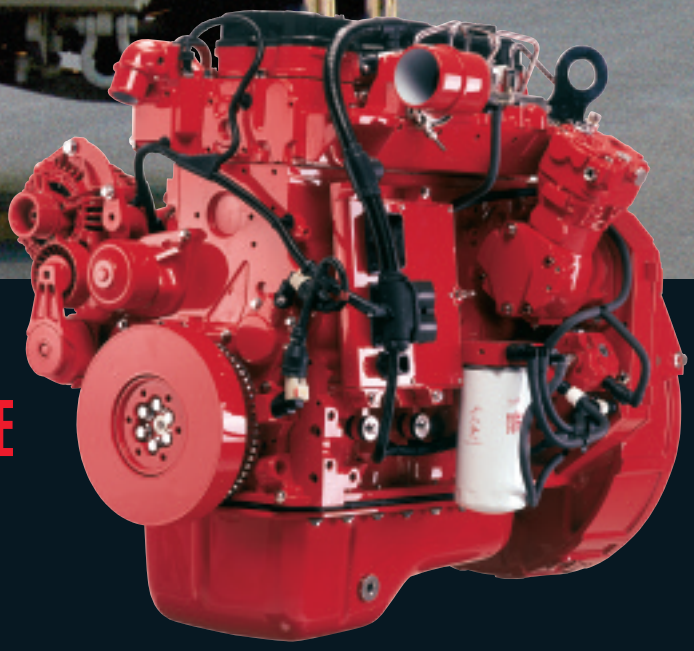
EVERY MISSION.



CUMMINS ENGINES FOR DEFENCE
60 - 850 HP

Cummins Inc. is the world's **largest** independent diesel engine manufacturer and is a **major supplier to defence agencies around the world** including the UK Ministry of Defence (MoD) and US government. Large numbers of Cummins-powered units are currently in **active service,** in a wide variety of equipment ranging from logistic trucks to heavy artillery.

Over $300 million is invested annually in research and engineering to maintain our technology leadership across a power band extending all the way to 3,500hp (2611kW). With engine manufacturing in 8 countries and over 5,000 support locations worldwide, Cummins has evolved into a truly international company.

That's why Cummins are specified in so many military applications around the world. The B/ISB^{e} series engines alone are in service in over 30,000 items of military equipment worldwide.

Experience with expertise

The Right Power For Every Need

Cummins is a global manufacturer of engines and related technologies including engine components, fuel systems, air handling, filtration, emission solutions and electrical power generation systems. Plus, Cummins is a leading producer of natural gas engines for alternative fuel vehicles.

Cummins diesels supply power for every type of military application worldwide: wheeled and tracked combat vehicles, logistic vehicles, naval propulsion and auxiliaries

SeaArk 34 Ram Patrol Vessel powered by QSB5.9

plus multi-megawatt generator sets. Available power options range from 45-3500hp (34-2611kW). From the smallest forklifts powered by the B3.3, to proven V903-powered tracked vehicles, to entire cities powered by QSK60 power generators, Cummins delivers every engine you need, wherever you need it.

Global Emissions Standards

Cummins is focused on providing the highest engine availability at the lowest possible running costs, whilst meeting the latest emissions regulations. Our strategy is driven by evaluating customer needs and market conditions in order to provide the optimum products with the appropriate technologies wherever Cummins engines operate. Equipped with a full portfolio of technology options such as SCR (Selective Catalytic Reduction), EGR (Exhaust Gas Recirculation) and DPF (Diesel Particulate Filter), Cummins can provide every technology to meet global engine emissions requirements.

SCR aftertreatment has been chosen to meet the Euro 4 and Euro 5 on-highway emission standards.

For the U.S military market, Cummins engines comply with the latest EPA emissions regulations using Cooled Exhaust Gas Recirculation (CEGR) and can be used for applications where military fuels are not required.

Also, engines remain available which meet previous emissions standards. Speak to your local Cummins representative to understand the emissions applicable to you. Wherever you are, Cummins has a Euro/EPA certified engine to meet your needs.

Military Fuel Capability*

Cummins engines are capable of operation on a wide range of military fuels, including NATO F-34 & F-54, JET A-1, JP-8 and AVTUR. The SCR system is also tolerant of high sulphur military fuels. If high-sulphur fuels are to be used, SCR-type engines are offered either with or without the SCR system, depending on customer preference.

