Schilling Marking Systems GmbH
In Grubenäcker 1
D-78532 Tuttlingen

Translation of the

Original Operating Manual

Multi-Marker

Please store for future reference!

Revision

Date	Version	Chapter	Reason	Responsible
06.07.2011	00.01	All	New edition	M. Schreieck
12.07.2011	00.02	All	correction	M. Schreieck

This Operating Manual was issued to the best of our knowledge. However, If you find any mistakes or unclear passages, please inform us accordingly. We will be thankful for any hints and suggestions.

Content

Illustrations

1 General Information

1.1 Scope of Supply and Responsibilities

This Microdot Marking System „Multi-Marker“ has been developed and manufactured by Schilling Marking Systems GmbH.

Technical changes due to new research and technology may be processed without prior notice.

The manufacturer is not responsible for subsequent changes applied by the operator.

Scope of Delivery:

Ill. 1 Scope of Delivery

- Base plate (1) with marking head (2), pillar (3) and hand crank (4)
- CD (5) with Software „SchillMarker II“ and Operating Manual (6).
- Mains adapter (7) and mains cable (8)
- Needle assembly (9)
- Pneumatic filter regulator (10)
- Pneumatic hose and connection (11)
- Serial connection cable (12)
- Screws (13)

The machine is delivered without a workpiece holder. It is the responsibility of the operator to assemble a suitable workpiece holder to the base plate, in order to avoid the need to manually hold the workpiece during the marking process.

1.2 Accessories

Ill. 2 Accessories

- Needle set
  - Light replacement needles with 60° / 90° / 118°
  - Normal piston and short piston, with springs
  - O-Rings, washers and allen-key

  Art. No.: 66.64SET.3
- „Multi-Marker“ portable version (optional)
  With handles and ground plate, incl. prism
- Pedal-operated switch to „START“ the marking process

2 Safety

2.1 Intended Use

The Marking machine subject to this document complies with the current safety instructions. If used in accordance to this operating manual, the Multi-Marker poses no danger to the operator or the workpiece.

The Multi-Marker is a microdot marking system for engraving workpieces made of metal or hard plastics.

The workpieces are inserted and removed manually.

This Marking unit is used in industries, both inside and outside of buildings (portable version). It is to be connected to a public electric power network.

Improper use: Utilization of workpieces made of wood and soft plastics (e.g. rubber).

This machine must not be used in areas that are exposed to danger of explosions!

2.2 Safety Classification

2.2.1 Structure of the Safety Classification

The following keywords linked with the hazard symbols are used in this document to illustrate possible dangers.

Danger!
Death or severe injuries **will occur** if the corresponding precautions are ignored.

Warning!
Death or severe injuries **may occur** if the corresponding precautions are ignored.

Caution!
Minor injuries may occur if the corresponding precautions are ignored.

Attention!
Material damage may occur if the corresponding precautions are ignored.

Information
Here you will find information and advice in order to be able to execute the subsequent operation effectively and safely.

2.2.2 Safety Signs and their Meanings

The meanings of the safety signs are indicated by the shape and the colour.

Shape	Colour	Meaning
	Safety colour red Contrasting colour white	Ban
	Safety colour yellow Contrasting colour black	Warning
	Safety colour blue Contrasting colour white	Command

2.2.3 Symbols used in this Document

Symbol	Meaning	Symbol	Meaning
	Warning: Dangerous places or situations		Warning: tripping hazard
	Warning: dangerous electrical tension		Warning: high pressure
	Unlock before operating		Use ear protection
	Don’t touch, live parts!		Advice for the disposal of materials

2.3 Saftey Instructions

The basic requirement for the safe usage and the undisturbed operation of the Marking System is the knowledge of the safety instructions and of the occupational safety regulations.

This Operating Manual includes all the important instructions for running the machine safely.

The internal corporate occupational safety regulations are to be considered.

Warning!

Ignoring this Operating Manual may cause injuries to persons and machine failure.

> This Operating Manual, and the safety instructions in particular, are to be read and implemented by every person who will operate the Multi-Marker.

> Only change the parameters and the settings after careful revision of this Operating Manual.

Danger!

