set the dial to zero.
3. Begin reducing the pressure in small increments (5% of rated system pressure) and observe the displacement on the dial indicator.
4. When the dial indicator has moved at least .01" [.25 mm] note the pressure. This is the hold-off pressure. The measured value must be within +/- 5% of the specified value.
5. Continue dropping the pressure to allow the actuator to extend 0.1" [2.5 mm].
6. Begin increasing the pressure in small increments and observe the displacement on the dial indicator.
7. The minimum pressure required to return the actuator rod back to within .01" [.25 mm] is the release pressure. Note this pressure. The measured release pressure must be within +/-5% of the specified value.

5.4 SERVICE

5.4.1 Special Tools

CALIPER	5303-SH	5305-SH	5308-SH	5310-SH	5312-SH
Locknut Socket	SKF TMFS 4	SKF TMFS 9	SKF TMFS 14	SKF TMFS 17	SKF TMFS 20
Hook Spanner	68-75 mm per DIN 1810	120-130 mm per DIN 1810 A	180-195 mm per DIN 1810 A	230-245 mm per DIN 1810 A	280-300 mm per DIN 1810 A
Test Hose	STAUFF SMS-20				

5.4.2 Stroke Adjustment

On spring applied calipers, it is extremely important that the clearance between the shoe and disc be maintained within specifications. The minimum incremental air gap adjustment is summarized in Table 3 and can be achieved by inverting the spindle locking plate. Adjust running clearance with the following procedure:

1. Maintain full retraction pressure then remove the actuator cover plate and retainer.
2. Using the correct socket for the hexagonal spindle, extend the wear adjustment screw by turning the hex bar clockwise until the running clearance between the disc and shoe is within specifications.
3. After the adjustment, re-assemble the actuator retainer plate and cover plate, along with the caging ring and gasket.

When the brake linings are replaced it will be necessary to reset the wear adjustment screw by turning counter-clockwise to allow for the extra thickness of a new lining.

Table 3 - Minimum Airgap Adjustment

CALIPER	5303-SH	5305-SH	5308-SH	5310-SH	5312-SH
Adjustment per $1/12^{th}$ of a turn	0.007 in [0.17 mm]	0.007 in [0.17 mm]	0.007 in [0.17 mm]	0.010 in [0.25 mm]	0.010 in [0.25 mm]

5.4.3 Actuator Service

5.4.3.1 Cylinder Removal

The actuator is designed so that the cylinder can be removed while the brake is in service by following these steps:

1. Discharge pressure and allow the brake to clamp the disc.
2. Remove the actuator cover plate and retainer, as well as the caging ring and set aside.
3. Disconnect hydraulic pressure from the cylinder.
4. Loosen and remove the locknut and o-ring from the spring guide.
5. Remove the cylinder assembly.

Re-assembly is done in the reverse order, with the locknut being torqued to the value specified in Table 4. Make note to position the cylinder so that the air bleeder is in the uppermost position.

5.4.3.2 Seal Replacement

With the cylinder assembly removed,

1. Carefully separate the piston and the cylinder.
2. Inspect wear surfaces, seals, wear ring, and o-rings for damage and replace as necessary. Note to install seals in the correct orientation as shown in Figure 3.

