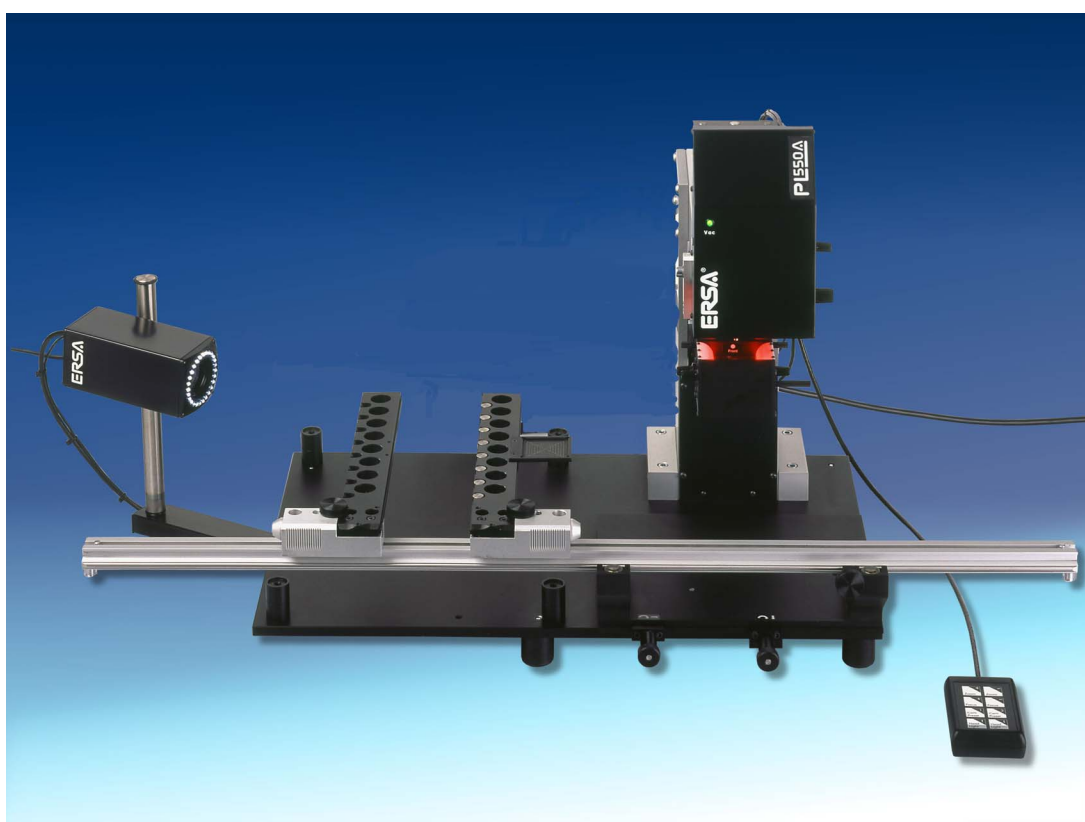


Operating Instructions

Precision Placement System ERSA PL 550 A

for Component Positioning and Process Monitoring



3BA00090_01
Issued: 12/2004

Operating Instructions

ERSA PL 550 A and PL 550 AU



Thank you for deciding to purchase an ERSA PL 550 A Precision Positioning System.

Your instrument was manufactured according to the highest quality standards and was tested before shipment. Before you take the placement system into operation, you have to read and understand the safety chapters of this operation instruction.

Please contact us if you have any further questions:

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1 INTRODUCTION

The ERSA PL 550 A Precision Placement System allows the processing of multiposition SMT components for rework and component insertion. It also allows process monitoring during the processing of electronic components in engineering, production and repairs. The PL 550 A offers the utmost flexibility and easy handling. At the same time, the system is perfectly suited everyday use in production.

The device can be combined with the Rework System IR 500 A or IR 550 A, set up directly on the base plate of the PL 550 A.

General hints to the operation instruction

Safety-related notes in these Operating Instructions are indicated as follows:
Non-observance of this information can lead to damages on the unit or injuries of the operators.

ATTENTION:

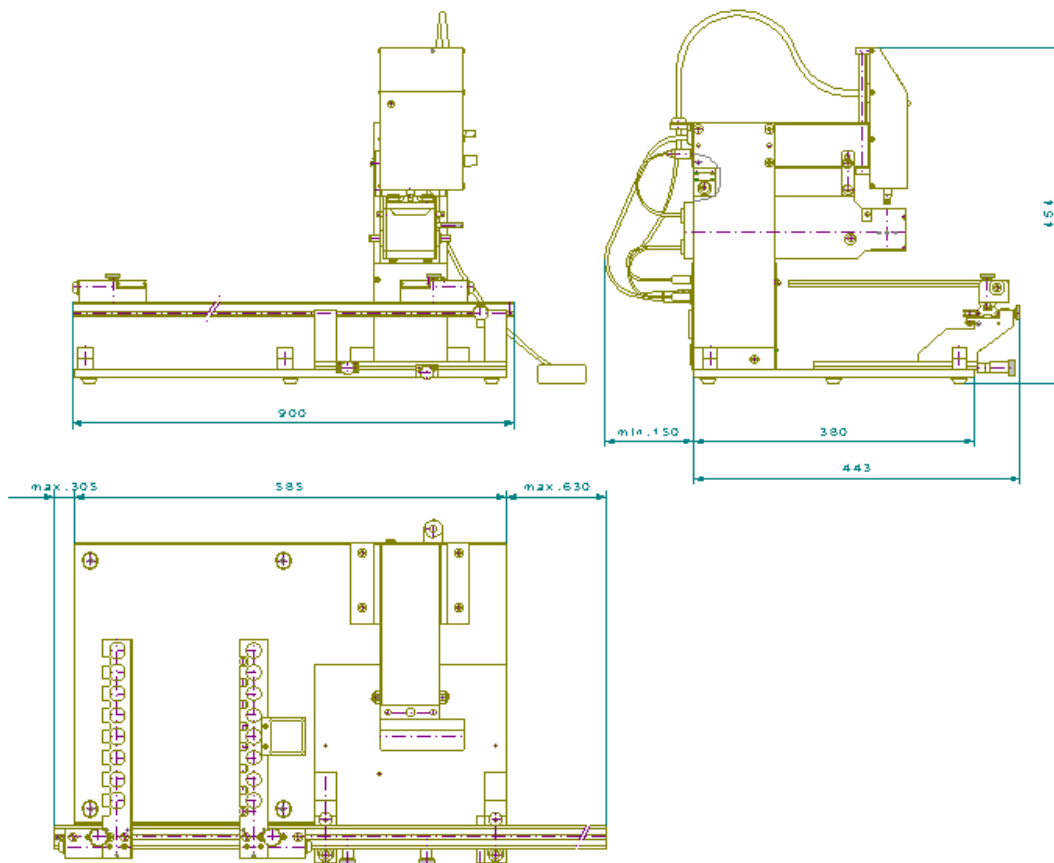
Be sure to follow these instructions!