Risk of death by touching “live” parts.

Only authorised electrical specialists may work on the electric equipment.

- Faulty connections or settings may cause damages.
- The device must only be operated with the provided cables.
- Do not work on live parts.
- Change faulty cables immediately. Fix loose connections. Ensure the device is disconnected from the power supply before working on any electrical parts.
- Cables must not be clamped or squeezed. Cables must be laid in a way that they cannot be damaged or expose tripping hazard. Don’t place anything on top of the cables and connections.

Explosion Hazard

- The Marking System must not be operated in areas that are exposed to the danger of explosion!

Warning!

Hearing Damage may be caused during continous operation!

Noise development during the marking process about 70dbA,

Noise development during a malfunction >70dbA.

- Wear ear protection

Warning!

Tripping Hazard!

> Make sure there are no loose cables or objects on the floor near the work area.

> Always place the device and the connections in a way that they nobody steps on them, drives over them or trips over them.

Warning!

Risk of injury by the improper usage of compressed air.

- Never point the exit end of the compressed air hose at humans. Severe body injuries can be caused.
- Never point the exit end of the compressed air hose at loose objects.
- Only authorised members of staff are allowed to work on the pneumatic device.
- Use dry, dust-free and oil-free compressed air. Otherwise damage can be caused to the solenoid valves, producing incorrect marking results.

Attention!

Material and functional damages!

- The device must not be doused with liquids, hosed with water or exposed to rain!
- Make sure the device stands properly during the transport and the commissioning.

2.4 Safety Concept

2.4.1 General Information

The target is to protect:

- the members of staff from injuries,
- the Microdot Marking System from damages and standstill,
- the environment from hazards.

The following safety measurements have been taken in accordance with a risk assessment:

- 24 V-connections for the motors of the moving X/Y axes to protect from an electric shock,
- The holding torque of the driver for the movement of the marking head on the X/Y-Axis has been minimised to an extent that the motor can be held manually at any time. This is to avoid contusions at the bottom opening of the marking head housing,
- Flares as status detector,
- Safety advice on the device and in the Operating Manual.

2.5 Remaining Risk

Symbols for warning from residual risks, that cannot be eliminated constructionally, have been fixed to the device.

Note

Consider all

- warnings and safety advice,
- other markings, such as rotating and transport directions

that are attached to the device.

2.6 Personnel Requirements, Duty of Care

2.6.1 General Information

Never have the device operated by members of staff who are under the influence of substances that reduce the ability of reaction or who are not able to operate the machine due to health problems.

Staff members who are to be trained or introduced to the machine may only operate the device under the supervision of an experienced trainer.

Note

This Operating Manual must always be available nearby the machine. The place of storage must be known by the members of staff.

2.6.2 Duty of Care

The members of staff must

- have read and understood this Operating Manual
- have been instructed to the functions of the machine
- know how to operate the machine
- not suffer from such health problems that could affect the ability to operate the machine.

2.6.3 Training

Only reliable, trained and instructed members of staff may operate this device.

Maintenance work may only be executed by specialists who have been trained accordingly and have the knowledge and the experience to assess the task, identify possible hazards and take the necessary precautions to eliminate the danger of accidents.

2.7 Procedure in the case of Emergency

Consider the following points:

- The places of the first aid stations must be known
- Members of staff must be informed about the procedures in the case of emergency.
- The correct procedures must be controlled regularly and recorded accordingly.

3 Technical Specifications

Dimensions & Weight			
Dimensions	L x H x W	Marking Head	149x198x173
		Pillar and Base Plate	380x260x680
Weight	kg	Marking Head	approx. 4,6
		Pillar and Base Plate	approx. 8,8

Marking Data	
Marking area x / y	100 x 50 mm
Height adjustment	310 mm
Marking speed	1 mm/s to 50 mm/s, 1 char/s, 3 mm height
Traverse speed	max. 80 mm/s
Marking resolution	0,1 mm, both X/Yaxes
Character height	from 1 mm freely editable
Stylus frequency	0 - 100 Hz
Impact force	adjustable
Height compens. of needle	max. 5 mm
Character set	DIN 1451m, additional sets available on request
Formats	Linear, angular and circular text, date, serial numbering, counter with pre- and suffix function, logos and graphics

