



HT Solar Energy J.S.C.

Shanghai Aerospace Automobile Electromechanical Co., Ltd.

# HIGHWAY

SUSTAINING INNOVATION  
SINCE 1960S

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Electromechanical Co., Ltd.

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HT Solar Energy J.S.C.

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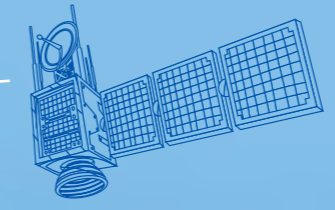
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[www.htsolar.com.tr](http://www.htsolar.com.tr)



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\* V means 1500V module

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HT72-156P  
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\* V means 1500V module





# HIGHWAY



## HT-SAAE A Large Scale State-Owned Company

Shanghai Aerospace Automobile Electromechanical Co. Ltd.,(HT-SAAE) belongs to China Aerospace Science & Technology Corporation, and Shanghai Academy of Spaceflight Technology. HT-SAAE started its research on solar technology application in space since 1960's.

As a large scale state-owned company, HT-SAAE owns a vertically-integrated industry chain from silicon ingots, wafers, cells, solar modules to solar systems and its subsidiaries have formed three main industry bases in Inner Mongolia, Shanghai and Jiangsu.

Since the beginning of 21st century, we have undertaken around 600 solar PV systems, including the "Bright Project" in west of China, The roof-top solar system for 2010 World EXPO. Solar plant in Jia Yuguan, China and solar plants in Italy and Germany.

Silicon



ORISI Silicon Co.,Ltd

Wafers



Shanghai Shenzhou New Energy Development Co., Ltd

Solar Cells



Lianyungang Shenzhou New Energy Co., Ltd

PV Modules



Shanghai Solar Energy S&T Co., Ltd

PV Systems



HT Solar Energy J.S.C.



# HIGHWAY

## Solar Module

# HT60-156M HT60-156M(V) 280W-300W

\* V means 1500V module



Advanced surface treatment, less surface reflection and 5BB cell design can reduce the series resistance and improve the module efficiency

18.4% Module Efficiency

Designed for high voltage systems of up to 1500 VDC, increasing the string length of solar systems and saving on BoS costs

TUV certification

Higher module's output power

Certified to withstand dynamic mechanical load 1000 Pascal

HT-SAAE guarantees highest production standards: IEC 61215, IEC 61730, IEC 62716 (Ammonia corrosion) & IEC 61701 (Salt Mist Corrosion)

PID resistant

Microcrack resistant Triple EL tested of high quality control.

All the modules are sorted and packaged by amperage, reducing mismatch losses and maximizing system output.

10Ys Products Warranty

25Ys Warranty on power output

Strict quality control, meeting the highest international standards: ISO 9001, ISO14001 and OHSAS18001

5W Positive tolerance 0/+5w guaranteed

Entire module certified to withstand extreme wind (2400 Pa) and snow loads (5400 Pa)



### Electrical Characteristics

Module	HT60-156M / HT60-156M(V)				
	Maximum Power at STC(Pmax)	280W	285W	290W	295W
Open-Circuit Voltage(Voc)	38.6V	38.8V	39.0V	39.7V	39.9
Short-Circuit Current(Isc)	9.32A	9.39A	9.46A	9.64A	9.71
Optimum Operating Voltage (Vmp)	32.4V	32.8V	33.2V	32.4V	32.8V
Optimum Operating Current(Imp)	8.65A	8.70A	8.75A	9.12A	9.16A
Module Efficiency	17.2%	17.5%	17.8%	18.1%	18.4%
Power Tolerance	0 ~ +5W				
Maximum System Voltage	1000V/1500V DC				
Maximum Series Fuse Rating	15A				
Operating Temperature	-40 C to +85 C				
STC: Irradiance 1000W/m <sup>2</sup> , module temperature 25, AM=1.5					
Optional black frame or white frame module according to customer requirements					

