

RBM402 KF and BLC Brushing machine

Translation of the Original Instructions



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General

The RBM 402 KF series is the highest developed brushing machine in our range and can be used for practically all cleaning operation during PCB manufacturing. It is ideally suited for professional prototyping or small batch production in modern PCB laboratories. The RBM 402 consists of a double sided wet processing brush compartment, a rinsing and a following squeeze-off zone and hot air drying compartment. The solid construction guarantees proper function and a long lifetime with a minimum of maintenance.

The standard version KF includes closed loop water supply with water tank, filter unit and pump. On request we manufacture model F with external water supply and automatic band filter to reduce copper concentration of the rinse water or the version BLC, a simple bench top version without base wagon and filter unit. The BLC is connected to fresh water supply.

Features:

Oscillating brushes with quick change device.

Precise parallel brush adjustment with hand wheel.

Brush, dryer, oscillation and conveyor can be separately switched on and off.

Oscillation and transport are step-less adjustable.

Digital read out for board thickness.

Digital read for power consumption of the brush motor.

Upper and lower brushing rollers are adjustable in pressure and have a digital read-out for the settings.

The wet-procession system comes together with a powerful squeeze + hot-air dryer.

Machine can be equipped with different kinds of brushes.

The „KF“ is indicating an integral closed loop rinsing system. This saves water costs and is urgently recommended in order to comply with German and European waste water regulations.

Model F. Machine is equipped with an automatic rinse water band filter. No guarantee for country specific copper concentration in the rinse water.

Model BLC: No base wagon and filter unit. This Bench top version has to be connected to fresh water supply.

Technical Data

Working width:	400 mm	Brushing speed:	1360 rpm
Board thickness:	0.3 - 5 mm	In-feed per turn of handwheel:	0,266 mm
Board sizes (minimum):	80x175 mm recommended 80 x 120 possible	Rinsing system water connection (BLC):	Outlet: 40 mm Outer thread, NW 32 mm Inlet: AD25 mm, 20 mm inner thread
Oscillation stroke:	10 mm	Rinsing water consumption (BLC):	26 l / min
Oscillation frequency:	10 - 110 1/min	Rinsing pressure max. (BLC):	1.5 bar
Stroke brushing roller 1:	max. 20 mm	Dimensions: (LxWxH / mm³):	1110x750x1160
Stroke brushing roller 2:	max. 15 mm	Power supply:	110-230 V, 50-60 Hz 2.3 kW (use 16 A buidling circuit breaker)
Brushing roller size:	89 x 410 mm ²	Weight:	170kg (BLC); 240kg (KF)

Technical details are subject to change without notice.

EG-Declaration of Conformity



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:	Brushing Machine RBM402

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, 10.1.2022

Jürgen Bungard Geschäftsführer

Intended Use of Machine

The system is designed for brush cleaning of printed circuit boards. All other applications require our written consent or happen on full risk of the user. The Bungard GmbH & Co. KG accepts no liability for damages incurred in non-authorized use or application of the machine.

Safety Instructions

General

Please read the following instructions carefully and pay particular attention to information on operating safety and set up.

Keep these instructions at a safe place. It contains information which also refer for later maintenance and cleaning.

The machines are intended for physical treatment of printed circuit boards.

The machines are not designed to be embedded or interconnected with other machines or systems. They may only be used in specially equipped rooms and be operated only by qualified staff. Children and pets are to be kept away!

Transport

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

Place of installation

The machine must be standing level and around the machine there has to be sufficient space for operation and maintenance work (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.

Do not run the machine in corroding, humid, dusty, extremely hot or explosive atmosphere. If you do run the machine in an atmosphere as described above be aware that this happens on your own risk and responsibility.

The operator has to provide appropriate safety precautions and equipment. We explicitly exclude any warranty for damages resulting from running the machine in an atmospheres as described above.

Electricity

The machine is made from certified parts according to standard practice for electrical safety. This does not relieve the user of his duty of care when handling electrically powered devices.

Connect the device only to the designated power supply as indicated in this manual or on the machine plate.

The red main switch disconnects the machine from the power supply. We presuppose that the safety fuses of the circuit and the residual current circuit are provided by the building's power supply.

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

Before all maintenance work on the machine (filling, emptying, cleaning, etc.) turn off machine and pull the plug.