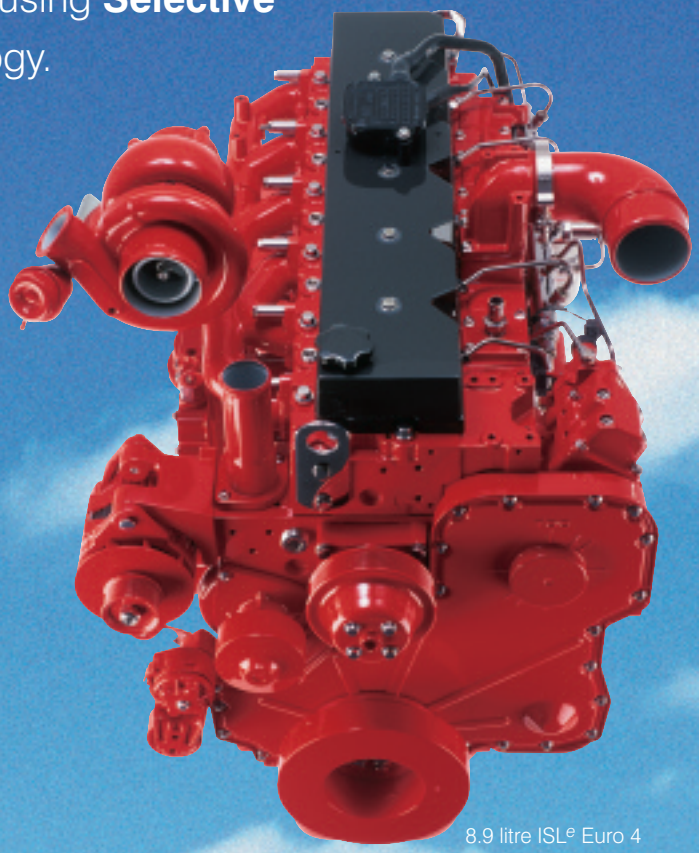
** In battlefield situations the engine can continue without emissions system derate.*

That's why you can rely on Cummins – every time.

Czech Army Pandur II 8x8 AFV powered by the ISL^{e} T450hp (Steyr-Daimler-Puch)

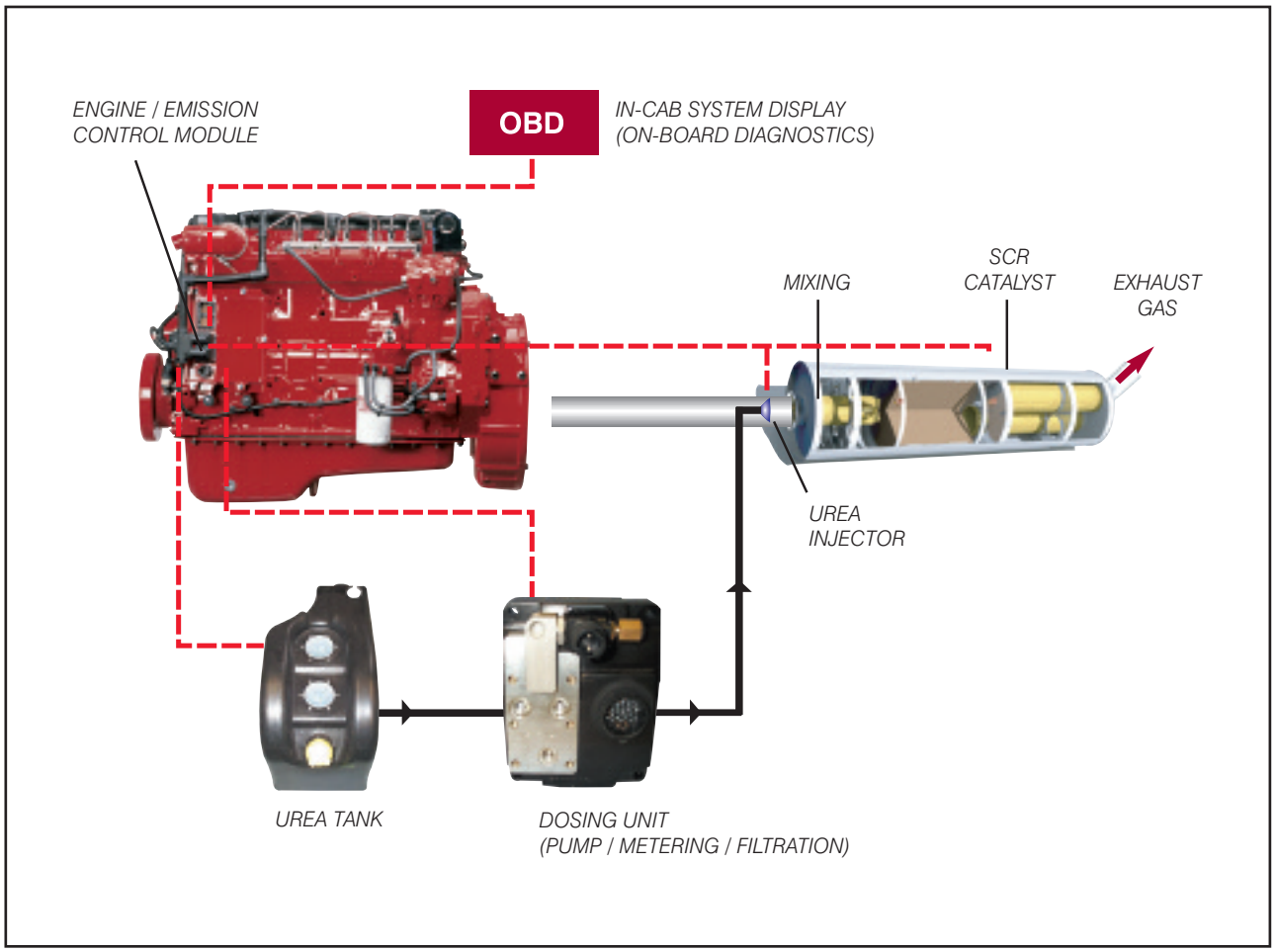
Cummins engines meet **Euro 4 emissions** legislation with the Integrated Engine Management (I.E.M.) system using **Selective Catalytic Reduction** (SCR) technology.