Notes are indicated by

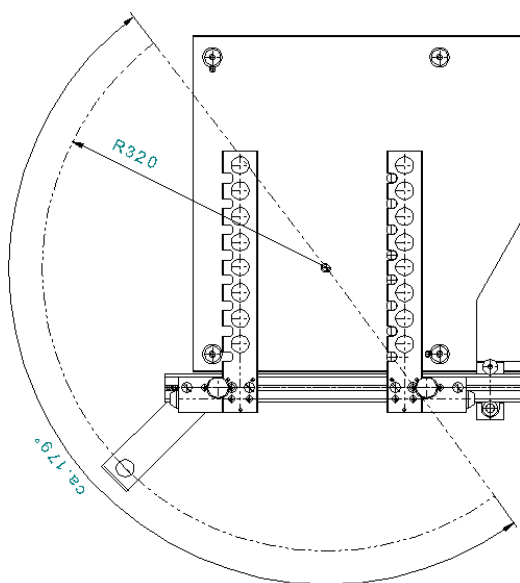
NOTE:

2 TECHNICAL DATA

2.1 DIMENSIONS



Views of PL 550 A (without RPC camera module)



View of swivel area of the RPC camera module

2.2 TECHNICAL OVERVIEW

Operating temperature:	0 – 40 °C
Relative humidity:	0 – 80 %

NOTE: Avoid severe temperature variations. After changing the location of the device, acclimatize the device before starting operation again (at least 30 minutes).

Weight:	approx. 21 kg
Housing design	antistatic
Power supply for basic unit:	100 – 230 V, 50/60 Hz
Component insertion force	approx. 1.5 N (vacuum switching point)
Component dimensions	max. 40 x 40 mm
Illumination	LED row light (separately adjustable for component and PCB) LED ring light for RPC camera (adjustable)

Performance data of the optical system and the cameras

RPC opt. working distance	ca. 200 mm
Camera zoom	72 x (18 x optical, 4 x digital)
Standard (CCIR)	PAL composite (FBAS)
Video out	BNC / cinch
White balance	automatic
Resolution	752 x 582 active pixels, > 460 TV lines
Min. sensitivity	3 lx (F1.4)

2.3 MONITOR SPECIFICATIONS

For optimal operation of the system, we recommend using a monitor with the following minimal specifications (monitor not included with delivery):

Horizontal resolution > 460 TV lines

Monitor type	color tube monitor (black & white not recommended) or PC monitor (with framegrabber) or flat screen
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Signal type	PAL composite (FBAS)
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Required terminal	cinch
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NOTE: Use of a monitor with inferior quality will directly affect the image quality and thereby limit the display quality for small components.

NOTE: For displaying live images on a PC and for managing image data, use the software package ERSa IDView (order number 0VSI100).

3 SAFETY INSTRUCTIONS AND REMARKS

3.1 INTENDED USE

The ERSA PL 550 A has been designed on base of the latest technical standards and acknowledged regulations and safety guidelines. Nevertheless there is a residual safety risk related to the placement system, especially when it is used by untrained personal or object of improper use.

The ERSA PL 550 A has exclusively been designed to place electronic components on top of printed circuit board assemblies. All other or above this usage is subject of improper use. The manufacturer / supplier is not liable for damages resulting from improper use of the unit.

The intended use includes the necessity of reading and understanding the operation manual and the safety instructions and remarks.

Unauthorized changes on the machines design and / or modifications influencing the safety of the PL 550 A are not allowed and exclude liability of the manufacturer / supplier related to resulting damages.

The system is designed for commercial use only. Private use is excluded.

3.2 SAFETY HINTS



ATTENTION:

Open the device only if the power plug has been completely disconnected from the supply network.

Repairs may be performed only by experienced and qualified electricians.
The device contains active parts.
There is a risk of fatal injury if inexperienced people work on the unit.



ATTENTION: The component insertion head is motor-driven! Do not reach into the area of motion of the component insertion head. Risk of hand injury!

NOTE:

The PL 550 A Positioning System is a sensitive and precise optical instrument. Always handle the device with the utmost care.

Alterations on this device will render the warranty void and can affect the functioning of the equipment.

4 STARTING OPERATION

4.1 SCOPE OF DELIVERY

The ERSA PL 550 A is supplied with the following components:

- ➔ Basic unit (complete with controller, vacuum component insertion head, X-Y micrometer table, Visionbox with integrated camera)
- ➔ Printed circuit board holder (mounted on the X-Y micrometer table)
- ➔ External vacuum pump (115 V or 230V version)
- ➔ Two vacuum suctioners (4 mm and 10 mm in diameter)
- ➔ Holder and switch off valve for ESD vacuum pipette and ESD vacuum pipette for safe component handling (0VP020)
- ➔ External keyboard
- ➔ Video connecting cable (cinch / cinch including adapter BNC / cinch)
- ➔ Three Allen wrenches
- ➔ Calibrating pin with calibrating plate
- ➔ Operating Instructions

Options:

- ➔ Reflow Process Camera, RPC camera module (order number 0VSRPC-UKIT) with integrated LED ring light mounted on a swivel arm
 - included with order number 0PL550A
 - not included with order number 0PL550AU
- ➔ Split optical system cassette (order number 0PL500A-SPC)

