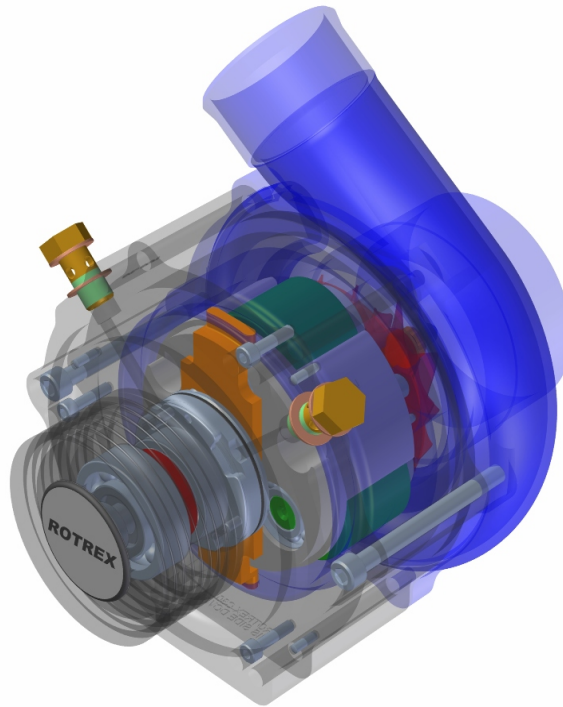
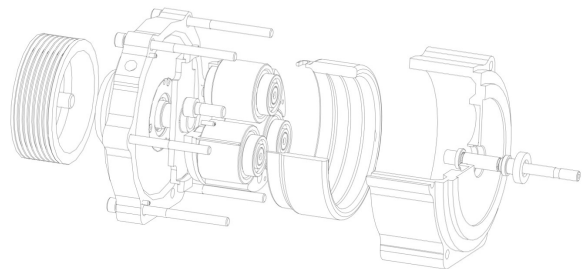


Rotrex C-type Supercharger Installation Instructions



C-type supercharger range

The C-type model range is a series of high performance superchargers with integrated oil system



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Foreword

Rotrex superchargers are based on a patented high-speed planetary gear drive. Much effort, experience and engineering skills have been put into the development of this product to make it the absolute best on the market. To get the most of the supercharger and to avoid problems please follow the instructions in this document carefully. This product can be potentially harmful if not installed or used properly. Do not attempt to install this product unless you have general automotive mechanical knowledge and experience with forced induction systems.

WARNING!

Before beginning any installation of the Rotrex supercharger, read and familiarize yourself with all the accompanying literature.

Do not put hands or fingers near the running supercharger. Suction is extremely powerful and can cause loose clothes, hair and fingers to be sucked into the device with risk of serious injury.

Use protective eyewear when working near the running supercharger.

Do not put hands or fingers near the pulley or drive belt while the engine is running.

When installing a supercharger to a vehicle, we recommend upgrading the transmission and brake system to accommodate the improved performance of the vehicle.

Please remember to disconnect the battery of the vehicle before doing any installation work.

Please be sure to follow the Installation instructions carefully and make sure that all the installation criteria outlined in the guide are followed. If the Rotrex supercharger is sold as part of an installation kit, be sure to follow the specific installation instructions.

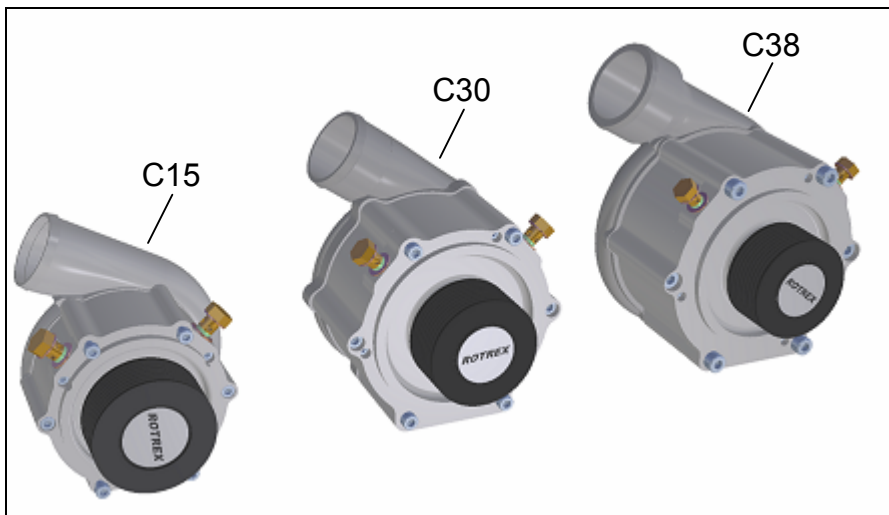
If there are any questions prior to or during installation of the Rotrex supercharger or the Rotrex supercharger kit, please contact your dealer where this product was purchased.

