Land Defense

MTU. Your partner for unrivaled solutions.
MTU is one of the Tognum Group's flagship brands
With its two business units – Engines and Onsite Energy and Components – the Tognum Group is one of the world's leading suppliers of engines, drive systems and distributed energy systems. These products are based on diesel engines up to 9100 kW (12003 hp), gas engines up to 2150 kW (2883 hp) of power, fuel cells up to 345 kW (463 hp) of power and gas turbines with up to 50000 kW (67050 hp).

The Engines business unit’s product range is comprised of MTU engines and drive systems for marine vessels, heavy land, rail and military vehicles, and for the oil and gas industry.

The Onsite Energy and Components business unit’s product portfolio is comprised of MTU Onsite Energy distributed energy systems as well as components for engines and drive systems. The energy systems consist of diesel engines for emergency power generation, including base and peak load, as well as cogeneration power plants – gas engines, fuel cells and gas turbines – that generate both electricity and heat.

An expert technological leader
Since its founding, MTU has set standards in technological expertise, innovative ideas and customized product and systems solutions. At MTU, research is a tradition. We concentrate our innovation on the systematic advancement of our core competencies in the areas of fuel injection, turbo charging and electronics right from the start.

A passionate engine specialist
We spend every day working with our customers to find the drive system that best fits their needs. Whether a standard system or a customized solution – we passionately assume responsibility in the art of engine building.

A reliable partner
We understand the specific requirements for diverse applications. In collaboration with our customers we look for the drive solution which is best suited to the individual requirements. Regardless of which drive system is selected, our top-quality electronics can be completely integrated into almost any area of application.

MTU supplies its customers with technologically advanced premium products that are proven in the field. MTU’s range of services for off-highway diesel engines is extensive – from standard to customized solutions.
We supply far more than just best-in-class engineering.

Protection and defense, support and combat: to fulfill their responsibilities military vehicles need drive systems which meet the highest requirements. MTU engines and drive systems have set the standards for years: unrivaled power, efficient and customized for special needs.

One-of-a-kind expertise. One-of-a-kind commitment.
MTU has over 60 years of experience with drive systems for military vehicles. We are the ones who repeatedly set standards in this field, and we continue to do so – all over the world. Together with our clients and vehicle manufacturers, we develop, manufacture, and service complex, completely customized drive systems – for every category of armored vehicle, for every special need. We are always focused on our mission: providing unrivaled solutions for enhanced performance.

As a system supplier, MTU is your efficient partner in every stage of the project – from design and planning to service.

System supplier with a wide range of products
Engines from five powerful series form the heart of our drive solutions. With this foundation, we cover the entire range at the highest technological level – from standardized solutions to customized, highly integrated system solutions, from light armored 4x4 wheeled vehicles to the heavy armored main battle tank.

The high power density, high torque, fuel efficiency, and the fulfillment of special military requirements make our drive systems the first choice, both when purchasing new vehicles and retrofitting existing units.

With MTU_ValueCare, we offer a comprehensive portfolio of products and services which ensure that your drive systems retain their value and run optimally.
A qualified team of specially trained technicians supports our discerning military customers in over 20 countries throughout the world.
1 Series 106
The compact, reliable Series 106 engine is available in four-cylinder and six-cylinder inline configurations with a power output of 160-240 kW (218-326 hp).

2 Series 199
Highly compact, with an output of 430-600 kW (585-816 hp) and adapted especially to the demands placed on military vehicles (with a dry-sump lubrication system, for example). The Series 199 is available in 6V and 8V configurations and is an ideal drive system for tracked armored and heavy wheeled vehicles.

3 Boxer: Top mobility with MTU
An 8V 199 engine powers the Boxer armored vehicle. The engine accelerates the vehicle, which can weigh up to 33 tons, to a top speed of over 100 km/h (62 mph).

Series 106 and Series 199

Diesel engines for light and medium vehicles.

Protection and agility
Light and medium-weight vehicles play an important role in the support of tank units. The main demands placed on such vehicles include: optimal protection for personnel, the highest degree of maneuverability and mobility on any terrain, a large operating range, and highest likelihood of survival under the most extreme conditions.

A proven series of engines
In order to meet these demands, personnel carriers, combat, reconnaissance and patrol vehicles are powered by the robust, powerful and compact Series 106 and Series 199 engines. These drive systems are based on Mercedes-Benz truck engines and are modified by MTU for use in armored vehicles. Exceptional quality and state-of-the-art technology are combined with economic benefits such as high fuel efficiency, low operating costs, and easy maintenance to satisfy the unique demands of military operations.

