



ePOWERTRAIN

**Our efficiency.
Your edge.**

v09/2022



ePOWERTRAIN

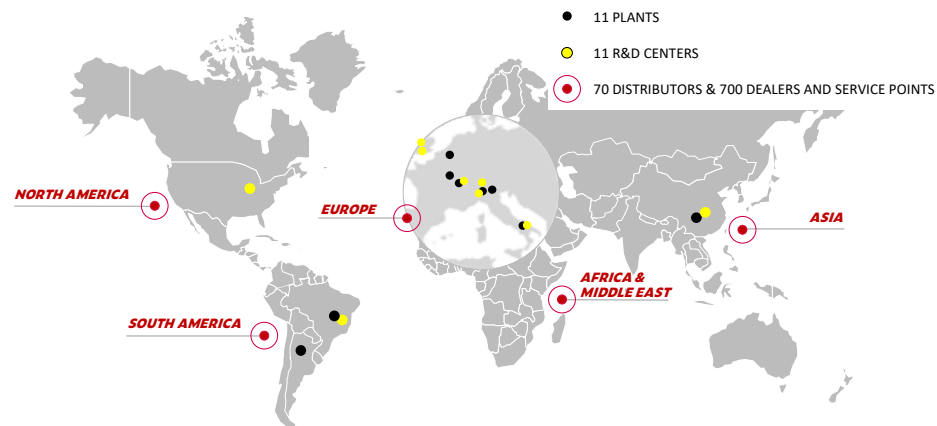
***ELECTRIC
DRIVELINES,
BATTERY
PACKS &
BMS***

**This is where
innovation happens.**

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ABOUT FPT INDUSTRIAL



FPT Industrial is the Brand of Iveco Group, dedicated to the design, development, production, sale, and assistance of powertrain systems for On-Road, Off-Road, Marine and Power Generation applications.

The company employs more than 8,000 people worldwide, in ten manufacturing plants and ten R&D centers. The FPT Industrial sales network consists of over 70 dealerships and over 700 service centers in almost 100 countries.

A wide product offering, including six engine ranges from 42 hp to 1,000 hp, transmission with torque up to 500 Nm, front and rear axles from 2,45 to 32 ton GAW (Gross Axle Weight). FPT Industrial offers the most complete line-up of Natural Gas engines on the market for industrial applications, with power that goes from 50 to 520 hp.

A dedicated ePowertrain division is driving the transition to zero-emission mobility and transportation with electric drivelines from light to heavy commercial vehicles, from 145 kW to 840 kW, modular battery storage and management systems for zero-emission commercial and people transport.

This extensive offering and a strong focus on R&D activities make FPT Industrial a world leader in industrial powertrains. We work for businesses serving other businesses, and we are committed to satisfy the requirements of both direct and final Customers.

We are proud to be a people-oriented and innovation-driven Company, that builds Customer advantage through continuous research an improvement, and creates value by leveraging this advantage.

TOWARDS CARBON NEUTRALITY



The Electrification of Industrial Vehicles

It is not just cars that will benefit from the advantages of electrification. This technology is taking on increasing importance in the field of industrial engines from companies such as FPT Industrial which are installed on trucks, buses, vans, special vehicles, agricultural and construction machinery, power generation, and marine applications.

The Challenge for Transport, Logistics, and Commerce

In the "on-road" segment – which includes light commercial vehicles, vans, trucks, minibuses, buses and special vehicles – it is essentially the reduction in pollutant emissions up to zero.

The goal is to reduce costs for the breakthrough toward zero-emission technologies. FPT Industrial is responding to the crucial challenges of transport sustainability, energy transition, and CO₂ emission reduction with a complete range of innovative products. Hybrid, battery-electric, and fuel-cell technology are all solutions that can help achieve the targets.

ePOWERTRAIN DIVISION



Pioneering innovation

Innovation and sustainability have always been the DNA of FPT Industrial. In order to remain at the forefront of technological advancements and best respond to market requirements, the Brand created a dedicated ePowertrain department in 2018.

