MULTIFIT®
众能力电

SOLAR PANEL
CLEANING EQUIPMENT
Customized Solutions

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More Power More Life

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COMPANY HONOR

Some Authoritative Test Reports And Certificates Of Honor.

HONOR

CONTENTS

MULTIFIT PROFILE

2009
Since

15+
Years In Solar Industry

Multifit Solar is a high-tech manufacturer which is mainly dedicated to research and development, produce, sale and construct of solar power systems and other green energy.

Our cleaning equipments include solar panel tracking cleaning robots, track-mounted fully automatic walking solar cleaning trolley, the third generation four-wheel drive mode of the solar cleaning robot with stronger cross-barrier ability, crawler-type upper and lower cleaning robot and semi-automatic photovoltaic cleaning brush for civil power stations.
Our cleaning robots realize the remote intelligent control and have many functions: automatic avoidance function to prevent the robot from slipping, automatic rectify correction mechanism and automatic adjustment to prevent the machine from deviation, running tilt, jamming, and good obstacle surmounting performance to surmount certain slopes, steps, and dislocations. Also, a new intelligent management cloud platform for remote photovoltaic panel cleaning robot has been set up in our robot. And our cleaning robot has our own unique technology in intelligent cleaning of photovoltaic panels by robots, automatic detection, tracking and positioning, group communication and control functions, as well as the establishment of an intelligent management platform with multi-terminal control.

In the future, Multifit will be continually committing to improve the renewable energy industry and develop more efficient and cost-effective solar cleaning solutions.

Research and development | **Production** | **Sell**

MULTIFIT CULTURE

ENTERPRISE MISSION

Bring more green electricity into our lives.

DEVELOPMENT VISION

Develop more efficient and cost-effective solar solutions.

TALENT CULTURE

Respect | **Trust** | **Responsibility**

Grow up | **Share** | **Happy**

THE IMPORTANCE OF CLEANING SOLAR PANELS

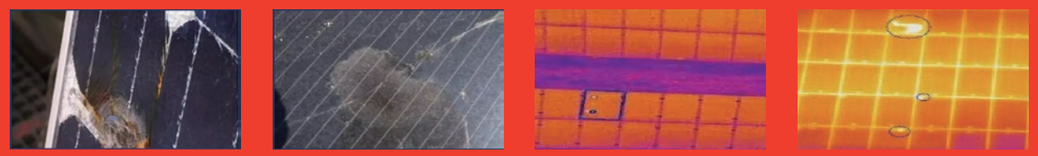
The effect of power generation efficiency.

① Pollutant Rust

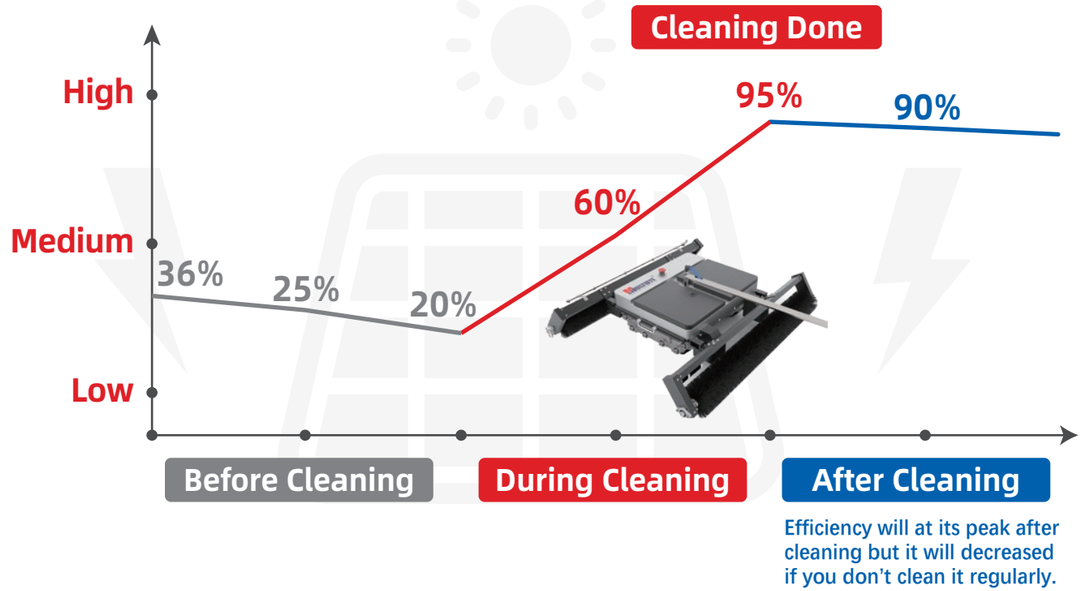
② Bird Droppings

③ Dust

The solar panels covered by pollutant may cause hot spots, which will damage the panel and even make the panel burned.



SOLAR PANEL POWER GENERATION EFFICIENCY



Efficiency will at its peak after cleaning but it will decreased if you don't clean it regularly.

THE ADVANTAGES OF USING SOLAR PANEL CLEANING ROBOT

- Longer Service Life
- Improve Energy Production
- Improve Efficiency

CHOOSING THE CLEANING EQUIPMENT YOU NEED

Cleaning Efficiency Of Cleaning Brush And Robot

Module	Reference value	MW	Area(㎡)	Efficiency (㎡/H)	Cleaning area (㎡/8H)	Required time (d)
MULR-C	1 person with 1 set of cleaning brush	1	4700	90	720	7
MR-G1 (single-board)	Robot walking speed 12m/min, 550W solar panel	10	47000	1640	13120	4
MR-G1 (double-board)		10	47000	3280	26240	2
MR-XY		10	47000	6560	52480	1
MR-T1	Robot walking speed 25m/min, 550W solar panel	10	47000	1500	12000	4

Scene Selection Of Cleaning Brush And Robot

MR-G series, MR-T1 series, MR-XY series and MULR series

• MR-G Series

Single-board Robot

MR-G Series can be applied in common single-board and double-board panels, single-board robot can be suited in panels angle under 40°.

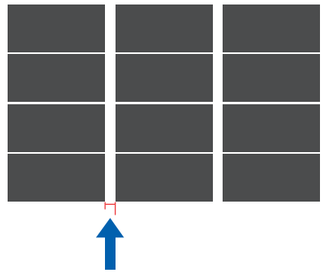
Double-board Robot

Double-board robot can be applied in panels size under 2384mm, angle under 30°.

