

# PROTOPLACE S- SEMI-AUTOMATIC PICK & PLACE SYSTEM

**USERS MANUAL**  
MAY 2004



## 1. Introduction

ProtoPlace is a new placer designed for professional use in the field of SMT assembling which supports multifunctional dispensing and placement of components of the highest complexity currently available on the market. A perfect construction and microprocessor controlled electronics enhance the precision and functionality of the machine.

The system is designed in accordance with the principles underlying ergonomic requirements and high technical standards. Owing to its newly designed electronics, fine-adjustable settings and automatic placement system, the basic model itself offers accurate and versatile applications. Additional options, such as dispensing, rework and micro-camera can simply be added. Semi-automatic placer ProtoPlace is a new product of upgraded Rapid Prototyping line that enables developers a faster, more direct and reliable way to new products.

TECHNICAL DATA	
Max PCB Size	400x300mm (15.7"x11.8")
Min Size of Components	0201 Chip Components
Power Supply	220 - 240V / 50Hz or 110-120V / 60Hz, 10VA
Compressed Air Supply	6 Bar (6x10 <sup>5</sup> Pa), min. 10l/min., filtered 0.005, Non-lubricated
Operating Air Pressure	1.0 - 4.0 bar (1x10 <sup>5</sup> Pa do 4x10 <sup>5</sup> Pa)
Basic Dimensions (WxLxH)	760 x 760 x 250mm
Max Dimensions (WxLxH)	1000 x 900 x 500mm with Feeders and a Turntable
Weight	25 - 35kg with Additional Devices
Vacuum	0 - 0.8 bar (0 - 0.8x10 <sup>5</sup> Pa)
Pulse/Pause Duration	0.1 - 9s / 0.1 - 2s
Number of Dosing Points	Up to 300/min
Dosing Quantity	Min 0.2mm <sup>3</sup>

TECHNICAL DATA	
Turntable Position	Left and/or backward
Feeders Position	Left
Ambient Conditions	Temperature: 5 - 35oC, humidity: 30 - 95%

## 2. General instructions

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### Caution:

Original packaging should only be opened on marked spots by means of a cross screwdriver, otherwise your warranty claim will not be processed. Please check the device immediately after unpacking. Check for possible transport damages, too. If any kind of damaging due to the transport is discovered, immediately inform your transport mediator.

### Attention:

Read information and explanations of the manufacturer of solder pastes, glues and detergents. Solder pastas are leaded. Avoid skin contact. Use exclusively original spare parts. In case of any claims please ensure that the machine is sent to its manufacturer in its original packaging.

### 2.1. Safety measures

To ensure safe use of the system the user should read this instruction manual and consequently follow the instructions.

The user should use the anti-static flattening equipment for handling with electronic components during operation.

If the user modifies the equipment, we cannot ensure its safe use or cover the repairs under warranty conditions!

While using chemicals, please follow manufacturers' safety measures, which are marked on the packaging and the enclosed declaration!

Particular caution is required when placing so that small parts, paste or glue don't get sucked through a picking needle. Maintain the equipment clean and keep order in the working area!

## 3. Installation and start-up

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The placer shall be set on a working table constructed for work with electronic components; the size of the table should be at least 800x800mm, i.e. 1000x900mm, if tape or stick feeders and the monitor are set as well.

### 3.1. Packaging removal

Loosen the wooden screws on the lower part of the cover sides of the packaging (6piece). Carefully lift the cover off the palette upwards. Remove fastening belts and unroll the blistered foil. Lay down the feeders and take off the tape feeder from back side.



### 3.2. Installation

Set the placer on a level surface of the working desk and place feeders on it. Adjust the feeder carrier sideways. Install the turntable on the back side. The turntable can also be adjusted sideways. Front right area is area constructed for palettes with components. The monitor is placed backward left facing the user.



