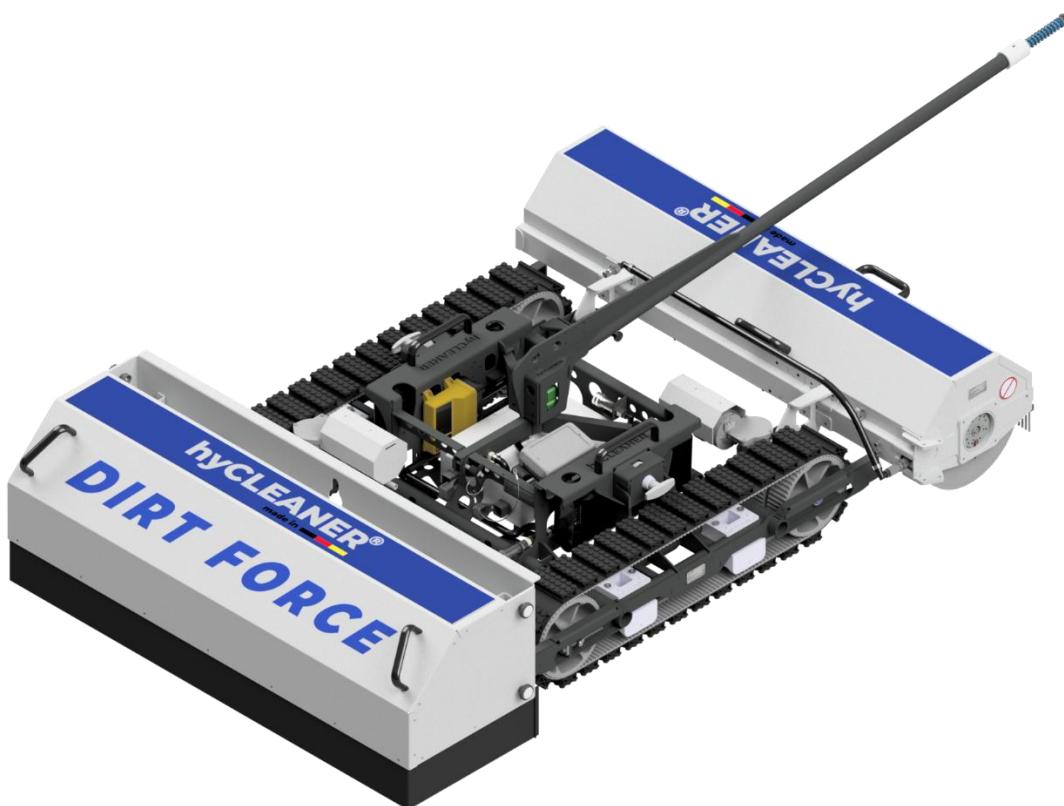


DIRT FORCE

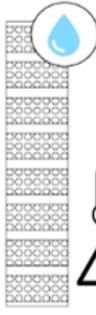
Additional operating instructions

Addition to the chapter: Accessories in the solarROBOT pro
operating instructions



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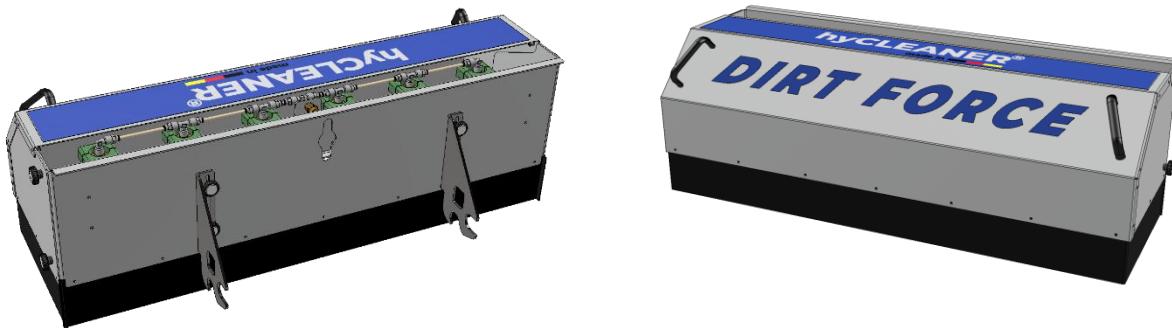
1. Glossary – Machine labelling

