

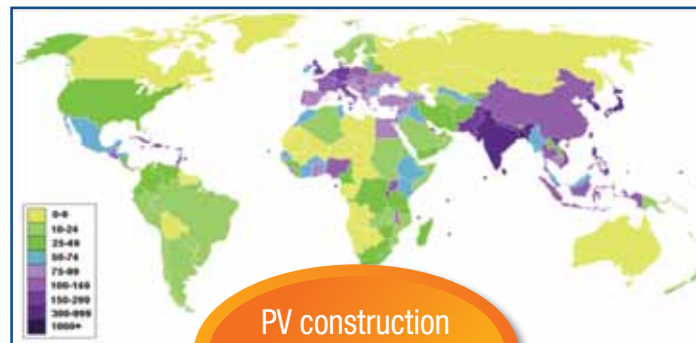
The Best Solution For the Next Generation,
Photovoltaic Energy!

Floating Photovoltaic System

Floating PV system is great efficient system which innovates the limitation of conventional PV site. It enables the best use of land, tidal control, building eco-friendly environment and the increase of generation.(10% more)

In comparison with conventional mounting based-PV system, Floating PV system is so cost-effective that it makes the best use of high generation supported by cooling effect.

■ Population Density of the World



PV construction variation for efficient use of land.



■ Key Benefits of Floating PV System

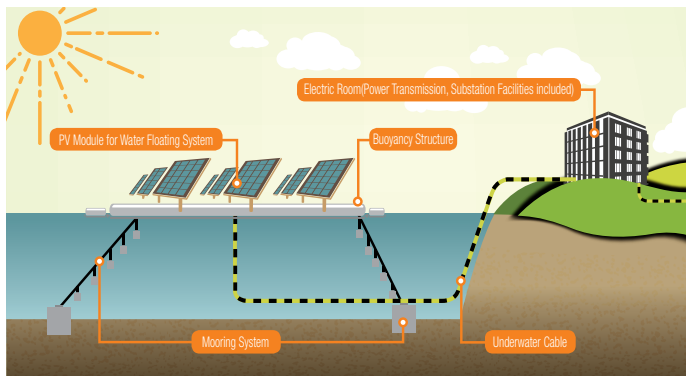
Conservation of Forest & Farmland [No Deforestation Damage] By Green System	Use of Water Surface [The Efficient Use of Land] By Eco-Friendly System	High Efficiency [10% Generation Increase] By Natural Cooling Effect
Preventing Green Tide [Green Tide can be Controlled] By Blocking Sunlight	Saving the Water Resources [Reducing Water Evaporation] By Blocking sunlight	Eco-friendly System [Natural Fish Farms] Under the Floating Platform

■ Application of LSIS Floating PV System

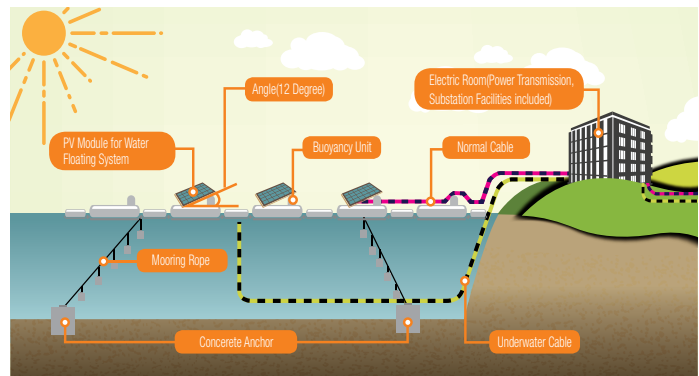
Contents	Structure Type	All-in-one Buoyancy Type
Concept Image		
Features	<ul style="list-style-type: none"> Easy to design for optimal PV module tilt Metallic Structure: Stable & Excellent Strength Buoyant Tank: Stable floating platform against a wind and a tide. Styrofoam inside that can maintain its buoyancy when it is broken Easy to maintain 	<ul style="list-style-type: none"> No need a platform design Easy to transport and fast to install Cost effective
Applicable Site	<ul style="list-style-type: none"> A place that is around 40-50m water deep lake as a dam lake and has much water level fluctuation. 	<ul style="list-style-type: none"> A place that is around 10-20m water deep such as a reservoir or a pond and had a little eater level fluctuation
Material	<ul style="list-style-type: none"> Aluminum-Zinc-Magnesium alloy 	<ul style="list-style-type: none"> HDPE(High Density Polyethylene)
Period & Workforce for Construction(1MW)	<ul style="list-style-type: none"> Approximately 60 days(3 team, 10 people per team) 	<ul style="list-style-type: none"> Approximately 50 days(3 team, 10 people per team)
Site Image		

