Technical Documentation

August 2024
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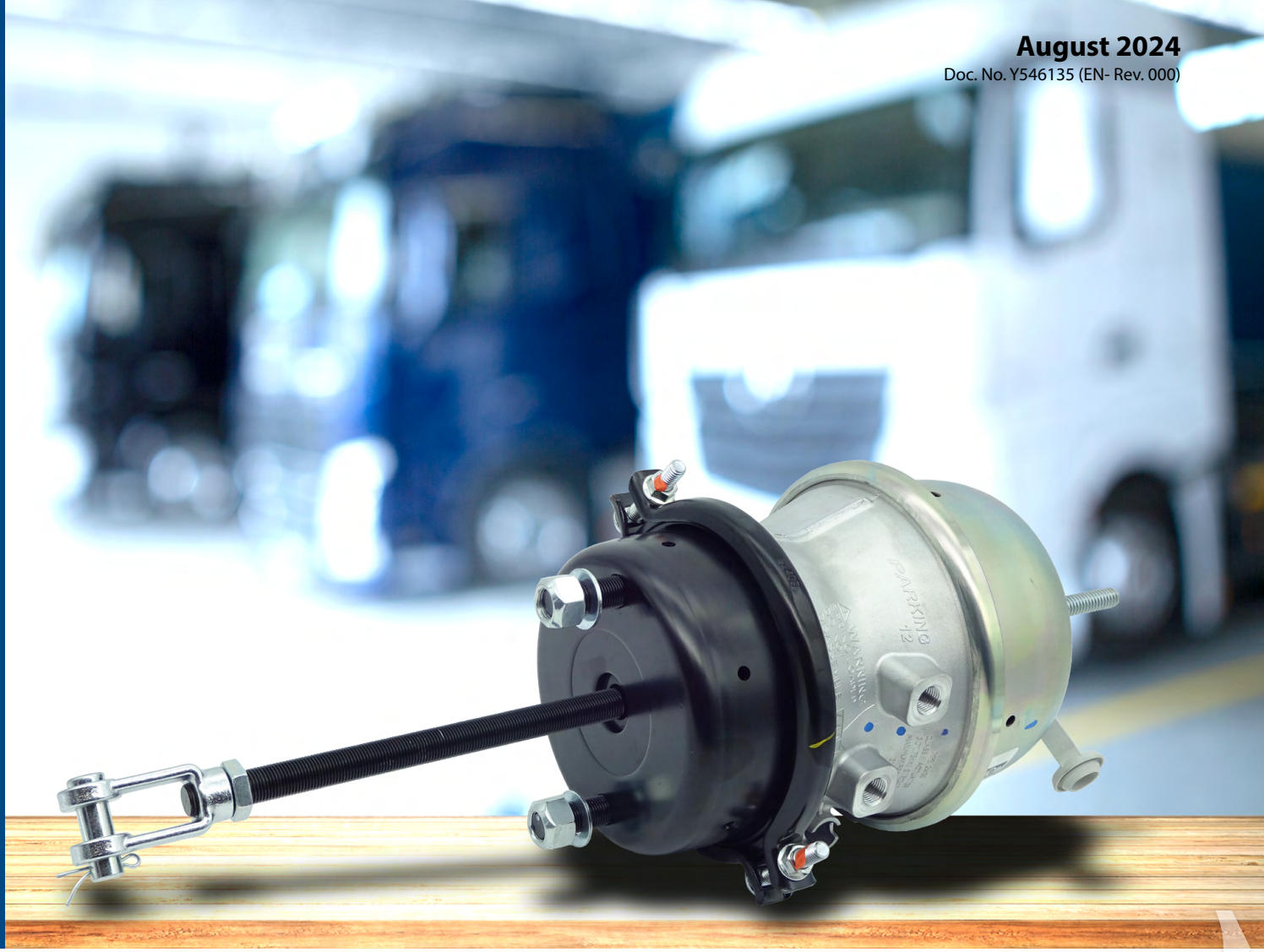


SERVICE MANUAL

Foundation Drum Brake Actuators NG4/EnduraSure S-Cam

Spring Brake Diaphragm / Diaphragm Actuators

KNORR-BREMSE

TRUCKSERVICES

Safety and Environmental Guidelines for Knorr-Bremse Commercial Vehicle Systems products

Note:
The safety advice listed below is applicable to general service and diagnostic work on braking systems. Also observe any recommendations from the axle or vehicle manufacturer concerning towing, jacking-up and securing the vehicle.

Caution!
Knorr-Bremse is not liable for any costs and damage caused by improper installation and use of Knorr-Bremse aftermarket products, in particular in the event of (i) use in non-approved applications and/or use in non-compliance with the technical specifications and installation instructions, (ii) incorrect installation or removal of Knorr-Bremse aftermarket products and (iii) failure to observe instructions on the use of tools.

In addition to product-specific installation and hazard warnings, the following precautions and additional hazard warnings must be observed before and during work on and around compressed air systems:

1. Always wear safety glasses when working with air pressure.
2. Never exceed the vehicle manufacturer's recommended air pressures.
3. Never look into air jets or direct them at anyone.
4. Never connect or disconnect a hose or line containing pressure; it may whip as air escapes.
5. When removing or servicing a product, ensure all pressure related to the specific system it is contained in has been depleted to 0 bar. Be aware that if the vehicle is equipped with an air dryer system, it can also contain air pressure along with its purge reservoir, if fitted, even after pressure has been drained from the other reservoirs.
6. If it is necessary to drain the air pressure from reservoirs, etc., keep away from brake actuator push rods and levers since they may move as system pressure drops. On vehicles fitted with air suspension, it is advised when undertaking such work, to support the chassis from sudden lowering and therefore prevent any possibility of being trapped between the chassis and axle or ground.
7. Park the vehicle on a level surface, apply the parking brakes, and always chock the wheels as depleting vehicle air system pressure may cause the vehicle to roll.
8. When working under or around the vehicle, and particularly when working in the engine compartment, the engine should be shut off and the ignition key removed. Where circumstances require that the engine be running, **EXTREME CAUTION** should be taken to prevent personal injury resulting from contact with moving, rotating, leaking, heated or electrically charged components. Additionally, it is advisable to place a clear sign on or near the steering wheel advising that there is **"WORK IN PROGRESS ON THE VEHICLE"**.
9. When working on vehicles equipped with air suspension, to guard against injury due to unexpected downward movement of the chassis caused by sudden pressure loss in the suspension system, ensure that the vehicle chassis is mechanically supported with a 'prop' between the chassis and the axle or between the chassis and the ground.
10. Examine all pipework for signs of kinks, dents, abrasion, drying out or overheating. Be aware that kinks in pipework may result in air pressure being trapped in the pipework and associated equipment. Replacement hardware, tubing, hose, fittings, etc. must be of equivalent size, type and strength as original equipment and be designed specifically for such applications and systems. Check the attachment of all pipework; it should be installed so that it cannot abrade or be subjected to excessive heat. Only use tools specially designed for cutting pipes in order to prevent incorrect cutting and, in particular, to avoid shavings remaining in the pipes or other impurities which may later lead to leaking connections and subsequent malfunctions of the system.
11. Components with stripped threads or damaged/corroded parts must be replaced completely. Do not attempt repairs requiring machining or welding unless specifically stated and approved by the vehicle or component manufacturer.
12. Never attempt to install, remove, disassemble or assemble a device until you have read and thoroughly understood the recommended procedures. Some units contain powerful springs and injury can result if not properly dismantled and reassembled. Use only the correct tools and observe all precautions pertaining to use of those tools.
13. Before removing any device note its position and the connections of all pipework so that the replacement/serviced device can be properly installed. Ensure that adequate support or assistance is provided for the removal/installation of heavy items.
14. We highly recommend to use only genuine replacement parts, components, and kits as supplied by Knorr-Bremse or the vehicle manufacturer containing original Knorr-Bremse parts. Knorr-Bremse will not be liable for any issues arising from the usage of non-Knorr-Bremse products. Only use the recommended tools as specified in related Knorr-Bremse instructions.
15. The serviced or replaced product must be checked for correct function and effectiveness.
16. If products have been dismantled, serviced or replaced, whose performance could affect braking performance or system behaviour, this should be checked on a roller dynamometer. Bear in mind that a lower performance may be experienced during the bedding-in phase if new brake pads/linings and/or brake discs/drums have been fitted.
17. The use of impact screwdrivers or impact wrenches in conjunction with Knorr-Bremse service tools for air disc brakes is not permitted. The service tools are not designed for such use. It is likely that the tools or the vehicle will be damaged and there is a serious risk of injury.
18. Do not use compressed air to clean the disc brake. Avoid air contamination of brake dust.

19. Prior to returning the vehicle to service, make certain that all components and the complete brake systems are leak free and restored to their proper operating condition.
20. During service work on vehicles with electronic parking brake, service or parking brake, or bus stop temporary hold brake, the brake system must be set to service and maintenance mode. Please also observe the instructions of the vehicle manufacturer.

Welding

To avoid damage to electronic components when carrying out electrical welding, the following precautions should be observed:

1. In all cases, before starting any electrical welding, remove all connections from any electronic control units or modules, noting their position and the order in which they are removed.
2. When re-inserting the electrical connectors (in reverse order) it is essential that they are fitted to their correct assigned position - if necessary this must be checked by PC Diagnostics.

Disposal of Waste Equipment by Business Users in the European Union

This symbol on the product, packaging or in user instructions, indicates that this product must not be disposed of with other general waste. Instead, it is your responsibility to dispose of the waste electrical and electronic parts of this product by handing them over to a company or organisation authorised for the recycling of waste electrical and electronic equipment. For more information about arrangements for waste equipment disposal please contact your Knorr-Bremse distributor or local Knorr-Bremse representative.

Note: If service work is carried out on a vehicle based on information provided herein, it is the responsibility of the workshop to ensure the vehicle is fully tested and in full functional order before the vehicle is returned into service. Knorr-Bremse accepts no liability for problems caused as a result of appropriate tests not being carried out.

This disclaimer is a translation of a German text, which should be referred to for all legal purposes.

Revision Details

Rev. 000	August 2024	New document

1. General Informations

1.1. General Informations

Reference documentation

Y193970 – TruckServices Actuator Maintenance Gauge (Product Video)
Y194318 – TruckServices Actuator Maintenance Gauge (Service Instructions)
Y302415 – TruckServices Actuator Maintenance Gauge (Service Instructions)
Y548437 – Knorr-Bremse Automatic Slack Adjusters

Industrial terms for parking condition of an Spring Brake Actuator

Foot brake pedal	Hand brake valve lever	High-power Spring	Release bolt	Spring Brake Actuator	Foundation Drum Brake (FDB)	Vehicle Condition
						
Not applied	Applied / "park"	Wound-in	Tighten	Caged	Activated	Parking
Possible	Not applied / "run"	Wound off	Loosen	Uncaged	Released	Driving

Spare Parts List

Knorr-Bremse PN	Description
II36860	Mounting Kit (2 hexagonal Self-locking Nuts)
K040394K50	Release screw Kit (Release bolt, Nut, Washer)
K037837	Forged Yoke (round)
K050194K50	Plug Spare kit (Dust plug and Rivet)
K161769	Breathing Plug kit

Note:

The Mounting Kit can be used on all NG4/EnduraSure S-Cam (BX7...) Spring brakes Actuators.

Service Tool

K108806K50 – Actuator Maintenance gauge

Torque requirements

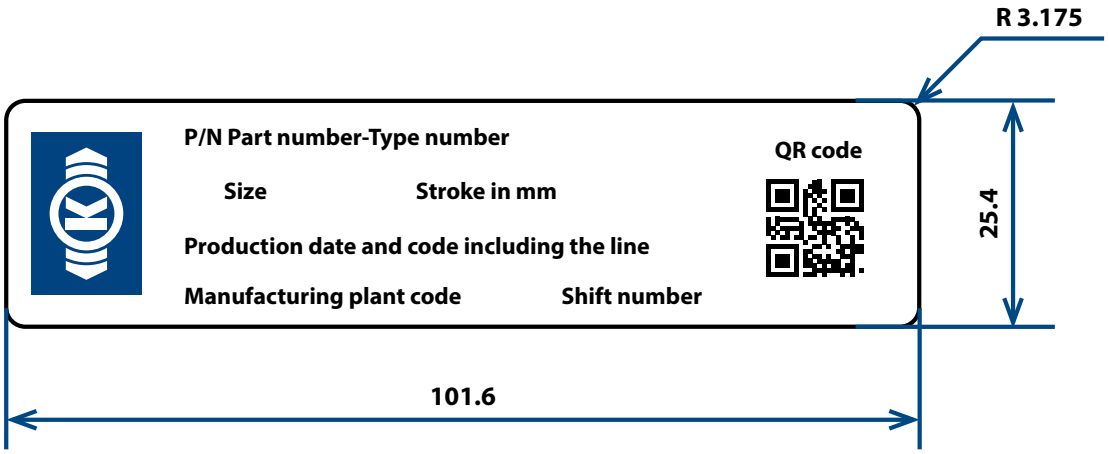
Thread size	Description	Tightening torque [Nm]	A/W Spanner size [mm]
M16x1.5	Mounting Nuts	180 $^{+30}$	24
M16x1.5 thin	Jam Nut	34 $^{+34}$	
1/2-10 ACME	Release bolt	68 MAX	19
	Release bolt in the pocket	14 MIN	
M16x1.5	Air connector fittings	40 $^{+5}$	24
3/8 - 16 UNC	Clamp band Nuts	30 $^{+24}$	15

Caution!

