



Wheels
Brakes
Tires
Hydraulic hoses/ fittings



BERINGER Team



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Owner - R&D



Véronique Béringer
Owner - Marketing



Claire Béringer
Owner - General Manager



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BERINGER AERO USA



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BERINGER AERO USA

Quality and Performance since 1985

- 1985** Gilbert Béringer created BERINGER Company helped by his wife Véronique. He has been manufacturing wheels, forks and side cars for motorbikes and then brakes, in the same spirit of quality and performance for 30 years. BERINGER braking products for motorbikes and cars have been accepted by the well-known racing teams for their exceptional reliability, allowing BERINGER to be used by many teams in the World Endurance Championships with many World Champion titles. This was all made possible by a team of exceptional mechanical engineers who have studied and developed new products whose performance/weight ratio is without precedent, for each specific use.
- 2002** BERINGER Wheels & Brakes was born, when Gilbert Béringer, also a pilot and aircraft builder fond of aviation, decided to apply his patented high performance braking solutions to the aeronautical world.
- 2007** Rémi Béringer, son of Gilbert and Véronique, joined the Company after he graduated as Mechanical Dipl. Engineer. Also fond of aviation, he designed with Gilbert most of the products dedicated to light-sport aircraft, Formula One Racers, gliders and various fast machines.
- 2009** BERINGER Company sold motorbike and car activities to focus on the development of wheels & brakes for aircraft. BERINGER AERO was born.
- 2011** BERINGER AERO moved to the airport of Gap-Tallard in the south of France, in a new building dedicated to aviation, with a direct access to the runway. This new plant consists of offices, workshops, and test room with the dyno and test benches designed by Rémi. A hangar welcomes the aircraft receiving the wheel & brake prototypes for the tests.
Claire Béringer, daughter of Gilbert and Véronique, joined the Company after she graduated as Aeronautical & Energy Dipl. Engineer (including 5 months at Oakland University–Detroit, MI) topped with a Master's degree in Commercial and Management Operations.
- 2012** BERINGER AERO USA Inc. was born in Chicago to answer the US customer needs. Viviane Michaud, also from Béringer's family, is in charge of the subsidiary.
- 2015** BERINGER celebrated the 30th anniversary of the Company. The ALG landing gear was designed to improve the safety of Taildragger Aircraft.
- 2016** BERINGER AERO USA moves to Greenville, South Carolina. For personal reasons, Rémi decides to leave the Company.

A flying family

In Béringer family, everybody flies: Gilbert, Véronique and Claire fly with their homebuilt tail dragger and also with ultralight Aircraft and gliders.

An advanced technology

BERINGER makes wheels and braking systems for a wide range of aircraft, from light aircraft up to its now-standard STC for the Pilatus PC-6, and the Cirrus SR20/22 plus complete kits for many popular aircraft, that include everything for a bolt-on conversion. These innovations are covered by nine patents and have allowed BERINGER brakes to take a decisive technological lead. The new ALG undercarriage is covered by a patent.

Quality and Certification

Of course, BERINGER® controls product quality to ensure total reliability to the users of wheels and brakes. This is evidenced by the Alternative Procedures to Design Organisation Agreement given by EASA in 2006 and by the Production Organisation Agreement given by DGAC in 2008.



? How can I order BERINGER parts

You can order through the BERINGER network as listed from the website.

Call us or send an e-mail at contact@beringer-aero.com at any time and we will return some ideas.

? I have a technical question. Who can help?

Our Service Centers are able to answer many technical questions, but for a precise technical or engineering question, please contact BERINGER directly.

? Why are most BERINGER wheels made for tubeless tires?

Tubeless has many advantages compared to tube type:

safer (less risk of puncture)

weight saving (a tube weights around 1 to 2 lbs)

cost effective (no tube means no tube to buy)

These are the same reasons why nowadays you find tubeless wheels on cars, motorcycles, and all commercial airplanes. Tubeless designs have specific features to be airtight (most designs use o-rings) and precise machining to ensure proper contact between tire and wheel.

? How can I choose the correct wheels, tires and brakes?

First, select your tires according to your use: What kinds of runways: grass, concrete, rough?

Match the wheel to the tires. (See our tire-wheel application chart in the catalog.)

The brakes you need will depend mostly on the weight of the aircraft and the landing speed, though tire size can come into play at the extremes of the size ranges: to get close, use the formula to calculate the Kinetic energy needed (see the catalogue page 9). Many popular setups are already listed p.10-17.

? How do I know the type of brake fluid to fill my brake system?

The type of brake fluid to use is most of the time written directly on the brake caliper and on m. cyls. DOT4 usually has yellow to amber color and MINERAL ("Mil spec" or "aviation") brake fluid is red. If you have any doubt please contact your BERINGER SERVICE CENTER.

? I filled my brake system with the wrong brake fluid: what can I do?

The wrong brake fluid will damage the seals after only few minutes of contact. This is potentially dangerous because after a short period your brakes can lock, leak or stop working properly. If you have put the wrong fluid into the system, you will have to change all the seals of the entire system. (Note: this is true, regardless which brand of brake parts you use.) If you have a BERINGER system, ask BERINGER for repair kits or send the parts back to BERINGER service for repair.

? If I switch to BERINGER Wheels/Brakes do I also need to change my M. Cylinders?

If they are compatible with the brake fluid then you still need to check the hydraulic ratio: with our brakes we recommend using M. Cyl.s with a piston bore of 1/2» (9/16" maximum). If the bore of the M. Cyl.s is too big, they cannot produce enough pressure to provide enough braking torque on the wheels. Some master cylinders are so crude (or just so old) that the inherent smoothness and feel of BERINGER calipers can be masked in operation; for this reason, we recommend using only BERINGER master cylinders.

? I want to improve my Wheel & Brake system but BERINGER prices are too high.

BERINGER systems are a little more expensive than ordinary products but thanks to their exceptional reliability and life, the operating cost is much more economical. It is often possible to pay back your investment in 1 or 2 years, with brake components that last, lines that don't leak, pads that have 3-5 times the life of legacy pads, quicker and simpler pad replacements, no tube expenses, no bearing maintenance, and (with ALIR), fewer flat-spotted tires and straighter, shorter stops. And all that time, you are enjoying better, smoother braking. (And BERINGER wheels save weight and look good, too.)

BERINGER respects our Planet

BERINGER AERO's commitment to sustainable development

Respect for the Environment

At BERINGER, toxic substances and non recyclable materials are eliminated from the fabrication process. Workshop trash is sorted prior to disposal.

An environmental awareness campaign is in force and consistently reviewed.

Reduction of Energy Consumption

Our specially-designed bioclimatic building (BBC) made of local wood only consumes only 10% of the energy required to heat or cool a conventional steel building.

98% of the energy used to heat our water is solar-powered

BERINGER employs vehicles using propane (LPG): they have reduced CO2 emissions and have no particulate emissions.

Eco-Designs for Products

BERINGER products are designed to have a virtually unlimited service life, because pieces that are worn down can be replaced.

Components are 99% recyclable.

98% of the products are made in France, within a radius of 200 miles; this process reduces transportation and energizes local industrial bases.

Respect for Human Dignity in the Workplace

From one end of the assembly line to another, from in-house to subcontractors, BERINGER staff members work in optimal conditions following the regulations of OIT (International Work Organization).

BERINGER does not award contracts based on "lowest-cost," and does not use outsourcing.

Respect for the Ethics of Economics

BERINGER partners (suppliers, subcontractors, banks, clients) are chosen based on ethical criteria, not only the lowest price

BERINGER commits to projects based on their moral philosophy :

- BERINGER wheels are not involved in projects that could intentionally threaten human life.
- BERINGER has partnerships in eco-friendly projects (e.g., Green challenge, SolarImpulse).

Zero Compromise on Quality

At BERINGER, quality is not only respect for procedures that the EASA certifies, such as the Design Approval Organization and the Production Approval Organization (Part 21G). Quality is a pledge of trust to our clients: our clients entrust us with their lives. To remain worthy of this trust, we offer a lifetime warranty (liability insurance) on materials and craftsmanship on all our products.

BERINGER integrates its partners in the projects, from design to commercialization

AeroProviders : a group of suppliers for Light Aviation manufacturers

PEGASE : innovation and development group of companies working for Aviation

Hautes Alpes Développement: Development Agency for local companies In Hautes Alpes department (region) of France.



Since 2010 the **MADE IN RESPECT** label has been recognizing BERINGER AERO's commitment to sustainable development.



On February 34th, 2012, BERINGER AERO won the **Trophée RSE PACA TPE** (Social Responsibility of the Companies).



In July 2015, the specific Know-how of BERINGER AERO has been recognized through the Label **Entreprise du Patrimoine Vivant EPV**.