### NOCT

Module	HT60-156M / HT60-156M(V)				
	Maximum Power	207W	210W	214W	218W
Open Circuit Voltage (Voc)	36.0V	36.2V	36.4V	37.0V	37.2V
Short Circuit Current (Isc)	7.53A	7.59A	7.64A	7.79A	7.84A
Maximum Power Voltage (Vmp)	30.2V	30.5V	30.9V	30.2V	30.5V
Maximum Circuit Current (Imp)	6.85A	6.88A	6.92A	7.21A	7.24A
NOCT	45 °C ± 2 °C				
NOCT: Irradiance 800W/m <sup>2</sup> , ambient temperature 20 C, wind speed 1 m/s					

### Mechanical Characteristics

Solar Cells	Monocrystalline 156.75 x 156.75mm
No. of Cells	60 (6 x 10)
Dimensions	1640mm x 992mm x 35mm (64.6 x 39 x 1.4in)
Weight	18.5kg (40.8lbs)
Front Glass	High transmission tempered glass
Frame	Anodized aluminium alloy
Junction Box	IP67
Cable	4mm <sup>2</sup> (IEC), 900mm
Connectors	MC4/MC4 Compatible
Packaging Configuration	30pcs/box, 910pcs/40'HQ Container

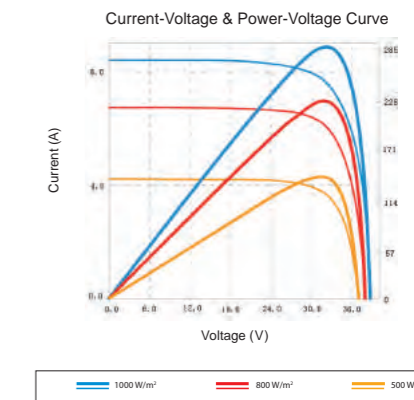
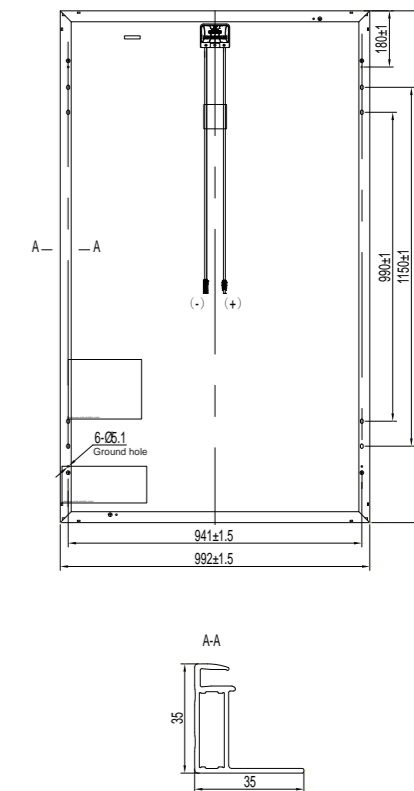
### Temperature Characteristics

Temperature Coefficient of Pmax	γ (Pm)	-0.39%/K
Temperature Coefficient of Voc	β (Voc)	-0.29%/K
Temperature Coefficient of Isc	α (Isc)	0.049%/K

### Warranty

10-year product warranty	
25-year warranty on power output	
Specific information is referred to the product quality guarantee	

### Information Box



I-V Curves

Shanghai Aerospace Automobile Electromechanical Co., Ltd.  
HT Solar Energy J.S.C.

Factory: Lianyungang ShenZhou New Energy Co., Ltd.  
HT Solar Energy J.S.C.



# HIGHWAY

## Solar Module

# HT60-156P HT60-156P(V) 265W-280W

\* V means 1500V module



Advanced surface treatment, less surface reflection and 5BB cell design can reduce the series resistance and improve the module efficiency



17.2%  
Module Efficiency



Designed for high voltage systems of up to 1500 VDC, increasing the string length of solar systems and saving on BoS costs



TUV certification



Higher module's output power



Certified to withstand dynamic mechanical load 1000 Pascal



HT-SAAE guarantees highest production standards: IEC 61215, IEC 61730, IEC 62716 (Ammonia corrosion) & IEC 61701 (Salt Mist Corrosion)



PID resistant



Microcrack resistant  
Triple EL tested of high quality control.



