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Altra Industrial Motion

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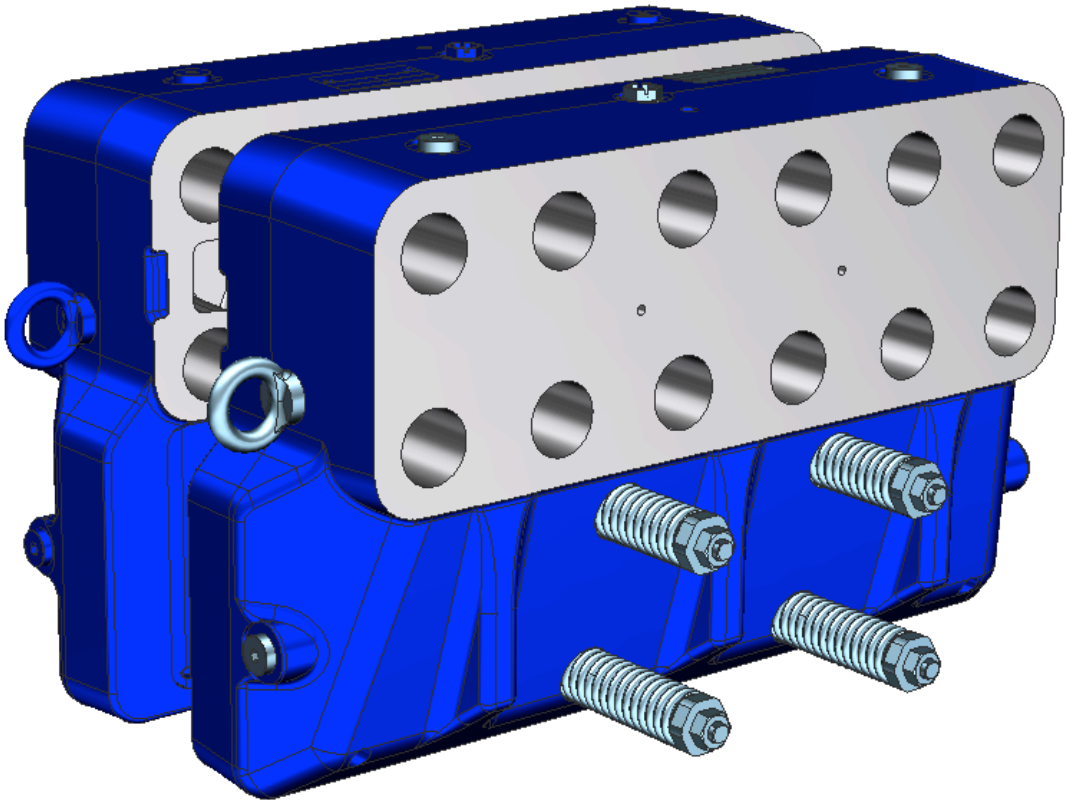
INSTALLATION, OPERATION & MAINTENANCE MANUAL

BSAB120 DIRECT ACTING HYDRAULIC BRAKE



Brake Assembly Part No. & Drawing No.:	6702405
Manual Number:	M1670

This manual should be read in conjunction with the latest issue assembly drawings.

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1. Amendment and Revision Record

Issue	Date	Amendment	Issue By	Checked By
01	06/09/17	First Issue	R. Heinsen	M. Atkins
02	06/10/17	Spares list amended	R. Heinsen	M. Atkins

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2. Introduction

This manual provides information and instructions on the installation, operation and subsequent maintenance of the BSAB120 direct acting hydraulic caliper brake.

Throughout the manual there are certain precautions that must be observed to prevent personal injury or damage to the product.

Only suitably qualified and competent personnel should carry out the installation and maintenance of these assemblies.

In all circumstances failure to adhere to installation and maintenance instructions will have a detrimental result on the performance and safe operation of the unit.

3. Specification

3.1. Operational Data

Maximum Pressure	= 160 bar
Clamping Force at 100 Bar	= 340 kN
Piston Area (Per Piston)	= 11310 mm^2
No. Pistons Per Brake Module	= 3
Volume of Oil Displacement Per Piston	= 22.6 ml
Hydraulic Ports	= G1/4 (1/4“ BSP)
Weight of Brake Assembly	= 170 kg
Weight of Brake Module	= 85 kg
Pad Area (Per Pad)	= 58000 mm^2
Max Pad Wear (Per Pad)	= 7 mm

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3.2. General Description

The BSAB120 is a direct acting, hydraulically applied spring released brake. Clamping force is applied to the brake disc by hydraulic pressure acting on each of the brakes pistons which transfer the force to the brake pads.