Energy Supply	
Power consumption	20 VA
Supply	90-265 VAC , 50/60 Hz
Memory	1 MB Flash / 1 MB RAM
Marking medium	Compressed air, oil-free, dry
Air requirements	200 l / min
Working pressure	6 bar

Work Environment	
Acceptable ambient temperature	5 °C to 45 °C
Noise emission	70 dB (A)

4 Machine Description

Ill. 3 View

Pos.	Description
1	Marking head
2	Base plate and aluminium profile
3	Compressed air filter regulator with connections for compressed air, manometer glycerine filled
4	Pillar with hand crank for height adjustment
5	Needle assembly with marking needle
6	Open bottom side with motor and marking head guide

4.1 Functional Description

The Multi-Marker with its pneumatic needle marking is used for engraving metal and hard plastic parts, e.g. for the automatic part identification.

During the marking process, the needle on the marking head displaces and compacts the material of the workpiece which forms the typical marking.

By regulating the valve control of the compressed air unit (max. 6 bar) the impact force and the marking speed of the marking head can be adjusted.

The needle in the marking head is spring loaded. During the marking process, the needle frequency determines the marking result. The standard frequency is 80 Hz / s.

The marking frequency is determined by the amount of opening and closing impulses of the magnet valve.

The head with the marking needle is moved by an electric motor (24V). The motor is software controlled. The movement depends on the programmed marking picture.

The delivered software „SchillMarker II“ controls the marking machine. A PC must therefore be connected by the corresponding interface. After the transfer of the marking parameters, the data chip that is already integrated into the Multi-Marker allows a PC-independent marking.

4.1.1 Introduction to Marking Technology

The marking procedure displaces material, and does not remove it. This means the material is compacted at the point where the needle penetrates the material surface. At the same time the material is displaced, producing a warp of material at the side and in front of the needle puncture point.

The deeper the needle penetrates the material, the higher the material warp.

Penetration depth:

The penetration depth is defined by the needle weight, the spacing of the needle to the workpiece and the pressure applied to the needle, together with the geometry of the needle tip.

Regardless of the needle type and geometry, as a basic rule it always applies that:

The larger the spacing of the needle to the workpiece, the higher the pressure setting at the maintenance unit, the deeper the marking.

The penetration depth defines the marking quality!

Fine lettering – slight depth

Keep the needle spacing to the workpiece as small as possible (approx. 0.5 mm). Reduce the pressure at the pressure valve accordingly (approx. 2,0 -2,5 bar).

Uses:

- for very thin material
- for very small lettering (e.g. 0,5 mm lettering height)
- to avoid material warping at the displacement point

Normal lettering – medium depth – light needle component

Needle spacing approx. 1 mm to 1,5 mm above the material surface. Pressure approx. 2,5 bar (material dependent).

Uses:

- for the most common marking types with character height > 1 mm

Needle frequency

The needle frequency in Hertz (Hz) indicates how often the needle is extended per second.

Examples:

- 10 Hz, the needle is extended 10 times per second (very slow).
- 50 Hz, the needle is extended 50 times per second (medium).
- 100 Hz, the needle is extended 100 times per second (fast).

The lower the Hertz number, the fewer dots are marked! If you also increase the marking speed, even fewer dots are marked. This produces “stress-free” marking for the material.

Vice-versa, the higher the Hertz number, the more dots are marked. Reducing the speed results in even more dots, producing a more detailed marking.

Standard lettering with the Multi-Marker is produced with 80 Hz.

Speeds

The speeds are stated in millimetres per second (mm/s). The marking speed is the time in which the needle moves during the marking procedure.

A speed of 10 mm/s is sufficient for standard lettering.

The **fast speed** is the distance between the zero point to the start of the lettering, between the individual vectors within a character and between the characters. The fast speed should be identical with the marking speed, but can be increased. The maximum fast speed should not exceed a speed of 60 mm/s.

The **reference run** describes the movement of the needle to the reference position and should not exceed a speed of 40 mm/s.

Pulses

The pulses are the times in which the valve opens and closes. These times are stated in milliseconds (ms).