All the modules are sorted and packaged by amperage, reducing mismatch losses and maximizing system output.



10Ys  
Products Warranty



25Ys  
Warranty on power output



Strict quality control, meeting the highest international standards: ISO 9001, ISO14001 and OHSAS18001



5W  
Positive tolerance 0/+5w guaranteed



Entire module certified to withstand extreme wind (2400 Pa) and snow loads (5400 Pa)



### Electrical Characteristics

Module	HT60-156P / HT60-156P (V)			
Maximum Power at STC(Pmax)	265W	270W	275W	280W
Open-Circuit Voltage(Voc)	37.8V	38V	38.2V	38.4V
Short-Circuit Current(Isc)	9.04A	9.11A	9.18A	9.25A
Optimum Operating Voltage (Vmp)	31.7V	32.1V	32.5V	32.9V
Optimum Operating Current(Imp)	8.37A	8.42A	8.47A	8.52A
Module Efficiency	16.3%	16.6%	16.9%	17.2%
Power Tolerance	0 ~ +5W			
Maximum System Voltage	1000V/1500V DC			
Maximum Series Fuse Rating	15A			
Operating Temperature	-40 C to +85 C			
STC: Irradiance 1000W/m <sup>2</sup> , module temperature 25, AM=1.5				
Optional black frame or white frame module according to customer requirements				

### NOCT

Module	HT60-156P / HT60-156P (V)			
Maximum Power	195W	198W	202W	206W
Open Circuit Voltage (Voc)	35.0V	35.2V	35.4V	35.6V
Short Circuit Current (Isc)	7.30A	7.36A	7.42A	7.47A
Maximum Power Voltage (Vmp)	29.3V	29.7V	30.1V	30.4V
Maximum Circuit Current (Imp)	6.64A	6.68A	6.72A	6.75A
NOCT	45 °C ± 2 °C			
NOCT: Irradiance 800W/m <sup>2</sup> , ambient temperature 20 C, wind speed 1 m/s				

### Mechanical Characteristics

Solar Cells	Polycrystalline 156.75 x 156.75mm
No. of Cells	60 (6 x 10)
Dimensions	1640mmx992mmx35mm(64.6x39x1.4in)
Weight	18.5kg(40.8lbs)
Front Glass	High transmission tempered glass
Frame	Anodized aluminium alloy
Junction Box	IP67
Cable	4mm <sup>2</sup> (IEC), 900mm
Connectors	MC4/MC4 Compatible
Packaging Configuration	30pcs/box, 910pcs/40'HQ Container

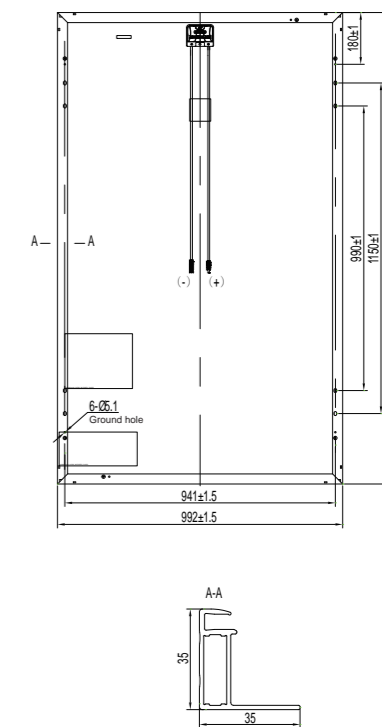
### Temperature Characteristics

Temperature Coefficient of Pmax	γ (Pm)	-0.41%/K
Temperature Coefficient of Voc	β (Voc)	-0.32%/K
Temperature Coefficient of Isc	α (Isc)	0.050%/K

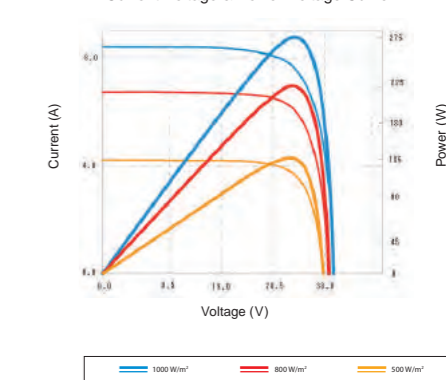
### Warranty

10-year product warranty	
25-year warranty on power output	
Specific information is referred to the product quality guarantee	

### Information Box



Current-Voltage & Power-Voltage Curve



I-V Curves

Shanghai Aerospace Automobile Electromechanical Co., Ltd.  
HT Solar Energy J.S.C.

