EXP 8000 / 12000 EXPOSURE UNITS

Instructions for Use

Translation of Original Instructions

Table of Content

Bungard Elektronik GmbH & Co. KG, Rilkestraße 1, 51570 Windeck – Germany
Tel.: +49 2292 / 9 28 28-0, Fax: +49 2292 / 9 28 28-29, E-mail: support@bungard.de

Introduction

The EXP 8000 / EXP 12000 series is a high speed double sided exposure machine mainly designed for industrial production and equipped with two 4000W (6000W) mercury halide lamps. These lamps in about 90 cm distance of the PCB ensure almost parallel light. The construction consists of a sturdy, welded tube frame with coated sheet plates. The PCBs are fixed in a vacuum drawer, which is slid into the exposure area. An optional yellow light table makes arrangement and control of layout and PCB very easy.

Function:

EXP 8000 (12000) guarantees a perfect exposure within a minimum of time and energy consumption by two UV-sensors. The required exposure energy is preset on a keyboard and shown on a digital readout. The two intelligent UV-light emission controllers (one per side) automatically measure the energy supplied per side and stop the exposure at preset energy amount.

A vacuum pump provides a close and uniform contact between artwork and board. The exposure cycle starts when the drawer is pushed in. At that moment the lamp shutters are opened and the lamp's power supply is increased from stand-by to full power. In stand-by mode, the energy is reduced to 25% in order to save energy and avoid heat problems. The machines have powerful cooling fans. When the exposure is finished the vacuum is stopped.

Features:

- High resolution exposure unit with almost parallel light
- Single and double exposure possible
- Different light amounts can be adjusted for the upper and lower lamp level by digital keyboard.
- Separate light sensors for both lamp levels with quick stop function; microprocessor controlled.
- Storage keys with 4 programs for standard application
- Vacuum drawer system (single drawer system)
- Prevacuum adjustable in time and pressure
- integrated exhaust system

Technical data EXP 8000 / EXP 12000

Max. Working area	600 mm x 600 mm
Recommended working area:	400 mm x 500 mm)
EXP 8000 Power supply:	380-400 V, 50 Hz triple phase L1 = 8 A; L2 =19 A; L3 = 10 A
	Fuse: 32 A per phase; 8 kW
EXP 12000 Power supply:	380-400 V, 50 Hz triple phase -NPE; I-net: 22A
	Fuse: 32 A per phase
Unit Size (W x H x L):	820 x 1950 x 1800 mm
Weight:	270 kg
Exposure:	Microprocessor controlled UV-light emission
Application:	suitable for fine line PCBs. Suitable for exposure and curing of solder mask.
Option:	built-in yellow light table
Exhaust:	Connection D200mm; Power of fan: approx. 1000 – 1200 m³/h

Special versions for 220 V 60hz available on request.

EG-Declaration of Conformity

CE **EG-Konformitätserklärung/Declaration of Conformity**

Hersteller / Supplier:	Bungard Elektronik GmbH & Co. KG Rilkestraße 1 51570 Windeck Germany
Bevollmächtigte Person für die Zusammenstellung der technischen Unterlagen: Person in charge	Jürgen Bungard, Geschäftsführer /general director Rilkestraße 1 51570 Windeck Germany
Produkt:	Belichtungsgerät EXP 8000 und EXP 12000 Exposure Unit EXP 8000 und EXP 12000

Hiermit erklären wir, dass die oben beschriebenen Maschinen allen einschlägigen Bestimmungen der Maschinenrichtlinie 2006/42/EG entspricht.

Die oben genannte Maschine erfüllt die Anforderungen der nachfolgend genannten Richtlinien und Normen:

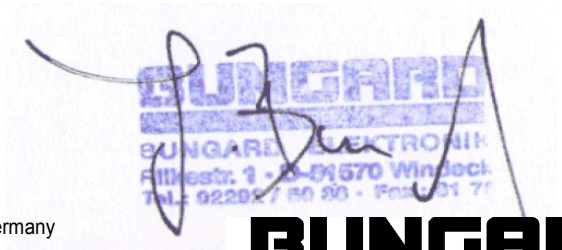
We hereby declare that the machines described above complies with all relevant provisions of the Machinery Directive 2006/42/EC.
The above machine meets the requirements of the following guidelines and standards:

- **Maschinenrichtlinie 2006/42/EG / Machinery Directive 2006/42/EC**
- **EMV-Richtlinie 2014/30/EG / EMC Directive 2014/10830EC**
- **Niederspannungsrichtlinie 2014/35/EG / Low Voltage Directive 2014/35/EC**

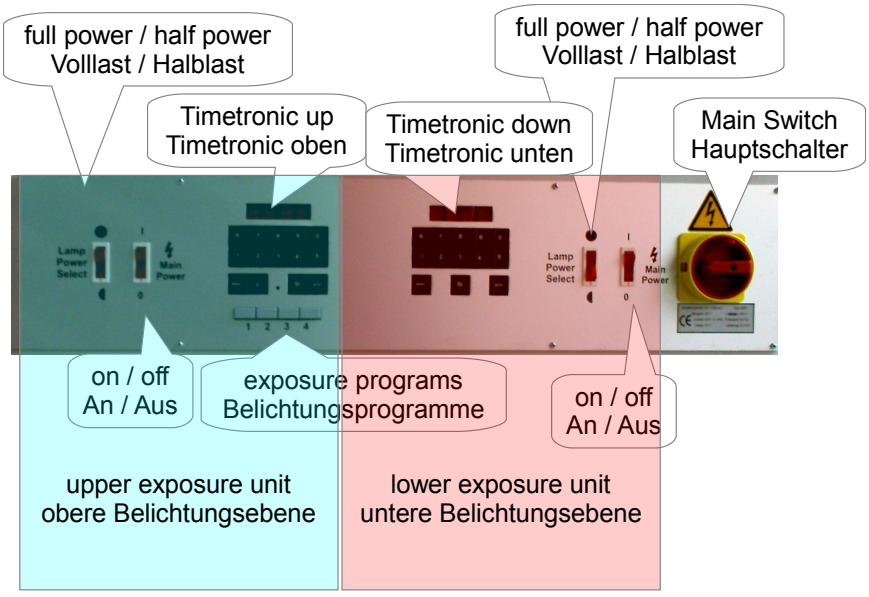
- **DIN EN 60204-1** Sicherheit von Maschinen - Elektrische Ausrüstung von Maschinen - Teil 1: Allgemeine Anforderungen / Safety of machinery - Electrical equipment of machines - Part 1: General requirements
- **DIN EN ISO 14121-1** Sicherheit von Maschinen - Risikobeurteilung - Teil 1: Leitsätze / Safety of machinery - Risk assessment - Part 1: Principles
- **DIN EN ISO 12100-1** Sicherheit von Maschinen - Allgemeine Gestaltungsleitsätze, Risikobeurteilung und Risikominderung / Safety of machinery - Basic concepts, risk assessment and risk reduction
- **DIN EN 55014-1 2012-05** Elektromagnetische Verträglichkeit, Anforderungen an Haushaltsgeräte, Elektrowerkzeuge und ähnliche Elektrogeräte, Teil 1: Störaussendung / Electromagnetic compatibility Requirements for household appliances, electric tools and similar electrical appliances Part 1: Emission
- **DIN EN 55014-2-2009-06** Elektromagnetische Verträglichkeit - Anforderungen an Haushaltgeräte, Elektro-werkzeuge und ähnliche Geräte - Teil 2: Störfestigkeit - / Electromagnetic compatibility - Requirements for household appliances, electric tools and similar apparatus - Part 2: Immunity
- **Niederspannungsrichtlinie / Low Voltage Directive 2014/35/EG**
- **Maschinenrichtlinie / Machinery Directive 2006/42/EG/37/EG**

Windeck, 10.1.2015

Jürgen Bungard Geschäftsführer



Composition



Short instructions

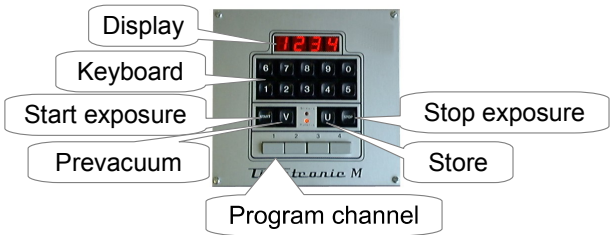
Setup

1. Remove the packing and check machine for transport damages.
2. Carefully read the manually. Pay attention to all safety instructions.
3. Lift machine off the palette e.g. with the help of a fork lift. After that machine can be moved to its place on its own rolls. Or use special cover of wooden box as a ramp.
4. Have your electrician connect the EXP 8000 with 380V, triple phase, 50hz. For special machines (e.g. 220 V 60 Hz) compare machine plate!
5. Install hot air outlet in order to prevent overheating of your PCB lab.
6. Install the upper lamp unit correctly.
7. Mount the yellow light table.

