

Friendly
Power

ecoFORCE



Fiamm Ecoforce

FIAMM
+ -
Starter Batteries





Today, the energy requirements of modern vehicles increase inevitably the demand of batteries that maintain the power for a long time. In order to face the new measures about CO₂ emissions imposed by the European Union, car manufacturers have developed several models of hybrid cars equipped with different electrically powered devices, such as Start & Stop and Brake Energy Regeneration, which require a much more intensive use of the battery. The new range of **ECOFORCE** batteries for micro hybrid cars provides a response to this need.

**MICRO HEV
HYBRID ELECTRIC VEHICLE**

Micro HEV are the latest generation cars that respect the environment through their ability to reduce significantly fuel consumption.

START & STOP

During stop status the Start & Stop function automatically switches the engine off and restarts it when the clutch pedal is pressed.



ecoFORCE

ORIGINAL QUALITY SPARE PARTS (BER 1400/2002)
ECOFORCE batteries are produced in the same production facilities where original equipment ones are manufactured, using the same technology, manpower, equipment and controls approved by the car manufacturers involved.

A stylized graphic featuring a dark green silhouette of a sun partially obscured by three overlapping clouds. The clouds are rendered in a lighter green with diagonal hatching. To the right of this graphic, the text "CO₂" is displayed in a large, white, sans-serif font. The "2" is a subscript, positioned below the "O".

CO₂

EMISSION

EU REGULATION ON CO₂ EMISSIONS REDUCTION

The growing attention to environmental issues led the EU to adopt new rules limiting CO₂ emissions. For that reason the European Commission has agreed that by 2012 the average emissions of CO₂ from passenger cars registered in the European Union may not exceed 130 grams per Km, compared to the current limit of 160 .

That initiative must be considered within a broader context, that is to say the fight against climate change.

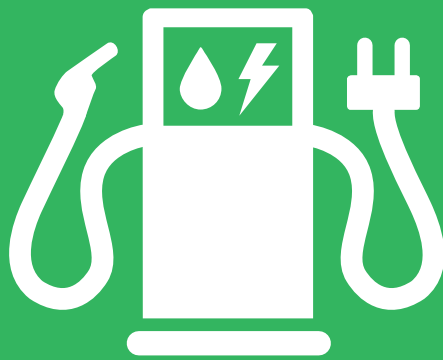
Individual mobility is very important in everyday life of many Europeans, but it should be noted that the use of cars has a strong impact on climate change, being the source of 12% of total carbon dioxide (CO₂) emissions. For that reason the European Union has set ambitious targets to reduce greenhouse gases and improving energy efficiency, to which all relevant economic sectors should contribute.

The challenge to car makers brings to a new era that will lead to significant changes as regards the production of new vehicles and to an increasing demand for advanced batteries for hybrid cars.

THE NEW REGULATIONS

The measure of 130 g/Km will be applied to cars manufactured in Europe and in countries outside Europe if registered within the EU. The average value of 130 g/Km of emissions from the engine, plus a further reduction of 10 g/Km with improving the efficiency of other components (eg.: tires, air conditioning system, etc.), will be applied to the entire fleet of each manufacturer.





HYBRID CARS




CAR MANUFACTURERS BEHAVIOUR IN RESPONSE TO THE EU REGULATION



Hybrid is an adjective that indicates, for a car, the simultaneous presence of two engines: an internal combustion engine (gasoline or diesel) and an electric one.

HYBRID CARS ARE NOT ALL ALIKE

There are different hybrid levels depending on the electrical architecture and on the capacity of reducing consumption.

