Pretreatment Device SurAChem® VG 03

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Surface Pretreatment Device
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SurAASil® Process
1. Introduction

The pretreatment device SurAChem® VG 03 is a device for surface silication, which works on the principle of flame pyrolysis.

The pretreatment device SurAChem® VG 03, utilizing flame pyrolysis of an organosilicon compound, generates a thin, high-density and bonded silicate layer with a high surface-energy on

- Metals
- Glass
- Ceramics
- Plastics

In combination with the adhesion promoter SurAChem® GE 141 (for epoxide resins), GM 138 (for acrylates) and GA 139 (for polyurethanes) this layer represents the basis of long-term water and solvent-stable adhesions, coatings and printings.

The pretreatment device SurAChem® VG 03 is suitable for the pretreatment of larger surface areas, due to the burner width of 60 mm.

2. Chemical background

Adhesion promotion by surface silication:

![Image](image.png)

Figure 1: Principle of adhesion promotion by surface silication
The surface pretreatment realizes:

1. The generation of a high-energy silicate layer (layer thickness max. 40 nm) on the material surfaces via flame pyrolysis (surface silicate coating)
2. The application of an adhesion promoter, suited to the adhesive, the coating or to the printed medium

For epoxy resins are used amino- or epoxy substituted silicic acid.

3. Setup and technical application

The SurAChem® VG 03 pretreatment device consists of the floor-mounted device with a burner connection, a regulating valve for the gas supply and a cartridge-holder / device handle, as also a hand-held fire torch with flame regulating valve and pressure hose.

4. Technical data

| Amount of SurASil cartridges | 1 |
| SurASil cartridges (SurASil® 600) | approx. 330 g net, approx. 480 g gross |
| Burning gas | Mixture of propane/butane with additives |
| Burning life | ca. 75 min/ cartridge |
| Operating temperature | 15 to 35 °C |
| Internal pressure at operating temperature | 4 to 5 bar |
| Operating pressure | ca. 1 bar |
| Flame temperature | 1300 °C |
| Size (Basic device) | L x H x W: 300 x 470 x 120 mm |

5. Handling

5.1. General Instructions

The following instructions and recommendations should be carefully studied before using the SurAChem® VG 03 surface pretreatment device. The observance and compliance with the handling procedure is part of granting the guarantee. Any modifications of the adjusted operating parameters as conducted by the factory and any interventions on the device will automatically invalidate the warranty.
5.2. Installation and Implementation

Place the device on a safe work table (laboratory bench, work bench, etc.) or floor and provide an additional exhaust system for continuous operation to extract the formed combustion gases.

The hand-held fire torch with the flame regulating valve and connected to the floor-mounted device over the pressure hose, should be mounted on the cartridge-holder / device handle when the device is not in use.

The 330 g SurASil® cartridge (SurASil® 600) [Figure 2 (1)], which is part of the standard delivery, will be screwed in the floor-mounted device after short shaking. Thereby, the device is ready for operating.

5.3. Operation

![Figure 2: Pretreatment device SurAChem® VG 03](image)

Burning nozzle (3)

Regulating screw (4) & Flame regulating valve (5)

Hand lever (6)

Gas cartridge (1)

Regulating valve (2)

Pressure hose (7)
Operations with the SurAChem® VG 03 pretreatment device are generally performed at room temperature between +15 and +35 °C. After the continuous operation with the surface pretreatment device (approx. 75 min/cartridge), it is of high importance to take a break of approx. 20 minutes before further operation.

Open the regulating valve for the gas supply at the floor-mounted device (Figure 2 (2)) in the “+” direction, as also the flame regulating valve on the hand-held fire torch [Figure 2 (5)] in the “+” direction. The hand-held fire torch can be ignited e.g., with a lighter by pulling the hand lever (operating position) [Figure 2 (6)]. The flame is factory-adjusted for an optimized operation and the burner can be used with hand lever pulled after flame ignition. The hand-held fire torch returns to the low flame by releasing the hand lever.

5.4. Turning-off of the hand-held fire torch

The turning-off of the pretreatment device is performed by turning the regulating valve of the gas supply at the floor-mounted device [Figure 2 (2)] complete in the “−” direction, then waiting for the rest of the gas, located in the system-circulation, to completely burn (approx. 1 minute at full operation with the hand lever pressed [Figure 2 (6)] and last, closing the flame regulating valve on the hand-held fire torch [Figure 2 (5)].

Caution: The burner nozzle [Picture 2 (3)] is very hot after operation. The hand-held fire torch should be immediately mounted on the cartridge-holder / device handle.

5.5. Appropriate Usage of the Flame

The substrate to be coated will be treated with the outer (oxidative) part of the flame by continuous movement of the burner over a short time. The treatment must not occur with the inner, blue-shining (reductive) cone of the flame. If necessary, reduce the lighting at the workplace for a better distinction of the flame parts.

Figure 3: Flame A – oxidative part (operating part for flame silication), B – reductive part
The treatment duration of the component surface is highly dependent on the type of the material and, as a consequence, on the feasible treatment speed. The treatment speed should be between 10 and 50 cm/s for metal, glass, ceramic surfaces as well as thick-walled plastics.

The best pretreatment speed and duration can be determined by pretests with the SurAChem® TT 5640 test ink.

It is recommended for thin-walled or heat sensitive components, in particular thermoplastics, to increase the treatment speed to 50 to 100 cm/s and, if applicable, to repeat the process. Local overheating should be avoided. In general, the temperature of the components should not exceed 150 to 200 °C. This is important for thermoplastic materials (see paragraph 6 - flame treatment of PTFE).