Operating

1. Turn on mains (emergency Stop). The fans will turn on automatically.
2. Turn on upper and lower exposure level. The lamps will start in stand-by-mode, the shutters are closed, no exposure is taking place. Only if the switches for the upper and lower level are turned on, the TIMETRONIC and the vacuum function can be programmed.
3. Open vacuum frame and insert pre sensitized board and films (in Film-bag or with reference pins/ whatever is suitable for your application).
4. Close vacuum frame and lock the handle. The Vacuum pump starts automatically now. If you slip in the drawer, then exposure starts after the pre-vacuum time is expired. We recommend though to control layout and PCB registration (position OK?/ no air bubbles?) before putting the drawer into the machine.
5. Now push the drawer all the way inside of the machine (micro switch position).
6. Exposure starts automatically at this position, if the pre-vacuum time has expired. The shutters swing open and the energy supply is increased to maximum.
7. Two UV-sensors measure the light amount separately for both exposure levels, the display of the TIMETRONIC counts down till the light amount is reached. Then the shutters are closed again and the vacuum is released.
8. Take out the vacuum drawer, unlock the handle and open the frame to take out your exposed PCB.

Programming Timetronic



1. Lamps are switched on
2. Select a channel (e.g. “1”).
3. Press "V" for vacuum selection at the left TIMETRONIC. Insert desired prevacuum time and "STORE".
4. Press "V" once again and insert desired light amount and confirm with "STORE".
5. If needed, adjust the light amount for the lower exposure level at the right TIMETRONIC. Insert your desired light amount (e.g. 100) with the keyboard and confirm with "STORE".
6. If desired you can program your settings for the other 3 channels in the same manner.

Recommended settings:

ORIGINAL BUNGARD positive presensitized boards:	energy amount: 200
BUNGARD, ALUCOREX (TM) positive presensitized aluminium front panel system	energy amount: 400
BUNGARD, negative dry film resist (1.5 mil) for galvano or tenting technology	energy amount: 75
BUNGARD, negative green soldermask (3 mil):	
exposure before development	energy amount: 100
exposure for curing after development	energy amount: 2000

Intended Use

Exposure of positive or negative developing photoresist, solder mask and Alucorex.
All other application need our written consent or happen on risk of the operator.

Safety instructions

General

Read all the safety instructions and all the operating instructions thoroughly before using the unit for the first time.

Keep these safety instructions and operating instructions somewhere safe in case you need to refer to them again in the future.

The machine is designed to exposure of positive or negative developing photoresist, solder mask and Alucorex. All other application need our written consent or happen on risk of the operator.

The 8000/12000 EXP is designed for use in the laboratory and operation by qualified staff. Also the unit should be repaired by qualified staff only. Never try to do more in the way of maintenance to your unit than the operating instructions allow. Beyond that, always consult an expert for repair work.

The machines are not intended for the integration or interconnection with other machines or systems. They may only be used in specially equipped rooms and be operated by qualified personnel. Children and pets must be kept away!

The general safety regulations for handling electrical equipment need to be observed.

Transport

Only use suitable lifting and transport equipment such as forklifts or pallet lifts. Secure the machine against sliding / tilting. Danger of damage!

Place of installation

The machine must be level and must have sufficient space around the machine for operation and maintenance (approx 1m on all sides).

Do not place the unit in a location near heat sources such as radiators, hot air ducts, furnace, and the like.

The installation environment is crucial to the smooth operation with the EXP 8000/12000. You must therefore place special emphasis on a dust-free room and an indoor air free of corrosive vapors, to ensure proper function.

Electrical

The machine is manufactured using tested components according to standard practice for electrical safety. This does not release the user from his duty of care when handling electrically powered devices.

Connect the device only to the power source indicated in the operating instructions or on the device. We assume a house-side fuse for the power source. The connection to the power supply may only be performed by a specialist.