Unless otherwise stated in writing the Rotrex supercharger or Rotrex supercharger kit is not street legal without proper approvals.

Key points

For best performance and durability please follow the key points stated below.

1. This product is intended for use on healthy well-maintained engines in good working order. Installation on a worn or damaged engine may result in serious failure of the engine.
2. To avoid engine knock, make sure to run the appropriate fuel grade (octane). If any sign of knocking is detected immediately discontinue running the engine under boost conditions until the problem has been solved.
3. Prior to initial start up make sure to prime the supercharger oil system, failure to do so may result in severe damage – go to page 6 for details.
4. Always use Rotrex SX100 traction fluid for the C-type range of superchargers. The recommended oil change interval is 80.000 km (50.000 miles) or every two years, whichever comes first.



Choose the right supercharger model

The amount of air delivered by the supercharger and consequently the boost pressure is determined by the supercharger model and the impeller speed in conjunction with the engine size and speed. The diagram below outlines the working area of each supercharger model within the C-range. For flow diagrams please refer to our technical datasheets. If in doubt please contact your dealer.

| Supercharger comparison table | | | | | | | | | |
|-------------------------------|---------------|-------------------------|-----------------------------|--------------------------|-----------------|-----------------|--------------------------------------|----------------------------------|------------------------------|
| Model | Finish | Air inlet diameter [mm] | Air discharge diameter [mm] | Max impeller speed [rpm] | Max boost ratio | Max flow [kg/s] | Power range ¹ [engine hp] | Typical adiabatic efficiency [%] | Max adiabatic efficiency [%] |
| C15-16 | Titanium grey | 60 | 45 | 201,500 | 2.48 | 0.11 | 30-130 | 65 | 71 |
| C15-60 | Titanium grey | 60 | 45 | 150,000 | 2.22 | 0.18 | 50-200 | 65 | 71 |
| C30-64 | Titanium grey | 60 | 50 | 120,000 | 2.80 | 0.26 | 100-280 | 72 | 76 |
| C30-74 | Titanium grey | 60 | 50 | 120,000 | 2.70 | 0.28 | 150-300 | 73 | 77 |
| C30-84 | Titanium grey | 76 | 50 | 120,000 | 2.75 | 0.30 | 200-320 | 74 | 77 |
| C30-94 | Titanium grey | 76 | 50 | 100,000 | 2.70 | 0.37 | 250-400 | 76 | 80 |
| C38-61 | Titanium grey | 76 | 63 | 90,000 | 3.00 | 0.50 | 300-550 | 74 | 76 |
| C38-71 | Titanium grey | 76 | 63 | 90,000 | 2.95 | 0.52 | 350-590 | 74 | 76 |
| C38-81 | Titanium grey | 76 | 63 | 90,000 | 2.90 | 0.55 | 400-630 | 76 | 78 |

¹ Power output is dependent on engine type, cooling of charge air, cam profile and timing, compression ratio etc.

Regardless of the supercharger type and model, always make sure to run it within its appropriate operating speed range specified in the technical datasheet. Exceeding these values voids warranty.

The most optimum supercharger for a given application will depend on lots of variables of which most are not known such as engine volumetric efficiency, or how this will be affected under boost conditions. This can very well be modelled using advanced engine calculation tools and theory. However, in most cases this is not necessary. Using some simple rules of thumb along with our supercharger flow charts will be adequate in most cases. If you are not familiar with flow charts, we have included a supercharger selection chart as a quick and simple visual guide to selecting the appropriate supercharger. For a more detailed investigation of analyzing the best supercharger fit for a given application we have included an example, which runs through the process for a given engine. This example is to be seen as a basic guideline, and may differ depending on engine variables.

Supercharger selection example: Boosting 250hp to 350hp.