All the used spanners must be equipped with torque measurement function in required range.

1.2 Product Identification and marking

1.2.1 White PE Tough Label with protective film and Improved Part Numbering fixed on the rear housing



1.3. Important Safety

Before working on or around Air braking systems and devices, the following precautions should be observed:

- Stop the engine before working under a vehicle.
- Always chock the wheels because depleting vehicle Air system pressure may cause the vehicle to roll. Keep hands away from Spring Brake Actuator pusher or push rods; they may apply as system pressure drops.
- Never connect or disconnect an Air hose or line containing Air pressure, it may whip as Air escapes. Never remove a device or pipe plug unless you are sure that all system Air pressure has been depleted.
- Never exceed recommended Air pressure and always wear safety glasses when working with Air pressure. Never look into Air jets or direct them at anyone.
- Never attempt to dismantle a device until you have read and understood recommended procedures. Some units contain powerful springs and injury can result if not properly dismantled. Use only correct tools and observe all precautions relative to the use of these tools.

1.4. Note

- Use only genuine Knorr-Bremse parts and it is recommended to replace Spring Brake Actuators always as an axle set.
- For safety reasons, when fitting a new Spring Brake Actuator, remove connection(s) from old Spring Brake Actuator and disassemble and discard old male fitting(s); the fir-tree plug(s) should be left installed in the Air pipe(s).
- Always use only new Mounting Nuts (for reference Knorr-Bremse Mounting kit PN: II36860) for the installation of the Spring Brake Actuator. Tightening torque is in the range of: **180 +30 Nm**.
- After installation of the replacement Spring Brake Actuator, ensure that the non pressure plate breather hole at the lowest point is unplugged. All other breather holes can be plugged or remain unplugged as in the Knorr-Bremse delivery condition.
- Please also refer to section Safety and Environment Guidelines on the Page 4 and 5 of this document, and other relevant safety instructions for repair work on commercial vehicles, especially for jacking up and securing the vehicle.

Attention!

The Knorr-Bremse Roman numerals I or II at the beginning of some old part numbers should not be read as 1 or 11.

Test preliminaries:

Before you begin testing the Air braking system, perform the following checks:

- Examine all pipework for signs of kinks, dents, abrasion, drying out or overheating.
- Check attachment of all pipework; it should be supported so that it cannot abrade or be subjected to excessive heat.

2. Product Features

2.1. NG4

- Basic product naming stands for continues development on Double Diapraghm Spring Brake (DDSB) technology by Knorr-Bremse Engineering.

2.2. EnduraSure

EnduraSure is Bendix® Trademark for the APR Spring less Parking portion, Knorr-Bremse is using in NG4 EVO PRO Disc applications already

- Ports machined to accept M16x1.5
- Fully threaded (M16x1.5) Push rod. Ready to cut to any other length
- Supplied complete with Yoke Assembly and Mounting Nuts. Kits available also separately
- Provides a quick and cost-effective option to the original Spring Brake Actuator servicing without additional manipulation or assembly equipment needs.
- Each Knorr-Bremse rationalized Spring Brake Actuator is TÜV and KBA approved.

3. Service Intervals

3.1. Introduction

The service interval is the length of time from the vehicle first entering service, or from the last service, until the point in time - or distance travelled by the vehicle (whichever is the earlier) - when it is recommended that the specified braking system device is serviced using a genuine Knorr-Bremse service kit or replaced with a new part, or in the case of ABS subjected to a system functionality check.

This service interval is provided for preventative maintenance purposes so as to minimize the probability of a vehicle breakdown.

The service interval does not preclude the intermediate testing of the device on the vehicle to ensure that it is functioning in a correct manner, or the correct maintenance of other devices in the system that may influence the service interval.

The service interval can also be influenced by the positioning of the device on the vehicle, and the following service intervals are based on the assumption that each device is positioned such it cannot be inadvertently abused or that external rubber boots/seals are not exposed to abnormal influences.

In addition to legally required periodic vehicle inspections, it is recommended that simple routine inspections of a general nature are carried out to maintain the braking system at a high level of functionality.

3.2. Definition

These simple routine inspections, including a visual check of the Spring Brake Actuator to verify that there is no damage or unexpected wear, should be:

1) the weekly checking for excess water in the reservoirs by operation of the reservoir drain valves and
2) the **6 monthly / (50,000 km)** checking of the complete braking system for excessive Air leakage during a maximum pressure foot brake application with the vehicle stationary and the parking brake released.

This inspection has to be done especially for vehicles which are used in severe environments (very high or low temperatures, high humidity, presence of aggressive substances or fluids …) or submitted to frequent braking (buses or coaches, garbage trucks, urban distribution …)

These inspections are carried out as preventive maintenance so as to minimize the possibility of a vehicle breakdown. The service interval can also be influenced by the positioning of the device on the vehicle and the service intervals are based on the assumption that each device is positioned such it cannot be inadvertently abused or that external rubber boots / seals are not exposed to abnormal influences.

3.3. Spare Parts

The Spring Brake Actuator **MUST** be serviced by using the genuine Knorr-Bremse Service Kit or part.

In general Knorr-Bremse Service Kits contain all of the components that can deteriorate with use, such as rubber parts (O-Rings, special seals, bonded inlet / exhaust valves, exhaust flaps ...), plastic and metal parts (filter elements, springs ...), fasteners and the correct grease.

The range of Service Kits is designed to enable each device to be serviced in part or completely. Knorr-Bremse Service Kits are only designed for use with genuine Knorr-Bremse assemblies and are only to be used in the manner detailed in these service instructions.

After servicing, the assembly must also be checked in accordance with vehicle manufacturer's instructions to ensure correct operation before the vehicle is placed back in service.