The brake assembly consists of 2 separate brake modules which are mounted opposite one another on a mounting plate (supplied separately). Each brake module houses 3 pistons.

The standard assembly is designed for use with a 30mm thick disc, with a nominal air gap of 3mm between each brake pad and brake disc with the brake pads in the new condition. As the BSAB120 is direct acting there is no loss of force from pad wear, resulting in no need to adjust the air gap as the pads wear. When the maximum pad wear of 7mm has been achieved (identifiable by measuring the air gap) the brake pads must be changed.

As the BSAB120 is direct acting, when there is no hydraulic pressure applied to the brake the external springs fitted though the brake housing to the brake pads retract the pistons and brake pad, which means the brake can be installed and removed without the need for hydraulic pressure.

The BSAB120 braking force can be adjusted by reducing or increasing the hydraulic pressure supplied to the brake. The maximum pressure for the brake is 160 bar.

Each brake module has four off G1/4 ports for hydraulic connection and 1 drain port. Only 1 hydraulic connection is required to each brake module to function, the remaining 3 ports should be plugged. The drain port should be connected to a clear bottle using clear pipe to allow any hydraulic leaks to be visually identified.

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3.3. Guarding

This product contains moving parts that if left exposed could present a crushing hazard. It is the customers' responsibility to provide suitable safeguard of these hazards to comply with relevant standards for the geographical area of use.

3.4. Braking Forces

Braking force is defined as the tangential force, acting on a disc, at the effective radius. This force is a function of the clamping force applied by the caliper, pressing the pads onto the disc, and the coefficient of friction (μ) generated between the friction material and the disc surface.

This friction coefficient will vary greatly depending on a number of factors, including:

- Friction pad material and production batch
- Disc material and surface finish
- Environment and operating conditions
- Duty (static holding, dynamic stopping, continuous tensioning)
- Pad pressures and rubbing speed
- Braking path temperatures
- Contamination of the disc or pads

In order to provide a meaningful comparison between a range of caliper types, brake manufacturers publish a nominal coefficient of friction on which brake performance is calculated. This is typically a value between 0.35 and 0.45.

All Twiflex published catalogues, data sheets and performance graphs assume a figure of 0.4, for standard organic linings, unless otherwise stated.

This represents mean friction, under ideal conditions, with fully bedded-in (burnished) and conditioned pads.

In practice, and in consideration of standard organic linings, it would be reasonable to expect a reduction of 25-30% for new or partially burnished pads. Dynamic friction at elevated rubbing speeds may be even lower still. It is therefore recommended that each application is considered on a case-by-case basis, with sufficient service factor applied to a brake selection to accommodate the likely worst-case conditions.

Twiflex Application Engineers can assist in providing details of expected operating characteristics and subsequent brake performance.

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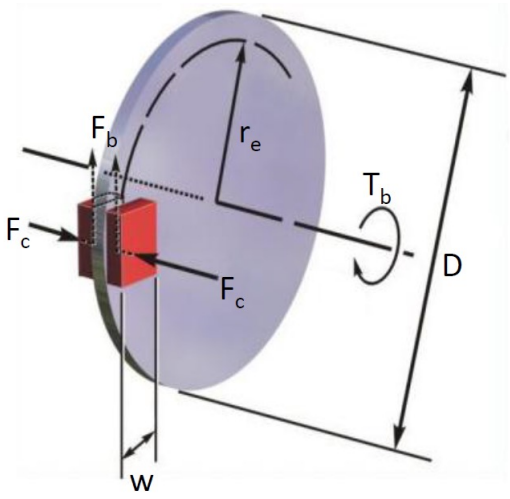
Definition of Braking Terms:



Fb Braking Force
Tb Braking Torque
Fc Clamping Force (or “Normal Force”, Fn)
μ Coefficient of Friction
re Effective Radius
R Disc Outside Radius

Effective Radius is the Disc Outside Radius (m) minus the distance from center of the brake pad to the outside of disc (0.136m).