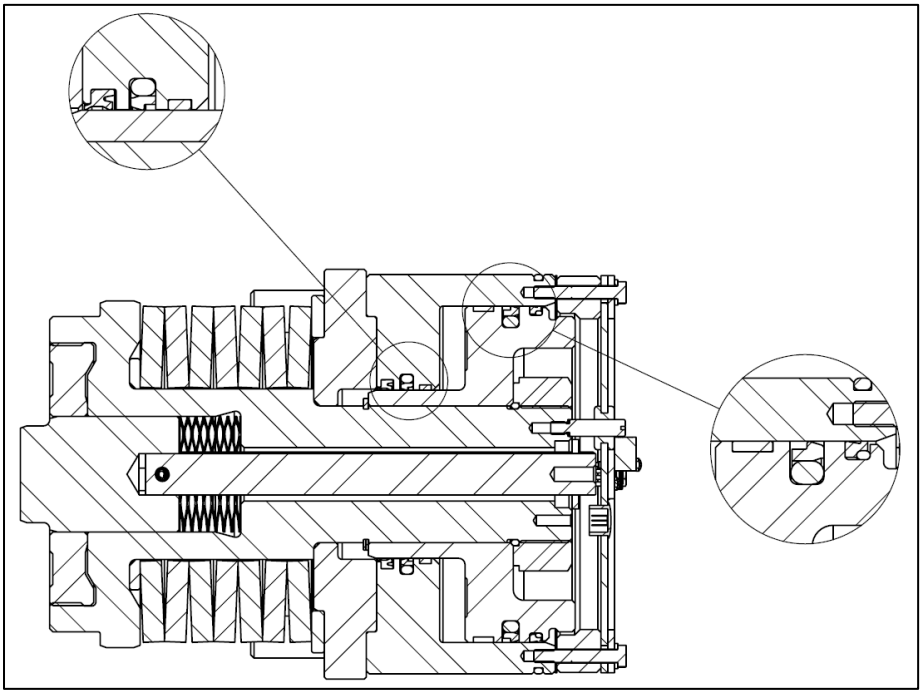


Figure 3-Seal Orientation

3. Re-assemble in the reverse order and tighten the locknut to the torque specified in the installation drawing. Make note to position the cylinder so that the air bleeder is in the uppermost position.

5.4.4 Spring Replacement

If maintenance is required on the springs or spring guide, the actuator must first be removed from the brake assembly with the following steps:

1. In order to remove the actuator, it must be caged following procedure in Section 3.1. The actuator can be removed from the caliper by loosening the four socket head cap screws at the base of the actuator.

2. After removal, with the actuator still caged, the spring guide and actuator base must be retained using bolts strong enough to retain the spring tension of the actuator as shown in Figure 4.

Figure 4-Actuator Retention Tool

3. With the spring guide retained, the locknut holding the piston can be removed, and the cylinder assembly can be removed from the actuator base.

4. Remove the spiral ring from the spring guide and use a press with sufficient capacity to compress the springs. Remove the retaining bolts and slowly release pressure thus allowing spring guide and actuator base to separate. Clean actuator, replace seals, inspect springs and change parts if necessary. Lubricate all moving parts, re-assemble and re-install actuator in reverse order.

5. When re-assembling the actuator, ensure that the top two springs are properly aligned

before compressing the springs as seen in the figure below. Failure to do so may result in the springs slipping and cause personal injury or damage to the assembly.

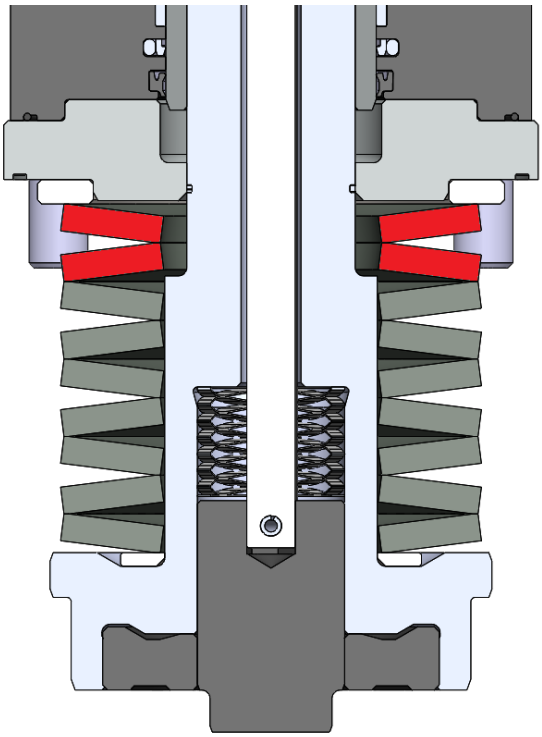


Figure 5 - Spring Alignment

BRAKE ACTUATORS CONTAIN COMPRESSED SPRINGS

The brake actuators contain springs that are under compression even when the brakes are not pressurized. The springs will release suddenly if disassembled incorrectly posing a risk of serious injury or death. Do not attempt to disassemble the actuators without clear work instructions and training.

5.4.5 Brake Linings

It is important to replace the linings before the rivets make contact with the disc. Before removing brake pads, secure the disc against rotation. In order to remove the brake shoe, hydraulic pressure must be applied to the actuator to release the brake. As a safety measure use the caging ring to hold the brake in the retracted position. The brake shoes can be removed with the following steps:

1. Set aside the actuator cover plate retainer and cover plate.
2. Remove the shoe pins.
3. Support the weight of the shoe assembly using the lifting eye.

4. Retract the hexagonal adjustment spindle to disengage the reaction pin from the socket in the back of the shoe. The lifting eye of the other shoe can be threaded into the hole at the end of the spindle and used for this.
5. Lift the shoe away from the caliper assembly.