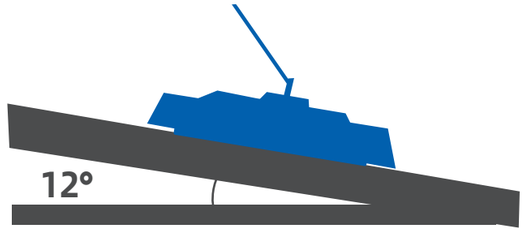
Double-board Robot

It also can be applied in four-board transverse arrangement solar arrays. If there are pressing block, the robot should be customized.

• MR-T1 Series

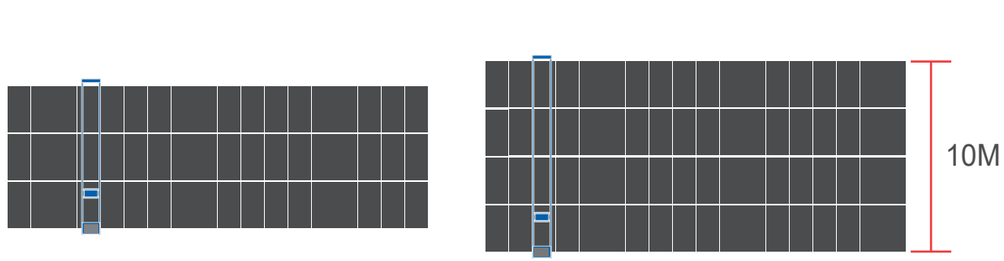


The gap is 60mm small.



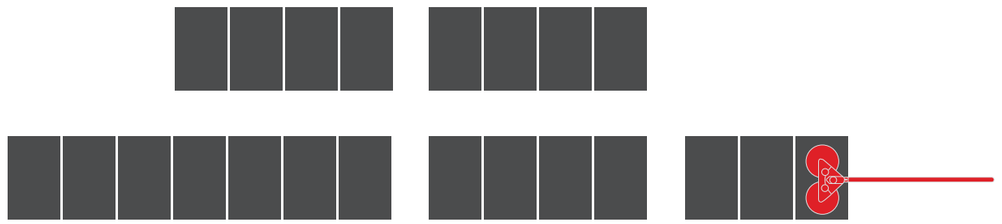
T1 robot is suitable for the array without board joints, and angle under 12°.

• MR-XY Series



XY robot can be applied in three-board and four-board solar array, the width of panels can up to 10m.

• MULR Series

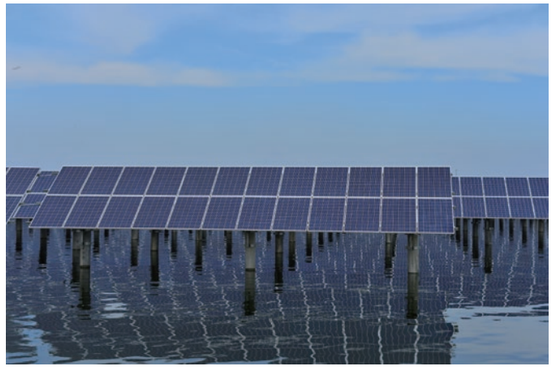


Cleaning brush can be applied in scattered solar arrays.

APPLICATION SCENARIO

- Single/dual Panel Photovoltaic Array
- Three-plate Photovoltaic Array
- Large Area Photovoltaic Power Station
- Flat Roof Photovoltaic Systems

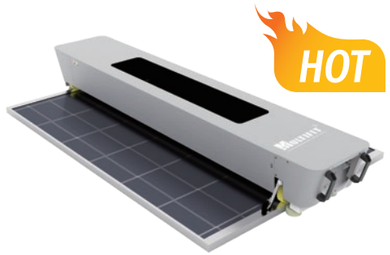
Customize the cleaning solution and maintain the photovoltaic system to ensure normal daily power supply.



MULTIPLE CLEANING EQUIPMENTS FOR VARIOUS SCENARIOS

PRODUCT CATEGORY

01 MR-G Series Right & Left Solar Cleaning Robot



Through automatic walking right and left in the aluminum frame to achieve intelligent cleaning of the solar panels .

MR-G1

MR-G2

MR-G-D (Double Brush)

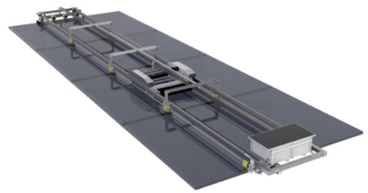
02 MR-T1 Series Tracking Solar Cleaning Robot

Through AI algorithm and visual detection to achieve full automatic cleaning of solar panels, cleaning the scene, without missing any dead corners.

MR-T1

MR-P1 (Photothermal glass cleaning robot)

03 MR-XY Series Up&Down Solar Cleaning Robot



Through automatic up and down cleaning to achieve intelligent cleaning of the solar panels.

MR-XY

04 MR-AR Series Shuttle Solar Robot Transfer Vehicle

By laying the track on the side of the solar array, the transport vehicle walks on the track automatically, and the automatic transport cleaning robot performs the cleaning task in different solar arrays.

MR-AR (Bridging, Robot-parking Spot, return space, Full-automatic rail-type transfer vehicle)

05 MULR Series Semi-Automatic Solar Cleaning Brush

Multiple Cleaning Equipments, for Various scenario.

MULR-A (Scrape brush)

MULR-B (Single head brush)

MULR-C (Double head brush)

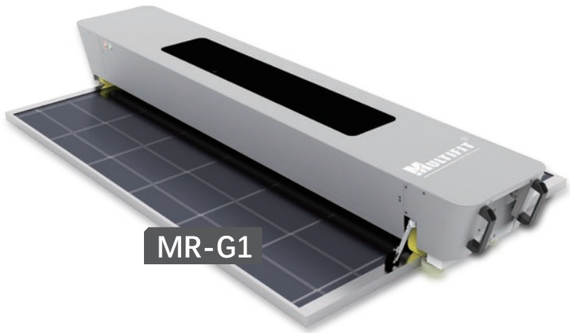
MULR-D (Rolling brush)