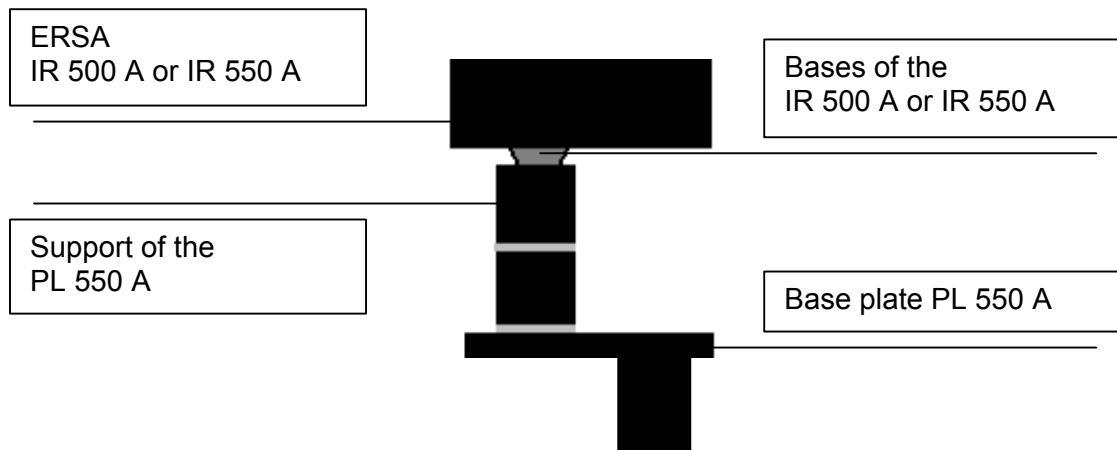
Before unpacking, please check the packaging for visible signs of damage during transport. If there is such damage, immediately notify the carrier and enter a remark on the delivery note.

The system is supplied according to the ordered configuration. Place the basic unit on a solid, level table with sufficient space at the rear and sides of the device.

4.2 POSITIONING THE IR 500 A / 550 A ON THE PL 550 A BASE PLATE

The left side of the base plate contains supports that can be individually unscrewed. Place the IR 500 A or IR 550 A Rework System on the base plate and connect the system according to the Operating Instructions.

The supports can be separately mounted in order to set the Rework System at either of three possible heights. Select the height suitable for your application.

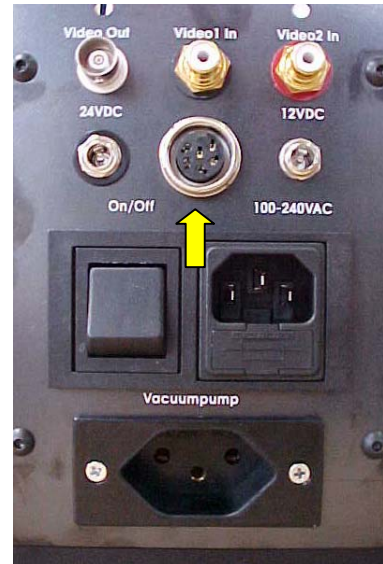


4.3 PORTS AND CONTROLS

The following ports are located on the rear of the device:

4.3.1 BASIC UNIT PORTS

- Monitor port, BNC (Video Out)
- Camera port of the Visionbox, cinch (Video1 In)
- Camera port for RPC, cinch (Video2 In)
- Voltage supply for component insertion head (24 V DC)
- Port for component insertion head cable (yellow arrow)
- Voltage supply for Visionbox (12 V DC)
- Power switch (On / Off)
- Power supply / power cable port (100-240 VAC)
- Connecting socket for vacuum pump (Vacuumpump)



View of connected device:

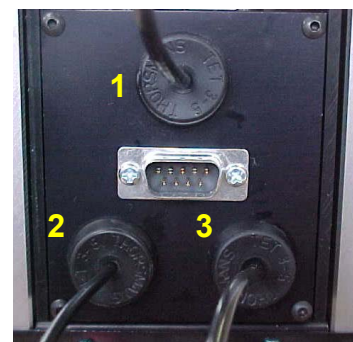


4.3.2 VISIONBOX PORTS

The following ports are located on the rear of the Visionbox:

- Port for camera control port going to component insertion arm (1)
- Camera signal going to "Video1 In" (2)
- Voltage supply going to "12 V DC" (3)

NOTE: The RS 232 plug-in connection is not used during operation. It is used to calibrate the camera during production.

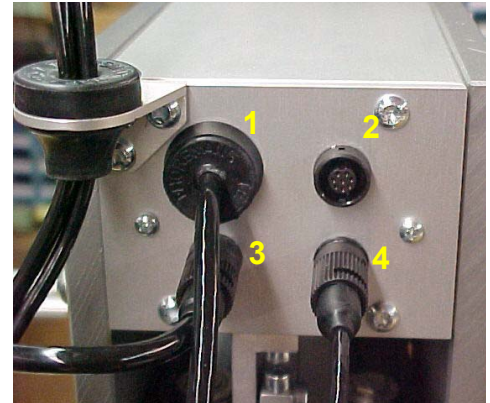


Operating Instructions

ERSA PL 550 A and PL 550 AU



- ➔ Control cable and supply voltage for component insertion head (1)
- ➔ Port for control line for RPC camera module (2)
- ➔ Port for external keyboard (3)
- ➔ Port for camera control coming from Visionbox (4)

