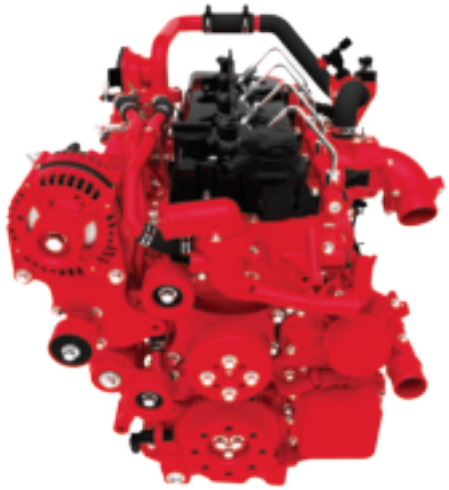
Smaller Meets Stronger.

QSF2.8, QSF3.8 And QSB4.5 (49-173 hp) For EPA Tier 4 Final/EU Stage IV.

Smaller Meets Stronger. Every™ Engine.



A Better Approach To Meeting Tier 4 Final Emissions Regulations.

Just as one size of engine doesn't fit the equipment or duty cycles of every piece of compact equipment, neither does a single approach to meeting Tier 4 Final emissions regulations.

That's where Cummins experience and technological resources give you a distinct advantage. We design and integrate all the key Tier 4 Final enabling systems from air intake to exhaust aftertreatment, optimizing the operation in a fully integrated package. This gives us a unique ability to evaluate every design option and select the exact solution that works best for a specific engine platform, each achieving near-zero emissions levels in its own way. It's an incremental approach based on achieving emissions goals by using the right engine systems and aftertreatment technology to meet specific power output, torque and installation requirements.

We have taken the cumulative experience gained from building ultra-reliable engines such as the larger Cummins QSB6.7, and incorporated that technology into our 4-cylinder compact platforms for Tier 4 Final/ Stage IV. Every one of these engines is designed to deliver a small footprint, simplified installation, strong performance, exceptional efficiency and ease of use. Every engine has been subjected to extreme testing for reliability and durability. Plus, they are all backed by Cummins parts, service and support – the largest and most capable network in the world.

It's an approach that standardizes and maximizes common features where it makes the most sense – and customizes and optimizes technology to deliver the best results. Smaller meets stronger. Every engine.

QSF2.8

Better. In Every Dimension.

The 2.8-liter QSF delivers performance at 74 hp (55 kW), which is comparable to that provided by larger engines up to 3.6 liters, in an envelope size that's similar to 2.2-liter engines used at 49 hp (37 kW). High Pressure Common Rail (HPCR) fuel injection, together with full-authority electronic controls and a Cummins wastegated turbocharger, combine to deliver a very impressive peak torque of 221 lb-ft (300 N•m).

This advanced technology enables the QSF2.8 to meet the near-zero emissions standards of Tier 4 Final/ Stage IV using only cooled Exhaust Gas Recirculation (EGR) and our proprietary Cummins Compact Catalyst (CCC). The same QSF2.8 engine without the CCC meets Tier 3/Stage III emissions regulations for regions where those standards apply.

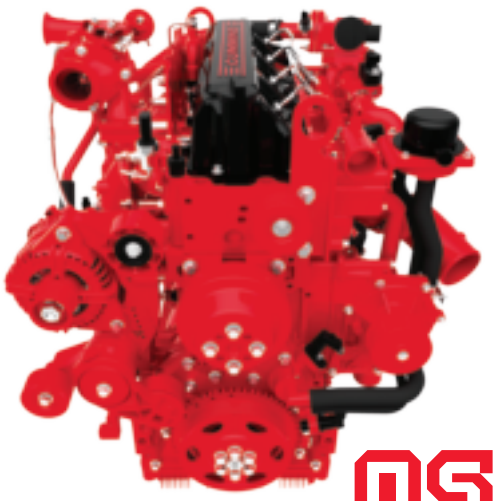
The CCC is truly "fit and forget" technology – a totally passive system that never needs any form of regeneration as required by a Diesel Particulate Filter (DPF). It also gives equipment designers the flexibility to mount components separately from the exhaust muffler or as part of a combined catalyst-and-muffler unit. Specifically designed for compact 4-cylinder applications, the CCC benefits from Cummins Emission Solutions' vast experience with Diesel Oxidation Catalyst (DOC) technology.

The compact design of the QSF2.8 includes our proprietary Direct Flow™ air cleaner, which takes up significantly less space than conventional cylindrical air filters, and has enhanced dust-holding capacity, for longer service intervals.

Innovative use of composite materials, together with a sculptured cast-iron block, give the QSF2.8-powered equipment a significant weight advantage, at just 507 lb (230 kg).

Maintenance is made simpler through remote mounting of the Electronic Control Module (ECM) for rapid plug-in diagnostics and data downloads using electronic tools such as the QuickCheck 5200. The oil fill, lube filter and fuel filter are set up for rapid service, with 500-hour intervals.