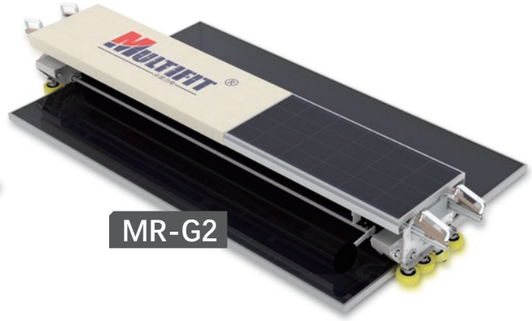
MULR-E (Water-driven brush)

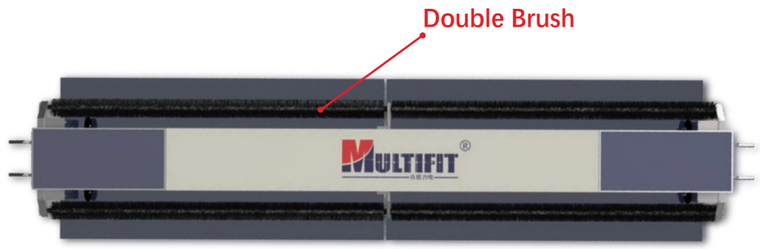
MR-G Series HOT

Right & Left Solar Cleaning Robot

01







Characteristics of MR-G series

Automatic Adjustment
Automatically correct and adjust to prevent machine deviation and jamming.

Solar power system
Self-charging-comes with a solar power system, convenient and efficient, can last 4-6 hours.

Strong Adaptability
Applicable to various arrangement arrays and various power stations.

℃ Ambient Temperature
-20℃(Unfrozen)~70℃

Intelligent Control
Internet Of Things Technology Application
Independent control, grouping, Control by mobile, automatic cleaning time and cleaning mode can be set.

Lightweight equipment ≈30kg
The whole machine is about 30kg, which is more than 30% lighter than similar products, and it is convenient to carry.

Adjusting The Brush Up And Down
When the brush wears out, the cleaning ability decreases. You can adjust the brush downward to increase the cleaning ability and double the service life of the brush.

Stronger Obstacle-crossing Ability
Including slope, step and misalignment, etc. Capable of spanning over 50mm misalignment of flat or end faces.

1min Disassembly And Assembly Of Brushes
Applicable to various arrangement arrays and various power stations.

Danger avoidance
Automatic edge sensing technology to prevent the robot from sliding down and avoid danger.

MR-G-D (Double Brush)

Better cleaning effect with double roller brush, overcome the disadvantage that the single-roller brush cannot clean the edge of the photovoltaic array, and can adapt to the photovoltaic system assembled by multiple rows of solar panels in an array.

OVERVIEW OF BRIDGE, ROBOT-PARKING SPOT AND RETURNING SPACE

The purpose of the construction is to make the cleaning robot work faster, start and stop smoothly and reduce the frequency of personnel handling cleaning machines.

Parking Spot

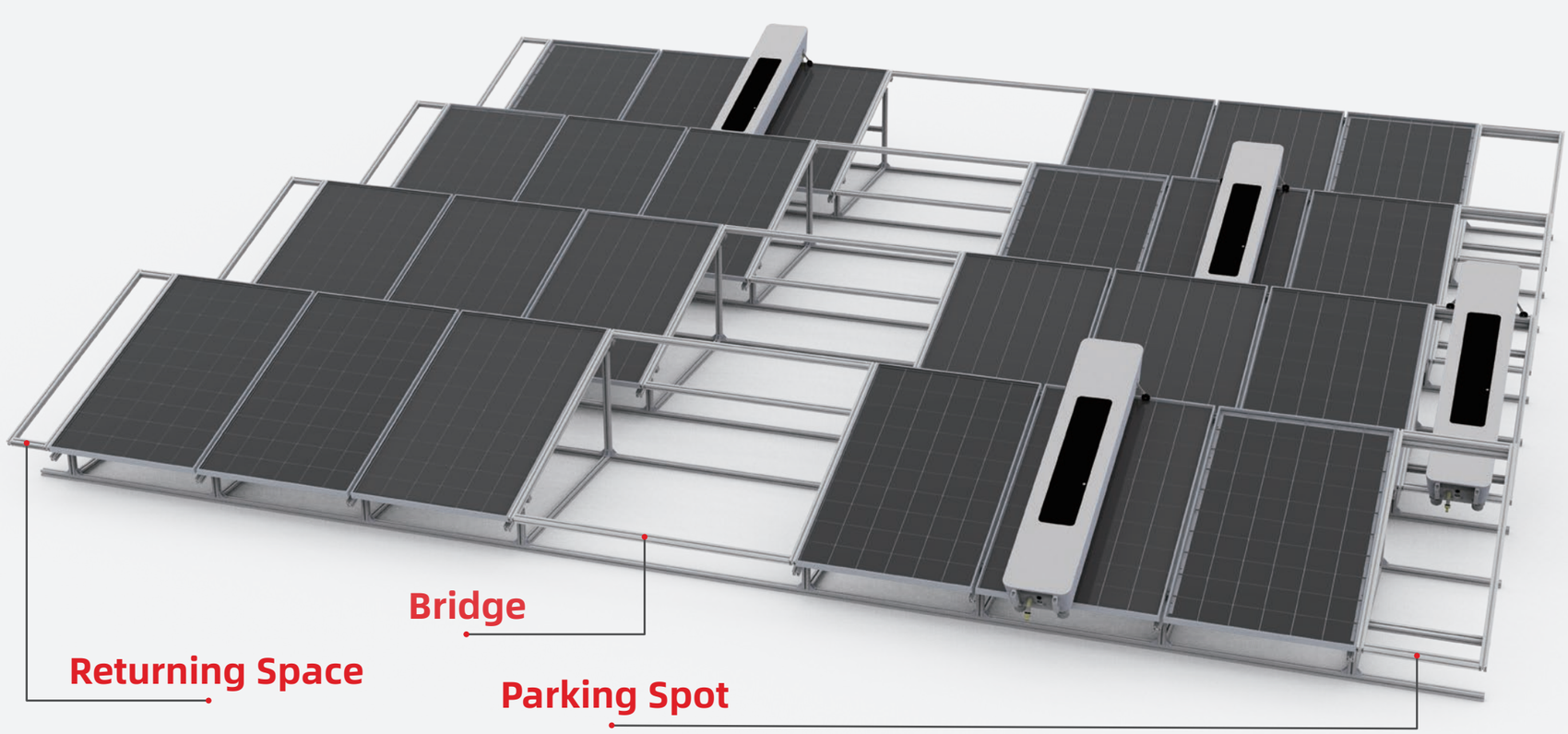
The harbor where the solar cleaning robot is parked.

