eMobility

Innovation electrified.

EATON
Powering Business Worldwide
Electric extraordinary.

In the midst of a revolution, experience matters. At Eaton, we’ve been innovating electric transportation breakthroughs for decades. We understand the electric revolution because we make it work.

Our power is proven.

Today the world has awakened to the limitations of fossil fuels. The global oil supply is not infinite. Emissions are not without consequence. Sustainability is no option. Now we have to change and now more than ever that change is electric.

Eaton is leading the way.

Our vast engineering and manufacturing resources span the globe with expertise that’s deep and wide. We do more than design custom electric vehicle products, systems and services efficiently — we power your success!

Overview

eMobility Portfolio

Power Electronics

Power Distribution and Protection

Power Systems

Low-voltage Products

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What’s inside.

Electrification is changing the automotive industry and Eaton’s eMobility business is at the forefront, helping to create next-level performance, safety and range.

— Dan Ouwenga
Advanced Technology Manager
Choosing the right partner.

The mission of Eaton’s eMobility business is to help you develop the safest, most efficient electric vehicles that travel faster and farther, with superior system protection.

Safer right now.
At Eaton, vehicle and system safety are at the forefront of everything we do. It always will be as EV manufacturers are tasked with building consumer confidence while navigating the many challenges of new, complex systems.

We proudly offer proven power protection expertise with market leadership in xEV high-voltage fuses. And we’re taking EV safety to the next level with new innovations like Breaktor™ circuit protection technology that reliably protects people and components from overloads and short circuit events — all while being resettable.

Efficient, effective, eMobility.
Bring us your toughest challenges – we’re ready. Our extensive integration experience helps us deliver the cost, packaging and timing efficiencies you need most. Our expertise in software development ensures more effective communication between different vehicle functions and the charging station. And we regularly transfer knowledge and apply technology advancements from our Electrical, Vehicle and Aerospace groups. Our experience in AC and DC and in multi- and single-phase systems is a key competitive advantage.

Delivering on a global scale.
Eaton expertly manages ever-changing global standards and regulations. We have manufacturing facilities worldwide with notable certifications such as ISO, IATF, IFRS and many others. Another unique advantage, especially when it comes to speed to market, is Eaton’s world-class simulation and testing capabilities.

Engineering excellence defined.
The Eaton engineering team is as global and comprehensive as the original equipment manufacturers (OEMs) we serve. This includes the full resources of the Eaton Engineering Centers of Excellence, as well as proven external partnerships. As a result, Eaton provides uncommon agility and innovation in all stages of development and manufacturing.

Eaton Key Advantages
Here is a look at some of the ways Eaton stands out.
• Expertly converge electrical and mechanical power competencies
• Deep experience with vehicle dynamics and system integration
• Proven safety and regulatory powerhouse
• Excellent OEM relationships
• Diverse industrial expertise, including vehicle, aerospace and hydraulics
• Power utility, commercial, industrial, residential and vehicle markets
• Unique high-voltage experience (greater than 36kV)
• Leader in power protection (greater than 30k amperes)
• Global engineering and manufacturing facilities
• World-class simulation and testing capabilities
• Comprehensive electric vehicle product portfolio

Electric vehicles powered by Eaton today.
Hybrid Electric Vehicle (HEV)
Plug-in Hybrid Electric Vehicle (PHEV)
Battery Electric Vehicle (BEV)
Fuel Cell Electric Vehicle (FCEV)

The amount of innovation it takes to deliver on EV range, efficiency and performance is really no different than what the industry has been doing in combustion engines since the 1800s. And we think it’s just getting started.

— Dr. Brian McKay
Global Head of Engineering
A powerful portfolio of solutions for every electric vehicle.

Safety, range, performance, efficiency, serviceability — we understand the challenges and are working alongside you to deliver powerful, brilliant solutions. Our strengths are Power Electronics for managing electrical power, Power Distribution and Protection for safety and reliably distributing power and Power Systems for managing mechanical power.

**Power Electronics**
- High- and low-voltage inverters
- DC/DC converters
- On-board chargers (OBC)
- Integrated components

**Power Distribution and Protection**
- Power distribution units (PDU)
- Fuses
- Breaktor™ circuit protection

**Power Systems**
- EV transmissions
- 48V mild hybrid

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Our immense global electrical competency, plus manufacturing, R&D and vehicle expertise, are yielding innovative EV solutions at a very quick pace.