### 3.3. Power supply

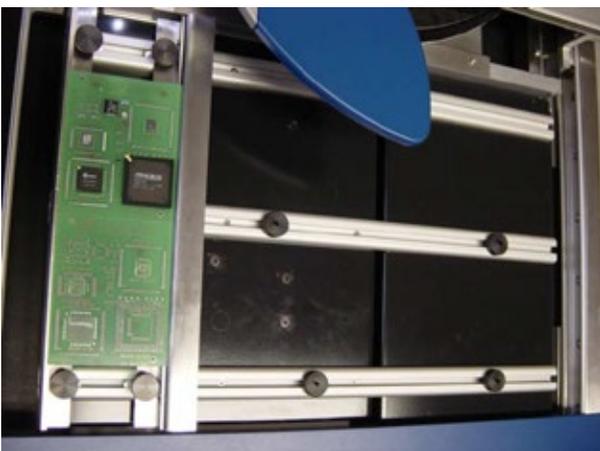
Connect the device to network supply by an enclosed cable (100-120V / 60Hz) or (200-240V / 50Hz).

Device is ready for operating on the voltage of 200-240V / 50 Hz . Be sure the voltage set at the machine corresponds with the line voltage. Check the voltage selector in the mains filter which is in the power switch. When switching to another line voltage make sure that both fuses in the mains filter are exchanged.

Then switch the voltage selector to ▼

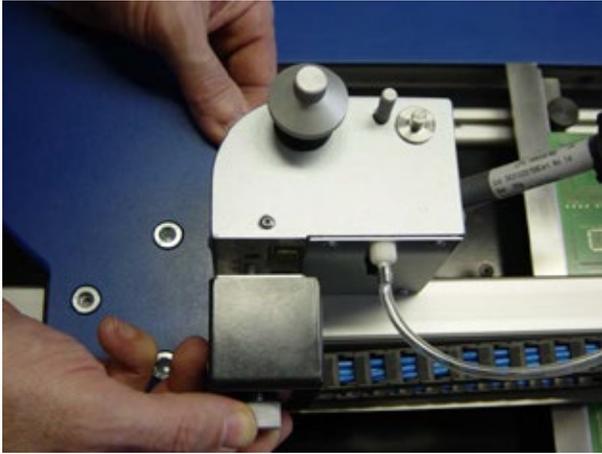
The T100mA fuse corresponds the voltage of 230V and the T200mA fuse to 115V.

We supply dry and not-greased compressed air with air pressure of 6 bars and air flow of minimally 10l/min (connecting pipe for a fast connection 6/4mm). Connect the drive of the circular feeder, foot switch for dosing, and the coaxial cable for the monitor.



### 3.4. Fixing of printed circuit board

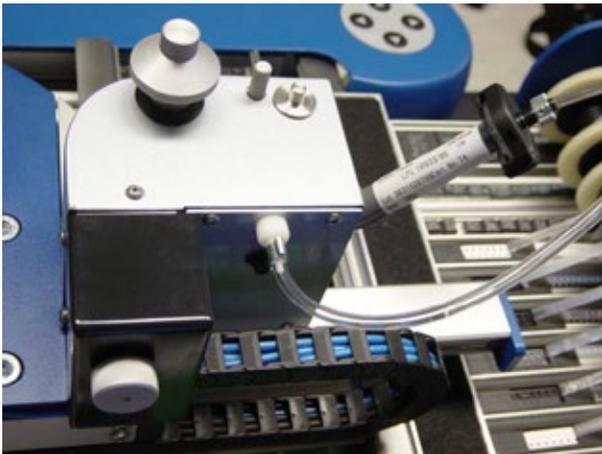
Single-sided and two-sided PCBs with a thickness of 0.8 to 5 mm can be fixed. Left fixing lath is usually fixated on the far left side, and the right - spring lath is moved across the profile grooves according to the width of PCB. We can also fix the A3 PCB, in which case 4 magnet supports and 4 sliding supports are available in the profile grooves.



