



aerospace  
climate control  
electromechanical  
**filtration**  
fluid & gas handling  
hydraulics  
pneumatics  
process control  
sealing & shielding



## Racor Filter Division Europe

Super Impactor  
Crankcase Ventilation Separator



ENGINEERING YOUR SUCCESS.

# Crankcase Ventilation - Super Impactor

## Diesel Engine Emission Control

## High Performance Crankcase Separator Systems for the future

With over 20 years' experience in crankcase filtration Parker Racor Filter Division Europe, a part of Parker Hannifin, the global leader in motion control technologies, has been developing new innovative high efficiency technology for crankcase emission control.

Parker introduce the new benchmark for ultra high performance, fit for life, closed crankcase ventilation solutions. The Super Impactor CCV eliminates environmental pollution from crankcase emissions, allowing open and closed crankcase circuit solutions at >98% efficiency, with no service element.

Smaller, lighter, more economical and with higher efficiencies than its closest rivals, the systems also include the ultimate crankcase pressure regulator offering the tightest crankcase pressure control.



Crankcase blow-by is produced when combustion gases under high pressure are blown past the piston rings into the crankcase. Laden with oil these gases must be allowed to exit the engine to prevent pressure

build up and seal failure. The control of diesel engine blow-by has become an important topic with the progressive reduction of NOX, Hydrocarbon and particulate in the global legislation.

By enforcing emissions targets, legislators have committed engine and vehicle manufacturers to find the technological advancements necessary to control blow-by venting and minimize impact on human and environmental health.

For achievement of current Euro / EPA directives, Closed Crankcase Ventilation systems are employed to return cleaned blow-by gas to the engine air intake system. The tighter demands for future legislation means that further step changes in engine design will be applied and the performance requirements for CCV systems will become yet more demanding.

## Super Impactor Key Features

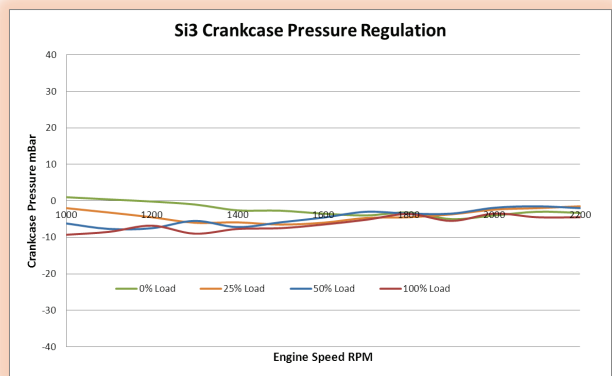
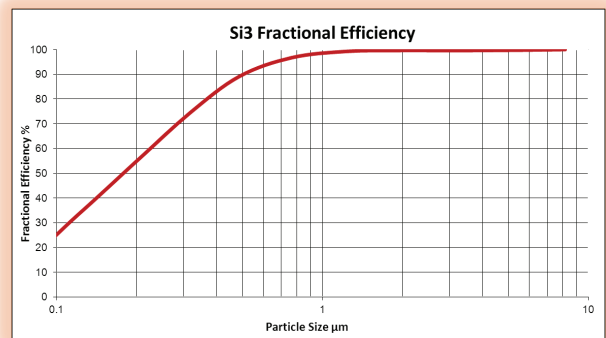


# Super Impactor Performance

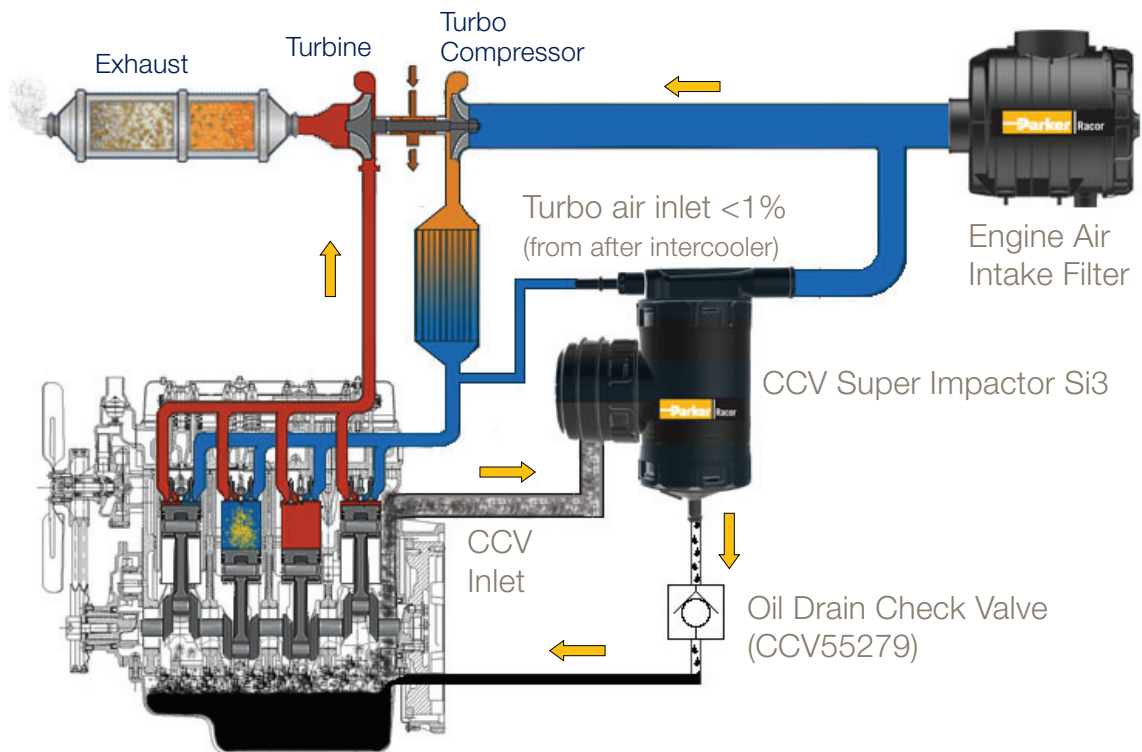
The Parker Super Impactor Si3 has been tested under laboratory conditions as well as in field trials.