— Peggy Prosser
Sales Director
Choose our Power Electronics to efficiently invert and convert power and control energy flow. These powerful, proven solutions optimize electric vehicle performance, dynamics and range.

We are global leaders in power conversion with expertise in industrial power electronics. We’re also a worldwide power management company with a formidable electrical knowledge base. Our vehicle expertise is even stronger thanks to innovations we’ve created in every sector we are privileged to serve.

Our Power Electronic solutions
- Inverters
- DC/DC converters
- On-board chargers
- Integrated components

Eaton is focusing on power density, safety and efficiency. We have a long history of making power electronics for different applications, so we’re taking that experience and expertise and applying it to electric vehicles.

— Vasilios Tsourapas
Engineering Manager
Inverters

A better-performing electrified vehicle is the result of our full line of power-dense inverters, from low to high voltage. Our high-voltage inverter converts direct current (DC) from the batteries or generator to alternating current (AC) to power the traction drive motors. In other words, it helps move the vehicle with these benefits:

- **Power density** — takes up less space
- **Efficiency** — optimized use of battery
- **Compact and lightweight** — easier to implement package design
- **Customized mechanical package** — includes motor integration
- **Maximized range** — efficient use of battery
- **Adaptable and scalable** — flexible design allows multiple power levels

Eaton’s power-dense inverters can be custom configured and integrated to support your unique system requirements. We are also an established and trusted powertrain partner.

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**Key Features – High-voltage Inverter**

- ISO 26262 and AUTOSAR compliant
- 35-kilowatt-per-liter output
- 70˚C with 10L-per-minute flow rate
- IGBT from 300 — 800A
- 400V system 85 — 200kW
- 98% efficiency
- Operating temperatures of -40˚C to 125˚C
- Custom and integrated aluminum enclosures

Eaton’s inverter technology in the passenger car space and the commercial vehicle space is really pushing the limits on how we create efficiency.

— Dr. Brian McKay
Global Head of Engineering
Exceptionally reliable, safe and easily customizable, the Eaton DC/DC converter changes the higher voltage of the battery to the lower voltage needed to power a vehicle’s entertainment system, windows and/or safety features. Benefits include:

- **Proven design** — 50+ years of DC/DC converter expertise, including 5+ years of BEV production
- **Custom solutions** leveraging standard production processes
- **Quiet, clean output power** — enables powering of sensitive loads, including radios and controllers
- **Compact, lightweight design**
- **Excellent system flexibility** — accepts wide range of input voltage and multiple output voltages

Eaton DC/DC converters are proven to provide clean and reliable power for the high-voltage system. Because of their excellent performance and reliability, they are selected for a variety of applications, including construction, agriculture, commercial and passenger vehicles.

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**Key Features – DC/DC Converter**

- **Wide range input**: 225 — 450V
- **Output voltages**: 12, 24, 48V
- **3kW output power**
- **Compact design**
- **95% efficiency**
- **Custom aluminum enclosures**

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‘When a customer needs multiple voltages on their vehicle, our decades of learning help us quickly deliver robust, reliable solutions.”

— Matt Nolan
Product Strategy Manager
On-board Chargers
Thanks to our superior on-board chargers, customers can safely charge their electric vehicles anywhere there is AC power. Eaton’s on-board chargers also efficiently deliver the best of both worlds: the fast, smart-charging capabilities your customers demand with proven packaging agility to reduce delivery times, cost and risk. Consider the benefits:

• Scalability — configurable for each vehicle platform
• Power density — takes up less space

• Compatibility with global electric standards
• Highly efficient — maximizes charge current and reduces charge time
• Customized mechanical package — easier assembly and integration into the vehicle
• Reduced development costs — leverages proven designs

Key Features – On-board Charger

- 225 – 500 volt DC output
- Bidirectional capability
- 95% efficiency
- Supports global charging standards
- Power density of 2kW per liter
- 3-phase and single-phase capable
- Custom and integrated aluminum enclosures

By using standard solutions, we can repackage very easily, increasing our speed of delivery to the customer.

— Laurent Collins
Product Strategy Manager
Eaton is developing integrated power electronics solutions by combining DC/DC converters and on-board chargers. Integrated units are designed to improve efficiency, increase reliability and provide packaging flexibility while saving space and decreasing costs by reducing redundant componentry.