### 3.5. Manipulator

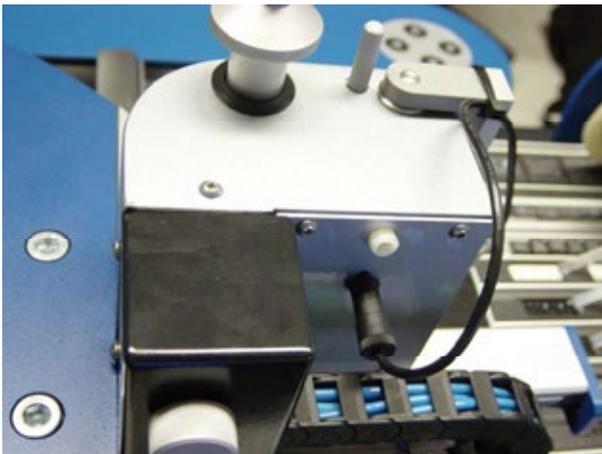
A placing manipulator can be removed and replaced by a rework unit.

Loosen the connecting screw from its back side and gently push it towards yourself and then take it off. It is placed back on a sliding track, drawn nearer to the connecting part and tightened with a connecting screw. Hence all connections are plugged in.



### 3.6. Dispenser

For dispensing of solder paste or glue cartridge is fastened with a clamp and plugged in the adapter with a connecting tube. The carrier is put on from the left side on the manipulator groove towards the stop and the pipe connection on the rear side of the manipulator.



### 3.7. Micro camera option

Either colour or black & white micro camera can be plugged in. The carrier is placed on the axis of the rotation centre above the feeder axis. Connecting cable is attached on the rear side of the manipulator.

For a colour camera there is besides the standard objective with a focal distance of 3.8 mm another objective with a focal distance of 8.0 mm. It is of great assistance while observing smaller components (0201) or components with a thicker division (0.3mm).



### 3.8. Monitor option

Video monitor is plugged on the network supply and connected to the video signal on the rear side of the placer.

(BNC connector)

Always check power supply compatibility with your country regulations.

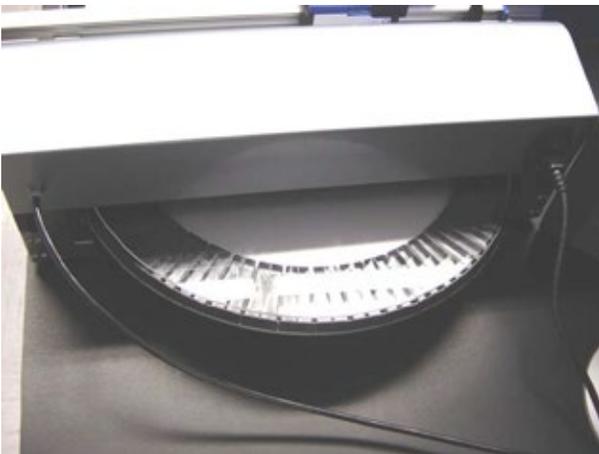
## 4. Accessories

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### 4.1. Turntable

It can be placed on the rear side or on the left side of the placer. It is put on two positioning screws. It is primarily constructed for picking individual components, which are not a part of the standard packaging. The components are loaded into the cups. Their type, value and the sign are marked on the label. The cups are made of conductive plastic, and they allow anti-static handling of components.



### 4.2. Motorized turntable

It can be additionally plugged in to the rear side of the placer by means of a connection cable for a motor drive. There are usually 75 cups inserted (15 single a30 double), but also 45, 60, 90 or even individual cups can be inserted. They can be removed – their position is determined by two centred holes, which allow their central fixation to be adjusted by means of two cones.



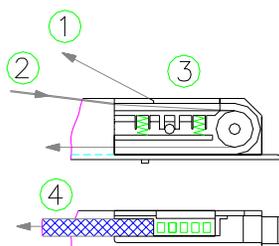
### 4.3. Feeder carrier

Feeder carrier is placed on two positioning screws on the left side of the placer. On the front side there is a feeder area and an area for turning overturned components. Tape or stick feeders are put into feeder carriers and pushed towards the stop.