Factory: Lianyungang ShenZhou New Energy Co., Ltd.  
HT Solar Energy J.S.C.



# HIGHWAY

## Solar Module

# HT72-156M HT72-156M(V) 340W-360W

\* V means 1500V module



Advanced surface treatment, less surface reflection and 5BB cell design can reduce the series resistance and improve the module efficiency



18.6%  
Module Efficiency



Designed for high voltage systems of up to 1500 VDC, increasing the string length of solar systems and saving on BoS costs



TUV certification



Higher module's output power



Certified to withstand dynamic mechanical load 1000 Pascal



HT-SAAE guarantees highest production standards: IEC 61215, IEC 61730, IEC 62716 (Ammonia corrosion) & IEC 61701 (Salt Mist Corrosion)



PID resistant



Microcrack resistant  
Triple EL tested of high quality control.



All the modules are sorted and packaged by amperage, reducing mismatch losses and maximizing system output.



10Ys  
Products Warranty



25Ys  
Warranty on power output



Strict quality control, meeting the highest international standards: ISO 9001, ISO14001 and OHSAS18001



5W  
Positive tolerance 0/+5w guaranteed



Entire module certified to withstand extreme wind (2400 Pa) and snow loads (5400 Pa)



### Electrical Characteristics

Module	HT72-156M / HT72-156M(V)				
	340W	345W	350W	355W	360W
Maximum Power at STC(Pmax)	340W	345W	350W	355W	360W
Open-Circuit Voltage(Voc)	46.3V	46.5V	47.3V	47.5V	47.7V
Short-Circuit Current(Isc)	9.35A	9.42A	9.62A	9.69A	9.76A
Optimum Operating Voltage (Vmp)	39.5V	39.9V	38.3V	38.7V	39.1V
Optimum Operating Current(Imp)	8.61A	8.65A	9.16A	9.19A	9.23A
Module Efficiency	17.5%	17.8%	18.0%	18.3%	18.6%
Power Tolerance	0 ~ +5W				
Maximum System Voltage	1000V/1500V DC				
Maximum Series Fuse Rating	15A				
Operating Temperature	-40 °C to +85 °C				

STC: Irradiance 1000W/m<sup>2</sup>, module temperature 25, AM=1.5  
Optional black frame or white frame module according to customer requirements

### NOCT

Module	HT72-156M / HT72-156M(V)				
	251W	254W	258W	262W	266W
Maximum Power	251W	254W	258W	262W	266W
Open Circuit Voltage (Voc)	43.3V	43.5V	44.2V	44.4V	44.6V
Short Circuit Current (Isc)	7.55A	7.61A	7.77A	7.83A	7.88A
Maximum Power Voltage (Vmp)	36.9V	37.2V	35.7V	36.1V	36.5V
Maximum Circuit Current (Imp)	6.80A	6.83A	7.23A	7.25A	7.28A
NOCT	45 °C ± 2 °C				

NOCT: Irradiance 800W/m<sup>2</sup>, ambient temperature 20 °C, wind speed 1 m/s

### Mechanical Characteristics

Solar Cells	Monocrystalline 156.75 x 156.75mm
No. of Cells	72 (6 x 12)
Dimensions	1956mm x 992mm x 40mm (77.0in x 39.1in x 1.6in)
Weight	22.5kg (49.6lbs)
Front Glass	High transmission tempered glass
Frame	Anodized aluminium alloy
Junction Box	IP67
Cable	4mm <sup>2</sup> (IEC), 1000mm
Connectors	MC4/MC4 Compatible
Packaging Configuration	26pcs/box, 672pcs/40'HQ Container