The first impulse provides the needle with enough air to penetrate the workpiece with enough depth at the first point after the resting position. If the time is set too high, the first puncture is clearly visible. In standard lettering, the time of the first pulse should be clearly less than the following pulses or be suppressed completely (1 ms).

For the following pulses, the needle is already moving so it does not need so much air as for the first time. For standard lettering the time should be 2.9 ms.

Waiting Time Start

Here you can adjust whether the needle should move straight away or wait briefly. The standard setting is 1 ms. This function is only important for very special marking tasks, e.g. for the 2D matrix code.

Waiting Time Stop

Similarly to the waiting time start, here the needle waits after the moved vector. The setting for standard lettering is 1 ms.

Needle

The standard scope of supply includes a soft spring with a light needle with a 118° tip. Many tests have revealed that this generally produces the best results. However, it is not possible to generalise here because the marking results depend on the material of the workpiece being marked, and on the character size. The needles are made of carbide and can be reground using a diamond wheel if necessary.

Our needles are available with a tip geometry of 60°, 90° and 118° - depending on the application. We can produce other tips on request.

Needle	Needle	Geometry	Radius
3 mm	6 mm	60°	R = 0,3 mm
3 mm	6 mm	90°	R = 0,5 mm
3 mm	6 mm	118°	R = 0,5 mm

5 Transport

The Multi-Marker is a mobile station. Ensure it is placed firmly.

5.1 Transport Bracket

The linear actuator of the marking head is secured during transportation to reduce damage.

Attention!

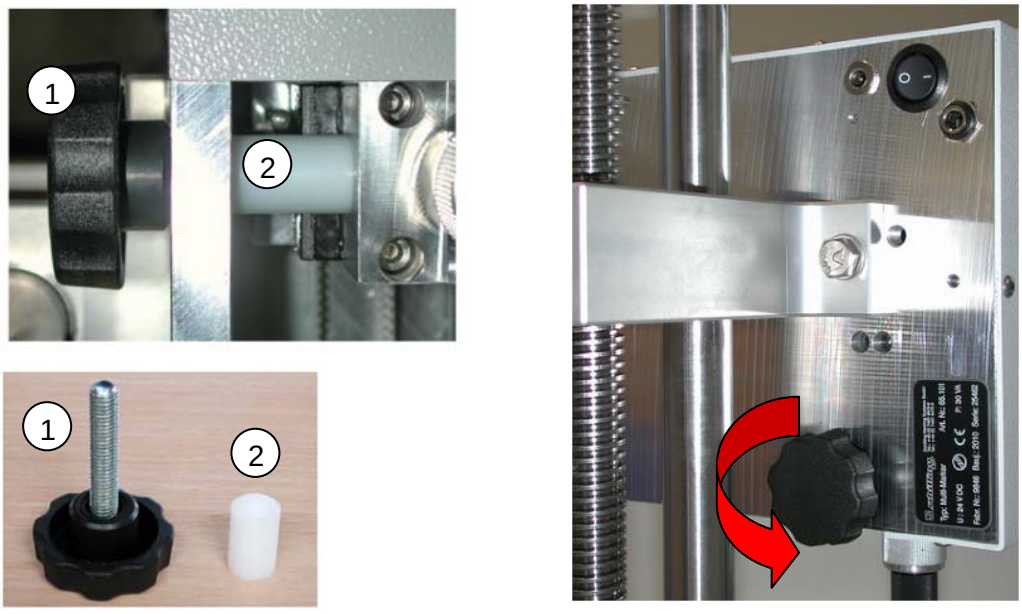
Material damages and risk of injuries!

- Work carefully – hands and feet might get crushed.
- Make sure the Multi-Marker cannot fall over or drop during the transportation.
- Ensure before transportation that all moveable parts are secured.

Attention!

Damage to motor!

- Remove the transport bracket before operation.



Ill. 4 Transport Bracket

- Unscrew the locking device (1) and remove the spacer sleeve (2).
- Please retain the two parts in case you need to reship the Multi-Marker.

6 Installation and Initial Operation

6.1 Assembly

6.1.1 Safety instructions for the Assembly

Attention!