The performance graphs below show that the Si3 exhibits exceptional separation efficiencies across the key aerosol size distribution ranges seen in crankcase blow-by, both when an engine is run at rated Power and Torque but also across the engine speed and power output range. Typically the Si3 will remove upstream blow-by aerosol oil challenge, reducing it to below 0.2g/hr down stream of the Si3 depending upon application.

The Si3 has been validated on current and future Euro / EPA compliant engines and demonstrates tight crankcase pressure regulation across all engine conditions and turbo depressions, the graph to the right shows crankcase pressures across the engine speed and load range for a Typical Tier 4/Euro 6 engine.

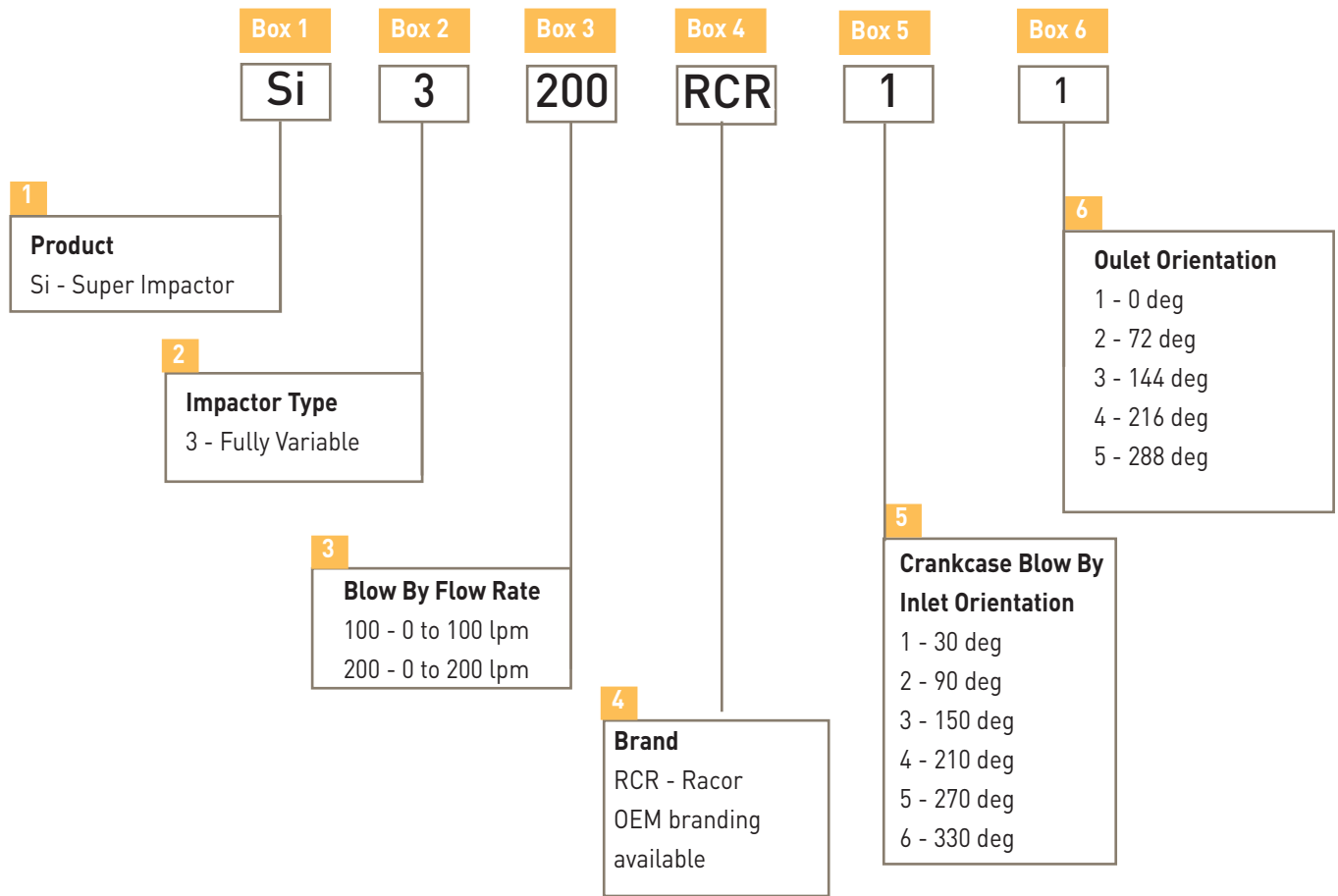


# Super Impactor Engine Routing



An example of a typical engine routing that incorporates a Racor air filter and also a Racor Super Impactor (not shown to scale.)