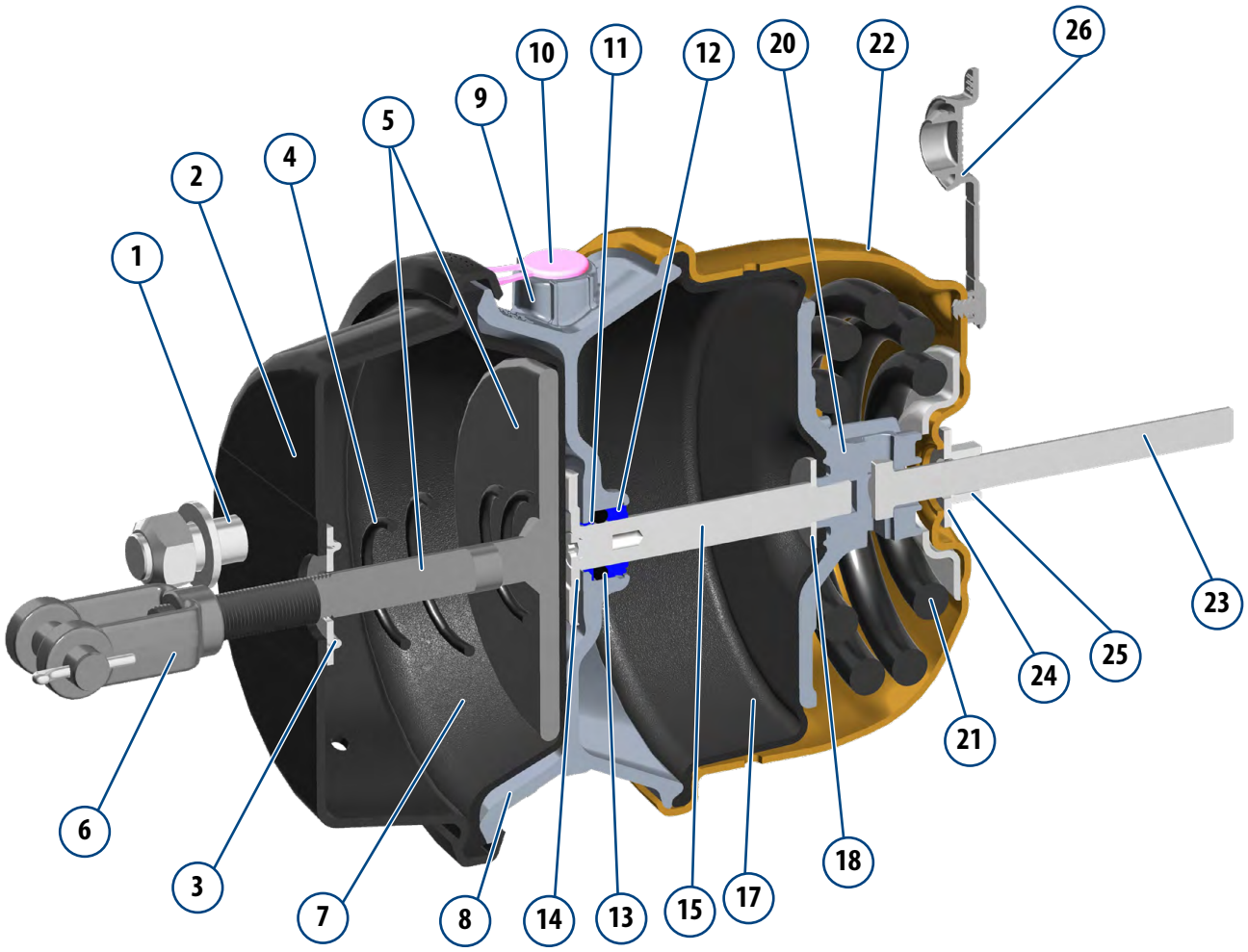
4. Basic Principles

4.1. Cross Section View and List of Components

Pos.	Description
1	Mounting stud
2	Non-pressure plate and Clamp ring
3	Sealing washer
4	Return spring
5	Front piston and Push rod
6	Yoke assembly
7	Service diaphragm
8	Adaptor base
9	Air connection Port

Pos.	Description
10	Air connection Port plug
11	Snap ring
12	Guide ring
13	O-Ring
14	Plate and screw
15	Rod
17	Parking diaphragm
18	Threaded washer
20	Pressure plate

Pos.	Description
21	High-power Spring
22	Rear housing
23	Release bolt
24	Release washer
25	Release nut
26	Dust plug and rivet



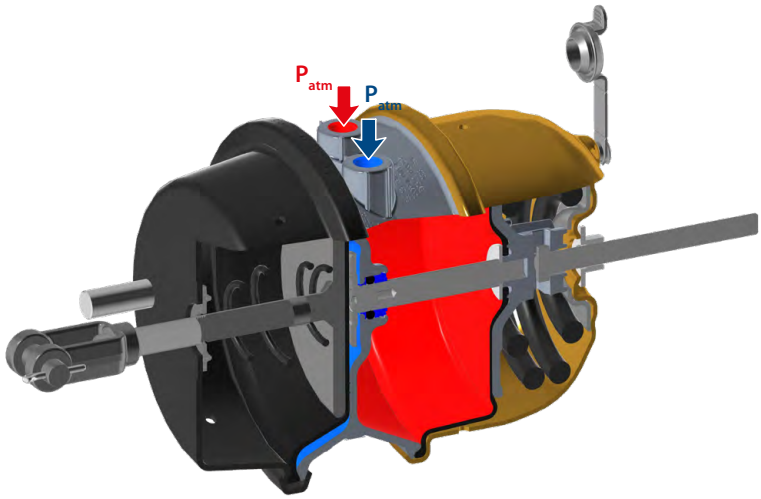
4.2. Application

The Spring Brake Actuator is used for generating the input force required for the service brake and the parking brake of the Foundation Drum Brake (FDB).

4.3. Functional Descriptions

4.3.1. Delivery condition

In delivery condition, the manual release system is activated in order to fully compress the High-power Spring (caged condition) and to allow mounting onto FDB Mounting Bracket. The return spring keeps the Front piston at zero stroke.

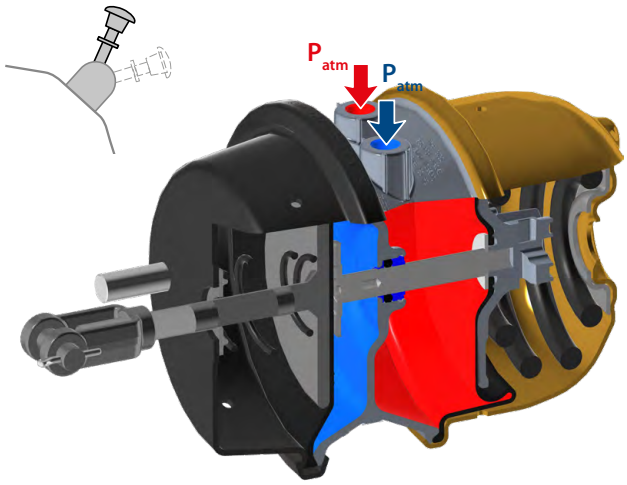


4.3.2. Parking brake condition (Braking with the Hand brake valve lever)

In parking brake condition, both Air connection Ports 11 and 12 are exhausted to atmosphere. Thus, the uncaged High-power Spring activates the Parking brake.