Bridge

According to the ups and downs of the array, establish a link track to allow the cleaning robot to walk smoothly into the next PV panel cleaning range.

Returning Space

The return position is to allow the cleaning robot to extend the cleaning range and make each solar panel of the photovoltaic array clean in place, in addition,it can protect the cleaning robot from falling when the sensing wheel is out of control.



MR-T1 Series

Tracking Solar Cleaning Robot

02

Characteristics of MR-T1 series

Functional Design

The visual positioning accuracy is less than 1°(angle), and the accidental falling design is prevented. Global power planning and intelligent alarm function.

Falling Protection

Falling protection, one person can move it, more convenient transportation and loading, easy to replace consumable parts, eco-friendly economy and mutiple material consumption can be reused.

Path Planning

The path planning passes 100% coverage at one time, and only needs one key operation. The new sensing system and the algorithm accomplish the fully autonomous operation.

Manual Replacement

A single machine can replace 10 labours, and one single person can monitor over 100 robots. For large-scale photovoltaic power plants, they can realize large-scale manual replacement.

MR-T1 Series

Tracking Solar Cleaning Robot

CLEANING ABILITY

Sink-float dust (adhesion ≤10-6N) cleaning result ≥99%
Dust accumulation (adhesion ≤10-4N) cleaning result ≥99%
Dry bird droppings (adhesion ≤10-2N) cleaning result ≥99%
Heavy metal contamination (adhesion ≤20-10N) cleaning result ≥99%
Cleaning efficiency (square meter/hour) ≥ 600

RECOMMENDED WORKING CONDITIONS

Ambient temperature: -20~70℃
Component Humidity: 5%~95%
(No condensation)
Component splicing gap: 20~90mm
(bridge over 40mm)

SECURITY CAPABILITY

Working mode:autonomous operation(pre-planned path);remote control;
Positioning method: AI vision
Positioning accuracy: ≤1°
Steering mode: crawler-type maneuvering
Anti-slip protection: crawler-type resistance
Anti-falling protection: AI vision + gravity sensing
Anti-tilting protection: AI self-correcting algorithm
IP Level: IP65

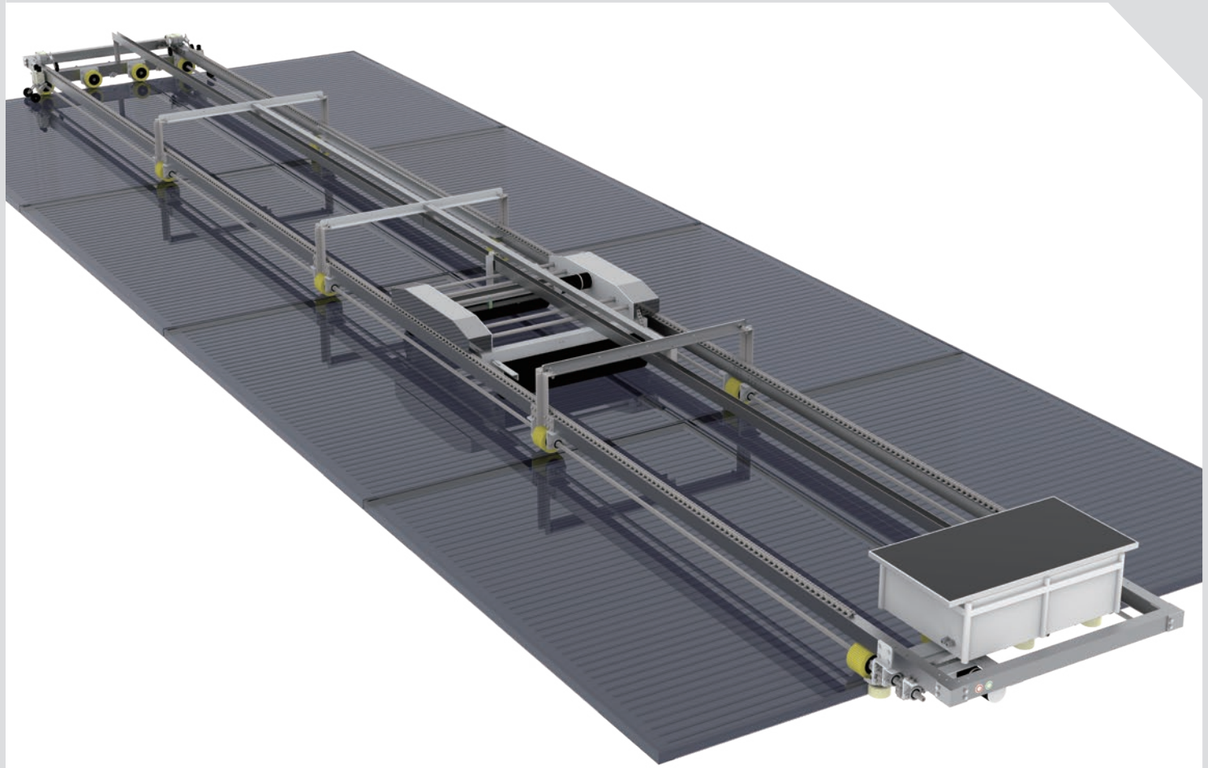
MR-P1（CUSTOMIZED）

Photothermal Glass Cleaning Robot

MR-XY Series

Up&Down Solar Cleaning Robot

03



Characteristics of MR-XY series

- The cleaning robot can adapt to the photovoltaic system assembled by multiple rows of solar panels in an array.
- Convenient to use in different photovoltaic power stations. Remote control with independent power supply.
- The aluminum alloy support. The frame part adopts multi segment splicing structure, which is convenient for transportation.
- Automatic edge sensing technology to prevent the robot from sliding. Autistic danger. The length of the equipment can be adjusted according to the size of solar panel.
- Without manual cleaning, integrated dry cleaning and water cleaning model .
- It adopts lithium battery and brushless motor, which is durable.

