

**LAARMANN**®

*Innovators in Solids*

**USER'S MANUAL**

**LAARMANN LM2000**

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## 1. SAFETY INFORMATION

Before using the machine, make sure to read and understand this manual thoroughly. Keep the manual close to the machine, easily accessible to all the users.





Improper operation can cause injury to persons or damage to the equipment.










### 1.1. WARNING SYMBOLS

The following are the warning symbols that are used in this manual.

	This symbol indicates a potential risk and alerts you to proceed with caution.
	This symbol indicates the presence of high voltage and warns the user to proceed with caution.
	This symbol indicates risks associated with hot surfaces.

### 1.2. SAFETY INSTRUCTIONS

	<b>Safety instructions</b> Claims for damages in any form whatsoever, for injury to persons or damage to the machine, caused through non-observance of the following safety instructions, are excluded.
	<b>Use according to the intended purpose</b> Do not make any alterations to the machine and use only approved spare parts and accessories. Otherwise the Declaration of Conformity will lose its validity and this will also lead to the loss of any guarantee claims.
	<b>Transport</b> Do not knock, shake or throw the LM2000 during transport. Otherwise the electronic and mechanical components may be damaged.
	<b>Packing material</b> Please keep the packing material for the duration of the guarantee period. In case of a complaint and return of the machine in unsuitable packing material, your guarantee claim will be lost.

	<p><b>Temperature variations</b></p> <p>If the LM2000 is subjected to high temperature variations, protect it against condensed water. Otherwise the electronic components may be damaged.</p>
	<p><b>Ambient temperature</b></p> <p>If the temperature drops below +5°C or exceeds +40°C, electronic and mechanical components can be damaged. Performance can be changed to an unknown extent.</p>
	<p><b>Atmospheric humidity</b></p> <p>If the humidity exceeds 85%, electronic and mechanical components can be damaged. Performance can be changed to an unknown extent.</p>
	<p><b>Electrical connection</b></p> <p>If the values for the mains power supply on the name plate are not observed, the electrical and mechanical components may be damaged.</p>
	<p><b>Inserting grinding media</b></p> <p>Ensure that the grinding media are inserted correctly in the machine. Otherwise they can be damaged, when starting the machine</p>
	<p><b>Removing and opening hot grinding media</b></p> <p>When removing and opening hot grinding media, always wear protective gloves. There is a danger of burning the hands</p>
	<p><b>Materials</b></p> <p>Observe the relevant regulations and directives for handling chemicals and hazardous materials.</p> <p>Milling of materials, which give a risk of fire or explosion, is prohibited.</p>
	<p><b>Cleaning</b></p> <p>Do not clean the LM2000 under running water. Danger to life through electric shock.</p> <p>Use only a soft cloth moistened with water. Cleaning agents and solvents should not be used, not for cleaning the milling tools either.</p>
	<p><b>Repair</b></p> <p>For your own safety, repairs must be carried out only by authorized service technicians.</p>



## 2. GENERAL DESCRIPTION

The LM2000 is a laboratory machine, which is suitable for pulverizing and homogenizing hard and brittle materials in the dry and wet state.

It is used for fast pulverizing.

The closed milling pulverizing system guarantees complete recovery of the samples.

Final finenesses of down to 20-40  $\mu\text{m}$  can be achieved, depending on the milling time and the specific properties of the sample material. The optimum filling of a LM2000 is around 1-1.3 Liters of sample material.

	The sample quantity should not be less than 25% of the bowl volume. <b>The puck may otherwise damage the bowl.</b>
	The bowl, puck and lid must always be made of identical material.

### **3. TECHNICAL FEATURES**

#### 3.1. CONSTRUCTION

The housing of LM2000 is made of steel plate with powder coated RAL5005 paint.

#### **Protective equipment**

The milling chamber of the LM2000 is safely closed by an electrical safety switch.

Starting of the machine is possible only when:

- power is connected;
- air pressure is sufficient;
- the emergency switch is not activated;
- all parameters are given to the digital program of the machine;
- There is a bowl inside of the machine when using the automatic program;
- Hood is locked;

#### 3.2. TECHNICAL DATA

Power supply	400V $\pm$ 10% - 50/60Hz
Rated power	2200W
Timer	5 sec - 99 min, timer HOLD function, in 1 sec steps (below 10 min), or 10 sec steps (above 10 min)
Max. bowl volume	2000 ml
Dimensions W x D x H (inclusive base plate)	1087 x 741 x 1378 mm
Weight	475 kg
Noise emission (without milling bowl)	70 dB(A)
Ambient temperature	+5°C - +40°C
Atmospheric humidity	< 85% RH

## 4. INSTALLATION

### 4.1. UNPACKING

Before the installation, carefully examine the delivery for possible damage or missing parts. Open the crate and take the machine out of the box. Check that the machine has not been visibly damaged during the transport.

Please keep the packing material for the duration of the guarantee period. In case of a complaint and return of the machine in unsuitable packing material, your guarantee claim will be lost.

Check that the mains cord is compatible with the local standard.

If any kind of damage occurred during transport, immediately make a complaint to the carrier. Any incorrect delivery or missing parts should be reported to the distributor.