Subsequently, the desired adhesives, coating or printing inks can be applied.

To achieve high performance adhesives, coatings and printings, we recommend preparing the flame-treated surfaces with a thin-layered coating of the adhesive promoter SurAChem® GE 141 for adhesion with an epoxide resin, the GA 139 for adhesion with polyurethanes, as also the GM 138 for adhesions with acrylates/methacrylates.

The pretreated components should be stored at room temperature and protected from contaminations. The storage time of the components between pretreatment and utilization of the adhesion promoter should not exceed one week. The storage time can be increased to one to two months due to the utilization of the adhesion promoter. Nevertheless, a short-term subsequent processing (adhesion, coating, printing) is recommended.

6. Additional Instructions for the pretreatment of PTFE surfaces

Special caution is required by the surface pretreatment of PTFE or other fluoropolymers.

Fluoropolymers decomposes over a temperature of 350 °C. Some of the formed decomposition products are high toxic after inhalation. As a consequence, it shall be taken into account, that the surface pretreatment will be performed under continuous fanning actions by avoiding component temperatures of over 200 °C. If necessary, e.g., at very small or thin-walled components, take some breaks. Generally, higher temperatures than 150 °C are not necessary to reach the desired effect.

7. Replacement of the gas cartridges

Before starting with the removal or replacement of the gas cartridges, the instructions mentioned in paragraph 5.4 (Turning-off of the hand-held fire torch) have to be followed.
The SurAChem® VG 03 pretreatment device can perform a continuous operation of approx. 75 min with a single filling (330 g cartridge - SurASil® 600). The empty cartridge will then be removed by turning it counterclockwise. The new cartridge, containing the SurASil® 600 special gas, will be installed on the floor-mounted device. The operation with the pretreatment device can be once more continued after a break of approx. 20 min.

8. Safety and transportation Instructions

The special gas SurASil® 600 is a doped propane/butane mixture and forms explosive mixtures with air, similar to pure propane/butane mixtures. Consequently, open sources of ignition must be removed. Furthermore, smoking is omitted when using the SurAChem® VG 03 pretreatment device. The information of the EC safety-data sheet must be taken into consideration.

- No toxic or harmful reaction products are formed. An air ventilation or fume hood should be available for long operations
- Please pay attention to the transportation regulations GGVS Class 2, No. 2F

9. Device Adjustments

9.1 The flame size can be slightly increased or decreased by utilization of the flame regulation valve at the hand-held fire torch [Figure 2 (5)] in the “+” and “–” direction, respectively.

9.2 The save-flame can be adjusted at the regulation screw of the hand-held fire torch [Figure 2 (4)] by turning the screw clockwise (decrease) and counterclockwise (increase) with the help of a screwdriver.

9.3 The pressure hose [Figure 2 (7)] can be removed from the floor-mounted for exchange or transportation purposes by a 19 and 17 mm spanner (left-handed thread). The pressure hose is to be screwed tightly once more before use.

10. Malfunction of the device and correction of faults

10.1. Ignition of the flame does not occur

- Be sure that the gas cartridge is not empty, exchange it if necessary
- Burner nozzle is polluted, cleaning with an appropriate brush
- If the burner cannot be ignited in spite of filled gas cartridge and proper installation and operation of the device please contact the manufacturer
10.2. Flame disruptions

- Strongly fluctuating flame size
- Flame size is over 150 mm
- Discharge of liquid gas out of the burner nozzle, no flame ignition
- Flame turns off in spite of filled gas cartridge and opened regulation valve for the gas supply on the floor-mounted device as well as opened flame regulation valve on the hand-held fire torch
- Close the flame regulation valve on the hand-held fire torch [Figure 2 (5)] and the regulation valve on the floor-mounted device [Figure 2 (2)]
- Place the device on an air ventilated working place (e.g., fume hood) or open air
- Unscrew the cartridge out of the floor-mounted device
- Open the regulation valve on the floor-mounted device and the flame regulation valve on the hand-held fire torch and release the gas considering all safety regulations for handling with burning gases
- Close all gas regulation valves and put into operation in accordance with the instructions in Paragraph 5 (Handling)
- If the flame-disruption is not overcome, please contact the manufacturer

11. Product liability

The manufacturer grants a warranty of 24 month from the date of delivery of the device. In this timer period, defective parts will be substituted or repaired free of charge. Defects and damages of the device, upon reception have to be reported immediately and in written form.

This warranty-claims apply at

- First buyers
- Utilization of original components and accessories supplied by SurA Chemicals
- Compliance of the application instructions

This warranty-claims do not apply at

- Safeguards and consumables
- Improper utilization of the device contrary to the users regulations and Instructions
- Incorrect installation of the accessories
- Improper operation, modifications at the device, damage or neglect
EG-Konformitätserklärung

EC Declaration of Conformity

im Sinne der EG-Maschinenrichtlinie 2006/42/EG


We (SurA Chemicals GmbH) herewith declare that the product described below is in accordance with the relevant safety and health requirements of the EC standards regarding design and version when delivered from our factory. This declaration becomes invalid whenever the product has been modified without our consent.

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Bezeichnung des Produktes/ Description of product Vorbehandlungsgerät

Typ/Series SurAChem® VG 03

Artikel-Nr./Fabrication No. 8103
Baujahr/Year of manufacture 2017

Das Produkt entspricht folgenden Richtlinien/ The product is in conformity with the following standards

X EN 292-1 und/ and 292-2, Sicherheit von Maschinen, Geräten und Anlagen/ Safety of machinery, instruments and systems

X EN 746-2, industrielle Thermoprozessanlagen Teil 2/ industrial thermoprocessing equipment part 2

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