Accessories: Lichen remover DIRT FORCE			
	 min. 20 l/min  min. 80 bar  max. 100 bar  min. 5 °C  max. 23 °C	Permissible amount of water	
		Permitted water pressure	
		Permissible water temperature	
		Attention: Avoid contact with body parts. The high-pressure water jet can cause severe injuries.	
	  min 10 °C  max. 20 °	Driving pad – Rubber, sections In conjunction with the lichen remover DIRT FORCE, cleaning is only permitted with with driving pad made of rubber. With this, it is possible to drive inclines of up to a maximum of 20°, depending on the surface condition. The outside temperature must not fall below 10 °C. With a dirty rubber driving pad, the machine loses traction on the surface!	 Attention: The grip is always dependent on the surface condition of the area to be cleaned.

2. Lichen remover

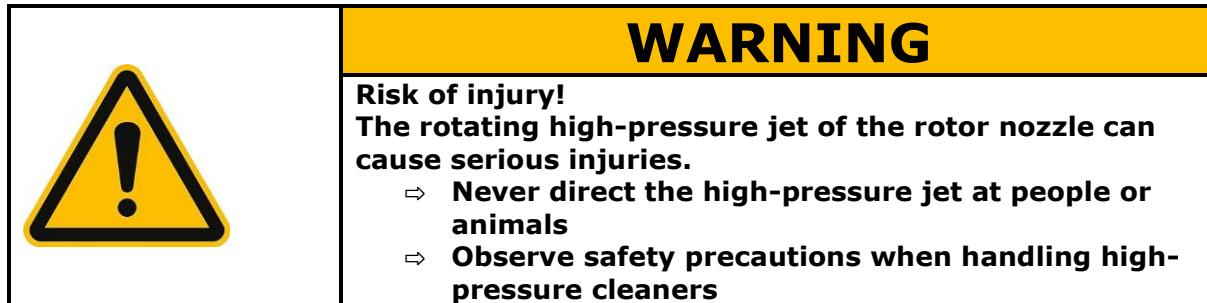
Article No.: 705.205

The lichen remover "Dirt Force" is designed for the technical cleaning of solar panels with stubborn dirt such as lichen infestation. The lichen remover is to be hung in the solarROBOT pro instead of the front brush. The second brush remains hung as a counterweight. If necessary, the brush can be used for re-brushing the area or alternatively brought to the highest brush setting so that there is no bristle contact with the area.



Length:	approx. 1180 mm
Width:	approx. 520 mm
Height:	approx. 375 mm
Weight:	approx. 18 kg
Max. permitted water pressure: remover	110 bar on the manometer of the lichen remover
Min. amount of water required:	20 l/min
Min. water temperature:	5 °C
Max. water temperature:	21 °C
Max. inclination angle*: (*depending on degree of pollution)	Ride in incline direction 20 ° (47%) Ride across the incline direction 20 ° (47%) Approach angle rear 30° (58%) Approach angle front 30° (58%)





2.1 High-pressure cleaner and high-pressure hose

The lichen remover is not operated via the water supply of the solarROBOT pro but requires a high-pressure cleaner and an associated high-pressure hose for operation. When selecting a high-pressure cleaner, the pressure losses of the high-pressure hose must be considered. The pressure losses depend on the inner diameter and length of the high-pressure hose, see the pressure loss table.