	MICRO HYBRID		MILD HYBRID	FULL HYBRID
SPECIAL EQUIPMENTS CO ₂ REDUCTION	Start & Stop	+ Start & Stop + B.E.R.	+ Start & Stop + B.E.R. + Power Motor Assist	+ Start & Stop + B.E.R. + Motor Assist + Electric Drive
ELECTRICAL ARCHITECTURE AND MAIN CHARACTERISTICS	+ 12 V Start & Stop system based upon a specific starter/alternator + Electrical Power < 3 kW		+ Micro Hybrid + braking energy recovery + Max. vehicle voltages 144 V + Electrical Power 5 ÷ 15 kW + Electric motor << Thermal motor	+ Medium hybrid + electrical drive + Usual vehicle voltages >> 144 V + Electrical Power >> 15 kW
CO ₂ AND FUEL SAVING	3 ÷ 6 %	5 ÷ 8 %	8 ÷ 12 %	15 ÷ 20 %
TECHNOLOGY	+ ECOFORCE AFB + ECOFORCE AGM	ECOFORCE AGM	+ Carbon Lead-acid Advanced + Ni-Mh + Li-ion	+ ZEBRA (Na-NiCl) + Ni-Mh + Li-ion
APPLICATION EXAMPLES	+ Fiat Group Automobiles + Toyota Optimal Drive + Ford Econetic + VW (Polo BlueMotion)	+ VW BlueMotion + Hyundai Blue Drive + BMW Efficient Dynamics + Mercedes Blue Efficiency + Audi	+ GM (Saturn Vue, Aura; Chevrolet Malibù) + Toyota (Crown S200) + BMW Active Hybrid 7	+ Lexus (600h I, GS 450, RX400h S) + Toyota (Prius, Camry, Highlander) + Honda (Insight, Civic hybrid) + Bredamenarini Bus (240 El Hybrid) + Autodromo (CAM Alè HEV Bus)
FIAMM VISION	AFB 	AGM 	FIAMM has set partnership relations with CNR for the development of Carbon Lead-acid advanced technology	ZEBRA 
FIAMM has filed a new Li-ion technology patent				

Zero
Emission
Battery
Research
Activity

ZEBRA
BATTERIES

EV

ELECTRIC VEHICLE

Unlike hybrid cars, the electric vehicle (EV) is a car that uses an electric motor for propulsion instead of the more common and traditional internal combustion engine.

FIAMM and Mes-Dea founded **FZ Sonick SA**, a new leading manufacturer of sodium-nickel chloride batteries: a technology developed for the electric traction motors, for the back-up power that allows maximum benefits to the systems of power generation from renewable sources.

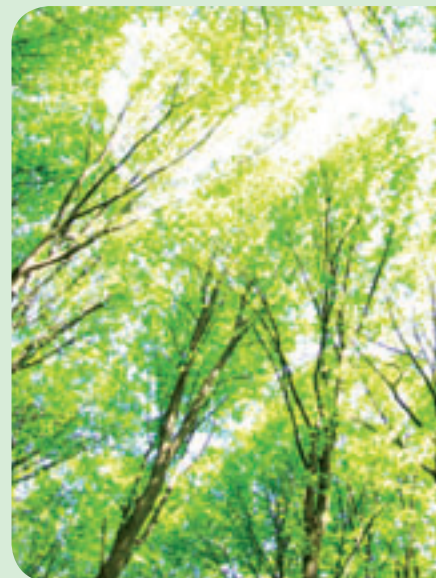
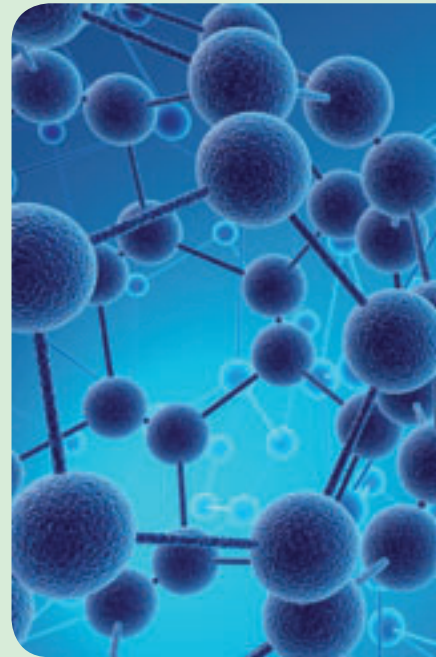
FZ SO|NICK

FIAMM
+ -

SO|NICK

ZEBRA

SO|NICK





MICRO HEV

START & STOP SYSTEM
BRAKE ENERGY REGENERATION



MICRO HEV (Hybrid Electric Vehicle) makes use of Start & Stop function that turns the engine off when the car is stopped and starts the engine up again when the driver presses the clutch pedal. Once the vehicle is stopped all electrical devices are powered by battery.

According to the NEDC cycle (New European Driving Cycle - used by all manufacturers for the calculation of fuel consumption) CO₂ emissions are reduced by 3-6% with the assistance of the Start & Stop function.

In addition to the Start & Stop function, MICRO HEV cars are also characterized by the presence of a device for the energy recovering during braking, reducing consumption by up to 8% compared to a conventional vehicle.

