



EdgePerformance AS

1417, 1484 & 1621cc Big-Bore Kit Installation Instructions

Please read all the instructions thoroughly before starting.



Each big bore kit comes with:

- 4x cylinders
- 4x pistons
- Piston rings and circlips pre-installed
- Big bore gasket set
- Cir-clip plunger tool

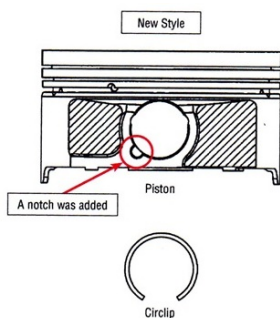
1. Each cylinder comes with pre-installed pistons, where the piston rings have been filed to proper end gap, rings oriented the correct way, and one circlip installed into each piston. Take a close look to see which side of the piston the circlip has been pre-installed into so that you put the cylinders on in the right order. The cylinders are cleaned and pre-lubricated ready for installation. **DO NOT REMOVE THE PISTONS FROM THE CYLINDERS.** Doing so will void any warranty as the risk of ring damage is severe.

Removal of the old cylinders and pistons

2. Drain the engine coolant by removing the expansion tank cap and undo the M6x35 stainless steel allen screw with copper washer located at the bottom of the water pump.
3. Remove all 4 exhaust manifolds. Remove the M6 allen screws from the intake manifolds so they can each be lifted out of the way. Remove the upper & lower coolant hoses on the cylinder heads. Stuff clean rags or paper into the exposed ports to prevent loose objects and contamination from falling into them.
4. Number the heads and valve covers 1-2-3-4 with a marker to ensure reinstallation in the same location.
5. Remove the valve covers. Keep the M6x30 mm Allen screws and washers with the covers.
6. Loosen the head bolts $\frac{1}{4}$ turn at a time until completely loose (to prevent warping). Remove the head while keeping the pushrods in the pushrod tubes. (Each rod is mated to its respective rocker arm and cam follower.
7. Start by removing the two front cylinders (1 & 2). Slide each cylinder off the studs, catching the piston so that the connecting rod does not slam into the crankcase. Leave the piston hanging in the connecting rod and stuff a clean shop rag or towel into the crankcase to prevent loose objects from falling into it. Remove the front piston pin retaining clip (facing the propeller) using a small screwdriver or a picker in the notch at the bottom of the wrist pin hole. The wrist pins may be loose enough to extract by pushing them out with your fingers. If too tight, use a wrist pin extractor (Rotax part no. 877091 or similar). Remove the rear cylinders (3 & 4) and pistons in the same manner.
8. Clean the cylinder mating surface on the crankcase with Loctite 7063 Super Clean (or standard brake cleaner) and wipe dry.

Installation of new cylinders and pistons

9. Check all the cylinder studs for tightness (removing the old heads may have loosened the studs). Retorque each stud to 3Nm (26 in-lbs) using a double-nut technique (may require using standard M8 x 1.25 nuts rather than the stock flanged nuts). Thread two nuts onto the stud and tighten them against each other. Then tighten the stud by applying torque to the outer nut.
10. Clean the base of the cylinders and cylinder heads with Loctite 7063 Super Clean (or standard brake cleaner) and wipe dry. Apply a thin coat of Wacker P12 high-temp silicone grease on the top of the cylinder where it mates to the cylinder head.
11. Apply the new cylinder base O-rings and install the new cylinders with pistons in place in the reverse order of removal. Start with the rear two cylinders. Apply a generous amount of engine oil to the wrist pin and wrist pin bore. Slide each cylinder onto the case studs and align the connecting rod with the wrist pin hole in the piston. Ensure that the installed piston pin circlip faces aft. Push the wrist pin through the connecting rod from the front until it lands on the aft piston pin circlip. Install the front piston pin circlip. Now slide the cylinder all the way down so that it mates with the crankcase. Ensure to hold the cylinders installed in place with your hands while you turn the crankshaft to extend the connecting rod that you are installing the next cylinder and piston assembly onto. **Take note on how to use the circlip plunger tool and how the circlip should be orientated in the figures below. The opening in the circlip should be facing down at 6 o'clock. Also take great caution not to overcompress the circlip when inserting it into the tool.**



12. Carefully slide the cylinder heads onto the stud bolts. Ensure the piston in the cylinder you are working on is at TDC. Right before the push rod tubes enters the bores in the crankcase, install the pre-oiled 16x5 O-rings on to the oil return (pushrod) tubes. Ensure that these O-rings are generously lubricated with engine oil. With the head and cylinder almost touching, gently push the head and cylinder together until the centering lip on the top of the cylinder fully engages into the bore in the cylinder head. Now push the cylinder head and cylinder together as a unit toward the crankcase while working the oil return tube O-rings into their receptacles until the entire assembly mates with the crankcase. Inspect the oil return tube O-rings carefully to ensure that they have been pushed evenly into place without getting pinched or rolled. Secure the cylinder head with two flanged M8 cap nuts (these go inside the valve cover) and then the two flanged M8 hex nuts.