# Super Impactor Configurator

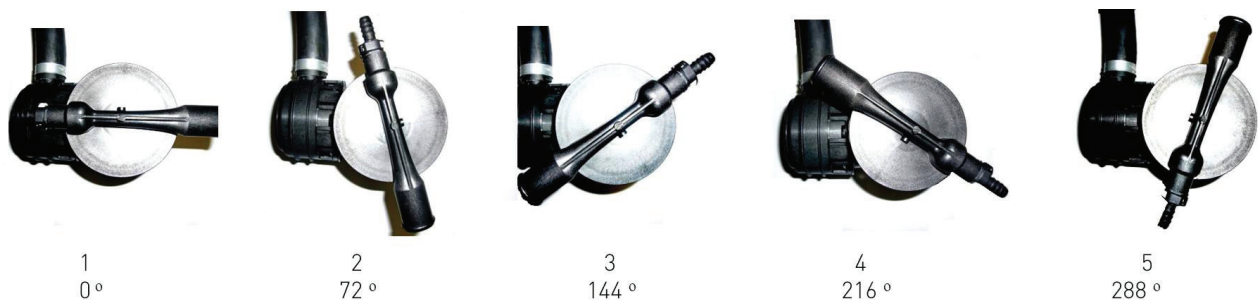


## Mounting and Orientation

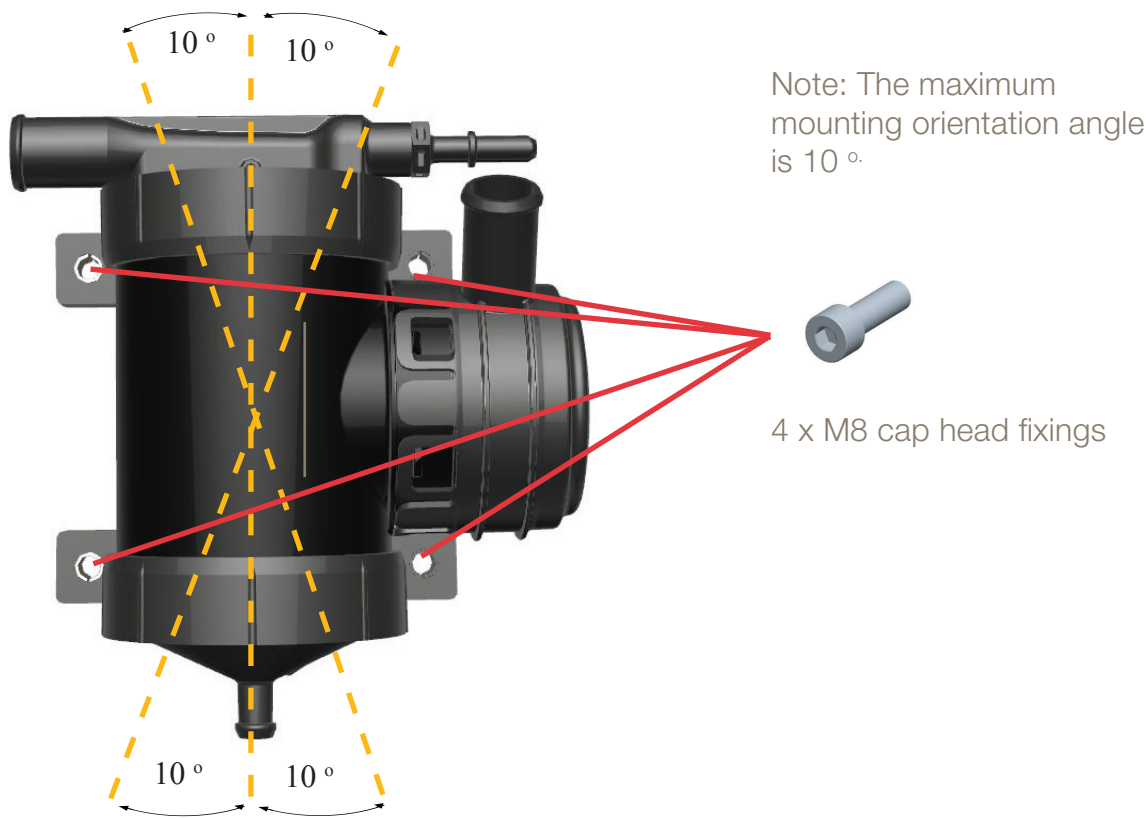
Inlet spigot mounting orientation (box 5 on configurator above).