GENERAL MAINTENANCE AND INSTALLATION MANUAL

The following instructions details are general instructions concerning BERINGER wheels and brakes. They can be used for the installation of BERINGER products on Light and Experimental airplanes.

If you have purchased products for a certified Aircraft you must refer to the Maintenance and Overhaul Manual in reference with your products.

The word “equipment” as used in this document is the entire unit : complete wheel or wheel with brake and disc.

“Wheel” or “wheel assembly” includes flanges, central spacer, bearings, circlips, assembly bolts, clips, valve and seals

“Brake” or “caliper” or “brake assembly” includes housing, pistons, seals, back plate, bolts, pads and disc. The disc is not bolted on the wheel so it is not considered to be part of the wheel assembly. The disc is also not fixed to the brake but for convenience it is considered as part of the brake assembly.

“Pad” includes the brake lining and the steel plate supporting the brake lining. Lining is the wearable material. Please note that “pad” is always used in this document because in BERINGER systems the lining is part of the pad and cannot be taken apart from the steel plate.

Cleaning

The aluminum parts are protected from corrosion with an anodizing coating. This thin coating does not protect against basic agent with pH > 9.

CAUTION: Cleaning the wheel and brake parts with basic agent may remove totally the anodizing coating

Acid agent may also attack the anodizing.

For cleaning the wheel and brake parts we recommend using only water and soap or dry clothes.

CONDITIONNING PROCEDURE

When new brake pads have been installed, it is important to condition them properly to obtain the best service life. Rated brake torque value is reached only after a full and proper conditioning of brake pads and discs.

CAUTION: Brake torque value can be only 50% of rated brake torque before conditioning. It means that even with full brake effort the aircraft will not stop as usual. Pilot must take into consideration this parameter to avoid loss of aircraft control during the conditioning procedure.

CONDITIONNING PROCEDURE:

1. Taxi aircraft for 500m (1500 feet) with light brake effort.
2. Perform two (2) consecutive stops from 50-55 km/h / 30-35 knots down to 10km/h / 5 knots. Apply light brake effort during these two stops; do not try to apply full brake effort.

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3. Allow the brakes to cool down for 10 to 15 minutes.
4. Apply brakes and check their efficiency at full throttle (same rpm as for a run up). If brakes hold, conditioning is completed.
5. If brakes cannot hold aircraft during static run-up, allow the brakes to cool completely and repeat steps 1 through 4.

This conditioning procedure will wear off high spots and prepare pads and disc friction surfaces. A visual inspection of the disc will indicate the pad condition: a smooth surface with light and regular grooves indicates that the pads and disc are properly conditioned.

NOTE: A rough surface of disc with deep grooves and isolated bumps indicates that an excessive brake effort has been applied during conditioning. In this case, bumps must be sanded and conditioning procedure repeated.

CAUTION: A wrong conditioning may affect brake performance and increase wear of pads and disc.

WHEELS

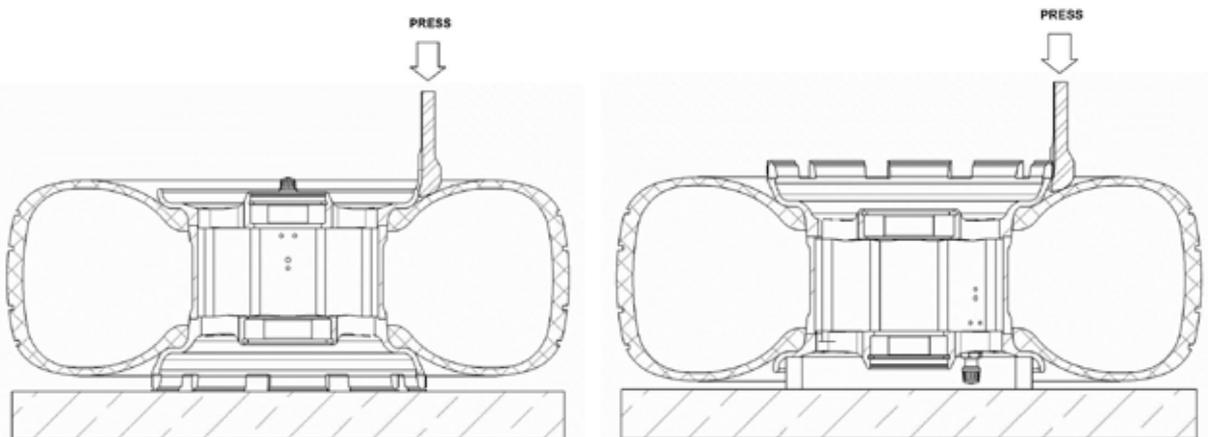
Disassembly – Reassembly – Tire change

DISASSEMBLY:

WARNING: Do not attempt to disassemble wheel until tire has been completely deflated. Otherwise, serious injury to personnel or damage to equipment can result.

WARNING: Do not attempt to remove valve core until tire has been completely deflated. Valve core will be ejected at high speed if unscrewed before air pressure has been released.

- a) remove wheel from aircraft (tire+rims)
- b) remove valve cap and apply a tire deflator to release tire pressure completely. Then remove the valve core.
- c) break the beads away from the wheel flanges by applying pressure by hand or using a wood or plastic tool as close to the tire bead as possible. Tire lubricant may be used to help. Repeat the operation every 90° on both sides, see pictures next:



Maintenance/Installation Manual

CAUTION: Do not pry between tire bead and wheel flange, this may destroy the structural and sealing properties of the wheel and tire.

- d) Remove all screws holding wheel halves together.

CAUTION: Do not use impact or power wrenches

Do not remove assembly screws before the tire beads are fully free from the wheel

- e) Separate wheel halves, remove the tire and o-ring
f) Carefully lay the wheel halves on a flat clean bench.

CLEANING:

- a) Clean all metal parts using water and soap, then wipe dry with a clean cloth. Valve core and central spacer must not be cleaned with solvent.

CAUTION: Do not use basic or acid agent on wheel halves. Anodizing can be totally removed within few minutes in contact with basic agent. Make sure that cleaning soap is not basic.

CAUTION: Sealing of ball bearings must not be damaged or cleaned with solvent.

- b) Clean wheel bead seat with evaporative solvent and wipe dry with a clean cloth.

CAUTION: oil-based solvent must not be used on wheel bead seat because tire will not stick properly on the wheel.

WARNING: evaporative solvents are toxic and volatile. Use a well-ventilated room. Avoid contact with skin or clothing. Do not inhale the vapor.

- c) Apply air pressure to dry internal threads

CAUTION: oil-based solvent or oily air pressure must not be used on internal thread because threadlocker will not properly lock the screws.

REASSEMBLY:

Tools and lubricants required:

- Plywood tool with conical bushing (recommended)
- Threadlocker medium strength Loctite 243
- Tire lubricant
- Evaporative solvent
- Torque wrench

- a) Check ball bearings and seals, replace them if required
b) Make sure that the inside of tire is clean and dry. Clean tire bead seat with a cloth impregnated with evaporative solvent to remove residual grease or wax

CAUTION: oil-based solvent must not be used on tire bead seat because tire will not stick properly on the wheel.

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Procedure to change tire on the BERINGER wheel SL & LE 6 inch - LIGHT 5 and 6 inch - CLASSIC 6 inch

B. To remove the tire:

- 1 Deflate the tire to zero pressure, unscrew the needle valve.
- 2 Separate the tire from the 2 sides of the wheel, specified below:

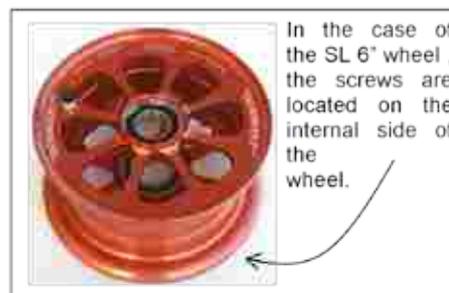


- Press the tire with a clamp until the separation with the wheel. .
- CAUTION:** Do not pry on the side of the wheel.
- Turn 90° and press again.
- Continue turning 90° and pressing till the tire is totally separated.
- Use tire mounting lubricant to facilitate the separation of the tire.



- Invert the wheel and do the same operation.
- Use tire mounting lubricant to facilitate the separation of the tire.

- 3 Check that the tire is totally free from the wheel: *The tire can rotate on the wheel by hand turning. It is recommended to spray a tire mounting lubricant to make the separation easier.*
- 4 Remove the M6 screws and lay them on the work-bench, as detailed on the photos.



- 5 Extract the side of the wheel which has the disc brackets, see photos below:



Revert the whole wheel with the tire delicately.



Pull up delicately by hand the side of the wheel with disc brackets.
CAUTION: No extra force is needed if the tire is correctly separated.



TAKE CARE
of the O-ring

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6 Remove the tire from the 2 other parts of the wheel, as detailed below.