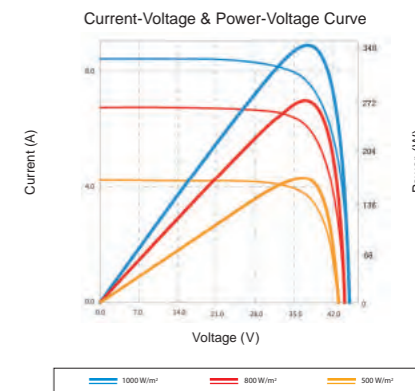
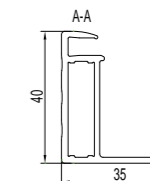
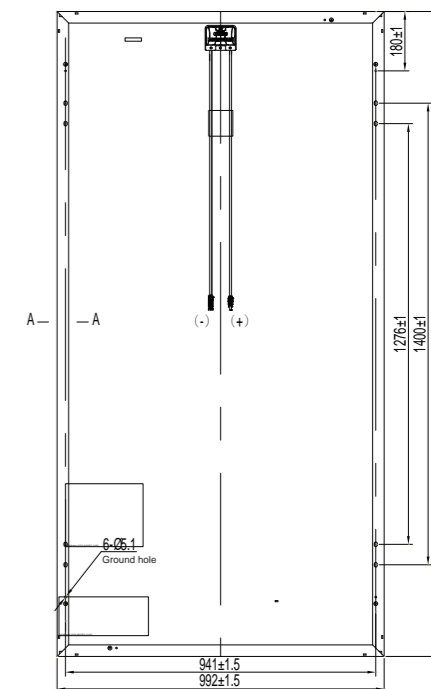
### Temperature Characteristics

Temperature Coefficient of Pmax	γ (Pm)	-0.39%/K
Temperature Coefficient of Voc	β (Voc)	-0.29%/K
Temperature Coefficient of Isc	α (Isc)	0.049%/K

### Warranty

10-year product warranty	
25-year warranty on power output	
Specific information is referred to the product quality guarantee	

### Information Box



I-V Curves

Shanghai Aerospace Automobile Electromechanical Co., Ltd.  
HT Solar Energy J.S.C.

Factory: Lianyungang ShenZhou New Energy Co., Ltd.  
HT Solar Energy J.S.C.



# HIGHWAY

## Solar Module

# HT72-156P HT72-156P(V) 315W-340W

\* V means 1500V module



Advanced surface treatment, less surface reflection and 5BB cell design can reduce the series resistance and improve the module efficiency



17.3%  
Module Efficiency



Designed for high voltage systems of up to 1500 VDC, increasing the string length of solar systems and saving on BoS costs



TUV certification



Higher module's output power



Certified to withstand dynamic mechanical load 1000 Pascal



HT-SAAE guarantees highest production standards: IEC 61215, IEC 61730, IEC 62716 (Ammonia corrosion) & IEC 61701 (Salt Mist Corrosion)



PID resistant



Microcrack resistant  
Triple EL tested of high quality control.



All the modules are sorted and packaged by amperage, reducing mismatch losses and maximizing system output.



10 Years  
Products Warranty



25 Years  
Warranty on power output



Strict quality control, meeting the highest international standards: ISO 9001, ISO14001 and OHSAS18001



Positive tolerance 0/+5w guaranteed



Entire module certified to withstand extreme wind (2400 Pa) and snow loads (5400 Pa)