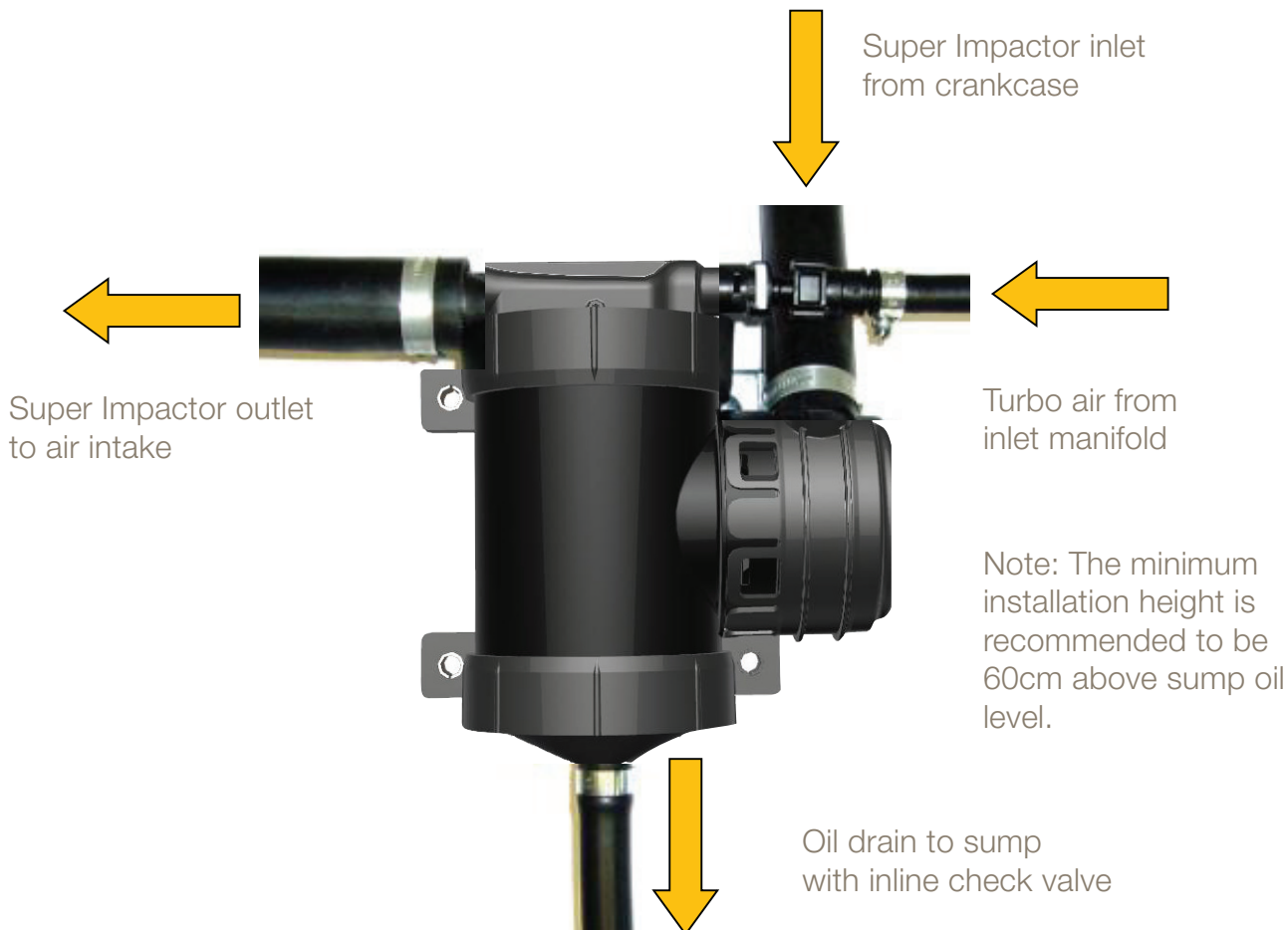
Outlet spigot mounting orientation (box 6 on configurator above).



# Super Impactor Installation



# Super Impactor Port Positions



# Super Impactor Specifications



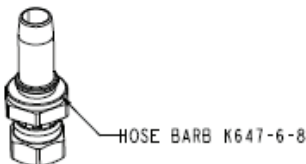
Specifications	Si3100	Si3200
Maximum Flow Rate	100 lpm	200 lpm
Port Sizes		
Inlet (Hose Connection)	26 mm	26 mm
Outlet (Hose Connection)	26 mm	26 mm
Turbo boost inlet (SAE J2044)	10 mm	10 mm
Oil drain outlet (Hose Connection)	13 mm	13 mm
Weight in grams (without check valve)	920 g	920 g
Crankcase Regulation Pressure	+ / - 10 mBar	
Max Operating Temperature	- 40 deg C to + 180 deg C	



## Super Impactor Kits - For Fuel Sump Drain Lines

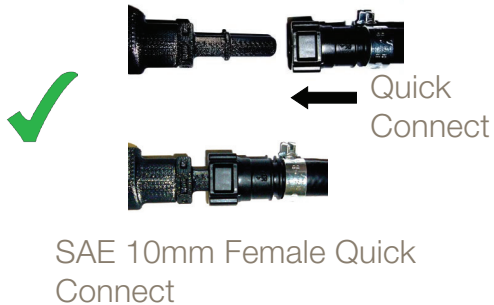
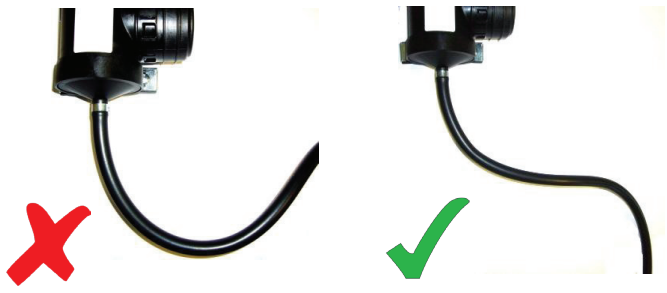
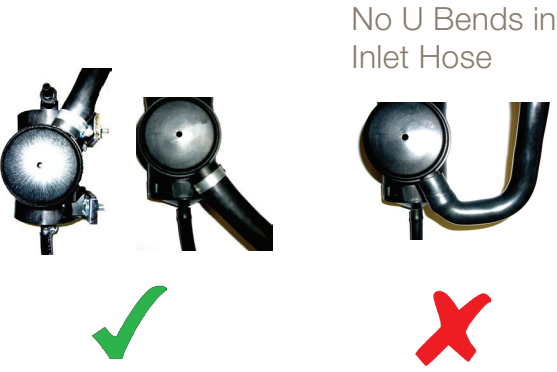

