
AN AUTOMATED TEST SYSTEM FOR TESTING
SINGULATED ELECTRONIC COMPONENTS AND A
METHOD OF TESTING SINGULATED ELECTRONIC
COMPONENTS

Field of invention

An embodiment of the invention relates to an automated test system for testing singulated electronic components. Further, an embodiment of the invention relates to a method of testing singulated electronic components.

Background of the invention

Due to a very complicated and sensitive production process of semiconductor components usually certain a not neglectable amount of semiconductor components don't work. As a consequence, the semiconductor components need to be tested most of the time with all their expected features. There is a variety of different machines which carry out the tests. However, there may be a need to provide more flexibility to one machine carrying out the tests.

Summary ~~of the Invention~~

There may be a need to offer a handler and for an automated test system for providing a higher flexibility for semiconductor testing.

In order to meet the need defined above, an automated test system for testing singulated electronic components and a method of testing of testing singulated electronic components are provided ~~according to independent claims~~.

According to an aspect, the present disclosure refers to an automated test system for testing singulated electronic components comprises:

a handler, comprising a plurality of handler pickers and/or a plurality of spinner pickers, the plurality of the handler pickers and/ or of the spinner pickers being adapted to each pickup one electronic component,

at least one processing station for processing one of the electronic components being picked up by one of the plurality of handler pickers,

a carrier station unit, and a first carrier being located in the carrier station unit, wherein the first carrier is adapted to carry a first plurality of electronic components to be tested, and

- the handler pickers and/or the spinner pickers are adapted to each place one electronic component at a time on the first carrier, and/or

- the handler pickers and/or the spinner pickers are adapted to each pick up one electronic component at a time from the first carrier,

a second carrier wherein the second carrier is adapted to carry a second plurality of electronic components to be tested, and

the automated test system further comprising

a test unit for testing singulated electronic components being located on a carrier, wherein

- while the second plurality of electronic components on the second carrier are tested in the test unit and the second plurality of electronic components rest on the second carrier,

- simultaneously the first carrier is 1) loaded with the first plurality of electronic components by the plurality of handler pickers and/or spinner pickers and/or 2) unloaded from the first plurality of electronic components by the plurality of handler pickers and/or spinner pickers, and

wherein the test system further comprises at least one of the group of

a tester, a soak station, a de-soak station, and a further test unit,

wherein at least two of the group of the handler, the test unit, the tester, the soak station, the de-soak station, and the further test unit are standalone units each having a different footprint and are movable to or away from each other.

According to another aspect, the present disclosure refers to a method of testing singulated electronic components comprises:

providing a handler, comprising a plurality of handler pickers and/or a plurality of spinner pickers, the handler pickers and/or spinner pickers being adapted to each pickup one electronic component at a time, at least one processing station for processing one of the electronic components being picked up by one of the plurality of handler pickers, and a carrier station unit, and a first carrier being located in the carrier station unit, wherein the first carrier is adapted to carry a first plurality of electronic components to be tested, and the handler pickers and/or spinner pickers are adapted to each place one electronic component at a time on the first carrier and the handler pickers and/or spinner pickers are adapted to each pick up one electronic component at a time, and a second carrier wherein the second carrier is adapted to carry a second plurality of electronic components to be tested, and a test unit for testing singulated electronic components located on a carrier, wherein the method comprises,

- testing the second plurality of electronic components of the second carrier in the test unit while the second plurality electronic components rest on the second carrier, and

simultaneously loading the first plurality of electronic components on the first carrier with the plurality of handler pickers and/or spinner pickers and/or unloading the first plurality of electronic components from the first carrier with the plurality of handler pickers and/or spinner pickers, and wherein the method further comprises providing at least one of the group of

a tester, a soak station, a de-soak station, and a further test unit,
wherein at least two of the group of the handler, the test unit, the tester, the
soak station, the de-soak station, and the further test unit are standalone units
each having a different footprint are movable to or away from each other.