- The integrated OBC DC/DC converter can operate in either 400V or 800V capacities.
- The DC/DC converter provides 12, 24 or 48V output.
- Ability to integrate magnetics into a common package.
- Modules are designed to be used in conjunction with each other.
- CAN communication and control of modules and between modules.
- Ability to integrate circuit protection and some power distribution.
- Reduce redundant content, including control circuits, protection circuits, connectors and magnetics.

Eaton has worked hard to not just combine modules into a single package, but integrate key components allow us to optimize the size of our power electronics reducing the otherwise redundant circuits.

— Matt Nolan
Product Strategy Manager

Integrated Components
The advantages of being a global power management company and an experienced automotive industry supplier are brilliantly demonstrated with Eaton’s Power Distribution and Protection solutions. We have multiple systems and breakthrough products (see Breaktor™ on page 31) to intelligently measure and distribute power to multiple sources as well as provide exceptional, compact circuit protection.

**Why choose eMobility at Eaton?**
We have uncommon range, and we are innovative. Choose a complete system or specific components to protect expensive electronics and energy storage, efficiently distribute electric power, provide preventive health monitoring and discreetly measure power consumption.

**Our Power Distribution and Protection solutions:**
- Power distribution units
- High-voltage power distribution unit
- Intelligent power distribution unit
- FLEX intelligent power distribution unit
- Fuses
- Breaktor

"We have specialized knowledge at Eaton. It’s unique that we know exactly how to deal with this type of energy, making it safe and reliable within multiple automotive applications."

— Mike Lau
Product Strategy Engineer
Power Distribution Units

Eaton’s power distribution units include a high-voltage power distribution unit, a next-level high-voltage intelligent power distribution unit and an intelligent FLEX power distribution unit for commercial vehicles.

The high-voltage power distribution unit (PDU) delivers power to all critical loads within the electric vehicle system, while protecting electrical and electronic components and vehicle occupants with reliable circuit protection solutions, including:

- Flexible, customized configurations — proven and optimized components
- Main battery contactors — up to 900V systems
- Traction inverter power distribution and fuse protection
- Fuse coordination — with contactors or Breaktor® for complete circuit protection
- Optional DC fast charge circuit and auxiliary power distribution
- Integrated pre-charge circuit
- DC current sensing

Eaton’s power management and circuit protection heritage provide proven safety and circuit protection during a fault or crash event.

Key Features — High-voltage Power Distribution Unit (PDU)

- Up to 900V battery terminal connections
- Available DC fast charge circuit
- Traction inverter connections
- Injection-molded housing for use in battery pack (or cast aluminum for underhood applications)
- High-voltage positive and negative contactors
- Laminated bus bar for improved power density
The high-voltage intelligent power distribution unit (iPDU) is a next-generation option for monitoring and managing all power distributed to power electronics. It provides central protection for the electrical system, including:

- Software integration in iPDU for complete programmable control of system components per functional safety/ASIL requirements.
- Contactor and fuse operational status monitoring — communicates vehicle operational status and diagnostics via Controller Area Network (CAN).
- Seamless over-current protection between fuse(s) and contactor(s) or Breaktor™.
- Optional ground fault detection for load circuits.
- Voltage and current sensing with data communicated over CAN network.
- Thermal and fuse life simulations ensure components are sized to handle the high current pulses and thermal environment within the PDU, reducing the risk of nuisance fuse openings.

Choose the high-voltage intelligent power distribution unit for enhanced safety and circuit protection during a fault or crash event, plus smart diagnostics that can ultimately help improve vehicle performance and reliability.

**Key Features — Intelligent Power Distribution Unit (iPDU)**

- Pre-charge resistor loads charges in power electronic capacitors without tripping circuit protection.
- Programmable microcontroller for management of intelligent functions.
- Up to 900V battery terminal connections.
Commercial Vehicle Exclusive

The high-voltage intelligent FLEX power distribution unit (FLEX PDU) is the next-generation option for monitoring and managing all power distributed to power electronics and provides central protection for the electrical system in commercial vehicles. FLEX PDU is made up of a series of power distribution elements, which are configurable to meet specific needs. Benefits include:

• A completely customizable solution — with short lead time
• Software integration — in FLEX PDU for complete programmable control of system components
• Contactor and fuse operational status monitoring — communicates vehicle operational status and diagnostics via Controller Area Network (CAN)
• Seamless over-current protection between fuse(s) and contactor(s) or Breaktor™
• Optional ground fault detection for load circuits

The Eaton FLEX PDU can be fully customized for specific requirements, reducing up-front development and prototyping costs.