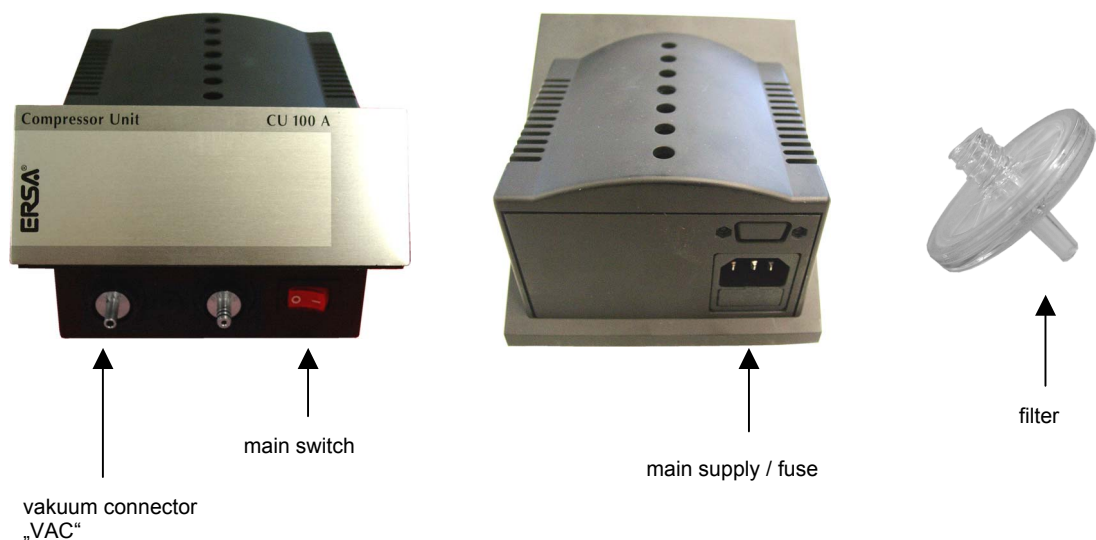


ATTENTION: Check whether the supply voltage lies in the range indicated on the rating plate.

4.3.3 VACUUM PUMP PORT

The vacuum is generated by an external vacuum pump. To prevent vibrations during component insertion, we recommend placing the pump a little away from the unit. The pump is switched on and off together with the system when the power supply is directly connected to the PL 550 A component placement system.

- Connect the power supply of the pump directly to the socket at the backside of the PL 550 A. Please use the included power supply cable.
- Connect the included silicone hose of the pump (20 cm) to the thinner $\varnothing$ 2,5mm hose of the PL system.
- Plug the opposite side of the silicone hose onto the filter.
- Finally plug the filter onto the connector „VAC“ at the front side of the pump.
- Switch on the pump by turning the main switch to „I“.



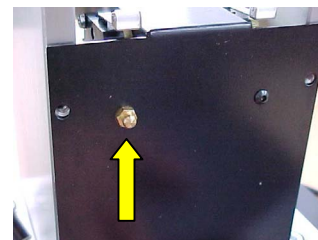
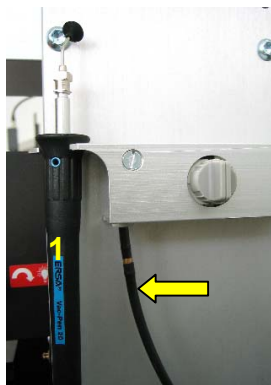
NOTE: The pump contains a pressure switch. It automatically switches off, when the vacuum has been generated and switches on again if vacuum is required.

4.3.4 CONNECTION OF ESD VACUUM PIPETTE AND A ESD WRIST STRAP

Connect the included ESD vacuum pipette (1) to the unit. The pipette is has to be located in the holder on the right side of the PL System

You will find hints, how to use the pipette in chapter 4.6.

For safety purpose you can connect an ESD wrist strap directly to the unit. (yellow arrow)



ESD connection.

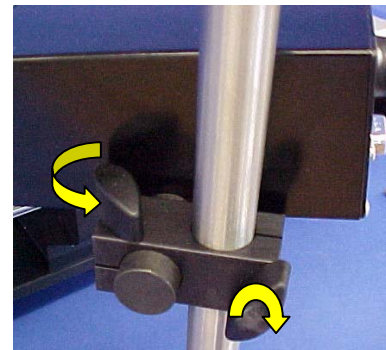
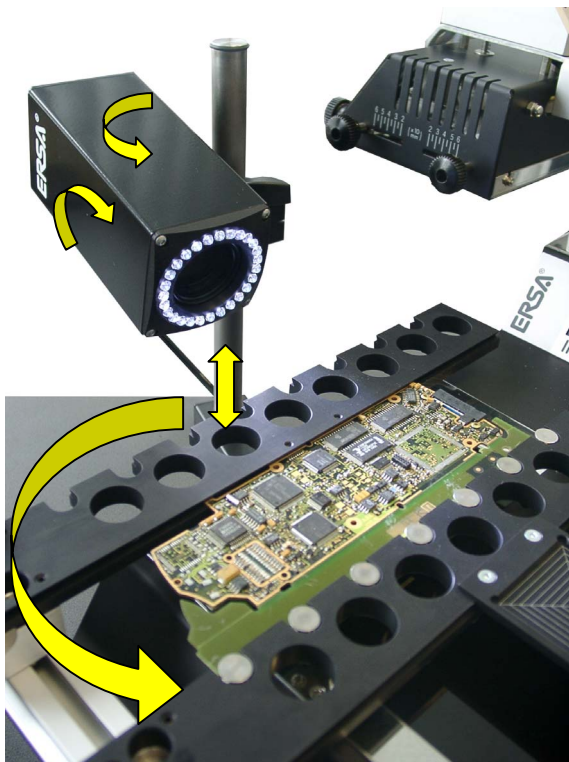
4.4 SETTING UP THE CAMERA MODULE

The RPC camera module (only included with order number 0PL550A) is premounted on a swiveling arm. Use the arm fixing screw located on the bottom side of the device to adjust the force needed to swivel the camera.

NOTE: The RPC-UKIT includes instructions on attaching the camera to the system.

The height and perspective of the camera module itself can be changed by means of the crosshead clamp, so that you can quickly set the optimal viewing angle for each application.

For applications requiring a direct view of the soldering joints (as with BGA balls), we recommend setting the camera in the forward viewing direction.



The camera module contains an LED ring light, whose brightness can be adjusted at the external keyboard.

The LED lighting is distinguished by a very long lifetime and very high color temperature, which varies little as the brightness is changed. The user thus receives images without color distortions under all lighting conditions.

4.5 USE OF THE PRINTED CIRCUIT BOARD HOLDER

The PCB holder is separately packaged and located under the basic system. It must first be mounted.

Carefully remove the PCB holder from the packaging and remove the stop screw on one side.

Hold the rail (1) so that the two movable PCB holders face upwards.

Carefully slide the rail into the roller guide. You'll notice slight resistance due to the pretension set by the manufacturer.

Press through this resistance and slide the rail completely in.

A fixing screw (2) is located on the front side.

We recommend always tightening this screw during the rework, to prevent accidental displacements.

