SOLAR PANEL CLEANING SYSTEMS
ROBOTS FOR SOLAR PANEL CLEANING

REMOTE CONTROLLED TRACKED ROBOT FOR THE CLEANING OF PV PANELS

MM Solar is a product designed for the specific cleaning of photovoltaic systems, mainly installed on medium and large roofs. Its purpose is to further speed up cleaning with less effort, increase safety for the operator and clean areas that are difficult to reach with a traditional equipment.

It combines the cleaning action of a specific rotating brush with nylon bristles with the use of demineralized water for perfect cleaning results. In fact it can be associated with a station for the production of demineralized water with the relative restraint system and automatic 40 m hose reel.

MM SOLAR 1
Cleaning up to 1500 sqm/h
4 hours continuously
KEY FEATURES

- Compact and easy-to-handle.
- Unique movement and displacement capabilities thanks to the wireless radio control.
- Lithium-ion batteries of latest generation (optional).
- Perfect control via sensitive joystick.
- Rotating brush with nylon bristles.
- Restraint system with 40 m automatic hose reel (optional).

Completely autonomous and powered by a 24V lithium-ion battery system of the latest generation (supplied separately), it ensures a working autonomy up to 4 hours, depending on the model. The operator can monitor and track the robot by a camera or GPS-RTK system thanks to the wireless card (optional).

<table>
<thead>
<tr>
<th>CODE</th>
<th>Width</th>
<th>Cleaning system</th>
<th>Rotation speed</th>
<th>Max speed rate</th>
<th>Max cleaning speed</th>
<th>Water consumption</th>
<th>Max pressure</th>
<th>Size</th>
<th>Weight (brush body only)</th>
</tr>
</thead>
<tbody>
<tr>
<td>MMSOLAR1</td>
<td>1390 mm</td>
<td>1220 mm Nylon Brush</td>
<td>250 rpm</td>
<td>60 m/min</td>
<td>1500 sqm/h</td>
<td>≥ 6 L/min</td>
<td>10</td>
<td>93x88x50</td>
<td>45 12</td>
</tr>
<tr>
<td>MMSOLAR2</td>
<td>1180 mm</td>
<td>1010 mm Nylon Brush</td>
<td>250 rpm</td>
<td>60 m/min</td>
<td>1300 sqm/h</td>
<td>≥ 6 L/min</td>
<td>10</td>
<td>88x73x35</td>
<td>35 9,5</td>
</tr>
<tr>
<td>MMSOLAR3</td>
<td>980 mm</td>
<td>810 mm Nylon Brush</td>
<td>250 rpm</td>
<td>35 m/min</td>
<td>1000 sqm/h</td>
<td>≥ 6 L/min</td>
<td>10</td>
<td>66x66x35</td>
<td>25 8</td>
</tr>
</tbody>
</table>
Professional equipment for washing all types of photovoltaic panels using DEMINERALIZED WATER (with a pressure between 20 and 70 BAR depending on the model) produced by REVERSE OSMOSIS (RO) filtration system. The system consists of a washable 100 mesh stainless steel prefilter, one or more 5 micron filters for microfiltration and active carbon filters and one or more RO membranes for the production of about 300,000 liters of demineralized water. These systems make it possible to obtain 100% pure water; they can be equipped with petrol engines or electric motors coupled with piston pumps for pressure washing water. Designed for private customers and professional users for the cleaning of small, medium and large roof or ground installations.