To avoid the risk of electric shock, do not remove the casing or open the back. There are no user serviceable parts inside. Leave servicing to the experts! Keep this unit out of the rain and away from moisture.

Pay attention to the warning signs on the machine. If you are not going to use the unit for some time, remove the plug from the socket.

Water connection

After work or prolonged interruption, close the cock valve of the building's water supply to prevent water damage from a possible leak in the hose.

Personal protection equipment

Do not touch heating elements and tubes. Danger of burn!

Rinsing water

The legislation generally prohibits to exceed certain maximum concentrations and quantities of copper (and other heavy metals) in the waste water (usually 0.5 mg copper / liter of water). After brushing the boards should not be rinsed under running water and do not dispose used rinsing water into the sewer! Operate the rinsing water only either in a closed loop rinse or treat the rinse water with a copper centrifuge or some special filter system. Metallic copper will be hardly removed in a ion exchanger system.

We recommend to use the water in the closed loop rinsing zone(s) as long as possible.

Collect used rinsing water and dispose the surplus together with the used chemicals.

Maintenance

The unit should only be maintained and repaired by qualified personnel. 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.

When changing the brush you must pay attention to the correct rotating direction of the brush.

For security reason, brushing rollers can only be activated if top cover is closed.

Attention: Do not start brush motor when brush is under load.

Set Up

Check packing and machine for transport damages. If such damages appear, inform your transport agent, your local dealer immediately and us and remark the damage on the transport papers.

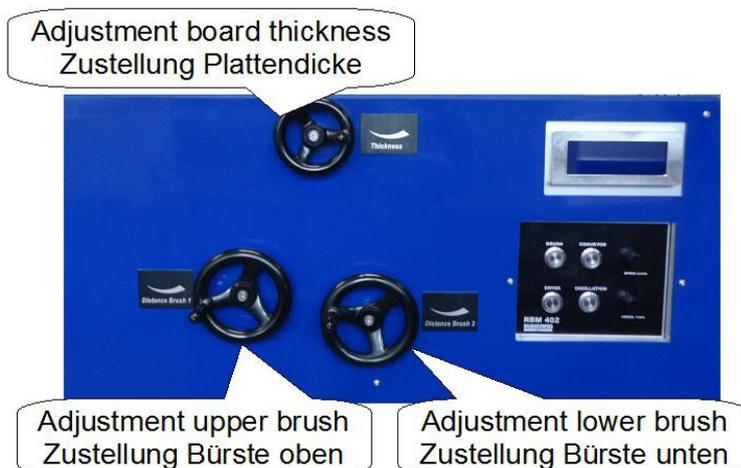
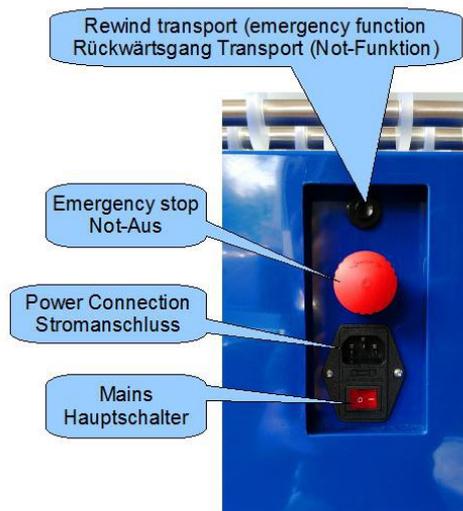
Unpack the machine at its final location. The RBM 402 requires a flat and level surface.

To enable easy changing of the brushes later on, we recommend to not place the machine directly next to a wall.

For reasons of save and economical transportation hand wheels for pressure and distance adjustment are dismantled. Please mount them according to the schematic and fix with Allen key screws.

Power connection has to be done according to machine requirements (see machine plate) in combination with your local standards. Cable colours are as follows: brown = phase, blue = neutral, yellow-green = earth. Please check if cabling of building and its safety devices correlate to max. power consumption of the machine.

The RBM 402 is equipped with a frequency converter, which enables operate the RBM 402 in all common power systems worldwide.