Spray tire mounting lubricant between the tire and the wheel.



BE CAREFUL this operation is delicate !
Pull up the tire and push the wheel at the same time with the thumbs.

7 When the tire is removed, clean all the parts. The wheel is ready for mounting a new tire, as detailed after.

CAUTION :

Use brand new O-rings clean and lubricated with a light coat of grease for bearings when you change the tire.

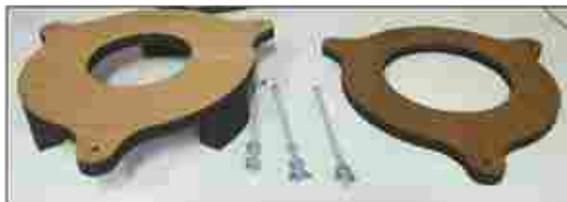


C. To mount a new tire:

NOTE : - Mounting correctly a brand new tire is not possible without the special tool:
Ref. OPA01 (5" wheel) et Ref. OPA02 (6" wheel).
- A proper mounting could not be guaranteed without using this special tool.

All the parts must be clean and dry

Special tools for tire mounting



WARNING: The following steps are different depending on the type of wheel: **SL, Light or Classic.**

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1 type of wheel: **SL and LE 6" wheel** (wheel in 2 parts)



Clean all the parts.
COMMENT: You must use a brand new O-ring kit at each tire changing.
Place the external part of the wheel on the special tool.



Clean the 2 tire flanges with thinner to remove residual wax.



Spray tire mounting lubricant on the tire flanges.

BE CAREFUL: The tire has a red triangle that must be in front of the valve.



- Place the second part of the special tool then insert the 3 bolts.
- Press the tire with the tool till the tire flange is totally under the level of the horizontal surface of the wheel.
- Clean the horizontal surface of the wheel.



Clean with pressurized air or dry cloth the other wheel flange. Check that there is no dirt in the ring groove.



Insert the new O-ring in the ring groove.



Place the flange with O-ring onto the other side of the wheel.



Put Loctite 243 (blue) at the end of each screw.



Insert all the screws that bolt the 2 wheel flanges.

Then refer to chapter: **D. To screw the wheel** page 6

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2

type of wheel: LIGHT wheel (wheel in 3 parts)



Remove the needle valve with the appropriate tool as detailed above.



Ø 3mm axle without sharp edges



Small O-ring

Large O-ring

- Insert a Ø 3mm axle without sharp edges in the valve hole.
- Insert the small O-ring (clean and dry) on the Ø 3mm axle.
- Check that there is no dirt in the ring groove.
- Insert the large O-ring on the side of the wheel (clean and lubricated).



Place the wheel spacer on the wheel flange and press by hand, as shown above. Check that the 2 parts are in contact.



Clean all the parts.
COMMENT: You must use a brand new O-ring kit at each tire changing. Place the 2 wheel parts previously assembled (spacer and flange) on the special tool in the right orientation for the tire mounting.



Clean the 2 tire flanges with thinner to remove residual wax.



Spray tire mounting lubricant on the tire flanges.

BE CAREFUL: The tire has a red triangle that must be in front of the valve.



- Place the conical aluminium tool on the wheel spacer as shown above.
- Spray tire mounting lubricant on this tool then put the tire on it.
- Press by hand to insert the tire on the wheel.



- Place the second part of the special tool then insert the 3 bolts.
- Press the tire with the tool till the tire flange is totally under the level of the horizontal surface of the wheel.
- Clean the horizontal surface of the wheel.



Place the whole assembly on the wheel flange as shown above.
BE CAREFUL: The O-ring must stay in the ring groove during this operation.



Put Loctite 243 (blue) at the end of each screw.



Insert all the screws that bolt the 2 wheel flanges.

Then refer to chapter:
D. To screw the wheel page 6

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3

type of wheel: **CLASSIC wheel** (flanges without holes)



Wire without sharp edges.

Large O-ring



- Insert a wire without sharp edges in the valve hole.
- Check that there is no dirt in the large O-ring groove.
- Insert the large O-ring on the side of the wheel (clean and lubricated).



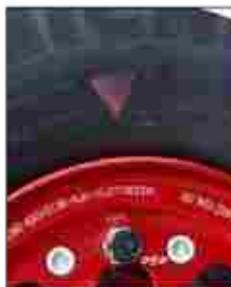
Place the wheel spacer on the wheel flange and press by hand, as shown. Check that the 2 parts are in contact.



Clean all the parts.
COMMENT: You must use a brand new O-ring kit at each tire changing. Place the 2 wheel parts previously assembled (spacer and flange) on the special tool in the right orientation for the tire mounting.



Clean the 2 tire flanges with thinner to remove residual wax.



Spray tire mounting lubricant on the tire flanges.

BE CAREFUL: The tire has a red triangle that must be in front of the valve.



- Place the conical aluminum tool on the wheel spacer as shown above.
- Spray tire mounting lubricant on this tool then put the tire on it.
- Press by hand to insert the tire on the wheel.



- Place the second part of the special tool then insert the 3 bolts.
- Press the tire with the tool till the tire flange is totally under the level of the horizontal surface of the wheel.
- Clean the horizontal surface of the wheel.



Place the 2 guide screws in 2 opposite holes on the wheel flange as illustrated.



Place the whole assembly on the wheel flange as shown above.

BE CAREFUL: The O-ring must stay in the ring groove during this operation.



Put Loctite 243 (blue) at the end of each screw.



Insert all the screws that bolt the 2 wheel flanges.

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D. To screw the wheel:



Tighten all the wheel screws to contact (2 to 4 Nm).

BE CAREFUL

Respect the order when you torque tighten the 8 x M6 screws.



Torque tighten to 10N.m (+-1Nm) equivalent to 1m.kg (+-0.1m.kg)

Then torque tighten twice each screw to 10N.m .

E. To inflate the tire:



- Screw the needle valve with the appropriate tool.
- Inflate the tire to the appropriate air pressure.
- 24h later : check that the air leak is not more than 10%
- Inflate tire to the appropriate air pressure and screw the valve cap.

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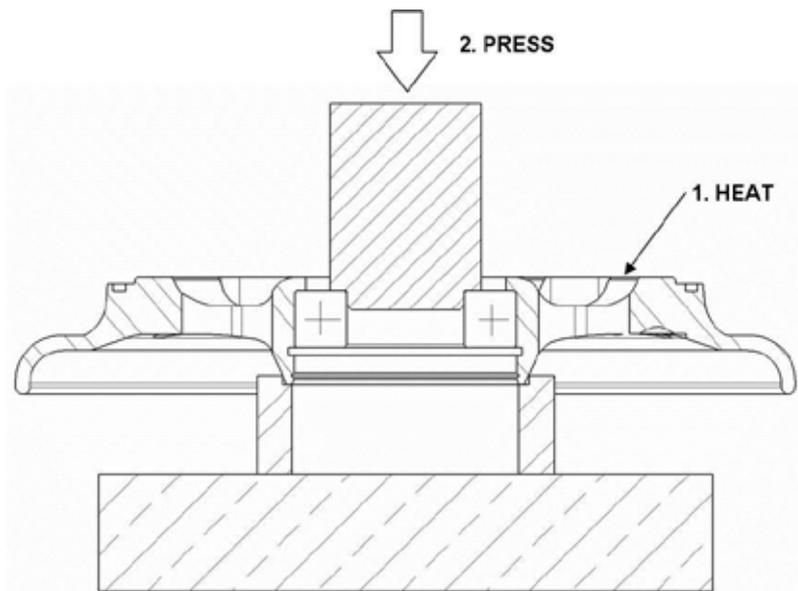
Maintenance of wheel assembly

The maintenance consists in the inspection of the wheel parts and if required the replacement of next parts:

- sealed ball bearings
- circlips
- assembly screws
- clips

NOTE: Maintenance can be performed by BERINGER service center.

- Disassemble the wheel following the previous procedure
 - Remove circlips on wheel half with lock ring pliers
 - Place wheel flange in an oven at 110°C (230°F) to 120°C (250°F) for 30 minutes, never exceed 150°C (300°F) (or use a heat gun at same temperatures)
 - Remove wheel half from heat source and immediately remove bearing. If the bearing does not fall out by himself: tap it evenly with a fiber drift pin or use a suitable arbor press.
- CAUTION: Do not reuse a ball bearing that has already been mounted, even if in new condition.



- Remove screws and clips if they are out of tolerance.

CAUTION: Clip screws have been mounted with threadlocker: do not force while screwing out the small screws otherwise you may break the screw.

CLEANING:

Clean all metal parts using water with soap or cleaning solvent and wipe dry with a clean cloth.

CAUTION: Do not use basic or acid agent on wheel halves. Anodizing can be totally removed within few minutes in contact with basic agent. Make sure that cleaning soap is not basic.