When the pressure in Spring pressure chamber is exhausted, the spring portion piston is pushed forward by the High-power Spring. The end of Pressure plate pushes the Parking diaphragm and APR rod outwards. The force of the High-power Spring is transferred to the FDB via the Slack Adjuster Lever. When pressure is reapplied to High-power Spring pressure chamber spring portion piston compresses High-power Spring and allows Pressure plate and Parking diaphragm to be returned to the brakes released position by the Return spring.

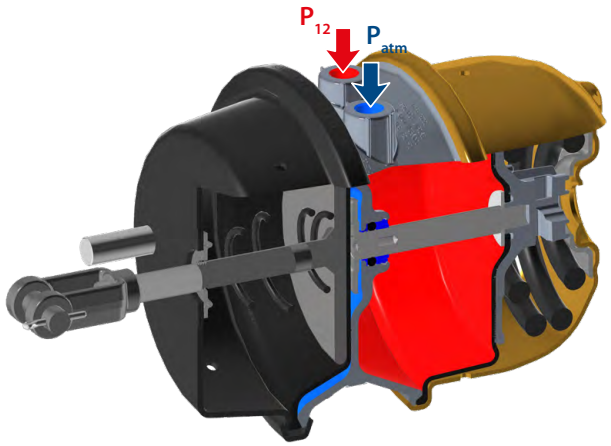
Parking Brake



4.3.3. Driving condition

In driving position, the Air pressure supplied through Air connection Port 12 moves the Pressure plate backwards, chamber is pressurized, and High-power Spring is held compressed by the Air pressure acting on Pressure plate. Consequently, the High-power Spring is fully compressed, and the parking brake is not activated, the spring portion is in the 'parking brake released' condition.

At the same time the Air connection Port 11 is vented to atmosphere, service brake chamber is not pressurized. Front piston and Service diaphragm are held backwards in the 'service brakes released' condition by the Return spring.



4.3.4. Service brake position (Braking with the Foot brake pedal)

When Air pressure supplied through Air connection Port 11 is introduced into service chamber the Service diaphragm moves the Front piston outwards with a force proportional to its effective area and the Air pressure value applied.

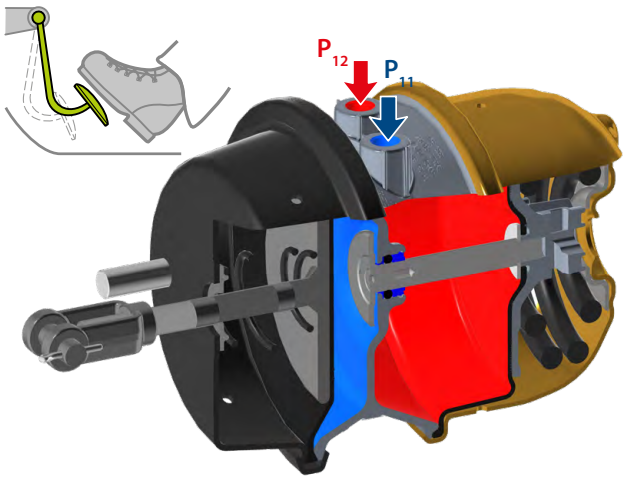
The Pusher transfers this force to the FDB via the Slack Adjuster Lever, thus the service brake is activated.

When the pressure is reduced or removed, the Return spring moves the Front piston and the Service diaphragm backwards to the 'service brake released' condition.

As the Service diaphragm moves forward, any water or other contamination is expelled through the vent drain hole. This also allows for equalization of any pressure between Non-pressure plate and atmosphere caused by Air displaced by the Service diaphragm.

During this phase, the Air pressure supplied through Air connection Port 12 keeps the Pressure plate backwards and the parking brake is not activated.

Service Brake



4.4. Extended functional features

4.4.1. Mechanical release of the parking brake

The FDB can be released mechanically in the event of any Air pressure lost (Air connection Port 12) or failure in the Spring Brake Actuator.

Chock the wheels to make sure that the vehicle cannot start rolling and turn the Release nut with the help of an open-ended 19 mm A/F - across flats - spanner in an clockwise direction in the fully wound in position with a tightening torque of **68 Nm MAX** until the FDB is released.

Caution!

When the repair has been carried out, loosen the Release nut anti-clockwise direction to uncage the High-power Spring fully into the Spring Brake Actuator until the Release bolt is in the fully wound out position according chapter **5.4.2.**

5. Installation of the Spring Brake Actuator to the vehicle

Go to the Product Search section of the website truckservices.knorr-bremse.com to select the correct Spring Brake Actuator part number or type number.

5.1. General product precaution

In assembled position, there must be no risks of damage of the Spring Brake Actuator by any external element (friction, shocks, chemical substances, etc.).

Spring Brake Actuators before mounting on the FDB Mounting Bracket must be stored in a dry, clean place, at normal conditions regarding temperature and pressure, sheltered from sun, ultraviolet and chemical substances.

The Spring Brake Actuator must be handled with care. The product must not drop down and must not have any mark caused by a shock.

If any abnormality on the Spring Brake Actuator (non-conform aspect, damage, strange behaviour that cannot be controlled with a test bench, …) is noticed, the Spring Brake Actuator cannot be used.

Before mounting on the FDB Mounting Bracket, the Spring Brake Actuator must be in delivery condition (High-power Spring caged).

Note:

Before starting work on the vehicle interface please refer to the Safety Guidelines on Page 2 and 3.

Caution!

The Spring Brake Actuator must not be disassembled for safety reasons as it contains a compressed High-power Spring which can cause an injury.

5.2. FDB Mounting Bracket preparation for the Spring Brake Actuator assembly

Prepare the FDB Actuator Bracket for assembly of the Spring Brake Actuator according to the FDB Service Manual.

Check that the FDB Mounting Bracket mounting surface is not cracked or damaged and is clean.

5.3. Preparation of the replacement Spring Brake Actuator before the installation

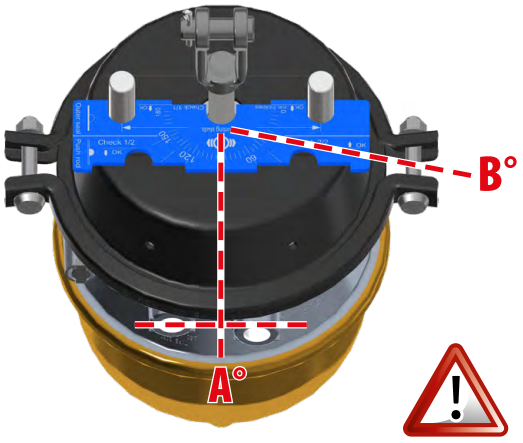
Make a final check that the replacement genuine Spring Brake Actuator matches the original in respect of Air connection Port´s Clamp ring angle and Push rod length.