The system is controlled and monitored from the engine mounted Electronic Control Module (ECM), providing a more reliable, cost effective, easier to install system. The I.E.M. strategy was formed around the ability to provide a total solution of engines, air handling and exhaust systems all under the Cummins umbrella. By working closely with Cummins Turbo Technologies and Cummins Emission Solutions, Cummins are in a unique position to provide a complete engine to exhaust pipe package.



8.9 litre ISL^{e} Euro 4

Emissions technology



The SCR system

SCR – How it Works

During optimum combustion there are undesirable but unavoidable emissions of nitrogen oxide and nitrogen dioxide. These are commonly amalgamated and collectively termed as NOx. In the SCR process a re-agent AdBlue (32.5% urea dissolved in water) is used to react with and neutralise the NOx. AdBlue which is a non toxic, odourless, non flammable liquid is injected into the exhaust system. The exact amount of AdBlue introduced into the system is precisely controlled by the electronic dosing unit. In the heat of the exhaust stream the AdBlue hydrolyses and ammonia molecules are released. The NOx and ammonia molecules react in the catalyst. Nitrogen and water as steam are all that remain after the reaction. This is clean, safe technology as Nitrogen is completely harmless and makes up almost 80% of the air we breathe.

Duro IIIP Protected military police vehicle powered by ISBe 250hp (Mowag)

Peacekeeping, **intervention** and **expeditionary operations** are driving the demand for lighter, more mobile AFVs suitable for **rapid deployment** and **all-terrain capability**. Despite sophisticated **protection** and enhanced **firepower**, out in the field this new generation of AFVs will need to rely on **speed** and **concealment** to ensure **survivability** – utilising the **latest clean combustion technology** offered by the Cummins engine range.

Rapid deployment AFV power

RG-31 mine protector vehicle powered by QSB6.7 275hp (Land systems OMC)

4.5 & 6.7 litre ISB^{e} Euro 4

These highly advanced engines provide outstanding power density for higher speeds together with exceptional fuel-efficiency and sustained operations. Meeting Euro 4 and Euro 5 emissions with clean combustion techniques they reduce both thermal and visible smoke signature to very low levels, helping to prevent detection. Engine qualities well recognised by leading manufacturers of both wheeled and tracked Armoured Fighting Vehicles (AFVs), as well as close relatives such as Armoured Personnel Carriers (APCs) and reconnaissance vehicles.