Key Features — Intelligent FLEX Power Distribution Unit (FLEX PDU)

Safety and efficiently monitors and manages all electric power distributed in an electric vehicle.

Fully customizable based on a vehicle’s power level, number of electric auxiliaries and battery packs.

Intelligent software integration for complete programmable control of system components, communicating operational status and diagnostics.

Our intelligent FLEX PDU leverages our industry experience and electrical expertise to ensure complete power protection with enhanced vehicle performance and efficiency.

Scott Adams
President
The Eaton Bussmann Series ® electric vehicle fuses are designed for the protection of high-power battery charging and management systems up to 500 Vdc in rating from 50 to 400 amps. It’s primary uses are battery protection, battery inverter and fast charging. Its auxiliary uses are DC/DC converter, HVAC and OBC.

These fuses open up to 10 times faster under high fault-current conditions, which helps ensure reliable protection of the circuit and components. Additional benefits include:

• Customizable — unique ratings or performance characteristics for custom applications
• Require up to 48% less space with reduced weight
• Simulation testing to help enable the life of the fuse in your application — unique driving profiles and conditions can be simulated to verify proper fuse size and performance under a wide range of driving behaviors
• Operation as low as 200% overload — provides backup protection to the battery management system
• Data logging system — each fuse has a serial number and date code for traceability of Critical-to-Quality characteristics
• Greater ampacity — Can be applied in parallel to realize greater ampacity within sizing guidelines
• Battery fuses available in three case diameters and sizes — 20 mm (100 to 150 amps), 25 mm (100 to 250 amps), 30 mm (200 to 400 amps)

Higher current rating in EVs come along with higher power requirements, especially for battery electric vehicles with the demands of faster charging, increased vehicle range and premium systems. For these applications, the Eaton Bussmann series of Electric Vehicle (EV) fuses includes high-power fuse solutions up to 1000 Vdc.

• 1000 Vdc charging-protection fuses enable fast-charging the vehicle via the DC/DC fast-charging unit
• High interrupting rating protects high-capacity battery packs with increased power levels
• Industry-leading simulation of fuse lifetime in both charging and high-demand driving cycles to reduce replacement needs for fuse protection
• Produced in IATF environment with traceability and technical cleanliness options
• Products are available in three square body diameters:
  1. 43mm (500V, up to 630A; 1000V, up to 350A)
  2. 51mm (500V, up to 800A; 1000V, up to 630A)
  3. 59mm (500V, up to 900A; 1000V, up to 800A)

High-Power Fuses

Our high-performance fuses are prepared to deal with increasing power and fault current levels of future battery systems.

— Till Wagner
Product Manager

Eaton Bussmann fuses are on seven of the top-ten electric vehicle platforms globally.

— Kevin Calzada
Product Strategy Manager

For future electric vehicle platforms, we recommend to go with high-current and high-power fuses. Our high-performance fuses are prepared to deal with increasing power and fault current levels of future battery systems.

— Till Wagner
Product Manager
Why Breaktor™ circuit protection is so important.

First, electric vehicle fuses must regularly handle extreme power fluctuations such as during engine starts, acceleration and braking. We know these high-current fluctuations can cause fuses to age faster than designed, especially in high-current BEV applications.

Second, the coordination between the fuse and the contactor can be challenging or even impossible to achieve when there’s a short circuit or overload in the system. Overcurrent protection with a fuse and a contactor is a delicate balancing act and can result in a nuisance fuse opening during regular operating conditions or worse, insufficient protection during a fault condition. The fuse-contactor coordination issue gets even more challenging as the continuous currents increase in the vehicle such as is happening in many BEV applications in the market today. Simply put, higher loads can create poor coordination between the fuse and the contactor, which can cause a range of challenges, including:

• Reduced fuse reaction time and slower circuit interruption
• Personnel safety risks
• Welded contactors
• Damaged electronics
• Nuisance fuse openings

The safer solution is Breaktor™, an Eaton exclusive.