The Super Impactor has kits available that ensure you can utilise the Super Impactor in many engine applications.

Part Number	Description
K0647-6-8	Hose Barb
CCV55279	Check Valve
1 / 4 - M14DC8UBV	Elbow Union



# Installation Instructions

The Super Impactor is very much a plug and play device follow the simple guide below for easy installation.

<p>Compressed Air from Inlet Manifold</p>  <p>SAE 10mm Female Quick Connect</p>	<p>Drain Hose Orientation</p>  <p>No U Bends in Drain Hose</p>
<p>Inlet Hose Orientation</p>  <p>No U Bends in Inlet Hose</p>	<p>Outlet Hose Orientation</p>  <p>No U Bends in Outlet Hose</p>

## Trouble Shooting



If the Super Impactor fails to separate oil from the blow-by gas ensure that the check valve has been installed in the correct orientation.

If the check valve has the incorrect orientation, flip the check valve around and re-start the engine.

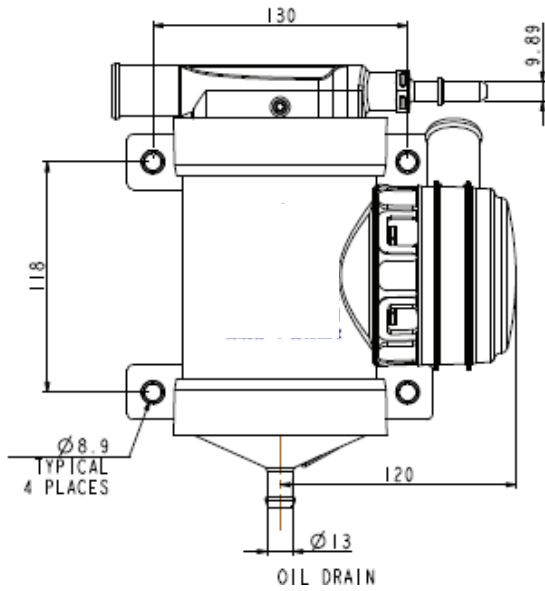
**If problems persist do not hesitate to contact Racor Technical Support:**

Tel No: +44 (0)1924 487000  
Fax No: + 44 (0)1924 487001  
Email: [filtrationinfo@parker.com](mailto:filtrationinfo@parker.com)  
[RFTC@parker.com](mailto:RFTC@parker.com)

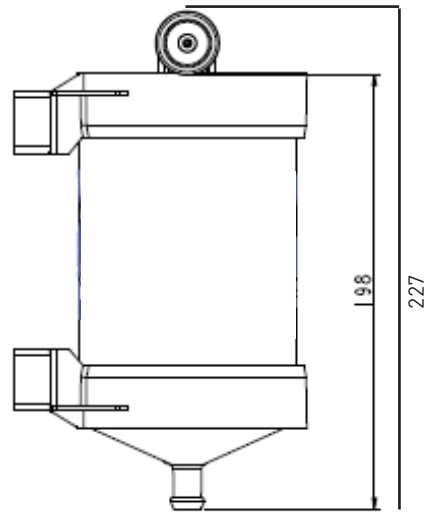
# Customer Interface Drawings

## Super Impactor 3

Front View

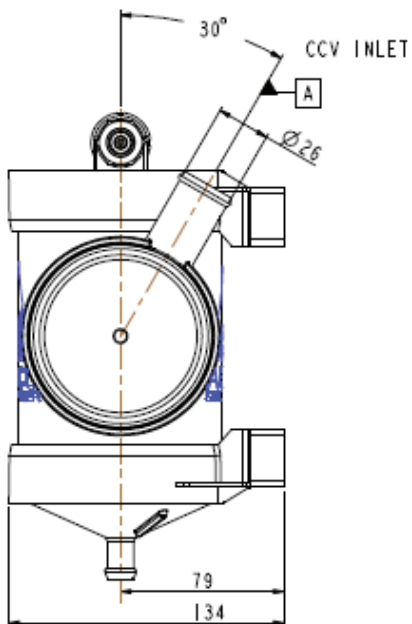


Side View

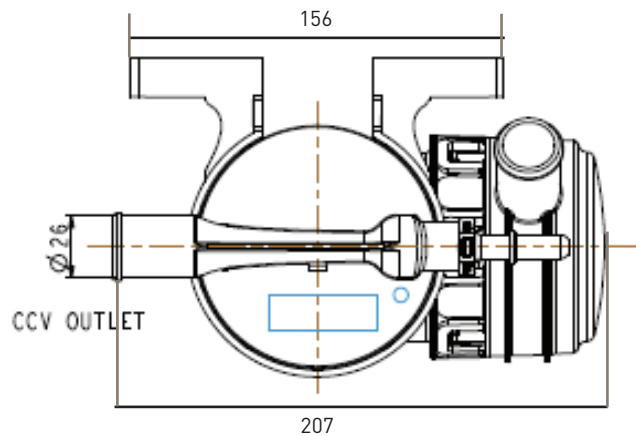


## Super Impactor 3

Top View



Top View



Please note that drawings are not to scale in comparison to each other.