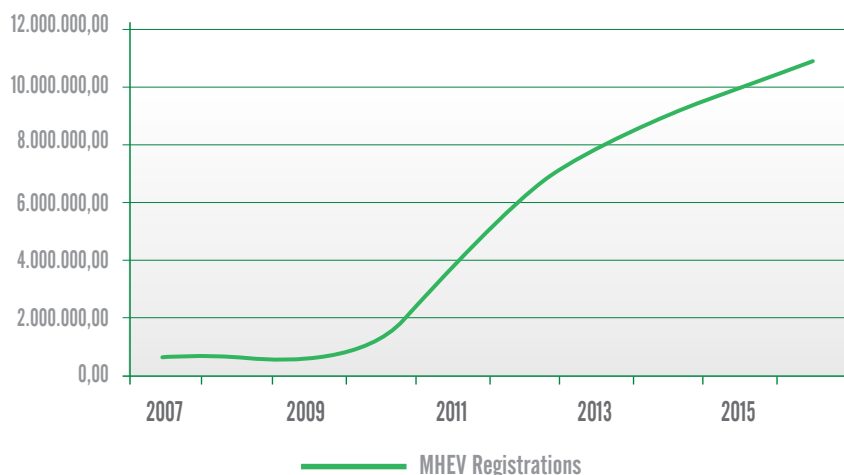
The Brake Energy Regeneration (BER) develops during deceleration or braking, then the energy produced by the movement of the vehicle is retrieved and stored in the battery. In this way, it reduces the engine work and decrease consumption. During the acceleration phase all unnecessary utilities are separated from the powertrain. In this way all engine power is available for acceleration and at the same time fuel consumption is reduced.

The devices described above require the use of a battery with an high charging and discharging acceptance.

AFB ECOFORCE is suited for cars with Start & Stop system, while AGM ECOFORCE is essential for those cars that combine different fuel-saving devices to the Start & Stop system.



EUROPEAN MARKET



FUEL SAVING TECHNOLOGIES

- + Gear shift indicator
- + High-efficiency alternator
- + Double clutch gear
- + Energy management system
- + Enhanced starter motor
- + Steering by wire and braking by wire

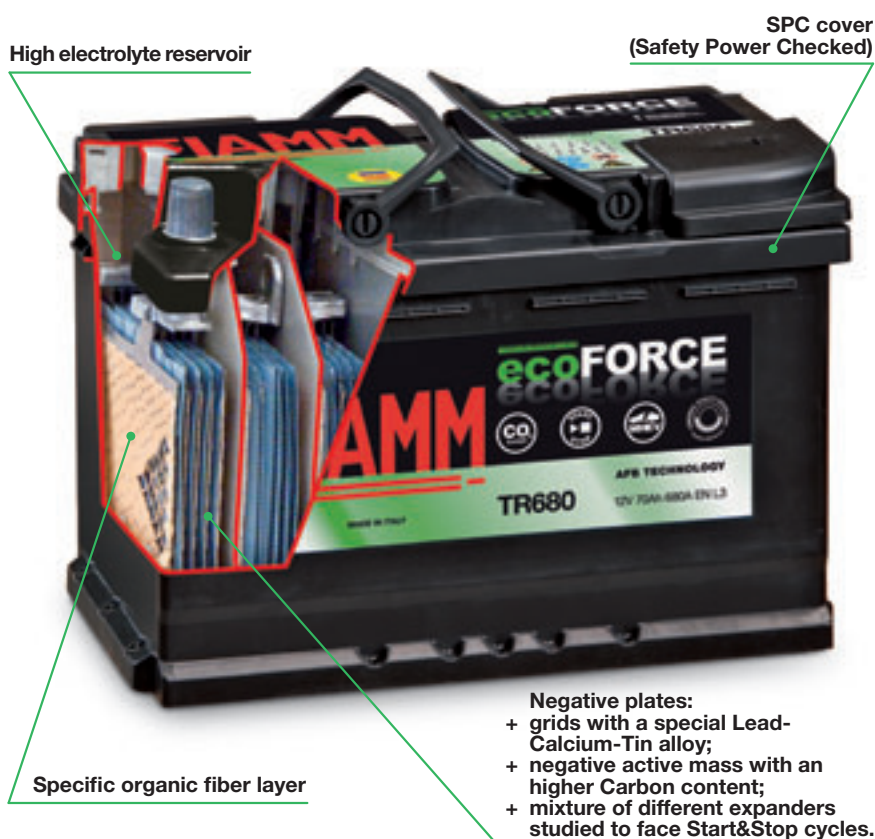
FIAMM HERITAGE TO SAVE THE ENVIRONMENT

AFB TECHNOLOGY

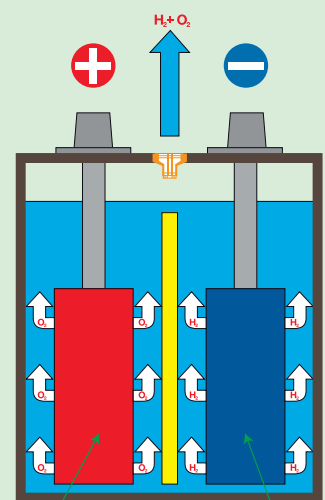
EVOLUTION OF TRADITIONAL LEAD-ACID BATTERIES