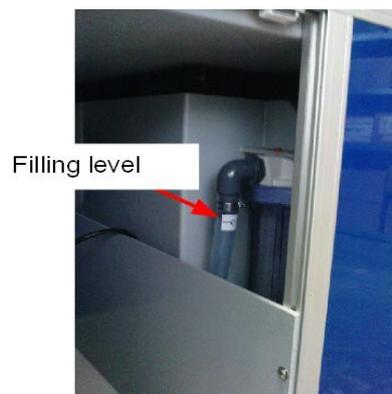


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The water supply for RBM 402 BLC requires a stop valve and a pressure reducer (maximum pressure for rinsing system: 1,5 bar). The discharge must be equipped with a siphon (no back draughts allowed). European legislation does not allow to discharge rinsing water into the drain. Rinsing water has to be cleaned before discharge. Alternatively we offer a closed loop rinsing tank to avoid rinsing water.

The standard version RBM 402 KF is equipped with an integrated rinsing tank. Tank, filter and pump are located in the frame of the machine. Before starting the machine, fill the tank with water. Open the lid of the brushing compartment on the top of the machine and fill in water. At the integrated rinsing tank there is a transparent tube filled with a filling level mark. Fill the tank only up to the mark.

When the machine is set up correctly, please make a function test.



Notes on reverse gear:

The reverse gear is used for emergencies! With it, jammed plates can be moved backwards out of the machine if necessary.

Reverse gear only works if the conveyor has been switched off beforehand. If a plate is jammed, turn off the brush, oscillation and drive and turn brushes up or down so that the plate comes free. Then switch on reverse gear.

After the plate has been freed, check the fit of the chain. If necessary, re-tension!

Function control

Please check:

Set both brushes to max. position

Dist. Br 1 = distance brushing roller 1 (upper) min. 20.0

Dist. Br 2 = distance brushing roller 2 (lower) min. 15.0

Check if brushing rollers are fixed correctly. If not, fix them hand-tight with the included socket spanner (wrench / Item no. SW 41). See details in chapter: exchange of brushing rollers.

Put thickness to max. (5 mm)

Make sure before switching on the main switch, that all functional switches:

Brush

Dryer

Conveyor

Oscillation

are switched off!

Then continue as follows:

Switch on Mains. With RBM 402 KF, the pump will start.

Switch on conveyor and check if rollers are turning correctly and speed may be varied with the potentiometer.

c = Conveyor/Antrieb	o = Oscillation/Oszillation
b1 = Distance Brush 1 Abstand Bürste 1	b2 = Distance Brush 2 Abstand Bürste 2
t. = Board thickness Plattendicke	p. = brush Pressure Bürstenandruck



Switch on oscillation. Check that oscillation speed may be varied with potentiometer.

Switch on dryer. Attention, do not touch heating elements and tubes. Heating-up time has to be approx. 1 min. Temperature is pre-set and is not to be changed.

Switch on brush. For security reason, brushing rollers can only be activated, if top cover is closed. It is not allowed to start engine on-load.

ATTENTION: The brush roller drive of the RBM 402 may only be switched on in an unloaded state. If the drive is blocked, an alarm sounds and the drive is switched off so that the machine is not damaged. The cause of the blockage must first be eliminated. The alarm is acknowledged by pressing the drive switch for a longer period of time (1-3 s) and the drive can be switched on again.

Operating

Surface quality

The RBM is equipped with medium fine brushing rollers for de-oxidisation and soft burring. The surface quality is a function of different parameters such as pressure, oscillation, conveyor speed, material quality and requirement of the job (de-oxidisation, polishing, burring). Optimised setting has to be found by individual tests.

This setting is preferably made with a dummy board that has a minimum length of approx. 250 mm and a min. width of 150 - 200 mm so that both brushing rollers can be brought into engagement.

Switch on the conveyor drive (conveyor) and move the board under the upper brush roller at a minimum feed rate (0.4 m / min in the display).

Set the brush pressure to approx. 40% in the display by adjusting the upper brush roller (the display may fluctuate by 5-8 display points due to the current measurement method).

Drive the board up to the lower brush roller.

Set the brush pressure to approx. 50% in the display by adjusting the lower brush roller.

The brush pressure should be set to the lowest possible value so that only the oxide layer is just removed. To achieve good adhesive strength for the laminate, the copper only needs to be slightly roughened. The higher the brush pressure, the greater the copper removal, which is undesirable.

