

## 01/2004

### Inspection and Handling Systems for the Electronics and Automobile Industries

pi4 strives to be your service partner in all facets of factory automation. Our passion is delivering you the optimal solutions, components and systems for your automation tasks.

For years, pi4 has been delivering inspection systems based on image processing a laser measurement technology to the automobile and electronics industries.

Inspection systems from pi4 excel in advanced technology;  
short inspection times  
acquisition of complex geometries  
comprehensive inspection and identification possibilities  
simple, easy-to-use operator interfaces  
high reliability  
remote maintenance and updates  
low service costs

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# Overview

## Image Processing Solutions: Supplier & Electronic Industries

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# Supplier & Electronic Industries Adhesive & Sealant Inspection



Photo: Automatica 2004. Station for the application of sealant on an oil sump with integrated camera inspection.

Adhesives are used in many branches of modern joining technology, particularly in the automobile industry. Classic joining methods such as screws, rivets and welding have been replaced by adhesives in many critical applications. In all cases an exact quantity of adhesive must be dispensed with high positional accuracy. Therefore the application is performed automatically via the use of robots or other application systems, and places high demands on the technology that is employed.

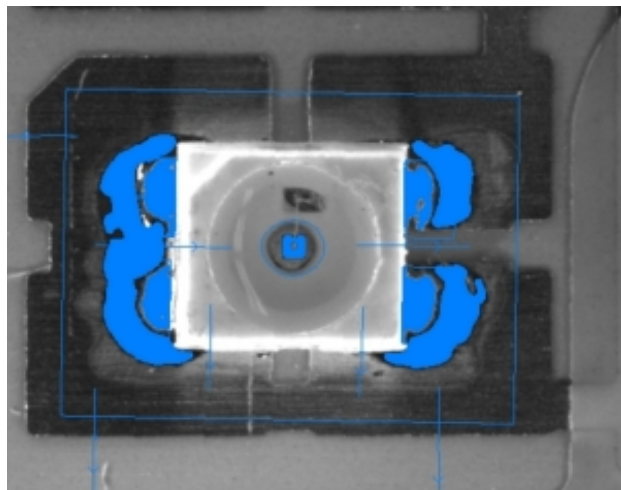
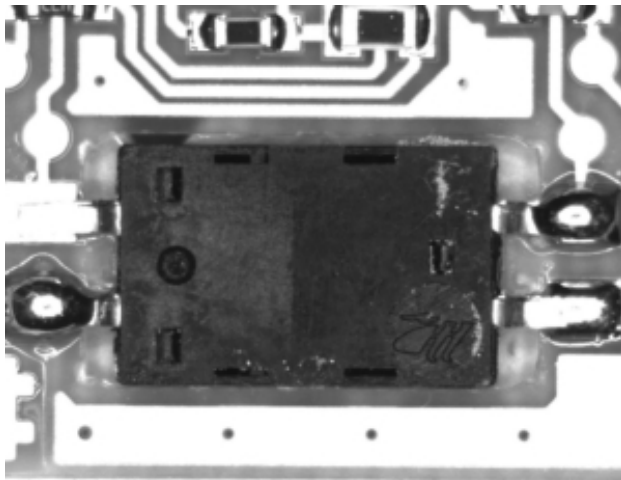
Only processes that are 100% controlled are able to achieve the required parameters within tight tolerances. The application of adhesive or sealant is difficult or impossible to inspect after assembly. Defects can only be repaired with difficulty, or in most cases, not at all.

pi4\_robotics offers laser or camera-based fully automatic inspection systems for your adhesive or sealant application task, which can be incorporated into any existing process.

- **100% Control**  
of adhesives and sealants using laser and camera-based inspection
- **Adhesive and Sealant Beads**  
positioning errors  
thickness errors  
interruption of flow  
constrictions
- **Laminar Products**  
recognition of local defects and irregularities
- **Position Recognition**  
and thus correction of the inspection area during positional changes of the workpiece
- **High Inspection Speed**  
with which the operation is able to be controlled directly at the dispensing process
- **Modular Inspection Systems**  
to be integrated directly into your production line, or as ready-to-run inspections cells that control the product via robots

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# Supplier & Electronic Industries Inspection of Electronic Modules