SETTING UP

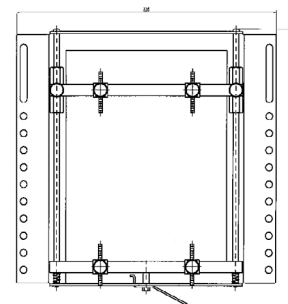
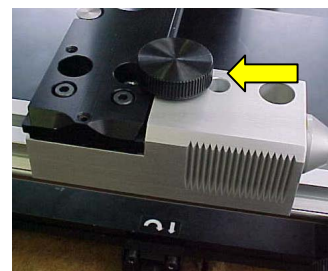
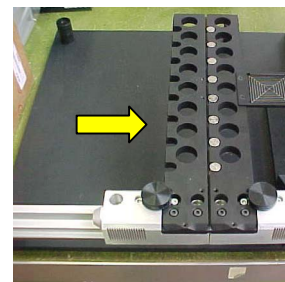
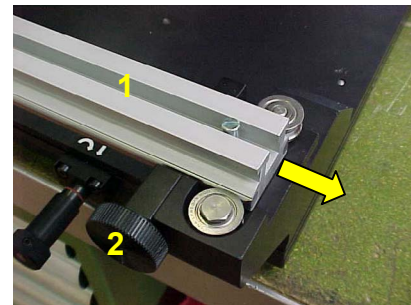
When setting up the device we recommend moving the two sliding PCB holders approximately to the middle of the rail.

To move the PCB holders, open the two black fixing screws on the top.

Another fixing screw prevents accidental movement during soldering.

The two PCB fixing rails can be moved. The right side has additional springs for clamping the board during work.

For small boards (max. 170 x 170 mm) ERSA recommends the additional use of the PCB holder PH 100. (see chapter 8)

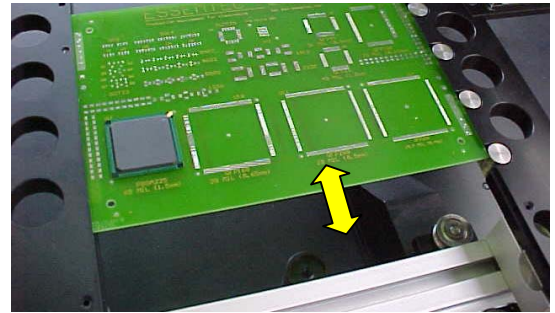


Operating Instructions

ERSA PL 550 A and PL 550 AU



The PCB can then be moved from the front and pulled out.



NOTE: Do not push the right rail too much against the PCB edge, to enable easy sliding from the front.

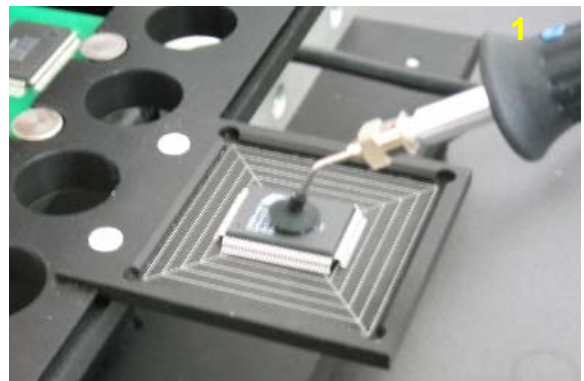
4.6 USAGE OF THE ESD VACUUM PIPETTE

The unit is equipped with a switchable ESD vacuum pipette. This hand held vacuum pipette enables the operator to handle ESD sensitive device securely.

The ESD vacuum pipette is located on the right side of the PL system and switched on if needed at the switching valve (on / off).



Further control of the vacuum is done directly on the handle by lifting or lowering the pointer finger over a vacuum drill hole (1).



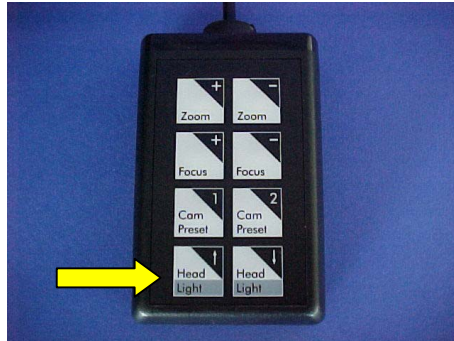
NOTE: Put the ESD vacuum pipette into its holder and switch off the valve if the pipette is not needed for operation.

4.7 SWITCHING ON THE SYSTEM

An ON/OFF switch is located on the back of the device (right). Switch on the unit after previously connecting it to a monitor.

Make sure that the device is correctly connected and that the vacuum pump is running.

After switching on, press the **Head / Light ↑** button to move the component insertion head to the upper position



ATTENTION: The component insertion head is motor-driven! Do not reach into the area of motion of the component insertion head. Risk of hand injury!

Then adjust the RPC camera module according your application.

Use the external keyboard for zooming and focusing.

NOTE: The device should be at room temperature before being used.

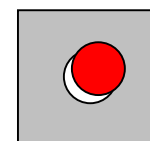
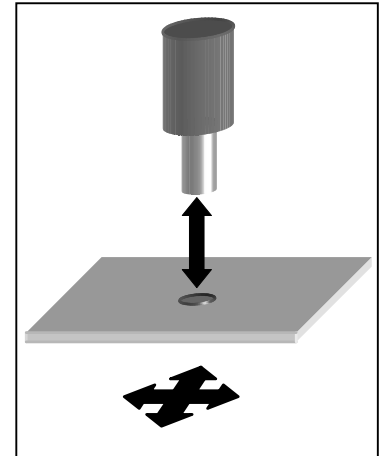
4.8 CALIBRATING THE SYSTEM

The positioning system was calibrated and adjusted in the factory. Vibrations occurring during transport may make recalibration necessary during installation, however. The same procedure can also be used to check the device at regular intervals.

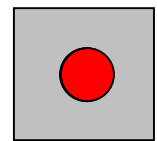
The aim of the calibration is to match the optical axis to the mechanical axis.

A. CHECKING THE SYSTEM

1. Insert the calibrating plate in the PCB holder
2. Mount the calibrating needle on the Z-axis
3. Move the component insertion head downwards using the motor
4. Slowly lower the calibrating needle into the hole in the calibrating plate. Use the X-Y micrometer table to achieve an exact fit. The needle must be able to move up and down the hole completely freely.
5. Move the component insertion head upwards using the motor drive
6. Check the image in the monitor. If the image does not appear like that labeled "GOOD" on the right, you have to recalibrate the system.