The key to select the right supercharger is knowing what flow and pressure ratio you will be running. From this knowledge you can go through the flow charts of the superchargers and choose the right model from there.

Generally speaking a normal gasoline combustion engine will produce about 120hp pr. 0.1 kg/s of air. By inserting the expected hp figure of the supercharged engine into the formula below, we now get the expected flow.

$$\text{Flow [kg/s]} = \frac{\text{hp}_{\text{supercharged}}}{1200}$$

Example:

Target power is 350hp... calculating the flow:

$$\frac{350}{1200} = 0.2917 \frac{\text{kg}}{\text{s}}$$

The approximate pressure ratio needed to produce this power on the given engine can be approximated from the below formula. The pressure losses through the filter, pressure pipes, intercooler and intake system including the power to drive the supercharger are approximated to about 15%, thus multiplying with 1.15 in the formula.

$$\text{PR} = \frac{\text{hp}_{\text{supercharged}}}{\text{hp}_{\text{naturally aspirated}}} \times 1.15$$

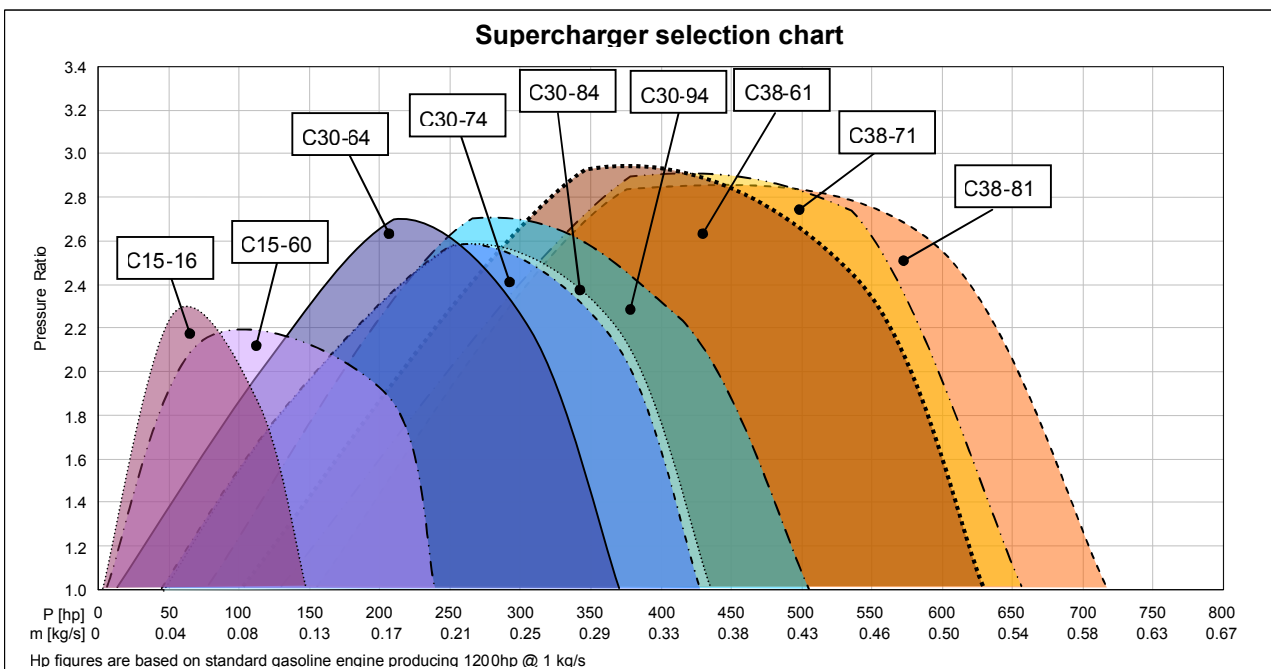
This is true only when the engine is run under low to moderate boost (up to 0.7 bar \cong PR 1.7), and that air entering the engine has been cooled to a temperature no more than 30°C above ambient temperature. Any other restrictions in the system will reduce the expected boosted power output. Such as a restrictive exhaust system, inlet filter, valve size etc.