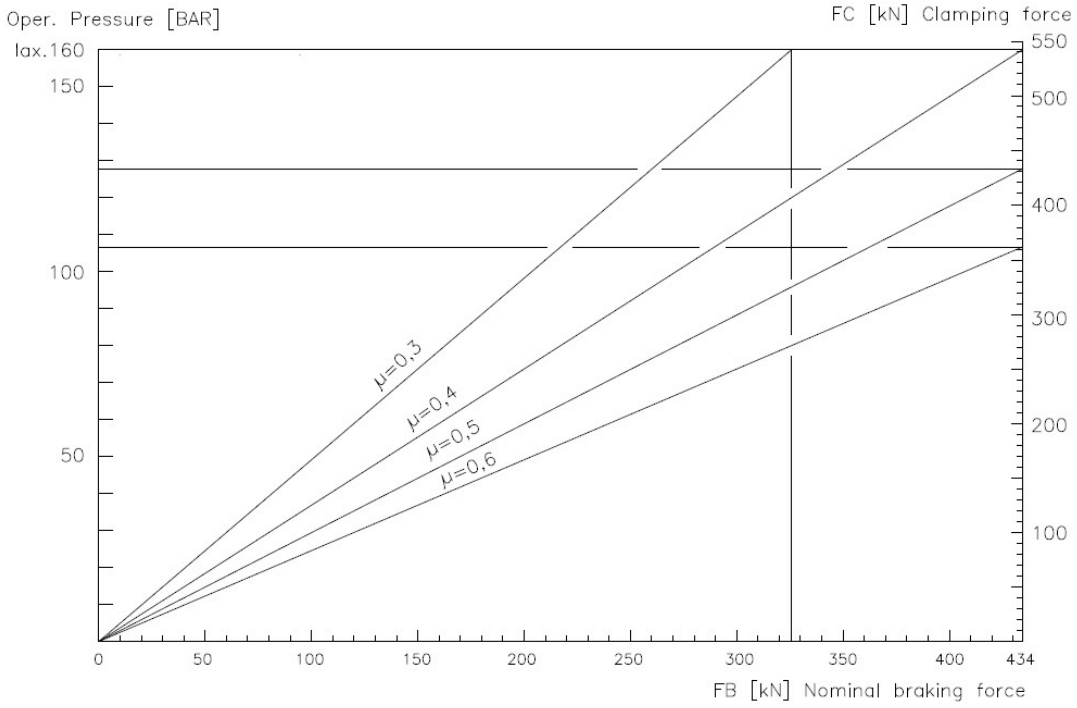
Braking torque (T_b) is given by:

T_b = Braking force x effective radius (m)

T_b = F_b (R - 0.136)

Typically, dynamic torque is around 10-15% lower than static torque under identical conditions

The clamping force is dependent on the hydraulic pressure applied to the brake. See below graph for forces at various pressures.



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3.5. Hydraulic Data

The brake assembly is hydraulically applied. To protect the seals and internal components the piston stroke should be limited. This is done by replacing the brake pads when the max brake pad wear is achieved.

As standard the hydraulic ports are supplied plugged with steel plugs and the drain port plugged with a plastic plug. The brake can be connected to the hydraulic supply in several ways depending on the application and access constraints.

Connect the hydraulic pressure to the lowest port and bleed from the highest point. Bleeding can be done by using a test point Male 1/4" BSP fitted to the highest hydraulic port.

The hydraulic ports not in use should be left plugged with a steel plug and O Ring (as supplied).

Maximum Permissible Pressure	= 160 bar
Piston Area (Per Piston)	= 11310 mm^2
Hydraulic Inlet Ports (4 per brake module)	= G1/4
Hydraulic Drain Port (1 per brake module)	= G1/4

3.6. Brake Pads

The brake assembly includes organic friction material brake pads.

Nominal Pad thickness	= 21 mm
Maximum Pad Wear (Per Pad)	= 7 mm
Pad surface area (Per Pad)	= 58000 mm^2