※ Period & Workforce for construction can be changed by field environment.

■ Floating PV System Design



Structure Type



All-in-one Buoyancy Type

※ Cable installation is subject to change under circumstances.

■ System Benefits (Especially for All-in-one Buoyancy)



Optimization

- Optimal design reflecting wind speed and wave height



Durability

- Using HDPE, more durable than LDPE & LLDPE, powered by high 'Molecular Mass' and 'Yield Strength'

*HDPE: High Density Polyethylene

*LDPE: Low Density Polyethylene

*LLDPE: Linear Low Density Polyethylene



Eco-friendly

- Qualified floating equipment(received 'Test Report' by Korea Testing & Research Institute)

*Completion of Material & Hygiene Safety Verification Test'(Dec.2013)

- Compatible with Eco-environment 'Water-floating PV Module' (No leaching lead & aldehyde)



Safety

- Applying mooring gear & reliable structure suitable for site
- Featured flooding prevention(inserting Expanded Polystyrene inside)



Easy for Installation-Carrying

- Available for carrying humanly (PVF 300M: 18.5kg/PVF 300SL:8.5kg/PVF 300SS: 3.3kg)
- Easy to install by commercialized tools



Reliability(Supported by Patents and Guarantee)

- Increase reliability powered by Eco-environment 'Water-floating PV Module'(under free guarantee within 5years)
- Patent Application Completed(Domestic/Overseas)

*Republic of Korea(Dec 10, 2013)

*Europe(Jan 9, 2014)

*USA(Dec 31, 2013)

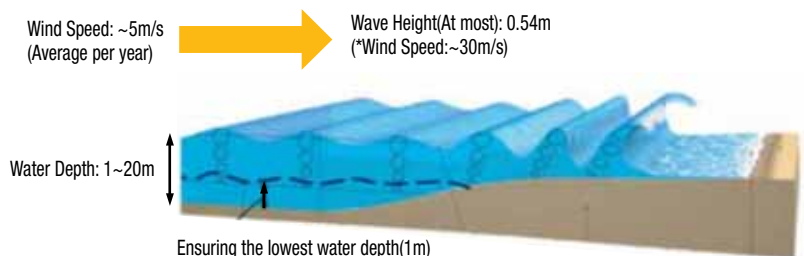
*China(Jan 10, 2014)

*Japan(Jan 10, 2014)

*Singapore(Jan 6, 2014)






■ Installation Condition (Especially for All-in-one Buoyancy)

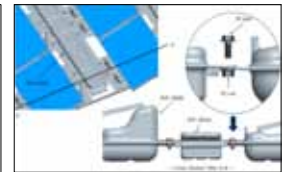
- ① Water Depth: 1~20m(at least: 1m)
- ② Wind Speed(Average per year) ~5m/s(at most: ~30m/s)
- ③ Wave Height(At most): 0.54m
- ④ Temperature Range: -20~55℃
- ⑤ Snow Load: 50kgf/m² (Dry Snow: 50cm, Wet Snow: 17cm)
- ⑥ Space Requirement(1MW): 13,617 m²



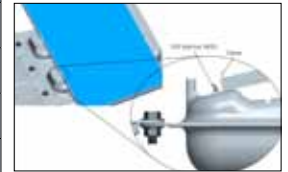
■ Main Components of All-in One Buoyancy System