With main hubs based in the R&D centers in Arbon, Switzerland, and Turin, Italy, the FPT ePowertrain division is committed to develop our new product generation, representing the future of the powertrain, today.

The ePowertrain division, leveraging FPT Industrial's expertise and heritage in different market sectors, contributes to boosting the Brand's worldwide growth in the dynamic industrial powertrain arena and to playing the leading role in the energy transition path towards the complete carbon neutrality.

FPT ePOWERTRAIN PLANT



100% electric. ZERO CO₂ emissions.

FPT Industrial's first dedicated manufacturing facility for the production of its new eDriveline products and Battery Storage solutions is based in Turin, Italy.

The facility includes approximately 7,000 sqm of manufacturing space and 7,600 sqm of warehouse space, with room for expansion based on business needs. Sustainability, innovation, and a people-centric approach are the pillars that have guided the design of the new plant.

First of all, the new high-efficiency Turin facility is the first Iveco Group Plant which is 100% carbon neutral by using energy from renewable sources.

Thanks to virtual & augmented reality, connectivity, and innovative technologies, the facility's workflows and layout have been optimized for higher quality, safety, reliability standards, and reduced time to market, with zero defects to customers.



eDRIVELINE

eAXLES

Wide range

Products for every application, from LCVs to Heavy Duty.

Compact design

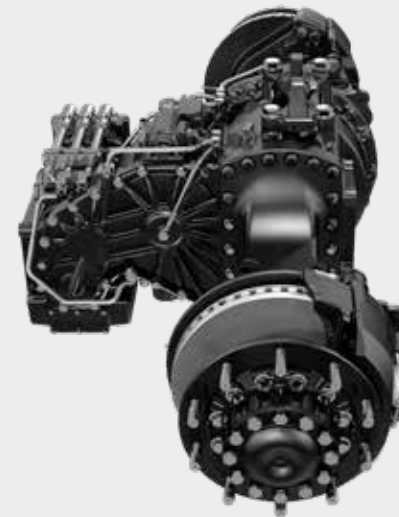
Designed to fully integrate all ePowertrain elements in a compact solution.

Tailor-made

Scalable and adaptable to meet various requirements thanks to FPT know-how.

Performance

Outstanding performance, efficiency, and reliability according to the mission application.



FPT Industrial is responding to the crucial challenges of transport sustainability, energy transition, and CO₂ emission reduction with a complete range of innovative products.

Designed to fully integrate all ePowertrain elements in a compact solution to easily house both the commercial load and the battery packs, the new eAxles will guarantee outstanding performance, efficiency, and reliability according to the mission application.

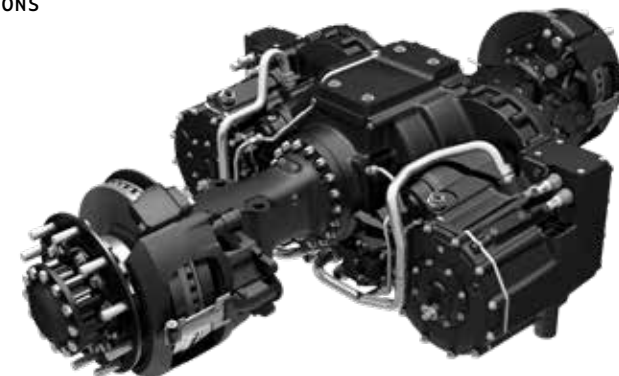
eAX 145-R
UP TO 10 TONS



eAX 375-R
UP TO 26 TONS (4X2)
UP TO 44 TONS (6X4)



eAX 840-R
UP TO 44 TONS



eAX 145-R



Fully integrated solutions for CO₂-free logistics



LCV applications



Up to 145kW



GVW up to 10 tons

Layout:

Adaptable layout to meet various powertrain needs.

Vehicle application:

Designed to easily replace traditional powertrains.

FPT presents a new prototype electric axle engineered for commercial vehicle applications. Demonstrating its commitment to R&D solutions, the prototype has been designed to bring together each component of the electric driveline in an extremely compact design, ensuring maximum performance and efficiency (>92%) without compromising on reliability.