The yellow-red main switch disconnects the machine from the power supply. The fuse protection of the circuit and the residual current circuit are to carry out on site.

After completion of the work, the main switch should always be turned off.

Before any work on the machine (cleaning, etc.) and when not in use switch off the machine and unplug it.

Lamps

When replacing the lamp let the lamp cool sufficiently. Warning: there is an immediate danger of inflicting severe burns!

NEVER touch the lamp with your fingers (or your hand) during installation. That would destroy prematurely the lamp. If you have but touched the bulb, clean it with a suitable cleaning agent.

Avoid contamination by ferric chloride. They lead to a partial absorption of the UV light because of its reddish-brown color and thus to underexposed areas on the board.

Only use Original-Bungard-lamps! They ensure that the ozon emission is far below the MWC-limit of 0,1ppm.

If you need to exchange the UV-filter screens at the lamps, ensure to use only Original Bungard UV-filter screens. Thex ensure, that no UV-B- or UV-C-rays (below 320 nm) are emitted into the operating zone.

Cleaning

When cleaning the appliance, keep yourself to the manufacturer's recommendations.

Vacuum

The thickness of the workpieces to be processed should not exceed 5 mm, otherwise a functional impairment of the vacuum, or even damage to the vacuum foil may result. For this reason, no sharp objects between the glass plate and

the vacuum film may be on the glass table, when the vacuum is turned on. Also make sure that the vacuum hose is not blocked by obstacles.

Operation safety

Do not stare into the UV lamps! Intended use is carried out in a closed state, in order to avoid eye injuries.

Exhaust

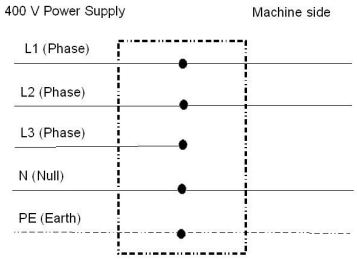
In order to avoid overheating of the machine, the exhaust air must be led to the outside. The length of the ventilation tube to the outside should not exceed 2.5m. If length of the ventilation tube is longer, provide an external exhaust system with approximately 1000-1200 m³ / h, that compensates for the pressure drop through the hose length.

Environment

Attention: mercury lamps must be handled carefully and disposed of in accordance with the rules of hazardous waste. Mercury is highly toxic. If the bulb breaks, be sure to attend your security responsible and wear suitable protective clothing to avoid serious health problems.

Set Up

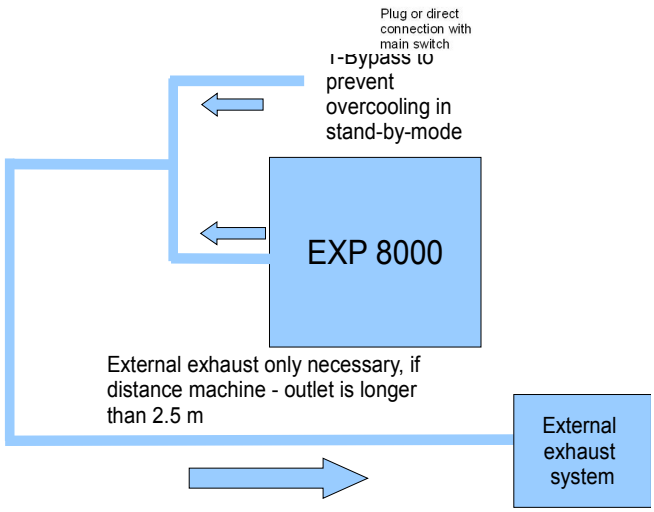
Electrical Connection: the machine is delivered with a power supply cable but not with a socket. Only a skilled and trained person may connect the machine to the 400 V power supply. Take care to secure each phase with a 32A fuse



The machine is supplied in a special wood packing. Check the condition of packing immediately at reception. Goods delivered by a carrier and signed as "Received in good condition" will be impossible to be returned as "Damaged in transit". If you recognize any damage after unpacking you need to declare this transport damage to the shipping agent immediately in written and verbal. In this case please also notify us.

To unpack, remove the lateral wood package. Due to the weight and danger of damage do not just roll the unit off the pallet. Use a fork lift to take the unit off the pallet and place it on even ground. From then on the machine may be moved on it's rollers.

