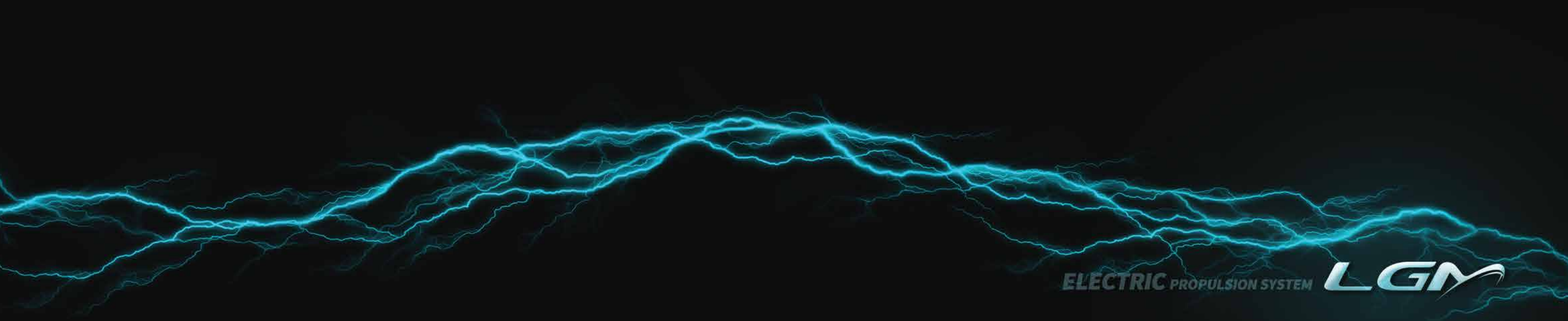

LGM

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Who We Are?

Have you ever sailed a paper boat when you were young? A white paper boat silently floating like a could in the sky...
A memory of a small paper boat
floating on a stream may remain with you.

LGM has concentrated on moving a ship using electric propulsion to capture your pure childhood memory for the future.

As a result, we have succeeded in commercializing our country's first eco-friendly, silent electric fishing boats, and obtaining the technology to lead the global market beyond Korea.

LGM will create a future where everyone in the world can live happily in a healthy environment without fine dust.

MEMBERS OF THE LGM FAMILY

INNOBIZ kipa. Korean Intellectual Property Office

CE N&T ISO 14001 ISO 9001

CONTENTS

What is e-Powertrain?

Device to work as a major propulsion system in a boat using power from battery and electric motor.

Uses of e-Powertrain

Generates propulsion on the rear of small & mid-sized boats or special boats (Lifeboat, Skiffboat, etc.)

▶ ***e-Outboard***
- Application : Ferry, Power Boats, Fishing Boats, Special Purposed Boats

▶ ***e-Inboard***
- Application : Power Boats, Excursion Ships, PWCs

▶ ***e-Sailing***
- Application : Sailing Yacht

We are Ready to Show You The Next E-boat Technology

Superior propulsive power and overall efficiency don't just fall out of the sky. They come from in house development that works uncompromisingly towards optimizing propulsive power and overall efficiency. It comes from using the newest technology for every component. This all come from using tailormade components where appropriate, instead of off the-shelf solutions. Carefully matching all components of the drive train for performance that is what superior drive train engineering is about.

Enjoy Your Dream!

The Hyper power, Superior battery Pack and Silence Enjoy Your life.

ELECTRIC PROPULSION SYSTEM

OUTBOARD

LGM promises high satisfaction to the customers by providing the e-Outboard that can be applied to small boats to 5ton fishing boats.
Become a front-runner as an environmentalist with LGM e-Outboard.

** All figures are subject to change for improvements.*
** Battery products standard proposed by economic feasibility and possible to be customized by customers' demands.*

O - 180
180 HP / 133 kW / 67.6 kWh (Battery)

O - 115
115 HP / 84 kW
33.8 kWh (Battery)

O - 90
90 HP / 65 kW
33.8 kWh (Battery)

O - 60
60 HP / 43 kW
33.8 kWh (Battery)

O - 40
40 HP / 23 kW
14.5 kWh (Battery)

O - 16
16 HP / 11 kW
7.26 kWh (Battery)

O - 8
8 HP / 6 kW
3.63 kWh (Battery)

ELECTRIC PROPULSION SYSTEM
INBOARD

LGM's electric inboards are designed to perform the same or better than it's engine counterparts while producing less noise and vibration. Comprised of over IP67 connectors and cases for better safety, all LGM powertrain kits are ready for unique boat applications.