To replace the linings, drill out the rivets and install the new lining with the proper rivets.

To re-assemble the shoe assembly, follow the removal steps in reverse order. It is critical that the reaction pin engages the shoe socket, the actuator cover plate will not fit onto the actuator unless the pin is engaged in the socket.

REACTION PIN MUST ENGAGE THE SHOE ON RE-ASSEMBLY

After re-assembling the shoes to the caliper, ensure that the reaction pin reengages the socket in the back of the shoe before putting the brake back into operation.

5.4.6 Removal of Caliper Half

1. Cage the actuator using the procedure described in Section 3.1.
2. If the brake pads are to be re-used, set aside in a clean and dry environment; otherwise ensure that spares are available.
3. Disconnect the hydraulic connections to the brake.
4. Support the weight of the calipers to be removed.
5. Unscrew and remove the six mounting bolts or tie rods.
6. Carefully slide the caliper half from the bolts or tie rods.
7. Replacement of the caliper half is the reverse of the removal. Ensure that mounting bolts are torqued to the value specified on the installation drawing.

5.5 CRITICAL FASTENERS

Table 4 lists all the critical fasteners for each brake. Ensure that these guidelines are followed when servicing your brake. The locations of each critical fastener is shown in Figure 6.

Table 4-Critical Fastener Torque Table

Location \ Caliper	5303-SH	5305-SH	5308-SH	5310-SH	5312-SH
Caliper mounting bolts	30 ft-lbf	120 ft-lbf	750 ft-lbf	1300 ft-lbf	2370 ft-lbf
Actuator mounting bolts	17 ft-lbf	230 ft-lbf	300 ft-lbf	500 ft-lbf	975 ft-lbf
Piston locknut	19 ft-lbf	155 ft-lbf	360 ft-lbf	800 ft-lbf	950 ft-lbf
Shoe pins	24 ft-lbf	140 ft-lbf	204 ft-lbf	711 ft-lbf	1125 ft-lbf