### 4.2. SELECTING THE RIGHT PLACE

When selecting the right place for the machine, please consider the following:

- Put the device on smooth, horizontal and stable place.
- Leave enough space beyond the device for normal air circulation, min. 200 mm at the back of the machine.
- Leave enough space around the device, that you will easy control and maintain it.
- Don't use the device in surroundings, where there are fast temperature and humidity changes. Also avoid places exposed to direct sunlight and places nearby heating devices.
- Avoid places, where the possibility of shocks and vibrations exists.

**Note: The machine should not be placed so, that it is difficult to pull out the cord plug from mains power supply.**

### 4.3. CONNECTING THE POWER CORD

The correct voltage and frequency for the LM2000 are given on the name plate. Ensure that these values correspond to the available power supply system.

To avoid interference from noise, surges and spikes, a dedicated line is preferred. If no such line is available, avoid lines to which powerful electric motors, refrigerators and similar devices are connected.

The power can be turned on and off by the emergency switch, located on the front cover at the right side of the machine. Light in the switch indicates, when the power is on.

Note that when power is lost the saved programs will be lost!

#### 4.4. ENVIRONMENT CONDITIONS

The machine has been built for operating in laboratory environment. Therefore the environmental conditions should be the following:

- Temperature from +5°C to +40°C
- Humidity up to 85% RH, non-condensing



## 5. INSTRUCTIONS FOR USE

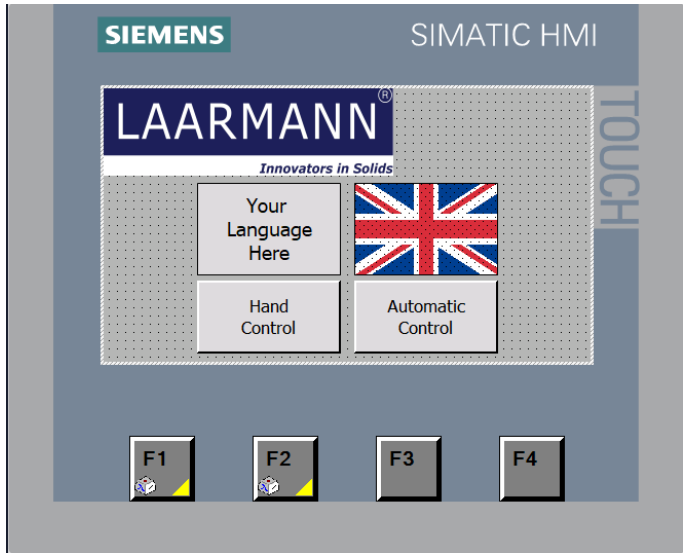
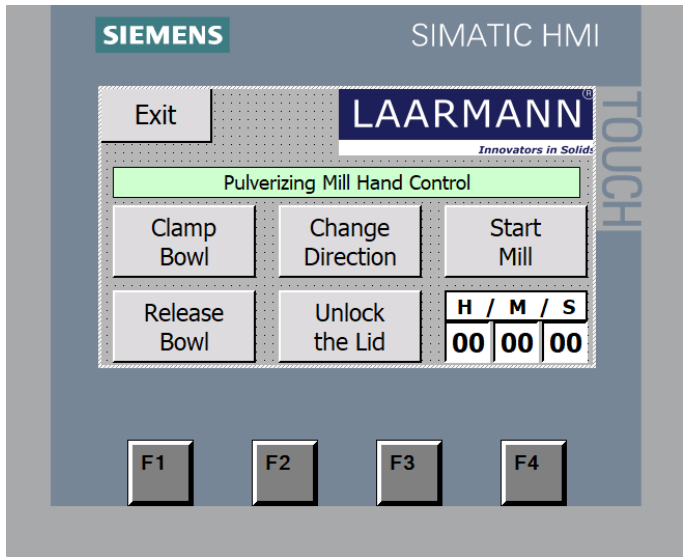
### 5.1. OVERALL VIEW


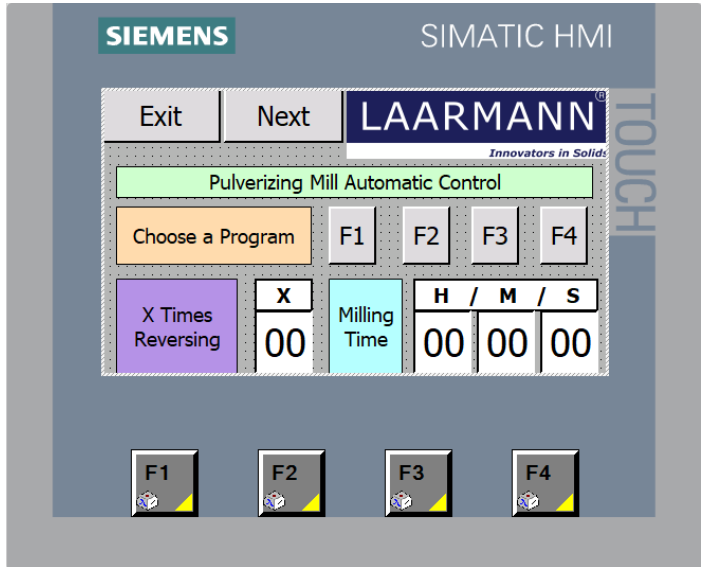


The LM200 has a couple new features:

- An improved air bellow system
  - The old machine released the bellow into rest position, in some cases this meant that the bowl can't be easily removed as the air bag was in the way. The new system sucks the air bag to its smallest size so the bowl can be easily removed.
- The overall footprint is decreased so a machine now fits onto an Europallet.
- The touchscreen has been moved from the hood to the side of the machine.
  - This prevents the cables wearing out over time.
- The machine now exist of an top and bottom half.
  - Removing the top half makes the inside easily accessible for maintenance.
- There is a new system for locking the lid.
  - There is an pneumatic magnet which resides in the framework and locks into the hood. The previous connection could break over time and when not aligned properly it wouldn't close.

5.2. Instructions for use

<p>1</p>	<p>This is the starting screen for the installation.</p> <p>Here you can select “Hand Controls” for manual input or select “Automatic System” for automatic.</p> <p>If you press “Hand Controls” go to <b>step 2</b>.</p> <p>If you press “Automatic System” go to <b>step 3</b>.</p> <p>If you experience errors please proceed to <b>step 6</b>.</p> <p>You can also have the controls in your own language, please contact LAARMANN for the options. Once bought your nations flag will appear next to the British flag and you can press it to switch languages.</p>	
<p>2</p>	<p>Here you see the overview of the manual system.</p> <p>Before starting the machine, you need to clamp the bowl. Press the “Clamp bowl” button and the button will change colour (green).</p> <p>You can press change direction while the machine is in motion to change the direction.</p> <p>To access the inside you must press Unlock the Lid to open the hood.</p> <p>Press “Start mill” to start the machine.</p> <p>When you stop the machine by pressing “Stop mill” you must press “Release Bowl” to be able</p>	

	<p>to remove the Bowl from the machine.</p> <p><b>H/M/S</b> count the passed time, these number can't be adjusted</p> <p>If you press exit, you will go back to the start screen.</p> <p>The hand control is mostly used for system checks and short milling. For operational use please use the automatic program.</p>	
<p>3</p>	<p>Here you see the overview of the automatic system.</p> <p>There are 4 available programs, F1 to F4. These also correspond with the physical numbers on the machine. In this screen you can set the programs. You switch between the programs by pressing on them, the last know settings will load.</p> <p>You can set the desired time by pressing <b>H</b>(our) / <b>M</b>(inutes) / <b>S</b>(econds).</p> <p>A number pad will appear (<b>see 5</b>) and here you can give in the desired speed or rotations. You confirm it by pressing </p> <p>When you have put in the desired parameters press next to go to the starting screen (<b>see 4</b>) and the settings will be saved automatically.</p>	