<table>
<thead>
<tr>
<th>Series</th>
<th>Engine model</th>
<th>Number of cylinders</th>
<th>Cylinder arrangement</th>
<th>Bore/stroke mm (in)</th>
<th>Nominal power kW (hp)</th>
<th>Nominal speed rpm</th>
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<tr>
<td>106</td>
<td>4R 106 TD21</td>
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<td>600 (816)</td>
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</table>

Series 199 highest rating projected development
Series 890

Diesel engines for light and medium vehicles.

Benchmark technology
The Series 890 is the fourth generation of MTU engines specifically designed for military vehicles. Fully integrated, light, and compact drive systems based on the Series 890 set the standard for highly integrated military vehicle systems of the future.

Key features
- Extremely compact design
- Available as inline and V configurations
- Optimal use in diesel-mechanical, diesel-electric, and hybrid drives
- Developed especially for mounting higher masses on the free end of the crankshaft
- Diesel and single fuel JP capability
- Series design delivers logistical benefits when equipping vehicle fleets
- Starter/generator technology with high electrical power capability

Series Engine model Number of cylinders Cylinder arrangement Bore/stroke mm (in) Nominal power max. kW (hp) at 4250 rpm Nominal power max. kW (hp) at 3800 rpm

890 4R 890 4 inline 115/107 (4.5/4.2) 400 (545) 365 (500)
5R 890 5 inline 115/107 (4.5/4.2) 500 (680) 460 (625)
6R 890* 6 inline 115/107 (4.5/4.2) 600 (815) 550 (750)
6V 890 6 V, 90° 115/107 (4.5/4.2) 600 (815) 550 (750)
8V 890 8 V, 90° 115/107 (4.5/4.2) 800 (1090) 735 (1000)
10V 890 10 V, 90° 115/107 (4.5/4.2) 1000 (1360) 920 (1250)
12V 890* 12 V, 90° 115/107 (4.5/4.2) 1200 (1630) 1100 (1500)

* projected development

Ratings depend on the specific requirement of each vehicle e.g. performance map/acceleration requirements, altitude, space claim and transmission concepts.

The Puma infantry fighting vehicle sets new international standards in technology and design. The MTU PowerPack® is based on a 10V 890 engine. It represents the most compact power unit of its kind. It features state-of-the-art integrated starter/generator technology driving the electrical cooling fans.

Series 890
Highly compact and heavy duty:
The Series 890 has an output of 400-1200 kW (545-1630 hp) for electrical drive and 365-1100 kW (500-1500 hp) for mechanical drive. It is available in 4 and 5 cylinder inline configurations as well as 6, 8, 10 and 12 V configurations.
Series 870 and Series 880

Diesel engines for heavy vehicles.

For MTU nothing is too heavy
In order to produce compact, extremely mobile, and sufficiently armored heavy vehicles, drive systems must be used that are both powerful and compact. The MTU Series 870 and Series 880 engines meet these requirements in an impressive way. These engines have acquired an excellent reputation in vehicles such as the Leopard II and Leclerc Tropicalised and in terms of mobility, power density and reliability worldwide. Additionally the Series 880 is available for use in amphibious vehicles.

Key features
– Highest power concentration with regard to weight and volume
– Fulfills MIL standards including nuclear hardening and electromagnetic shielding
– Uses state-of-the-art technology such as starter generators and CAN bus communication
– Low fuel and oil consumption due to use of modern engine management and injection systems
– Diesel and single fuel JP capability

<table>
<thead>
<tr>
<th>Series</th>
<th>Engine model</th>
<th>Number of cylinders</th>
<th>Cylinder arrangement</th>
<th>Bore/Stroke mm (in)</th>
<th>Nominal power kW (hp)</th>
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<td>735 (1000)</td>
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<td>MT 881 Ka-501</td>
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</table>

* for amphibious vehicles
MTU Systems Solutions

MTU PowerPack®

System expertise utilized in a practical way
Decades of experience gained from numerous projects carried out around the world led to extraordinary drive systems: the MTU Power Packs®. Compact, highly integrated and extremely flexible, this optimal drive solution can be precisely tailored to the respective vehicle and mission profile.