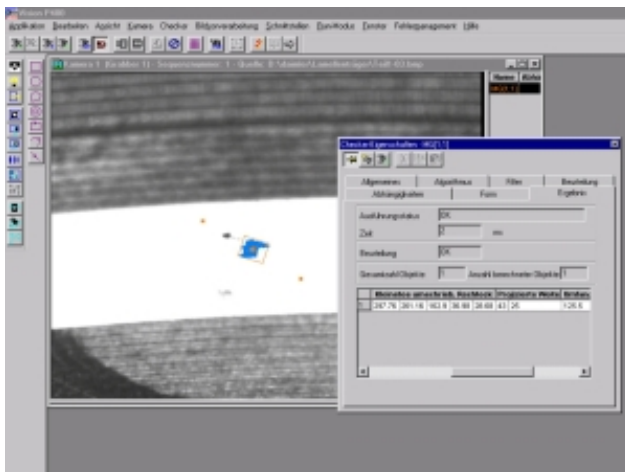
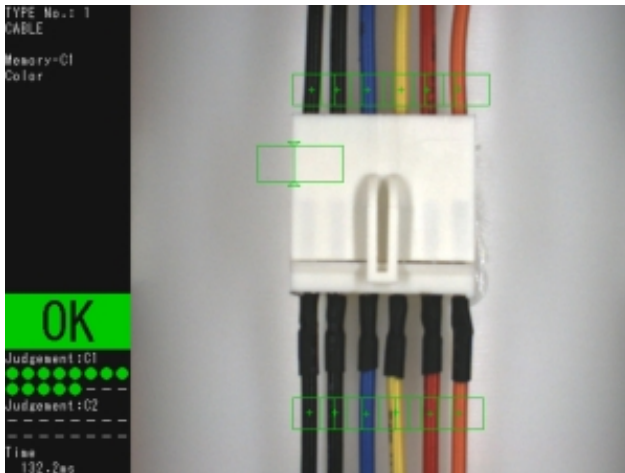
- **Cost Reduction**  
by avoiding wastage
- **Quality Assurance**  
through optical control
- **Inspection of the characteristics**
- **Presence and position**  
of the component
- **Inspection of Polarity**  
of components
- **Inspection of Soldering Paste**
- **Control of Soldered Joints**  
short circuits  
quality (image 1)  
presence (image 2)
- **Laser Height-Measurement**
- **Optical Functional Inspection**  
of LEDs and LCD displays

The fully automatic inspection of printed circuit boards (PCBs) and electrical connections is of great significance to the reliability and profitability of electronics production. Automatic Optical Inspection (AOI) systems from pi4 set high standards in all areas of inspection, such as in component mounting, soldered joints, paste printing and the application of joining compound.

The core of the automatic inspection systems are high-resolution camera and laser systems, which are modularly and flexibly designed. pi4 also offers classic inline stations and customer-specific solutions for the inspection of PCBs in completed assemblies.

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# Supplier & Electronic Industries Surfaces, Colour and Structure



- **Inspection of Plastic Parts**  
colour, tone, brightness, pattern  
e.g. of car-door handles  
  
control of order of assembly  
e.g. cables shown in Image 1  
embeddings  
recognition of colour transitions  
control of inlayed parts  
  
form and proportional accuracy
- **Inspection of Metallic Parts**  
surface quality; scratches, bubbles, rust  
  
coatings, e.g. in electroplating

A flawless surface, colour and structure is just as important for visible surfaces as it is for functional surfaces such as those of shafts or housing components. pi4 offers a wide range of optical inspection systems that are able to record colour, patterns and structure as well as the depth of scratches or bubbles with an accuracy of resolution up to 1µm.

Through the use of endoscopes, areas that are difficult to access may also be inspected.

In Image 1 an application is shown, whereby the installation order of cables is inspected.

In Image 2 an application is shown, whereby a surface is checked for scratches, bubbles or other damages.

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# Supplier & Electronic Industries Remote Services



## Remote Alarm

The user can be notified of alarms, such as poor product quality or disruptions in production, via the control panel, by email or by telephone.

## Remote Monitoring

The machine status can be visualised via internet or LAN.

## Remote Operation

Systems from pi4 can be operated over landline or internet, whereby current images can be transferred.

## Remote Maintenance

The on-site maintenance team can be comfortably supported from pi4 headquarters. The status of all machines can be checked. In cases of minor errors such as dirty or misaligned sensors, remote diagnosis of errors can avoid costly servicing.

## Remote Programming

All pi4 systems can remotely receive upgrades.

- **Cost Reduction**  
of maintenance operations
- **User Support**
- **Remote Alarm**  
alarm notifications via the control panel, email, fax or telephone
- **Remote Problem Diagnosis**
- **Remote Programming**
- **Remote Operation**
- **Transmission Possibilities**  
analogue modem  
  
ISDN modem  
  
Ethernet with either LAN and/or internet  
  
GSM

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## Outstanding Product Characteristics

### - Quality and Reliability

...are standard at pi4.

Through internal quality management and well-organised, controlled development processes, we ensure consistently high quality and durability. With a specifically-chosen range of components, complemented by our own in-house production and software development, we achieve supreme reliability.

### - Machine Safety

Your safety is of utmost importance to us. Our machines are subjected to extensive safety analyses, and are designed and tested according to the latest safety concepts and standards.

### - Low Service Costs; thereby Significant Cost Reduction

...through automatic self-governing machines.

With these capabilities, maintenance work is only requested when it is actually necessary.

Our service team can work with the machine online, thanks to remote maintenance technology.

### - Rapid Spare-Part Delivery, and Long Spare-Part Stock Supply

...are ensured by consistently using standard parts from reliable, renowned suppliers.

### - Comprehensive Operating Manuals and Service Documentation

Elaborate operating manuals enable a fast familiarisation with our inspection systems.

### - Full-Service Systems Partners

pi4 employees speak the language of the industry. Our project teams are not only responsible for product development and optimisation, but also the onsite setup and commencement of operation. Through this comprehensive, in-depth experience, innovative solutions for an extensive range of automation tasks are created.