Example:

Expected power is 350hp and the power of the naturally aspirated engine is 250hp thus giving us an expected required pressure ratio of about 1.61.

$$\frac{350}{250} \times 1.15 = 1.61$$

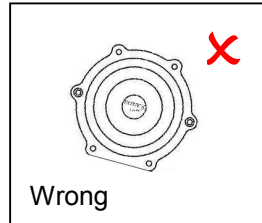
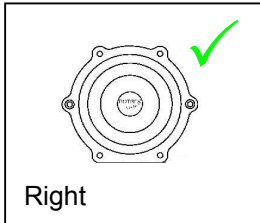
After studying the supercharger selection chart and flowcharts in the datasheets, we can conclude that the C30-94 is a good match with an adiabatic efficiency of more than 70% at the point of 0.29kg/s and PR 1.6. The C38-61 approaches 77% adiabatic efficiency under similar conditions with a working point closer to the middle of the chart, and would be the recommended unit for this application provided there is room for it on the vehicle. If minimum physical size is essential, the C30-94 would be the recommend choice for this application.



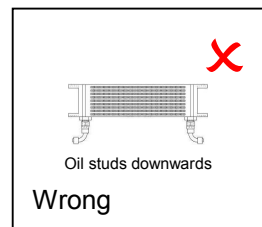
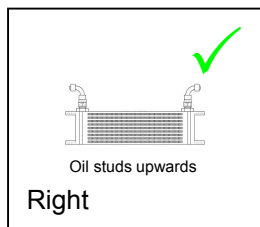
Considerations

When determining where to place the supercharger in the engine compartment please consider the following:

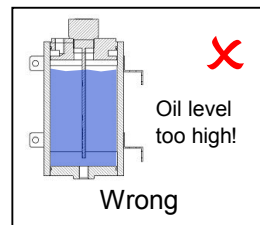
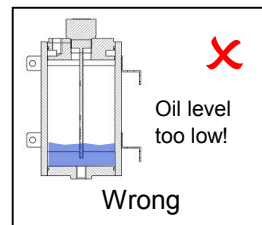
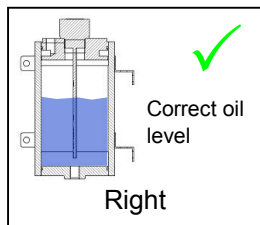
1. The flat surface of the supercharger must be facing downwards and within +/- 15 deg. to horizontal.



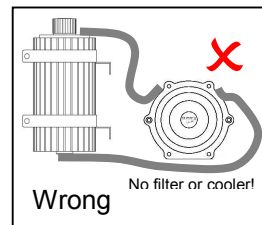
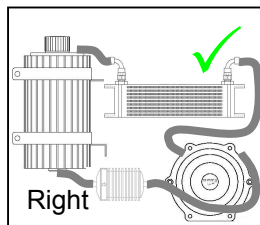
2. When mounting the oil cooler make sure the studs on the oil cooler are positioned upwards. This allows air looms to escape, and the oil cooler to work as intended.



3. Check the supercharger oil level after initial start up. Always follow the correct procedure for oil level check: **Rev the engine to 2-3000 rpm, then check the oil level at idling. Overfilling will cause the breather cap to leak. The correct oil level is between the min and max marking of the dipstick measured with the thread of the cap fully engaged. Check the oil level regularly.**



4. Always use a filter with the oil system. We recommend our standard oil system supplied with oil filter, cooler and canister.



The supercharger must be bolted to the engine using a suitable mounting bracket. In general, we recommend minimum 8mm steel plates or comparable strength for other materials. Take care not to place the supercharger near heat sensitive components such as fuel lines, plastic or rubber components. For correct operation the supercharger pulley must turn clockwise when seen from the pulley side.

Compressor outlet position

The compressor housing air outlet of the supercharger can be rotated freely 360° in 60° intervals. When rotating the compressor housing please follow the procedure described in this section.

1. First identify the desired outlet direction of the compressor housing respecting the flat face of the gear house is facing downward and horizontal within $\pm 15^\circ$.
2. Loosen the two large bolts securing the compressor housing to the gear housing. Do this carefully and only a couple of turns on each screw at a time – making sure the compressor housing does not come off at an angle damaging the impeller.
3. With the bolts completely removed the compressor housing can be rotated by hand while still on the gear housing. Again pay attention not to damage the impeller during this operation.
4. With the compressor outlet at the desired location fit the two bolts and tighten to the torque according to the chart below.

| Compressor housing bolt tightening torque | | | |
|---|-----------|-------------|----------------|
| Supercharger | Bolt size | Torque [Nm] | Torque [ft-lb] |
| C15 | M5 | 4.5 | 3.3 |
| C30 | M6 | 9 | 6.6 |
| C38 | M8 | 15 | 11 |