Apply air pressure to dry internal threads

CAUTION: oil-based solvent or oily air pressure must not be used on internal thread because thread-locker will not properly lock the screws.

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INSPECTION:

Visually inspect wheel flanges for cracks, nicks, corrosion, or other damage.

Causes for replacement of wheel flanges:

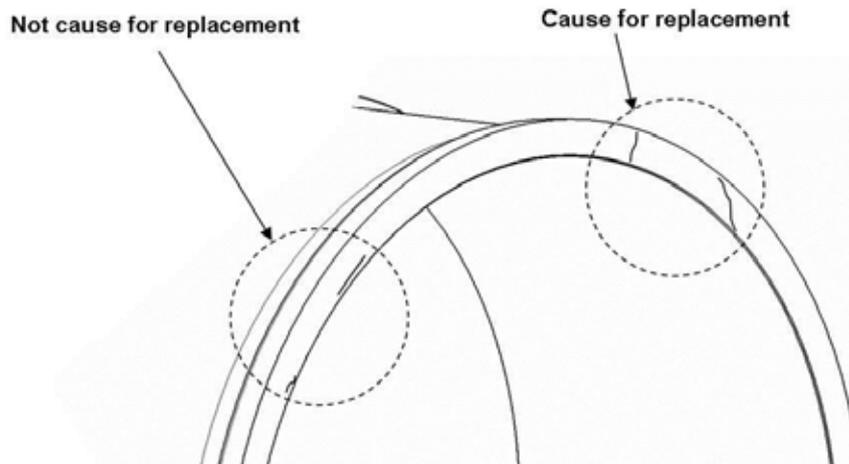
1. Signs of deep corrosion in critical areas
2. Anodizing color removed on more than 15% of external surface
3. Heavy nicks
4. Deformed flanges
5. Damaged bearing bore
6. Crack

CAUTION: Anodizing coating must not be painted.
Do not use sandpaper on any parts. Sandpaper will remove anodizing coating.

Visually inspect outer wheel half for scratches, nicks, corrosion, or other damage.

Causes for replacement of outer wheel half :

1. Signs of deep corrosion in critical areas
2. Anodizing color removed on more than 15% of external surface
3. Heavy nicks
4. Scratches on sealing surfaces in contact with o-ring
5. Crack



REASSEMBLY:

- a) Place wheel flange in an oven at 110°C (230°F) to 120°C (250°F) for 30 minutes, never exceed 150°C (300°F) (or use a heat gun at same temperatures)

CAUTION: Do not attempt to install bearing without heating the wheel flange, it will damage bearing bore.

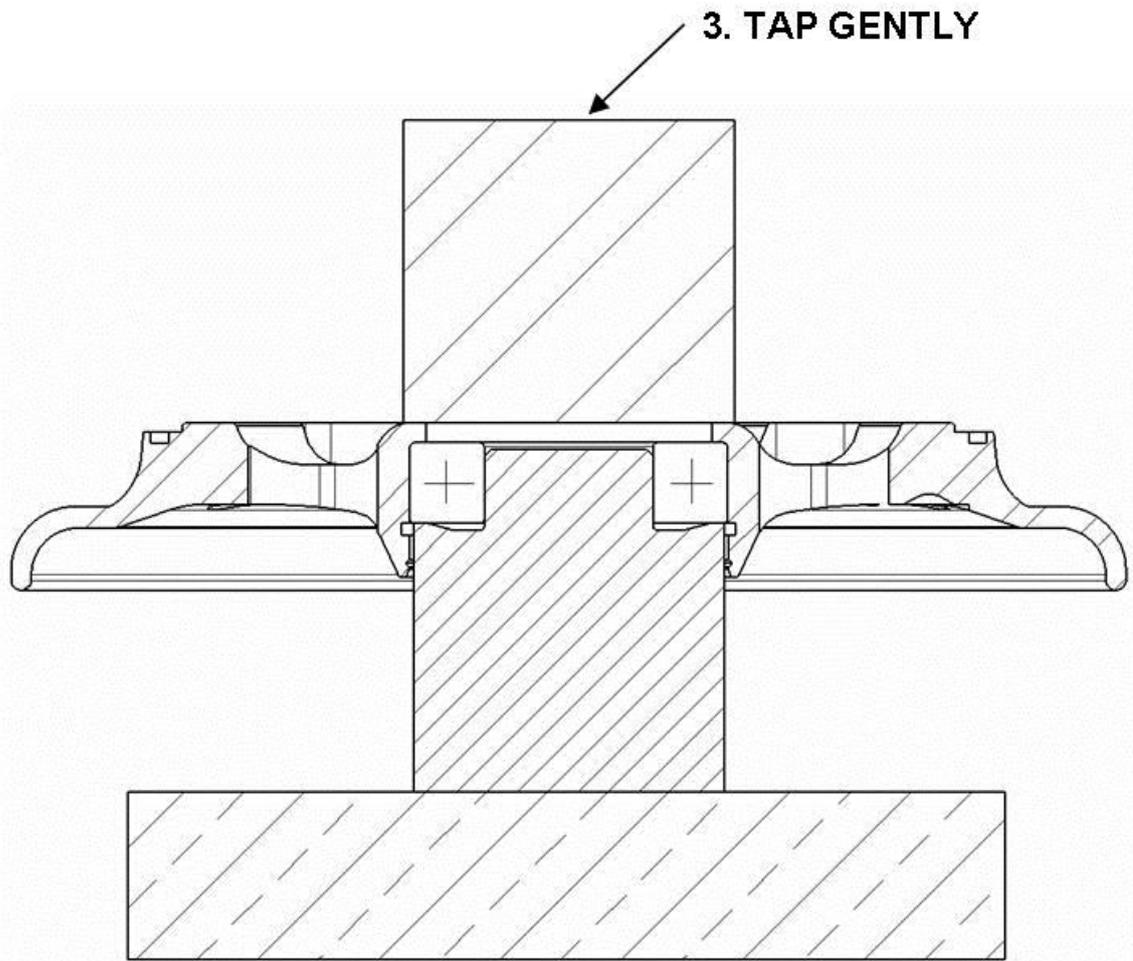
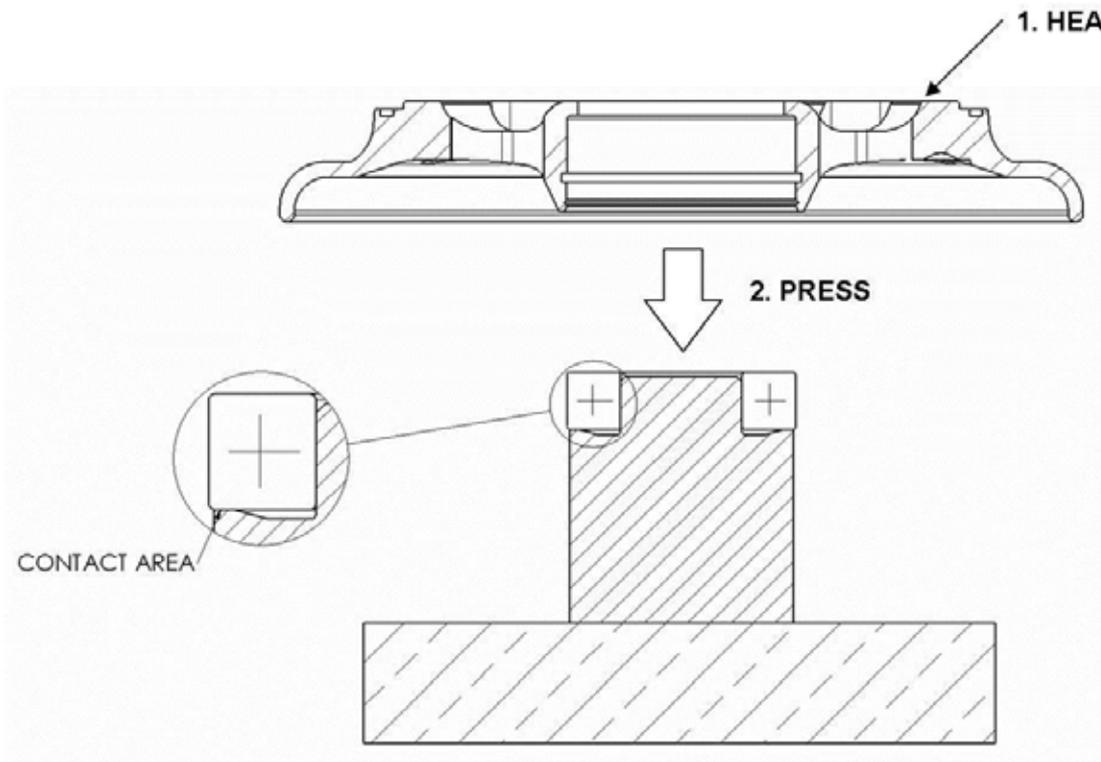
- b) Use a new sealed ball bearing

CAUTION: Do not reuse a ball bearing that has already been mounted, even if in new condition.
CAUTION: Use only a ball bearing approved by BERINGER. There are many different qualities in ball bearings and most of them are not compliant with BERINGER requirements.