1) All-in-one Buoyancy System Components

Image					
Model Name	<PVF 300M>	<PVF 300SS>	<PVF 300SL>	<PE bolt/nut>	<Clamp>
Material/Weight/Buoyancy	HDPE/18kg/210kgf	HDPE/3.3kg/30kgf	HDPE/8.5kg/80kgf	HDPE	AI
Size	1,508x1,132x470mm	646x586x225mm	646x1,520x225mm	M30	53.86x40x43.4mm
Function	For PV module installation	For maintenance	For maintenance	For unit combination	Fixing PV module
Characteristic	- Reliable floating units(Minimize flooding by inserting stuff material inside) - Enhancing strength by applying HDPE / Gray-color(UV resistant) / Light and easy to install - Optimized design considering ventilation & prevention of declining PV generation				



[Combination(unit to unit)]



[Installation of PV Module]

2) Water Floating PV Module

• Water Floating PV Module VS Normal PV Module

Contents	Water Floating PV Module	Normal PV Module
Encapsulant	Specialized material	EVA
BUSBAR Material	Pb Free	Pb(including lead)
IP Class	IP67	IP64
Insulation Class	>50MΩ	>40MΩ
Presence of water-polluted material	None(passed by drinkability)	Aldehyde can be detected in EVA & Busbar
Resistancy for high temperature and humidity	High resistancy	Low resistancy
Damp Heat Test Result (5,000hr, 85% humidity, 85℃)	2~3% output decline	90% output decline

3) Inverter

Item Description	Capacity	EA
500kW Photovoltaic Inverter	500kW	2
Model Name	LSP-T500L	



DC Input		AC Output	
Max.Power (kW)	550kW	Rated Power	500kW
MPPT Range	450~850V	Rated Current	962A
Starting Voltage	450V	Rated Voltage	300V
Max. Voltage	1,000V	Current Distortion	<5% / <3%
Max. Current	1,222A	Power Factor	<0.95
Size	W : 2,350mm / H : 2,074mm / D : 822mm		
Operating Temperature	-5~+40℃		
Protection Degree	IP21		
Communication Method	RS485		

• Test Reports and Certificates of floating PV system (KTR, KTL, LSIS)



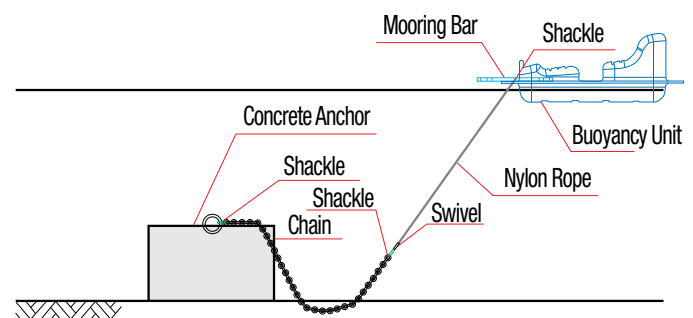
<Test Report of PV Module & Buoyancy Units>

<Test Report of Weather Proof & Mechanical Load >



4) Mooring System

- Anchor: Supporting Floating PV system
- Mooring Bar: Dispersing heavy weight concentrating floating units
- Nylon rope: Supporting system by connection floating units and anchor
- Chain: Prevention for damage of mooring line
- Shackle: Connection component of mooring bar and line
- Swivel: Prevention for twisting of mooring line



■ All-in One Buoyancy System Arrangement(1MW, Sample)