In the case of scratched boards, the brush pressure should be increased until the scratches have been sanded out. If necessary, the board must be run through several times.

The information provided is only a guideline. The optimal settings are to be determined by tests, with the desired micrograph being the decisive factor.

ATTENTION:

The displayed value of the brush pressure does not correspond to a defined value.

The display serves for reproducibility of the settings as well as an overload display for the brush drive motor. The maximum value is 99%. If the value is exceeded, the brush motor switches off and a warning signal and an error message sound. The brush pressure must be reduced immediately! The error message can be acknowledged by switching the machine off and on again.

When the brush drive is switched on, the pressure display briefly goes to overload (motor starting current), but must run back within a few seconds.

Once the settings listed have been made, the brushing machine is ready for operation.

Presetting of RBM

Turn on mains.

Adjust distance of brushing rollers to maximum possible values.

Pre-set required board thickness.

Turn on brushing rollers and oscillation (oscillation hubs approx 70-90).

Adjust pressure. For pressure adjustment you need a cut off piece of PCB with minimal width of 200 mm and minimal length of 250 mm (to run both brushing rollers together).

Turn on conveyor and set speed to minimal value (0.2m/min). Enter board and modify the distance of brushing roller 1 so that approx. pressure 450 is achieved.

Drive board to roller 2.

Now modify the distance of brushing roller 2 until pressure is approx. 600.

Normally it is sufficient for PCB processing to work with low pressure to remove oxides and to have a good base for PTH or photo laminating. More pressure removes more copper, which is not wanted. Only deep scratches in the PCB surface require higher pressure and if necessary more than one processing.

These remarks are only guidelines. Best settings for your desired surface have to be found by trial.

ATTENTION: the pressure display shows the increase of power consumption of the brushing roller motor as well as a possible overload. That is why there is only a linear relationship between displayed value and pressure for boards of the same width. Nevertheless the display will be helpful to have good reproducible results.

When starting the motor, pressure display will show higher values for a few seconds. That is normal. If the value remains high for a couple of seconds, the motor is overloaded. In this case, stop the machine and repair failures.

After making these checks, the machine is ready for operation.

Drying

The dryer consists of a mechanical squeeze off and a hot-air drying compartment. If conveyor speed is set correctly, drying efficiency should be about 100 %. Important for good results is that the drying clothes are in a good condition. They have to be exchanged from time to time. Complete dry clothes work worse than moisten ones.

Maintenance

Exchange of brushing roller 1 (upper):

To change the brush, lift up brushing roller 1 by turning the hand wheel counter-clockwise.

Check distance display to be sure that the roller is in upper position.



Switch off mains and pull the plug.

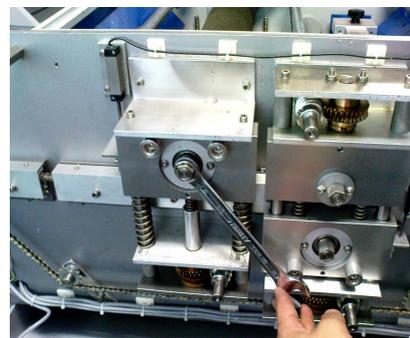
Open top cover of the machine.

Remove the hand wheels and loosen the fixing screws of the blue case on the right (seen from the inlet).

Loosen the fixing of the cable, so you can slide the cable through the case, when you remove the case.



Block the brushing roller manually and loosen full floating axle clockwise (left-handed thread !) till you can pull it off.



Take out brushing roller and dismount the shaft with the included wrench.

Insert shaft into new brushing roller and fix it with the wrench.
Attention: take care of rotating sense marked on the shaft !!

Insert complete unit into the machine.

Insert full floating axle.

Fix it by turning counter-clockwise.

Use socket spanner to fix axle hand-tight.

Close top cover and side cover. Mount hand wheels.

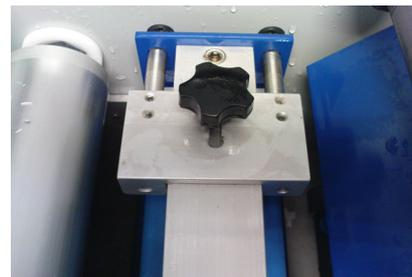
Grind brushing roller is necessary.



Exchange of brushing roller 2:

The brush changing for the lower brush roller is similar to the upper brush roller.