Key features
- All drive system design and components come from a single source, ensuring that each component is perfectly integrated for reliability and optimal performance.
- MTU collaborates with vehicle manufacturers to perfectly integrate subsystems during the MTU PowerPack® development phase.
- Consideration of specific customer requirements, including reliable operation in extreme conditions occurs from the beginning.
- Interfaces are reduced due to the optimal system integration of the PowerPack.
- Every PowerPack is delivered ready to be installed into the vehicle, due to quick and easy plug and play technology.
- Self-locking mountings are a key advantage of the MTU PowerPack®.
- The systems are subjected to rigorous testing by MTU under simulated environmental conditions before shipment.
- For testing purposes, entire PowerPack systems can be operated outside of the vehicle even under load.
- From the project start, MTU is the single contact and partner for logistics and service.
- MTU Power Packs® may also be efficiently used to retrofit existing vehicles in addition to powering new ones.
- Replacement of the original drive system with an MTU Power-Pack® prolongs the service life of a weapons system and increases combat efficiency.
MTU Systems Solutions

MTU EuroPowerPack

Technical Data

<table>
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<tr>
<th>MTU EuroPowerPack</th>
<th>Development stage I</th>
<th>Development stage II</th>
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<td>Nominal power (kW (hp))</td>
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<td>1200 (1630)</td>
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<td>Nominal speed (rpm)</td>
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<td>Power to weight ratio (kW/kg)</td>
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<tr>
<td>Compression ratio</td>
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<td>17:1</td>
</tr>
</tbody>
</table>

A star among PowerPacks

A special position among MTU PowerPacks® is held by the MTU EuroPowerPack based on an MTU Series 880 engine (MT 883) – a drive system developed for the third generation of main battle tanks (MBTs).

Key features

- The most compact drive unit in its power class for MBT applications due to the integration of the components into one system also minimizing weight.
- The MTU EuroPowerPack combines an MT 883 engine with a Renk HSWL 295 TM transmission and is designed principally as a rear drive unit.
- Power is transmitted to the gearbox by a transfer gearbox, mounted parallel to the engine reducing length by nearly 1 m (39 in) when compared to the original drive unit in the Leopard II.
- Compared to the original approximately three additional cubic meters are available to be used for fuel tanks, ammunition space or automatic loaders; compact drive systems provide more flexibility in vehicle design.
- The MTU EuroPowerPack delivers high power density in a compact design.
Diesel-Electrical Drive Systems

mbrid –
The MTU parallel hybrid drive.

**mbrid: Distinctively MTU.**

The starter generator technology initially developed for Series 890 engines is now available for all MTU engine series as well. The MTU solution represents the optimal combination of diesel engine and electric motor. With its extremely compact design highly-efficient installation is possible for both new and retrofitted vehicles. The flywheel generator is permanently magnetically-excited; it can be operated either as a generator or an electric motor.

Among today’s hybrid drive systems, MTU prefers the parallel hybrid drive, which delivers the advantages of maximum compactness and minimum risk.

**mbrid is further proof of the wide-ranging systems expertise of MTU.** Its design is advanced and yet so simple that vehicle manufacturers and operators can implement mbrid very easily:

- Extremely compact MTU engines can be equipped on the driving end with a specially-developed flywheel starter generator including a rotor without any bearings. A counterbearing is not required, saving space and weight.
- An additional electrically switchable clutch exists between the diesel engine and the flywheel generator.
- Used in boost operation, for a short time there is a clear torque increase available at the crankshaft in the low engine speed range. The boost power is generated through the traction batteries.
- With a closed coupling, the vehicle is driven in the classical manner only by the diesel engine. The generator provides the necessary electrical power for the vehicle and for charging the batteries. In braking mode, the energy released is regenerated via the generator.
- When the vehicle is parked, it is also possible to use the diesel/generator unit for external power supply up to full generator output.
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- When the vehicle is parked, it is also possible to use the diesel/generator unit for external power supply up to full generator output.

**Your benefits:**

- **External power supply:** The flywheel starter generator together with the generator controller and power supply converter can be used as an external power supply producing 100 kVA up to higher levels.
- **High availability of electricity:** On-board system is robust and available to produce power when needed.
- **Low risk:** A conventional transmission including braking and steering system can be used.
- **More compact diesel engine possible:** Due to the availability of an additional power source (electric motor) in the drivetrain, a smaller diesel engine can be used – improving driving dynamics and fuel economy and delivering low emissions.
- **Improvement of mobility with “Silent Move”:** Slow speed operation is near silent.
- **Higher peak power and boost capability:** Additional peak power is available using the electric motor as a generator.

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**mbrid Modes**

**Diesel-mechanical mode**

With a closed coupling, the vehicle is driven in the classical manner only by the diesel engine. The generator provides the necessary electrical power for the vehicle and for charging the batteries. In braking mode, the energy released is regenerated via the generator.

**E Drive – ‘Silent Move’**

The generator is disconnected from the diesel engine by the electric clutch; the diesel engine is stopped and the generator used as an electric motor. Supplied by the traction batteries, the vehicle can be operated completely electrically and extremely quietly.