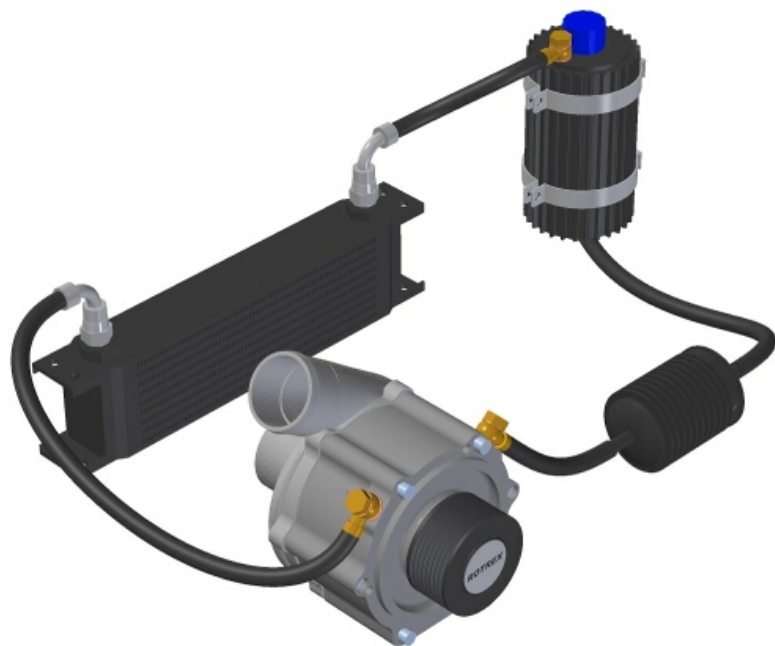
Lubrication system

The Rotrex C-type supercharger drive has been developed and extensively tested with the Rotrex SX100 traction fluid. To maintain the ultimate level of performance and durability it is very important that the unit is run with the SX100 traction fluid. Never use any other type of oil with the C-type supercharger range.

Check the oil level regularly using the method described on page 6. The oil and filter change interval of the C-range is 80,000 km / 50,000 miles or two years, whichever comes first.

The oil canister can be placed above below or level with the supercharger. This gives the installer a great degree of freedom when deciding where to place the canister and supercharger in the engine compartment.

While an inlet oil temperature below 80°C is maintained, the internal temperature of the supercharger will not reach critical temperatures even under extreme driving conditions. To accommodate this, an oil cooler is required on the oil return line from the supercharger to the oil canister. Our standard oil system contains everything



needed for a standard supercharger installation: All hoses, fittings, filter, cooler and canister. The oil cooler must be installed where there is good airflow in front of other coolers in the engine compartment

On request a special system can be supplied without the cooler. This system relies on cooling from the aluminium canister alone. This solution requires extensive testing and oil temperature monitoring to make sure the system is operating within spec.

Oil lines

When routing the oil supply and return lines, care must be taken to prevent cracks and cuts of the oil lines. If this occurs it could be catastrophic to the supercharger or engine.

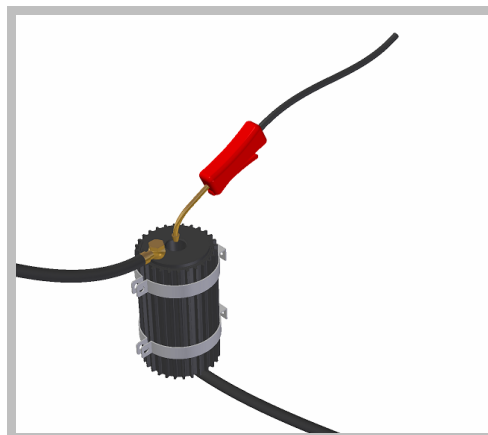
- Oil lines must be routed in safe distance from the exhaust system or other hot parts.
- Make sure there is clearance to other moving parts such as the ventilator fan, alternator belt and pulleys.
- Do not bend the oil hoses due to risk of restricted oil flow.
- Engine vibration and movement must be taken into account when routing the oil lines.
- Make sure there is no debris in the oil system before initial start-up.
- Prime the oil system correctly prior to initial start up.