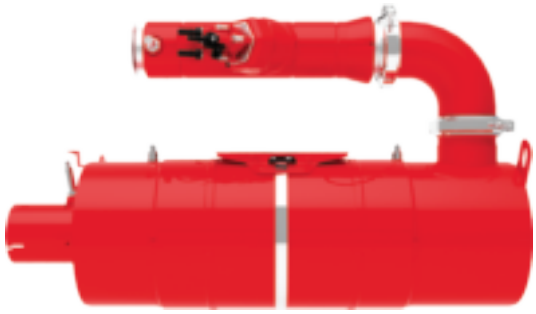
Built to Cummins stringent manufacturing standards for use anywhere in the world, the QSF2.8 is smaller, stronger and simpler by design than any other engine with this output – while retaining legendary reliability and durability. In other words, it is better in every dimension.



QSF3.8

Compact Power Redefined.

Achieving near-zero emissions levels in an engine delivering 85 hp to 132 hp (63-98 kW) without compromising power, performance or fuel economy is a big challenge. An even greater challenge is to do so using only a Selective Catalytic Reduction (SCR) aftertreatment system. Yet that's exactly what Cummins engineers have achieved in the QSF3.8 – without the need to add a DPF or even a DOC to the aftertreatment system.



The QSF3.8 uses an SCR system designed expressly for this engine by Cummins Emission Solutions (CES) to enable oxides of nitrogen (NOx) conversion to take place at lower exhaust temperatures. CES has manufactured over 1 million SCR systems – and has more experience with this technology than any other company. The Cummins SCR system features a decomposition tube designed to enable more effective mixing of the Diesel Exhaust Fluid (DEF) ahead of the catalyst.

This technology path also allows the QSF3.8 to reduce the amount of cooled exhaust gas being recirculated through the combustion chamber, increasing the power output to the highest level of any engine in the sub-4-liter engine class while simultaneously keeping fuel efficiency comparable to that of our Tier 4 Interim 3.3-liter engine.

Full-authority electronic controls and industry-standard data links make it easier to electronically integrate the QSF3.8 with equipment, as well as track engine performance data and perform routine servicing on this engine. A wastegated turbocharger from Cummins Turbo Technologies is simple and robust in design. The QSF3.8 engine's small size and multiple SCR configuration options make installation easier for design engineers.

Maintenance is kept at an absolute minimum with a crankcase ventilation breather that requires no filter element, and a Cummins Filtration Direct Flow air cleaner that has a higher dust capacity, for extended filter change intervals – up to twice those of conventional air cleaners.

The QSF3.8 delivers an unprecedented combination of high-performance, reliable emissions technology, low-cost installation and reduced operational costs, making it ideal for rental applications – all in an engine with the ease of use and robust performance that is critical for rental equipment, redefining the meaning of compact power for an entire industry.

QSB4.5

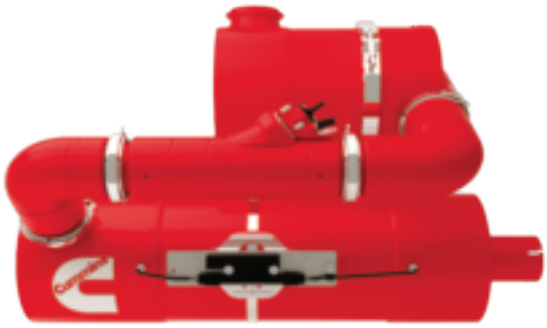
Built To Overachieve.

The 4-cylinder QSB4.5 for Tier 4 Final is more powerful and responsive than ever before, delivering up to 173 hp (129 kW), with a peak torque of 520 lb-ft (705 N•m), a 12 percent increase over that of the previous Tier 4 Interim engine.

The Tier 4 Final QSB4.5 shares a similar Cummins VGT Turbocharger, an HPCR fuel system and an ECM with the Cummins QSB6.7 engine. It is not surprising that the QSB4.5's power output is comparable in performance to that of many 6-cylinder engines below 174 hp (130 kW), from a much smaller and lighter package.

SCR is combined with the simplicity of our CCC as a highly flexible installation package. Used on Tier 4 Interim installations, the CCC is proven to effectively remove Particulate Matter (PM) using simple flow-through passive oxidation. Smaller dimensions than other types of aftertreatment make this catalyst ideal for space-constrained equipment. Together, the CCC and Cummins SCR work as a fully integrated, ultra-clean aftertreatment system. Extremely robust packaging ensures that the aftertreatment system achieves durability equal to that of the QSB4.5 engine.