** All figures are subject to change for improvements.*
** Battery products standard proposed by economic feasibility and possible to be customized by customers' demands.*

i - 115
115 HP / 84 kW
33.8 kWh (Battery)

i - 90
90 HP / 65 kW
33.8 kWh (Battery)

i - 40
40 HP / 23 kW
14.5 kWh (Battery)

i - 60
60 HP / 43 kW
33.8 kWh (Battery)

i - 180
180 HP / 133 kW
67.6 kWh (Battery)

i - 270
270 HP / 200 kW
135.2 kWh (Battery)

i - 330
330 HP / 246 kW
135.2 kWh (Battery)

S - 110
110 HP / 84 kW
4.032 kWh (Battery)

S - 90
90 HP / 65 kW
4.032 kWh (Battery)

S - 40
40 HP / 23 kW
4.032 kWh (Battery)

S - 25
25 HP / 19 kW
2.016 kWh (Battery)

S - 16
16 HP / 11 kW / 1.008 kWh (Battery)

S - 8
8 HP / 6 kW / 1.008 kWh (Battery)

** All figures are subject to change for improvements.*
** Battery products standard proposed by economic feasibility and possible to be customized by customers' demands.*

Do you want to hear only the sound of waves in the middle of the tranquil sea and relax? LGM's e-Saildrive is noiseless and no smoke because it does not burn fuel. In addition, the e-Sailing Series can be recharged while sailing by applying the Regeneration System. If you are with LGM's e-Saildrive, you can experience unlimited sailing with the comfort of sailing and without battery.

Exchangeable Technology

We understand that battery swap system must be the best solution for Marine EV's as it eliminates frustrating battery charging times and battery weight problems.
The only way to overcome the weight and water pipe problems is to divide the battery power packs into many sub-packs which can be easily handled by human power. But the division of battery power pack was regarded as 'mission impossible technology' in the Marine EV industry because of obstacles in battery management and communication among components. LGM is the only company in the world which overcame these barriers in the battery swap system.

Battery Control

• *Efficient control and management of Li-ion battery*
** Patent "Power input control circuit for battery management system" 1 Other*

Extreme Battery Powerpack Technology

** All figures are subject to change for improvements.*

Optimized Battery Case For Water Resistance

• *IP67-level waterproof (Protected from immersion up to 1m in depth)*
** Patent "Battery connection system"*

Easy Battery Replacement

• *One-touch battery swapping system*
** Patent "Battery stack assembly" 2 Others*

External Material

• *P.P is applied to absorb shock, high elasticity, acid resistance, lightweight and scratch resistant*
• *The influence of external temperature and maintains internal temperature consistently with its heat fiber and cooling pipe*
** Patent "Battery case system having good heating and cooling"*

Cooling System

• *Maintains internal temperature and heat conduction by applying the copper pipe*
• *Overheating prevention system by applying refrigerants*
** Patent "Battery cooling system and boat using it" 3 Others*

ETC.

** Patent "Testing device of battery pack" 3 Others*

• LGM's Battery Pack and Apparatus

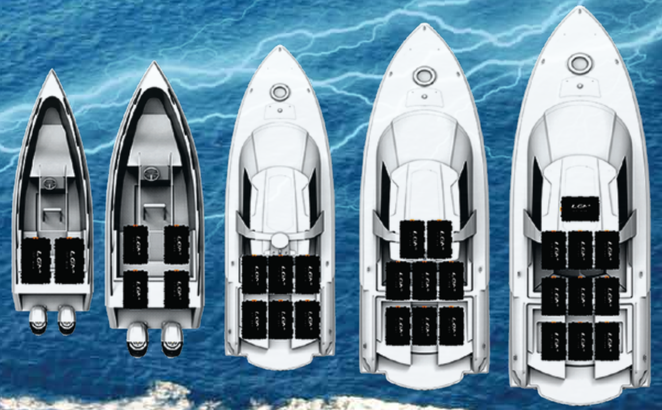
Applied the CNT (Carbon Nano Tube) heat exchange technology Maximizes battery efficiency even under low temperature

• Battery temperature control system

Maintains the optimal to operate and preservation a battery

Breakthrough Battery Limitations

Innovative technology that allows the user to adjust the sailing distance.
Just adjusting the battery pack quantity will make your dreams come true.