The installation location of the machine is of special importance. You should choose a mostly dust free room with a non corrosive atmosphere. The floor should be flat and straight. Place the machine in some distance to the wall so you always have access to the rear and the lower exposure level.



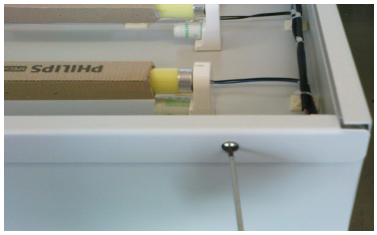
Exhaust connection

The EXP has a special air exhaust on the top. This needs to be connected to a flexible hose of 200 mm diameter to release the hot air outside of the room. The way of the exhaust pipe should be Max. 2.5 m. For longer ways please provide an external exhaust system with about 1000-1200 m³/h, which compensates the pressure drop caused by the pipe length. If the EXP 8000/12000 is in stand-by-mode, the fans of the EXP run at low speed. To avoid that the external exhaust system cools down the lamps too much when in stand-by-mode, we recommend the use of a T-Pipe as bypass access, so the external exhaust takes the air from the room and not from the EXP (Compare Schematic at beginning of Set Up chapter).

If you ensure room air **inlet** over a filter system, you easily obtain almost clean room atmosphere.

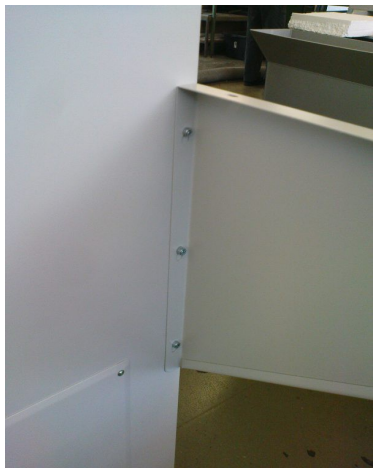
Light table option:

In case you ordered the EXP 8000 with a yellow light table, this light table was disassembled for save transportation. Also check the yellow light table for transport damages, then mount the holder, fix the table unit and connect with power supply of machine. Remove transport packing of the yellow light tubes and insert the frosted glass screen. To do so remove the retainer, mount screen and secure with retainer. On the right of the table there is the switch to turn on the light.



Retainer


Connection to EXP


Mounting

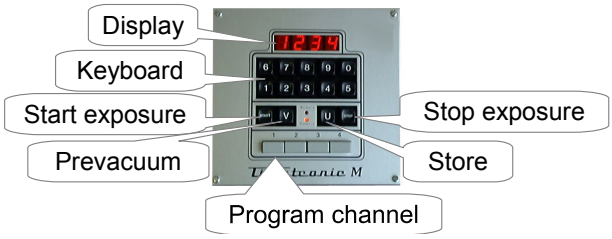
Exposure energy management

Your machine has two independent TIMETRONIC control system. The left is controlling the upper exposure level and has additional facilities for the pre-vacuum time function and the right controls the lower exposure level. If you want to expose single sided, you need to use the upper exposure level.

Pre-vacuum means, the exposure cannot start before a pre-set count-down time is finished. The count-down time will be started automatically whenever vacuum is activated. This ensures good vacuum film fixation.

Furthermore both TIMETRONIC controllers are used for programming the energy amount of the upper and lower exposure level. Both have 4 programmable channels, that may be selected in the lower row.

To adjust the TIMETRONIC, you need to turn on the main switch (upper/lower exposure level on/off).



Programming of TIMETRONIC

1. Switch on the upper lamp level at the main switch.
2. Select a channel (e.g. “1”).
3. Press "V" for vacuum selection at the left TIMETRONIC. The vacuum time set for this channel appears. Now you overwrite the value with the keyboard (e.g. 15) and confirm with "STORE".
4. Press "V" once again. Now you are in the light mode. The red LED light will show the light amount programmed for channel 1. Insert your desired light amount (e.g. 50) with the keyboard and confirm with "STORE".
5. If the lower exposure level is switched on as well, you can adjust the light amount for this level at the right TIMETRONIC. Insert your desired light amount (e.g. 100) with the keyboard and confirm with "STORE".
6. Machine is ready to use now. If you now select channel 1 and start exposure (press “START” at the left TIMETRONIC), then the machine will start exposure after a prevacuum time of 12 seconds and will stop exposure at the upper level after energy amount of 50 is reached and stop at the lower level after energy amount of 100 is reached. As you can see, the upper and lower level can be programmed with different light amounts.
7. If desired you can program your settings for the other 3 channels in the same manner.