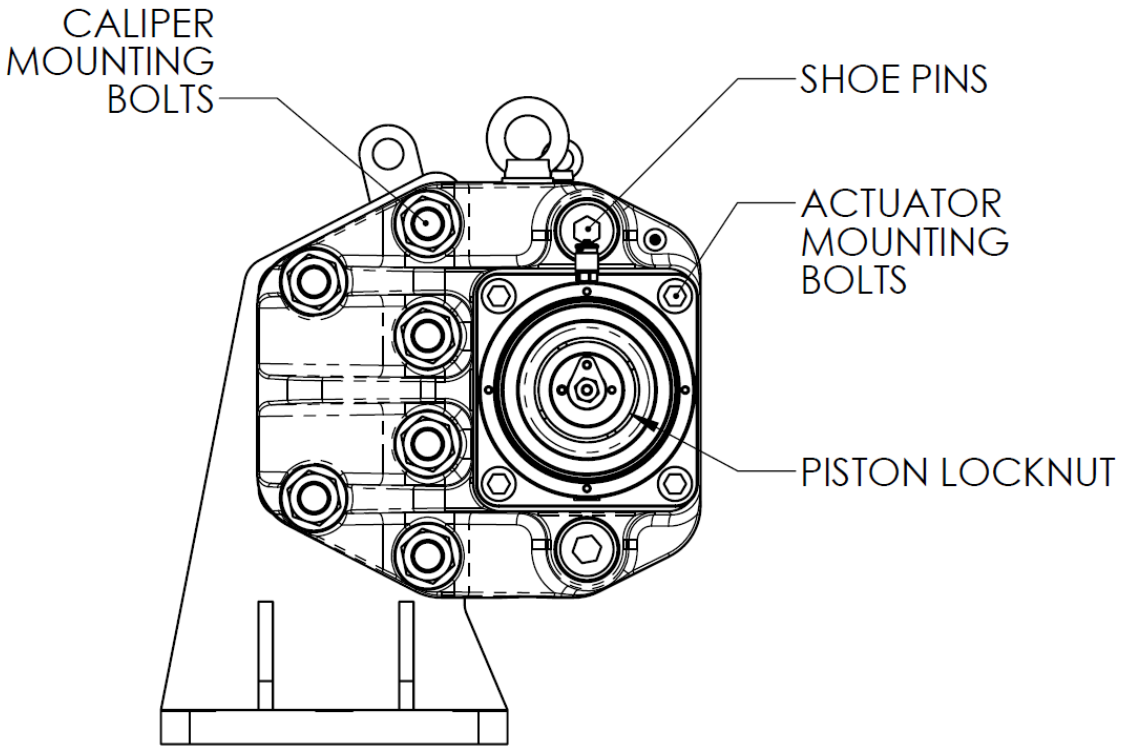


Figure 6-Critical Fastener Locations

5.6 Recommended Spare Parts

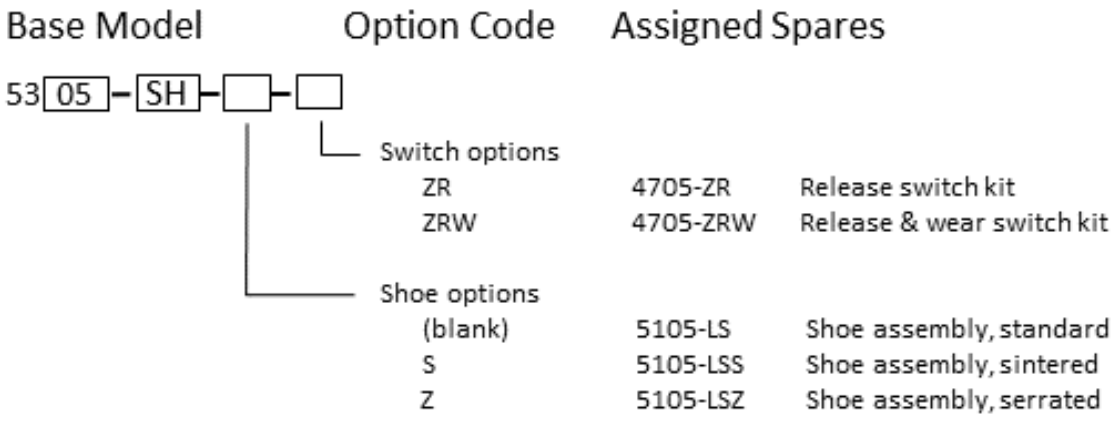
The quantity and type of spare parts that should be carried in stock depends on the criticality of the equipment, the hours of operation per day and severity of the service. The User will need exercise some judgement based on experience as to what spares should be kept on hand. As a guideline Kobelt recommends the following spare parts program (see parts lists for specific part numbers):

A) <u>All Service Conditions</u>
   1. Lined shoes
   2. Seal kit
   3. Proximity switch

B) <u>Continuous or Critical Operation</u>
   Items from A plus below:
   1. Actuator assembly
   2. Shoe pins
   3. Brake pads with set of rivets

5.7 Spare Part Options

In several cases the spare part that is required is dependent on the model code delivered. Reference the diagram below to determine which spare is required.



6 WARRANTY

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.

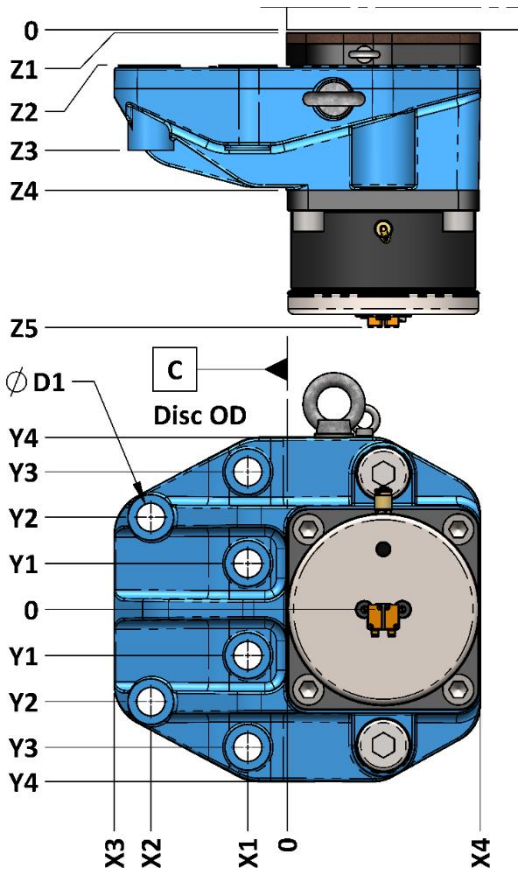
Upon identification of a potential issue or defect with a Kobelt Product or Part, the Warranty Applicant ("Applicant") must immediately contact Kobelt and describe the issue in writing, by letter, fax, email or other electronic conveyance. Kobelt will then assess the cause of the defect, and determine 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 3rd party manufacturing companies. However, these products and parts are subject to applicable 3rd party warranties, and may not be the same as the Kobelt warranty.