Cummins ISB^{e} and ISL^{e} engines provide ideal configurations for many of these vehicle types – building on the rugged dependability of the B and C Series engines proven with defence forces around the world. With high power output and compact envelopes they provide significant installation advantages by releasing valuable internal space and aiding payload. Deep reserves of torque are available right across the rpm range for rapid response and cross-country capability.

The QSM and QSX engines are power matched for heavier AFVs. Although exceptionally strong, they are lighter and more compact than other engines in their class. With integrated engine compression brakes they provide a stealth capability by preventing the give-away thermal signature associated with service brakes.

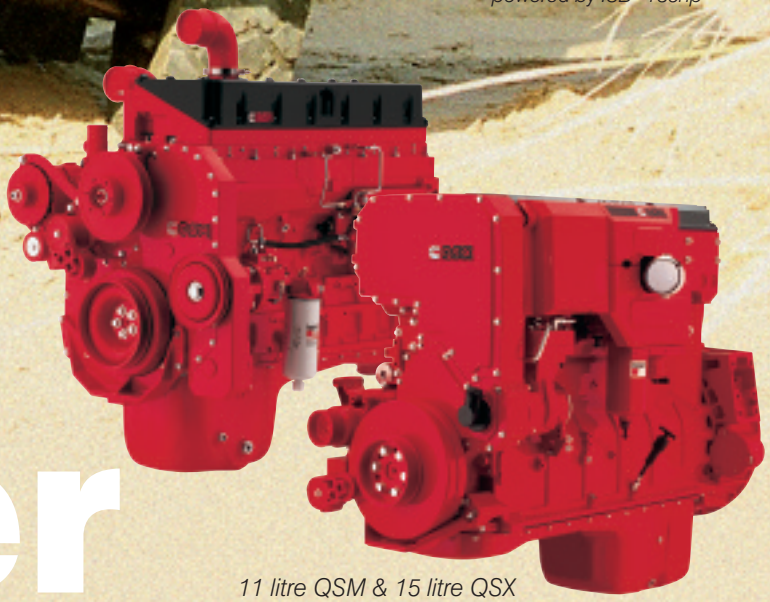
To help unleash the full driving potential of the vehicle, Cummins electronic technology reaches out from beyond the engine to fully integrate with other electronically controlled systems on the powertrain. Significantly, these engines can also be programmed with a combat 'power boost' capability which instantly uprates the power / torque profile.

While a new generation of AFVs may offer improved operational capabilities, military forces are also looking at cost-effective methods of upgrading existing vehicles. Cummins repower capability has dramatically extended the life of armoured equipment in many projects – while enhancing performance, reducing fuel consumption and lowering maintenance costs.

Clockwise from top: *British Army FV430 MK3 powered by 6BTAA 250hp (BAE Systems), Portuguese Army Pandur II 8x8 AFV available with ISL^{e} T450hp (Steyr-Daimler-Puch), UK Royal Marines Viking armoured all-terrain vehicle powered by the ISB^{e} 250hp (Hägglunds), British Army Bulldog upgraded armoured fighting vehicle powered by 6BTAA 250hp (BAE systems), Danish Army Eagle IV Armoured Patrol Vehicle with ISB^{e} 250hp (Mowag)*

Supacat 600 series powered by ISB^{e} 185hp

Logistic support **power**



11 litre QSM & 15 litre QSX

Close support logistic vehicles perform an **essential link** for military operations, moving vital supplies, fuel and personnel to the **front line**.

Recognising the need to improve the mobility and reduce the vulnerability of these vehicles, latest designs feature improved protection and sophisticated drivelines. With higher on and off-road performance these vehicles can maintain progress with a rapidly moving battlefield, reducing the logistical tail.

For cargo carriers, tactical vehicles, bowsers and transporters, Cummins engines need very little introduction. Across the 4.5 to 15 litre range they are equipped with deep reserves of torque to outperform much larger engines, particularly when hill-climbing. Advanced electronics and turbocharging contribute to class leading levels of fuel efficiency.

Cummins ISB^{e} has established an outstanding reputation for power, performance and driveability appropriate for the latest generation of all-terrain, multi-purpose vehicles.

The low relative weight of the ISB^{e} enhances payload potential. With stealth factors becoming increasingly important, engine noise is reduced due to an innovative rear gear train design and common rail fuel system. Clean combustion techniques lower both thermal and visible smoke signature, adding a further advantage.