5.3.1. Usage of the Knorr-Bremse Maintenance Gauge Service Tool K108806K50

5.3.1.1. Air connection Port(s) and Clamp ring orientation

Measure the angle (A) of the Air connection Ports on the Intermediate flange relative to the Mounting studs.

Measure the angle (B) of the Clamp ring on the Intermediate flange relative to the Mounting studs.



For help in usage of the Knorr-Bremse Maintenance Gauge see the animation Y193970 on the website: truckservices.knorr-bremse.com under Download Software then Animations. Other document´s refer Page 6.

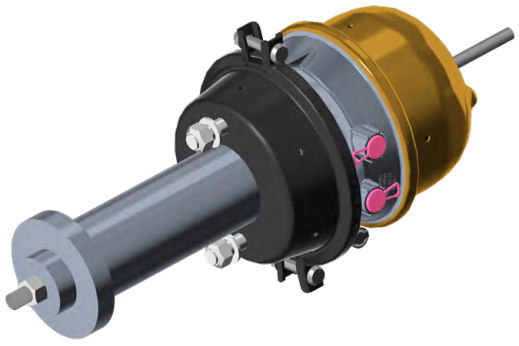
Air port and clamp ring orientations

If the replacement Actuator Spring brake Clamp ring and Air connection port positions are different to those on the original unit, the following procedure must be carefully followed.

Important Note:

Before any adjustments are made to Air connection port or Clamp ring angles, the High-performance Spring MUST be fully winded off.

Remove the Push rod Jam nut and place a suitable metal tube (not supplied by Knorr-Bremse) over the Push rod.



Replace and hand tighten the Jam nut against the Tube end then rotate it 2or 3 more turns to relieve the load of the Service return spring. The Clamp ring Fasteners can now be loosened so that it is possible to reposition the Rear housing and Clamp ring as required.

Ensure the Clamp ring is correctly located before tightening the fasteners. Tighten the Clamp ring Fasteners to **30 +24 Nm**.

Remove the Jam nut and the Tube from the Push rod.

Fully apply and release air pressure to Port 11 approximately 10 times. Re-tighten the Clamp ring fasteners to **30 + 24 Nm**.

Once again apply air pressure to Port 11 and check for leakage by applying a soap solution around the Clamp ring.

No leakage is allowed.

Warranty claims

Claims under warranty for leakage from the Clamp ring interface will not be honoured if the leakage is assessed to be as a direct result of re-orientation of the Air connection ports or Clamp rings.

5.3.1.3. Push rod protrusion

The measured Push rod protrusion refer chapter 6.1.4. should now be marked on the Push rod of the replacement unit. However, if the dimension included the old Welded Yoke, firstly screw on a new yoke and adjust it to the same dimension – measured to the Yoke Pin Centre line CL. Mark the Push rod to allow for full thread engagement.

Saw the Push rod to the marked length with a hacksaw and finally, using a suitable file, clean the end thread to accept the Yoke.

> **Note:**
>
> Do not cut the Push rod to length until the High-performance Spring is fully winded off.

5.3.1.4. Jam nut and Yoke assembly

Fit the Jam nut and Yoke assembly but do not tighten the Jam nut. If delivered tighten the Jam nut release.

5.3.1.5 Release bolt packaging

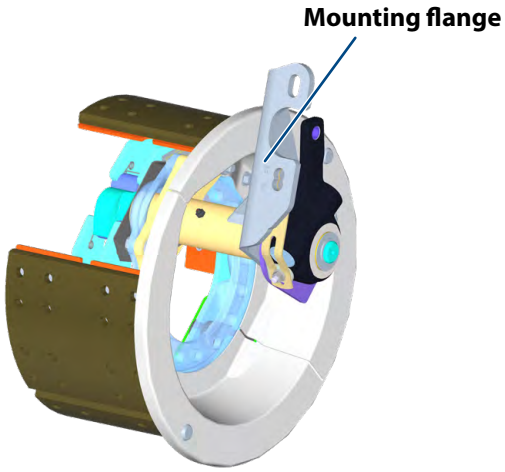
Ensure adequate clearance is provided behind the actuator to allow the Release bolt to be removed in case of needs.

5.4. Assembly and merge of Spring Brake Actuator together with FDB Mounting Bracket and Slack Adjuster Lever

Move the Hand brake valve lever to the "run" position (Foundation Drum Brakes are released).

5 Installation of the Spring Brake Actuator to the vehicle

Before mounting the Spring Brake Actuator on the FDB Mounting Bracket, the front Mounting flange surface (in contact with the FDB Mounting Bracket) must be inspected (not cracked or damaged) and cleaned.



Assemble the genuine new Spring Brake Actuator on the FDB Mounting Bracket. Always respect the orientations of the Air connection Ports 11 and 12.

Use suitable Foundation Drum Brake Mounting Bracket with adequate stability (material thickness). Hole dimensions according to DIN Plain Mounting face, only primed (**maximum thickness 0.1 mm**), not final coated. Direct contact of the full surface of the Actuator Spring brake Mounting flange must be made with the Foundation Drum Brake Mounting Bracket. No spacing washers, adapter plates or other elements are allowed.

Manually fit 2 new and unused M16x1.5 Self-locking Nuts (parts included in the Knorr-Bremse genuine Mounting kit PN II36860) and tighten alternatively in line with recommended following procedure:

- Apply a pre-torque of 120 Nm on Nut #1 and Nut #2
- Apply a final torque Nut #1 and Nut #2, see chart:

Final torque	
Self-locking Nuts (EN ISO 10513)	200 $^{+10/-20}$ Nm
Alternative(Standard Nuts & Washer)	180 $^{+30}$ Nm

General requirements of mechanical engineering concerning progressive tightening must be followed.

Important Note:

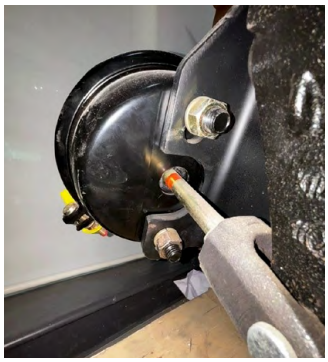
Washers are not supplied by Knorr-Bremse. In case you decide to use Nut and Washers, they must be fitted between the Mounting nuts and the FDB Mounting Bracket - never between the Spring Brake Actuator NPP and the FDB Mounting Bracket.

Caution!

Do not re-use the old Nuts – interface to FDB Mounting Bracket is safety feature.