# Superimpactor Development History

## - OEM Focus

The major OEM's for heavy duty engines have found a solution for fit for life crankcase ventilation in oil driven or electrically powered centrifuges. The oil driven centrifuge is complex, relatively costly and requires significant integration into the engine block. This has left the medium duty value sensitive market with lower cost filter solutions with mediocre efficiency and short life servicing intervals.



From 2006 the Parker Racor, UK based R&D team initially investigated a simplified competitive centrifuge system driven via compressed air. Whilst early testing was positive, subsequent innovation and engineering theory accentuated the possibility to increase aerosol velocities greater than 100m/s without the use of rotating parts. Primary focus was on taking a small amount of turbo air and using that energy to raise the separation efficiency of an inertial impactor. This technology which is fit for life, flexible in design and light weight has been named the 'Super Impactor' and the first production version went onto production engines in May 2010 with volume deliveries commencing when Tier IIIb and

Tier IV engine deliveries start to ramp up.

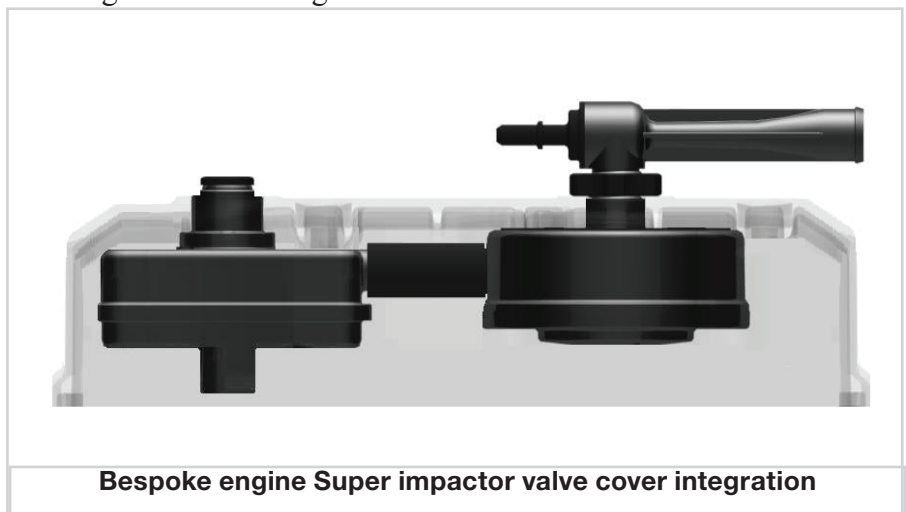
Whilst the Super Impactor is achieving up to 95% gravimetric efficiency the technology has been advanced and optimized using mathematical modeling, CFD analysis, Particle Image Velocimetry, and empirical analysis methods. With a simple modular construction the technology can now include multi-stage impaction reaching up to 98% efficiency or secondary stage submicron filtration achieving in excess of  $\geq 99\%$  efficiency.

The 'Super Impactor' Technology will be available for medium, heavy, and industrial sized engines controlling blow-by gas up to 1000litres per minute whilst maintaining crankcase pressure limits and efficiencies throughout the engine life. The cleaned gas can be closed to the intake system and high separation efficiency prevents damage to turbo compressors and intercooler systems. Alternatively the cleaned gas can be returned to atmosphere and satisfy the total engine emission regulations

of the future. The technology enables the return of separated oil back to the crankcase sump and provides long lasting prevention of oil consumption.

A great advantage of this development is its malleability and potential for engine integration. The core technology can be integrated into an engine valve cover or other accompanying equipment; such technical solutions are currently being developed in Europe and the USA. Much of the development work has been carried out in-house in Parker's state of the art development facilities in West Yorkshire (UK), but Parker have also partnered with The University of Leeds who have been instrumental in producing key optimised legacy data and software which has enabled the engineers to meet tough development challenges.

This information was originally written by Adrian Mincher, R&D Engineer, Racor Filter Division Europe for Engine Technology Magazine.



# Racor Crankcase Filtration Filter Coalescer Range

In a robust, compact package, the Racor Closed Crankcase Ventilation (CCV) Filter Systems provide superior oil coalescence and crankcase pressure control under the most severe conditions.

CCV systems eliminate crankcase emissions and provide a cleaner engine environment by performing the functions below:

- They reduce oil consumption by separating the oil from crankcase gases and returning the oil to the sump.
- The high-efficiency filter prevents fouling of the turbocharger and after-cooler.
- Keeps engine compartment and components clean.
- Filtered crankcase gas is returned to the engine intake system for re-combustion instead of polluting the environment.