According to an ~~embodiment of the invention~~example an automated test system for testing singulated electronic components comprises:

a handler, comprising a plurality of handler pickers and/or a plurality of spinner pickers, the handler pickers and/or spinner pickers being adapted to each pickup one electronic component at a time,

at least one processing station for processing one of the electronic components being picked up by one of the plurality of handler pickers,

a carrier station unit, and a first carrier being located in the carrier station unit, wherein the first carrier is adapted to carry a first plurality of electronic components to be tested, and the handler pickers and/or the spinner pickers are adapted to each place one electronic component at a time on the first carrier and the handler pickers and/or spinner pickers are adapted to each pick up one electronic component at a time from the first carrier,

a second carrier wherein the second carrier is adapted to carry a second plurality of electronic components to be tested, and

a test unit, for testing singulated electronic components located on a carrier, wherein

- while the second plurality of electronic components on the second carrier are tested in the test unit and while the second plurality of electronic components rest on the second carrier during testing,
- simultaneously the first carrier is loaded with the first plurality of electronic components by the plurality of handler pickers and/or spinner pickers and/or unloaded from the first plurality of electronic components by the plurality of handler pickers and/or spinner pickers.

According to an ~~example~~embodiment of the invention a method of testing singulated electronic components comprises:

providing a handler, comprising a plurality of handler pickers and/or a plurality of spinner pickers, the handler pickers and/or spinner pickers being adapted to each pickup one electronic component at a time, at least one processing station for processing one of the electronic components being picked up by one of the plurality of handler pickers, and a carrier station unit, and a first carrier being located in the carrier station unit, wherein the first carrier is adapted to carry a

processing singulated electronic components a such individually, and also to use (test) carriers having singulated electronic components loaded for testing the electronic components in a test unit for testing electronic components arranged on a carrier. By stepwise loading the electronic components one at a time by one picker into a receptacle and on a carrier and stepwise unloading the electronic components from the carrier by the picker, this may allow for using two incompatible methods of processing and testing electronic components and becoming compatible. Even if processing of singulated electronic components in processing stations seems to need a complete different time period than testing a carrier by a test unit in a parallel way the picker driven processing and the carrier driven test may coincide needing the same amount of time or at least a comparable amount of time, so that the whole process and the supply by the automated test equipment may become efficient.

According to an ~~exemplary embodiment~~example the automated test system comprises, when the second plurality of electronic components on the second carrier are tested in the test unit, and simultaneously the first carrier is loaded with or unloaded from the first plurality of electronic components by the plurality of handler pickers and/or spinner pickers:

- simultaneously the at least one processing station processes one electronic component picked up by one of the plurality of handler pickers.

In addition to simultaneously loading / unloading the carrier and testing the electronic components on the carrier, further simultaneously may at least one processing station processes one electronic component being picked up by one of the plurality handler pickers. As a consequence, the three sub-processes may run at least partially at the same time.

According to an ~~example~~exemplary embodiment of the automated test system, picking up and placing one electronic component at a time by one handler picker and/or spinner picker comprises:

- a movement of the one handler picker and/or spinner picker relative to the carrier.

The term "movement" may refer to a motion or move which may originate from the picker and/or the carrier. This may allow for placing the electronic

components into different receptacles on the carrier. The handler pickers and/or spinner pickers themselves may have an additional inner freedom of rotation.

According to an ~~exampleexemplary embodiment~~ of the automated test system, picking up and placing one electronic component at a time by one picker comprises:

- a movement of the carrier comprising a linear movement in up to 3 dimensions, and/or

- a movement of the one picker comprising a linear movement in up to 3 dimensions and/or a rotatable movement of the handler picker and/or spinner picker.

A relative movement of the carrier relative to the picker may originate from a linear movement in up to three dimensions of the carrier and/or a linear movement in up to three dimensions of the carrier and/or a freedom of having an inner rotational freedom to move (or turn).

According to an ~~exampleexemplary embodiment~~ of the automated test system, the carrier station unit comprises a first carrier station and a second carrier station, each of the first and second carrier stations, being adapted to receive, carry, and/or move at least one of the first and second carrier, and being adapted to replace the first carrier by the second carrier.

The carrier station unit may have a first carrier station to receive, hold, and/or move a carrier and may have a second carrier station to receive, hold, and/or move a further carrier. The carrier station unit may be adapted to exchange and/or position the carrier and the further carrier, or the first carrier and the second carrier, respectively.

According to an ~~exampleexemplary embodiment~~ the automated test system further comprises at least one further carrier,

adapted to being loaded and unloaded by a handler picker and/or spinner picker with a further plurality of electronic components, wherein the further carrier, is adapted in that the further plurality of electronic components are tested while resting in receptacles of the further carrier.