<table>
<thead>
<tr>
<th>CODE</th>
<th>Engine</th>
<th>HP</th>
<th>Tap water</th>
<th>Demineralized water</th>
<th>DIMS cm</th>
<th>Weight Kg</th>
</tr>
</thead>
<tbody>
<tr>
<td>HPB</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>HPK-E</td>
<td>ELECTRIC</td>
<td>230 V 1-phase</td>
<td>2.0 HP</td>
<td>0-50 bar</td>
<td>660 L/h</td>
<td>20 bar</td>
</tr>
<tr>
<td>HPK</td>
<td>PETROL</td>
<td>Honda GX 25</td>
<td>1.0 HP</td>
<td>0-30 bar</td>
<td>480 L/h</td>
<td>20 bar</td>
</tr>
<tr>
<td>HPK-E-MAXI2</td>
<td>ELECTRIC</td>
<td>230 V 1-phase</td>
<td>3.0 HP</td>
<td>0-50 bar</td>
<td>660 L/h</td>
<td>50 bar</td>
</tr>
<tr>
<td>HPK-S-MAXI</td>
<td>PETROL</td>
<td>SUBARU SP17</td>
<td>6.0 HP</td>
<td>0-50 bar</td>
<td>660 L/h</td>
<td>50 bar</td>
</tr>
</tbody>
</table>
REVERSE OSMOSIS FILTRATION SYSTEMS
FOR THE PRODUCTION OF DEMINERALIZED WATER

HYDRO PURE BARROW

HPB-E WITH ELECTRIC MOTOR

HPB-S WITH PETROL ENGINE

<table>
<thead>
<tr>
<th>CODE</th>
<th>Engine</th>
<th>TYPE</th>
<th>HP</th>
<th>Tap water PRESSURE</th>
<th>FLOW RATE</th>
<th>Demineralized water PRESSURE</th>
<th>FLOW RATE</th>
<th>DIMS</th>
<th>Weight Kg</th>
</tr>
</thead>
<tbody>
<tr>
<td>HPB-E</td>
<td>ELECTRIC</td>
<td>230 V</td>
<td>3 HP</td>
<td>0-70 bar</td>
<td>1260 L/h</td>
<td>50 bar</td>
<td>390 L/h</td>
<td>80x170x100</td>
<td>155</td>
</tr>
<tr>
<td>HPB-S</td>
<td>PETROL</td>
<td>SUBARU SP17</td>
<td>6 HP</td>
<td>0-70 bar</td>
<td>1260 L/h</td>
<td>50 bar</td>
<td>390 L/h</td>
<td>80x170x100</td>
<td>150</td>
</tr>
</tbody>
</table>

BARROW / PICK-UP

OPTIONAL:
- MEM50
  Additional 50 bar membrane kit for washing with demineralized water (to double the demineralized water flow).
- HPB-2VL
  Kit to work with 2 operators at the same time. Kit includes: an aluminium telescopic pole of 4,2 m (2 sections), a counter-rotating double brush, 10+10 m hose and double connector with quick couplings (this kit can be connected to the machine only if the kit MEM50 is already installed).

HYDRO PURE PICK-UP

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<th>FLOW RATE</th>
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<th>FLOW RATE</th>
<th>DIMS</th>
<th>Weight Kg</th>
</tr>
</thead>
<tbody>
<tr>
<td>HPP-500</td>
<td>PETROL</td>
<td>SUBARU SP17</td>
<td>6 HP</td>
<td>0-70 bar</td>
<td>1260 L/h</td>
<td>50 bar</td>
<td>390 L/h</td>
<td>140x160x130</td>
<td>175</td>
</tr>
<tr>
<td>HPP-1000</td>
<td>PETROL</td>
<td>SUBARU SP17</td>
<td>6 HP</td>
<td>0-70 bar</td>
<td>1260 L/h</td>
<td>50 bar</td>
<td>390 L/h</td>
<td>140x210x130</td>
<td>195</td>
</tr>
</tbody>
</table>
HYDRO PURE MODULAR

CHOOSE HOW TO COMPOSE YOUR “HYDRO PURE MODULAR”:

- Water treatment system:
  - Water filtration (from 200 microns to 5 microns via disposable or washable cartridges)
  - “Eco Duplex” water softener
  - Reverse Osmosis (RO)
  - Demineralization using blending-bed resin cartridges
  - Anti-precipitant kit

- Water heating system with boiler:
  - 12V
  - 220V

- Water storage system (300/500/1,000 Liters)

- Power generator

- Hose reels

- Telescopic poles and brushes of all kind

MODULAR
Composable cleaning system with modular sections for fitting on vans.