Priming prior to initial start up

To ensure proper oil circulation and adequate lubrication during the first few minutes of operation, it is important to prime the oil system before the engine is started for the first time after the supercharger installation.

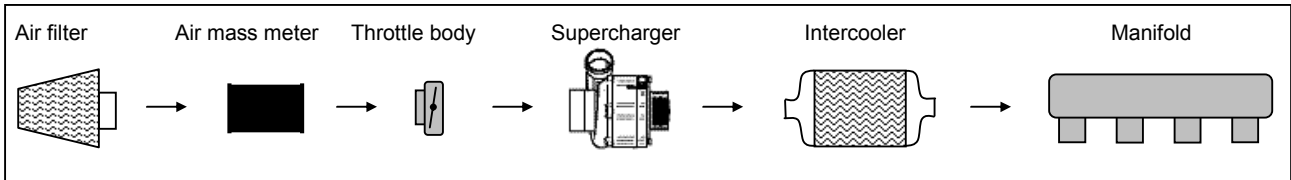
The priming process is done easiest with all oil components in place and installed.

1. Fill the oil canister with traction fluid.
2. The banjo bolt at the oil line attached to the supercharger inlet marked "oil inlet" is to be loosened a couple of turns allowing air to escape the system.
3. Apply pressurized air to the oil filler hole of the canister. Do not pressurize the system to more than one bar or 15psi. Use a rag or a sponge as a seal between the air-gun and the canister.
4. When oil appears at the "oil inlet" tighten the banjo bolt and the system is primed.
5. Top up the oil canister.
6. Switch on the engine, and let it run at idle for 5 minutes while checking the oil system for leaks.
7. Check the oil level using the correct procedure described on page 6.
8. A run-in period of 100 km (65 miles) is highly recommended. During this run-in period don't run the engine at more than half of the engine's RPM range

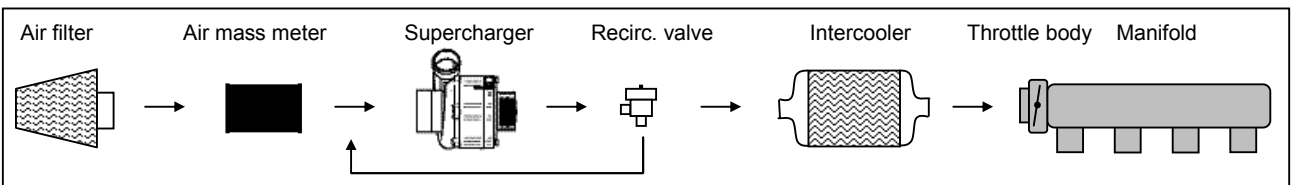


Air ducting

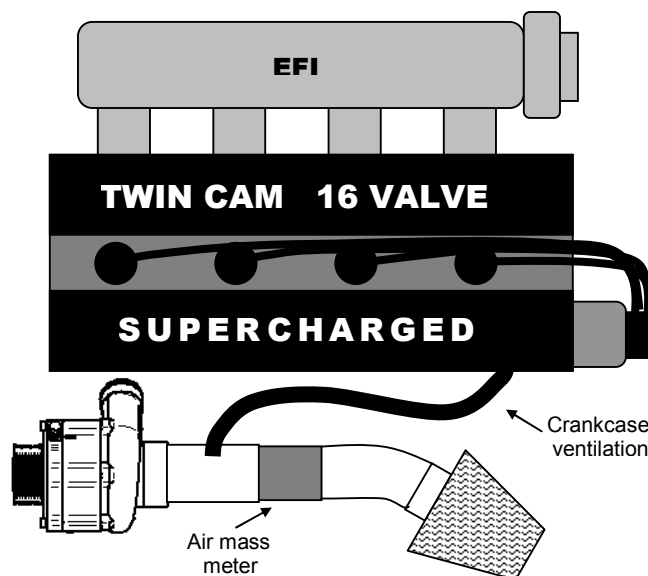
The most energy efficient solution is to have the throttle body positioned upstream of the supercharger. This will minimize the pump work by the supercharger, thus minimizing fuel consumption under part load because of the thin air situation around the impeller at throttle angles less than 90°. Also a re-circulation valve can be avoided in this type of set up.