Smart Management Control System

Track the status of the MR-XY Cleaning Robot

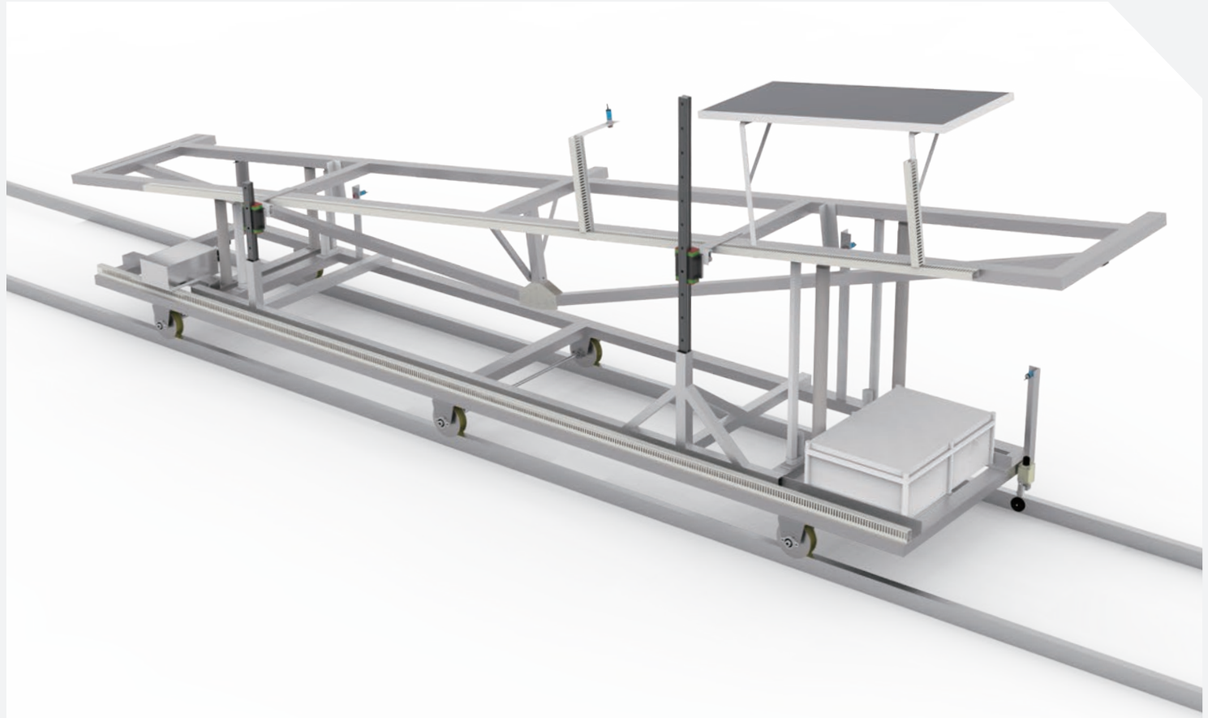
1. Improve the transmission efficiency of solar panels.
2. Extend the service life of the panel.

Turn on the intelligently managing control system according to your needs, follow up in real time, and keep your solar panels as clean as new.

MR-AR Series

Shuttle Solar Robot Transfer Vehicle

04



Characteristics of MR-AR series

PURPOSE OF CONSTRUCTION
Make the cleaning robot work faster, start and stop smoothly, reduce the frequency of personnel handling cleaning machines.

BRIDGING
According to the ups and downs of the array, establish a link track to allow the cleaning robot to walk smoothly into the next PV panel cleaning range.

APRON
The harbor where the solar cleaning robot is parked. According to your needs, the cleaning work will be carried out at fixed time and fixed point. The solar cleaning robot will return to the apron and wait for the next cleaning service. The parking will not affect the power generation rate of the photovoltaic power station.

RETURN POSITION
This is a position that is easy to be ignored. If there is no return position, there will always be an invisible position at the edge of the photovoltaic panel, which not only affects the power generation efficiency, but also affects the life of the photovoltaic panel. The return position is to allow the cleaning robot to extend the cleaning range and make each solar panel of the photovoltaic array clean in place, in addition,it can protect the cleaning robot from falling when the sensing wheel is out of control.

Overview of Transfer Vehicle

PHOTOVOLTAIC PANEL MAINTENANCE

It is used for the maintenance of large photovoltaic power station system, reducing the manual handling process, and can clean photovoltaic panels in time.

SAVE TIME AND EFFORT

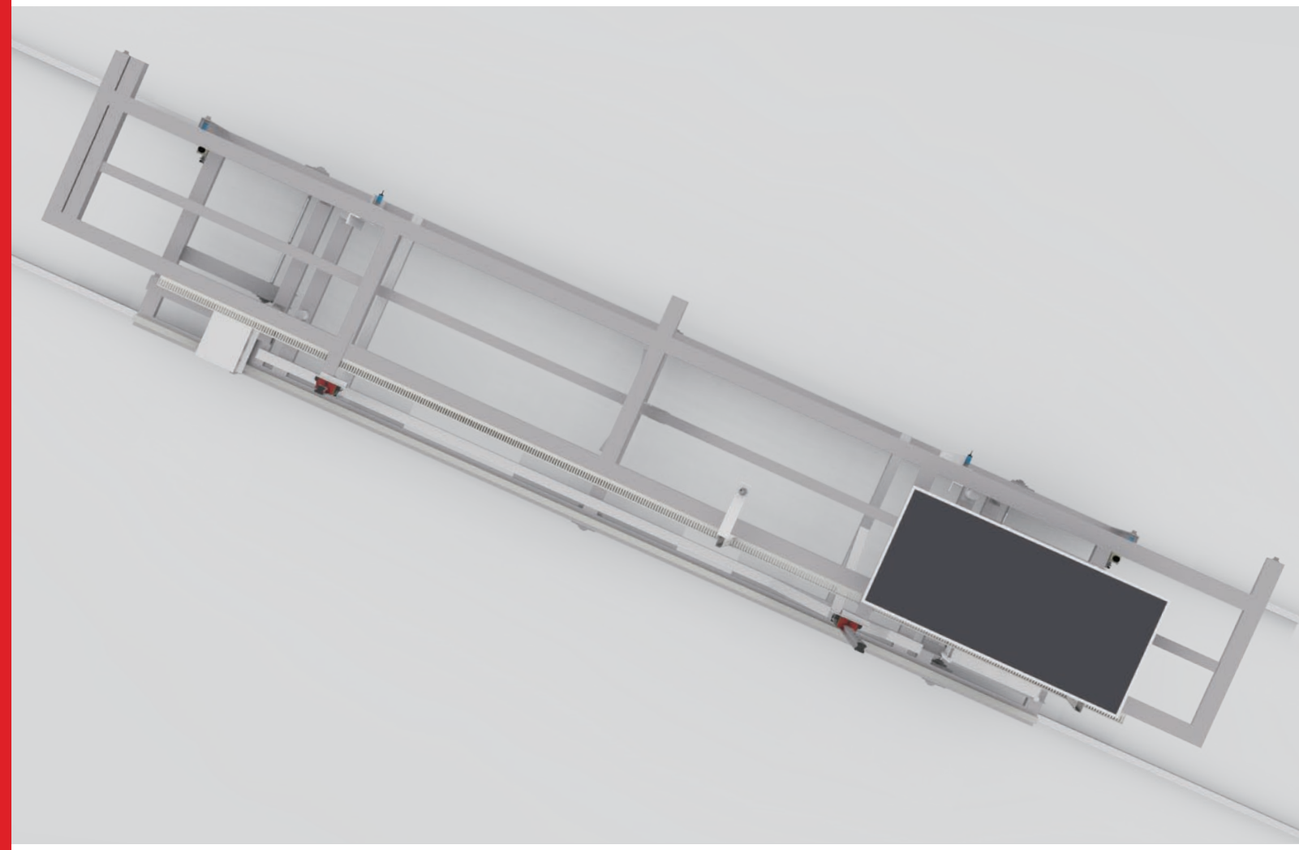
It is time-consuming and laborious to carry the cleaning robot manually. If the photovoltaic power station is built on a flat ground and roof, it is recommended that you equip a transfer vehicle that can walk automatically when purchasing the cleaning robot. Press the start switch, the transfer vehicle moves forward, the sensor on the transfer vehicle senses the photovoltaic array and aligns with the array, the transfer vehicle stops moving forward, at this time, the front and rear rods are adjusted and lifted to the level of the photovoltaic array, and the G1 solar cleaning robot senses and starts the equipment to start cleaning.