What is the correct prevacuum time ?

We recommend a prevacuum time of 10 seconds or more.

What is the correct exposure energy ?

For optimum efficiency and best possible results, we recommend to make a STOUFFER test exposure to find best settings. The following settings, found in our company, will help you for your first PCBs:

Recommended settings:

ORIGINAL BUNGARD positive presensitized boards:	energy amount: 200
BUNGARD, ALUCOREX (TM) positive presensitized aluminium front panel system	energy amount: 400
BUNGARD, negative dry film resist (1.5 mil) for galvano or tenting technology	energy amount: 75
BUNGARD, negative green soldermask (3 mil):	
exposure before development	energy amount: 100
exposure for curing after development	energy amount: 2000

Select active exposure layers:

you may use the EXP 8000 as a single side exposure unit or a double side exposure unit.

Use left switches to select upper active layer and to select lamp intensity (full or reduced).

Use right switches to select lower active layer and to select lamp intensity (full or reduced). For single sided exposure choose the upper level, with the lower level you cannot create vacuum. Compare overview operating panel on page 3.

How to stop exposure:

You can interrupt exposure by pulling out the vacuum frame (position is micro-switch controlled). This function will enable you to continue exposure by inserting the frame again.

Or

you can stop exposure by pressing the “STOP”-button at the left TIMETRONIC. This function will open the vacuum and reset the exposure energy to preset level. That means, if you press “START” again, the machines starts the prevacuum time again.

Vacuum adjustment

can be done by turning a valve (aluminium knob) right below of the manometer. Turning left will increase vacuum, turning right will reduce vacuum. If the pointer is in the red area, the vacuum is insufficient, in the green area vacuum is alright.

vacuum display

Maintenance

exchange of lamps:

If the exposure time prolongs to approx. 30%, you should think of exchanging the lamp. We recommend to keep original lamps as a spare part to avoid downtime of the machine.

1.) Switch on main switch of the level you want to exchange the lamps at. Start exposure and turn off the main switch during exposure. That way shutters remain open.

2.) Wait to allow machine to cool down. **Attention: OTHERWISE you risk severe burnings !**

3.) Turn knurled screws to open lamp's box and swing open the case. Now you have access to the lamps.

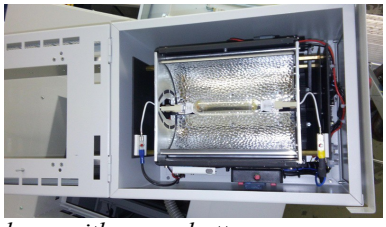
4.) Carefully disconnect and dismount old lamp. **Attention: the mercury lamps are must be handled with care and discharged according to local regulations. Mercury is highly poisonous. If lamp is broken, ask your safety engineer for help and wear appropriate clothing.**

5.) Insert new lamp and connect it carefully. Double check that it is in correct position and fixed tightly. NEVER touch lamps with your hands. Fingerprints will significantly reduce lifetime of the lamp. If you should touch the lamp, you will have to clean them to remove fingerprints.

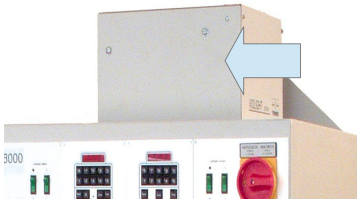
6.) Use opportunity to clean reflector and glass protection of your lamp with clear water or mild soapy water.

7.) Reassemble lamp in reverse direction.

unscrew here and swing open



lamp with open shutters



upper lamp unit

The upper lamp unit can be removed from the machine(e.g. For lamp exchange). Install the lamp carefully in the provided opening.

Replacing the vacuum foil:

If the vacuum foil was destroyed or damaged, it must be replaced.

The foil is fixed with an aluminium profile and double sided tape.

We recommend to remove the upper vacuum frame for the exchange.

First loosen the screw at the side of the compression spring. Ensure that the cover does not fall.

Then loosen the rear mounting screws.

Put the frame on a table.