Breaktor replaces traditional fuses and contactors by combining switching and protection functions into one efficient package. The result is proven, fast protection — less than 5 milliseconds — against overload or short circuit. The result is safer electric vehicles for all.

Beyond its life-saving breakthroughs, Breaktor brings intelligent cost savings too. Unlike a blown fuse, which would necessitate an expensive repair, Breaktor can easily be reset after a fault. Breaktor also operates independently of the current direction, allowing application for both charging and duty use.

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A safety breakthrough that’s changing circuit protection for the better.

The story of Breaktor really tells the story of eMobility — what’s possible when you combine our very extensive expertise in high-power switching and high-voltage systems with our strong OEM relationships and system knowledge.

— Kevin Calzada
Global Product Strategy Manager

Did you know?

It’s called Breaktor because it uniquely combines functions of the breaker (fuse) and the contactor.

— Till Wagner
Product Manager

Breaktor represents the very best of what Eaton eMobility can do — taking what we know about electrical power and applying it to improve electrical vehicles in new and better ways.

— Mike Lau
Product Strategy Engineer

The story of Breaktor really tells the story of eMobility — what’s possible when you combine our very extensive expertise in high-power switching and high-voltage systems with our strong OEM relationships and system knowledge.

— Kevin Calzada
Global Product Strategy Manager
Breaktor™ is an innovative new safety solution from Eaton that protects the electrical vehicle main power line from battery to inverter by combining two key components — the circuit breaker and the relay. Benefits include:

- Combined switching and protection function — replaces traditional fuses and contactors, solving coordination challenges in high-current systems
- Improves functional safety by opening circuit safely if a system were to malfunction
- Resettable and bidirectional — can be reset after a fault and it is independent of the current direction, allowing application for both charging and duty use
- Embedded short-circuit sensing — recognizes a short-circuit fault without the need to be triggered by BMS, helping with the system redundancy and distributed capabilities
- Current-limiting — improves system protection in the event of a short circuit
- Quick driver coil disconnection — helps eliminate contact welding after an overcurrent event
- Optional mirror contact — for even higher functional safety levels

At-a-Glance

Breaktor combines current switching and resettable bidirectional short-circuit protection with fast actuation (up to 900V).

Bottom line: Breaktor is a safety device. It helps improve safety to an electric vehicle’s occupants and equipment, including power electronics.

Kevin Calzada
Global Product Strategy Manager

What’s very unique about Breaktor is that, upon sensing an overcurrent, it can shut off power completely in less than 5 milliseconds — that’s protection in the blink of an eye.

Kevin Calzada
Global Product Strategy Manager

Did you know?

Breaktor combines current switching and resettable bidirectional short-circuit protection with fast actuation (up to 900V).

Key Features — Breaktor

- Permanent magnet system
- Helps control location of arcing
- Splitter plates
  - Split the arcing into smaller, lower-voltage arcs to help with extinguishing
- Current sensor
  - Senses unsafe overcurrent conditions and communicates to on-board PCBAs
- Driver electronics
  - Powers Breaktor actuation and deenergizes coil during overcurrent event
- Movable contact
- Fixed contact
- Driver coil
  - Actuates Breaktor with low-voltage current

What’s very unique about Breaktor is that, upon sensing an overcurrent, it can shut off power completely in less than 5 milliseconds — that’s protection in the blink of an eye.

Kevin Calzada
Global Product Strategy Manager

Did you know?

Breaktor combines current switching and resettable bidirectional short-circuit protection with fast actuation (up to 900V).
Solutions from Eaton’s Power Systems group are meeting global needs for more efficient electric vehicle transmissions and accessories. What’s more, many Eaton products, such as fuses, inverters and power distribution units, are integrated into these proven systems.

Eaton has deep experience with hybrid systems in a variety of challenging environments along with expertise in gear design and shifting technology — this is unique! Only Eaton has this combination of abilities along with a rich electrical knowledge base. It’s no wonder the world’s hardest-working commercial vehicles and buses have relied on Eaton Power Systems for more than 15 years.

Our Power Systems solutions
- EV Transmissions (diversified commercial applications)
- 48-Volt Mild Hybrid

“We have specialized knowledge at Eaton. It’s unique that we know exactly how to deal with this type of energy, making it safe and reliable within multiple automotive applications.”