UNLIMITED EXPANDABLE

CBS Type (302.4V, 70Ah)

Nominal Voltage (Vdc)	302.4
Nominal Capatity (Ah)	70
Energy (kWh)	21.168
Operating Voltage (Vdc)	252.0 - 348.6
Charging Voltage (Vdc)	348.6
Charging Current	30A (0.42C-rate)
Discharging Current / Instnnt	70A / 200A (2.85C-rate)
Communication / Master to Pack	Can 2.0b
Operation Temperature (ambient)	0°C ~ 60°C
Configuration	75 1P
Size (mm)	890 x 560 x 460
Weight (kg)	178.0
IP Rating	IP67 (Proteceed from immersion up oo 1m in depth)

Fixed Type

	345.6V, 98A	86.4V, 168A
Nominal Voltage (Vdc)	345.6V	86.4V
Nominal Capatity (Ah)	98A	168A
Energy (kWh)	33.87kWh	14.52kWh
Operating Voltage (Vdc)	288.0 - 384.0	67.2 - 98.4
Charging Voltage (Vdc)	99.6	72.0 - 96.0
Charging Current	30A (0.3C-rate)	84A (0.5C-rate)
Discharging Current / Instnnt	98A / 280A (2.85C-rate)	84A / 240A (2.85C-rate)
Communication / Master to Pack	CAN	CAN
Operation Temperature (ambient)	0°C ~ 60°C	0°C~ 60°C
Configuration	4 Module	4 Module
Size (mm)	1,000 x 830 x 314	485 x 830 x 628
Weight (kg)	148.0 (37.0kg x 4)	80.0 (20.0kg x 4)
IP Rating	IP67	IP67

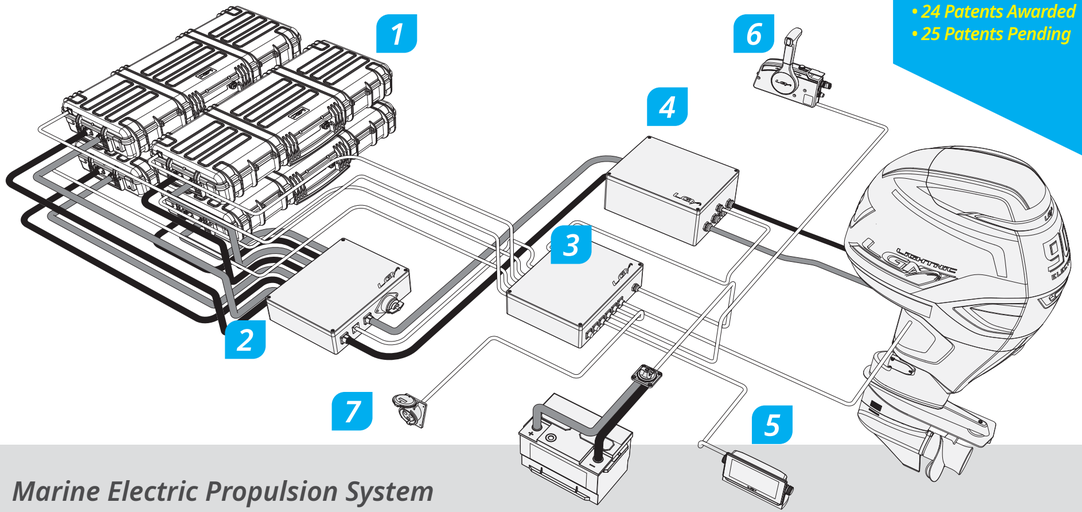
36V, 28Ah

Nominal Voltage (Vdc)	36
Nominal Capatity (Ah)	28
Energy (kWh)	1.008
Operating Voltage (Vdc)	28.0 - 41.0
Charging Voltage (Vdc)	41.5
Charging Current	14A (0.5C-rate)
Discharging Current (Continuous)	28A (1.0C-rate)
Discharging Current (Max)	80A (2.85C-rate)
Size (mm)	141 x 141 x 260
Weight (kg)	6.2

End-to-End Innovation

Integration Value

A System that is greater than Sum-of-the-Parts.

