



INNOVATION IN MOTION

ecoFORCE

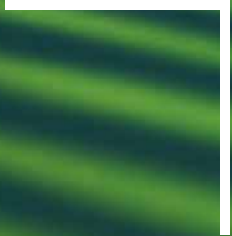


FIAMM
+ -



 **ecoFORCE**





FIAMM EXPERIENCE AT THE SERVICE OF THE ENVIRONMENT

The growing energy needs of modern cars demand batteries capable of ensuring **reliable and consistent performance over time**.

With the increasingly stringent European regulations on **reduction of CO₂ emissions**, car manufacturers have introduced hybrid and electric models that, despite evolutions, still fit at least one **12V lead-acid** battery. This component is essential for **starting the vehicle** and for **supporting the on-board electrical systems**.

The **ecoFORCE** range is designed to meet all these requirements, offering **reliability, long service life** and **optimum performance**, while guaranteeing efficient operation of even the most advanced systems.

Emissions

EU DIRECTIVE ON THE REDUCTION OF CO₂ EMISSIONS



Altogether, cars and light commercial vehicles account for approximately 15% of all CO₂ emissions in the European Union, including those from fuel procurement.

To meet this challenge, the European Union has introduced stricter regulations for reducing emissions. According to EU Regulation 2023/851, the targets for the entire EU vehicle fleet include a 55% reduction in average CO₂ emissions for new passenger cars and 50% for new light commercial vehicles compared to 2021 levels by 2030. Furthermore, from 2035, all new cars and vans placed on the EU market will have to be zero-emission.

These regulations pose significant challenges for automotive manufacturers and usher in a new era of transformation in vehicle production. They also have a significant impact on the component sector. The battery will become the beating heart of the car to start the engine and guarantee unprecedented storage capacity. In these circumstances, ecoFORCE batteries are designed to meet these new requirements, securing high performance and reliability for hybrid and electric vehicles.

	Micro Hybrid Micro HEV	Mild Hybrid MHEV	Full Hybrid HEV	Plug-in Hybrid PHEV	EV
	Internal combustion engine. Start & Stop combined with regenerative braking.	Internal combustion engine. Small electric motor and 48V support battery.	Internal combustion engine. Limited-range electric traction with high-voltage battery.	Internal combustion engine. Electric traction with a high-voltage battery used as the main energy source.	Electric traction with a high-voltage battery.
ENGINE					
PROPULSION	Internal combustion engine	Internal combustion engine	Internal combustion engine Electric traction (10-30 km)	Internal combustion engine Electric traction (50-100 km)	Electric traction (200-500 km)
12V BATTERIES					
12V BATTERY FUNCTION	Starting the engine Start & Stop Services (engine off)	Starting the engine Start & Stop Services (engine off) Backup system (electrical traction failure)	Starting the engine - Services (engine off) Backup system (electrical traction failure) Auxiliary power supply (while driving)	Starting the engine - Services (engine off) Backup system (electrical traction failure) Auxiliary power supply (while driving)	Switching on the CPU - Services (engine off) Backup system (electrical traction failure) Auxiliary power supply (while driving)

Why AFB and AGM?

MICRO HEV

Micro HEVs (Micro Hybrid Electric Vehicles) are equipped with a minimal electrification system based on an upgraded battery and an advanced starter motor. These vehicles do not have electric motors and instead use technologies like the Start & Stop system to turn off the internal combustion engine when the car is stopped (e.g., at traffic lights) and to recover energy during braking to power onboard devices. This improves fuel efficiency and reduces emissions slightly, but does not allow driving in electric mode.

MILD HEV

MHEVs (Mild Hybrid Electric Vehicles) combine an internal combustion engine with a small electric motor, which supports the engine during acceleration and starting. These vehicles cannot travel in all-electric mode, but they do improve fuel efficiency by reducing fuel consumption and emissions.