## CCV Operation

- CCV systems operate by filtering contaminants and coalescing oil mist from crankcase gases. The crankcase breather hose is connected to the 3/4" inlet hose barb of the CCV assembly. The connection at the engine can be positioned at the valve cover or crankcase.
- The pressure regulating valve protects the engine from excessive crankcase vacuum.
- The only routine maintenance required for the Racor Closed Crankcase Ventilation filter system is filter replacement. Typical service life of the high-performance filter in diesel applications is 750 hours. Some variations in service life occur depending on load profile, engine wear condition, flow, aerosol mass concentration of crankcase emissions, and soot concentration.
- Filtered air from the CCV assembly is plumbed to the air intake system between the air filter and turbocharger.
- Coalesced oil drains from the filter sump to an external drain. A check valve holds oil in the line until it is released to the oil pan via a hose connection.



Specifications	CCV4500	CCV6000	CCV8000	CCV12000
Maximum Flow Rate	10 CFM (283 LM)	20 CFM (566 LM)	40 CFM (1133 LM)	50 CFM (1416 LM)
Maximum Engine Rating	400 HP (298.3 KW)	800 HP (596.6 KW)	1600 HP (1193.1 KW)	2000 HP (1491.4 KW)
Inlet/Outlet Port Size	1 3/16"-12 STOR	1 5/8"-12 STOR	1 7/8"-12 STOR	1 7/8"-12 STOR
Weight (approx.)	3.3 lbs (1.5 kg)	5.0 lbs (2.3 kg)	8.7 lbs (3.9 kg)	9.3 lbs (4.2 kg)
Replacement Filter Media Density: Low	CCV55248-04	N/A	N/A	N/A
Replacement Filter Media Density: High	CCV55248-08	CCV55274-08	CCV55222-08	CCV55222-12-08
Replacement Filter Media Density: Ultra	CCV55248-10	CCV55274-10	CCV55222-10	CCV55222-12-10
Housing Material	Die cast head, glass-filled nylon and black powder epoxy-coated steel bowl.	Die cast head, glass-filled nylon and black powder epoxy-coated steel bowl.	Die cast head, glass-filled nylon and black powder epoxy-coated steel bowl.	Die cast head, glass-filled nylon and black powder epoxy-coated steel bowl.
Crankcase Pressure Regulator	Integral	Integral	Integral	Integral
Bypass/Change Indicator	Integral or Remote	Integral or Remote	Integral or Remote	Integral or Remote
Engine Block Check Valve Return Fitting	1/4" NPT	1/4" NPT	3/8" NPT	3/8" NPT
Swivel Fitting (Qty.)	#6 JIC (2 pcs.)	#6 JIC (2 pcs.)	#8 JIC (2 pcs.)	#8 JIC (2 pcs.)
Oil Drain Hose I.D.	0.375 in. (0.95 cm)	0.375 in. (0.95 cm)	0.5 in. (1.27 cm)	0.5 in. (1.27 cm)

Units can be manifolded to handle higher flow rates. Do not use CCV1500 in continuous duty applications.

# Racor Filter Division Europe

## Fuel Filtration

The Most Advance Fuel Delivery Systems in The World

Racor has quality-certified manufacturing, engineering, and distribution in place around the world, so no matter where you are you can rely on Racor to solve tough filtration problems from the refinery to the engine. Over the years, Racor has kept pace with the increasing demands of fuel filtration, from tough engine

requirements for ever-finer particle removal efficiencies and longer life, to the effective processing of ULSD and biodiesel.

The heart of these advances is in Racor's proprietary engineered filter media families. Our selection of Aquabloc® medias are known worldwide for their combination of high efficiency, long life and



unsurpassed water-removal performance, meeting and exceeding the challenges of today's diesel engine requirements in all markets and environments.



Over the years, Racor has kept pace with the increasing demands of air filtration, from tough engine requirements to longer life. Our engineers collaborate with customers to design a solution that provides installation flexibility,

## Air Filtration

Protect Your Equipment and Environment

superior performance ease of service and unmatched customer satisfaction.

ECO III is the newest addition to Racor's complete ECO family of air filtration systems.

ECO systems can be configured to meet a wide range of on-the-road, off-road, and industrial applications.

From ECO Series to a custom designed air filtration system, Racor provides an innovation solution to exceed customer expectations. Racor is the most trusted name in engine protection. Why trust your investment to anything else?

## Oil Filtration

Engineered Solutions For Your System

Racor engineers have designed a new generation of top load filters to meet the requirements of today's oil-controlled, high pressure fuel injection systems. Racor media meets the variable geometry and variable nozzle turbocharger requirements. An uncompromising, high level of fluid cleanliness is needed to achieve operating efficiency and reach service life. The environmentally-friendly cartridge oil filters are crushable, incinerable and cost-effective to replace.



The Racor Bypass Oil Series removes dirt, varnish, ash, tar, soot and other contaminants that full-flow filters cannot remove from your engine's oil and hydraulic systems. The system also removes condensed water, which forms component-damaging acids if left in the oil. The Racor Bypass Oil Series removes 99.5% of damaging contaminants to minimize wear and extends engine component life.