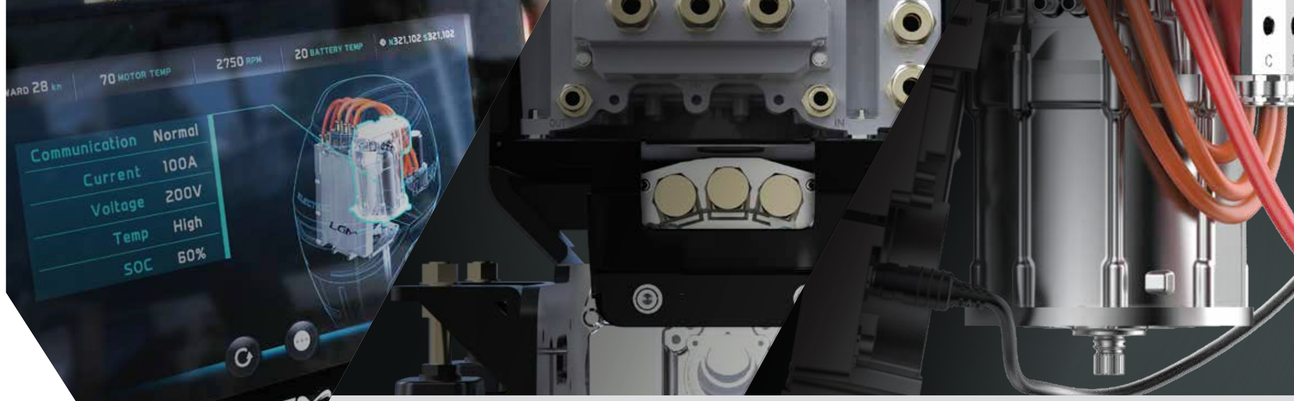


END-TO-END INTELLECTUAL PROPERTY

- 24 Patents Awarded
- 25 Patents Pending

Marine Electric Propulsion System

LGM is applying integrated electric boats, excluding hulls such as hyper electric propulsion engine, battery power pack equipped with BMS, other electronic systems and digital monitoring system for Internet of Things (IoT). LGM's End-to-End Innovation will present you a quiet, fuel-free electric boat.



1

BMS (Battery Management System)

2

PDU (Power Distribution Unit) BIS (Battery Information System)

3

BCU (Boat Control Unit) BMU (Boat Management Unit)

4

PCBU (Power Circuit Breaker Unit)

5

ADS (Active Display System)