HEV

HEVs (Hybrid Electric Vehicles) or Full Hybrid vehicles have both a combustion engine and an electric motor with a battery that can be recharged by energy recovery during braking. They can travel for short distances in electric mode, but are not recharged from an external source. They automatically alternate the use of the engine and the electric motor to optimise consumption.

PHEV

PHEVs (Plug-in Hybrid Electric Vehicles) are similar to HEVs but have a larger battery that can also be recharged by plugging into the mains. They can travel tens of kilometres in 100% electric mode before switching to the internal combustion engine.

BEV

BEVs (Battery Electric Vehicles) are all-electric vehicles, powered exclusively by a rechargeable battery. They do not have a combustion engine and have zero emissions during use. Their range varies according to battery capacity.

These propulsion architectures require at least one 12V battery, which is suitable for the various functions necessary for starting and operating the car. This ensures safety and the support of essential functions, even in an emergency, such as the lights, braking system, and electric power steering.

- The new **xEV AGM ecoFORCE** battery is indispensable for cars that combine a Start & Stop system with various fuel-saving devices and is perfect as an auxiliary support for hybrid and electric propulsion.
- The **AFB ecoFORCE** battery is generally suitable for cars with Start & Stop systems.

New xEV ecoFORCE AGM



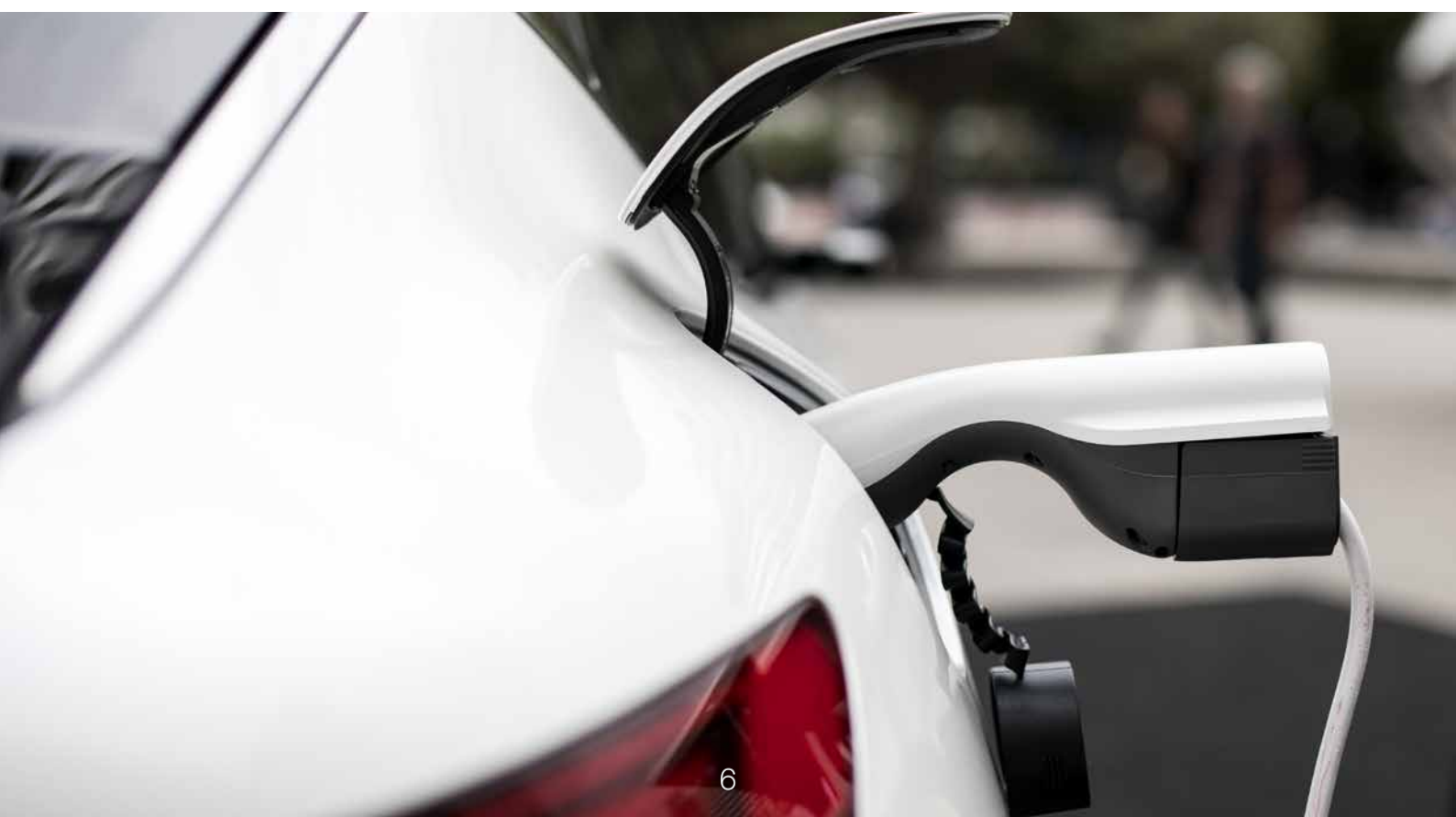
xEV ecoFORCE AGM batteries are designed to support the growing energy needs of modern vehicles, ensuring reliability, high performance, safety and advanced functions.