- c) Install the ball bearing into bearing bore of heated wheel flange using appropriate tool. Tap gently into place with a fiber drift making sure cup is evenly seated against shoulder of wheel half.

CAUTION: Do not use a hammer to press bearing, it will damage balls and cause failure of ball bearing

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- d) After cooling down period, install new circlips
- e) Check that circlips are in place

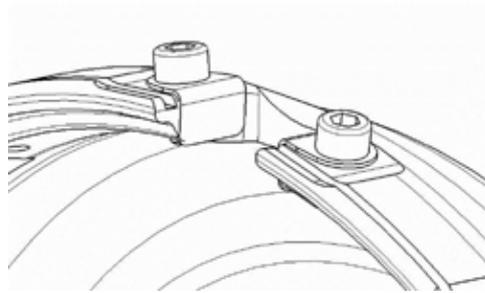
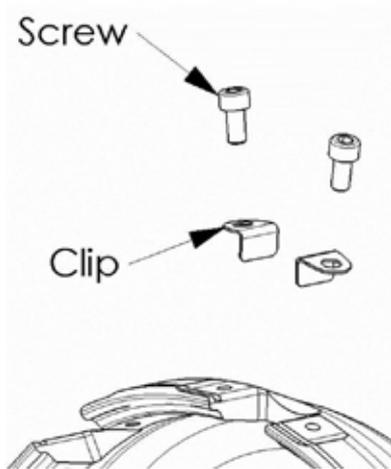
CAUTION: Circlips maintain ball bearing, if circlips are not in place bearing can slide out and cause the blocking of the wheel.

- f) If clips have been removed then install new clips and new screws
- g) Put a drop of threadlocker high strength (Loctite 271 recommended) on each end of the clip screw

CAUTION: using a wrong threadlocker or not from recommended type may cause loose of screws or removal problem. Do not leave threadlocker more than few minutes on the screw.

- h) Torque tighten to 1.5 N.m (13 in-lb) while pressing the clip onto the rim with a grip
- i) Check that disc slides without effort in wheel slots.

NOTE: if disc cannot slide in the slots, remove concerning clip and install again.



Overhaul of wheel assembly

The overhaul of the wheel assembly consists in maintenance plus next operations:

- new anodizing
- detailed inspection of the wheel flanges and central spacer

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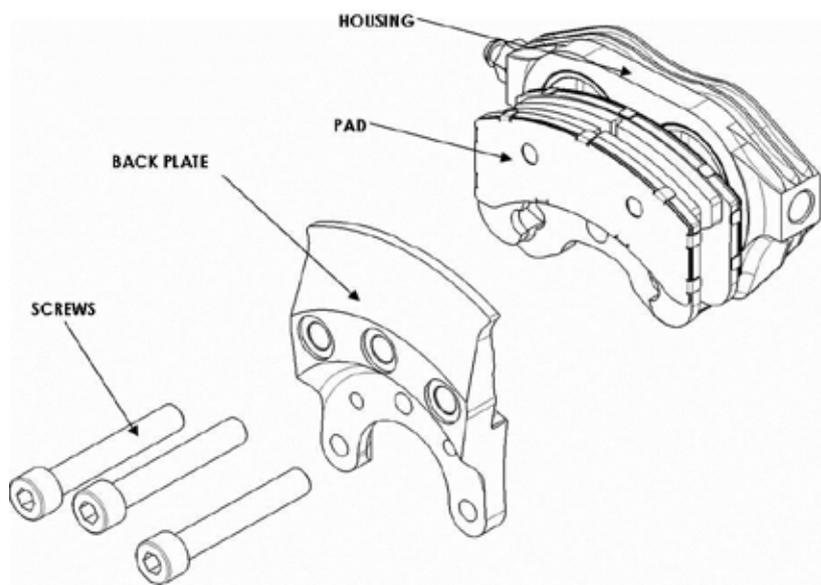
BRAKE ASSEMBLY

Description

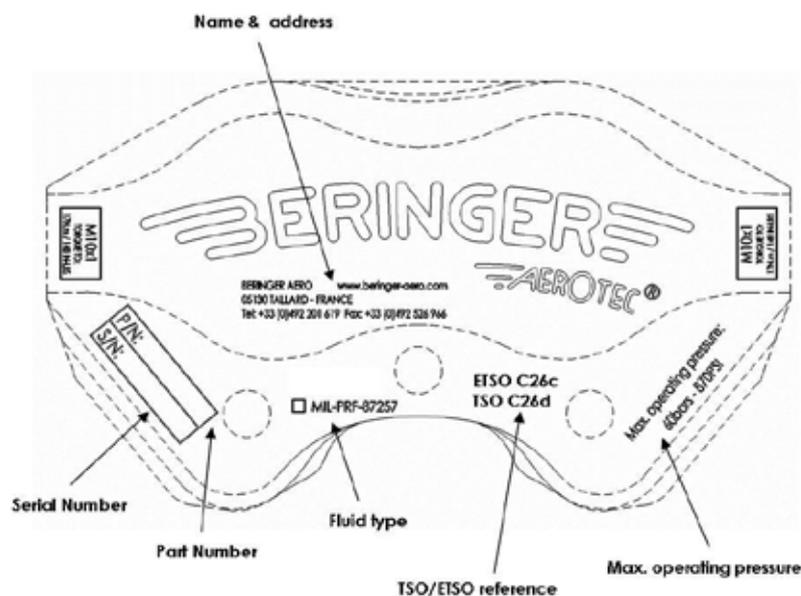
Brake caliper are made of aluminum alloy. A thin anodizing coating protects aluminum from corrosion. Anodizing does not protect from nicks and scratches.

Calipers are in 2 separated parts bolted together: the housing with pistons and the back side or back plate.

To assure equal pressure on both brake pads, disc is floating and brake pads can slide on 2 of the 3 assembly screws.



Brake housing is equipped with the same inlet port on each side to be used on left or right strut of the aircraft. The unused port is sealed by a bleeding screw. Inlet and outlet port have Metric M10x1 internal thread.



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Maintenance of brake assembly

The maintenance consists in the inspection of brake caliper and the replacement of next parts:

- piston seals
- pistons
- Assembly screws
- Bleeding screw
- Banjo Screw
- Copper washers

NOTE: Maintenance can be performed by BERINGER service center.

DISASSEMBLY:

- a) Remove wheel from the aircraft
- b) Remove caliper assembly from the axle, disconnect from brake hose.
- c) Remove assembly screws, remove pads and back plate
- d) Remove pistons

NOTE: Air pressure can be used to remove pistons. Replace caliper back plate and blow air pressure into inlet.

WARNING: Pistons will be ejected at high speed. Serious injury to personnel can result if precautionary measures are ignored.

- e) Remove seals with a plastic clamp or a thin plastic plate.

CAUTION: Do not use a screw driver.

Do not use a metal plate or tool even from soft metal like aluminum, it will scratch the seal groove and cause fluid leakage.

- f) Remove bleeding screw

CLEANING:

Clean all metal parts using water with soap or cleaning solvent and wipe dry with a clean cloth.

CAUTION: Do not use basic or acid agent on wheel halves. Anodizing can be totally removed within few minutes in contact with basic agent. Make sure that cleaning soap is not basic.

Clean seal grooves with a toothbrush or soft plastic brush and evaporative solvent. Make sure that no dust stays inside seal grooves

Apply air pressure to dry internal thread and seal groove

CAUTION: oil-based solvent or oily air pressure must not be used on internal thread because thread-locker will not properly lock the screws.

INSPECTION:

Visually inspect Caliper housing and back plate for cracks, nicks, corrosion, or other damage.

Causes for replacement of caliper housing:

1. Signs of deep corrosion
2. Anodizing color removed on more than 15% of external surface

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3. Heavy nicks
4. Anodizing removed on internal piston bore
5. Scratched piston bore
5. Scratched or damaged seal groove
6. Crack

CAUTION: Anodizing coating must not be painted.
Do not use sandpaper on any parts. Sandpaper will remove anodizing coating.

CAUTION: Do not try to sand or polish internal piston bore, it will remove anodizing coating.

REASSEMBLY:

- a) Lubricate new seals with a thin coat of thick silicone grease

CAUTION: Never reuse a piston seal that has already been removed from his groove.

- b) Lubricate piston bore with a thin coat of thick silicone grease

NOTE: Use silicone grease (-50°C to 200°C) compliant with FDA CFR art. 178.3570 (liquid grease in spray is not allowed)

- c) Insert seals in their groove only by hand.
- d) Lubricate piston cylinder with a thin coat of thick silicone grease

CAUTION: Do not use any tool for these operations.