6

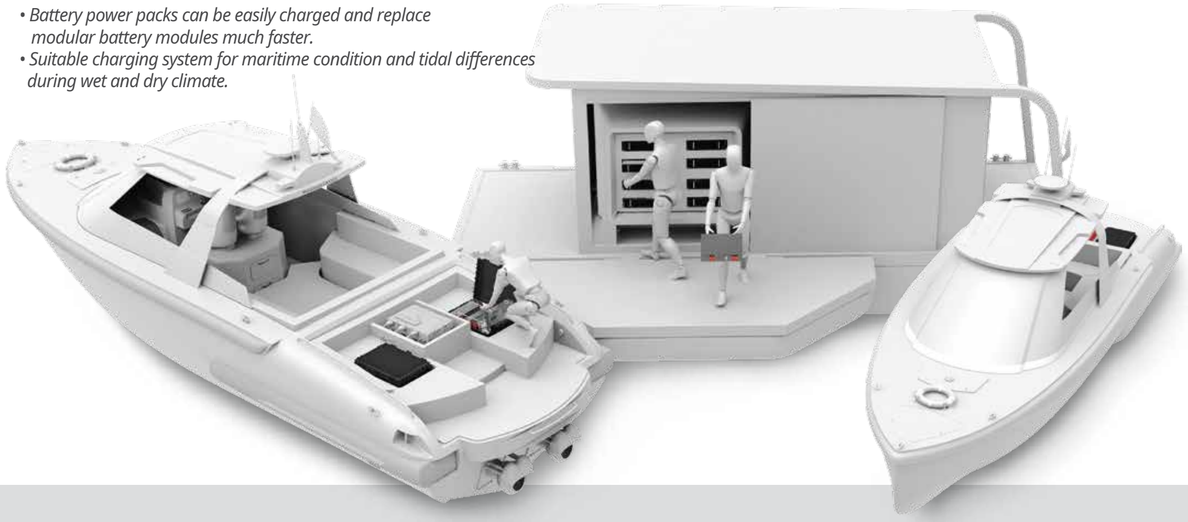
Electric Throttle

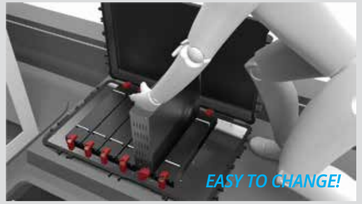
7

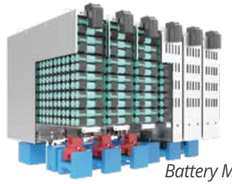
OBC (On Board Charger) Charging Terminal

Ships' floating exchange battery charging flatform

- *Battery power packs can be easily charged and replace modular battery modules much faster.*
- *Suitable charging system for maritime condition and tidal differences during wet and dry climate.*