Indeed, the ISB^{e} engine comes with a military pedigree that few other engines can match, based on the outstanding success of its B Series predecessor in the British and U.S. Armies. Now joined by the larger ISL^{e}, these engines offer unrivalled power and productivity for medium mobility transport and tactical vehicles.

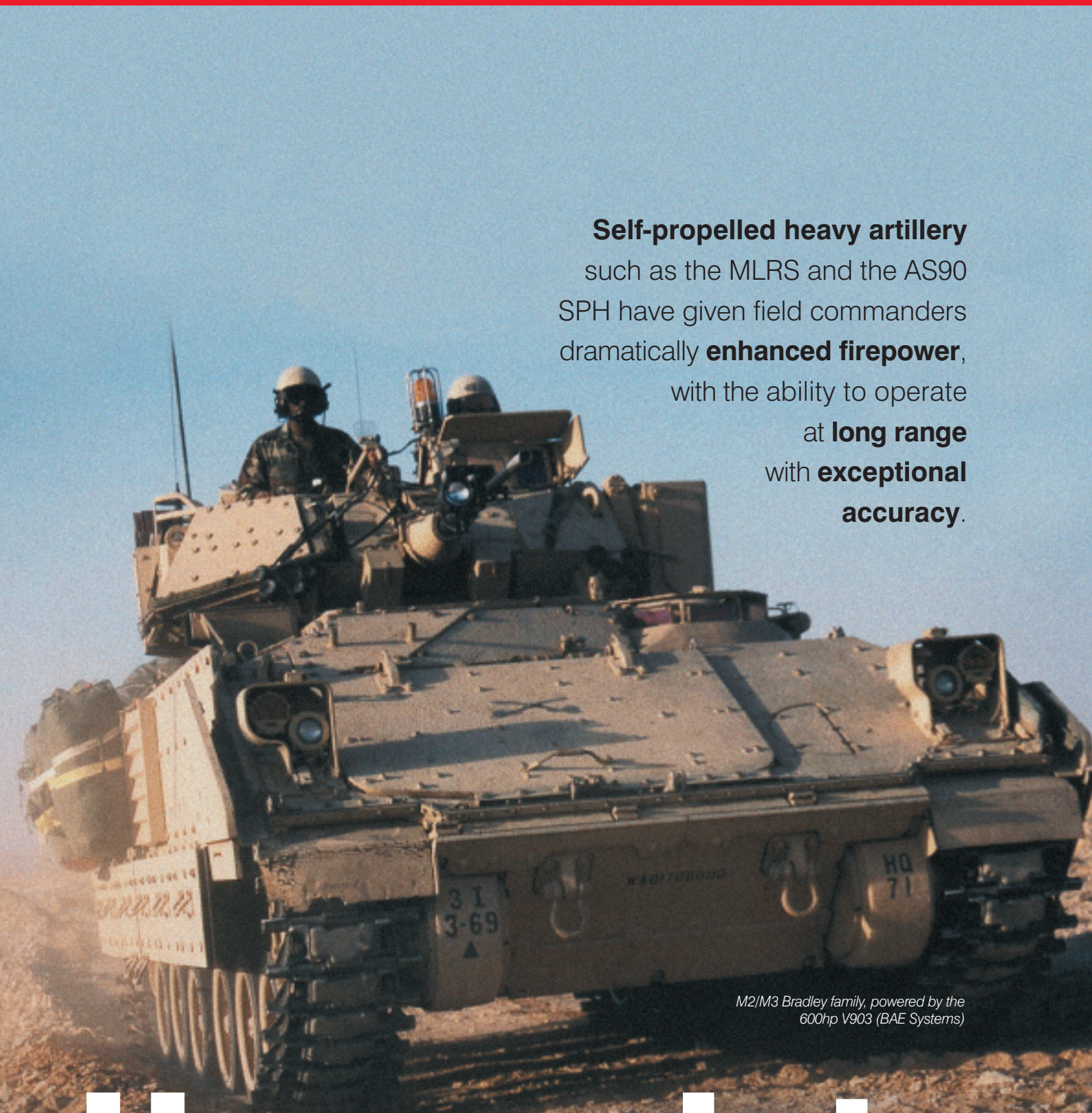
Playing a key role in the logistical chain are fleets of commercially proven road haulage trucks and tankers delivering supplies to the forward receiving area ready for onward transfer. Specified to military standards, these vehicles require engines with first class reliability, fuel-efficiency and the ability to cope with low standard roads. Cummins heavy-duty engine range is ideally suited for this vital support role.