**Diesel-mechanical mode with boost mode**

Used in boost operation, for a short time there is a clear torque increase available at the crankshaft in the low engine speed range. The boost power is generated through the traction batteries.

**Power supply**

When the vehicle is parked, it is also possible to use the diesel/generator unit for external power supply up to full generator output.

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**Diesel engine**

**Electric clutch**

**Transmission**

**Starter generator**

**Traction battery**

**External power supply converter**

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**Engine**

**Starter/Generator**

**Transmission**

**Switchable Clutch**

**Rotor with Damper**

**Stator Housing**

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**4R 890 with mbrid**
MTU Portfolio of Services

Unrivaled solutions. Unrivaled support.

1. Slope testing
   MTU has a facility to test engines in inclinations of up to 100% in all directions and in all combinations. The test cell accommodates up to 2 tons in weight and 2200 kW (3000 hp) in power at all inclinations. Lubrication systems can then be specifically adjusted to customer requirements.

2. Special PowerPack testing
   MTU is one of few companies around the world that have the capabilities to test complete PowerPacks for military vehicles. The MTU test facilities handle PowerPacks up to 2000 kW (2720 hp). The main purpose is to minimize cost-intensive vehicle trials with tests to simulate real vehicle and environmental conditions, including cooling system, air filtration system, optional gear shifting and acceleration.

3. Cold start testing
   Operating under extreme climate conditions is a key requirement for military vehicles. MTU PowerPacks® are cold start tested for temperatures down to -42° C (-43.6° F). This includes the complete vehicle infrastructure, such as fuel system wiring.

4. Immersion testing
   Many customers require tests beyond the engine and PowerPack. Immersion testing is completed by MTU and can include whole vehicle testing. MTU addresses these needs with qualified test engineers and specific knowledge on how to minimize risks.

Technology with added value

Our engines and systems are the preferred drive units for military vehicles used around the world. An extensive portfolio of services, customized exactly to these applications, offers added value and important benefits.

An essential part of our service portfolio is a comprehensive internal testing program. Before an MTU drive system can be used in a vehicle, it must first undergo rigorous testing at our testing facilities. Whether cold-start testing, sloped testing, special PowerPack testing, or immersion testing – MTU has the equipment and facilities necessary. The result is the highest level of confidence, right from the beginning.

You benefit from our experience

— As a system partner, MTU supports the entire process from design and planning through delivery and service.
— With the MTU lifecycle cost (LCC) analysis, maintenance costs can be predetermined during the planning stage due to our well-founded estimates of maintenance and operating costs based on decades of experience of real-world applications.
— With MTU LCC costs are clearly understood, making it possible to recognize valuable opportunities to reduce costs.
— MTU has a comprehensive quality system and has achieved ISO 9001:2008 and 14001:2005 certifications.
— MTU engines have proven reliability and endurance with a 400-hour NATO run.
We are committed to delivering the best products, services and maintenance solutions. With that as our goal, we offer you a portfolio of products and services above and beyond the technology itself. They are perfectly developed for MTU military engines and drive systems, helping to retain the value of the engines and systems for years to come.

MTU_ValueCare is an unparalleled portfolio of value-enhancing products and services individually tailored to your specifications.

The three main product lines of MTU_ValueCare are:

- **MTU_ValueService**: extensive global solutions from the global MTU service network
- **MTU_ValueSpares**: genuine MTU spare parts and top-quality consumables
- **MTU_ValueExchange**: overhaul of MTU engines and MTU PowerPacks

**MTU_ValueService**

MTU offers you professional maintenance solutions according to your needs. These solutions include MTU Customized Care: maintenance plans covering preventive and/or corrective maintenance for a pre-determined period of time. MTU Customized Care makes it easy to plan maintenance throughout the lifecycle of your engines and systems to ensure maximum availability. Professional maintenance is performed by MTU experts using only genuine MTU parts. These experts have comprehensive product knowledge and direct connection to MTU manufacturing expertise. The terms and maintenance schedules of each MTU Customized Care are precisely tailored to the needs of each customer.

**Your benefits:**

- Professional maintenance by MTU experts
- Optimized availability
- Maximum cost certainty
- Increased flexibility
- Optimum scheduling with reduced fixed costs

**MTU_ValueSpares**

The MTU_ValueSpares program offers genuine parts and consumables to ensure the continued peak performance of your MTU engines and systems. We provide everything required from a single source. To ensure quality, MTU_ValueSpares parts and consumables are designed, tested and approved specifically for MTU engines, and include the latest updates. This is all to ensure you can experience the best performance possible.