Safety valves

Electrolyte absorbed in glass microfibre separator mats



Polypropylene one-piece container



By implementing AGM (Absorbent Glass Mat) technology, they offer greater resistance to charging and discharging cycles than conventional batteries, guaranteeing high and long-lasting performance.

The sealed design makes them maintenance-free, while the reinforced structure ensures vibration resistance and optimal efficiency.

Developed as an evolution of the previous version dedicated to micro-hybrid vehicles, the new xEV ecoFORCE AGMs are also suitable for use in hybrid or all-electric vehicles, providing a reliable solution for motorists looking for a durable, high-performance battery.

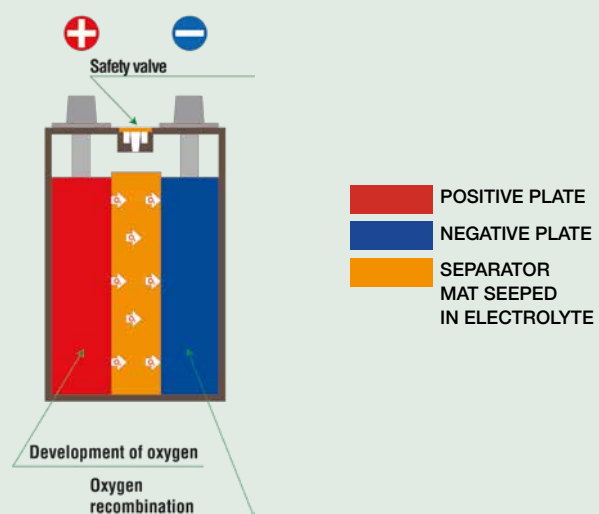
AGM TECHNOLOGY

EcoFORCE AGM batteries differ from conventional lead-acid batteries because they implement gas recombination technology, making them maintenance-free.

In free-acid batteries, recharging causes water to disassociate into hydrogen and oxygen, resulting in a loss of electrolyte. The AGM (Absorbent Glass Mat) technology of ecoFORCE uses a special microporous separator mat seeped in a controlled amount of electrolyte.

Oxygen released from the positive plate migrates to the negative plate, where it recombines with hydrogen, forming water and creating a closed electrochemical cycle. This system requires the highest precision construction and highly selected materials to ensure optimum efficiency and durability.

AGM BATTERY OPERATION (ABSORBENT GLASS MAT)



CAUTION: **FIAMM** recommends the use of AGM batteries for replacing auxiliary batteries in hybrid and electric vehicles due to their superior characteristics in terms of deep cycle resistance, safety and chemical stability. Although AGM is technically superior, in some cases it is still necessary to retain the technology installed by the manufacturer to ensure full compatibility with the electronic systems of the vehicle.



