

**MM**

*energy*

# SOLAR PANEL CLEANING SYSTEMS



[WWW.MMSPRAY.IT](http://WWW.MMSPRAY.IT)



# 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





### MM SOLAR 2

Cleaning up to **1300 sqm/h**  
**2 hours** continuously



### MM SOLAR 3

Cleaning up to **1000 sqm/h**  
**2 hours** continuously

## KEY FEATURES

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).



24V  
LI-ION BATTERY












WIRELESS  
RADIO CONTROL



MAXIMUM SLOPE  
30%

- ✓ **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).

CODE	 Brush width	 Cleaning system	 Rotation speed	 Max speed rate	 Max cleaning speed	 Water consumption	 Max Pressure bar	 DIMS cm	 Weight (brush body only)
ROBOT MM SOLAR									
MMSOLAR1	1390 mm	1220 mm Nylon Brush	250 rpm	60 m/min	1500 sqm/h	≥ 6 L/min	10	93x88x50	58,4 13,0
MMSOLAR2	1180 mm	1010 mm Nylon Brush	250 rpm	60 m/min	1300 sqm/h	≥ 6 L/min	10	88x73x35	39,7 11,8
MMSOLAR3	980 mm	810 mm Nylon Brush	250 rpm	35 m/min	1000 sqm/h	≥ 6 L/min	10	66x66x35	35,3 10,2

PRODUCT  
**100%**  
MADE IN ITALY

# REVERSE OSMOSIS FILTRATION SYSTEMS

## FOR THE PRODUCTION OF DEMINERALIZED WATER

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.



**HPK-E**  
WITH ELECTRIC MOTOR



**HPK**  
WITH PETROL  
ENGINE

## HYDRO PURE KART



**HPK-E-MAXI2**  
WITH ELECTRIC MOTOR



**HPK-S-MAXI**  
WITH PETROL ENGINE

### KART / BARROW / PICK-UP SUPPLIED COMPLETE WITH:

- Reverse Osmosis filtering system
- 4 m aluminium telescopic pole
- 40 cm fixed brush with nylon bristles
- Counter-rotating double brush with nylon bristles and fitting for telescopic poles for 40 cm working width
- 25 m hose
- Flowmeter
- Hand-held TDS meter (to keep regular checks on the water quality).

Customizable with a range of options and accessories such as telescopic poles, brushes and hoses of different sizes.

CODE	Engine			Tap water		Demineralized water		DIMS cm	Weight Kg
	TYPE		HP	PRESSURE	FLOW RATE	PRESSURE	FLOW RATE		
HPB									
HPK-E	ELECTRIC	230 V 1-phase	2,0 HP	0-50 bar	660 L/h	20 bar	180 L/h	50x70x105	43,4
HPK-E-MAXI2	ELECTRIC	230 V 1-phase	3,0 HP	0-50 bar	660 L/h	50 bar	390 L/h	50x75x105	56,8
HPK-S-MAXI	PETROL	HONDA GP200	5.5 HP	0-50 bar	660 L/h	50 bar	390 L/h	50x80x105	75



# REVERSE OSMOSIS FILTRATION SYSTEMS

## FOR THE PRODUCTION OF DEMINERALIZED WATER

### HYDRO PURE BARROW



**HPB-E WITH ELECTRIC MOTOR**



**HPB-S WITH PETROL ENGINE**

CODE	Engine			Tap water		Demineralized water		DIMS cm	Weight Kg
	TYPE		HP	PRESSURE	FLOW RATE	PRESSURE	FLOW RATE		
HPB									
HPB-E	ELECTRIC	230 V 1-phase	3 HP	0-70 bar	1260 L/h	50 bar	390 L/h	80x170x100	155
HPB-S	PETROL	HONDA GP200	5,5 HP	0-70 bar	1260 L/h	50 bar	390 L/h	80x170x100	150