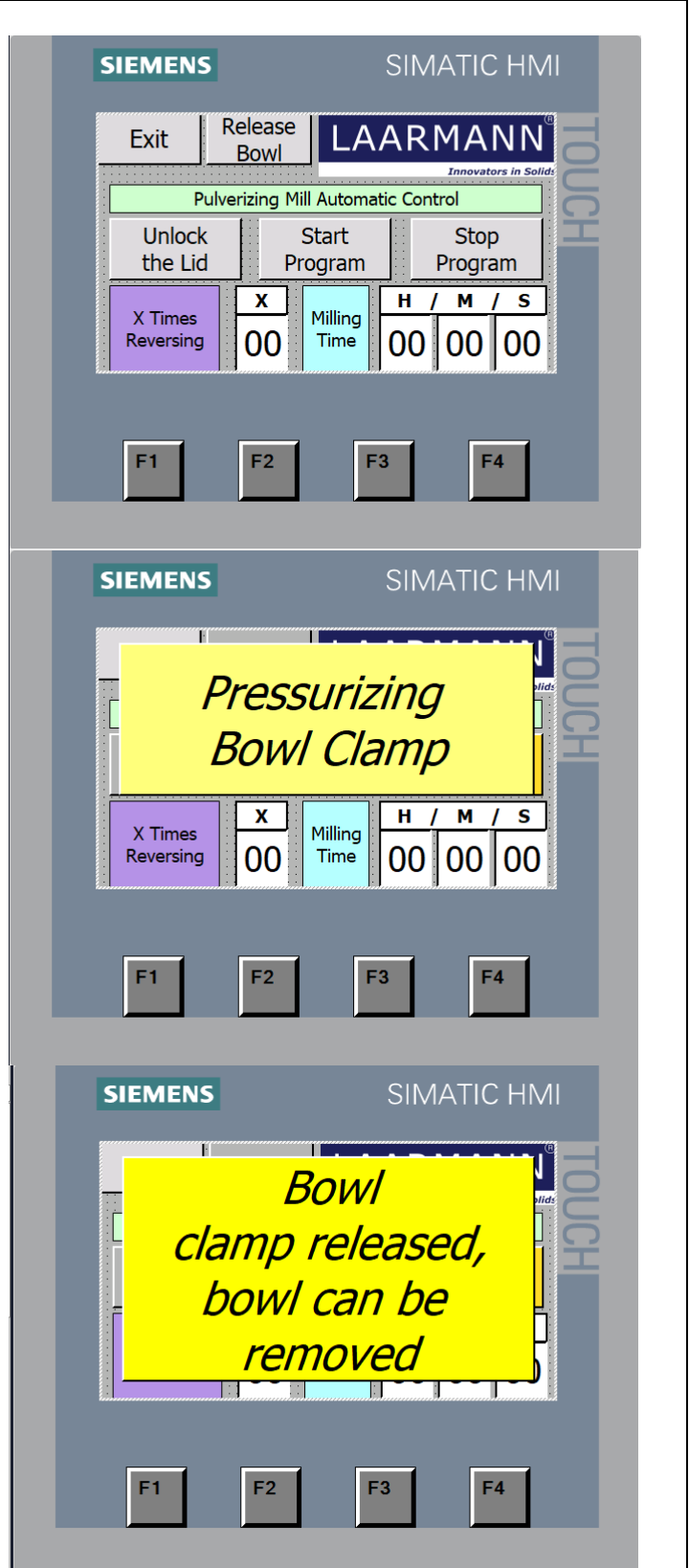
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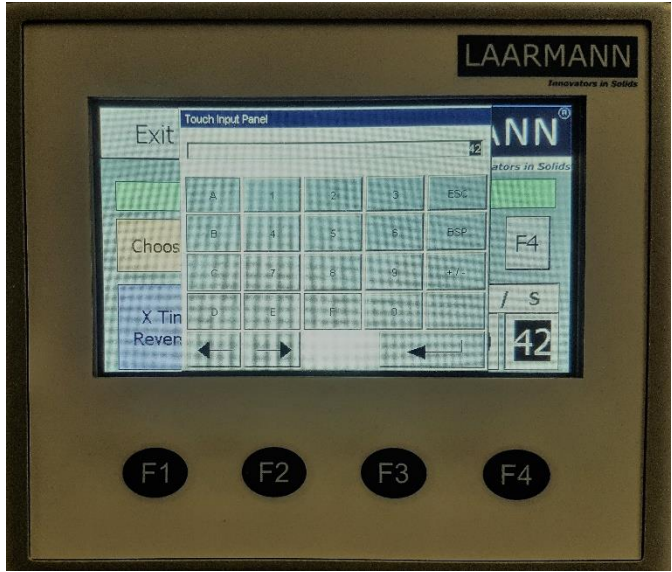
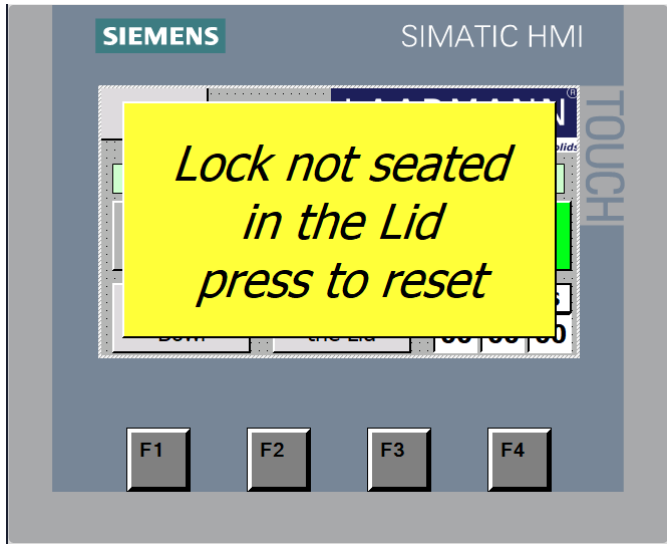

Here you see the overview of the automatic system starting screen.