ECOFORCE AFB (*Advanced Flooded Battery*) is an evolution of traditional lead-acid batteries. The main features that differentiate an AFB battery from a conventional lead acid battery are:

1. electrolyte reservoir increased;
2. high exchange surface with the electrolyte;
3. negative plates features:
 - a. grids with a special Lead-Calcium-Tin alloy;
 - b. negative active mass with an higher Carbon content;
 - c. mixture of different expanders studied to face Start & Stop cycles;
 - d. application of a specific organic fiber layer;
4. double layer separation: PE + specific Polyester fibers soft layer;
5. protection of the electrodes against corrosion and potential danger.



ADVANCED FLOODED BATTERY DURING DISCHARGE



Oxygen development

Hydrogen development

	POSITIVE PLATE
	NEGATIVE PLATE
	SEPARATOR
	ELECTROLYTE

WARNING
 Traditional lead-acid batteries are not suitable for micro hybrid vehicles. In case of replacement FIAMM recommends the installation of AFB/AGM batteries in all above models, respecting the original battery technology.

ecoFORCE AFB



ECOFORCE AFB (Advanced Flooded Battery) is the best option for compact cars equipped only with Start & Stop system. In this case the battery is characterized by a withstand to cycles, two times higher than a traditional battery: in queues or at traffic lights, ECOFORCE AFB provides power to all electrical components when the engine is off and a reliable starting when the clutch is pressed.

THE PRINCIPAL BENEFITS OF ECOFORCE AFB AT A GLANCE

- + Latest OE technology and quality
- + High charge and discharge acceptance (two times more than a traditional battery)
- + Negative active mass composition specifically designed to meet the typical cycles of Start & Stop
- + Good starting performance
- + Longer cycle life than standard lead-acid starter batteries (when measured in terms of energy output)
- + Totally maintenance-free

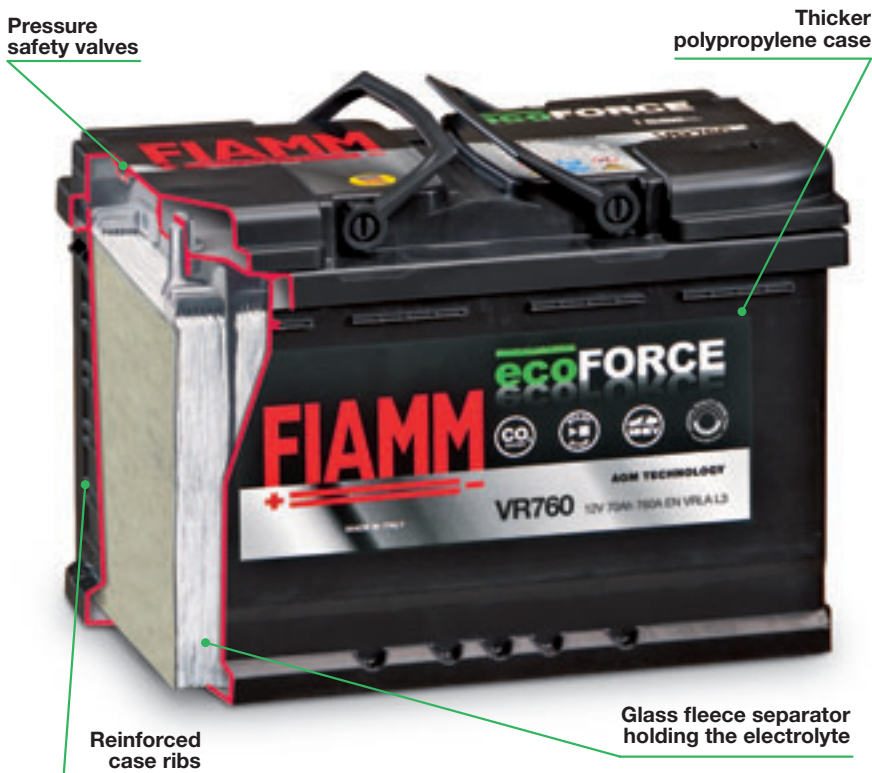
TECHNICAL INFORMATION ECOFORCE AFB

CODE	PERFORMANCE		DIMENSIONS				FEATURES		
	Ah	CCA A (EN)	BOX	LENGTH (mm)	WIDTH (mm)	HEIGHT (mm)	LAYOUT	TERMINAL	HOLD-DOWN
TR520	60	520	L2	242	175	190	0	1	B13
TR680	70	680	L3	278	175	190	0	1	B13
TR740	80	740	L4	315	175	190	0	1	B13