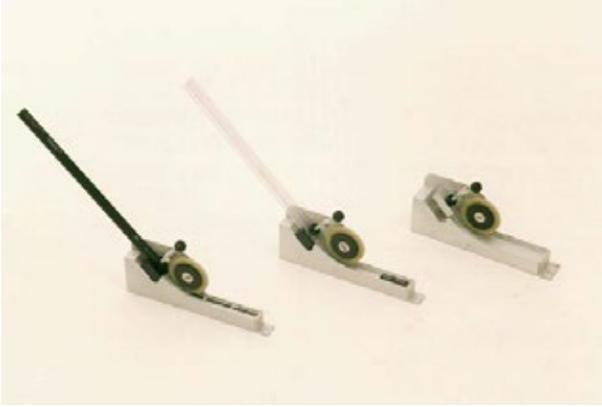
### 4.4. Tape feeders

We choose between tape feeders of 8.12 mm or 6 mm in width. Disk with components is placed on the feeder axis, and the tape is placed into the picking carrier, as the image indicates. Components are handed forward by rotation of the transport wheel, and the rest of the tape moves backwards along the lower side.

Tape Feeder 8, 12, 16mm

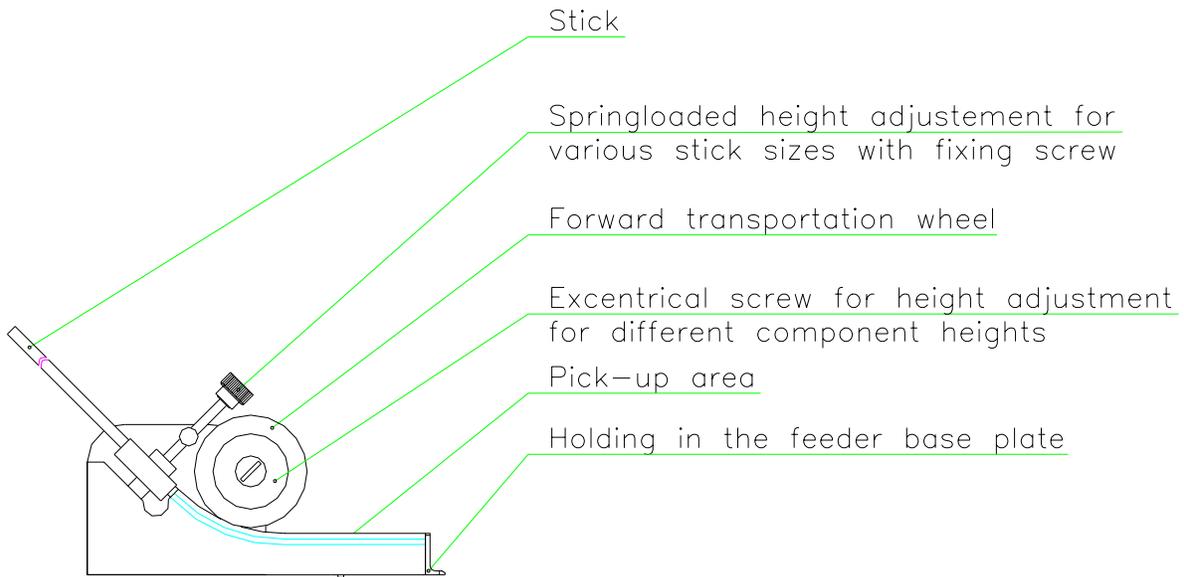


- 1 – cover tape which is pulled away from the tape 2
- 2 – tape with components
- 3 – Push the tape guidance down and slide in the open tape from the back until it is coming out behind the feedernose
- 4 – Take the cover tape out of the feedernose and attach it in the slide of the covertape wheel.



#### 4.5. Stick feeders

We choose between feeders for SO and PLCC components with narrower or wider width. The stick with components is placed on to the spring stop, and the components are handed forward by means of a soft part of the transport wheel, as the image indicates.