IMPORTANT: To ensure a constant tightening torque, lightly grease the flanges on the M8 cap and hex nuts.

Initially tighten the M8 cap nuts and hex nuts diagonally and evenly no more than finger tight. Reinspect the return tube O-rings carefully before torquing the heads any further. If there is any doubt about the integrity of the O-rings, remove the cylinder head and carefully inspect them for cuts or tears. (Consider having spares handy (Rotax part no. 850930).

13. Repeat steps 11 and 12 on the two front cylinders and heads.
14. With all four cylinders and heads in place and evenly aligned, attach a cylinder head aligning tool (Rotax part no. 877262) on top of the intake ports with four M6x25 mm allen screws as shown in Figure 1 below. With the aligning tool in place, torque heads evenly to 5Nm according to the tightening order shown in Figure 2 below. Remain sensitive to any binding or uneven movement. The importance of even tightening and ensuring the integrity of the oil return tube O-rings cannot be overemphasized. Heads are to be torqued according to the heavy maintenance manual, and depending on the cylinder head and stud P/N that you engine has. Refere to the Rotax HMM.

Figure 1
Cylinder Head Aligning Tool

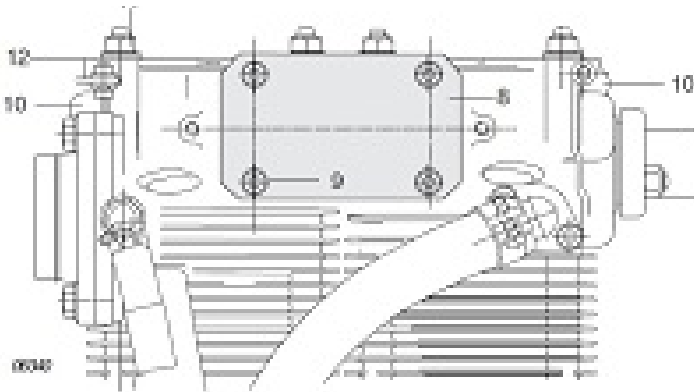
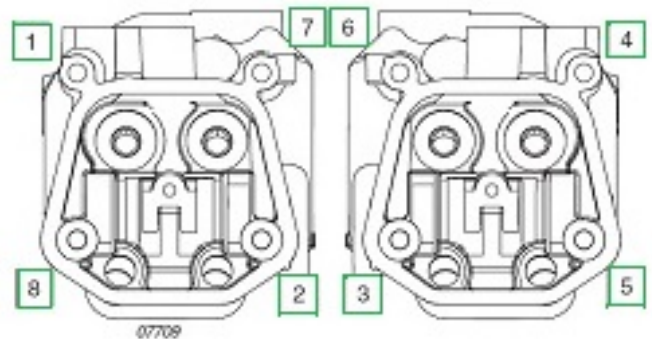


Figure 2
Cylinder Head Torque Pattern



15. If you have the old style cylinder and head studs which are only threaded in the ends, use the following torque sequence and values: 5Nm + 10Nm + 22Nm.
16. If you have the new style fully threaded studs use the following torque sequence and values: 5Nm + 10Nm + 30Nm. **Then undo and torque one bolt at a time to: -360° (fully loosen) + 10Nm + 150°.**
17. Install valve covers ensuring that both O-rings are in place, one large one around the outside perimeter and a small one in the middle that seals the M6x30 Allen screw (Rotax part numbers 250285 and 430205, 4x ea). Torque the M6 Allen screws with flat washers to 10Nm.

IMPORTANT: The valve covers must not touch each other. There must be a gap of at least a 0.2 mm (0.008 in) between them.

IMPORTANT: The length of the M6 valve cover screw must be 30 mm and the valve cover O-rings must hold pressure. If this screw is loose or if the valve cover leaks, blow-by pressure will not build up sufficiently to return oil to the oil tank.

18. Install both intake manifolds and the four upper coolant hoses located under and adjacent to each intake port. Ensure O-rings are in place in each intake port (black) and coolant port (red). Before tightening the intake manifolds, install the coolant hose fitting that sits below the intake manifold. Torque intake manifold and coolant flange M6 Allen screws to 10Nm.

19. Install new spark plugs. Always use NGK DPR9EA-9 on the 1484/1621cc big bore kits and also NGK DPR9EA-9 for the 1417cc turbo big bore kit. Put a small amount of Wacker P12 silicone high temperature thermal conductivity paste on the middle threads as shown below. (Thermal paste only needs to be applied once) Torque to 20Nm.



NOTE: Rotax recommends using Wacker P12 Silicon Thermal Paste but less expensive alternatives include Dow Corning 340 Silicone Heat Sink Compound Lubricant Grease or MG Chemicals 860 Silicone Heat Transfer Compound. Both are available through Amazon.com, our webshop or your local Rotax dealer. Individual packets are available online through Aircraft Spruce or Leading Edge Air Foils and others.