**Your benefits:**

- Reduced complexity – everything from one source
- All parts and consumables are approved by MTU and include the latest updates
- Our spare parts program is customized to meet the unique requirements of each customer

**MTU_ValueExchange**

The MTU_ValueExchange program covers the complete MTU overhauls of engines and PowerPacks, among other things. Engines and PowerPacks overhauled by MTU offer the same level of durability, reliability, performance and economy that our customers have come to expect from new MTU engines and PowerPacks. We offer the same high level of service and support throughout the life of an MTU-overhauled engine, backed by a complete line of parts and consumables and our worldwide service network to maximize the life of your engines and PowerPacks.

**Your benefits:**

- Only genuine MTU parts and components are used
- Customized warranties
- Extended warranties are available
- Supported by the same worldwide network of certified MTU service partners as new engines
- Tested using the same procedures as new engines and PowerPacks

**Other services**

In addition to these services, we offer the following to our military clients:

- Training on all engines and PowerPacks, in multiple languages and in 21 training centers around the world
- A full line of customized technical documentation
- Workshops and testing solutions such as facility planning
- On-site service for preventive and corrective maintenance during the warranty period and for follow-up service
- Fast reaction times and local support
- Highly trained and flexible technicians

Purchasing MTU engines pays off in many ways: not just from their performance and reliability, but also the satisfaction you get from receiving superior service – from MTU_ValueCare.
MTU. Your partner for unrivaled solutions.
## MTU References.

### Main battle tank

<table>
<thead>
<tr>
<th>Engine model</th>
<th>Nominal power</th>
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<tbody>
<tr>
<td>TAM</td>
<td>MB 833 Ka-500 520 kW (720 hp)</td>
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<tr>
<td>M 48</td>
<td>MB 837 Ea-500 551 kW (750 hp)</td>
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<tr>
<td>M 60</td>
<td>MT 881 Ka-501 735 kW (1000 hp)</td>
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<tr>
<td>Leopard I</td>
<td>MB 838 CaM-500 610 kW (830 hp)</td>
</tr>
<tr>
<td>AMX 30</td>
<td>MB 833 Ka-501 625 kW (850 hp)</td>
</tr>
<tr>
<td>OF 40 MK II</td>
<td>MB 838 Ca-501 698 kW (950 hp)</td>
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<tr>
<td>K 1</td>
<td>MB 871 Ka-501 882 kW (1200 hp)</td>
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<td>Arjun</td>
<td>MB 838 Ka-501 1030 kW (1400 hp)</td>
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<td>Leopard II</td>
<td>MB 873 Ka-501 1100 kW (1500 hp)</td>
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<td>Leclerc</td>
<td>MT 883 Ka-500 1103 kW (1500 hp)</td>
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### Howitzer

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### Personnel carrier

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<td>Boxer</td>
<td>8V 199 TE20 530 kW (721 hp)</td>
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<td>Fuchs</td>
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### Bridge-laying vehicle

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<td>K1 Bridgelayer</td>
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### Infantry fighting vehicle

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### Anti-aircraft vehicle

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<tr>
<td>Buffel</td>
<td>MB 873 Ka-501 1103 kW (1500 hp)</td>
</tr>
<tr>
<td>Leclerc/Recovery</td>
<td>MT 883 Ka-500 1103 kW (1500 hp)</td>
</tr>
</tbody>
</table>

### Mine-clearing vehicle

<table>
<thead>
<tr>
<th>Engine model</th>
<th>Nominal power</th>
</tr>
</thead>
<tbody>
<tr>
<td>Keiler</td>
<td>MB 871 Ka-501 810 kW (1100 hp)</td>
</tr>
<tr>
<td>Husky</td>
<td>6R 106 TD20 150 kW (205 hp)</td>
</tr>
</tbody>
</table>

### Amphibious vehicle

<table>
<thead>
<tr>
<th>Engine model</th>
<th>Nominal power</th>
</tr>
</thead>
<tbody>
<tr>
<td>EFV</td>
<td>MT 883 Ka-524 2016 kW (2760 hp)</td>
</tr>
</tbody>
</table>

### Patrol vehicle

<table>
<thead>
<tr>
<th>Engine model</th>
<th>Nominal power</th>
</tr>
</thead>
<tbody>
<tr>
<td>Iguana</td>
<td>4R 106 TD21 160 kW (220 hp)</td>
</tr>
<tr>
<td>Tactica</td>
<td>6R 106 TD20 180 kW (255 hp)</td>
</tr>
<tr>
<td>Nimr</td>
<td>6R 106 TD20 205 kW (280 hp)</td>
</tr>
</tbody>
</table>