### Electrical Characteristics

Module	HT72-156P / HT72-156P(V)					
	315W	320W	325W	330W	335W	340W
Maximum Power at STC(Pmax)	315W	320W	325W	330W	335W	340W
Open-Circuit Voltage(Voc)	45.4V	45.6V	45.8V	46V	46.2V	46.3V
Short-Circuit Current(Isc)	9.05A	9.12A	9.19A	9.26A	9.33A	9.41A
Optimum Operating Voltage (Vmp)	37.8V	38.2V	38.6V	38.9V	39.3V	39.6V
Optimum Operating Current(Imp)	8.34A	8.39A	8.44A	8.49A	8.54A	8.59A
Module Efficiency	16.2%	16.5%	16.7%	17.0%	17.3%	17.5%
Power Tolerance	0 ~ +5W					
Maximum System Voltage	1000V/1500V DC					
Maximum Series Fuse Rating	15A					
Operating Temperature	-40 °C to +85 °C					
STC: Irradiance 1000W/m <sup>2</sup> , module temperature 25, AM=1.5						
Optional black frame or white frame module according to customer requirements						

### NOCT

Module	HT72-156P / HT72-156P(V)					
	231W	231W	239W	242W	246W	251W
Maximum Power	231W	231W	239W	242W	246W	251W
Open Circuit Voltage (Voc)	42.1V	42.3V	42.5V	42.7V	42.9V	43.1V
Short Circuit Current (Isc)	7.31A	7.37A	7.43A	7.48A	7.54A	7.68A
Maximum Power Voltage (Vmp)	35.0V	35.4V	35.8V	36.2V	36.5V	36.8V
Maximum Circuit Current (Imp)	6.60A	6.64A	6.67A	6.70A	6.74A	6.82A
NOCT	45 °C ± 2 °C					
NOCT: Irradiance 800W/m <sup>2</sup> , ambient temperature 20 °C, wind speed 1 m/s						

### Mechanical Characteristics

Solar Cells	Polycrystalline 156.75 × 156.75mm
No. of Cells	72 (6 × 12)
Dimensions	1956mm×992mm×40mm(77.0in×39.1in×1.6in)
Weight	22.5kg (49.6lbs)
Front Glass	High transmission tempered glass
Frame	Anodized aluminium alloy
Junction Box	IP67
Cable	4mm <sup>2</sup> (IEC), 1000mm
Connectors	MC4/MC4 Compatible
Packaging Configuration	26pcs/box, 672pcs/40'HQ Container

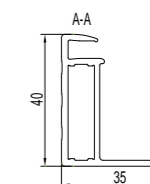
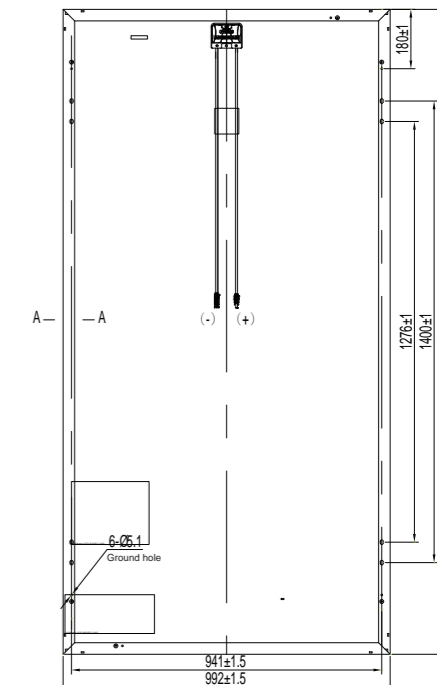
### Temperature Characteristics

Temperature Coefficient of Pmax	γ (Pm)	-0.41%/K
Temperature Coefficient of Voc	β (Voc)	-0.32%/K
Temperature Coefficient of Isc	α (Isc)	0.050%/K

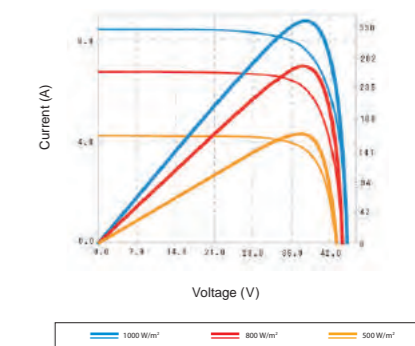
### Warranty

10-year product warranty	
25-year warranty on power output	
Specific information is referred to the product quality guarantee	

### Information Box



### Current-Voltage & Power-Voltage Curve



### I-V Curves

Shanghai Aerospace Automobile  
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