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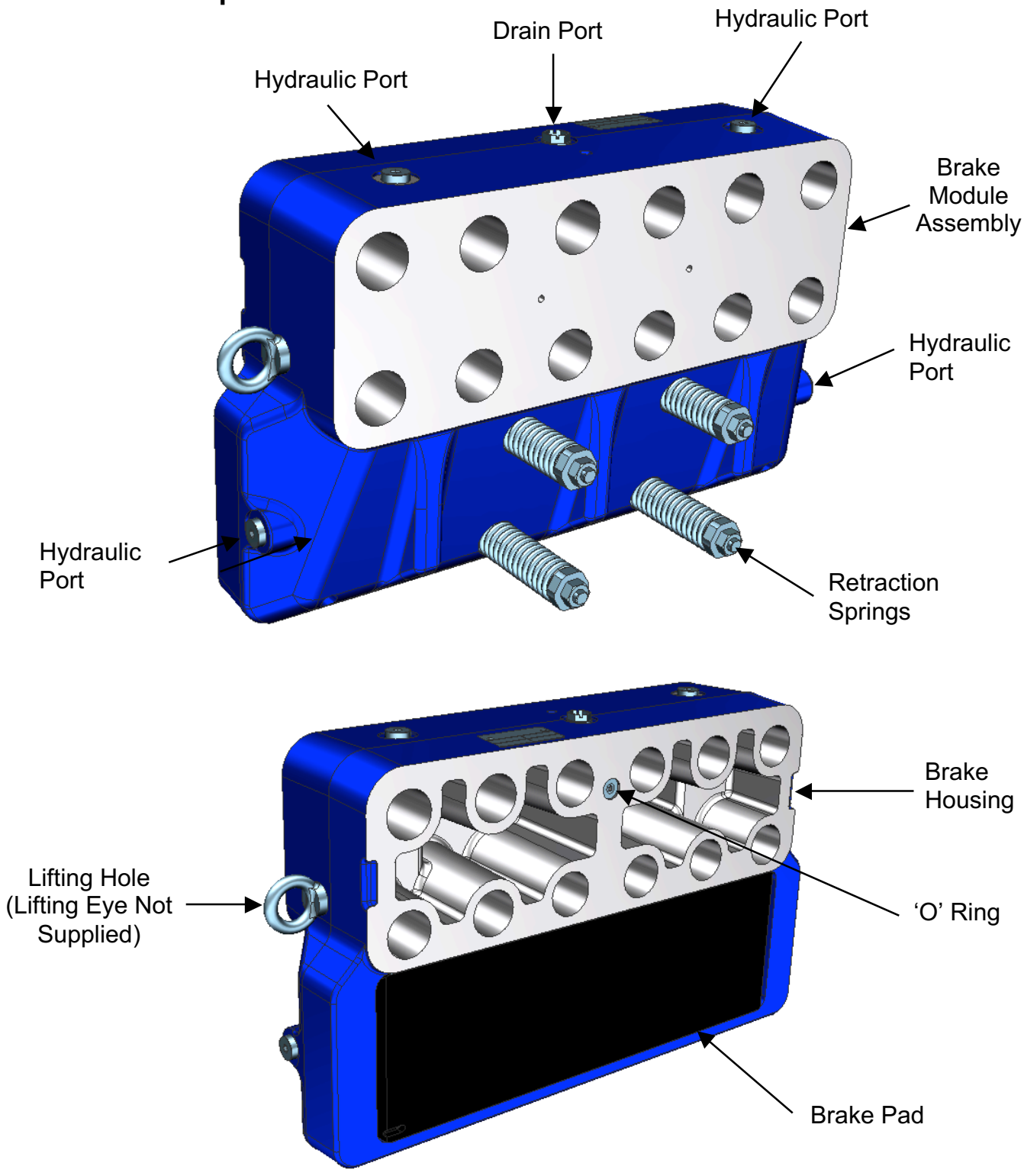
4. Installation & Adjustment

4.1. Exploded View



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4.2. Brake Assembly Installation

See general arrangement and brake mounting drawing 6702405.

Both brake modules should be fitted opposite one another to a mounting plate / pedestal of suitable structure to withstand the resultant braking forces. The thickness of the mounting plate should be the disc thickness – 2mm (See drawing 6702405 for mounting plate tolerances).

Secure the brake disc from rotation and clean both sides of the brake disc using brake disc cleaning fluid.

Ensure the mounting face of the brake mounting plate is clean and free from oil or grease.

Note: Each brake module weighs approx. 85kg, the modules should be lifted using eye bolts fitted in the brake housing lifting holes.

4.2.1. Ensure the brake pads are fitted to the brake module. If the pads aren't fitted refer to section 5.3 for fitting instructions.

4.2.2. Fit the two small 'O' rings to the holes in the mounting face in each module.

4.2.3. Mount both brake modules to the mounting plate.

4.2.4. Apply Molykote MoS2 grease to the 12 off M36 Grade 10.9 bolts and fit the bolts, washers and nuts to secure the brake modules on the mounting plate.

4.2.5. Torque tighten the 12 off M36 bolts to 2560Nm.

4.2.6. Connect the hydraulic pressure supply via flexible or hard hydraulic pipe to the lowest hydraulic port in each of the brake modules.

4.2.7. Fit a length of clear pipe to the drain port on each brake module and connect the opposite end to a clear bottle positioned away from the brake disc. This will allow any hydraulic leaks to be visually observed.