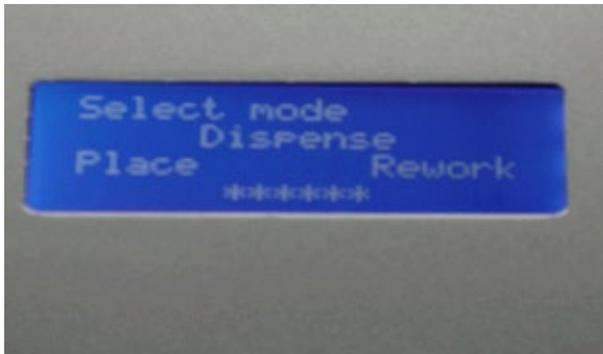


#### 4.6. Palettes

Component palettes are placed as close as possible to the placing unit, right from the fixing of the printed circuit board. They can be placed upright or alongside, according to the size and fullness of the palette. Empty or full palettes serve for height adjustment, otherwise sliding or magnet support are used for supporting of printed circuit.

## 5. Handling the machine

After the plugging of the device and sufficiently supplied compressed air pressure the main switch is turned on. Display offers the basic choice of handling the machine.



### 5.1. Display

Four-lined display on a blue surface allows for a clear choice between work operations and adjustments. The form and installation of descriptions resemble installation and position of keys on the keyboard.



### 5.2. Keyboard

Pushing the buttons on the keyboard allows us to choose operating ways, move through adjustments and set the values of individual parameters. Keys are gently standing out and have a spring click, which enables easier blind handling. Function of narrow keys is always indicated on display.



### 5.3. Pneumatic settings

Possible pneumatic settings:

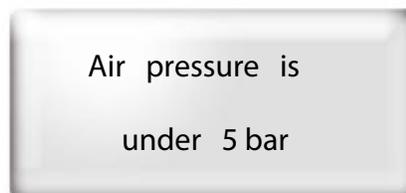
pressure regulator, manometer for dispenser, adjustment of picking and dispensing and adjustment of the air flow for rework.

- VACU: adjustment of vacuum for picking the components;

- DISP: adjustment of NON-DROP vacuum for dispenser

- FLOW: air flow adjustment for rework option

If the air pressure in the device is too low or is not supplied, the device will indicate it like this:



## 6. Picking and placing



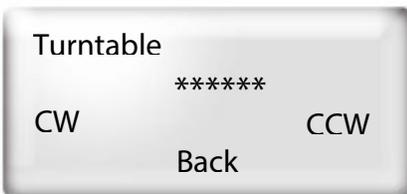
On the basic menu we choose **Place** (left key) which enables automatic and manual placing. We pick from cups on the turntable, which are chosen manually by rotating the disc of the turntable or from tape nests, or from component carriers of stick feeders.

Exit from the menu is confirmed by a left **Back** key.



### 6.1. Manual placing

On the placing menu we choose **Manual Pick & Place** (right key). While picking the component the vacuum is turned on by means of pressing the needle on the body of the component, and is present until the component is placed on the desired position. The component is gently pressed onto the placing area, which consequently turns the vacuum off. Vacuum is again turned on by a further press downwards.



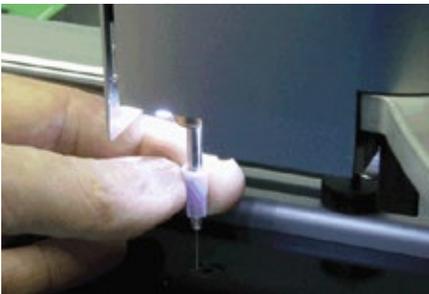
### 6.2. Turntable shifting

If picking is conducted from the motorized turntable, then there are two sub-menus for turntable shifting **Turntable** (upper key) available in both placing menus. By pressing a left key **CW** the cups move clockwise and counter-clockwise **CCW** by a right key. Shifting stops by releasing the keys.