— Mike Lau
Product Strategy Engineer
Eaton offers a variety of EV transmissions for commercial vehicles and buses. With over 15 years and 2 billion miles of safe, reliable service, our EV transmissions deliver efficiency and performance required for the most challenging applications. Benefits include:

- Efficient motor use — including extended range and/or reduced battery size
- Improved performance on grades — including improved starting ability with a smaller motor and better acceleration
- Tailored to the application — bus, truck, a variety of motor pairings, custom shift calibrations

Eaton’s proven EV transmissions improve performance on grades, allow motors to operate more efficiently and improve top speed in a smaller and lighter package.

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The performance and acceleration in electric commercial vehicles is phenomenal. And when you have this peak torque at zero speed, you no longer have to worry about clutches closing.

— Julie Marshaus
Engineering Manager

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**Key Features — EV Transmissions**

- Integrated electric actuation system
- SAE nodal mounts
- Transmission-mounted ECU
- Direct drive top gear
- Helical gearing
- All-aluminum enclosure

Power Systems
### Portfolio of EV transmissions

Eaton offers flexibility to meet application needs

<table>
<thead>
<tr>
<th>FEATURE</th>
<th>MD EV 2</th>
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<th>Typical PHEV applications</th>
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</table>

**Note:** *Max input speed: vocation dependent. **Proof of concept model. Final specifications may differ.*

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### EV transmissions: Medium-duty 2-speed key specifications & capacities

- **Max. input speed**: 6000 rpm
- **Max. torque capacity**: 700 Nm
- **Dry weight**: 81 kg
- **Total length**: 582 mm
- **Oil capacity**: 4.6 liters
- **Maintenance intervals**: 3 years, 300,000 km oil change (bus/vocational)

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</tbody>
</table>
### Eaton eMobility

- **Max. input speed**: 5000 rpm
- **Max. torque capacity**: 1200 Nm
- **Dry weight**: 109 kg
- **Total length**: 420 mm
- **Oil capacity**: 7.3 liters
- **Maintenance intervals**: 4 years, 300,000 km

### EV transmissions

#### Medium-duty 6-speed key specifications & capacities

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- **Max. input speed**: 4500 rpm
- **Shift controls**: Eaton proprietary shift control logic
- **Max. torque capacity**: 1150 Nm
- **Dry weight**: 273 kg
- **Total length**: 590 mm (with SPL90 yoke)
- **Oil capacity**: 9.2 liters
- **PTO**: 6-bolt
- **Maintenance intervals**: 3 years, 288,000 km oil change (bus/vocational)

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### EV transmissions

#### Medium-duty 4-speed key specifications & capacities

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- **Max. input speed**: 4500 rpm
- **Shift controls**: Eaton proprietary shift control logic
- **Max. torque capacity**: 1150 Nm
- **Dry weight**: 273 kg
- **Total length**: 590 mm (with SPL90 yoke)
- **Oil capacity**: 9.2 liters
- **PTO**: 6-bolt
- **Maintenance intervals**: 3 years, 288,000 km oil change (bus/vocational)
EV transmissions
Heavy-duty 4-speed key specifications & capacities

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48-Volt Mild Hybrid

The 48-volt mild hybrid is an electronically regenerative accessory drive ideal for commercial vehicle applications. It can be used to power sleeper cabs on linehaul trucks or adapted for a variety of purposes. As an integrated solution, the 48-volt mild hybrid features a 48-volt motor that drives the HVAC and replaces the alternator to charge the battery. It’s a flexible solution providing both 48 volts and 12 volts to run accessories. Benefits include:

- Air-cooled package eliminates the need for liquid cooling line, reducing excessive cable and harnessing costs
- Modules can work in conjunction with each other
- CAN communications and control of modules and between modules
- Ability to integrate circuit protection and some power distribution
- 10kW 48V motor drive and 3kW 48/12 bidirectional DC converter

The 48-volt mild hybrid enables fuel savings by mounting the accessories on the transmission, delivering a 2% annual fuel-efficiency savings. It’s also compliant with Greenhouse regulations that encourage anti-idle solutions in the sleeper cab market.
Commercial vehicles work hard. Cargos are heavy and conditions can be extreme. At Eaton, we’ve been on the forefront of powering these titans for over a decade. We’ve gladly plowed through dirt, climbed steep roads and shifted through narrow passes to understand the challenges. As a result, Eaton EV transmissions are the premier choice for a diverse range of commercial applications. The benefits are proven — range, performance and efficiency increase, costs decrease.