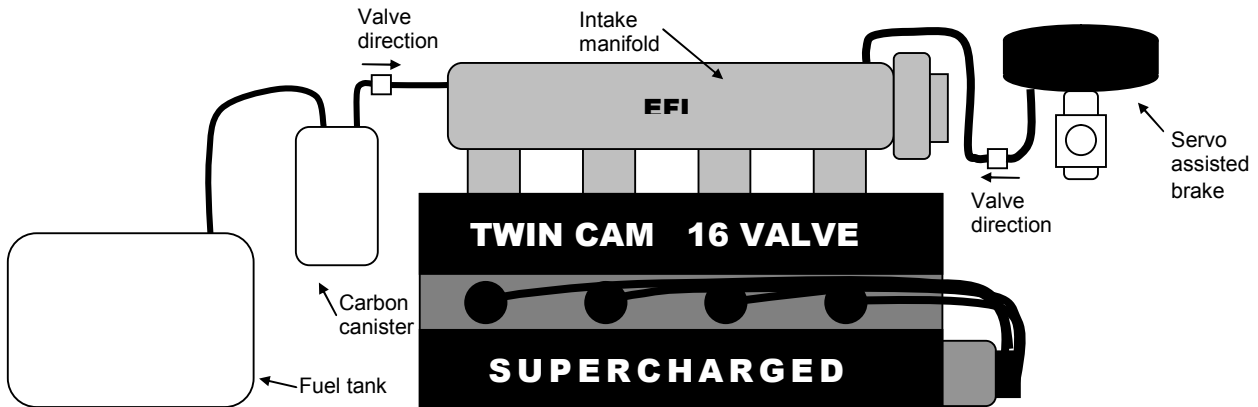
A somewhat simpler approach (recommended for most aftermarket applications) is to leave the throttle body at the original position. If you choose to position the throttle body downstream, a re-circulation valve is recommended. If the valve is omitted the supercharger will create noise under deceleration caused by surge. Surge occurs when the supercharger keeps making pressure at low airflow forcing the compressor to work outside the intended operation area. This will be most noticeable on high boost applications under high engine rpm with the throttle closed (deceleration). The re-circulation valve will prevent surge by allowing air to circulate from the pressure side of the supercharger to the inlet side of the supercharger under manifold vacuum conditions.



The crankcase ventilation system (Positive Crank Ventilation PCV) is to be connected to the inlet of the supercharger. If the vehicle is equipped with a Mass Metering Unit (MMU), the crankcase ventilation must be connected downstream of the MMU to prevent oil vapours from corrupting the signal of the MMU.



The carbon canister and exhaust gas re-circulation (EGR) valve can be connected using check valves to prevent pressurized air from entering the systems under boost conditions.



It is imperative that there is an air filter on the inlet of the supercharger. If this is neglected, there is a risk of damage to the supercharger from objects being sucked into the inlet. An open filter arrangement, such as K&N cone filters, will in some cases give induction noise from the impeller. To prevent induction noises please use a closed filter box as seen on most OE applications.

Do not make unnecessary sharp bends on the air ducting, as bends will cause pressure drop resulting in loss of power.

All air ducting on the inlet side of the supercharger must be of a type that does not collapse and restrict the airflow under vacuum. Bear in mind that a partially blocked air filter will result in significant vacuum.

Hoses, pipes, filters, valves etc. must be fastened with proper clamps to prevent air leakages in the system.

Testing

Upon completion of the installation, the vehicle must be tested on a dynamometer. This will give the opportunity to identify leaks, noise, vibration, and improper alignment of belt, overheating or other faults in the installation. It will also give the opportunity to make sure the engine is running with the correct air/fuel ratio. If the engine is knocking the fuel and ignition timing must be changed. Alternatively reduce boost pressure and/or inlet temperature with a better intercooler/charge cooler or water injection solution.

The Rotrex supercharged vehicle

Any increase in performance of a vehicle must responsibly (if not legally) also be accompanied by an equal increase in performance of the braking system, tires, suspension, steering and engine mounts. Many manufacturers supply the necessary kits for increased brake performance, improved suspension, improved engine mounts etc. Consult performance specialists for more information.

Warranty

No person at ROTREX A/S is authorized to bind ROTREX A/S to any other liabilities, warranties other than the official Rotrex warranty granted with the purchase.

Parts found to be defective due to debris or other foreign material in the system will not be honoured for warranty and will be considered ground to void any other associated liabilities.

If the Rotrex supercharger has been disassembled or changed in any way the warranty is automatically void.