Pressure loss table

Pressure loss [bar] / metre											
Flow rate		Inner diameter (nominal size)									
I/min	I/h	3/16" 4,8 mm	6,0 mm	1/4" 6,4 mm	5/16" 8,0 mm	3/8" 9,5 mm	12,0 mm	1/2" 12,7 mm	15,0 mm	5/8" 15,9 mm	18,0 mm
18	1.080	5,59	1,83	1,33	0,44	0,18	0,06	0,04	0,02	0,01	
19	1.140	6,23	2,04	1,48	0,48	0,21	0,06	0,05	0,02	0,02	
20	1.200	6,91	2,26	1,64	0,54	0,23	0,07	0,05	0,02	0,02	
21	1.260	7,62	2,50	1,81	0,59	0,25	0,08	0,06	0,03	0,02	
22	1.320		2,74	1,98	0,65	0,28	0,09	0,06	0,03	0,02	
23	1.380		2,99	2,17	0,71	0,30	0,09	0,07	0,03	0,02	
24	1.440		3,26	2,36	0,77	0,33	0,10	0,08	0,03	0,02	0,01
25	1.500		3,54	2,56	0,84	0,36	0,11	0,08	0,04	0,03	0,01
26	1.560		3,83	2,77	0,91	0,38	0,12	0,09	0,04	0,03	0,02
27	1.620		4,13	2,99	0,98	0,41	0,13	0,10	0,04	0,03	0,02

Pressure loss table (Source: www.hochdruckreiniger.de)

High-pressure cleaner

For optimal use of the lichen remover, the following parameters of a high-pressure cleaner should be considered:

- Optimal range of water flow rate 20 - 25 l/min
- Optimal range of max. working pressure 160 - 220 bar (here the hose length must be calculated according to the pressure loss table)

High-pressure hose

For the high-pressure hose, ensure that the water pressure of the lichen remover does not fall below the water pressure of the high-pressure cleaner. It is recommended to use a high-pressure hose with a minimum inner diameter of 8 mm.

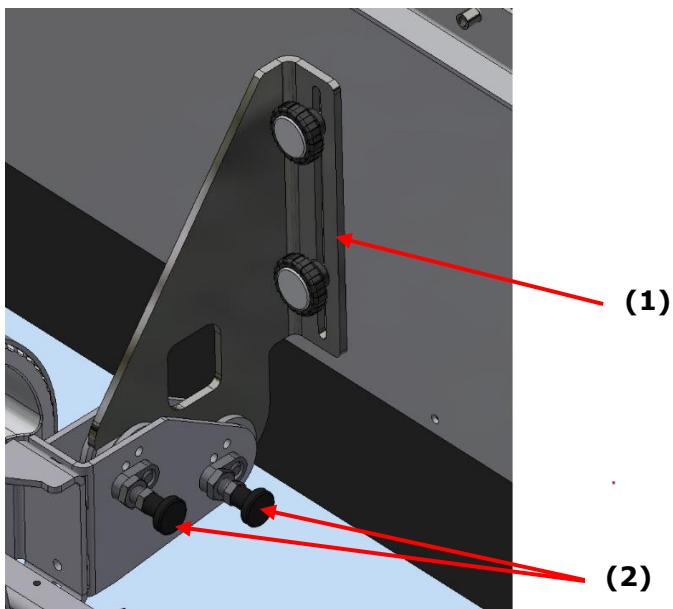
2.2 Commissioning of the lichen remover

Positioning of the lichen remover

The lichen remover is to be hooked into the solarROBOT pro in place of the front brush system and then connected to the drive units (see chapter connection of the brush system with the two drive units). In this process, the lichen remover can be used as the sole system for cleaning in the direction of travel. The rear brush system remains mounted on the robot and serves as a counterweight and can optionally be used for post-brushing the area.

If necessary, align the lichen remover parallel to the surface by adjusting the locking pins **(1)** on the drive units. Align yourself with the splash guard.

With the help of the adjustable claws **(2)** of the lichen remover, the lichen remover can be adjusted in height. The splash guard of the lichen remover should hover approximately 1 cm above the surface.



Use of the standard hose guide:

The use of the standard hose guide is only possible to a limited extent and must be observed by the operator at all times during application. Secure the high-pressure hose along the hose guide, e.g. with cable ties. Use the entire length of the hose guide to secure it. Ensure that the connection to the lichen remover is not under tension. It should be noted that the hose guide is no longer 360° rotatable with this adaptation. This results in restricted manoeuvrability of the machine and must be considered during cleaning.

Alternatively, the lichen remover can be used as usual with the accessory hose guide high-pressure (HD).