The product has been designed to replace traditional powertrain solutions on existing standard platforms, minimizing the impact and required adaptations. Thanks to FPT's engineering know-how, the project can be declined in multiple configurations. The first version of this prototype has been developed within the SYS2WHEEL project, supported by the European Commission's H2020 program.

eAX 145-R Specifications (prototype):

Application:	Light Commercial Vehicles
Type:	Rear Axle
n. eMotors:	2
Peak Power (kW):	145
Peak Wheel Torque (Nm):	6,4k
GAW (ton):	7
GVW (ton):	10
System efficiency:	>92%
Brake system:	DISC
Braking power of discs (Nm):	11k
Weight (kg):	350
Gear – n. speed:	1
Gear ratio:	11
Durability Be10 (km):	up to 400k

Find out more:



eAX 145-R

eAX 375-R



A high-performance, high-efficiency solution for medium and heavy applications



MCV 4x2 applications



HCV 6x4 applications



Up to 375kW



Up to 375kW x2



GVW up to 26 tons



GVW up to 44 tons

Scalable solution:

Scalable and adaptable to meet various powertrain requirements.

Durability:

Extended service life (Be10) up to 1,600k km (depending on customer and vehicle mission profile).

Heavy-duty applications:

Designed for 4x2 medium-duty trucks and 6x4 heavy-duty applications.

Braking torque:

Disc brake system with high braking torque performance – up to 18 kNm / 13,300 lb-ft.

The integrated electric axle is suitable for medium-duty 4x2 and heavy-duty 6x4 vehicles. Thanks to two-speed gearing, and brand-new design, the eAX 375-R delivers high performance, outstanding efficiency, and extended durability. The design developed by FPT's engineering team allows the electric axle to be scalable and extremely adaptable to meet different powertrain requirements. This is how FPT's know-how supports everyday customer requirements.

eAX 375-R Specifications (prototype):

Application:	Medium 4x2 Heavy 6x4
Type:	Rear Axle
n. eMotors:	1
Peak Power (kW):	375
Peak Wheel Torque (Nm):	30k
GAW (ton):	11
GVW (ton):	26 (medium)* 44 (heavy)
System efficiency:	>92%
Brake system:	DISC
Braking power of discs (Nm):	-
Weight (kg):	680
Gear – n. speed:	2
Gear ratio:	10 / 33
Durability Be10 (km):	up to 1,600k*

* depending on vehicle mission profile

Find out more:



eAX 375-R

eAX 840-R



Designed for Nikola Tre, engineered for your needs.



HCV 4x2 & 6x2 applications



Up to 420kW x2



GVW up to 44 tons

Performance:

High-performance, high-efficiency electric axle for heavy-duty truck applications.

Integrated layout:

All the mechanical and electrical components are integrated into a lean axle structure, in order to maximize residual vehicle space following installation.

Through the joint venture between IVECO, NIKOLA, and FPT Industrial, in just two years we have rapidly designed, engineered, and launched a product that is destined to pioneer the world electric heavy commercial vehicles market.

Installed for the first time on the Nikola Tre BEV, the eAX 840-R is a dual-eMotor axle for vehicles up to 44 tons GVW which guarantees high performance and efficiency, reliability, and low TCO, with long oil change intervals and a rated service lifetime of up to 1,200,000 km.

eAX 840-R Specifications:

Application:	Heavy
Type:	Rear Axle
n. eMotors:	2
Peak Power (kW):	840
Peak Wheel Torque (Nm):	45k
GAW (ton):	13
GVW (ton):	44
System efficiency:	>92%
Brake system:	DISC
Braking power of discs (Nm):	30k
Weight (kg):	1.360
Gear – n. speed:	1
Gear ratio:	21,5 or 25
Durability Be10 (km):	up to 1.200k

Find out more:



eAX 840-R

CENTRAL DRIVE

Compact design

Designed to fully integrate eMotor, and gearbox.