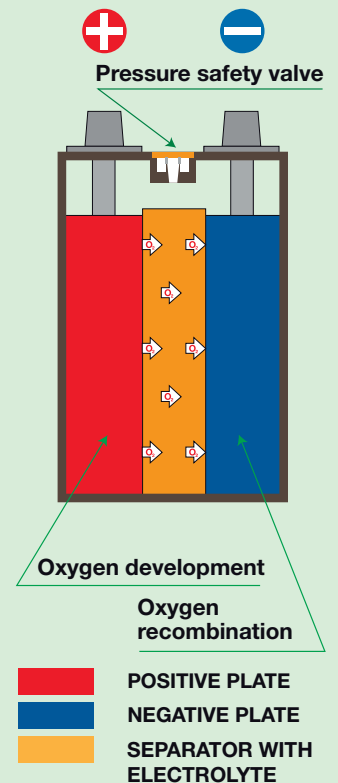
AGM TECHNOLOGY

The main feature that distinguishes ECOFORCE AGM from a traditional battery is the gas recombination technology. For a traditional lead-acid battery the phase of charging is characterized by the dissociation of water into hydrogen and oxygen. The two gasses leak from the caps, while the level of electrolyte inside the battery decreases. ECOFORCE uses instead the principle of recombination.

Thanks to a special microporous separator (*Absorbent Glass Material*), impregnated with a controlled quantity of electrolyte, the oxygen released from the positive plate after the dissociation of water during charging, can migrate to the negative from which is fixed and then recombine with hydrogen, restoring the water that was dissociated. This establishes a closed electrochemical cycle, without any gas emission and without water consumption. It's a simple system, but to work best it requires great precision in manufacturing and an accurate choice of components. Important are both the whole plate-separators compression and the purity of the components.



AGM BATTERY DURING DISCHARGE



WARNING
 Traditional lead-acid batteries are not suitable for micro hybrid vehicles. In case of replacement FIAMM recommends the installation of AFB/AGM batteries in all above models, respecting the original battery technology.

ecoFORCEAGM



ECOFORCE AGM (Absorbent Glass Material) is the best battery for micro hybrid car models with Start & Stop device, Brake Energy Regeneration and other technologies conceived to save consumption (such as gear shift indicators, intelligent alternator, etc.).

Therefore the functioning of all these instruments depend on the presence of a battery that provides optimal performance, mainly in conditions of extreme cycling.

THE PRINCIPAL BENEFITS OF ECOFORCE AGM AT A GLANCE

- + Latest OE technology and quality
- + High cranking amperage
- + Extreme charge and discharge acceptance (three to four times longer cycle life than traditional batteries)
- + Low self-discharge
- + Higher resistance to vibrations than conventional batteries
- + Totally maintenance-free
- + Leak-proof and Spill-proof

TECHNICAL INFORMATION ECOFORCE AGM

CODE	PERFORMANCE		DIMENSIONS				FEATURES		
	Ah	CCA A (EN)	BOX	LENGTH (mm)	WIDTH (mm)	HEIGHT (mm)	LAYOUT	TERMINAL	HOLD-DOWN
VR760	70	760	L3	278	175	190	0	1	B13
VR800	80	800	L4	315	175	190	0	1	B13
VR900	90	900	L5	353	175	190	0	1	B13



Download the application from your smartphone to connect through the QR Code to all the most interesting news of FIAMM:

- to the following link: <http://www.i-nigma.mobi>

- or send an SMS containing the word qk (+39) 349 2410601. You will receive an SMS with a link to click depending on the model of your mobile phone.



ISO 9001:2000



ISO/TS 16949:2002

1907/2006/EC REACH COMPLIANT



**Italian Passion
Global Energy**

FIAMM SpA
Viale Europa 63
Montecchio Maggiore (VI)
36075 - Italy
Tel +39 0444 709311
Fax +39 0444 699237
www.fiamm.com

Batterie Avviamento
Sede Operativa e Uffici Commerciali
FIAMM SpA
Viale del Lavoro 20
Veronella (VR)
37040 - Italy
Tel. + 39 0442 489111
Fax. +39 0442 489162
info.starter@fiamm.com