The 11 litre QSM comes with a life-to-overhaul goal of 1 million km. Built with structural strength for long durability, it weighs only 940kg to offer a useful payload advantage. The QSM is also equipped with the latest advanced combustion technology for improved fuel economy and emissions control with longer oil change intervals.

For ultra-heavy duty haulage look no further than the 15 litre QSX. A revolutionary design with dual overhead camshafts, available with an integrated engine brake delivering up to 665hp (496kW) of braking power. Packed with the very latest technology, the EPA Tier 3 / EU Stage IIIA QSX offers higher than ever reliability and a life-to-overhaul goal of 1.6 million km.

Clockwise from top left: *UK Royal Air Force 6 x 4 aircraft refueller designed for air transportability, powered by a 245hp C Series (Dennis Eagle), Duro III military tactical vehicle 6x6 powered by ISB^{e} 185hp (Mowag), High mobility 6 x 6 tactical truck powered by an ISM 400hp (ATC/TATRA)*

Self-propelled heavy artillery such as the MLRS and the AS90 SPH have given field commanders dramatically **enhanced firepower**, with the ability to operate at **long range** with **exceptional accuracy**.



M2/M3 Bradley family, powered by the 600hp V903 (BAE Systems)

Heavy-duty combat power

US Marine Corps AAV7A1 Amphibious Assault Vehicle powered by the V903 (BAE Systems)

A key design consideration is the ability to operate with rapid, easy movement across almost any terrain, displaying much of the mobility of a main battle tank.

While the engine needs to be powerful and compact to meet this requirement, it also needs to offer exceptional reliability to ensure maximum availability of these high-value battlefield assets. The heavy-duty V903 engine is purpose developed by Cummins for these highly demanding applications – and during combat situations the outstanding abilities of this unique engine have been fully proven.

The V903 has also proved an ideal power solution for one of the most important elements on the battlefield – the tracked infantry fighting vehicle, typified by the M2 Bradley together with derivatives such as the M3 cavalry fighting vehicle.

Equipped with 600hp (447kW) of Cummins heavy-duty power, the Bradley can maintain progress with main battle tanks right at the forefront of the action. Very high power-to-weight ratio enables these vehicles to incorporate heavier armour and more firepower, while the inherent reliability of the engine is a major advantage during high intensity operations.

MLRS Multiple Launch Rocket System with V903 powered carrier (Lockheed-Martin)

With repowers and platform upgrades of armoured assets high on the agenda, Cummins has already anticipated higher power demands by uprating the V903 to 850hp (634kW) with electronic capability – while still retaining all the inherent durability of the proven engine design.

British Army, 155mm AS90 self-propelled howitzer, equipped with VTA903 T660hp (BAE Systems)

RTCH Rough Terrain Container Handler adapted for the US Army, powered by a 375hp QSM11 (Kalmar Industries)

Special purpose vehicles

Military engineering equipment with the ability to perform **rapid road clearing**, **logistics handling** or **airfield rebuilding** exert an important influence on the speed and success of the overall operation. Peacekeeping operations now place **higher than ever demands** on equipment, fully dependent on the ability of the engine to operate at **peak performance for long periods**.

Remanufactured all-terrain 30 tonne capacity Coles crane upgraded with a 240hp C Series (Grove)

In this respect, Cummins engines are highly regarded by leading equipment manufacturers – offering higher power density with unrivalled levels of durability. For engineering, handling and airfield support equipment, a full range of 45 to 3500hp (34-2611kW) engines are available meeting European and US low emission standards for off-highway applications.

The latest Cummins Quantum System (QS) electronic engines can operate at full power at lower rpm, offering a power boost reserve and reduced fuel consumption. Cummins can also offer in-depth experience in repowering older equipment to significantly extend working life on a cost-effective basis.

Cummins power is well represented in a new generation of highly specialised equipment such as the High Mobility Engineering Vehicle (HMEV), with road speeds of 100 km/h combined with generous hydraulic and earthmoving capabilities. While the RTCH rough terrain reachstacker equipped with Cummins power meets the most demanding requirements for all-terrain container handling.