Before you can loosen the lower brush roll though, you must remove the rear pair of pressing rollers. To do so, loosen the black screw and push away the aluminium female holly from the machine wall. The pair of pressing rollers is now loose and can be removed from the leadership on the other side.



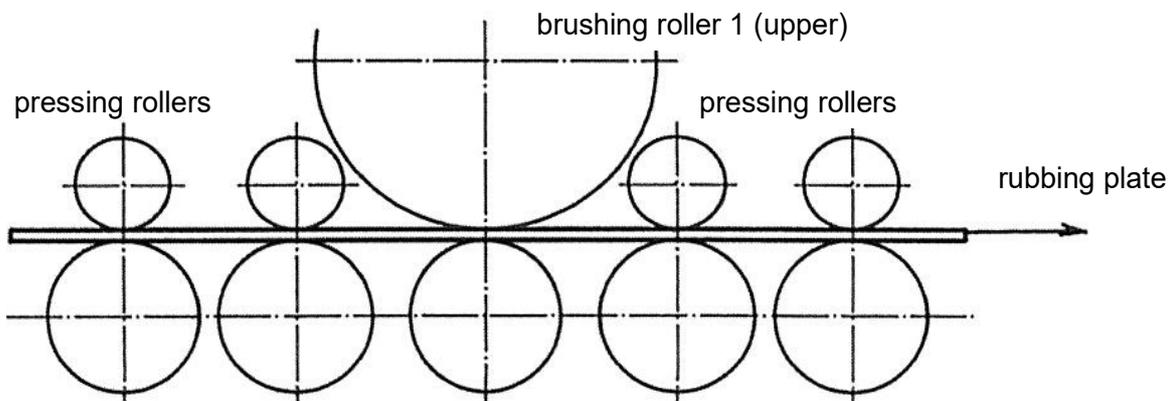
Grinding and levelling of brushing rollers

New and / or worn out brushing rollers have to be grinded by use of the included grinding board.

Procedure upper brushing roller:

Insert grinding board (rough side top) so that plate is fixed by press rollers (see drawing below) on both sides. Stop conveyor. Activate rinsing. Switch on brush rotation + oscillation. Feed brushing rollers by turning hand wheel clockwise until surface is levelled.

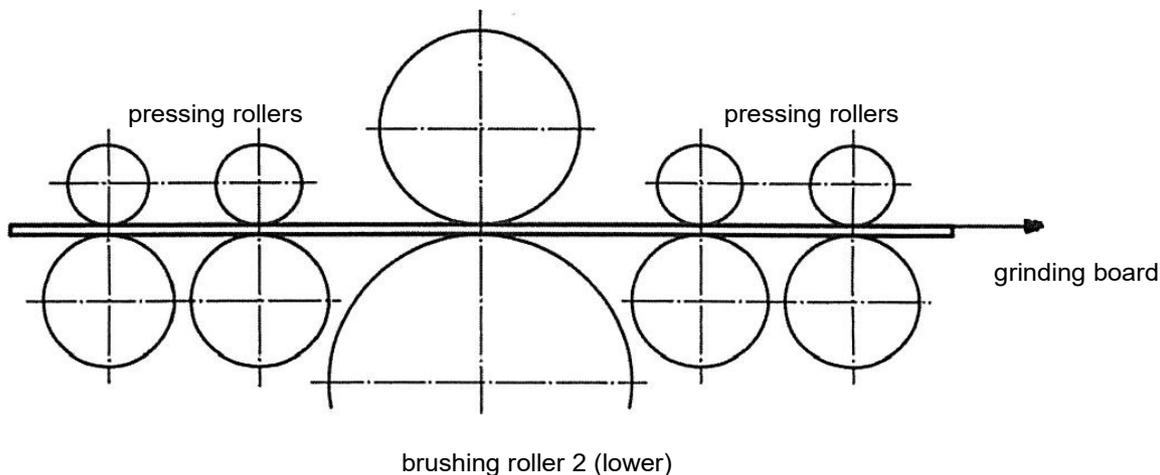
Turn on conveyor and drive out grinding board.



Procedure lower brushing roller:

Insert grinding board (rough side bottom) so that plate is fixed by press rollers (see drawing below) on both sides. Stop conveyor. Activate rinsing. Switch on brush rotation + oscillation. Feed brushing rollers by turning hand wheel clockwise until surface is levelled.