### HYDRO PURE PICK-UP



#### 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).

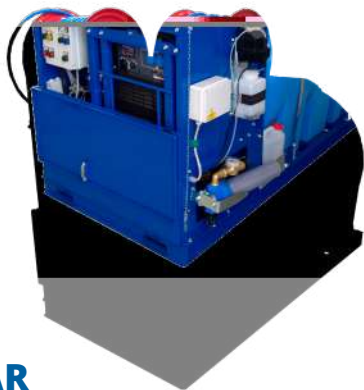
CODE	Engine			Tap water		Demineralized water		DIMS cm	Weight Kg
	TYPE		HP	PRESSURE	FLOW RATE	PRESSURE	FLOW RATE		
 HPP									
HPP-500	PETROL	HONDAGP200	5,5 HP	0-70 bar	1260 L/h	50 bar	390 L/h	140x160x130	175
HPP-1000	PETROL	HONDAGP200	5,5 HP	0-70 bar	1260 L/h	50 bar	390 L/h	140x210x130	195

PRODUCT  
**100%**  
MADE IN ITALY

# MODULAR SYSTEMS

## CUSTOMIZABLE ON REQUEST

### HYDRO PURE MODULAR



#### MODULAR

Composable cleaning system with modular sections for fitting on vans.

#### 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

## RESIN SYSTEMS



#### 8,5 LTR FILTER VESSEL

##### FR8.5

8,5 L resin system prefilled with resins. It will produce approx. 1,200 L of pure water (at 200 ppm).

##### 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:**  
4m telescopic pole, 40 cm counter-rotating double brush, 10 m high pressure hose (a pressure washer is required).

#### 25 LTR RESIN TROLLEY SYSTEM



##### FR25

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

#### 50 LTR RESIN TROLLEY SYSTEM



##### 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

- ✓ Use: **Private**
- ✓ Size of the PV plant: **Small**
- ✓ Location of the PV plant: **Roof / Ground**

## 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

- ✓ Use: **Private**
- ✓ Size of the PV plant: **Medium**
- ✓ Location of the PV plant: **Roof / Ground**

PRODUCT  
**100%**  
MADE IN ITALY

# BRUSHES

## FOR CLEANING PV PANELS

### 60-80-100 CM ROTARY BRUSH ELECTRIC 24V DC



#### ROTARY BRUSHES WITH 24V DC ELECTRIC MOTOR

Powered by lithium batteries or 115-230V AC/24V DC transformer

Supplied with coupling for telescopic poles with 10 m of cable and command for the selection of the rotation direction - on/off (supplied without batteries and accessories)

Minimum operating pressure and flow rate 3 bar 3 l/min

#### HSRL624VN

60 cm working width - weight 6.4 kg – **300 sqm / hour**

#### HSR824V

80 cm working width - weight 7.2 kg – **400 sqm / hour**

#### HSR1024V

100 cm working width - weight 8.0 kg – **500 sqm / hour**

Splash guard protection on request

Trolley with 4 wheels for connection to hoses on request

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

### 60-80-100 CM HYDROKINETIC ROTARY BRUSHES



#### ROTARY BRUSHES WITH HYDROKINETIC MOTOR

Minimum operating pressure and flow rate 50 bar- 9 l/min. Supplied with coupling for telescopic poles. They can work in combination with a demineralizing resin system and a suitable pressure washer or with reverse osmosis system such as Hydro Pure Barrow / Hydro Pure Pick-Up.

#### HSRL6N

60 cm working width - weight 4.6 kg – **300 sqm / hour**

#### HSRL8

80 cm working width – weight 5.4 kg – **400 sqm / hour**

#### HSRL10

100 cm working width - weight 6.2 kg – **500 sqm / hour**

Splash guard protection on request

Trolley with 4 wheels for connection to hoses on request

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



# BRUSHES FOR CLEANING PV PANELS

## 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

- ✓ Use: **Professional**
- ✓ Size of the PV plant: **Large**
- ✓ Location of the PV plant: **Roof**

## 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



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 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 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 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

- ✓ Use: **Professional**
- ✓ Size of the PV plant: **Large**
- ✓ Location of the PV plant: **Ground**



# ACCESSORIES AND SPARE PARTS



## **L11120M**

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





**M.M. S.r.l.**

Via R. Dalla Costa, 110  
41122 Modena - ITALY  
Tel. +39 059 25 16 54  
Fax +39 059 25 17 11  
[mm@mmspray.it](mailto:mm@mmspray.it)



[www.mmspray.it](http://www.mmspray.it)