- e) Insert new pistons into caliper housing only by hands. One or two fingers should be enough to push the piston.

CAUTION: Never push the pistons using a tool or a press. If pistons don't slide with hands they will be sticking. This can cause braking troubles and overheating.

NOTE: Do not try to sand or polish the pistons, they must be replaced by new ones with perfect polishing and controlled surface.

- f) Insert a new bleeding screw, change copper seals

CAUTION: Copper seals must be changed at each removal of the hydraulic fitting.

- g) Insert new brake pads
- h) Use new screws
- i) Put a drop of threadlocker medium strength (Loctite 243 recommended) on each end of the assembly screw.

CAUTION: using a wrong threadlocker or not from recommended type may cause loss of screws or removal problem.

- j) Screw to contact and torque tighten to 25 N.m (220 in-lb)
- k) Torque all screws a second time to 25 N.m (220 in-lb)

CAUTION: Check that brake pads can slide without effort

- l) Brake assembly is ready for installation on the aircraft

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TROUBLESHOOTING

This paragraph provides information necessary to identify, diagnose and correct potential problems which may occur with the wheel or brake assemblies.

TROUBLE	PROBABLE CAUSE	CORRECTION
1. Brakes won't hold	Improper conditioning of brake pads and disc	See the conditioning procedure §2
	Brake fluid or grease on disc and pads	Clean the disc and change the pads
	Wrong brake fluid has caused blocking of pistons	Change all seals of the system, put the right fluid
	Pads worn below minimum wear limits	Change brake pads
	Insufficient hydraulic pressure Improper master cylinder bore	Check the master cylinder type and geometry
2. Excessive toe pedal travel, spongy pedal or lever	Air in hydraulic system	Bleed the hydraulic system
	Leak in the system	Locate leak and repair
	Improper brake lines, too expandable	Replace brake lines
	Caliper assembly bolts are not tighten	Torque bolts to proper value
	Improper adjustment of master cylinder: does not release completely	Modify the pedal geometry or length of master cylinder
	Defective seal in master cylinder	Replace
3. Brake drag	Residual brake pressure due to improper adjustment of master cylinder: does not release completely	Modify the pedal geometry or length of master cylinder
	Residual brake pressure due to excessive pressure in the reservoir	Open and close the reservoir to release the pressure
	Wrong brake fluid has caused blocking of pistons	Change all seals of the system, put the right fluid
	Improper brake assembly fixing	Inspect and repair
	Pistons do not retract	Inspect for damage, change seals and pistons
	Pads are blocked and do not release	Inspect and repair
4. Rapid disc and pads wear	Improper conditioning of pads and disc	See the conditioning procedure §2
	Frequent overheating of disc and pads, brake is not adapted to the use	Replace brake assembly by another model with increased energy capacity
	Excessive rusting, scoring or pitting of brake disc	Repair or replace the disc and pads
5. Cracked or distorted wheel flanges	Improper tire inflation pressure	Replace wheel flange, check tire inflation pressure
	Loads applied excess the wheel load ratings	Change wheel model for a stronger one

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TROUBLE	PROBABLE CAUSE	CORRECTION
6. Rapid decrease of tire pressure (10 PSI per day)	Improper tire mounting, damaged seal	Disassemble and replace seals
	Leak at valve core	Replace valve core
7. Medium decrease of tire pressure (10 PSI per week)	Improper tire	Use only tubeless tires
	Scratches on sealing faces	Replace the part by a new one
	Defective valve core	Replace valve core
8. Slow decrease of tire pressure (10 PSI per month)	Standard decrease of pressure with some tubeless tires	Inflate tire to the appropriate pressure. Check inflation pressure every month.

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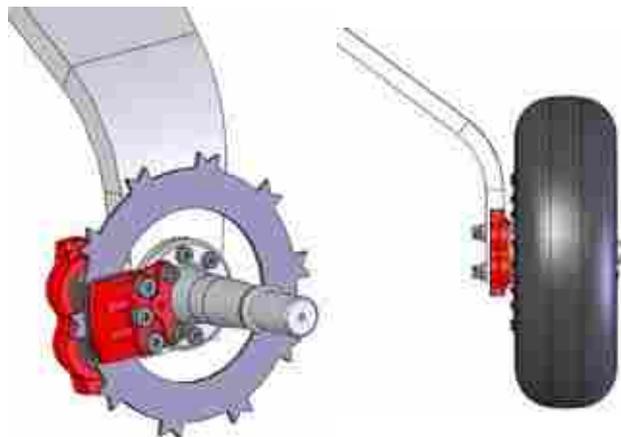
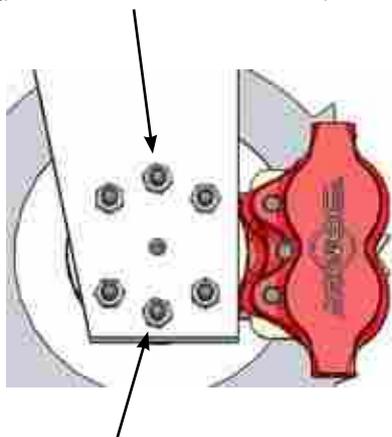
Installation of the main wheels with brake discs and calipers on the gear leg

Install the caliper mounted on the main wheel axle on the gear leg and put in the 6 screws (screw head must be on wheel side)

The locking nuts must be on the gear leg side

Put in the brake disc between the two brake pads : YOU MUST NOT DISASSEMBLE THE CALIPER TO DO THIS OPERATION

NYLSTOP STAINLESS STEEL NUT
(put washers in case of composite gear leg)



Tightening torque for the axle/gear leg linkage:

Screw 6mm = 10N.m (88 in.lb)

• screw ¼ pouce = 9N.m (80 in.lb)

• screw 8mm = 20N.m (177 in.lb)

Report to the instruction of the plane specific manual.

For certain mounting, a bearing spacer is delivered (to fit between the axle and the wheel)



- if one spacer is delivered, fit it on the axle
- put with the hand the wheel with the tire on the wheel. Help the disc to fit inside the slots. Do not force
- grease copiously the axle thread and screw the axle nut. Use the appropriate tightening tool
- tighten the screw until you feel the contact with the bearing (tightening

torque for information : 25N.m)

- you must ABSOLUTELY install the pin

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Nylstop slotted nut
ou slotted nut + pin



nut + pin

The LOCKING WIRE MUST ABSOLUTELY
and PROPERLY BE INSTALLED
BEFORE THE FLIGHT

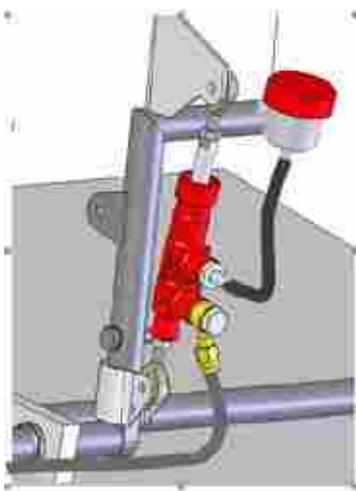


During the installation, you must check the following points:

- there is not play between the wheel and its axle
- the stainless steel locking wire limiting the disc is in place (wire diameter 1mm). You must check at each plane check before the flight that this locking wire is in proper place otherwise the disc could go out of its slots in the wheel.
- The wheels can freely rotate : airplane on blocks, wheel in the air, you must be able to rotate the wheel easily with the hand without special effort or hard spot.
- brakes locked, airplane on the ground , you must not be able to move the airplane.