POOR



GOOD

B. RECALIBRATION

1. Open the screws (1) of the Visionbox brackets on both sides.
2. Two Allen screws (2) are located on top for the fine adjustment. These screws allow the Visionbox to be adjusted until the monitor displays an image like that labeled "GOOD" above.
3. Now tighten the fixing screws.
4. Repeat the test procedure as described under A.



NOTE: It may be necessary to screw in or unscrew the Allen screws alternately in order to achieve the fit.
Use the supplied Allen wrench for loosening and tightening the screws.

5 FUNCTIONAL DESCRIPTION

The ERSA Precision Placement System PL 550 A was developed for use with ERSA IR Rework Systems. It allows ultra-precise component positioning and process monitoring during soldering, and thus provides the optimal supplement to an IR rework system.

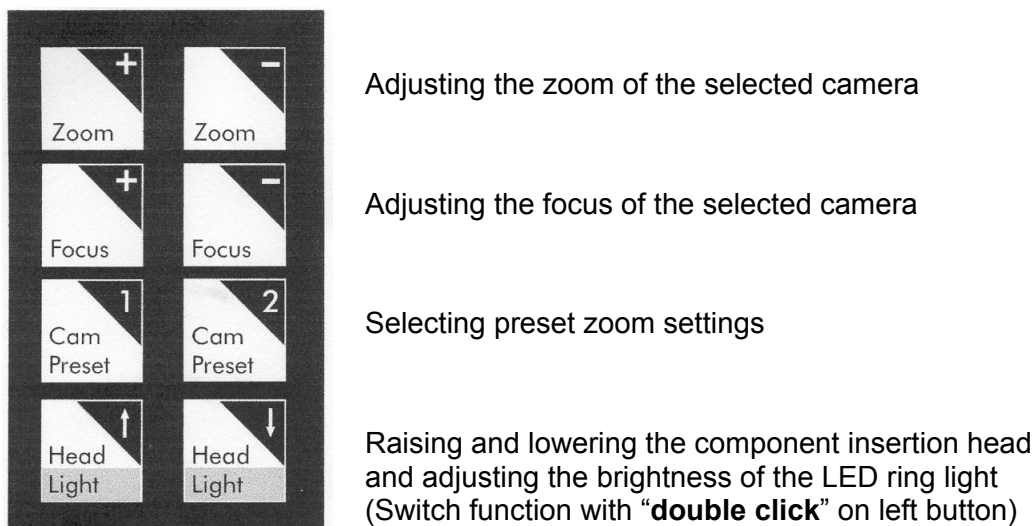
5.1 OPERATION

5.1.1 THE KEYBOARD

All electrical functions on the PL 550 A are conveniently controlled at an external keyboard. Connect the keyboard at the back of the device.

The keyboard is used for both cameras, the integrated camera of the Visionbox and the optional Reflow Process Camera (RPC).

The individual functions are explained below.



5.1.2 ADJUSTING THE ZOOM

Use the **Zoom +** and **Zoom -** buttons to adjust the zoom range of the cameras. For greater enlargements the camera image is internally enlarged digitally. This can diminish the image quality.

The adjusted zoom ranges are retained even after the unit is switched off, and are available when it is switched on again.

5.1.3 ADJUSTING THE FOCUS

Use the **Focus +** and **Focus -** buttons to adjust the given camera's focus to the given working position.

If you cannot focus a particular image, then the object is located outside the working range of the camera.

5.1.4 USING THE CAM PRESET

Besides the continuously variable zoom adjustment with the **Zoom +** and **Zoom –** buttons, two predefined zoom settings are also available on each camera. The zoom settings are attained using the **Cam Preset 1** and **Cam Preset 2** buttons.

These zoom settings allow the user to change quickly between an overview display and a detailed view without having to adjust the complete zoom range manually.

5.1.5 MOVING THE COMPONENT INSERTION HEAD AND ADJUSTING THE RPC ILLUMINATION

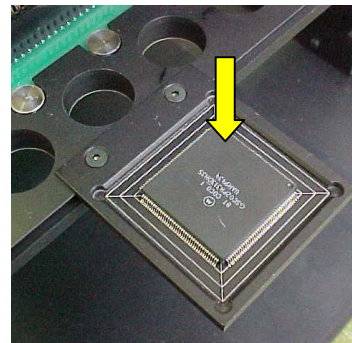
Use the **Head / Light ↑** and **Head / Light ↓** buttons to raise and lower the component insertion head and to regulate the integrated LED ring light of the camera module. In this way you can adapt the light intensity to any application.

Change the function by double-clicking (briefly pressing twice) the **Head / Light ↑** button with the Visionbox pushed back (RPC camera enabled).

5.2 PICK UP COMPONENTS

Place the component to be positioned in the component tray and align it using the grid that has been moved up. Use the ESD vacuum pipette to handle the sensitive device. (see chapter 4.6)

Center the component tray and component under the component insertion head (monitoring with the Visionbox) and then lower the component insertion head using the motor. (**Head / Light ↓** button)



NOTE: For safety reasons keep the given button pressed during the entire lowering or raising movement.

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Manually lower the vacuum needle by turning the positioning rotary knob (1).

As soon as the green LED on the positioning head lights up, the vacuum automatically switches on and the component can be raised.

Use the **Head / Light ↑** button to move the component insertion head upwards by motor again.

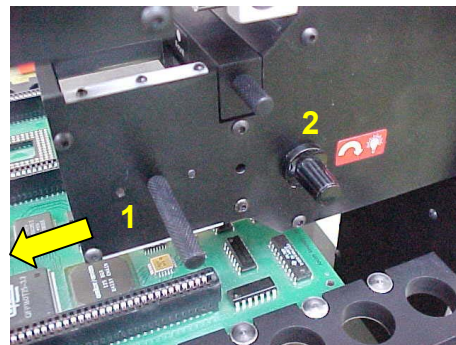


NOTE: Depending on the component height, you may have to adjust the mounting height of the suctioner at the Z-axis. Use the Allen wrench supplied for this purpose.