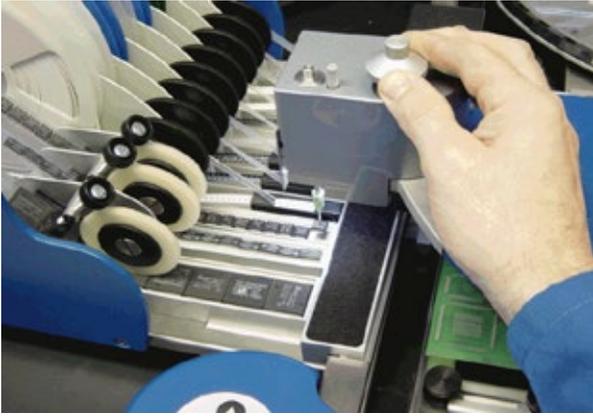


### 6.3. Automatic placing

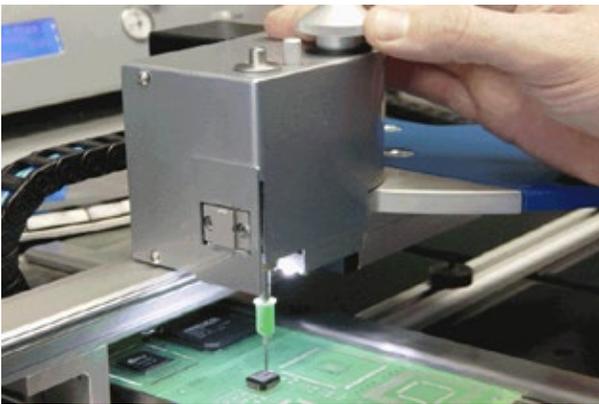
Vacuum is started automatically. To pick up the component we choose **Place** (left key) from the basic menu, and there we choose **Auto** (upper key). With this option nozzle should only touch it slightly. For placing component is gently pressed against PCB and vacuum is switched off for a short time.



Picking needle is chosen according to the size and weight of the component. Usually a needle of 0.84 in diameter (green colour) is used, but with bigger components a vacuum cap or a needle of 1.37 in diameter are used. It is placed on a vacuum axis, pulled out with a gentle twist while a rotating button is held with the other hand.



Choose a component intended for placing. While picking a component the vacuum is present, therefore we only touch the centre of the component with a needle, and the component is sucked onto the nib of the needle. The component is raised and carried above the placing area.



The component is carried above the placing area and put nearer to the placing position. First it must be correctly rotated then set in both directions. The component is gently pressed onto the placing area and the vacuum turns off. After a few moments the vacuum automatically turns on again.



#### 6.4. Precise placing with fine adjustment

By pressing lower **Place** button a downwards walk limiter is activated. The height is set with a regulatory screw (besides fixing the camera) according to the appropriate height of the component. This option allows a placing of components with a previous fine positioning. This ensures a simpler position adjustment.



The picked component is carried above the placing area and put nearer to the placing position towards the walk limiter. Then by pressing a right **Brake** key the position of the component is blocked in all directions except in the direction of rotation. First it must be correctly rotated and then set to the position of the placing area in both directions.



Fine adjustment of the placing area is conducted by buttons found in the front part of the placing stop. Left button serves for frontward – backward directions, and the right one serves for left – right directions. When the position is pleasing, the key **Place** is pressed.



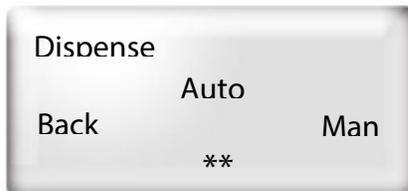
## 6.5. Micro placing

Rotating CCD camera (colour or black and white) is rotated around the placing axis and is magnified by 3.8 times (for standard components) or by 8 times with replaceable objective (for components with fine pitch and micro components). The figure indicates an example of placing of components of the size 0201 by means of a needle of 0.15 mm in diameter.



For different weights or sizes of components variously thick needles and different sub-pressure are used; the latter is adjusted on the right side of the placer by a **vacu** button. Heavier components require stronger sub-pressure (a louder sound, coming from the silencer on the ejector can be heard). A vacuum cap of a 4 or 9 mm in diameter can also be used for heavier components.