4.2.8. Prior to operation the brake should be bled to remove any air from the system.

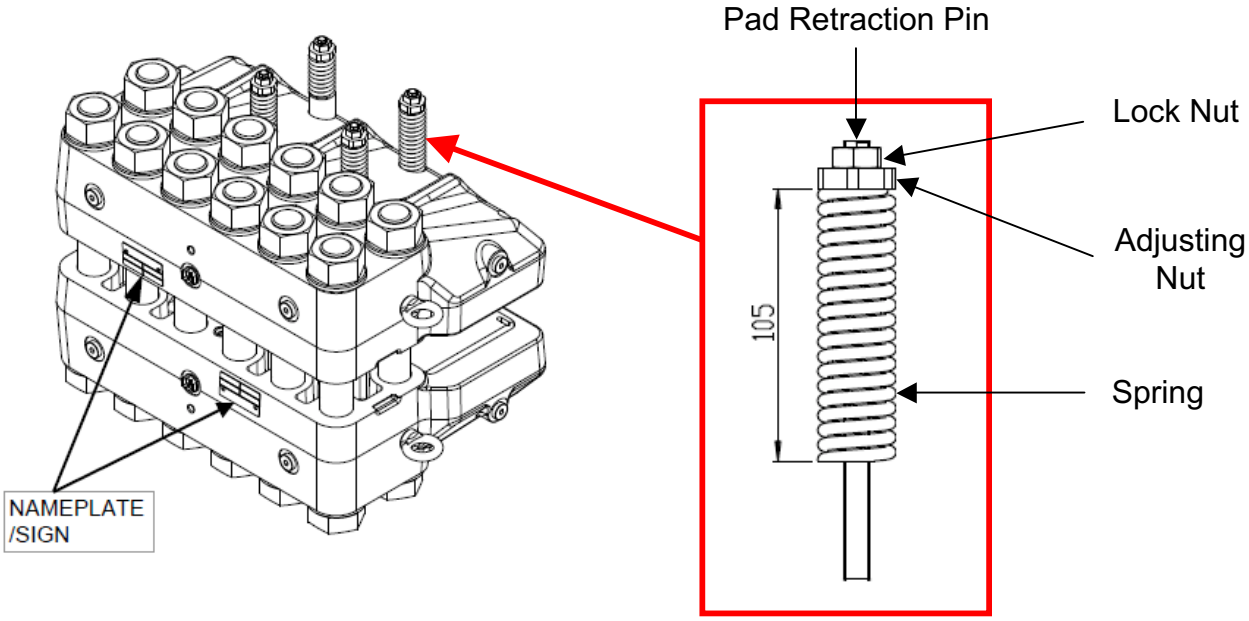
4.2.9. Fit a bleed nipple or test point to the highest hydraulic port and connect a length of clear tube to the bleed nipple and the other end to a container to receive the hydraulic oil.

4.2.10. Apply a low hydraulic pressure, around 15 bar, and open the bleed nipple. Once the hydraulic fluid runs consistently with no bubbles close the bleed nipple and remove the clear pipe.

4.2.11. Increase the hydraulic pressure to the correct operating pressure and cycle the brake On and Off several times to check it is functioning correctly. When On the brake pads should come into contact with the brake disc and when off there should be a nominal 3mm gap between each brake pad and the brake disc.

4.2.12. Set the pad retraction spring assemblies by following the below procedure:

- Fit pad retraction pin through the brake housing and screw into the brake pad (if not already fitted) and torque tighten to 27 Nm.
- Tighten the pad retraction pin to
- Apply normal operating pressure so that the brake pads are in contact with the brake disc.
- Wind the adjusting screw in until the correct spring is compressed to 105mm, as shown in the below illustration.
- Lock in position by tightening lock nut.



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4.3. Brake Pad Conditioning

NOTE: Before the brake assembly is ready for use, the brake pads need to be fully bedded-in.

For detailed information regarding the running in and conditioning of brake pads see Twiflex Manual No. M1060.

4.3.1. The bedding-in procedure consists of two phases:

- Bedding the pads on the disc so that the full area of the pad is making contact and the disc itself is beginning to polish.
- Progressive generation of heat at the pad surface to condition the material by chemical change until it is able to perform the maximum duty defined by its application.

4.3.2. The amount of bedding-in / conditioning that will be needed in any particular case will vary according to the initial condition of the material and the severity of the duty. The procedure may be shortened or lengthened by the commissioning engineer according to their observation of the performance of the pads during this period.