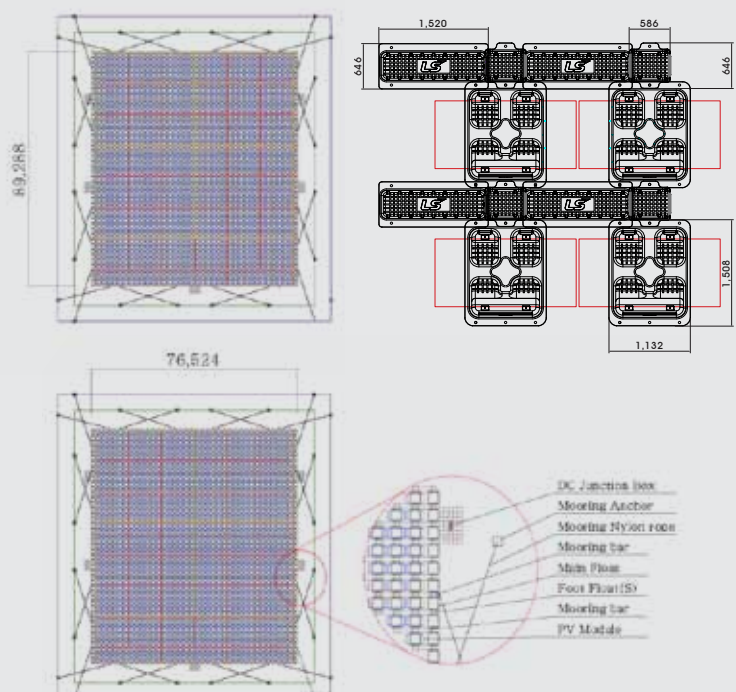
1) System Arrangement(1MW, Sample)

Module(Wp)	310Wp
Series	18
Strings	180
Module Q'ty(EA)	3,240
PV Power(kW)	1,004.4kW

2) System Overview

- Capacity: 1,004.4kW
- Main Equipment
 - Photovoltaic Module: Water-Floating system PV Module(310W)
 - PV Inverter: LSP-T500L
 - Monitoring Unit: LS Local Server, CCTV
 - Structural Equipment: All-in-one Buoyancy
- Requirement for grid-connection
 - Within 200m of intervals at interconnection grid.
- Space Requirement: Approximately 13,617 m²

3) System Drawing(1MW)





Safety Instructions

- For your safety, please read user's manual thoroughly before operating.
- Contact the nearest authorized service facility for examination, repair, or adjustment.
- Please contact a qualified service technician when you need maintenance.
Do not disassemble or repair by yourself!
- Any maintenance and inspection shall be performed by the personnel having expertise concerned.

Floating Photovoltaic System Demonstration Site, Hapcheon Lake(2012)



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www.lsis.com

Head Office

LS Tower , 127, LS-ro, Dongan-gu, Anyang-si, Gyeonggi-do, Korea

Tel +82-2-2034-4820

Fax +82-2-2034-4428

Email yleea@lsis.com



PVM S320PD



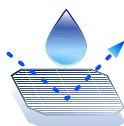
PVM S330PD

Mono-Crystalline(PID Free)

Floating system PV module

LSIS Photovoltaic Module makes a difference

LSIS has been manufacturing photovoltaic modules for more than 30 years. We are confident that this history-based experience can provide convenience and efficiency to make the best use of building solar power system. LSIS PV modules are all made in Korea with assuring credibility and the highest quality.



Adaptable PV module on the WATER SURFACE

- Pb free module to prevent water pollution
- Enhanced resistance against humidity
- High protection grade : IP67 (IEC Standard grade : IP65)
- Enforced insulation strength (Higher than 50MΩ)



LSIS values 'PID Free'

Mega-Scale PV Plants can be easily exposed PID effects that can lead to or accelerate module degradation through multiple factors. LSIS provides reliable PID Free Module tested and guaranteed.



Plus Power Tolerance

LSIS delivers only reliable products
Within a nominal power output tolerance from 0 to 3%.



Warranty

10 years Product Warranty for Mechanical Defect
10 years for 91.5% Power Warranty
25 years for 83% Power Warranty



Proper module for total solution system

LSIS Power Testing & Technology institute is recognized as a testing and certification laboratory of KEMA (Inspection of Electrical Materials of Netherland), IEC, CE, CB and CESI. LSIS PV Module obtained certification TUV, JET, J-PEC.