CONTINUE CLEANING

After cleaning, the G1 solar cleaning robot moves to the transfer vehicle, and the transfer vehicle moves to the next array to continue cleaning.

Customization of Transfer Vehicle

According to the array data of your photovoltaic power station, the technical department will provide you with the design scheme.

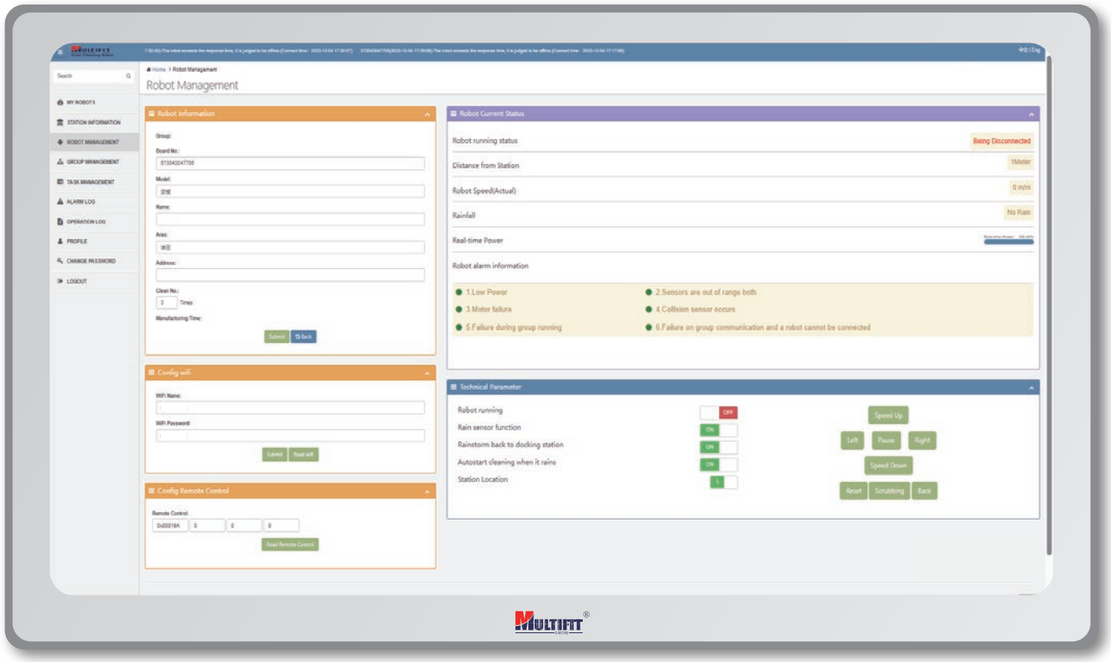


The data required are:

1. Width of solar panel array.
2. The height (maximum and minimum dimensions) of the solar panel array and the angle of the photovoltaic panel.
3. Array drawings and panoramic photos of the photovoltaic power station.

CONTROLLER/REMOTE SMART MANAGEMENT CONTROL SYSTEM

Smart Management Control System



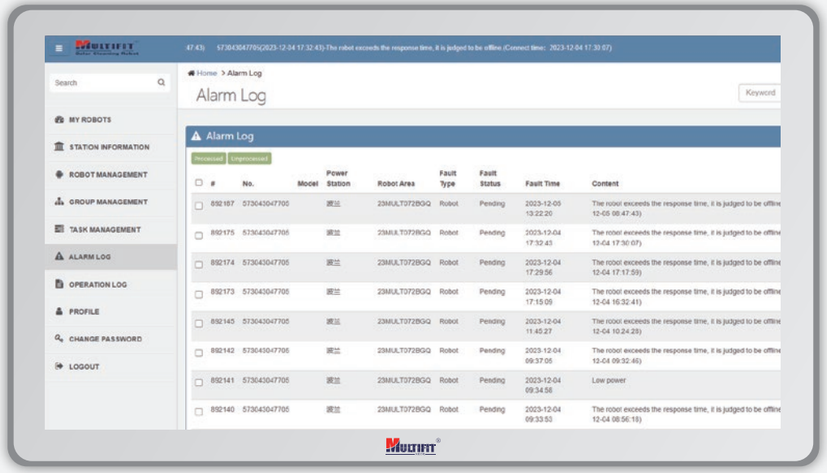
Remote Control

Start at any time, stop at any time, scrub repeatedly, where there is no network, you can use the remote control to start and operate the solar panel cleaning robot.

REMOTE SMART MANAGEMENT CONTROL SYSTEM

Platform

Fully Automatic.



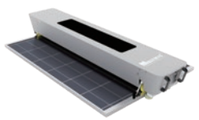
No need for you to be on site.