Damage to machine!

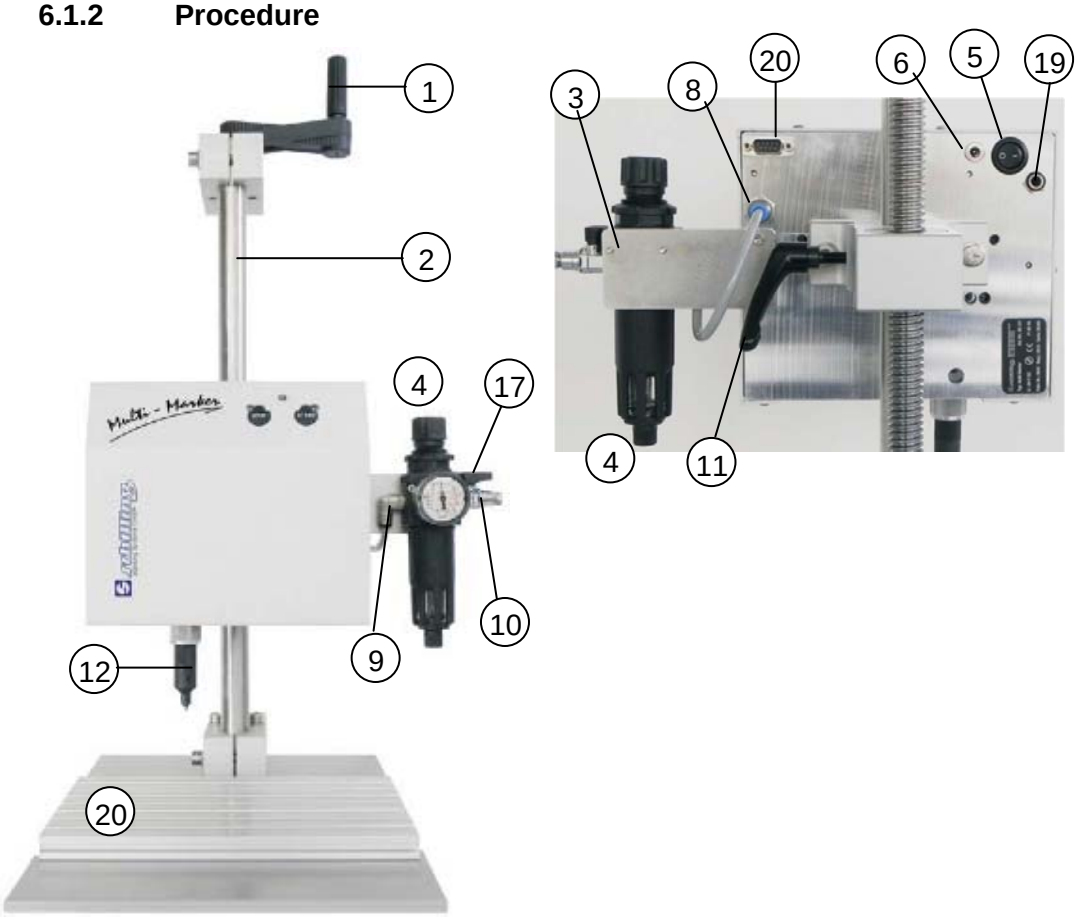
- Always ensure that the device is placed on a stable work surface.
- Choose a dry, flat and non-slip location.
- Ensure appropriate ergonomics.

Warning!

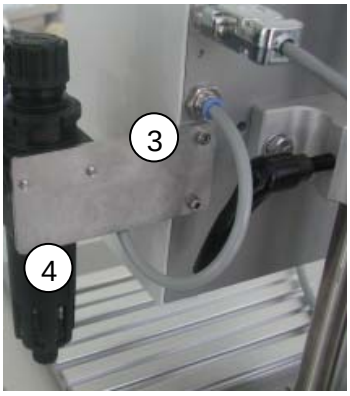
Tripping hazard!

- Ensure that no loose cables or objects are lying on the floor around the work area.
- Always place the device and the connections in a way that nobody steps on them, drives over them or trips over them.