The use of an electric torque gun (Nut runner) to tighten the Nuts is recommended.

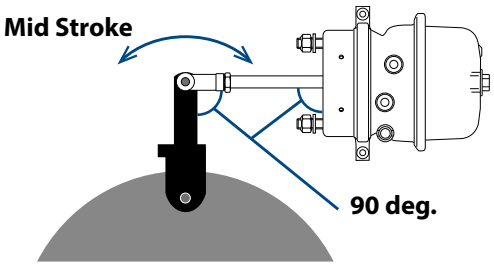
Do not use an impact wrench.



Note:

Nut#1 is the one which is in higher position or less accessible from the operator who assembles the Spring brake Actuator.

5.4.1. Setting of the Yoke assembly



Check that the Yoke thread is fully engaged on the Push rod. Rotate the Yoke assembly so that its Jaw is correctly aligned with the Slack Adjuster Lever.

Wind the Slack Adjuster Lever to meet the Yoke.

Note:

This applies to manual and also to the automatic Slack Adjusters (ASA). NEVER pull the Yoke and Push rod forward to meet the Slack Adjuster Lever.

After applying grease to the Yoke pin and Yoke holes, insert the Yoke pin into the Yoke assembly and fit the new Split pin. Ensure the legs of the Split pin are spread so that it cannot fall out during the vehicle run later.

Finally, tighten the Jam Nut to a torque of **34-68 Nm**.

Important Note:

The optimum efficiency of the Spring Brake Actuator installation is ensured if the following condition is fulfilled:

The angles between Push rod and Slack Adjuster Lever and between Push rod and Mounting bracket should each be approximately 90 deg., when the Push rod is at its mid-stroke position.

5.4.2. Release (uncaging) of the compressed High-power Spring from the Spring Brake Actuator

Use a 19 mm A/F - across flats - spanner and rotate the Release nut in an anti-clockwise direction (INFO: tightening torque **68 Nm MAX**) until the Release bolt is in the fully wound out position.

Take out the "T" End of the Release bolt from the inside of the Rear housing of the Pressure plate internal slot. Unscrew completely the Release nut and remove together with the Release washer.

Clip inside of the Rear housing hole the Dust plug and ensure it fits and seals the release mechanism hole.

Do not use an impact wrench.

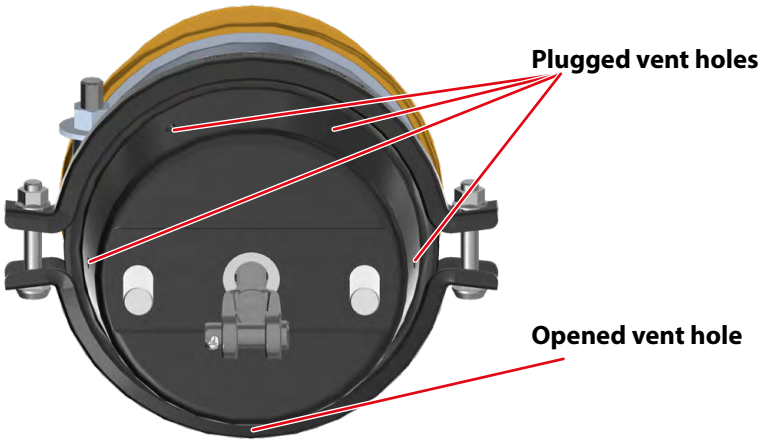
a Place the Release bolt into the storage pocket on the side of the Intermediate flange and manually pre-tighten the Release nut with the Release washer, located only between the Release nut and Intermediate flange.

Final tightening torque for the Release bolt assembly in the pocket has to be **14 Nm MIN** unless otherwise specified.

Do not use an impact wrench.

5.4.3. Service portion vent drain (breathing) hole(s)

After installation of the Spring Brake Actuator on the vehicle make sure that there is an open vent drain hole in the service portion Non-pressure plate (NPP) of the Service Brake Actuator pointing towards the ground with **± 30° MAX** tolerance.



It is recommended by Knorr-Bremse to plug any other vent holes with plugs (included in the service kits) to decrease dust and water continual ingress inside of the NPP.

5.5. Port Connection to the Air Brake Circuits

All the sealing surfaces (Sealing washer, front surface of the Non-pressure plate, Air connection Ports, …) between the Spring Brake Actuator and the Air brake circuits or the braking system must be undamaged and clean.

Correctly connect Air service brake hose to Air connection Port 11 and Air parking brake hose to Air connection Port 12 (Port 11 & 12 are marked on the Intermediate flange of the Spring Brake Actuator) and be sure that the hoses are not twisted or in contact with moveable vehicle components.

Knorr-Bremse genuine Air connector fittings should be tightened to **40** $^{+5}$ **Nm**.

Other Air connection Port Fittings must be tightened according to value indicated by the vehicle manufacturer or in line with Service Kit producer advise.

All Connection Port Fittings has to be checked to ensure that there is no leakage during operation of the Spring Brake Actuator.

5.6. Testing

5.6.1. Final check of the installation setup

Check of the successful installation of Spring Brake Actuator on the FDB Mounting Bracket and Slack Adjuster Lever.

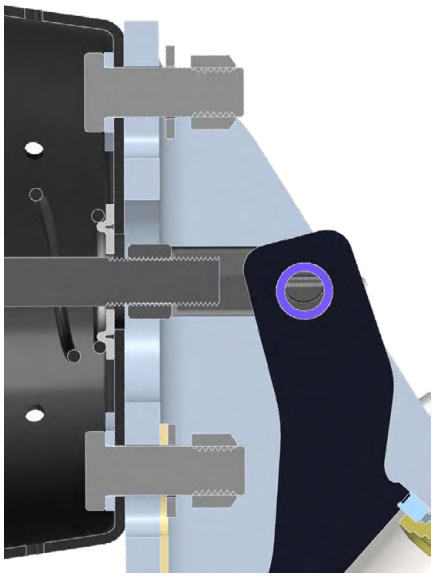
Note:

The Push rod pivoting angle must not exceed **± 3°** in all directions during the actuation´s.

Provide the test for leakage and check the brake functionality and effectiveness before operation.

Service portion

Apply Air pressure of approximately 10 bar 10 times to Air connection Port 11 by using the Foot brake pedal. During these applications, check the Air tightness of the Spring Brake Actuator in the Clamp ring area using a leakage detection fluid or a soap solution and also check other Air supply interfaces like i.e.. Air connection Port 11 fitting.



FDB Mounting bracket and Spring Brake Actuator Interface cross section

Parking portion

Apply the Air pressure to the Air connection Port 12 of the Spring Brake Actuator by using the Hand brake valve lever (parking brake in "released" position) and keep the High-power Spring compressed. Check the correct function of the parking brake.