There may be a first, a second, and a further carrier be located within the automated test equipment. In particular, one of the three carriers may be tested

in the test unit, further two carriers may be located in the carrier station unit, or the first and second carrier station, respectively, to be loaded and/or unloaded. The two carriers in the carrier station unit may be loaded and unloaded simultaneously. E.g. two different handler pickers and/or spinner pickers may each first load the first carrier and second, may unload the first carrier, and vice versa.

When two carriers are used, one carrier may be unloaded from tested electronic components and loaded with untested electronic components, while the other carrier may be in the test unit so that the electronic components on the other carrier can be tested. Using two carriers may be appropriate, when unloading and loading electronic components is faster than testing the same number of electronic components.

When three carriers are used, one empty carrier may be waiting in the carrier station to be loaded with the untested electronic components, while another carrier may be tested in the test unit and a further carrier may be unloaded from tested electronic components.

According to an ~~exampleexemplary-embodiment~~ the automated test system further comprises at least two processing stations, wherein

at least one of the at least two processing stations is located upwards of the carrier station unit, and wherein at least one other of the at least two processing stations is located downwards the carrier station unit.

The terms "upwards" and "downwards" may refer to a direction from lower to higher, and in particular from an earlier time to a later time. I.e. that the handler pickers stop subsequently at the first processing station, the carrier station unit, and then the second processing station to serve each. Equally said, the carrier station unit may be arranged between two different processing stations.

According to an ~~exampleexemplary-embodiment~~ of the automated test system, the handler further comprises a spinner, being linear movable and rotatable about a spinner axis, and wherein the plurality of spinner pickers are arranged to pointing radially outwards from the spinner axis.

A spinner may be in particular used if flipping the electronic components require before and after testing.

According to an ~~example~~~~exemplary embodiment~~ of the automated test system, the handler further comprises a rotary table,

wherein the plurality of pickers is arranged at distal ends of pickup heads radially extending from a center of the rotary table.

The expression "rotary table" may refer to a plate being arranged horizontally and turning on axis, perpendicular to the plate. Handlers comprising one central rotary table are also called "turret handler". The expression "arranged at distal ends of pickup heads" may refer to a position of the pickers. Extending radially outward from the axis of the rotary table, there are pickup heads, on which ultimate ends the pickers are arranged, one picker for each pickup head. When the rotary table turns, then the pickup heads with the pickers at their ends may turn around stepwise. The rotary table may turn forwards and/or backwards, depending whether the electronic components to be tested are parts of a so called "lot". The rotary table may allow for loading a specific number of electronic components from a source in one direction and may unload in the counter-direction back to the source.

According to an ~~example~~~~exemplary embodiment~~ the automated test system further comprises a robot and/or a carrier exchange section, wherein

the robot, and/or the carrier exchange section being adapted to receive the first carrier with the first plurality of electronic components and transferring the first carrier to the test unit, in that after having transferred the first carrier the robot and/or the carrier exchange section completely removes from the test unit.

The term "robot" may refer to a device that automatically performs complicated often repetitive tasks, and here, the robot may pick up one of the carriers and may convey or move the one carrier to a different position and in particular to the test unit and, if necessary, inside the test unit. The robot may remove completely from the test unit after positioning the carrier inside the test unit.

Same may hold for the "carrier exchange section" wherein the difference to the robot may be that the carrier exchange section may allow only for linear movements of the carrier. The carrier exchange section may completely remove from the test unit after placing carrier inside the test unit. However, the carrier exchange section may be arranged inside the test unit so that here the carrier

exchange section may remove from a testing position of the carrier inside the handler.

According to an ~~exampleexemplary embodiment~~ of the automated test system, the test unit is a microphone test unit adapted to test microphones.

The test unit may be or comprise a microphone test unit.

According to an ~~exampleexemplary embodiment~~ the automated test system further comprises at least one of the group of a tester, a soak station, a de-soak station, or a further test unit, wherein

at least two of the group of the handler, the test unit, the tester, the soak station, the de-soak station, and the further test unit, have a different footprint.

The term "footprint" may refer to an area on the ground (here: test floor) covered by something. E.g. the test unit, and the further test unit, may have both different footprints and both different footprints than the footprint of the handler on the test floor. The test unit and the further test unit may both be almost independent machines having an own power supply and may be controlled different compared to the handler. The test unit, the further test unit and any other part of the automated test system, such as the tester, the soak station, the de-soak station, if having an own footprint may comprise rollers. The term "rollers" may refer to move on rollers or wheels, i.e. the first test unit, the second test unit, the handler, and all other part having an own footprint may have rollers or wheels as well.