Commercial electric vehicles powered by Eaton

- Pickup/delivery
- Municipal (street sweepers, water sprayers, sanitation)
- Bus (city transit, shuttle, school, tourist)
- Port drayage
- Regional logistics
- Yard tractor

Electric buses and trucks need to be able to go up hills and run at highway speeds when they are fully loaded. Our solution is to expand the range of the motor by adding an EV transmission. With this addition, the vehicle can perform well on hills and efficiently at highway speeds with a smaller, less costly motor.

— Scott Adams
President
Low-voltage power conversion
Eaton’s power conversion solutions provide standard and custom products for a wide range of DC to DC conversion, battery equalizer and DC to AC inverter requirements. Exceeding the most stringent performance requirements of military, commercial vehicle, agriculture and construction applications, Eaton provides rugged products that maximize vehicle productivity and useful life.

Low-voltage power management
Eaton’s commercial vehicle power management product range features a wide variety of battery management and protection solutions, including manual and automatic low-voltage disconnects, battery isolators, and intelligent battery separators to manage multiple battery banks. Eaton also has expertise in providing specialty control solutions such as solid state flashers, daytime running lights and DC current sensors.

Beyond electric vehicles
Moving beyond electrified vehicles, our team at Eaton brings together vast electrical and industrial experience to give you a robust portfolio of low-voltage products. These commercial vehicle solutions range from off-the-shelf catalog products to fully customized, next-generation systems that enable differentiation.

The engineering strength and proven track record of the Eaton, Bussmann, Sure Power and Omnex product portfolio provides you with the capability to accelerate "smart system" and custom component development, resulting in innovative, industry-leading solutions.

We are experts on the effects of harsh environments relating to temperature extremes, vibration, high moisture, chemicals and transient power fluctuations. We know vehicle power and control systems from the smallest to largest platforms and will partner with you to develop reliable products and system solutions. Following is a look at our low-voltage product categories.

Our low-voltage product portfolio is highly diverse, competitive and customizable to meet the power management needs of our on-road and off-road key OEM customers as well as channel partners. Our continued investment in this portfolio ensures that we maintain our technical superiority in key product lines.

— Pratik Trivedi
General Manager, Operations
Eaton eMobility has supplied traditional low-voltage 24/12V DC/DC converters and battery equalizers for 30 years. These Power Conversion products are designed, tested and validated to meet commercial vehicle and construction/agriculture and military vehicle standards and have demonstrated millions of combined hours and miles of reliability in these rugged applications.

— Carl Smith
Sales Manager

Vehicle controls
Eaton vehicle control solutions offer a broad range of solutions not only for on- and off-road vehicles but for many commercial machine applications requiring rugged, dependable switches. These products are at the heart of many systems, including commercial vehicle applications like heavy-duty trucks, construction and agriculture. Eaton is proud to offer solid performance vehicle and commercial controls for global applications, including everything from electromechanical push-button rocker and toggle designs to electronic rocker, indicator and display devices — all of which are customizable.

Wireless controls
Robust, easy to use and configurable, OMNEX mobile control transmitters and receivers stand up to the most demanding industrial conditions. Eaton’s OMNEX remote control products have been used to wirelessly control high-value machinery in harsh environments with utmost reliability, precision and durability.

TD110 two-way handheld remote
Designing the products of tomorrow.

What does the future of electric transportation look like? Ask Eaton eMobility’s Advanced Technology Team. They’re designing it every day.

More power density, adding more intelligence to components, new ways of combining electrical and mechanical engines, more electric performance cars, improved battery performance and brand-new modes of transportation are on the short list.

While the innovations of 10, 15 or 20 years from now are in development at Eaton, our work today is better, thanks to this kind of forward-thinking exploration.

“We have the technology and engineering expertise to create what this can be. eMobility is the future,” says Dan Ouwenga, Advanced Technology Manager.

For us, it’s about creating wins for our clients, their customers and ultimately for our grandchildren as we look at new ways of conserving energy and lowering emissions.

— Scott Adams
President

Innovation electrified.