5.3 OPERATING THE VISIONBOX

To align the component over the landing area of the PCB, pull the Visionbox at the handle (1) into the front position. The system then switches to "Video 1 In" and the image of the Visionbox appears on the monitor.

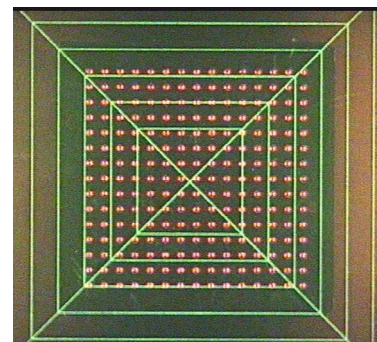
Turn the knob (2) to adjust the red LED illumination for the underside of the components.



The rotary knob for illuminating the upper side of the PCB with white LEDs is located on the opposite side of the Visionbox.

5.4 ALIGNING THE COMPONENT

The component illuminated from below can now be aligned in advance at the grid. The angle is adjusted using the rotation rotary knob. (1)



Now slide the PCB under the Visionbox until there is an optical superposition of the component underside and the landing areas on the PCB.

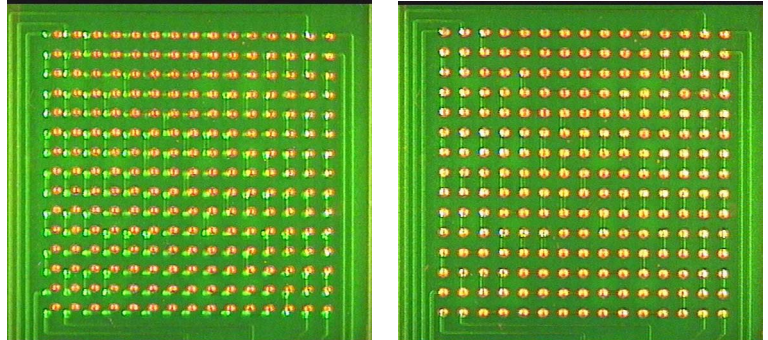
Operating Instructions

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Following this coarse alignment fix the PCB holder with the clamping screw (see 4.5).

Bring the two planes into the camera's focus by manually lowering the component.

The grid dimensions of landing area and component must match.



Now bring the component and landing areas into coincidence by adjusting the position of the PCB by means of the two micrometer screws (X and Y).



NOTE: When positioning BGA components, you can further enlarge the center of the component by means of the zoom, to monitor the position.

5.5 CENTERING THE X-Y MICROMETER TABLE

We recommend re-centering the micrometer table after each time it is used. You will then always the maximum travel distance at your disposal.

The red rings on the micrometer adjusters indicate the center positions.

For a more precise alignment, simply position the component tray with the crosshair at the center of the camera and align the X-Y table with the crosshair.

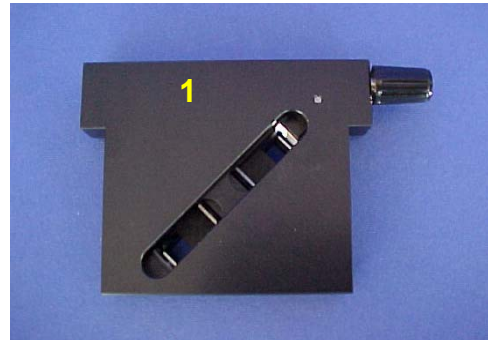


5.6 WORKING WITH THE OPTIONAL SPLIT OPTICAL SYSTEM CASSETTE

Use the Split Optical System Cassette (1) to process larger fine-pitch components.

The Split Optical System Cassette is an ultra-precise device allowing two opposite corners of a component to be displayed greatly enlarged. Because of the laws of optics, however, only one part of the component can be made visible.

(Order number 0PL500A-SPC)



ATTENTION: Use the necessary caution when handling the Split Optical System Cassette.
CAUTION – GLASS!

The cassette is inserted in the system instead of the standard aperture plate.

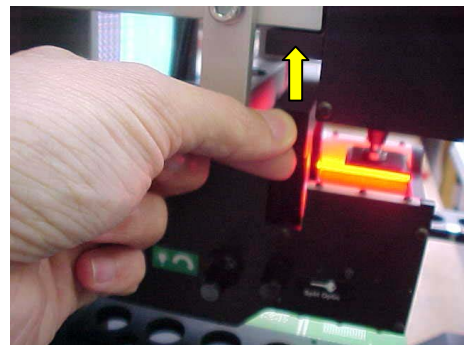
To remove the aperture plate, first loosen the fixing screw (2) on the left side of the Visionbox. Then cautiously remove the aperture plate from the slot.



The Visionbox must be positioned so that the aperture cassette can be lifted out.

Insert the Split Optical System Cassette instead, with the designation "Front" forwards.

Fix the cassette in place again.



NOTE: Depending on the design, you can use the Split Optical System Cassette to process only square components.

5.7 AREAS OF APPLICATION OF THE REFLOW PROCESS CAMERA (RPC)

Depending on the case at hand, the RPC camera module can be used for the following visual tasks:

Process visualization

- Live monitoring of the rework soldering process with an ERSA IR Rework System
- Recording of the process in combination with IDView.

Soldering joint visualization

- Performance of manual soldering operations with camera support
- Dispensing of solder paste with camera support
- Positioning of components with camera support

Soldering joint inspection

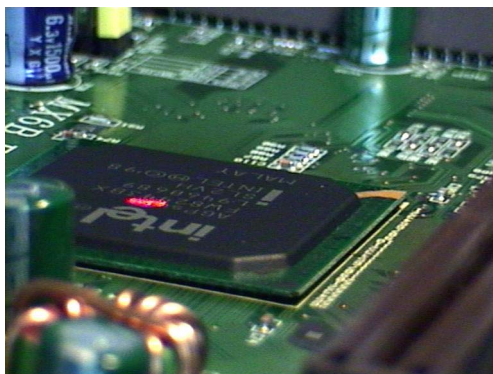
- Monitoring and documentation of soldering joints
- Monitoring and documentation of solder paste printing

NOTE: For displaying live images on a PC and for recording and managing image data, use the software package ERSA IDView (order number 0VSID100).