INSTALLATION of the BRAKES :

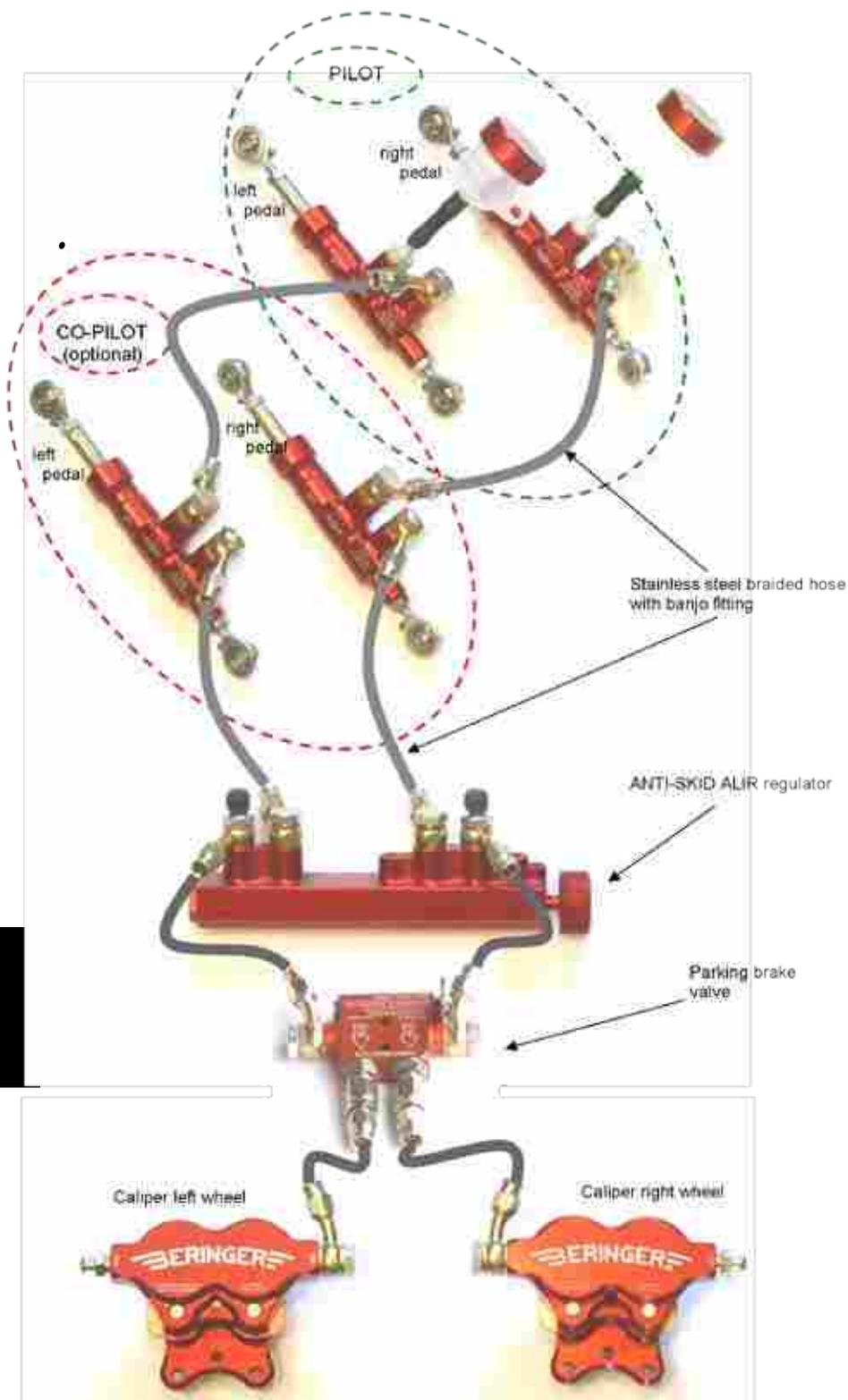
MASTER BRAKE CYLINDERS : depending on the aircraft, the master brake cylinder(s) are located on the control stick, on the pedals or between the seats and must be installed according to the state of art.



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BRAKE SCHEMATIC with balanced anti-skid ALIR REGULATOR case of DIFFERENTIAL BRAKING

Differential braking system with in-line balanced anti-lock regulator (ALIR anti-skid & in-line braking) and parking brake valve (master cylinders are mounted in serie)

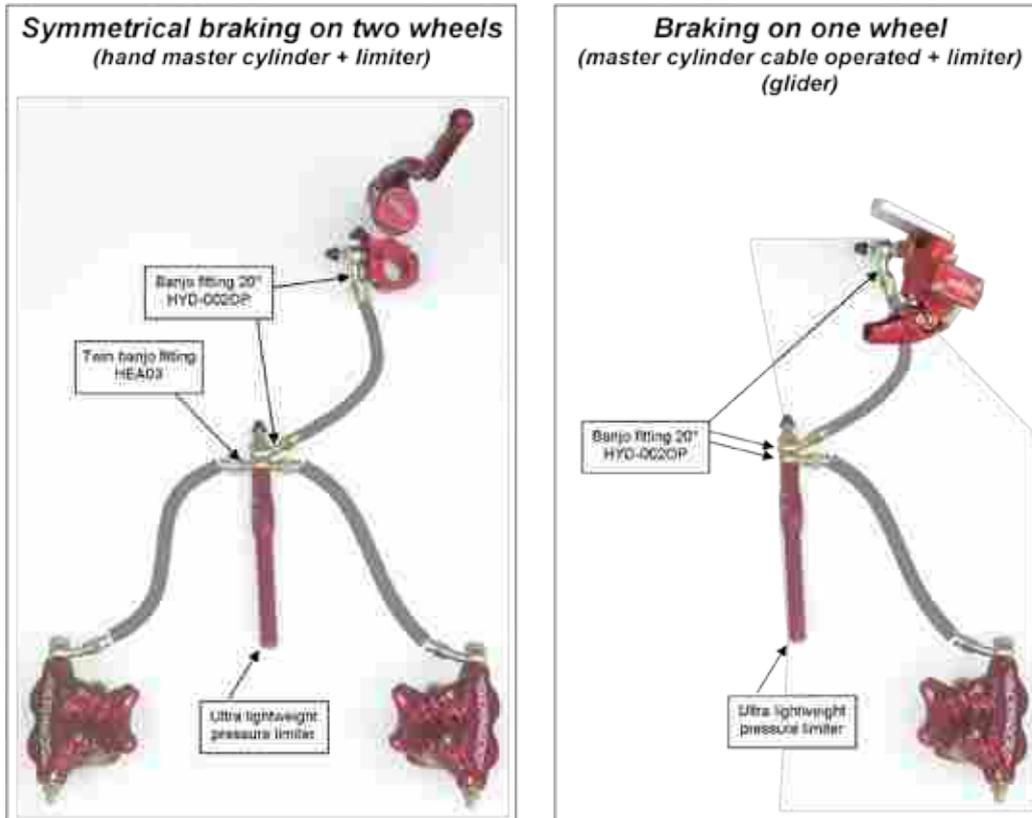


Tightening torque :
Banjo screw = 15-17N.m
(130-150 in.lb)

Bleeding screw = 15-17N.m
(130-150 in.lb)

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BRAKE SCHEMATIC with LIMITER case of a SYMMETRICAL BRAKING



Tightening torque :

Banjo screw = 15-17N.m (130-150 in.lb)

Bleeding screw = 15-17N.m (130-150 in.lb)

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Assembly instructions for hose and banjo fittings

Preliminary:

Tools needed to make a brake line:

- click-type torque wrench
- fine screwdriver
- Cutter plier

Safety instructions:

Brake lines must be made carefully. In the purpose to ensure an optimal safety of the brake system, the lines must be done as describe next.

In case of any question or problem, please contact BERINGER.

1- A banjo fitting is made of the 3 following parts :



2- Cut the hose to the required length :



- Using a fine tooth saw blade or cutter plier, cut hose to the required length.
- Clean any loose debris from both the cut ends and inside the hose.
- Then use a flat pliers to make the hole circular, as shown on the picture below.

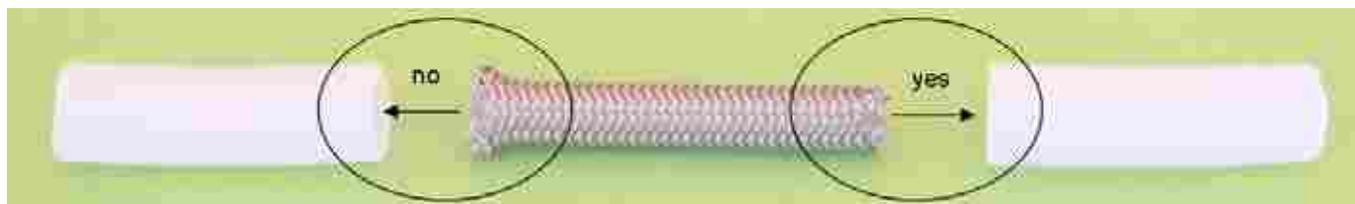


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WARNING concerning the installation of the stainless steel braided hose in a tube or in the landing gear leg:

Due to the stainless steel braid, when you cut the hose, the two sides of the hose are not identical:

- On one side the braid retracts and it becomes easy to insert it into a tube or into the landing gear leg.
- On the other side, the braid expands and it is difficult to insert it in any tube or LG leg.



3- Push one socket over the overbraid working and flare out end of stainless steel from the PTFE inner tube :



Flare out stainless steel from PTFE tube (5mm length min.)

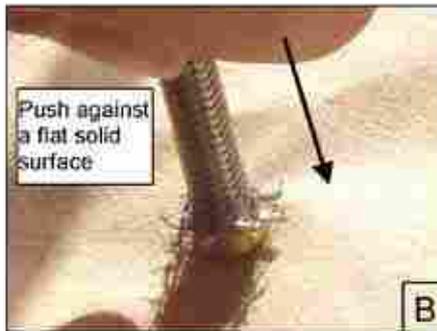
Use a fine screwdriver.