4.3.3. The principle is to work the brake lightly at first to remove high spots to achieve as close to 100% pad contact with the disc as possible. This is best achieved by operating the brake several times with the disc rotating. When complete, carry out any statutory or other testing that may be required.

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5. Maintenance

5.1. Maintenance & Inspection Program

The following schedule should be followed in addition to any statutory requirements:

MAINTENANCE SCHEDULE			
ITEM	WEEKLY	MONTHLY	PERIODIC
a) Check for hydraulic leaks	X (note 1)		
b) Observe brake operation	X		
c) Note and record pad wear		X (note 2)	
e) Clean brake of accumulated deposit			x (note 3)
f) Remove friction disc debris and clean brake path on brake disc			X (note 3)
g) Observe bolt security			x
h) Check availability and condition of spares			x

1. Any appreciable hydraulic leaks, indicates that one or more of the internal seals require replacing. The most convenient way to replace seals on-site is to replace the complete brake module assembly.

2. Check pad wear and replace when 7mm pad wear has been achieved.

3. Under adverse conditions this may be required more frequently.

5.2. Loss of Braking Force

Possible causes are:

a) Contaminants on surface of brake pads, especially lubricant.
b) Contaminants on surface of brake disc.
c) Frictional fade due to overheating.
d) Insufficient hydraulic supply pressure.
e) Hydraulic leak due to seal failure.

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5.3. Replacing Brake Pads

Note: Before removing brake pads, release and isolate the hydraulic supply to the brake assembly and secure the disc against rotation.

Brake pad replacement is required when each of the pads have worn 7mm, at this point the total pad thickness will be 14mm.

To check the amount of brake pad wear, measure the gap between the brake pad and the brake disc. This is known as the 'Air Gap'. If the air gap is 10mm the pads must be changed.

5.3.1. Release and isolate the hydraulic pressure to both brake modules.

5.3.2. To remove the brake pads the brake module must first be removed from the mounting plate. Support the weight of both brake modules (approx. 85kg each) using suitable lifting equipment.

5.3.3. Remove the 12 off M36 bolts, washers and nuts.

5.3.4. Remove both brake modules from the mounting plate.

5.3.5. Remove the 4 off spring retraction assemblies fitted to each brake module. This is done by loosening the nut, removing the spring and unscrewing the pin from the pad.

4.3.6. Remove the brake pad from the brake module.

4.3.7. Fit new brake pad to module.

4.3.8. Fit the spring retraction assembly and loosen the nut.

4.3.9. Clean both brake module mounting faces and the brake mounting plate.

4.3.10. Fit both brake modules to the brake mounting plate.

Note: Mounting of the modules must always be carried out using new bolts, washers and nuts.

4.3.11. Apply Molykote MoS2 grease to the 12 off M36 Grade 10.9 bolts and fit the bolts, washers and nuts to secure the brake modules on the mounting plate.

4.3.12. Torque tighten the 12 off M36 bolts to 2560Nm.

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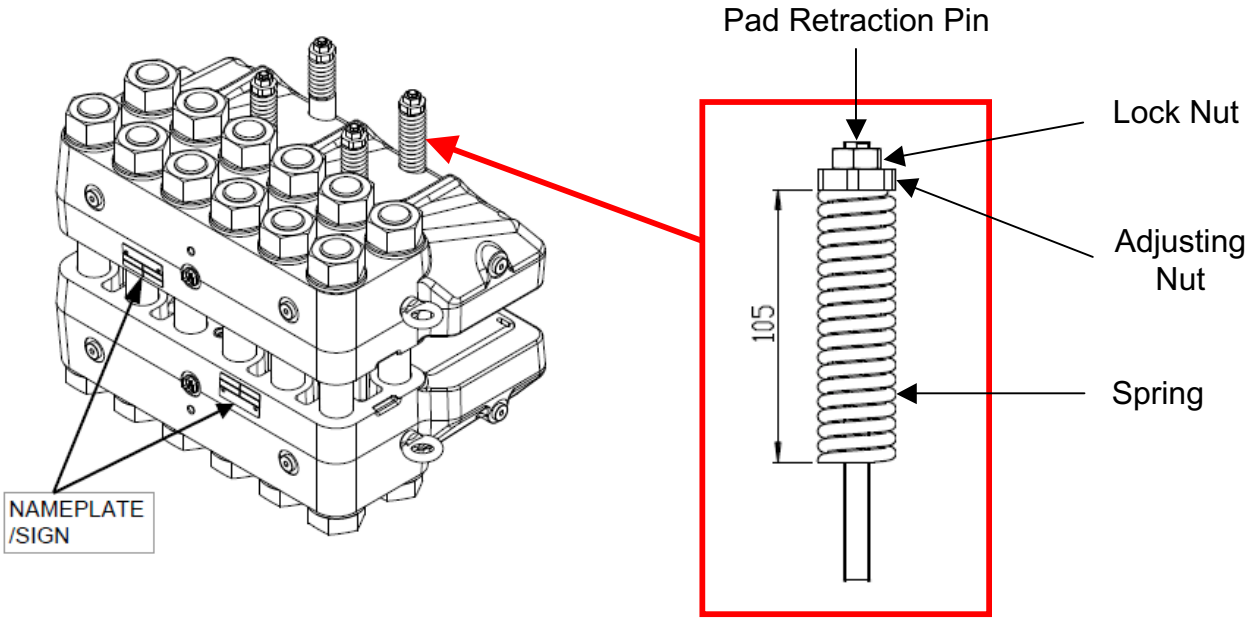
4.3.13. Connect the hydraulic supply to both brake modules.