MAIN ADVANTAGES

- › OE technology and quality
- › Made in Italy
- › Reliability under high load conditions
- › High starting capacity and electrical support
- › Excellent behaviour at low temperatures
- › Maximum inrush current
- › Extreme resistance to charge and discharge cycles (three times that of conventional lead-calcium batteries)
- › Minimum self-discharge
- › Superior vibration resistance than conventional batteries
- › Maintenance-free
- › No gas leakage

ENFORCEMENT DATE OF EN50342-1: 2015-11

The new edition of **EN 50342-1**: Lead-acid starter batteries - Part 1: General requirements and methods of test came into force in October 2018.

This standard governs the measurement of the electrical and mechanical properties of lead-acid batteries for automotive applications.

One of the innovations of the 2015 edition of EN 50342 is the classification of some battery performance levels.

THE PERFORMANCE
TO BE CLASSIFIED AND THE
RESPECTIVE LEVELS ARE:

EN 50342-1: 2015	MIN	MAX
Water consumption	W1	W5
Charge storage	C1	C2
Resistance to vibrations	V1	V4
Micro-cycle duration	M1	M3

TECHNICAL FEATURES

Example of the specifications
stated on the label:

12V 70Ah 760A EN
EN 50342-1/6: W5-C2-V2-M3

REFERENCE	PERFORMANCE		DIMENSIONS				SPECIFICATIONS			EN50342-1:2015 EN50342-6:2015			
	Cap. Ah	CCA A (EN)	BOX	L (mm)	W (mm)	H (mm)	LAYOUT	TERMINAL	HOLD- DOWN	Water Consumption	Charge Retention	Resistance to Vibrations	Endurance Myco Cycle
VR170	10	170	BTX 12	150	87	130	1	-	B00	W5	C2	V2	E4
VR200	12	200	BTX 14	150	87	145	1	-	B00	W5	C2	V2	E4
VR340	35	340	B20	196	127	220	1	3	B00	-	-	-	-
VR370	45	370	B24	236	127	224	1	3	B00	W5	C2	V2	E4
VR540	50	540	L1	207	175	190	0	1	B13	W5	C2	V2	M3
VR680	60	680	L2	242	175	190	0	1	B13	W5	C2	V2	M3
VR760	70	760	L3	278	175	190	0	1	B13	W5	C2	V2	M3
VR800	80	800	L4	315	175	190	0	1	B13	W5	C2	V2	M3
VR850	95	850	L5	353	175	190	0	1	B13	W5	C2	V2	M3
VR950	105	950	L6	394	175	190	0	1	B13	W5	C2	V2	M3

ecoFORCE AFB



ecoFORCE AFB (Advanced Flooded Battery) is an evolution of conventional lead-acid batteries. ecoFORCE AFB is the best solution for cars equipped with Start & Stop systems that need more energy support than that offered by conventional SLI batteries.

High electrolyte reserve



SPC cover

Large exchange electrolyte surface area



In this case, the battery is characterised by a cycling resistance two times greater than that of a conventional battery. In queues or at traffic lights, ecoFORCE AFB powers all the electrical components when the engine is off and ensures reliable restarting as soon as the clutch is engaged.

AFB TECHNOLOGY

ecoFORCE AFB batteries implement targeted technical solutions and are designed for high performance and long service life.

These include increased electrolyte reserve for greater autonomy and better charging and discharging cycle performance, while the large electrolyte exchange surface promotes a more efficient and stable reaction.