6.1.2 Procedure



Ill. 5 Assembly



- Choose an appropriate location
- Fix the hand crank (1) onto the pillar (2)
- Use the delivered screws to fix the bracket (3) together with the compressed air filter regulator (4) on the right of the rear side of the marking head housing.

Electric Power Supply:

Ensure that the mains switch (5) is set on „OFF“ (O).

- Connect the power supply to the marking head (see connection (6) on the left of the rear side of the marking head).
- Connect the mains cable and the power supply. Plug the mains cable into a secured socket.

Pneumatic Supply:

- **First**, connect the short pneumatic hose with the entry (8) to the right of the rear side of the marking head and the exit (9) to the maintenance unit (left).
- **Then**, connect the pneumatic supply hose first with the entry to the maintenance unit (10) and then with the pneumatic network.

Warning!

Risk of injury by the improper usage of compressed air.

- Never point the exit end of the compressed air hose at humans. Severe body injuries can be caused.
- Never point the exit end of the compressed air hose at lose objects.
- Only authorised members of staff are allowed to work on the pneumatic device.
- Use dry, dust-free and oil-free compressed air. Otherwise damage can be caused to the solenoid valves, producing incorrect marking results.

Attention!

Damage to machine!

- Use dry, dust-free and oil-free compressed air. Otherwise damage can be caused to the solenoid valves, producing incorrect marking results.

Needle Assembly:

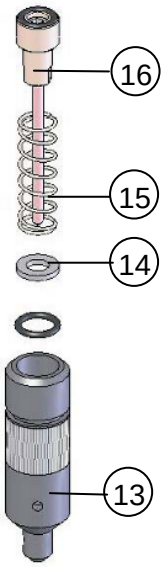
- Loosen the fixing screw (11) on the right of the pillar and crank the marking head upwards so that you can fit the needle component easily.

  Check the needle assembly (12)!

  It consists of the needle holder housing (13), a plain washer 6 mm inner diameter (14), spring (15) and needle with piston (16).

Commissioning the Needle Assembly:

- First place the washer in the cylinder, then the spring on the washer, and then insert the needle!
- Now open the shut-off valve (17) at the maintenance unit and adjust the pressure initially to approx. 2.5 bar.
  If the marking is too fine, increase the pressure as required.



Ill. 6
Needle Assembly

Available Needles

- 3 mm needle, light with soft spring
- 3 mm needle, moderate weight with hard spring
- All needles available with 60°, 90° and 118° tip angles.
- Special lengths of needle and needle holders are available on request.

Spacing the needle to the workpiece:

- After commissioning the jig (or similar, not included in the delivery) to the base plate (19) and inserting the workpiece, use the hand crank (1) to move down the marking head until the tip of the needle reaches a distance of about 1 to 1.5mm to the workpiece..
- Use the set screw (11) to fix the marking head in this position.
- If necessary, readjust the needle after a first test marking.

Jigs

Jigs are used to position and fix the workpiece. On request we also deliver special jigs made in accordance to your requirements or help you to find a suitable fixing aid.

Foot Switch

A foot switch facilitates the starting of the marking process, e.g. if the workpiece is held with both hands.

- The foot switch is to be connected to the rear side of the Multi Marker (19).

6.2 Initial Operation

Attention!

Damage to motor!

- Remove the transport bracket before starting. (see chapter 5.1.)

Installation and Connection of the Machine Controller

The marking jobs are controlled by a PC or laptop. After the transfer of the marking parameters, the data chip that is already integrated into the Multi-Marker allows PC-independent marking.

- Install the software „SchillMarker II“ onto a PC / laptop. Insert the CD into the drive and follow the installation instructions.
- Connect the PC/ laptop with the delivered cable to the interface (20) of the Multi-Marker.
- Start the software „SchillMarker II“.

Please read the instruction manual (on the installation CD) for the operation of the software „SchillMarker II“!

7 Operation

7.1 Safety Instructions for the Operation

Warning!

Ignoring this Operating Manual may cause injuries to persons and machine failure.

> This Operating Manual, and the safety instructions in particular, are to be read and implemented by every person who will operate the Multi-Marker.