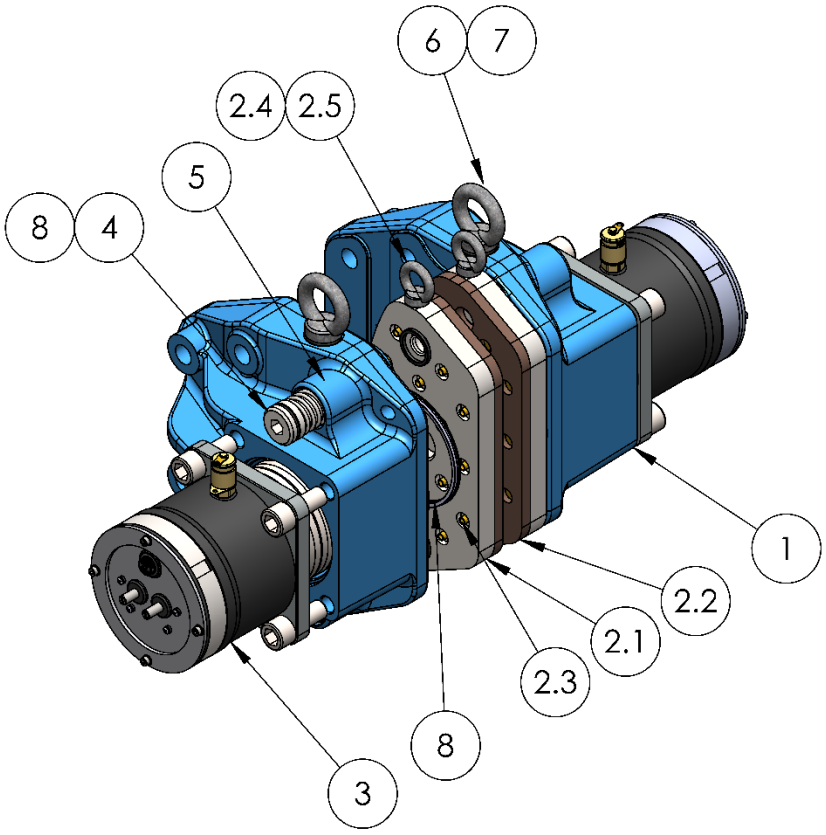
Appendix A – Installation Dimensions



PART No.	5303-SH	5305-SH	5308-SH	5310-SH	5312-SH
X1	0.65 in [16.5 mm]	0.98 in [25 mm]	1.57 in [40 mm]	1.97 in [50 mm]	2.36 in [60 mm]
X2	2.26 in [57.5 mm]	3.58 in [91 mm]	5.51 in [140 mm]	6.89 in [175 mm]	8.27 in [210 mm]
X3	3.05 in [77.5 mm]	4.86 in [124 mm]	7.48 in [190 mm]	9.35 in [238 mm]	11.22 in [285 mm]
X4	2.95 in [75 mm]	5.12 in [130 mm]	7.87 in [200 mm]	9.84 in [250 mm]	11.81 in [300 mm]
Y1	.73 in [18.5 mm]	1.22 in [31 mm]	1.87 in [47.5 mm]	2.34 in [59.5 mm]	2.81 in [71.5 mm]
Y2	1.48 in [37.5 mm]	2.44 in [62 mm]	3.74 in [95 mm]	4.69 in [119 mm]	5.63 in [143 mm]
Y3	2.32 in [59 mm]	3.74 in [95 mm]	5.75 in [146 mm]	7.28 in [185 mm]	8.74 in [222 mm]
Y4	2.95 in [75 mm]	4.92 in [125 mm]	7.19 in [183 mm]	9.15 in [233 mm]	11.02 in [280 mm]
Z1	.02 in [0.5 mm]	.02 in [0.5 mm]	.04 in [1.0 mm]	.06 in [1.5 mm]	.06 in [1.5 mm]
Z2	0.70 in [17.9 mm]	1.10 in [28 mm]	1.44 in [36.7 mm]	1.75 in [44.4 mm]	1.95 in [49.6 mm]
Z3	2.20 in [56 mm]	3.40 in [86 mm]	4.91 in [125 mm]	6.05 in [154 mm]	7.13 in [181 mm]
Z4	3.20 in [81 mm]	5.17 in [131 mm]	6.59 in [167 mm]	8.28 in [210 mm]	9.74 in [247 mm]
Z5	6.83 in [173 mm]	10.29 in [261 mm]	12.5 in [318 mm]	15.45 in [393 mm]	17.62 in [448 mm]
D1	7/16 in [M10]	5/8 in [M16]	1-1/8 in [M27]	1-1/2 in [M36]	1-3/4 in [M42]
PORT	-2 ORB	-6 ORB	-8 ORB	-8 ORB	-12 ORB
WEIGHT	40 lbs [18 kg]	173 lbs [78 kg]	521 lbs [237 kg]	1115 lbs [506 kg]	1759 lbs [798 kg]