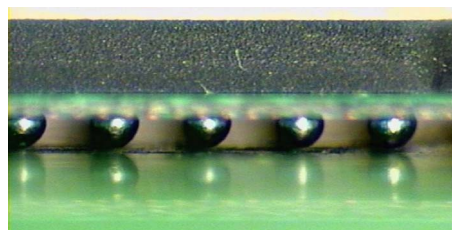
For documenting and evaluating inspection photos we recommend the software package ImageDoc (order number 0VSFG100)

5.8 APPLICATION EXAMPLES

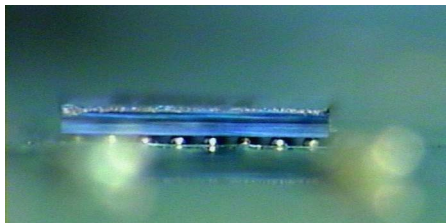
Process visualization on a PBGA:



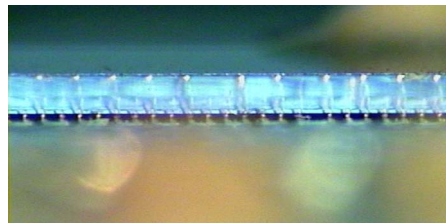
PBGA viewed from above



PBGA before melt



Process visualization on a µBGA



Process visualization on a flip chip

6 ERROR DIAGNOSIS AND CORRECTION

Despite the careful manufacture and quality control of the systems, errors and problems may arise during operation of the ERSA PL 550 A. Below we describe the procedure for diagnosing and correcting errors.

NOTE: Do not place the IR system together with the PL 550 A in front of a window or near an intense light source, since external light can negatively affect the image quality.

The component cannot be precisely positioned

→ Calibrate the system (see section 4.8).

The image cannot be focused

The viewed object is either too far from or too near the camera lens.

→ Change the distance between the object and the camera and try again to focus with the **Focus +** and **Focus –** buttons.

→ Clean the camera lenses.

The image colors are wrong or brightness/contrast is less than optimal

→ Check the settings on your monitor or PC. If necessary, also check the image parameters of the ERSA IDView software.

The Reflow Process Camera does not function / or there is no image

No image on the monitor:

→ Check the plug-in video connection between the camera module and the basic unit and between the basic unit and the monitor. (If possible, set up a direct connection between the camera module and the monitor).

The LED ring light remains dark and no image is displayed on the monitor:

→ Also check the plug-in connection of the voltage supply between the camera module and the basic unit.

In case of other errors, contact your supplier or ERSA.

7 MAINTENANCE AND CARE

Make sure that the optical components of the camera module are free of dirt and grease.

NOTE: Use only genuine ERSA expendable and spare parts to maintain reliable functioning and the warranty.

Depending on the degree of soiling, perform the following maintenance operations:

- ➔ Using a moist cloth and mild household cleaner, remove solder paste and flux residue as well as dust from the system.
- ➔ Clean the camera lens and the beam splitter of the Visionbox using the Optical System Cleaning Kit (0VSLC100).
- ➔ Clean the guide rods of the component insertion head and the guide rails of the PCB with a slightly oiled cloth.
- ➔ Regularly check the mobility of the rack and pinion drive at the component insertion head and if necessary re-grease the rack and pinion.
- ➔ Change the vacuum filter if the the vacuum is to less or the filter is visible contaminated.

8 SPARE PARTS AND OPTIONS

0PL500A-S00.8	Vacuum suctioner, 0.8 mm diameter
0PL500A-S01.2	Vacuum suctioner, 1.2 mm diameter
0PL500A-S003	Vacuum suctioner, 3 mm diameter
0PL500A-S004	Vacuum suctioner, 4 mm diameter
0PL500A-S010	Vacuum suctioner, 10 mm diameter
0PL500A-SPC	Split Optical System Cassette (option)
0VSRPC-UKIT	Reflow Process Camera Upgrade Kit (camera module with swivel arm)
0PL500A-VB	Visionbox
0VSRPC555R	RPC * LED PCB ring light
0VSRPC550A-DP	RPC * dimmer print
0PL500A-MA01	Motor drive complete with plugs
0PL505A	Control electronics for motor drive (insertable from the rear)
0PL505	Control electronics for Visionbox
0PL505B	Control electronics for vacuum
0PL505C	Power electronics
0CU103PL	Vacuum pump, 220 – 230 V
0CU103PL-0A	Vacuum pump, 100 -110 V
3N401	Filter for vacuum pump
0PL500A-TA01	Keyboard with cable
0PL500A-MK01	Video cable PL 500 A – monitor (BNC/cinch-cinch)
0PL500A-KS01	Calibration set, complete (calibrating plate with needle)
0PL500A-BA	Component tray
0PL500A-LP01	Printed circuit board support (option)
0PH100	PCB holder, for small PCBs (option)
0VSLC100	Optical system cleaning kit

Operating Instructions

ERSA PL 550 A and PL 550 AU



ESD Vacuum pipette

0VP020 Vacuum pipette, ERSA Vac Pen

0SVP12K Curved tip

0SVP13A Suction cups, antistatic (set of 4, 6 und 9 mm)

Software packages

0VSID100 ID View Image Explorer (with framegrabber) (option)

0VSFG100 ImageDoc software (with framegrabber) (option)

* In case these parts become defective, we recommend completely exchanging the RPC camera (0VSRPC-UKIT) if necessary

9 WARRANTY

The warranty period corresponds to the General Terms of Sales Deliveries and Payment of ERSA GmbH.

The ERSA GmbH can accept warranty claims only if the device is returned in the original packaging.

These Operating Instructions were produced with the utmost care. Nevertheless, we cannot provide any guarantee for the content, completeness or quality of the information contained in this manual. The content is being continually updated and adapted to current conditions.

All the data contained in these Operating Instructions, including specifications of products and procedures, have been obtained in good conscience and using the latest technical equipment. These specifications are provided without obligation and do not discharge the user from the responsibility of conducting an inspection before using the device. We accept no responsibility for violations of the industrial property rights of third parties or for applications and procedures that we have not previously expressly approved in writing. We reserve the right to make technical changes in the interest of product improvement. Within the bounds of legal possibility, liability for direct damage, consequential damage and third party damage resulting from the acquisition of this product is excluded.

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We reserve the right to make technical changes in the interest of product improvement.