	Notice
	If you also wish to operate the trailing brush with water, you will need a second water source. In this case, one of the hoses must be routed separately (e.g., as described above using cable ties). Attention: Restricted manoeuvrability of the machine.

Connecting the lichen remover to the high-pressure cleaner

Before the lichen remover is connected to the high-pressure cleaner, the following steps must be carried out:

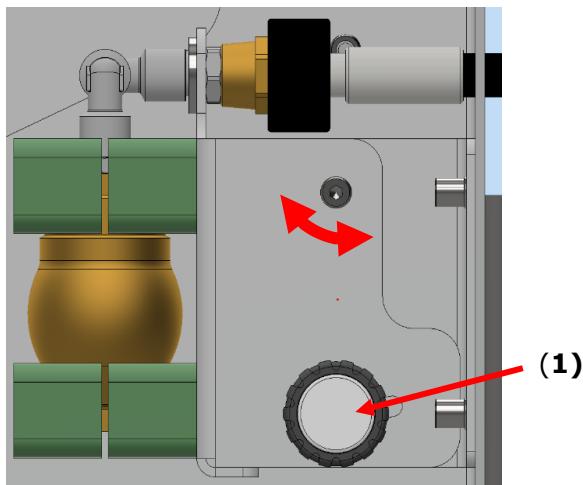
- Check all parts of the lichen remover for secure fit. Check all lines and hoses for damage and tightness.
- Check the high-pressure cleaner according to the associated operating instructions.
- Check the high-pressure hose for damages and tightness.
- Rinse the high-pressure cleaner and the high-pressure hose for approximately 30 seconds. Ensure that the water contains no impurities to avoid possible clogging of the rotor nozzles.
- Set the high-pressure cleaner to the minimum water flow using the bypass valve.
-

Now connect the lichen remover to the high-pressure cleaner. Switch on the high-pressure cleaner and adjust the water flow using the bypass valve to a minimum of 80 bar up to a maximum water pressure of 110 bar, as read on the pressure gauge of the lichen remover (not on the high-pressure cleaner).

Angle adjustment of the rotor nozzles

The rotor nozzles of the lichen remover are rotating nozzles.

The angle of the rotor nozzles can be adjusted as needed. To do this, the knurled grip screws **(1)** must be loosened and then the rotor nozzle holder fixed in the desired position.

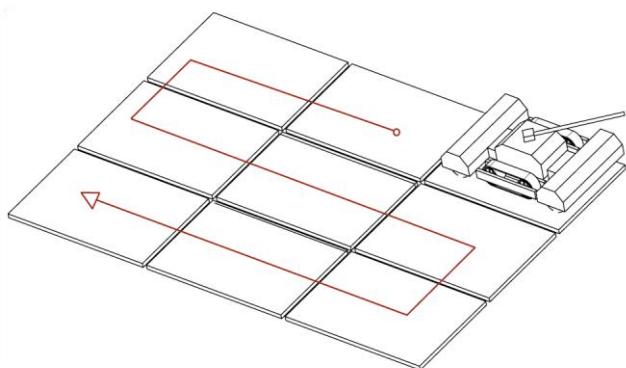


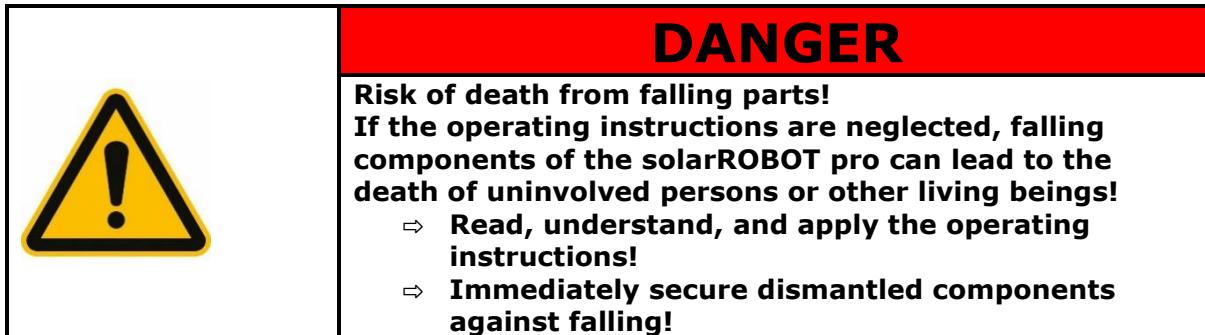
The rotor nozzles on the lichen remover are delivered as standard pointing vertically downwards. Here, the cleaning circle is evenly distributed, leading to an optimal cleaning result. It should be noted that removed dirt particles can be distributed in different directions.