20. Install exhaust system and the 4 lower coolant hoses.
21. Fill waterspider with Glycol 30/70 or 50/50 mix or Glycol and distilled water (Do not used tap water).
22. Fill the oil tank with a suitable break-in oil, **DO NOT USE AeroShell Sport Pluss 4 initially**. Start with 2.7 liters and add as required. Recommended break-in oil are: Amsoil, Royal purple, RedLine, Joe Gibbs dedicated break-in oil. Do not skip this part.
23. The oil system must be purged with compressed air according to Rotax Service Instruction (SI-912-018)
24. Start the engine and let warm up. Idle at 2500rpm and look for leaks. Tighten hose clamps etc after engine has become hot. Once you have reached normal operating temps, shut down the engine.
25. With you aircraft securely tied town, start up the engine again and follow the break-in procedure below. Carefully monitor the static RPM. Fixed pitch propellers might need to be replaced. Ground adjustable propellers might need to be re-pitched. Constant speed propellers might need to have the end stop micro switches or end-stops on hydraulic governors adjusted to not overspeed the engine/propeller. Aim for >5500rpm static on a fixed or ground adjustable prop. 5700-5800rpm on a CS propeller. It is important that you monitor the EGT limits while putting the engine under load and high rpm. Refer to the Rotax Operation Manual for EGT limits. Typically aim for 740-760°C on WOT and 760-790°C while on cruise. A wideband O2 lambda sensor is also a usefull tool for tuning. Installing larger jets may be necessary. *A good starting point might be 2.72/#158 needle and main jets on the 1484cc kit.*
26. **BREAK-IN:** Operate the engine at and between 2500-4600 rpms on the ground for preferably 30-60 minutes and change oil filter. Inspect filter and magnetic drain plug for any fragments. Ensure to install a new oil filter before starting the engine for the first time. Some fine metal particles are normal to find during the break-in process. If everything looks good, continue with the break-in process in-flight.
27. The engine should be run on the break-in oil for 2 hours, and the engine should **NOT** be run at high rpm and high load during these first hours of operation. Once airborne, reduce power, climb out with good speed and a low nose to maximize cooling, and vary engine rpm between 4200-5500rpm during the first 2 hours of operation. Do not maintain rpms above 5000rpm during the

break-in period for more than 1-2 minutes at a time. Some customers report the cylinders might burn some oil the first 10-20 hours. But we see this all the time on new original 912/914 engines as well. If the engine burns more than 100ml per hour then the piston rings should be replaced, pistons and cylinders inspected and cylinders possibly re-honed with a #320-grit diamond flex-hone. The break-in process must be done over again if the rings are replaced.

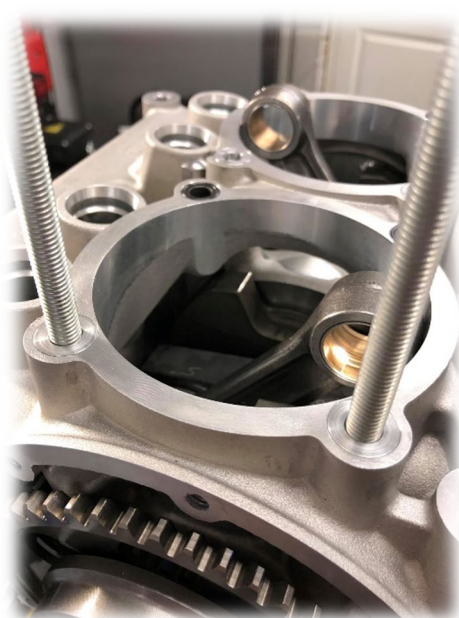
28. Do not rush the break-in process and take your time. A properly broken in engine will last much longer than one just flown like it`s stolen.
29. Perform regular compression or preferably leak-down tests to have a good track of your engine. Any sudden changes can give good indications that something abnormal is going on, and better yet to reveal this on the ground than while flying.
30. Next page covers the 92mm 1621cc installation and machining process.

31. When installing 92mm 1621cc kits, the heads and crank case halves must be machined.

- The heads must be milled to ID 100.10mm
- The crank case cylinder bores must be milled to ID 95.10mm

The M8 stud nuts (PN 929116) that holds the case halves together (image below) must be turned down 2.6mm on a lathe.

Install the supplied 15.20x8x3.2mm aluminum washers as per the picture below. Drive them in place with a M8 bolt, large washer and apply loctite 648 when pressing them into place. **When installing the cylinders, apply a thin coat of gasket sealant over these sealing washers to ensure no leaks.**



Showing how the kit arrives

**RECOMMENDED END RING GAPS, IN CASE OF PISTON OR RING REPLACEMENT.*

84/86mm Turbo pistons

Top ring - 0.025" - 0.026"

2nd ring - 0.034" - 0.035"

Oil scraper - 0.017" - 0.019"

88mm NA pistons

Top ring - 0.025" - 0.026"

2nd ring - 0.034" - 0.035"

Oil scraper - 0.017" - 0.019"

92mm NA pistons

Top ring - 0.026" - 0.027"

2nd ring - 0.035" - 0.036"

Oil scraper - 0.017" - 0.019"