According to an ~~exampleexemplary embodiment~~ the method comprises: when the second plurality of electronic components on the second carrier are tested in the test unit, and simultaneously the first carrier is loaded with and/or unloaded from the first plurality of electronic components with the plurality of pickers,

- simultaneously processing one electronic component picked up by one of the plurality of pickers with the at least one processing station.

According to an ~~exampleexemplary embodiment~~ the method further comprises: picking up from a carrier, and placing on a carrier, one electronic component at a time with one picker comprising

- moving the one picker and the carrier, relative to each other.

According to an ~~example~~~~exemplary embodiment~~ the method comprises: picking up and placing one electronic component at a time with one picker comprising

- moving the carrier, comprising a linear movement in up to dimensions and/or
- moving the one picker wherein the movement comprises a linear movement in up to dimensions, and/or a rotatable movement of the picker.

An automated test system for testing singulated electronic components comprises a handler, comprising a plurality of pickers, the pickers being adapted to each pickup one electronic component, at least one processing station for processing one of the electronic components, a first carrier, a second carrier, and a test unit, for testing singulated electronic components located on a carrier.

When the second plurality of electronic components on the second carrier are tested in the test unit while the second plurality of electronic components rest on the second carrier, simultaneously the first carrier is loaded with the first plurality of electronic components by the plurality of pickers and/or unloaded from the first plurality of electronic components by the plurality of pickers.

The aspects defined above and further aspects of the pre-sent invention are apparent from the examples of embodiment to be described hereinafter and are explained with reference to the examples of embodiment. The invention will be described in more detail hereinafter with reference to examples of embodiment but to which the invention is not limited.

Brief Description of the Drawing

Fig. 1 shows an embodiment of the automated test equipment for testing different types of electronic components

Fig. 2 is a detailed view of the automated test equipment including view of a rotary handler

Fig. 3 shows an open microphone test module comprising an inner chamber, and including a carrier

Fig. 4 shows a closed microphone test module comprising an inner chamber, and including a carrier

CLAIMS

1. An automated test system ~~(300)~~ for testing singulated electronic components ~~(800u)~~ comprises:

a handler ~~(400)~~, comprising a plurality of handler pickers ~~(210)~~ and/or a plurality of spinner pickers ~~(220)~~, the plurality of the handler pickers ~~(210)~~ and/or of the spinner pickers ~~(220)~~ being adapted to each pickup one electronic component ~~(800u)~~,

at least one processing station ~~(430)~~ for processing one of the electronic components ~~(800u)~~ being picked up by one of the plurality of handler pickers ~~(210)~~,

a carrier station unit ~~(550)~~, and a first carrier ~~(810)~~ being located in the carrier station unit ~~(550)~~, wherein the first carrier ~~(810)~~ is adapted to carry a first plurality of electronic components ~~(800u)~~ to be tested, and

- the handler pickers ~~(210)~~ and/or the spinner pickers ~~(220)~~ are adapted to each place one electronic component ~~(800u)~~ at a time on the first carrier ~~(810)~~, and/or
- the handler pickers ~~(210)~~ and/or the spinner pickers ~~(220)~~ are adapted to each pick up one electronic component ~~(800u)~~ at a time from the first carrier ~~(810)~~,

a second carrier ~~(820)~~ wherein the second carrier ~~(820)~~ is adapted to carry a second plurality of electronic components ~~(800u)~~ to be tested, and

the automated test system ~~(300)~~ further comprising

a test unit ~~(100,100',100'')~~ for testing singulated electronic components ~~800u~~ being located on a carrier ~~(810,820)~~, wherein

- while the second plurality of electronic components ~~(800u)~~ on the second carrier ~~(820)~~ are tested in the test unit ~~(100)~~ and the second plurality of electronic components ~~(800u)~~ rest on the second carrier ~~(820)~~,
- simultaneously the first carrier ~~(810)~~ is 1) loaded with the first plurality of electronic components ~~(800u)~~ by the plurality of handler pickers ~~(210)~~ and/or spinner pickers ~~(220)~~ and/or 2) unloaded from the first plurality of

electronic components ~~(800u)~~ by the plurality of handler pickers ~~(210)~~ and/or spinner pickers ~~(220)~~, and

wherein the test system ~~(300)~~ further comprises at least one of the group of

a tester ~~(480)~~, a soak station ~~(460)~~, a de-soak station ~~(470)~~, and a further test unit ~~(100', 100'')~~,

wherein at least two of the group of the handler ~~(400)~~, the test unit ~~(100)~~, the tester ~~(480)~~, the soak station ~~(460)~~, the de-soak station ~~(470)~~, and the further test unit ~~(100', 100'')~~ are standalone units each having a different footprint ~~(102, 102', 102'', 402, 352, 462, 472, 482)~~ and are movable to or away from each other.