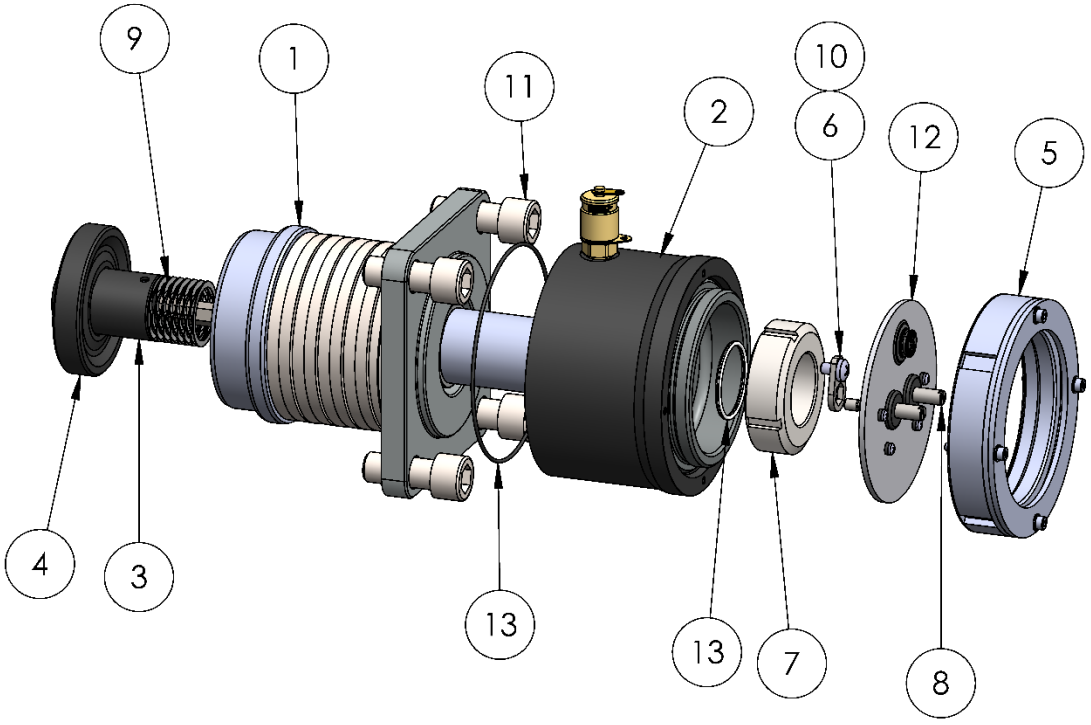
Appendix B – Parts Lists

5305-SH: BRAKE CALIPER ASSEMBLY



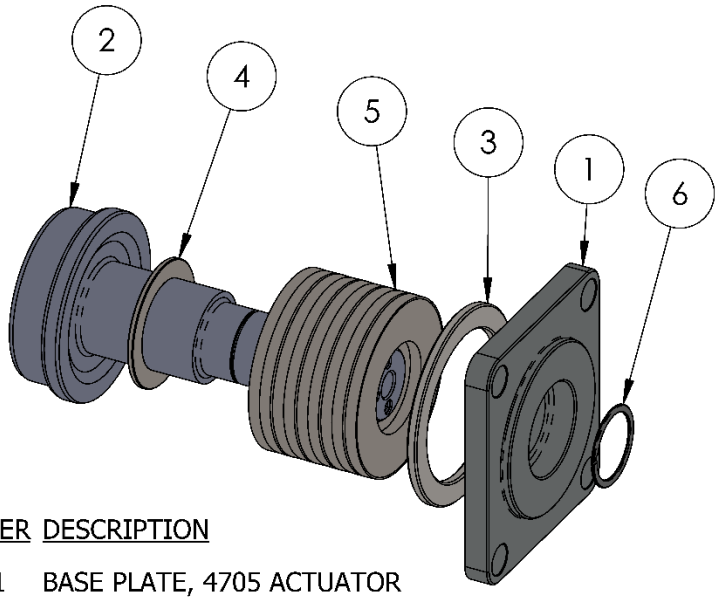
ITEM	QTY.	PART NUMBER	DESCRIPTION
1	2	5305-0001	BODY, 5305 CALIPER
2	2	5105-LS	SHOE ASSEMBLY, 5105 CALIPER
2.1	1	5105-0005	SHOE, BRAKE, 5305/5105
2.2	1	5105-0007	BRAKE LINING, 5105/5305 CALIPER
2.3	16	1033-1014	RIVET, ∅1/4 X 7/8 (10-14), BRASS
2.4	1	1204-0010	WASHER CONICAL M6 DIN 6796 ST YZ
2.5	1	1042-2006	EYE BOLT, M6-1 x 12mm, DIN 580, ZP
3	2	4705	ACTUATOR, SPRING / HYDRAULIC
4	4	5105-5000	SHOULDER BOLT,1 DIA X 2.25
5	4	1201-0258	SPRING, 3.63" LG, 1.276" OD, S&G, AISI 302
6	2	1042-2012	EYE BOLT, M12-1.75 x 20.5mm, DIN 580, PLAIN
7	2	1204-0011	WASHER CONICAL M12 DIN 6796 STEEL
8	1	5305-RK	SEAL KIT, 5305 CALIPER

4705: ACTUATOR ASSEMBLY



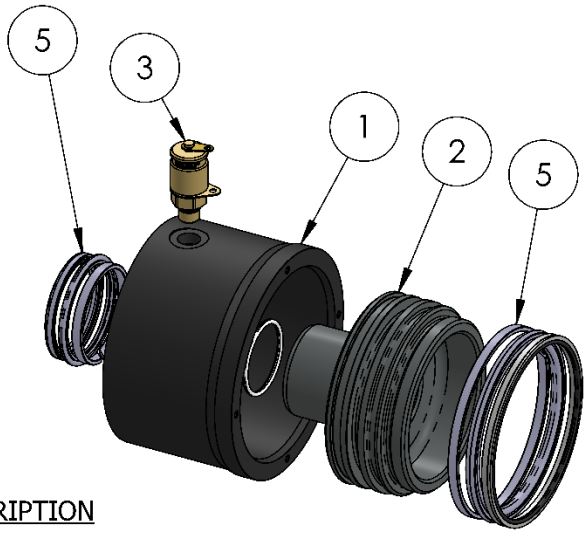
ITEM	QTY.	PART NUMBER	DESCRIPTION
1	1	4705-SP18	SPRING PACK, 18K, 5305 BRAKE