4.3.14. Bleed the brake as per section 4.2.

4.3.15. Apply normal operating hydraulic pressure to the brake and check that the pads are in contact with the brake disc.

4.3.16. Set the retraction spring assemblies by following the below procedure:

- Fit pad retraction pin through the brake housing and screw into the brake pad (if not already fitted).
- Tighten the pad retraction pin to
- Apply normal operating pressure so that the brake pads are in contact with the brake disc.
- Wind the adjusting screw in until the correct spring is compressed to 105mm, as shown in the below illustration.
- Lock in position by tightening lock nut.



Note: New pads will require bedding in and conditioning as described in section 4.3.

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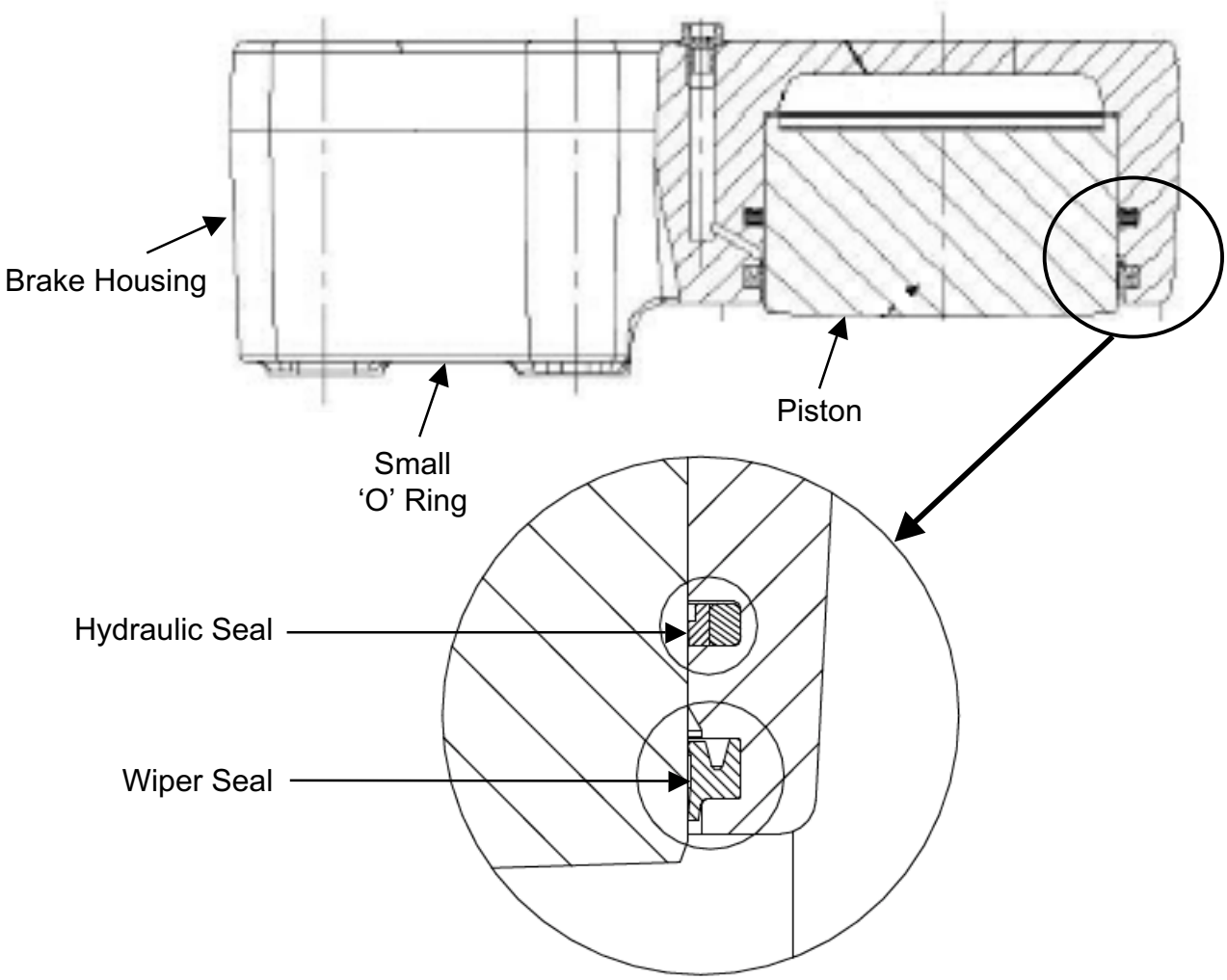
5.4. Replacement of Seals