Apply the Air pressure of more than 1 bar to Air connection Port 11 using the Foot brake pedal and check for correct function of the service brake.

Move hand brake lever to the 'park' position (brakes applied).

Before driving the vehicle, perform several applications of the service and parking brakes.

Refer to the vehicle manufacturer's instruction for any further recommendations regarding correct adjustment of the brakes and check for correct operation.

6. Replacement of Spring Brake Actuator

6.1. Removal of the old Spring Brake Actuator from the Vehicle

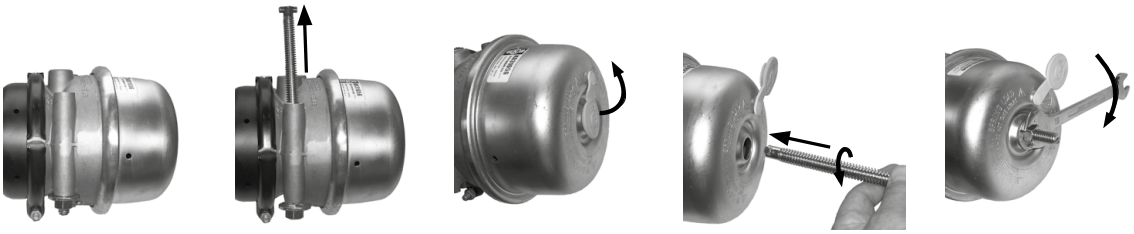
Caution!

Knorr-Bremse recommends replacement of Spring Brake Actuators always in axle sets.

6.1.1. Vehicle stabilization against rolling

Ventilate the Air connection Port 12 via the Hand brake valve lever (to the "park" position Foundation Drum Brakes activated). Then ensure that Air connection Port 11 and 12 are free of Air pressure. Ensure vehicle wheels are chocked.

6.1.2. Winding-off the High-power Spring

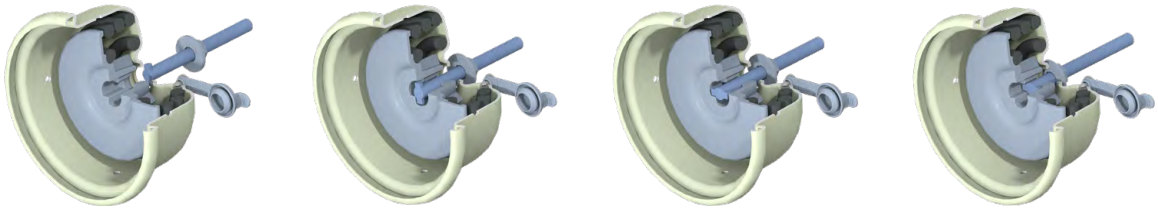


1 2 3 4 5

Set that the Hand brake valve lever in the "run" position (parking Foundation Drum Brake in "released" position). Air connection Port 12 is with Air pressure now.

Unclip and unplug the Dust plug.

6.1.2.1 T-bolt function explanation



1 2 3 4

Remove the Release bolt from the storage pocket on the side of the Intermediate flange and fully place the "T" End inside of the Rear housing into to the Pressure plate internal slot.

Turn until the tabs are locked up. Manually tighten up the Release nut with Release washer until the mechanical contact with the Rear housing is established (as shown on the picture 1-4).

Fully wind-off the parking brake High-power spring using the Release nut.

For that operation use a 19 mm A/F - across flats - spanner, rotate and Release nut in a clockwise direction not exceed **68 Nm** applied torque.

Do not use an impact wrench.

6.1.3. Disconnection

Release the Air from Parking brake portion by moving the Hand brake valve lever to the "park" position (brakes applied).

Disconnect Air pressure hoses from Air connection Ports 11 and 12 taking careful note of which hose is connected to each port for correct reinstallation.

Remove the Split Pin and Yoke Pin from the Yoke Assembly.

Cover the Air connection Ports with plugs to prevent entry of dirt or fluid inside.

Untight and remove Spring Brake Actuator Mounting Nuts and remove Washers (if previously fitted) – Nuts and Washers cannot be re-used and has to be environmentally friendly scrapped.

Remove Spring Brake Actuator from the common FDB Mounting Bracket interface.

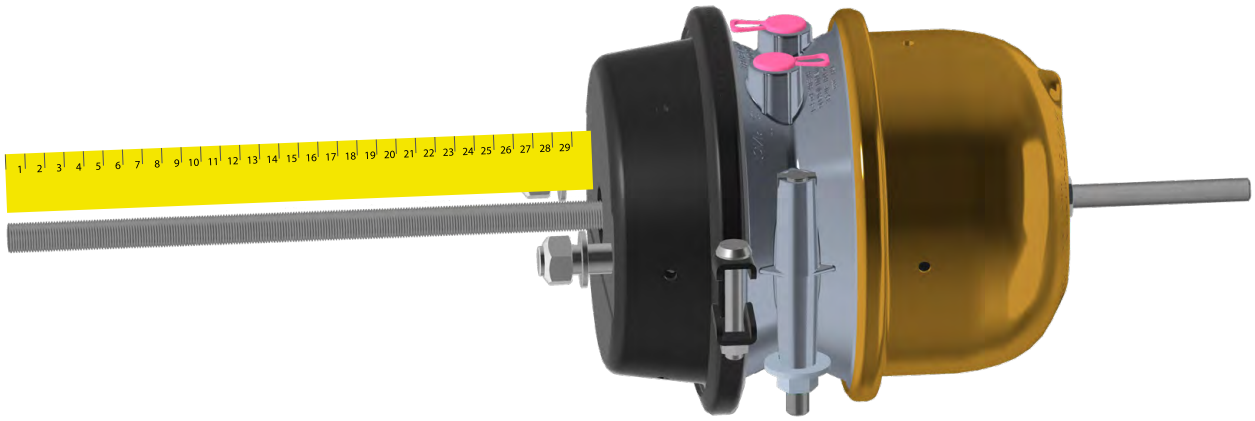
6.1.4. Determination the correct Push rod length from the replaced unit

To measure the push rod length, the High-Power Spring MUST be in the fully wound off condition – see instructions in Section 5.4.2. above.

Measure the distance between the Push rod end and the Mounting face - see picture. If the replaced unit has a Welded yoke to the Push rod, measure between the Yoke pin Centre line CL and the Mounting face.

Note:

If the old unit is damaged, it is possible that the Push rod is not fully retracted. To check for this, push the Push rod into the unit and hold it there, whilst taking this measurement.



6.1.5. Selection of the correct size of replacement Spring brake

The Type number and Part number of the Spring brake is being shown on the label of the original unit.

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