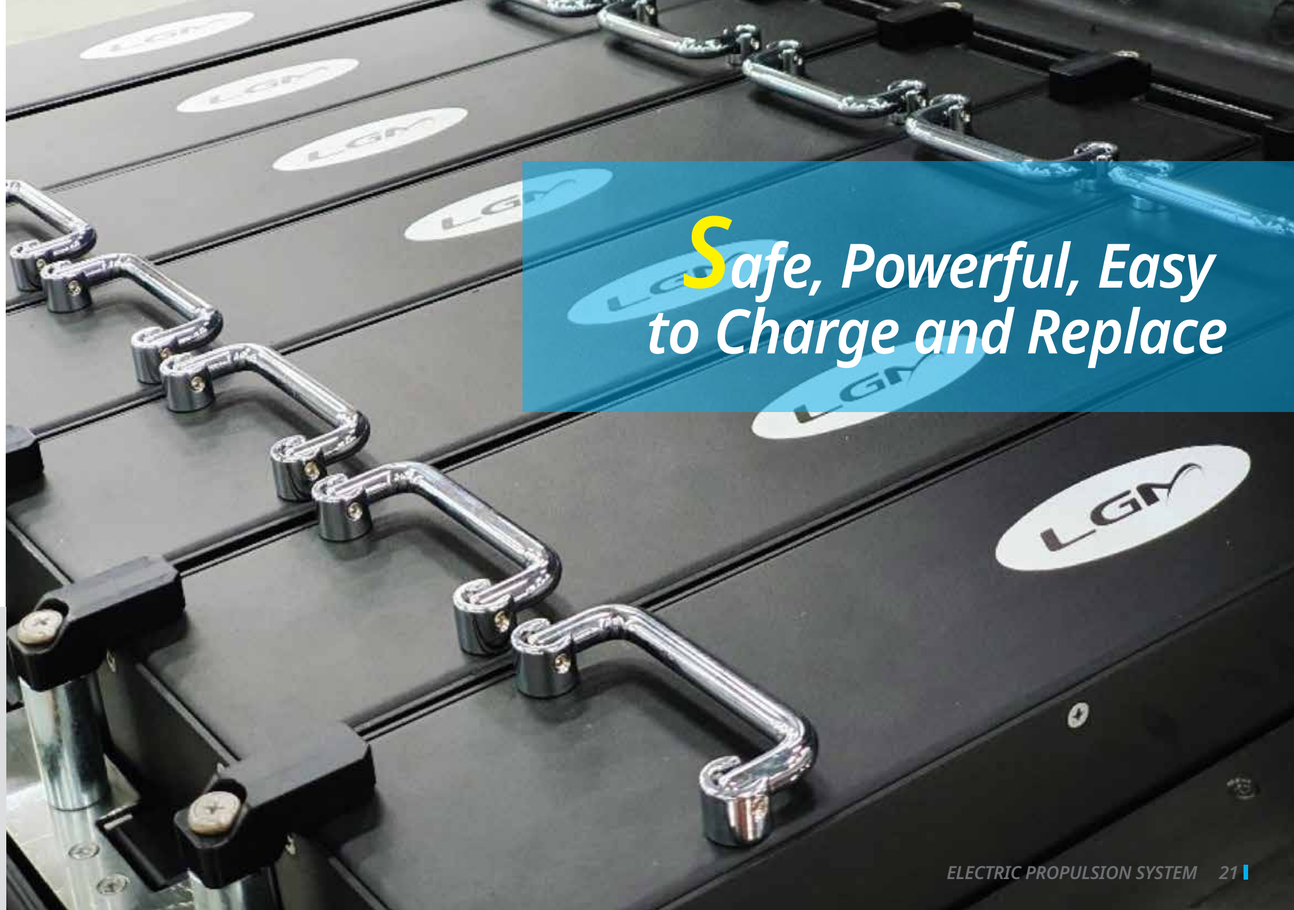






Battery Module

Bare Cell

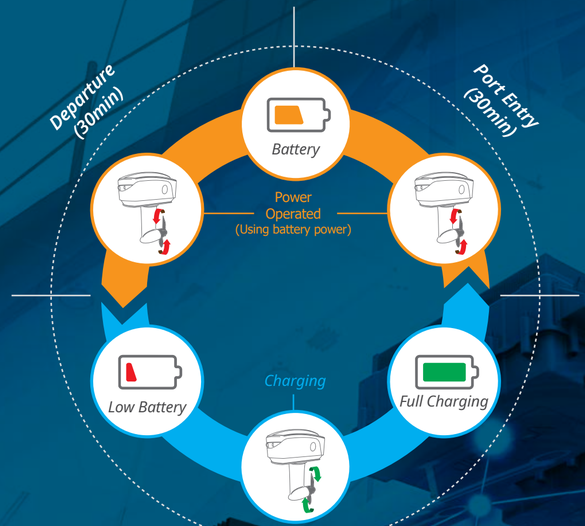


Safe, Powerful, Easy to Charge and Replace

Saildrive Energy Recharging System

Quiet and eco-friendly, electric saildrive uses a charged battery to departure and can charge their own batteries while sailing.

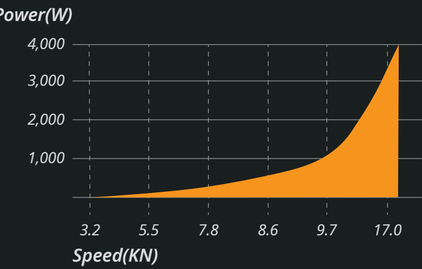
Recharging System Diagram



Sailing (3-5hours)
Energy use for home appliances

LGM's Sailing Regenerator System is an automatic function of the saildrive. There is no need to worry about battery discharge during sailing, and there is little need to use the generator.
It is activated in the display of the sailing yacht and when the button is pressed, it switches to the energy regeneration mode and the propeller is activated until the battery is charged and the hydroelectric power is generated.

Recharging Battery Power
(5kW Regeneration)



Classification	Speed	Power
Unit	Knot	Watt
LGM Recharging System	5.5	187.2
	7.8	331.2
	9.7	1,044
	17.0	3,500

Real-Time Diagnose & Control

Quick execution of necessary measures for accidents and dangers

• Collects real-time information of boat's status through IoT-based ADS(Active Display System) for electric boats.

Sends emergency signals automatically

• When there is any abnormality of battery while under water or if any accident occurs, ADS automatically sends emergency signals to control center for help to enable quick response and rescue.