# Parker Worldwide

**AE – UAE**, Dubai  
Tel: +971 4 8127100  
parker.me@parker.com

**AR – Argentina**, Buenos Aires  
Tel: +54 3327 44 4129

**AT – Austria**, Wiener Neustadt  
Tel: +43 (0)2622 23501-0  
parker.austria@parker.com

**AT – Eastern Europe**,  
Wiener Neustadt  
Tel: +43 (0)2622 23501 900  
parker.easteurope@parker.com

**AU – Australia**, Castle Hill  
Tel: +61 (0)2-9634 7777

**AZ – Azerbaijan**, Baku  
Tel: +994 50 2233 458  
parker.azerbaijan@parker.com

**BE/LU – Belgium**, Nivelles  
Tel: +32 (0)67 280 900  
parker.belgium@parker.com

**BR – Brazil**, Cachoeirinha RS  
Tel: +55 51 3470 9144

**BY – Belarus**, Minsk  
Tel: +375 17 209 9399  
parker.belarus@parker.com

**CA – Canada**, Milton, Ontario  
Tel: +1 905 693 3000

**CH – Switzerland**, Etoy  
Tel: +41 (0) 21 821 02 30  
parker.switzerland@parker.com

**CL – Chile**, Santiago  
Tel: +56 2 623 1216

**CN – China**, Shanghai  
Tel: +86 21 2899 5000

**CZ – Czech Republic**, Klecany  
Tel: +420 284 083 111  
parker.czechrepublic@parker.com

**DE – Germany**, Kaarst  
Tel: +49 (0)2131 4016 0  
parker.germany@parker.com

**DK – Denmark**, Ballerup  
Tel: +45 43 56 04 00  
parker.denmark@parker.com

**ES – Spain**, Madrid  
Tel: +34 902 330 001  
parker.spain@parker.com

**FI – Finland**, Vantaa  
Tel: +358 (0)20 753 2500  
parker.finland@parker.com

**FR – France**, Contamine s/Arve  
Tel: +33 (0)4 50 25 80 25  
parker.france@parker.com

**GR – Greece**, Athens  
Tel: +30 210 933 6450  
parker.greece@parker.com

**HK – Hong Kong**  
Tel: +852 2428 8008

**HU – Hungary**, Budapest  
Tel: +36 1 220 4155  
parker.hungary@parker.com

**IE – Ireland**, Dublin  
Tel: +353 (0)1 466 6370  
parker.ireland@parker.com

**IN – India**, Mumbai  
Tel: +91 22 6513 7081-85

**IT – Italy**, Corsico (MI)  
Tel: +39 02 45 19 21  
parker.italy@parker.com

**JP – Japan**, Tokyo  
Tel: +(81) 3 6408 3901

**KR – South Korea**, Seoul  
Tel: +82 2 559 0400

**KZ – Kazakhstan**, Almaty  
Tel: +7 7272 505 800  
parker.easteurope@parker.com

**LV – Latvia**, Riga  
Tel: +371 6 745 2601  
parker.latvia@parker.com

**MX – Mexico**, Apodaca  
Tel: +52 81 8156 6000

**MY – Malaysia**, Shah Alam  
Tel: +60 3 7849 0800

**NL – The Netherlands**,  
Oldenzaal  
Tel: +31 (0)541 585 000  
parker.nl@parker.com

**NO – Norway**, Ski  
Tel: +47 64 91 10 00  
parker.norway@parker.com

**NZ – New Zealand**, Mt Wellington  
Tel: +64 9 574 1744

**PL – Poland**, Warsaw  
Tel: +48 (0)22 573 24 00  
parker.poland@parker.com

**PT – Portugal**, Leca da Palmeira  
Tel: +351 22 999 7360  
parker.portugal@parker.com

**RO – Romania**, Bucharest  
Tel: +40 21 252 1382  
parker.romania@parker.com

**RU – Russia**, Moscow  
Tel: +7 495 645-2156  
parker.russia@parker.com

**SE – Sweden**, Spånga  
Tel: +46 (0)8 59 79 50 00  
parker.sweden@parker.com

**SG – Singapore**  
Tel: +65 6887 6300

**SK – Slovakia**, Banská Bystrica  
Tel: +421 484 162 252  
parker.slovakia@parker.com

**SL – Slovenia**, Novo Mesto  
Tel: +386 7 337 6650  
parker.slovenia@parker.com

**TH – Thailand**, Bangkok  
Tel: +662 717 8140

**TR – Turkey**, Istanbul  
Tel: +90 216 4997081  
parker.turkey@parker.com

**TW – Taiwan**, Taipei  
Tel: +886 2 2298 8987

**UA – Ukraine**, Kiev  
Tel: +380 44 494 2731  
parker.ukraine@parker.com

**UK – United Kingdom**,  
Warwick  
Tel: +44 (0)1926 317 878  
parker.uk@parker.com

**US – USA**, Cleveland  
Tel: +1 216 896 3000

**VE – Venezuela**, Caracas  
Tel: +58 212 238 5422

**ZA – South Africa**,  
Kempton Park  
Tel: +27 (0)11 961 0700  
parker.southafrica@parker.com

## European Product Information Centre

Free phone: 00 800 27 27 5374

(from AT, BE, CH, CZ, DE, DK, EE, ES, FI,  
FR, IE, IL, IS, IT, LU, MT, NL, NO, PL, PT, RU,  
SE, UK, ZA)



## Parker Hannifin Manufacturing (UK) Ltd.

Racor Filter Division Europe

Tel: +44(0)1924 487000

Email: filtrationinfo@parker.com

www.parker.com/rfde