For on-site power, Cummins generator drive engines can also be found in highly reliable, fuel-efficient gensets extending from 25 to 2700kWe.

Clockwise from top: *Finnish Air Force ground power unit with integrated 152hp B Series (Houchin), French MPI Beach Recovery Vehicle powered by the ISM[e], 420hp (MPI), HMT 4x4 400 Series air-portable Special Forces vehicle powered by the ISB[e] 185hp (Supacat), High Mobility Engineering Excavator powered with QSB6.7 190hp (JCB)*

BvS10 armoured all-terrain vehicle powered by the ISB^{e} 250hp (Hägglunds)

Enhancing your vehicle

Cummins information products provide **easy access to the engine management system for rapid diagnostics** and data downloading, helping to ensure **maximum uptime for vehicles**.

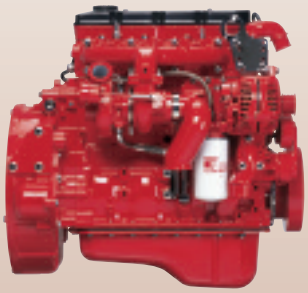
60-850hp Power Range

Cummins range of electronic engines has evolved using well proven technology and meets military requirements for durability without the need for re-engineering.

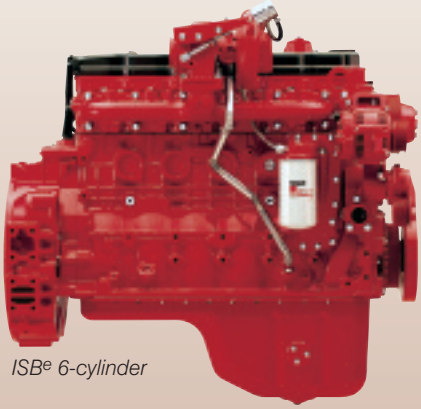
In-service reliability is further assured thanks to smart self-protection systems preventing engine wear from cold starting, overheating or excessive idling. Extended service intervals and reduced maintenance also ensure higher than ever levels of vehicle availability.

The electronic management system can be programmed outside of Euro 4 levels for higher 'power boost' ratings activated in combat or emergency situations. A full range of engine ratings are also available to meet US EPA emission regulations.

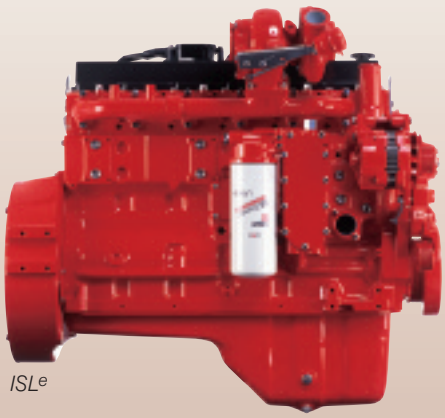
Duro IIIP powered by ISB^{e} 5.9 245hp (Mowag)



ISB^{e} 4-cylinder



ISB^{e} 6-cylinder



ISL^{e}

Power for military equipment

The **outstanding reliability** of Cummins electronic technology has been well established for over 10 years in the most **demanding applications** operating under **severe duty cycles**.

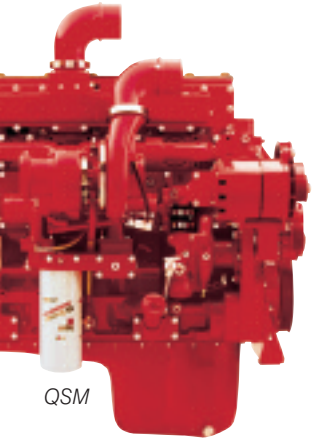
Cummins Power for Military Equipment

V903 (295-850hp)

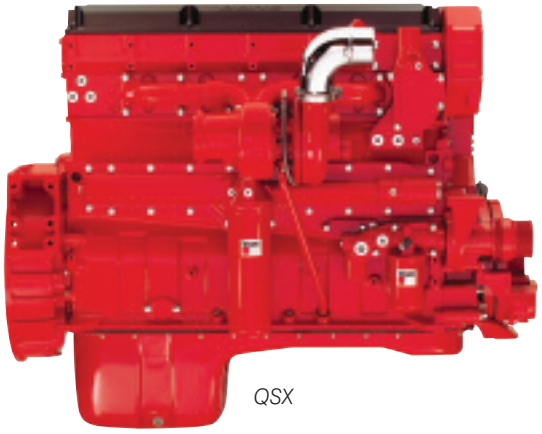
Purpose-designed military diesel engine with proven combat credentials. A 14.8 litre, 90 degree vee 8 cylinder format offers high power density, enhanced by 32-valves and compact air-to-water aftercooling. The highest rated version features electronic controls, high pressure common rail fuel system and twin VG turbochargers. Lower ratings retain the PT mechanical fuel system with single turbocharging or natural aspiration.