Turn on conveyor and drive out grinding board.



Your brushing machine is ready for use now.

Exchange of drying clothes:

Drying tissues have to be exchanged as required.

Switch off dryer and let it cool down. Dismount heat sheet by loosening 4 Allen key screws.

Dismount upper squeeze roller.

Remove old drying clothes and clean rollers.

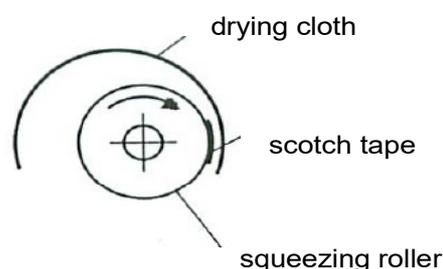
Fix new double sided scotch tape on the roller surfaces.

Cover upper roller with cloth. Roll up cloth and fix it temporarily with scotch tape to avoid uncoiling.

Cover lower roller according to schematic drawing.

Use conveyor transport to roll it up.

Insert upper squeeze roller and remove scotch tape fixation. Mount heat sheet again.



Friction bearings

At least every 6 month all friction bearings have to be oiled. Worm gear pair of brushing roller lifts have to be greased. Attention: full floating axle of oscillation system is fitted with silicon based sliding bearings that should not be greased nor oiled.

Do not oil the plastic bearings of the rollers. Plastic bearings may swell and if oil gets into the brushing compartment and on the pcbs you will have problems with other applications (e.g. pth, laminating and surface treatment)

RBM 402 KF: Change of Rinsing water

The water circulation in the tank has to be changed as needed. Since the rinsing water usually contains copper, it must be disposed of in accordance with your local legislation.

Turn off the main switch of the machine and unplug the power cable of the rinsing water tank.

Then loosen the two screws of tank fixation on the right and open the door. Take the two lids off the tank. You can remove the back lid by lifting it slightly and rotate the rear to the left and then pull it out to the left side.



Loosen the hose clamp from the water supply of the machine.



You can now remove the tank. This is especially easy if you have drained the water through the drain cock before.

Clean the tank thoroughly. Replace the filter if necessary, and mount the tank in the reverse order. Then fill the tank back from the brushing compartment on the top till the filling mark on the tank.



Spare part list

	Programmierter Konverter mit Halterung für RBM402	Converter incl. programming for RBM 402,	
	Bürstmotor mit Halterung für RBM402	Brushing motor with fixation for RBM402	
680182	Bürstwalze für RBM 402	abrasiv roller for RBM 402	
680185	Zahnriemen für RBM 402/402x	Belt for RBM 402/402	
6000	Aufnahmesystem Bürstwelle	Take up system for Brush RBM402	
6000 LM571830	Getriebemotor für Antrieb RBM402	Gear motor conveyor RBM402	
6000 LM571830	Getriebemotor für Oszillation RBM402	Gear motor for oscillation RBM402	

Guarantee

All machines are submitted before distribution to examination on 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

Bungard GmbH & Co.KG reserves the right to change or enhance its machines or machine specifications according to its judgement, if necessary. Bungard cannot be held responsible to implement aforesaid changes into machines sold already.

Bungard products and services are liable to the current prices and conditions, which are subject to change.

The instructions and definitions in this document are also subject to change and mark no assurance on the part of Bungard.

This manual contains informations of the Bungard RBM402 and is the translated English version.

Please regard the "Sales terms and delivery conditions". These are available after fulfilment of the contract. We don't furnish a guarantee or warranty in cause of damages at material or hurts of people because of

Incorrect use of the machine

Wrong setup, installing and operating of the machine or incapable service

Use of the machine with defective safety equipment

Non-observance of the service manual in regard to transport, stocking, setup, installation and service of the machine

Unlicensed modifications at the machine

Incorrect or incomplete repairs

Destructive force effect at the machine in cause of foreign objects or external use of force

Use of non-original spare parts

normal wear parts.

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.

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

Running the machine in corroding, humid, dusty, extremely hot or explosive atmosphere happens at the operator's own risk and responsibility.

We explicitly exclude any warranty for damages resulting from running the machine in in corroding, humid, dusty, extremely hot or explosive atmosphere.

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