RESIN SYSTEMS

KIT8-1
8.5 L resin system - 1,200 L autonomy (at 200 ppm)
SUPPLIED WITH:
- 4 m telescopic pole, 40 cm fixed brush, 10 m hose.

KIT8-2
8.5 L resin system - 1,200 L autonomy (at 200 ppm)
SUPPLIED WITH:
- 4 m telescopic pole, 40 cm counter-rotating double brush,
- 10 m high pressure hose (a pressure washer is required).

FR8.5
8.5 L resin system prefilled with resins. It will produce approx. 1,200 L of pure water (at 200 ppm).

FR25
25 L resin system prefilled with resins. It will produce approx. 4,000 L of pure water (at 200 ppm).

FR50
50 L resin system prefilled with resins. It will produce approx. 8,000 L of pure water (at 200 ppm).
Tilting trolley to facilitate the operation of replacing resins in the vessel. Pressure washer compartment or tool holder.

SUPPLIED WITH: Trolley • Prefilter • Carbon filter • Flowmeter • Fittings • TDS Meter to keep regular checks on the water quality.
**BRUSHES FOR CLEANING PV PANELS**

### FIXED BRUSHES

**HSF**  
Cleaning capacity: **100 sqm/h**  
- Dual water supply  
- 40 cm working width  
- 10 bar max  
- Suitable for telescopic poles  
- It works with all the devices  
- Weight: 0.8 kg

**HSFG**  
Cleaning capacity: **150 sqm/h**  
- Doppia alimentazione  
- 60 cm working width  
- 10 bar max  
- Suitable for telescopic poles  
- It works with all the devices  
- Weight: 1.2 kg

### DOUBLE COUNTER-ROTATING BRUSHES WITH NYLON BRISTLES

**HSRN**  
Cleaning capacity: **200/250 sqm/h**  
- Nylon bristles, 40 cm working width  
- Connection for telescopic poles  
- Minimum operating pressure and flow rate 20 bar 8 L/min  
- With resin systems it works in combination with a suitable pressure washer  
- Weight: 2.2 kg

**HSRN-NEW**  
Cleaning capacity: **200/250 sqm/h**  
- Version with floating system  
- Nylon bristles, 40 cm working width  
- Connection for telescopic poles  
- Minimum operating pressure and flow rate 20 bar 8 L/min  
- With resin systems it works in combination with a suitable pressure washer  
- Weight: 2.6 kg
60 CM ROTARY BRUSH

HSRL6 HYDROKINETIC
Cleaning capacity: 300 sqm/h
60 cm working width
Connector for telescopic poles
Minimum operating pressure and flow rate 40 bar 6 L/min
With resin systems it works in combination with a suitable pressure washer
Weight: 5.5 kg

Use: Professional
Size of the PV plant: Large
Location of the PV plant: Roof / Ground

HSRL6 24V ELECTRIC
Cleaning capacity: 300 sqm/h
60 cm working width
24V electric motor
Connector for telescopic poles (without battery or accessories)
With 10 m of cable + selector for the rotation direction
Minimum operating pressure and flow rate 3 bar - 3 L/min
Weight: 6.0 kg

80 & 100 CM ROTARY BRUSHES

HSRL8 HYDROKINETIC
Cleaning capacity: 400 sqm/h
80 cm working width
Connector for telescopic poles
Minimum operating pressure and flow rate 50 bar 9 L/min
With resin systems it works in combination with a suitable pressure washer
Weight: 5.5 kg

HSRL10 HYDROKINETIC
Cleaning capacity: 500 sqm/h
100 cm working width
Connector for telescopic poles
Minimum operating pressure and flow rate 50 bar 9 L/min
With resin systems it works in combination with a suitable pressure washer
Weight: 6.5 kg
**100 CM ROTARY BRUSHES**

**HSRL HYDROKINETIC**
- Cleaning capacity: **400 sqm/h**
- 100 cm working width
- Complete with support
- Connector for flexible hoses
- Aluminium splash guard
- Minimum operating pressure and flow rate 50 bar 11 L/min
- With resin systems it works in combination with a suitable pressure washer
- Weight: 20.0 kg