> Only change the parameters and the settings after careful revision of this Operating Manual.

Warning!

Hearing Damage may be caused during continous operation!

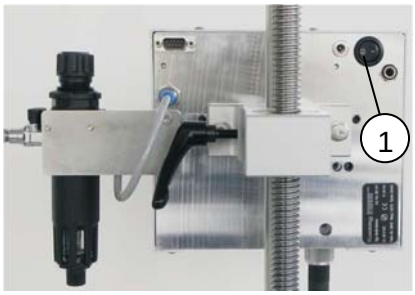
Noise development during the marking process about 70dbA,

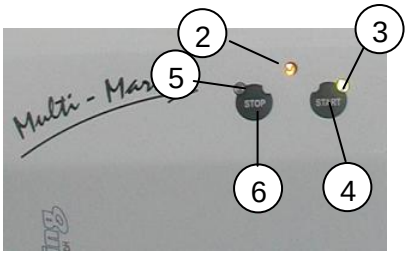
Noise development during a malfunction >70dbA.

- Wear ear protection

7.2 Switching on and off

- Use the rocker switch (1) to switch on the Multi-Marker.
- The yellow light (2) indicates that the machine is switched on.
- The green light (3) indicates that the machine is ready for use.
- Press „START“ (4) to start the Multi-Marker.
- As soon as the machine is working the red light (5) is illuminated. The device is ready to be stopped. Once „STOP“ (6) is pressed, the red light is extinguished. The driver of the marking head stops and the machine is ready again to use.





8 Troubleshooting

The following chart will help to localise and correct problems occuring on the machine.

Error	Possible Cause	Elimination
Faint marking results	Wrong adjustment of the distance and / or the pressure of the needle.	Readjust the distance and the pressure of the needle
	Needle defect	Exchange or reground the needle.
	Workpiece not suitable (wood, soft plastics, rubber)	Replace the workpiece
High noise level	Leaking compressed air supply	Check the pneumatic connections
	The distance of the needle to the workpiece is too high	Reduce the distance of the needle to the workpiece
	Missing workpiece	Insert the workpiece into the jig
PC-independent working is not possible	The memory chip has „lost" the marking job	Exchange the battery on the control board, reload the marking job from the PC.
The marking of text is not possible (only the marking of graphics functions)	The memory chip has „lost" the character set	Exchange the battery on the control board, reload the character set with the PC and the software „MegaDater"

9 Maintenance

9.1 Safety Instructions for the Maintenance

Danger!

Risk of death by touching “live” parts.

Only authorised electrical specialists may work on the electric equipment.

- Faulty connections or settings may cause damages.
- The device must only be operated with the provided cables.
- Do not work on live parts.
- Change faulty cables immediately. Fix loose connections. Ensure the device is disconnected from the power supply before working on any electrical parts.
- Cables must not be clamped or squeezed. Cables must be laid in a way that they cannot be damaged or expose tripping hazard. Don’t place anything on top of the cables and connections.

Warning!

Risk of injuries by the improper use of compressed air.

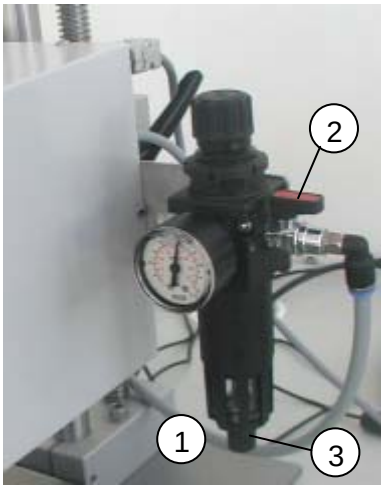
- Before starting the repair, release the pressure of all system parts that need to be opened.
- Never point the exit end of the compressed air hose at loose objects.

Consult our technical maintenance staff members in case of:

- the mains cable or the mains plug being damaged or scratched;
- the transmission cable being scratched or the plug being damaged;
- liquid being spilt over the machine;
- the machine having been exposed to rain or water;
- the machine having been dropped or damaged;
- a clear reduction of the performance of the machine or the marking result.