Multiple cleaning robots work simultaneously.

PRODUCT PARAMETER

Solar Panel Cleaning Robot

MR-G1 Series Right & Left Solar Cleaning Robot

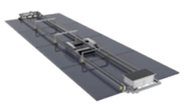


Length of Machine	Customized According To Photovoltaic Panel Size
Obstacle Crossing Ability (Gap Distance)	20mm
Traveling Distance	One-way Travel Distance From 1800~4320M (12m/min)
Traveling Speed	12-20m/min
Generator Power	100w/200w/300w
Weight of Machine	30-115kg
Width of Machine	365mm
Height of Machine	280mm
Water Used Per Hour	270~330 L/H (0.3mpa)
Charging Method	Flexible Photovoltaic Panel
Battery Type	LiFePO4 Battery
Working Time	4~6 Hours
Brush Life	2~3 Years
Applicable Temperature	-20℃(Unfrozen)~70℃
Cleaning Way	Dry/Watering Cleaning
Cleaning Mode	OneTime/Repeated Time/Positioning/Schedule
Bridge Mounting Rail/ Rain Sensor Device/ Wireless Remote Controller/ Intelligent Management App/ WiFi Module/Robot Group Control Module	Optional Configuration
4G Module	Standard Configuration

MR-T1 Series Tracking Solar Cleaning Robot

Model	MR-T1	MR-T1 AUT
Water consumption	180L/H	
Robot size (excluding roller brush)	685mm×617mm×320mm	
Weight	Main body (excluding lithium battery)：30kg Brush roller：10.5kg	
Body material	aluminum alloy	
Protection grade	IP65	
Anti corrosion grade	C4	
Brush lifespan	2-3 Years	
Motor Power	Walking motor: 400W, roller brush motor: 40W (parameters will be iterated with product updates)	
Power input	24VDC	
Battery capacity	10AH	
Working time	4-5H	
Charging time	3-4H	
Cleaning width	1m（Acceptable customized length）	
Applicable angle	0-12°	
Obstacle surmounting ability	slab joint 60mm	
Cleaning method	Dry cleaning/washing	
Sweeping speed	15-25m/min	
Travel mode	Remote control direction control	Follow the set trajectory for cleaning
Navigation method	/	Grid lines of photovoltaic panels

MR-XY Series Up&Down Solar Cleaning Robot



Name	Working Time (H)	Walking Speed (m/min)	Walking Distance (m)	Ambiant Temperature (℃)
MR-XY	＞4	8-12（m/min）	＞2000m	-20℃~70℃ No Condense

Control Mode	Field Remote Control And Manual Keys
Working Way	Use Remote Control To Operate Cleaning, No Manual Work Is Required
Parking Apron	Parking Areas On The Left And Right Side Of The Panel Array
Protection Level	IP65
Remark	Customized Based On Solar Pv Array Size

MULR Series

SCRAPE BRUSH
MULR-A

05-1

Characteristics of MULR-A series

SIMPLE OPERATION
No ladder or stool is needed, just standing on the ground, you can easily finish.

MULTIFUNCTION
The back of the brush head can be used to scrape snow and water without leaving dust.

ADVANTAGE
Cleaning, which is safe and convenient.

MAKE UP
A brush and mop can be applied to one rod.

MULR Series

SINGLE HEAD BRUSH MULR-B

05-2

Characteristics of MULR-B series

CLEANING RANGE

Single-head cleaning brush can be used to clean small area solar panels.

BRUSH CHARACTERISTICS

The bristles are moderately soft and hard, and do not harm the photovoltaic panel.

ANGLE ADJUSTMENT

The angle of the brush head fits the solar panel, which can be adjusted with the angle of the solar panel.

MULR Series HOT

DOUBLE HEAD BRUSH MULR-C

05-3

Characteristics of MULR-C series

DOUBLE-SPEED
Cleaning brush can be used for double-speed and convenient cleaning.

EASY TO CARRY
Lithium battery is carried in a backpack, no need to carry batteries, easy to carry.

SUPPORT CUSTOMIZATION
The length of the water supply pipe can be customized, please call for consultation.

ANGLE ADJUSTMENT
The angle of the brush head fits the solar panel, which can be adjusted with the angle of the solar panel.

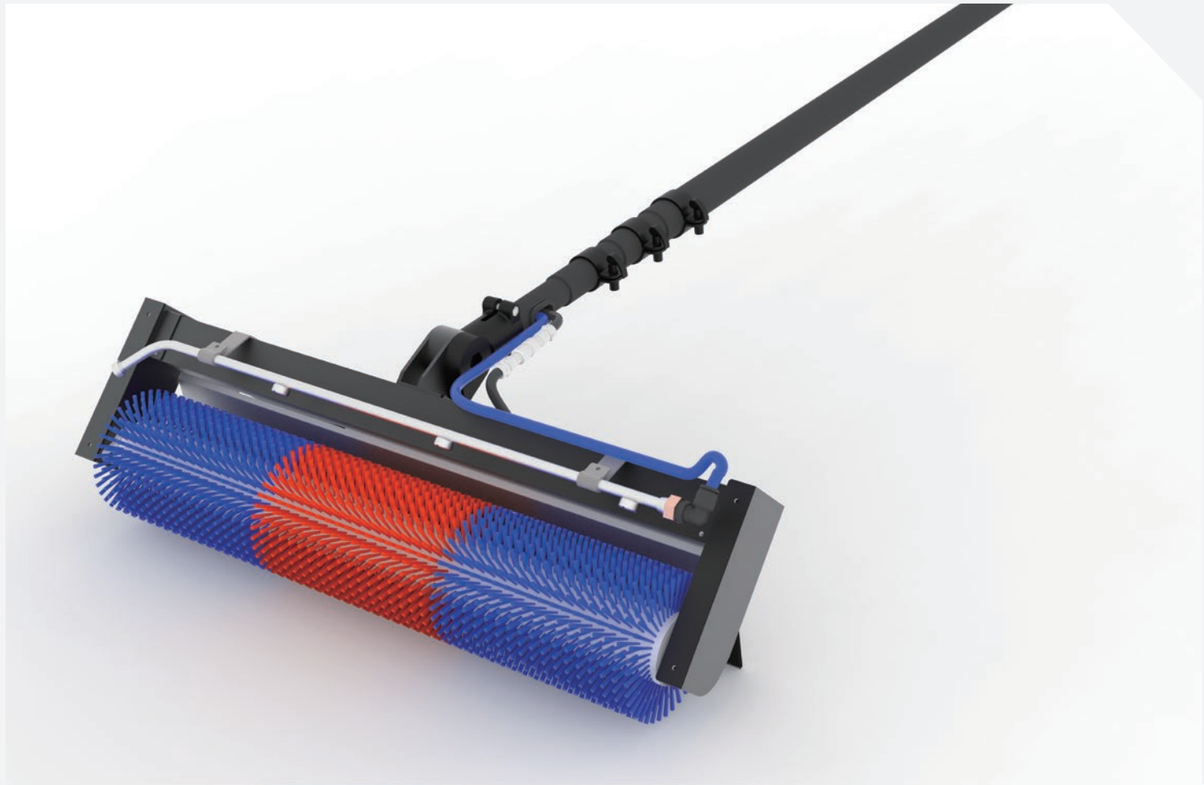
HIGH EFFICIENCY
The design of dual motors can maximally offset the centrifugal force which originated from the running of the motor, because of that the brush can runs smoothly, as the operation become easier with higher efficiency for cleaning.