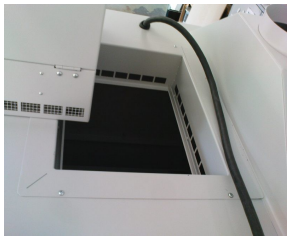
Loosen the screw of the aluminium profiles and remove foil and tape completely.

Stick new double-sided tape (eg Tesa) to the frame. Spread the new foil flat on the table.

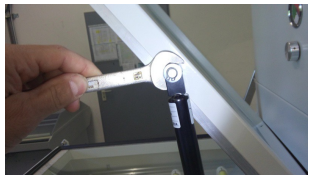
Put the vacuum frame with the adhesive tape on the film. Turn the frame around and screw the aluminum profiles (punch the screw holes into the foil)

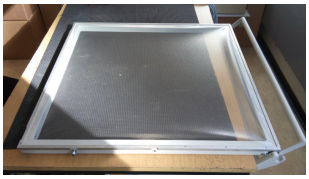
The tension of the vacuum foil is correct if the film can be pressed in the center of the frame without problems on the glass bottom.

The glass can be cleaned with a good window cleaner and the sealing lip with a damp cloth lint.



lamp pit





Spare Part List

Essential Spare Parts:

40301-1	844407	Lamp TH4527 4000W
6000		Replacement Mylarfolie 900 x 900 mm

General Spare Parts

6000	5312	Timetronic upper lamp
6000	5310	Timetronic lower lamp
6000	33305	lamp starter für Strahlertyp TH 3007
6000	33312	fluorescent tube yellow
6000	33313	Starter 4-22 W for fluorescent tube yellow
6000	33333	fluorescent tube white
6000	33344	Ignitor for Strahlertyp TH 4527
6000	40608	solenoid valve
6000	43392	shutter motor
6000	43450	Fan upper lamp
6000	43468	Fan lower lamp and machine body
6000	43762	Trafo für Strahlertyp TH 3007
6000	44597	ballast
6000	56711	PCB relais board
6000	63301	fuse 6,3 A
6000	63309	fuse 2 A
6000	63342	fuse 4 A
6000	63796	connector
6000	63798	connector
6000	68582	gas pressure spring 300 N
6000	71380	toggle switch red
6000	71747	mains switch
6000	75031	Vacuumpump
6000	75051	manometer
6000	95806	reflector
6000	95903	Upper photo sensor
6000	95904	Lower photo sensorr
6000	101012	Mylarfoil with sealing lip 730 x 710 mm (special edition for russia)
6000	xxx	Replacement Mylarfolie 900 x 900 mm
6000	105087	UV-filter-glas for lamp
6000	105151	milk glass 800x700x4mm for inspection table
6000	105180	crystal glass 710x735x6
40301-1	844407	Lamp TH4527 4000W
6000	44165	Trafo 400V / 50Hz
6000	44197	Trafo 380V / 60Hz

Guarantee

All machines are submitted before distribution to examination on tightness, function and continuous operation firmness. On the machine we grant a work warranty of 12 months to our customers starting from purchase date on accuracy in material and processing. We warrant at our choice by exchange of incorrect parts or by repair of the machine in our house. Old parts change into our possession.

Disclaimer of Warranty

All parts subjected to wear and the heater element are excluded from this warranty. This also applies to defects to the machine caused by non-observance of this manual or of parts of it.

Use only original light bulbs. The use of non-original light bulbs will void all warranty claims.

We cannot accept subsequent claims from damage or destruction of work pieces worked on in the machine, because we have no knowledge or control over the operating conditions at your site. This is valid in a general manner also for requirements from damage to articles, buildings and persons as well as the environment.

We do not warrant that the function of the machine will meet the customer's requirements or that the operation of the machine will to this regard be error free.

In no event will we be liable to the customer for any incidental, consequential, or indirect damages of any kind, including loss of profit and prosecution for environmental pollution, even if we could have been aware of the possibility of such damages.

Operating the machine in corrosive, dusty, humid, extremely hot or explosive atmosphere is take place at the operators own and only risk.

The operator has provide suitable precautionary safety and protective measures. We explicitly deny any liability for damage resulting from running the machine in such an atmosphere.

All information was arranged with great care. We reserve ourselves however mistake and technical changes without previous announcement.

Copyright