This is the first application of our award-winning VGT Turbocharger technology on a 4-cylinder engine. Cummins patented sliding nozzle technology has fewer wear sites than any other variable turbine design, bringing unprecedented durability while providing precise adjustment of airflow delivered to the engine, enabling rapid boost at low engine rpm while maintaining a high level of boost at higher rpm. The QSB4.5 brings the simplicity of a single turbocharger, in contrast with other 4-cylinder engines requiring two turbochargers to achieve equivalent power, torque and altitude capability. Mid- and high-mount options provide design flexibility, for easier machine integration.



The SCR system on the QSB4.5 has been configured specifically for this engine by CES, with the catalytic reaction occurring even at low operating temperatures. DEF dosing levels are minimized with enhanced mixing into the exhaust flow.

A Cummins Direct Flow air cleaner helps make installation easier with a significantly reduced space claim and higher filtration capacity.

Engine Model	Maximum Power Output hp (kW) @ rpm	Peak Torque lb-ft (N•m) @ rpm	Turbocharger	Aftertreatment
QSF2.8	**Inline 4-cylinder design, 2.8 liter displacement, EPA Tier 4 Final/EU Stage IV**			
QSF2.8 74	74 (55) @ 2500	221 (300) @ 1600	Wastegated Turbocharger	Cummins Compact Catalyst
QSF2.8 65	65 (48) @ 2500	200 (270) @ 1600	Wastegated Turbocharger	Cummins Compact Catalyst
QSF2.8 49	49 (37) @ 2500	147 (200) @ 1600	Wastegated Turbocharger	Cummins Compact Catalyst
QSF3.8	**Inline 4-cylinder design, 3.8 liter displacement, EPA Tier 4 Final/EU Stage IV**			
QSF3.8 130	132 (99) @ 2300	360 (488) @ 1600	Wastegated Turbocharger	Cummins Selective Catalytic Reduction
QSF3.8 130	130 (97) @ 2200	360 (488) @ 1600	Wastegated Turbocharger	Cummins Selective Catalytic Reduction
QSF3.8 120	127 (95) @ 2500	360 (488) @ 1600	Wastegated Turbocharger	Cummins Selective Catalytic Reduction
QSF3.8 120	120 (89) @ 2200	360 (488) @ 1600	Wastegated Turbocharger	Cummins Selective Catalytic Reduction
QSF3.8 110	110 (82) @ 2500	306 (415) @ 1600	Wastegated Turbocharger	Cummins Selective Catalytic Reduction
QSF3.8 100	104 (78) @ 2000	306 (415) @ 1600	Wastegated Turbocharger	Cummins Selective Catalytic Reduction
QSF 3.8 85	85 (63) @ 2200	277 (376) @ 1600	Wastegated Turbocharger	Cummins Selective Catalytic Reduction
QSB4.5	**Inline 4-cylinder design, 4.5 liter displacement, EPA Tier 4 Final/EU Stage IV**			
QSB4.5 173	173 (130) @ 2100	520 (705) @ 1500	Variable Geometry Turbocharger	Cummins Compact Catalyst + SCR
QSB4.5 173	173 (130) @ 2000	520 (705) @ 1500	Variable Geometry Turbocharger	Cummins Compact Catalyst + SCR
QSB4.5 163	168 (126) @ 2300	466 (632) @ 1500	Variable Geometry Turbocharger	Cummins Compact Catalyst + SCR
QSB4.5 160	163 (122) @ 2200	460 (624) @ 1500	Variable Geometry Turbocharger	Cummins Compact Catalyst + SCR
QSB4.5 160	165 (123) @ 2000	460 (624) @ 1500	Variable Geometry Turbocharger	Cummins Compact Catalyst + SCR
QSB4.5 155	155 (116) @ 2000	460 (624) @ 1500	Variable Geometry Turbocharger	Cummins Compact Catalyst + SCR
QSB4.5 140	142 (106) @ 1800	457 (620) @ 1500	Variable Geometry Turbocharger	Cummins Compact Catalyst + SCR
QSB4.5 130	140 (105) @ 2400	457 (620) @ 1500	Variable Geometry Turbocharger	Cummins Compact Catalyst + SCR
QSB4.5 130	130 (97) @ 2300	387 (525) @ 1500	Variable Geometry Turbocharger	Cummins Compact Catalyst + SCR
QSB4.5 130	140 (105) @ 2000	520 (705) @ 1500	Variable Geometry Turbocharger	Cummins Compact Catalyst + SCR
QSB4.5 121	121 (90) @ 2200	347 (470) @ 1500	Variable Geometry Turbocharger	Cummins Compact Catalyst + SCR

Cummins Inc.
Box 3005
Columbus, IN 47202-3005
U.S.A.

Phone: 1-800-DIESELS™ (1-800-343-7357)
Fax: 1-800-232-6393
Internet: cumminsengines.com

Twitter.com/CumminsEngines
YouTube.com/CumminsEngines

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Cummins Ltd.
Yarm Road, Darlington
County Durham, DL1 4PW
UK

Phone: +44 (0) 1327 886464
Fax: +44 (0) 870 2413180
Internet: emea.customerassistance@cummins.com