The angle of the rotor nozzles can be adjusted as desired. This changes the cleaning circle in the direction of travel and is no longer evenly distributed. The changed angle ensures the removal of dirt particles in the forward direction of travel. Compared to the factory setting, this can lead to a reduced cleaning result.

Cleaning with lichen remover

When working with the lichen remover, pay attention to the guidance of the high-pressure hose. As high-pressure hoses are generally stiffer and heavier than low-pressure hoses, they can restrict the machine's driving characteristics and provoke a crash. It is imperative to ensure that the hose is fed from above.





2.3 Storage, maintenance and care of the lichen remover

The lichen remover, as well as associated hoses and high-pressure cleaner, must be stored dry and frost-free.

Clean the lichen remover after each usage with low-pressure water without any cleaning agents. For stubborn dirt, use a brush with soft bristles.

Check all parts of the lichen remover for secure fit. Check all lines and hoses for possible damage.

The operating time of the installed rotor nozzles is generally +/- 150 hours before the wear parts should be replaced with a repair kit.

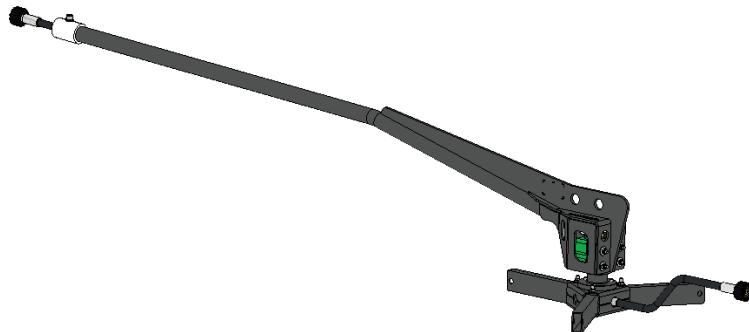
Wear is noticeable when:

- the rotation jet becomes uneven
- the rotational movement of the rotor nozzle becomes more unstable or eventually stops rotating altogether

3. Hose guide high-pressure (HD)

Article No.: 705.208

The hose guide HD is designed for cleaning with high-pressure water and is only to be used in conjunction with the lichen remover on the solarROBOT pro. The hose guide HD allows a 360° rotation around its own axis when installed on the solarROBOT pro.

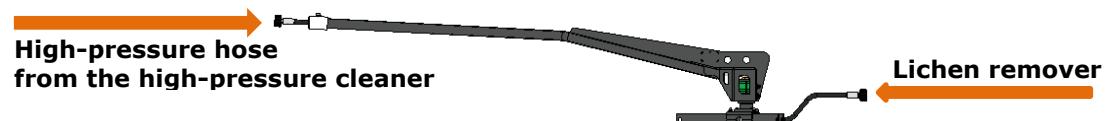


Height:	approx. 350 mm
Width:	approx. 392 mm
Length:	approx. 1,660 mm
Weight:	approx. 3.7 kg

In the bend area of the hose guide tube is a sheet metal collar with 2 adjacent holes. These holes can be used as attachment points if the solarROBOT pro is to be lifted using lifting equipment (e.g. onto solar modules).

Attaching the hose guide HD to the solarROBOT pro is done analogously to the supplied standard hose guide via the three bars. It should be noted that the connection hose to the lichen remover is placed opposite the bolt lock due to the connection.

For connecting the hose guide HD to a high-pressure hose (upper part) and to the lichen remover (lower part), a hand screw connection (M22x1.5) is used. The lower part of the hose guide is screwed to the adapter AG (M22x1.5) on the pressure gauge of the lichen remover.



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