Brake Module Section View

If the brake is found to have a hydraulic leak it is recommended that all seals are replaced at the same time.

The seals and internal bores of the brake must be protected from contamination at all times, any contamination could cause damage to the seals and leak to hydraulic leaks.

Safety Note: Before carrying out any work on the brake assembly, release and isolate the hydraulic pressure and secure the disc against rotation.

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5.4.1. Remove the hydraulic pipe from both brake modules.

5.4.2. Remove the brake modules from the brake mounting plate, as described in section 5.3.

5.4.3. Move the brake modules to a clean work surface, free from any dirt or debris which could contaminate the brakes internal components.

5.4.4. Remove the brake pads and retraction spring assemblies as described in section 5.3.

5.4.5. Remove and discard the two small 'O' rings fitted to the mounting face in each brake module.

5.4.6. Remove the piston from the brake housing by hand. If it cannot be removed by hand, compressed air can be used via the hydraulic port to release the piston. If compressed air is used take care to ensure the piston is not shot out of the brake housing.

5.4.7. Check the pistons for visible damage. If damaged replace with new.

5.4.8. Using a small flat screwdriver remove the wiper seal and hydraulic seal from the brake housing. Take care not to damage the grooves in the brake housing, if these become damage it may lead to hydraulic leaks. If the housing becomes damaged replace with new.

5.4.9. Clean the internal bores of the brake module and piston.

5.4.10. Lubricate the new seals with mineral or synthetic oil and fit the new hydraulic seal and wiper seal in the orientation shown in the brake module section view above.

5.4.11. Fit the piston to the brake housing and push down as far as possible into the housing.

5.4.12. Fit the brake pads.

5.4.13. Fit the spring retraction assemblies and loosen the nut.

5.4.14. Clean both brake module mounting faces and the brake mounting plate.

5.4.15. Fit 2 new small 'O' rings to the holes in the brake module mounting faces.

5.4.16. Fit both brake modules to the brake mounting plate.

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Note: Mounting of the modules must always be carried out using new bolts, washers and nuts.

4.2.13. Apply Molykote MoS2 grease to the 12 off M36 Grade 10.9 bolts and fit the bolts, washers and nuts to secure the brake modules on the mounting plate.

4.2.14. Torque tighten the 12 off M36 bolts to 2560Nm.

5.4.17. Connect the hydraulic supply to both brake modules.

5.4.18. Bleed the brake as per section 4.2.

5.4.19. Adjust the spring retraction assemblies as described in section 4.3.

5.4.20. Operate the brake On and Off several times checking for correct operation and hydraulic leaks.

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6. Recommended Spares

WARNING ! Use only genuine ***Twiflex*** spare parts. Failure to do so will invalidate your warranty and may lead to excessive wear and consequential damage.

6.1. Stocking Spares

Although certain spares are held in stock at Twiflex (Bedford), normal recommended spares should be held by the customer to reduce costly “downtime”

6.2. Recommended Spares

List of Recommended Spares:

Part No.	Description	Qty (Per Brake)
6702405	BSAB 120 Brake Assembly	1
Contact Twiflex	M30 Bolt (Length Dependent on Disc Thickness)	12
22183-517	M30 Washer	12
5100242	M30 Nut	12
6000815	Seal Kit	1
7000431	Brake Pad	2
7909119	Retraction Spring Assembly	2

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7. Appendix A

Brake general arrangement and Brake Mounting Drawing 6702405