4- Insert the olive :



Push the olive onto the end of PTFE inner tube and under the stainless steel braid. Make sure that all stainless steel filaments are outside of the olive.



Push against a flat solid surface



PTFE tube must be in contact with the olive

Make sure that PTFE tube is fully homed in the olive.

5- Insert main fitting body :



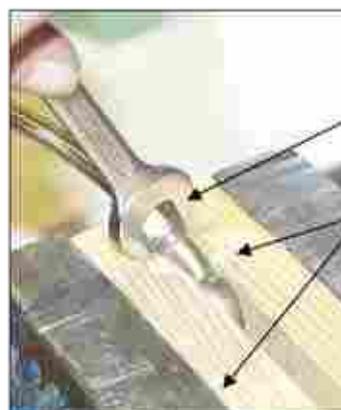
Put lubricant

Push between hands the main fitting body and hose as shown on left picture.

Turn with hand the main fitting body to start threading the socket as shown on picture below.



6- Finish tightening the socket onto the fitting :



Torque tightening the socket at 10N.m to 15N.m (90 IN-LBS to 132 IN-LBS)

Maintain with wood plates to preserve the main fitting body

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Brake system bleeding procedure

A. Bleeding of the braking system :

1- Tools

- Pressure bleeder kit
- lots of rags

2- Method

To bleed the brake system consists in removing all air bubbles. If bleeding is not done properly, bubbles can stay in the brake system. It will result in poor brake performances, or no brake torque at all.

Next are some recommendations:

- open the reservoir of the master cylinder : remove the reservoir cap and replace it with the proper cap delivered in the bleeding kit. Then connect the small bottle to the cap as shown on the photo.



- Open the bleeding screw of the caliper



- Connect the pressure tank to the bleeding screw of the caliper as shown on the photo

- Protect CAREFULLY the brake disc and the brake pads from the brake fluid.

- Fill in the pressure tank with brake fluid
- Pump on to the handle of the pressure tank to reach a 15psi pressure
- The fluid goes from the caliper up to the master cylinder reservoir



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- When the reservoir is full, the extra fluid goes away to the small bleeding bottle through the transparent hose. You can see the air bubbles leaving the circuit through this hose.
- The bleeding operation is completed when no bubble can be seen any more in the hose

At this step, you should have some brake pressure when pulling master cylinder lever.

If you feel no effort at all on the master cylinder lever, that means too much air bubbles are still in the brake system. Repeat the operation taking care that you still have fluid in the tank under pressure.

- In order to help the bleeding process, release and pull lever 5-6 times and check if lever is harder to pull (or push) than before.

When the bleeding is completed on the first wheel:

- Close the bleeder screw of the caliper
- Disconnect the hose of the caliper
- Repeat the same operation on the other wheel.

When the bleeding is completed **on both wheels.**

- Disconnect the hose of the bleeding bottle
- Remove carefully the bleeding cap of the reservoir
- Replace it with the normal reservoir cap

**Air bubbles stay always at upper points
Check your brake lines
Bleeders should be at each upper point
of the brake system**

Do not use thinner or equivalent, it will damage the seals inside the braking parts.

Clean the parts only with dry rags or with soaper water

B. SECURITY CHECKS before flying :

it is necessary to check next points before the first flight

- All bolts and nuts must be torqued to appropriate value and locked with wire.
- Distance between controls and new parts must be checked.
- Wheels must turn freely on the axle (2 revolutions min. when turning with hand).
- Safety wire around the disc must be in place.
- Level of brake fluid adjusted to maximum (indicated on reservoir).
- Clean brake fluid with dry rags.
- Place lever in parking position during 15min and check eventual leakage of fluid around parts and fittings. Torque again if necessary.
- Place lever in parking position and check that plane cannot be moved by 2-3 persons.

On the ground:

- Check brake efficiency: performs 2-3 stops at low speed on taxiway (do not perform more than 2-3 consecutive brakings, system can overheat).
- place lever in parking position and apply engine power: the plane should not move at all, even at full power.
- After these tests, check again that wheel are turning freely when brakes are released (2 revolution min. when turning by hand).

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ATTENTION: Brake efficiency can be surprising. Make sure than you can control the new brake system before flying.

For any question, please contact directly BERINGER AERO

HOW TO SET the ALIR REGULATOR

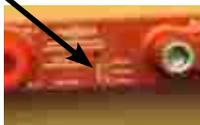
The ALIR anti-skid regulator can prevent the wheel locking if it is properly set.

When you rotate the thumbwheel, you change the maximum pressure available in the wheel brakes.

You look at the thumbwheel in front of you :

- if you rotate it clockwise : the braking power increases
- if you rotate it anti-clockwise : the braking power decreases

The coarse setting is indicated on the top of the regulator:
As example, on the picture, the lowest pressure indicated is 20 bars and the maximum pressure 50 bars.



1 click on the thumbwheel = 1 bar
1 revolution of the thumbwheel = 5 clicks = 5 bars

Setting :

First of all, you must have done approximately twenty landings to run in the brakes (report to the chapter BRAKES RUNNING IN) **with the regulator set at a 20 bars pressure approximately.**

Then you will do braking tests with the aircraft **at low load** to evaluate what is happening:

- if the deceleration is not enough : increase the pressure of the regulator
- if the wheels are locking : decrease the pressure of the regulator until the wheel locking disappear
- in the case of a tail dragger, if the tail lifts up : decrease the pressure of the regulator

BRAKES RUNNING IN :

You **MUST RUN IN** properly the brake pads and the discs to ensure the best performance and the best life time to the brakes.

Running in instruction : during 20 to 30 landings :

- brakes must be operated smoothly
- without too strong effort on the brake controls (master brake cylinders)
- without heating the brakes

nota : **TAKE CARE** that braking efficiency is reduced by approximately 50% when the brakes are new. This warning is also available when you put new brake pads and discs.

Life time of wear parts

For certified parts (STC - TSO) you must refer to the according Maintenance Manual

Wear parts :	Limit wear allowed :
Brake pads (linings)	Min. thickness : 1mm (0.039 Inch)
Replacement of the discs	Min. thickness : 2.8mm (0.109 Inch)
Replacement of the wheel protection clips (internal rim)	Play between disc and rim >0.8mm (0.0315 Inch) measured with a gauge block
Replacement of the wheel o'rings :	
5" wheel : Ø118 (2x) and Ø2.8 (1x)	
6" wheel in 3 parts: Ø142 (2x) and Ø2.8 (1x)	
6" wheel Classic : Ø130 (1x) and Ø142 (1x)	
6" wheel SL in 2 parts : Ø142 (1x)	each time you disassemble the wheel
Brake fluid : depending on which type	

Maintenance cycle

For certified parts (STC - TSO) you must refer to the according Maintenance Manual

Life time of BERINGER products depends on the way you use them. In any case the following maintenance cycles are maximum limits. In case of intensive use, the wear of parts must be more often checked and replaced.

Check of the different parts of the equipment:	New material	Annual check	Replace-ment advice
Thickness of brake pad compound	3mm	x	
Thickness of the brake disc	3mm	x	
Radial play between disc and internal rim	0 to 0.4	x	
Brake fluid level	maxi	x	
Replacement of the brake disc	neuf		5 years
Replacement of caliper pistons and piston seals	neuf		10 years
Replacement of o'ring seals, bearings and screws of the wheels	neuf		10 years

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Following products: wheel, caliper, master cylinder, anti-lock regulator are safety parts. They have been assembled with strict procedures and tested to ensure a total reliability.

- Disassembling without respecting the proper procedures will cancel the guaranty.
- Consult us before disassembling any product, we will send you the adapted procedures.

IMPORTANT NOTES :

Use only WATER or SOAPED WATER to clean BERINGER products. Do not use any thinner or cleaning sprays, it will damage the seals. Do not use any grease or lubricants that are not prescribe by BERINGER, they may be not compatible with seals.

- In case of problem, contact us before doing anything on the products.
- Use only the type of brake fluid indicated on the parts from a sealed bottle in our brake parts.

Procedure to change brake pads on brake caliper

1- Remove the 3 screws M8

Heat the caliper to 60-80°C can help to remove the screws.

Screws to be removed



2- Clean the outsides of the pistons all around with a dry cloth

3- Push back the pistons with one finger (no force is needed)

If you cannot push back the piston with one finger, caliper must be checked and rebuilt.



4- Assemble the pads and back plate of the caliper with the caliper body

- Put blue Loctite 243 on the end of each screw and all of them

- Then torque to **25N.m** each screw
(respect of torque value is very important).

Torque to 25N.m
(220 IN.LBS)



- Put a drop of white paint between each screw and back plate

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