**HSRL 24V ELECTRIC**
- Cleaning capacity: **400 sqm/h**
- 100 cm working width
- 24V electric motor
- Automatic with radio control (without batteries or accessories)
- Complete with support
- Connector for flexible hoses
- Aluminium splash guard
- Minimum operating pressure and flow rate 3 bar 3 L/min
- Weight: 26.0 kg

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**TELESCOPIC POLES**

**ALUMINIUM**

**HLT4**
- Length: Min 2.4 m Max 4.2 m
- 2 sections - 2.7 kg

**HLT4/3**
- Length: Min 1.6 m - Max 4.5 m
- 3 sections - 2.7 kg

**HLT6**
- Length: Min 2.4 m - Max 6.2 m
- 3 sections - 3.4 kg

**HLT7**
- Length: Min 2.9 m - Max 7.6 m - 3 sections - 3.9 kg

**CARBON FIBRE**

**HLTC6**
- Length: Min 1.8 m - Max 6.3 m
- 4 sections - 1.8 kg

**HLTC7**
- Length: Min 1.8 m - Max 7.7 m - 5 sections - 2.2 kg

**HLTC9**
- Length: Min 1.8 m - Max 9.0 m - 6 sections - 2.6 kg

**HLTC10**
- Length: Min 1.8 m - Max 10.0 m - 7 sections - 3.9 kg

**HLTC13**
- Length: Min 1.8 m - Max 13.0 m - 7 sections - 4.2 kg

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**PRODUCT 100% MADE IN ITALY**
BRUSHES FOR CLEANING PV PANELS

125 & 175 CM ROTARY BRUSHES

**HSRL 125 HYDROKINETIC**
Cleaning capacity: **600 sqm/h**
125 cm working width
Complete with roller coupling support for ground installations
Allows the operator to clean two rows of PV panels
Connector for flexible hoses
Aluminium splash guard
Minimum operating pressure and flow rate 50 bar 18 L/min
With resin systems it works in combination with a suitable pressure washer
Weight: 27.5 kg

**HSRL 175 HYDROKINETIC**
Cleaning capacity: **900 sqm/h**
175 cm working width
Complete with roller coupling system for ground installations
Allows the operator to clean two rows of PV panels
Connector for flexible hoses
Aluminium splash guard
Minimum operating pressure and flow rate 50 bar - 18 L/min
With resin systems it works in combination with a suitable pressure washer
Weight: 33.9 kg

**HSRL 125 E ELECTRIC**
Cleaning capacity: **600 sqm/h**
125 cm working width
24V electric motor
Automatic with radio control (without batteries or accessories)
Complete with roller coupling support for ground installations
Allows the operator to clean two rows of PV panels
Connector for flexible hoses
Aluminium splash guard
It works with all devices that produce at least 3 L/min 3 bar
Weight: 32.5 kg

**HSRL 175 E ELECTRIC**
Cleaning capacity: **900 sqm/h**
175 cm working width
24V electric motor
Automatic with radio control (without batteries or accessories)
Complete with roller coupling support for ground installations
Allows the operator to clean two rows of PV panels
Connector for flexible hoses
Aluminium splash guard
It works with all devices that produce at least 3 L/min 3 bar
Weight: 39.0 kg
L1120M
Cold water pressure washer with 1-phase electric motor of 2.2 kW, 3-ceramic piston pump, 120 bar adjustable, 11 L/min

BCF
10 L TANK OF DETERGENT CLEANER for pv panels

ADD
ECO DUPLEX automatic softener 12V or 230V - 30x50x43 cm - 60 L/min Max - 20.0 kg

HHOSE
EXTENSION HOSE with quick couplings for HPK-E, HPK and HPK-MAXI

Hose Reels
Without hose

Anti-Precipitant Kit

Spare Resins

Filter Vessels

Filters

Osmosis Membranes

Product 100% Made in Italy