2. The automated test system ~~(300)~~ according to claim 1,

wherein, when the second plurality of electronic components ~~(800u)~~ on the second carrier ~~(820)~~ are tested in the test unit ~~(100)~~, and simultaneously the first carrier ~~(810)~~ is loaded with or unloaded from the first plurality of electronic components ~~(800u)~~ by the plurality of handler pickers ~~(210)~~ and/or spinner pickers ~~(220)~~,

- simultaneously the at least one processing station ~~(430)~~ processes one electronic component ~~(800u)~~ transported by one of the plurality of handler pickers ~~(210)~~.

3. The automated test system ~~(300)~~ according to at least one of the claims 1 or 2,

wherein picking up and placing one electronic component ~~(800u)~~ at a time by one handler picker ~~(210)~~ and/or spinner picker ~~(220)~~ comprises:

- a movement of the carrier ~~(810)~~ comprising a linear movement in up to 3 dimensions, and/or
- a movement of the one handler picker ~~(210)~~ and/or spinner picker ~~(220)~~ comprising a linear movement in up to 3 dimensions and/or a rotatable movement of the handler picker ~~(210)~~ and/or of the spinner picker ~~(220)~~.

4. The automated test system ~~(300)~~ according to at least one of the claims 1 to 3,

wherein the carrier station unit ~~(550)~~ comprises a first carrier station ~~(551)~~ and a second carrier station ~~(552)~~, each of the first and second carrier stations ~~(551, 552)~~ being adapted to receive, carry, and/or move at least one of the first and second carrier ~~(810, 820)~~, and being adapted to replace the first carrier ~~(810)~~ by the second carrier ~~(820)~~.

5. The automated test system ~~(300)~~ according to at least one of the claims 1 to 4, further comprising

at least one further carrier ~~(810, 820)~~, adapted to being loaded with and unloaded from a further plurality of electronic components ~~(800u)~~ by a handler picker ~~(210)~~ and/or a spinner picker ~~(220)~~,

wherein the further carrier ~~(810, 820)~~ is adapted in that the further plurality of electronic components ~~(800u)~~ are tested while resting in receptacles of the further carrier ~~(810, 820)~~.

6. The automated test system ~~(300)~~ according to at least one of the claims 1 to 5, further comprising

at least two processing stations ~~(430)~~,

wherein at least one of the at least two processing stations ~~(430-1, 430-2)~~ is located upwards of the carrier station unit ~~(550)~~, and wherein at least one other of the at least two processing stations ~~(430-3, 430-4)~~ is located downwards the carrier station unit ~~(550)~~.

7. The automated test system ~~(300)~~ according to at least one of the claims 1 to 6,

wherein the handler ~~(400)~~ comprises a spinner ~~(230)~~, being linear movable and rotatable about a spinner axis ~~(231)~~, and

wherein the plurality of spinner pickers ~~(220)~~ are arranged to pointing radially outwards from the spinner axis ~~(231)~~.

8. The automated test system ~~(300)~~ according to at least one of the claims 1 to 6,

wherein the handler ~~(400)~~ comprises a rotary table ~~(410)~~, and

wherein the plurality of handler pickers ~~(210)~~ are arranged at distal ends of pickup heads ~~(420)~~ radially extending from a center of the rotary table ~~(410)~~.

9. The automated test system ~~(300)~~ according to at least one of the claims 1 to 8, further comprising

a robot ~~(350)~~ and/or a carrier exchange section ~~(250)~~,

the robot ~~(350)~~, and/or the carrier exchange section ~~(250)~~ being adapted to receive the first carrier ~~(810)~~ with the first plurality of electronic components ~~800u~~ and transferring the first carrier ~~(810)~~ to the test unit ~~(100)~~, in that after having transferred the first carrier ~~(810)~~ the robot ~~(350)~~ and/or the carrier exchange section ~~(250)~~ completely remove from the test unit ~~(100)~~.