9.2 Compressed Air Filter Regulator

The Multi-Marker is nearly maintenance-free. However, condensation may accumulate over time inside the compressed air filter regulator and this needs to be removed regularly.



> Check the water level at the window (1) of the filter

> Deactivate the compressed air supply by closing the lock valve (2).

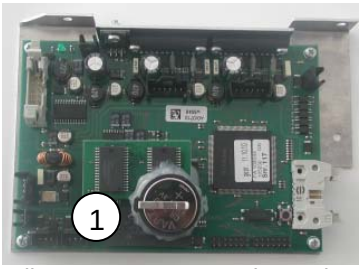
> Open the drain screw (3) of the maintenance unit and collect the condensation with a suitable container or cloth.

> Close the drain screw (3) of the filter regulator and open the compressed air supply (2).

9.3 Battery Replacement

The memory chip on the control board should not loose the character set or the „marking job“ when the Multi-Marker is disconnected from the power supply. Therefore, a button cell (1) has been integrated into the control board which needs to be replaced after a long storage time (lifetime of the battery about 3-4 years).

Please consult our service staff members.



Ill. 7 Control Board

10 Dismantling and Disposal

10.1 Dismantling

> Disconnect the machine from the power supply and other supply connections.

> Release the pressure from any pneumatic parts.

10.2 Storage

If the storage conditions are ignored components may corrode or suffer from premature aging. This may lead to a reduction of the lifetime of the machine.

> Always store the machine and its components in a dry area and protect it from the influences of the weather.

10.3 Disposal

Information!

Protect the environment!

The usage and the disposal of old parts are legally regulated.

EC Declaration of Conformity

According to the following EU directives:

- **2006/42/EG Appendix II, 1 A - Machinery Directive**
- **EG 2004/100/EG – EMC Directives**

Manufacturer:	**Authorised representative of the manufacturer: (only for imports from outside of the EU)**	**Authorised representative for the technical documentation (responsible for the documentation):**
Schilling Marking Systems GmbH In Grubenäcker 1 D-78532 Tuttlingen	(to be entered by the manufacturer)	(to be entered by the manufacturer)

The manufacturer / authorised representative declares that the following apparatus:

Product designation:	Microdot Marking Machine
Type:	Multi-Marker
From Serial Number:	25697 onwards
From year of manufacture:	2011 onwards

complies with the essential requirements of the above mentioned regulations,

based on the following harmonized standards and specifications applied:

EN 349	1993 + A1:2008	Safety of Machinery - Minimum Gaps to avoid Crushing of Parts of the Human Body
EN 614-1	2006	Safety of Machinery – Ergonomic Design Principles – Part 1: Terminology and General Principles
EN 894-1	1997	Safety Of Machinery - Ergonomics Requirements for the Design of Displays and Control Actuators - Part 1: General Principles for Human Interactions with Displays and Control Actuators
EN 1037	1995+ A1:2008	Safety of Machinery – Prevention of Unexpected Start-up
EN ISO 4414	2010	Pneumatic Fluid Power - General Rules and Safety Requirements for Systems and their Components
EN ISO 12100	2011-03	Safety of Machinery - General Principles for Design - Risk Assessment and Risk Reduction
EN 60204-1	2006	Safety of Machinery - Electrical Equipment of Machines - Part 1: General Requirements
EN 61000-6-2	2005	Electromagnetic Compatibility (emc) - Part 6-2: Generic Standards - Immunity for Industrial Environments
EN 61000-6-4	2007	Electromagnetic Compatibility (EMC) -- Part 6-4: Generic Standards - Emission Standard for Industrial Environments
EN 61310-2	1995	Safety of Machinery - Indication, Marking and Actuation - Part 2: Requirements for Marking
EN 61310-3	1999	Safety of Machinery - Indication, Marking and Actuation - Part 3: Requirements for the Location and Operation of Actuators

And also the relevant German standards and guidelines.

This Declaration of Conformity will lose its validity if changes are made on the device that have not been approved in writing by Schilling Marking Systems GmbH.

Tuttlingen, 08.08.2011	**Rosmarie Schilling, CEO**	
(Place / Date)	(Printed Name / Position / Title)	(Signature)