Real-Time Monitoring

Data Collection & Analysis

Control Server

Remote Communication [Data Sending]

GPS

Converged Module

SG/4G/WIFI/BT Remote Communication

Automatically activates necessary measures for any accidents or dangers

POLICE

Marine Police

Operation of Emergency Charging

Unmanned Operation of Central Control

Emergency Charging Dispatch

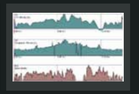
Contents Provider | **Marine Safety Center**

Monitoring of ship's status

- Propellant RM
- Propellant output
- Propellant temperature
- Battery temperature
- Battery operation status
- Battery voltage & Current
- Abnormality in battery
- Operation of communication
- Devices

Real-time report for remaining mileage and ship's status through data analysis

Communication Status



Remaining Mileage

ELECTRIC Powertrain Specification

e-Outboard Series	O - 8	O - 16	O - 40	O - 60	O - 90	O - 115	O - 180
Max / Continuous Power (kW)	9 / 6	15 / 11	43 / 23	60 / 43	110 / 65	150 / 84	173 / 133
Max / Continuous Torque (N·m)	48 / 19	90 / 29	72 / 31	167 / 78	255 / 105	251 / 142	555 / 248
Operational Speed (rpm)	0-2,800	0-2,800	0-8,006	0-7,160	0-10,250	0-8,000	0-6,204
Rated Battery Voltage (Vdc)	43.2	43.2	86.4	345.6	345.6	345.6	345.6
Efficiency at Optimal Operation (%)	88.4	88.4	90	90	92	90	90
Communication	CAN 2.0b	CAN 2.0b	CAN 2.0b	CAN 2.0b	CAN 2.0b	CAN 2.0b / RS232	CAN 2.0b
Motor Weight (kg)	11.0	17.0	15.7	35.0	37.5	46.0	77.0
Controller Weight (kg)	2.5	2.5	4.7	7.5	12.2	7.5	7.5

e-Inboard Series	i - 40	i - 60	i - 90	i - 115	i - 180	i - 270	i - 330
Max / Continuous Power (kW)	43 / 23	60 / 43	110 / 65	150 / 84	173 / 133	200 / 200	250 / 246
Max / Continuous Torque (N·m)	72 / 31	167 / 78	255 / 105	251 / 142	555 / 248	2,100 / 1,225	2,700 / 2,230
Operational Speed (rpm)	0-8,006	0-7,160	0-10,250	0-8,000	0-6,204	0-3,500	0-3,375
Rated Battery Voltage (Vdc)	86.4	345.6	345.6	345.6	345.6	691.2	691.2
Efficiency at Optimal Operation (%)	90	90	92	90	90	94	94
Communication	CAN 2.0b	CAN 2.0b	CAN 2.0b	CAN 2.0b / RS232	CAN 2.0b	CAN 2.0b	CAN 2.0b
Motor Weight (kg)	15.7	35.0	37.5	46.0	77.0	217.0	340.0
Controller Weight (kg)	4.7	7.5	12.2	7.5	7.5	26.1	35.1

Further Release →

e-Saildrive Series	S - 8	S - 16	S - 25	S - 40	S - 90	S - 110
Continuous Power (hp / kW)	8 / 6	16 / 11	25 / 19	40 / 23	90 / 65	110 / 84
Operational Speed (rpm)	0-3,100	0-3,100	0-2,200	0-2,530	0-2,530	0-2,530
Reduction Ratio	1.93 : 1	1.93 : 1	1.93 : 1	4.05 : 1	4.05 : 1	4.05 : 1
Weight (kg)	40.5	46.5	50.5	172.0	198.0	218.0
Rated Battery Voltage (Vdc)	48.0	48.0	72.0	302.4	302.4	302.4
Communication	CAN 2.0b	CAN 2.0b	CAN 2.0b	CAN 2.0b	CAN 2.0b	CAN 2.0b
Installation Optimal to	Daysailer / Racing	Daysailer / Racing	Daysailer / Racing Monohull / Multihull	Monohull / Multihull	Monohull / Multihull	Monohull / Multihull
Min. Regenerating Speed (kn)	5.8	5.8				
Max. Regenerating Output (kW)	3.0	3.0				