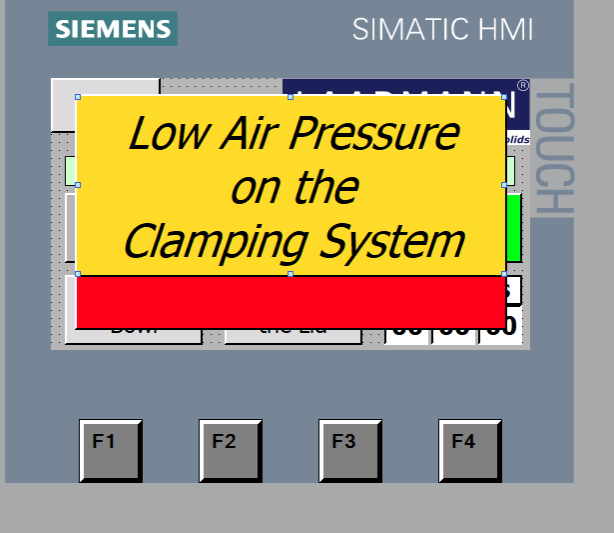
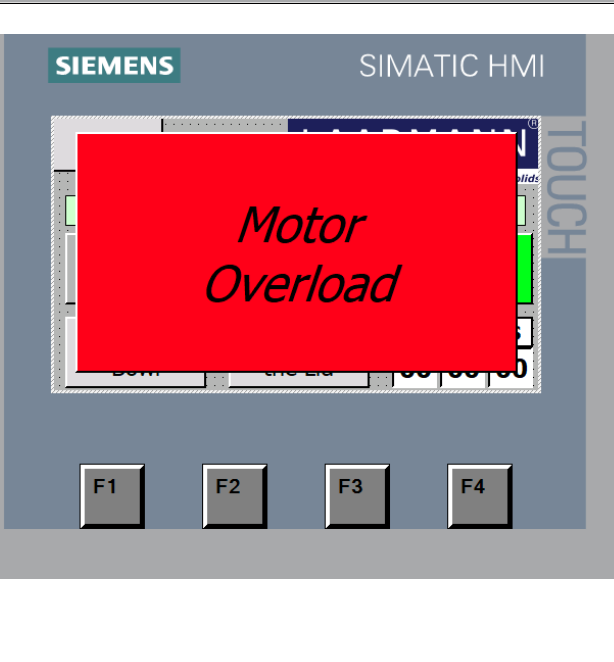
Here you will see the selected parameters and are able to start the machine for use.

The machine will automatically pressurize the bowl and start the program.

Once the programme has finished you can press “unlock the lid” and “release bowl” to open the hood and remove the bowl inside.



<p>5</p>	<p>Here you see the number pad.</p>	
<p>6</p>	<p>In case of this message, please close the hood and press "lock the Lid".</p> <p>If this message comes up when the lid is closed and you have pressed "lock the Lid" carefully check if you can open the hood or not.</p> <p>After verifying press to reset and check again.</p>	
<p>7</p>	<p>In case of this message, please check all the emergency stops and verify that the installation doors are correctly closed.</p> <p>To release the emergency stop you need to turn it and it will come up.</p> <p>After verifying that all stops are checked press the message to continue.</p>	

<p>8</p>	<p>In case of this message, please check the pressure coming from the supply.</p> <p>The pressure should be around 7-8 to ensure smooth operation.</p> <p>Also check if there is no air escaping within the system.</p> <p>Open the side panel with the delivered keys to verify that the machine receives enough pressure.</p>	 <p>The screenshot shows a Siemens SIMATIC HMI interface. At the top, it says 'SIEMENS' and 'SIMATIC HMI'. Below that, there's a yellow rectangular warning box with the text 'Low Air Pressure on the Clamping System' in black. Below the yellow box is a red bar. At the bottom of the screen, there are four function keys labeled F1, F2, F3, and F4. The background shows a faint image of a machine's control panel.</p>
<p>9</p>	<p>In case of this message please contact authorised personnel to check the motor of the machine.</p> <p>After visual inspection and ensured that no parts are either broken or damaged, contact an electrical engineer to verify the connections.</p> <p>When everything is checked, run the machine in hand control without grinding media inside. If the machine works properly you can resume using it as normal.</p> <p>Should it still not work, please contact Laarmann.</p>	 <p>The screenshot shows a Siemens SIMATIC HMI interface. At the top, it says 'SIEMENS' and 'SIMATIC HMI'. Below that, there's a large red rectangular error box with the text 'Motor Overload' in black. Below the red box, there are four function keys labeled F1, F2, F3, and F4. The background shows a faint image of a machine's control panel.</p>





## 6. WORKING INSTRUCTIONS

### 6.1. GENERAL

The LM2000 is a high performance product. It is used mainly in the processing minerals.


### 6.2 Starting the milling process

- Set the parameters as described before
- Open the lid of the machine and put in the sample on top of the puck in the bowl
- Close the machine lid and press start on the display.

	The milling process can only be started, when the hood is closed, the power is connected and when the air pressure is high enough.
	Do not open the hood during the milling process, also not by force.
	Do not mill inflammable or explosive samples! For these kind of samples, please contact LAARMANN for special features.
	Please note that the properties and therefore the dangerous nature of your sample, can change during the milling process.

### 6.3 Stopping the milling process

- Stop the milling operation by pressing the emergency switch.
- Pressing stop on the display
- When the milling time elapses, the milling process is automatically ended. The display is reset to the last set value.

	When removing and opening the bowl, always wear protective gloves. There is a danger of burning the hands.
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## 7. TROUBLESHOOTING

Problem	Explanation / Solution
Machine is not starting	Check the mains power supply. Check the air pressure Call the emergency knob and release it. Check if you have the correct settings for running the program.
Display doesn't work.	Call authorized service.

Should the problem not resolve, please contact LAARMANN.

## 8. MAINTENANCE

LM2000 needs to be greased first time after 20 hours.



Later intervals each 40 Hours.

LAARMANN advises to use LAARMANN GREASE. Similar can be graphite free, high temperature grease.

### 8.1. WEAR

The milling tools can become worn out, depending on the frequency of the milling operation and the milled material. The milling bowl, lid and puck should be regularly checked for wear and replaced, if necessary. Contact Laarmann for the corresponding spare parts.