2	1	4705-S	CYLINDER ASSEMBLY, 4705 ACTUATOR
3	1	4705-0031	REACTION PIN ASSEMBLY
4	1	4705-0026	WEAR ADJUSTMENT SCREW, 4705 ACTUATOR
5	1	4705-0038	CAGING RING ASSEMBLY, 4705 ACTUATOR
6	1	4705-0033	LOCKING PLATE, WEAR ADJUSTMENT
7	1	1022-1361	LOCKNUT, M40X1.5, 70mm OD
8	2	4705-5100	PROXIMITY SWITCH TARGET
9	1	1204-0103	SPRING, WAVE, 35mm OD, SHIM ENDS, STEEL
10	1	1012-3610	SCREW, PAN HD PHILLIPS, M6-1 x 10mm, A2
11	4	1041-5304-B	SCREW CAP SKT HD M16 X 40MM CL 12.9 BO
12	1	4705-0039	COVER PLATE ASSEMBLY, STANDARD
13	1	4705-RK	SEAL KIT, 4705 ACTUATOR

4705-SP18



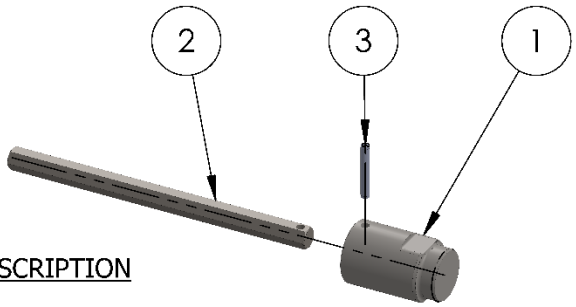
ITEM	QTY.	PART NUMBER	DESCRIPTION
1	1	4705-0001	BASE PLATE, 4705 ACTUATOR
2	1	4705-0022	SPRING GUIDE
3	1	4705-0024	SPRING WASHER, OUTER, 4705 ACTUATOR
4	1	4705-0023	SPRING WASHER, INNER, 4705 ACTUATOR
5	9	1204-0009	DISC SPRING, 100X51X7, MUBEA 190001
6	1	1029-4240	RETAINING RING, SPIRAL DNS-40, 40mm