## 7. Dispensing



The dispensing is useful for creating a prototype by coating solder paste or glue. Dispensing needles of 0.69 mm in diameter are used for solder paste and needles of 0.61 and 0.50 mm in diameter for fine-pitch components. For glues the needles with 0.61, 0.50 and 0.40 mm in diameter are used. The dispensing needle is put into the cartridge and levelled with the placing needle. From the basic menu we choose a **Dispense** menu.



### 7.1. Manual dispensing

In the Dispense menu we choose the **Man** sub-menu. The pressure is set by the pressure regulator. In order to magnify it we rotate it clockwise and usually set it between 2 and 3 Bars on the manometer.

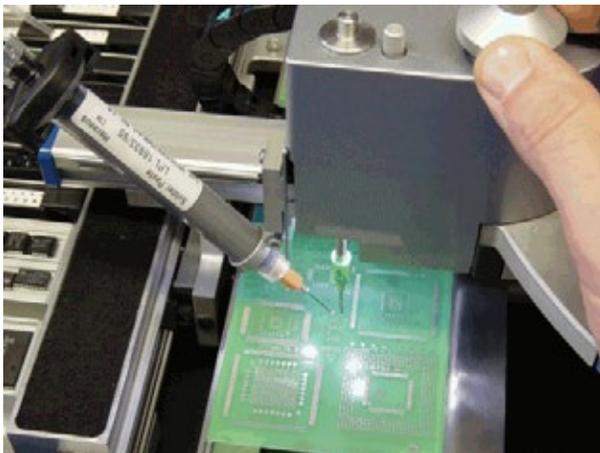


For rare media sub-pressure is used, in case if the pressure is not supplied, so the media doesn't leak out of the dosing needle, or remains on the same level. For triggering of dispensing the foot switch is used.



### 7.2. Automatic dispensing

In the Auto Dispense sub-menu we choose adjustments for the length **Pulse** from 0.1 to 9.0 s in degrees of 0.1 s. Upper key **Inc** is used for lengthening and the lower **Dec** for shortening the pulse. We can also set **Pause** between connected pulses from 0.1 to 2.0 s in degrees of 0.1 s.



The height of the dispensing needle is set in such a way it touches the printed circuit while the dispensing is triggered by a picking needle. The dispensing can also be triggered as with manual dosing, namely by using a foot switch.

## 8. Rework option



For soldering or reworking already soldered components the Rework menu is chosen. A standard nozzle of 5 mm in diameter and a nozzle for SMD components of 3 mm in diameter are available. For replacing or reworking bigger components special de-soldering nozzles are used – different for every class. The temperature of the heater is set on a working unit, and the air flow for soldering is set on the control unit.



In the rework menu we firstly open the air flow by an upper Air key, and then with a right key we turn on the heater Heat. After completing the process the air flow is present as long as the heater and nozzle cool off.

## 9. Maintenance

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After completing the work process, the connection must be turned off, the compressed air supply disconnected and the device covered in order to keep it from collecting dust.

If the dispensing was implemented, the cartridge must be closed and placed in the refrigerator or in any other dark and cold place. The needles must be emptied and cleansed with isopropil alcohol. The needle can be placed on an empty cartridge and emptied by manual dosing. Then it can be moistened in alcohol and cleared by blowing.

Occasionally coordinate rails should be greased with fine machine oil for rails. And from time to time make sure the air supply is dry and, if necessary, empty the water eliminator

## 10. Trouble shooting

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No supply: check the supply unit and the fuse on the rear side of the device.

Pressure in the device is under 5 Bars: check the connection and supply of the compressed air; also make sure the supply tube isn't compressed.

Vacuum isn't present or isn't sufficient: make sure the needle isn't crammed; if it is, it must be replaced, and the vacuum stifler should be fully opened.

Caution should be taken when placing so that small chips, paste or glue aren't sucked up through the picking needle. The easiest way for clearing by blowing the crammed needle is by using a dispenser. The needle can be placed on an empty cartridge and emptied by means of manual dosing.