### 8.2. CLEANING

	Before cleaning the machine, unplug the mains cord from wall socket. Use only a soft cloth moistened with water. Cleaning agents and solvents should not be used, not for cleaning the milling tools either.
	Do not clean the LM2000 under running water. Danger to life through electric shock.



9. PARTS LIST LAARMANN LM2000

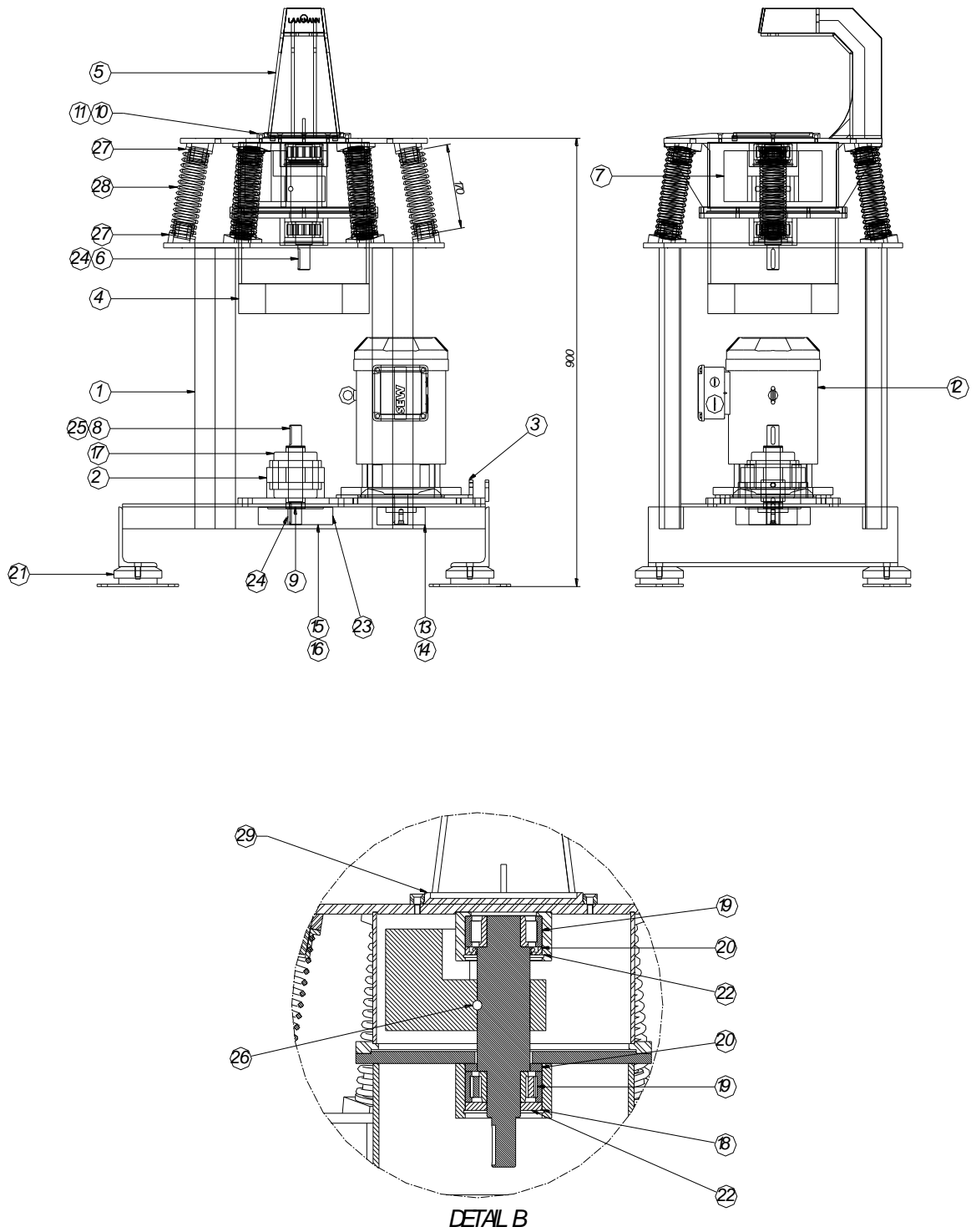
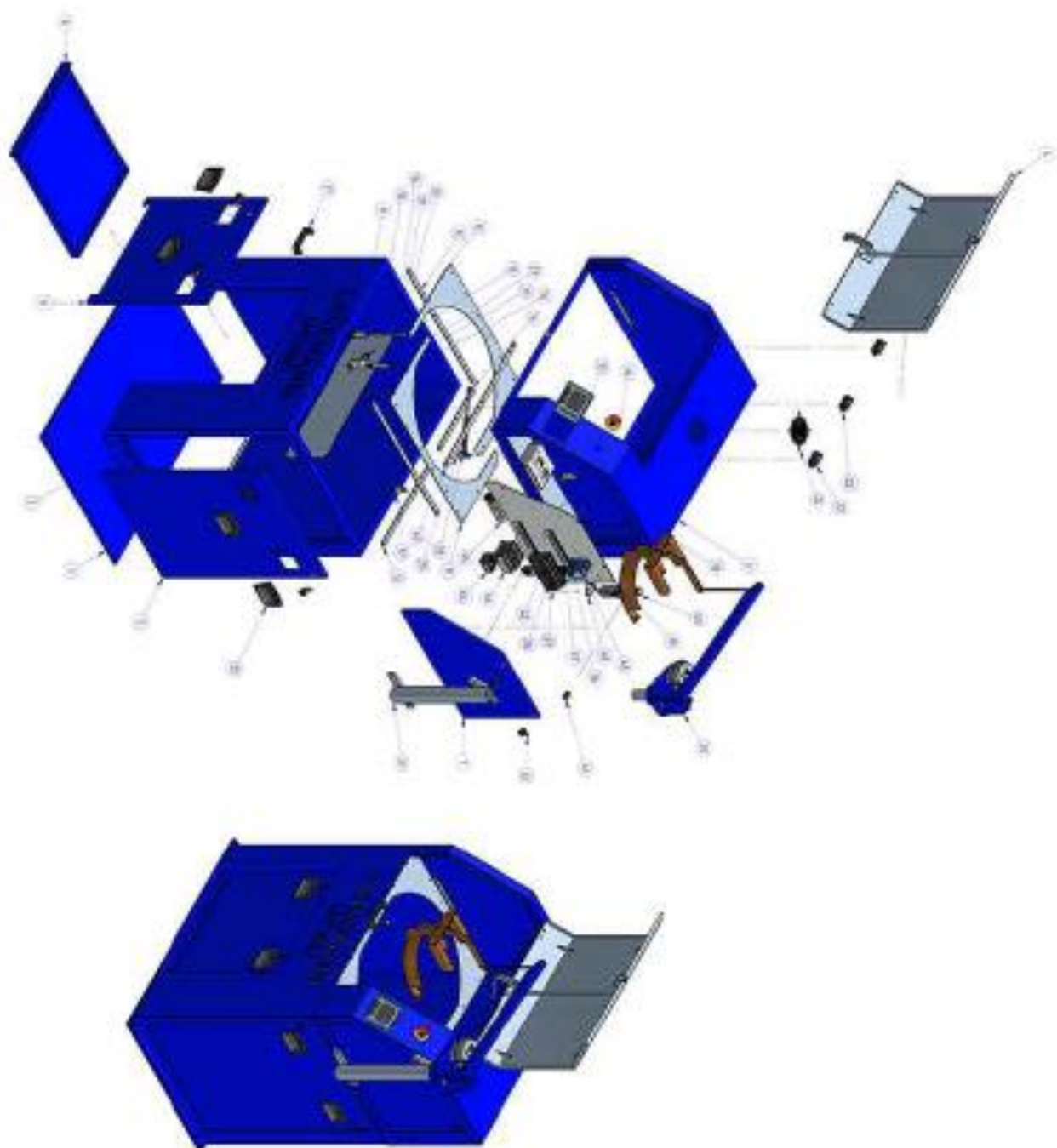