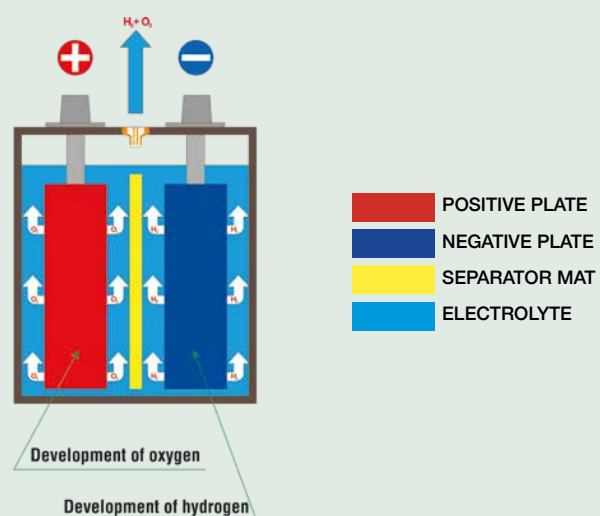
The negative plates have PbCaSn (Lead-Calcium-Tin) alloy grids, with carbon-enriched active mass to improve performance in Start & Stop cycles.

Specific expanders are also fitted and an organic fibre layer limits the expansion of the active mass.

The positive plates are made of PbCaSn alloy and designed to resist corrosion and high temperatures.

Finally, the electrode flags are protected against corrosion, increasing the overall safety and reliability of the system.

AFB BATTERY OPERATION (ADVANCED FLOODED BATTERY)



CAUTION: The use of conventional free-acid batteries in micro-hybrid vehicles with Start & Stop systems is strongly discouraged and could be dangerous because they are not compatible with the high cycling requirements of these systems. **FIAMM** recommends the installation of **AFB or AGM** batteries according to vehicle specifications. In any case, always respect the original battery technology installed by the manufacturer, to ensure safety, reliability and correct electrical system operation.



MAIN ADVANTAGES

- › OE technology and quality
- › Made in Italy
- › High resistance to charge and discharge cycles (higher cycling resistance than a conventional Pb-Ca battery)
- › Negative active mass composition specially designed for typical Start & Stop cycles
- › Excellent starting power
- › Longer life cycle than conventional lead-calcium batteries (measured in terms of energy output)
- › Maintenance-free

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Water consumption	W1	W5
Charge storage	C1	C2
Resistance to vibrations	V1	V4
Micro-cycle duration	M1	M3

TECHNICAL FEATURES

Example of the specifications
stated on the label:

12V 60Ah 680A EN
EN 50342-1/6: W3-C2-V2-M1

REFERENCE	PERFORMANCE		DIMENSIONS				SPECIFICATIONS			EN50342-1:2015 EN50342-6:2015			
	Cap. Ah	CCA A (EN)	BOX	L (mm)	W (mm)	H (mm)	LAYOUT	TERMINAL	HOLD- DOWN	Water Consumption	Charge Retention	Resistance to Vibrations	Endurance Myco Cycle
TRM40	40	420	B20	197	129	227	0	3	B00	W3	C2	V2	M1
TRM40X	40	420	B20	197	129	227	1	3	B00	W3	C2	V2	M1
TRN45	50	500	B24	238	129	227	0	3	B00	W3	C2	V2	M1
TR540	50	540	L1	207	175	190	0	1	B13	W3	C2	V2	M1
TR600	60	600	L2	242	175	190	0	1	B13	W3	C2	V2	M1
TRQ65	65	650	D23	232	173	225	0	1	B00	W3	C2	V2	M1
TR650	65	650	L3B	278	175	175	0	1	B13	W3	C2	V2	M1
TR680H	60	680	L2	242	175	190	0	1	B13	W3	C2	V2	M1
TR760	70	760	L3	278	175	190	0	1	B13	W3	C2	V2	M1
TRS75	75	640	D26	260	173	225	0	1	B00	W3	C2	V2	M1
TR730	75	730	L4B	315	175	175	0	1	B13	W3	C2	V2	M1
TR740	80	740	L4	315	175	190	0	1	B13	W3	C2	V2	M1
TRT95	95	760	D31	302	172	220	0	1	B00	W3	C2	V2	M1
TR850	95	850	L5	353	175	190	0	1	B13	W3	C2	V2	M1





xEV ecoFORCE AGM:
ENERGY THAT DRIVES
THE FUTURE, WITHOUT
COMPROMISE.

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