MOTOR SPEED
Brush motor speed: 270rpm
Brushless motor speed: 350rpm

MULR Series

ROLLING BRUSH
MULR-D

05-4



Characteristics of MULR-D series

STRONG ADAPTABILITY

It can be used for both washing and drying, which can adapt to various complex terrains and environments.

LONG ENDURANCE

The lithium battery pack can last about 5-8 hours, it is more convenient to clean.

HIGH SELECTIVITY

For water supply, this washing machine does not have its own water supply device, but provides a variety of water supply pump schemes for everyone to choose freely.

MOTOR SPEED

High speed motor: 400rpm
Super wide brush head: 65cm

MULR Series

WATER-DRIVEN BRUSH
MULR-E

05-5

Characteristics of MULR-E series

HIGH PERFORMANCE
Better cleaning performance in high areas. Better lateral force balance.

EASY TO CLEAN
The use of a two-way cleaning brush makes it easy to clean out dirt or residue without the use of chemical cleaning agents.

EASY TO OPERATE
Lightweight and high-strength structure, easy to handle and operate at high altitude.

HIGH EFFICIENCY
Counter-rotating round brushes with ball bearings. The sturdy brass hinge allows for flexible adjustment of the working angle. Pre-flush adjacent modules.

PRODUCT PARAMETER

Solar Panel Cleaning Brush

MULR-A Scrape Brush

Brush Head	
Size	350mm
Material	PP

Brush	
Size	350mm
Material	Rubber Edging

Telescopic Rod	
Size	3.6m
	5.4m
	6m
	7.2m
	9m
	10.8m
Material	Aluminum or Carbon Fiber

MULR-B/C/D

MULR-B
(Single head)

MULR-C
(Double head)

MULR-D
(Rolling brush)

MODEL	Power Supply	Telescopic Pole
AC SUPPLY MULR-B01 MULR-C01 MULR-D01	Be connected to 100-120V AC or 200-240V AC power source (Optional)	VGlass Fiber/ Carbon Fiber/ Aluminum Alloy Length: 1.5-3.5m/ 1.7-5.5m/ 1.9-7.5m (Optional)
DC SUPPLY MULR-B02 MULR-C02	Connect to 24V10Ah lithium battery	
MULR-D02	Connect to 24V20Ah lithium battery	
DUAL SUPPLY MULR-B03 MULR-C03 MULR-D03	Connect to 110-240V power source, or to lithium battery (choose the supply you need for different cleaning environment)	

MULR-D Rolling Brush

Specification		Suitable Voltage AC 100-240V
Motor	Type	Direct Current
	Working Voltage	24V
	Power	100W
	Rotating Speed	400 Rpm
Battery	Lithium Battery	24V/20Ah
	Working Hour	5H -8H
Telescopic Rod	Material	Carbon Fiber
	Wall Thickness	1mm
	Wire Length	4m/6m/8m
Brush Head	Bristle Length	650mm
	Material	PP

SEMI-AUTOMATIC SOLAR CLEANING BRUSH

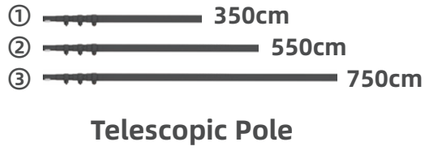
THREE CONFIGURATION LISTS

MULR-B MULR-C MULR-D ——

AC Power Supply Version

MULR-B01 MULR-C01 MULR-D01

Brush Head



Telescopic Pole

Accessories

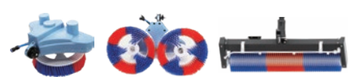
Power Adapter

8m Extended Power Cable

15m Water Pipe

Lithium Battery Supply Version

MULR-B02 MULR-C02 MULR-D02



Brush Head

Telescopic Pole

Backpack

Accessories

Lithium Battery

Battery Charger

15m Water Pipe

Electrical Spring Wire

Dual Power Supply Version

MULR-B03 MULR-C03 MULR-D03

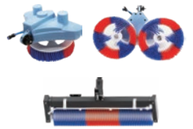
Backpack

Accessories

Lithium Battery

8m Extended Power Cable

15m Water Pipe

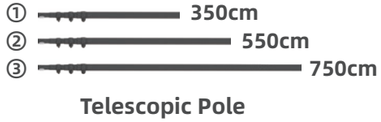


Brush Head

Power Adapter

Battery Charger

Electrical Spring Wire



Telescopic Pole

PROJECT CASES

50KW rooftop PV project in Jakarta, Indonesia

5MW ground PV power station in Maltese

30.2KW roof of a cement plant

200KW rooftop PV power station bridge in Guang'ao, Shantou

50KW in Belgium

1.5MW rooftop PV power station in Turkey

CLEANING ROBOT

2MW industrial and commercial PV power station in Malaysia

200KW PV poverty alleviation power station in Zhengzhou, Henan province

2.1MW in Xinjiang

20MW ground-based PV power station in the United States

Transfer Vehicle in Indonesia

PROJECT CASES

CLEANING ROBOT

6.3MW Qatar World Cup-Transportation photovoltaic power station

6.3MW Qatar World Cup-Transportation photovoltaic power station

20MW ground-based PV power station in the United States

25.5KW rooftop in Hebei

1.134MW ground-based PV power station in the Guang Dong

30 MW Solar Panels Cleaning Solutions in Hainan, China