Integration

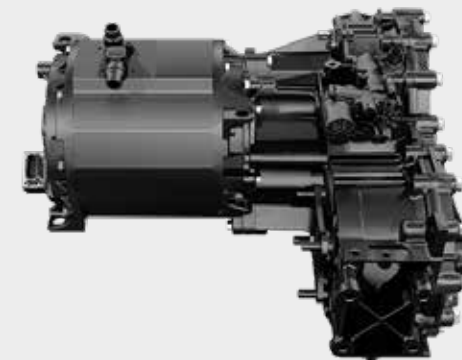
Easy integration into existing vehicle platforms.

Durability

Extended service life (Be10) up to 350,000 km (depending on customer mission).

Dual mode

Ready for Hybrid "dual mode" applications.



The FPT Central Drive – eCD 140 for Light Commercial applications is a compact and complete solution for integrating electric drive systems into existing conventional vehicles. FPT's engineering team has designed a lean, integrated central drive system in order to guarantee easy integration into existing platforms.

For rear-wheel drive applications, as with all FPT products, the eCD 140 is extremely durable, efficient, and reliable (up to 350,000 km, with lifetime oil fill).

Integrating an electric drive system into existing conventional vehicles



LCV – Minibus applications



Up to 140kW



GVW up to 8 tons

eCD 140



Specifications:

Application:	LCV
n. eMotors:	1
Peak Power (kW):	140
Peak Wheel Torque (Nm):	1,6k
GAW (ton):	-
GVW (ton):	<8
System efficiency:	>92%
Weight (kg):	<115
Gear – n. speed:	1
Gear ratio:	4
Durability Be10 (km):	up to 350k

Find out more:



eCD 140



BATTERY STORAGE & MANAGEMENT

BATTERY PACKS & BMS

Multipack solution

High flexibility thanks to multipack solution.

High C-rate

Solution for quick charging & discharging times.

High energy density

To guarantee maximum performance and optimize weight and installation space. (leveraging on high-performance cells and modules)

State-of-art BMS

Customized Battery Management System for the longest battery life.



FPT Industrial's high-performance, reliable, and top-quality ePowertrain range is completed by state-of-the-art battery storage and management solutions.

In collaboration with Microvast, a Texas-based company and market leader in ultra-fast-charging, long-life battery power systems, FPT Industrial has started battery pack development and production for commercial vehicle, minibus, and bus applications, featuring a multipack option for both goods and people transport missions.

Our commitment to high-performance and reliable electrification solutions is completed by its range of cutting-edge Battery Management Systems, customized to get the longest battery life according to mission requirements, thanks to the acquisition of Potenza Technology.

eBS 37
LCV - MINIBUS APPLICATIONS



eBS 69
BUS APPLICATIONS



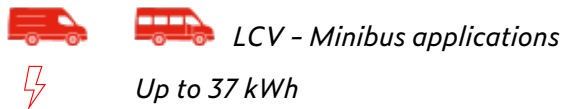
eBM 36
STATE-OF-THE-ART BATTERY MANAGEMENT SYSTEM



eBS 37



Battery Pack for zero-emission urban mobility



Multipack solution:

High flexibility thanks to multipack solution.

High C-rate:

Solution for quick charging & discharging times.

High energy density:

To guarantee maximum performance and optimize weight and installation space.

State-of-the-art BMS:

Customized Battery Management System for the longest battery life.

FPT Industrial's high-performance, reliable, and top-quality ePowertrain range is rounded out by state-of-the-art battery storage and management solutions. In collaboration with Texas-based Microvast, a market leader in ultra-fast charging, and long-life battery power systems, FPT Industrial has started to develop and produce battery packs for all application needs, with different product offerings depending on customer mission profiles and requirements. The 37 kWh FPT Battery Pack for LCV and Minibus applications is a modular battery pack that incorporates Microvast cells with unique Lithium-ion technology for impressive energy density and depth-of-discharge (95%), with advantages in terms of reduced battery weight. Thanks also to NMC technology (Lithium Nickel Cobalt Manganese), the most high-performance solution to date (for Commercial Vehicle applications), the eBS 37 offers quick charging. Furthermore, this advanced, well-designed system also offers high energy density and stability.