6 inch
Cells

PVM S320PD

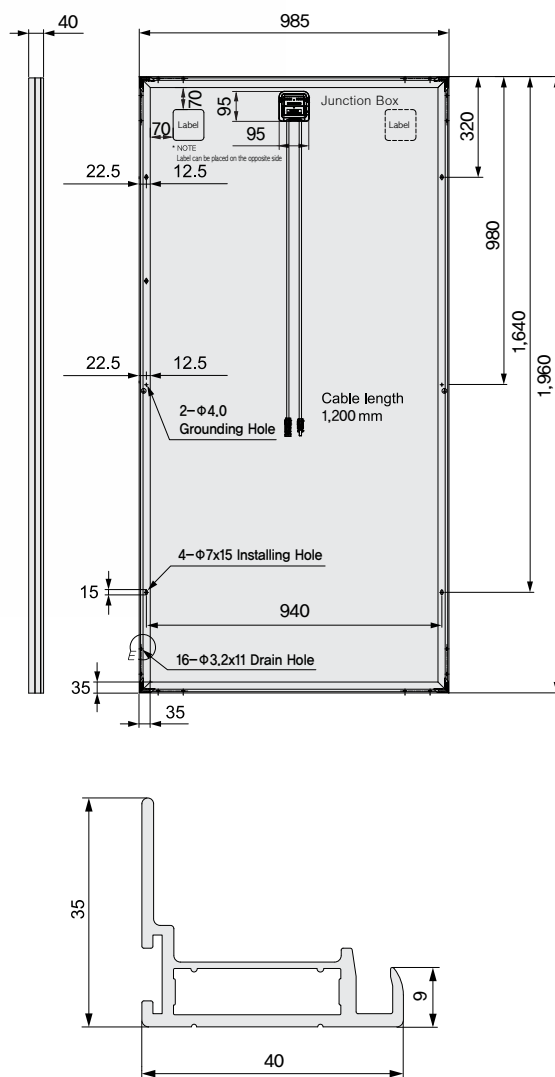
6 inch
Cells

PVM S330PD

Mono-Crystalline(PID Free)

Floating system PV module

DESCRIPTION	PVM S320PD	PVM S330PD
MECHANICAL DATA		
Cell Type	Mono-Crystalline	
Cell Dimensions	156.75 x 156.75 mm (6 inch)	
Cell Quantity per Module	72 ea	
Number of Busbar	3 ea	
Dimensions [L x W x T]	1,960 x 985 x 40 mm	
Weight	23 kg	
Bypass Diodes	3 ea	
Connection Type	MC4 Compatible	
Length of Cable	1,200 mm	
Maximun Load	5,400 pa	
ELECTRICAL DATA		
Nominal Power (Pmax)	320 Wp	330 Wp
Performance Tolerance	0 ~ +3%	0 ~ +3%
Module Efficiency	16.58%	17.09%
Open Circuit Voltage (Voc)	46.22 V	46.36 V
Short Circuit Voltage (Isc)	8.97 A	9.14 A
Voltage at Maximum-Power Point (Vmp)	39.06 V	39.15 V
Current at Maximum-Power Point (Imp)	8.21 A	8.44 A
Temperature Coefficient (Isc)	0.0386 [% / °C]	
Temperature Coefficient (Voc)	-0.3906 [% / °C]	
Temperature Coefficient (Pmax)	-0.5657 [% / °C]	
Maximum System Voltage	1,000 V	
Maximum Rated Current of Diode	20 A	
Over Current Protection Rating	12 A	
CERTIFICATION AND WARRANTY		
Certification	KS, TUV Rheinland, CE	
Product Warranty	10 years	
Output Warranty	10 / 91.5 [years/%]	
	25 / 83 [years/%]	



LSIS

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www.lsis.com

Head Office

LS Tower, 127, LS-ro, Dongan-gu, Anyang-si, Gyeonggi-do, Korea

Tel +82-2-2034-4465, 4598 **Fax** +82-2-2034-4428

Email kwchoia@lsis.com, jwleeg@lsis.com