10. The automated test system ~~(300)~~ according to at least one of the claims 1 to 9,

wherein the test unit ~~(100)~~ is a microphone test unit ~~(100)~~ adapted to test microphones ~~(800u)~~.

11. A method of testing singulated electronic components ~~(800u)~~ comprises:

providing a handler ~~(400)~~, comprising a plurality of handler pickers ~~(210)~~ and/or a plurality of spinner pickers ~~(220)~~, the handler pickers ~~(210)~~ and/or spinner pickers ~~(220)~~ being adapted to each pickup one electronic component ~~(800u)~~ at a time, at least one processing station ~~(430)~~ for processing one of the electronic components ~~(800u)~~ being picked up by one of the plurality of handler pickers ~~(210)~~, and a carrier station unit ~~(550)~~, and a first carrier ~~(810)~~

being located in the carrier station unit ~~(500)~~, wherein the first carrier ~~(810)~~ is adapted to carry a first plurality of electronic components ~~(800u)~~ to be tested, and the handler pickers ~~(210)~~ and/or spinner pickers ~~(220)~~ are adapted to each place one electronic component ~~(800u)~~ at a time on the first carrier ~~(810)~~ and the handler pickers ~~(210)~~ and/or spinner pickers ~~(220)~~ are adapted to each pick up one electronic component ~~(800u)~~ at a time, and a second carrier ~~(820)~~ wherein the second carrier ~~(820)~~ is adapted to carry a second plurality of electronic components ~~(800u)~~ to be tested, and a test unit ~~(100, 100', 100'')~~ for testing singulated electronic components ~~(800u)~~ located on a carrier ~~(810, 820)~~, wherein the method comprises,

- testing the second plurality of electronic components ~~(800u)~~ of the second carrier ~~(820)~~ in the test unit ~~(100)~~ while the second plurality electronic components ~~(800u)~~ rest on the second carrier ~~(820)~~, and

simultaneously loading the first plurality of electronic components ~~(800u)~~ on the first carrier ~~(810)~~ with the plurality of handler pickers ~~(220)~~ and/or spinner pickers ~~(210)~~ and/or unloading the first plurality of electronic components ~~(800u)~~ from the first carrier ~~(810)~~ with the plurality of handler pickers ~~(210)~~ and/or spinner pickers ~~(220)~~, and wherein the method further comprises providing at least one of the group of

a tester ~~(480)~~, a soak station ~~(460)~~, a de-soak station ~~(470)~~, and a further test unit ~~(100', 100'')~~,

wherein at least two of the group of the handler ~~(400)~~, the test unit ~~(100)~~, the tester ~~(480)~~, the soak station ~~(460)~~, the de-soak station ~~(470)~~, and the further test unit ~~(100', 100'')~~ are standalone units each having a different footprint ~~(102, 102', 102'', 402, 352, 462, 472, 482)~~ are movable to or away from each other.

12. The method of testing electronic components ~~(800u)~~ according to claim 11, wherein

when the second plurality of electronic components ~~(800u)~~ on the second carrier ~~(820)~~ are tested in the test unit ~~(100)~~, and simultaneously the first carrier ~~(810)~~ is loaded with and/or unloaded from the first plurality of electronic components ~~(800u)~~ with the plurality of handler pickers ~~(210)~~ and/or spinner pickers ~~(220)~~,

- simultaneously processing one electronic component ~~(800u)~~ picked up by one of the plurality of handler pickers ~~(210)~~ with the at least one processing station ~~(430)~~.

13. The method of testing electronic components ~~(800u)~~ according to claim 11 or 12,

wherein picking up from a carrier ~~(810, 820)~~ and placing on a carrier ~~(810, 820)~~ one electronic component ~~(800u)~~ at a time with one picker ~~(210)~~ comprises

- moving the one picker ~~(210)~~ and the carrier ~~(810, 820)~~ relative to each other.

14. The method of testing electronic components ~~(800u)~~ according to at least one of the claims 11 to 13,

wherein picking up and placing one electronic component ~~(800u)~~ at a time with one picker ~~(210)~~ comprises

- moving the carrier ~~(810, 820)~~ comprising a linear movement in up to 3 dimensions and/or
- moving the one picker ~~(210)~~ wherein the movement comprises a linear movement in up to 3 dimensions, and/or a rotatable movement of the picker ~~(210)~~.