Max. power: 850hp @ 2900 rpm (634kW)
Peak torque: 2086 Nm @ 2900 rpm
Weight (dry): 1,271kg

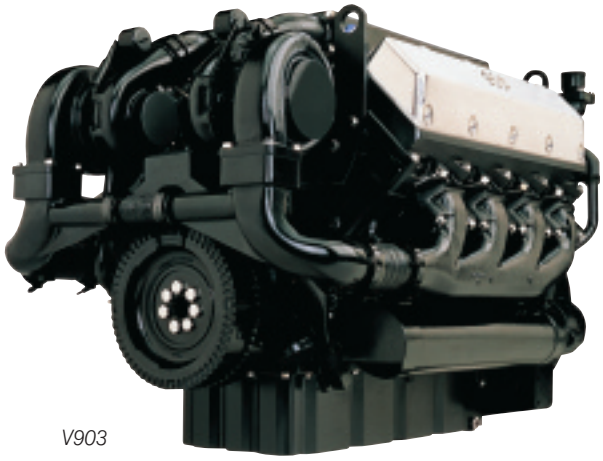
Pandur II 6x6 AFV available with ISL^{e} 350hp (Steyr)



QSM



QSX



V903

Model	Cylinders	Capacity (litres)	Max Power		Max Torque (Nm)
			kW	hp	
B3.3	4	3.3	63	85	292
QSB3.3	4	3.3	82	110	412
ISB^{e}	4	4.5	138	185	700
ISB^{e}	6	6.7	224	300	1100
ISL^{e}	6	8.9	336	450	1700
QSM	6	10.8	298	400	1898
QSX	6	15	496	665	2542
V903	Vee 8	14.8	634	850	2086

Cummins is a pioneer in product development. Thus specifications may change without notice.

Cummins Electronic Technology

Cummins information products provide easy access to the engine management system for rapid diagnostics and data downloading, helping to ensure maximum uptime for vehicles.

Cummins Electronic Technology allows the engine to look after itself. Sensors throughout the engine continually send data back to the ECM for self diagnosis and protection.

Combat 'power boost'

While Cummins engines already offer outstanding power density, they can also be programmed with an optional combat 'power boost' capability. At the touch of a button, smart electronic technology can instantly uprate power and torque to that of a larger engine. For normal operations the engine retains an emissions-compliant profile, but for limited periods such as high intensity training, emergency or combat situations, the added power boost can make a crucial difference to the success of the mission.

Concealment technology

Cummins latest clean combustion technology significantly enhances the stealth capability of military vehicles. Lower engine noise reduces the acoustic signature and visible smoke emissions are virtually eliminated.

A major reduction of particulate and other invisible emissions from the vehicle exhaust also reduces thermal imaging signature. Stress-free engine brake options prevent the give-away thermal signature typically emitted by wheeled vehicle braking systems, as well as significantly extending service brake life.

Electronic Tools

INSITE™ – For years Cummins INSITE software has been making it easy for technicians to troubleshoot, repair and service our electronic engines through easy-to-follow steps on your computer. Providing the kind of uptime you demand from your vehicles.

QuickCheck 5100

With the new QuickCheck 5100 handheld computer you get everything you need to capture and monitor engine data quickly and conveniently. The rugged, portable and user-friendly QuickCheck 5100 is fully compatible with Cummins electronic diesel engines as well as other electronic engines.

QuickCheck 5100

For more information, please visit us at http://quickcheck.cummins.com or see Bulletin 4081707.

At Cummins, we recognise that it's not just about investing in the best engine technology. Equally important is the investment we make in our service support. With a network of over 5,000 dealer locations, few other engine companies come close to Cummins global support capability. And that support goes even further with QuickServe – our commitment to rapid response. Cummins customers can access on-line a complete portfolio of engine diagnostics, maintenance procedures, repair and parts information.

QuickServe®

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