Fig.1: LM2000 internal parts

**MANUAL LM2000**

ITEM	QTY	Description	Specification
1	1	Subassembly frame	20120025-31-00
2	1	Subassembly bearing plate	20120025-32-00
3	1	Subassembly motor plate	20120025-33-00
4	1	Subassembly cover	20120025-34-00
5	1	Weld assembly clamping table	20120029-01-00
6	1	Cover shaft	20120025-35-01
7	1	Weight	20120025-36-01
8	1	Bearing shaft	20120025-37-01
9	1	Bushing	20120025-38-01
10	1	Mounting plate	20120029-02-01
11	2	Dowel	20120029-03-01
12	1	Electric motor	
13	1	Pulley	
14	1	Taper bush	
15	1	Pulley	
16	1	Taper bush	
17	2	Bearing	
18	1	Seal	
19	2	Bearing	
20	1	Seal	
21	4	Machine mounting	
22	2	Shaft circlip	
23	2	V-belt	
24	2	Shaft key	
25	1	Shaft key	
26	1	Pin	
27	12	Spigot bush	
28	12	Spring	
29	1	Platform insert	
30	1	Universal drive shaft	(not depicted)



ITEM NUMBER	NAME
1	Base Assembly
2	Binocular Right Microscope
3	Binocular Right Frontside Assembly
4	Binocular Right Bottom
5	View Assembly
6	Lock System
7	Microscope Raising Base Left
8	Microscope Raising Base Right
9	Base and Topbar connection Side
10	Base and Topbar connection Right Side
11	Base and Topbar connection Left Side
12	Base and Topbar connection Right Side
13	Base and Topbar connection Left Side
14	Base and Topbar connection Left Side
15	Front-Back Cylinder Mounting Bracket
16	Lamp Bracket
17	Air lock Mounting Bracket
18	mounting bracket
19	Left/Right Side Right
20	Spacer
21	Cylinder
22	Pen grid
23	Spring Mounting
24	Spring LM2000
25	Handle
26	Inner Lock
27	Mounting Foot
28	Pressure Sensor
29	Mounting Foot for Air Regulator