eBS 37 Specifications:

Application:	LCV - Minibus
Type:	Battery Pack
Cell Technology:	Li-ion
Cooling system:	Water-cooled
Nominal energy (kWh):	37
Energy density (Wh/kg):	140
C-rate (continuous):	1C (charge) 2C (discharge)
Cathode technology:	NMC
Protection:	IP6K9K
Life cycles:	>2.500
Weight (kg):	260

Find out more:



eBS 37

eBS 69



Battery Pack for zero-emission people transport



BUS applications



Up to 69 kWh

Multipack solution:

High flexibility thanks to multipack solution.

High C-rate (continuous):

Solution for fast charging & discharging times.

High energy density:

Best-in-class energy density ensures maximum performance.

State-of-the-art BMS:

Customized Battery Management System for the longest battery life.

FPT Industrial's high-performance, reliable, and top-quality ePowertrain range is rounded out by state-of-the-art battery storage and management solutions. In collaboration with Texas-based Microvast, a market leader in ultra-fast charging, and long-life battery power systems, FPT Industrial has started to develop and produce battery packs for all application needs, with different product offerings depending on customer mission profiles and requirements. The 69 kWh FPT Battery Pack for Bus applications is a modular battery pack that incorporates Microvast cells with unique Lithium-ion technology for impressive energy density, offering best-in-class performance in City Bus applications. Thanks also to NMC technology (Lithium Nickel Cobalt Manganese), the most versatile, powerful, and high-performance solution to date, the eBS69 offers quick charging. Furthermore, this advanced, well-designed system also offers high energy density and stability.

eBS 69 Specifications:

Application:	Bus
Type:	Battery Pack
Cell Technology:	Li-ion
Cooling system:	Water-cooled
Nominal energy (kWh):	69
Energy density (Wh/kg):	>175
C-rate (continuous):	1C (charge) 1C (discharge)
Cathode technology:	NMC
Protection:	IP6K9K
Life cycles:	>6.500
Weight (kg):	388

Find out more:



eBS 69

eBM 36



SBMS



CMCs

State-of-the-art Battery Management System

Increased battery life:

Customized Battery Management System for the longest battery life based on individual mission requirements

Highly flexible:

Internal know-how for the design of customized solutions and reductions in development time and costs.

SBMS:

BMS components: the Subpack Battery Management System is the control unit built on single processor architecture with lockstep to achieve ASIL C integrity level.

CMC:

BMS components: the Cell Monitor Circuit is connected to cells, placed close to battery for achieving short sensor wire length and increase the accuracy.

FPT Industrial's commitment to high-performance and reliable electrification solutions for transport is rounded off by a state-of-the-art Battery Management System, customized to achieve the longest battery life for individual mission requirements, thanks to the acquisition of Potenza Technology. This outstanding British company is at the forefront of electric powertrain technologies, with a consolidated and diverse set of skills in functional safety engineering, battery management systems for traction accumulators, and the design and development of electrical and electronic systems. The BMS solution resulting from the partnership between FPT Industrial and Potenza Technology is highly flexible for different energy storage solutions, allowing for a considerable reduction in development times while guaranteeing customized software solutions without compromising ASIL integrity levels.

eBM 36 Specifications:

Type:	Battery Management System
High Voltage range (V):	8 to 1.000
Low Voltage range (V):	6 to 32
Operating Temperature (°C):	-40° to +85°
System ASIL:	ASIL C*
Software - multipack support:	1 – 15 packs in parallel
High Level Software Features	-
Cell Balancing	Passive
SOX Algorithms	SOC, SOH & SOP
Contactors (max 5x)	Control, weld detection & life estimation
Safety Measurements	Isolation test, HVIL & HV measurement
Vehicle Application	Power limits / derate, CAN interface

*requires eBM implementation in accordance with safety manual

Find out more:



eBM 36



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