4705-S



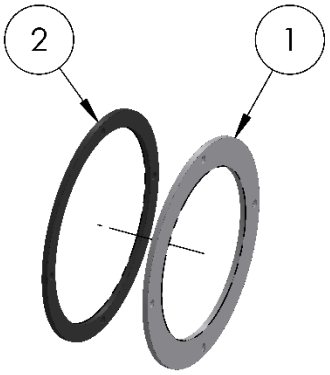
ITEM	QTY.	PART NUMBER	DESCRIPTION
1	1	4705-0021	CYLINDER, 4705 ACTUATOR
2	1	4705-0020	PISTON, 4705 ACTUATOR
3	1	7039-5721	TEST POINT, -4 ORB, STAUFF SMK20-7/16-20UNF-VE
4	1	7039-0662	PLUG_ HEX SKT_ #06 ORB_ PLATED STEEL
5	1	4705-RK	SEAL KIT, 4705 ACTUATOR

4705-0031



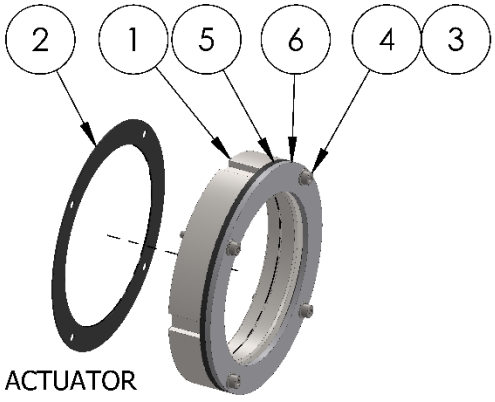
ITEM	QTY.	PART NUMBER	DESCRIPTION
1	1	4705-0029	REACTION PIN, 4705 ACTUATOR
2	1	4705-0030	SPINDLE, 4705 ACTUATOR
3	1	1024-0820	SPRING PIN, 3/16 X 1 1/4, AISI 420

4705-0037



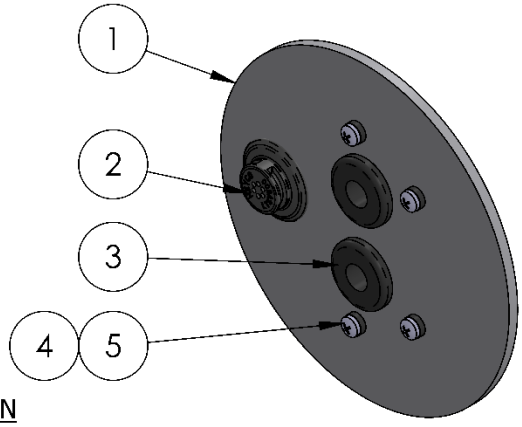
ITEM	QTY.	PART NUMBER	DESCRIPTION
1	1	4705-0034-A	RETAINER, COVER PLATE, 4705 ACTUATOR
2	1	4705-0035	GASKET, 4705 COVER

4705-0038



ITEM	QTY.	PART NUMBER	DESCRIPTION
1	1	4705-0027	CAGING RING, 4705 ACTUATOR
2	1	4705-0036	GASKET, 4705 ACTUATOR
3	4	1023-0804	WASHER, M4, DIN 125, A4
4	4	1002-6004	CAP SCREW, SKT HD, M4X.07X30, A2-70
5	1	4705-0035	GASKET, 4705 COVER
6	1	4705-0034-A	RETAINER, COVER PLATE, 4705 ACTUATOR

4705-0039



ITEM	QTY.	PART NUMBER	DESCRIPTION
1	1	4705-0032	COVER PLATE, 4705 ACTUATOR
2	1	7039-5931	VENT PLUG, SNAP IN
3	2	6001-1330	GROMMET, RUBBER, 3.2mm X 8 mm ID
4	4	1023-0656	WASHER, SEALING, .12" ID, VITON
5	4	1012-3306	SCREW, PAN HD, M3-05 x 6mm, DIN 7985, A2 SS