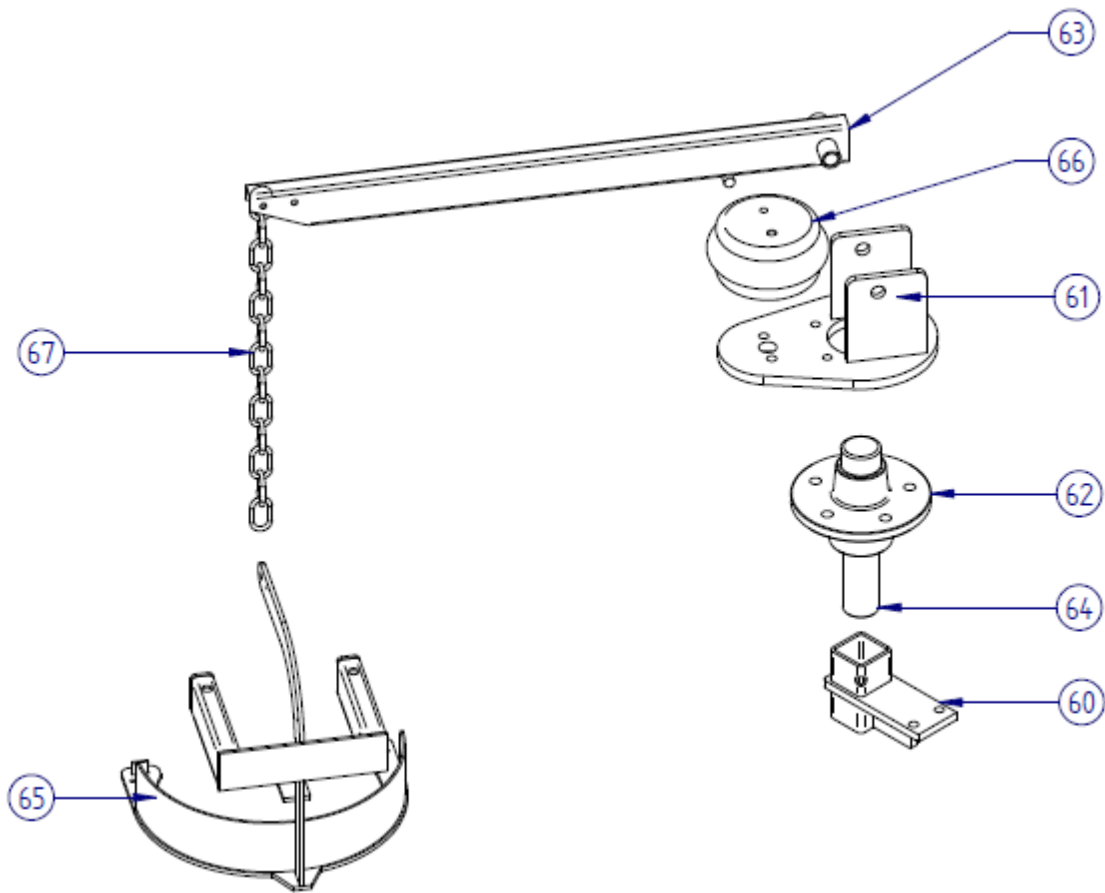


Fig.3: LM2000 Toolboy

ITEM	QTY	Description	Specification
60	1	Support	M0006-20-00
61	1	Turntable	M0006-03-00
62	1	Pivot	M0006-04-01
63	1	Lifting arm	M0006-15-00
64	1	Shaft	M0006-06-01
65	1	Cradle assembly	M0006-07-00
66	1	Airbagclamp	
67	1	Chain	
68	1	Mounting bracket filter reg. (not in picture)	M0006-08-01
69	1	Filter regulator (not in picture)	G1¼" 5mic. 0-12bar type: T171BEMAD

## 10. CE CERTIFICATE

LAARMANN  
**Pulveriser**  
**Type** LM2000  
Product Pulveriser  
Model LM2000  
Power supply 400V/50Hz



This declaration of conformity confirms compliance of the above mentioned equipment to the relevant sections of the following European Directives:

91/368EWG	European machine guideline
73/23/EWG	EC Low Voltage Guidelines
EN 292, 294, 418	Safety guidelines
VBG 1,4,5 en 22	General electrical facilities
89/336/EEC	Electromagnetic Compatibility Directive (EMC)
EN 5008-1-1992	Emissions
EN 50082-1-1992	Immunity
EN 60204-1 Part 1	Safety of Machinery – Electrical Equipment of Machines

### **WARNING:**

This equipment is required to be operated strictly in accordance with the instructions given in the operating manual supplied with the product. All supply voltages and frequencies as stated on the rating plate must be used. External power cables and connectors must be supplied by LAARMANN. Any additional equipment used must be of a type approved by LAARMANN.

### **This conformity certificate will lose its validity in case of:**

- **Usage of unlicensed spares**
- **Usage of unlicensed accessories**
- **Any self made modifications of the machine**

LAARMANN GROUP B.V.

Roermond, September 2012

Dhr. G. van Laarhoven