Robotisation & test of image sensors

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SW Test Workshop
Semiconductor Wafer Test Workshop

e2v
Bringing life to technology

June 5-8, 2016

Overview

1-who is e2v ?

2-what is the context ?

3-Why a robot ?

4- how ?

5-conclusion

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e2v Group

Advanced technology and vital services for critical systems

RF Power

Electron devices and sub-systems generating, amplifying & precision controlling RF power
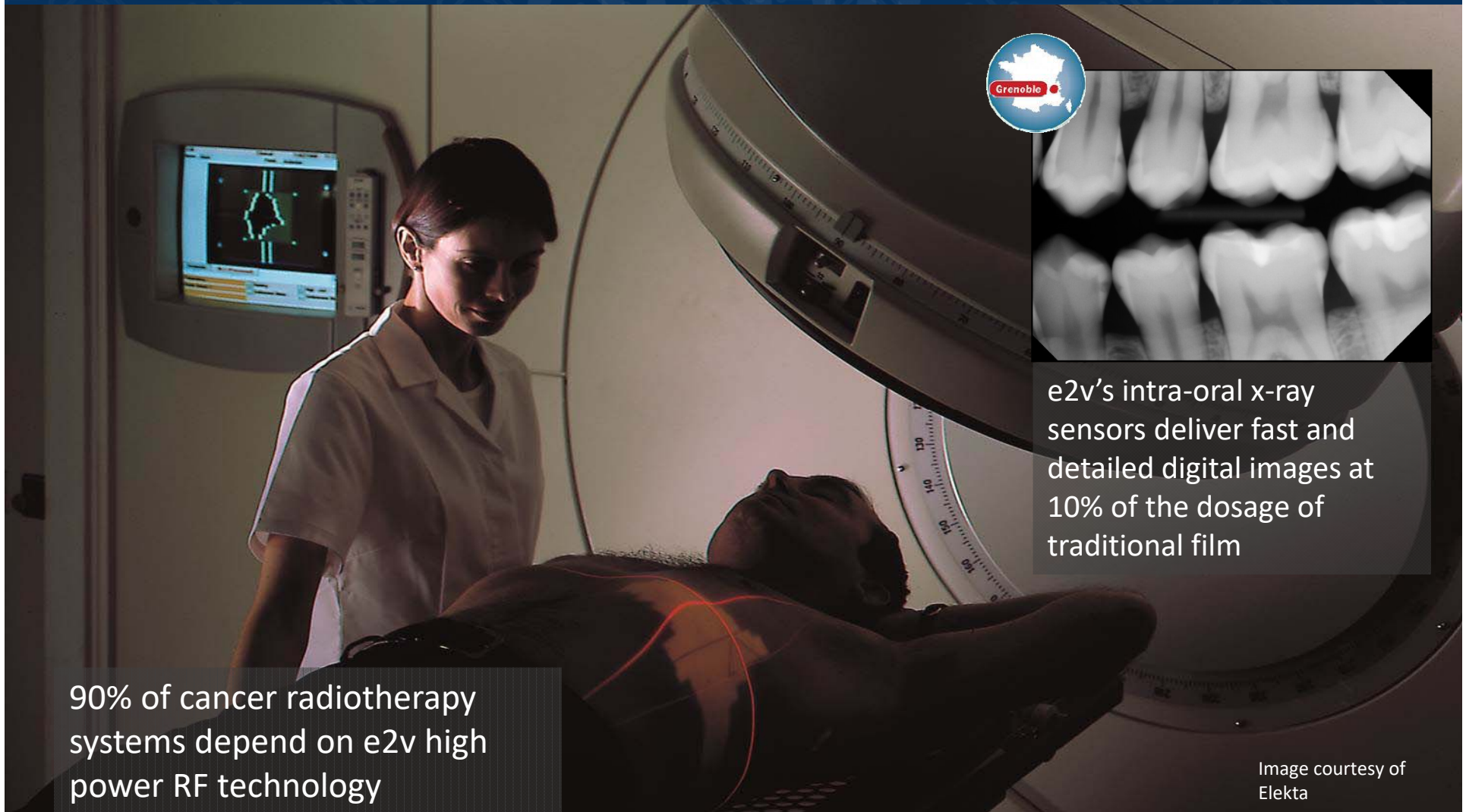
Imaging

CCD & CMOS sensors, focal plane arrays, cameras & sub-systems

Semiconductors

Hi-rel semiconductors for space, aerospace, defence & industrial applications
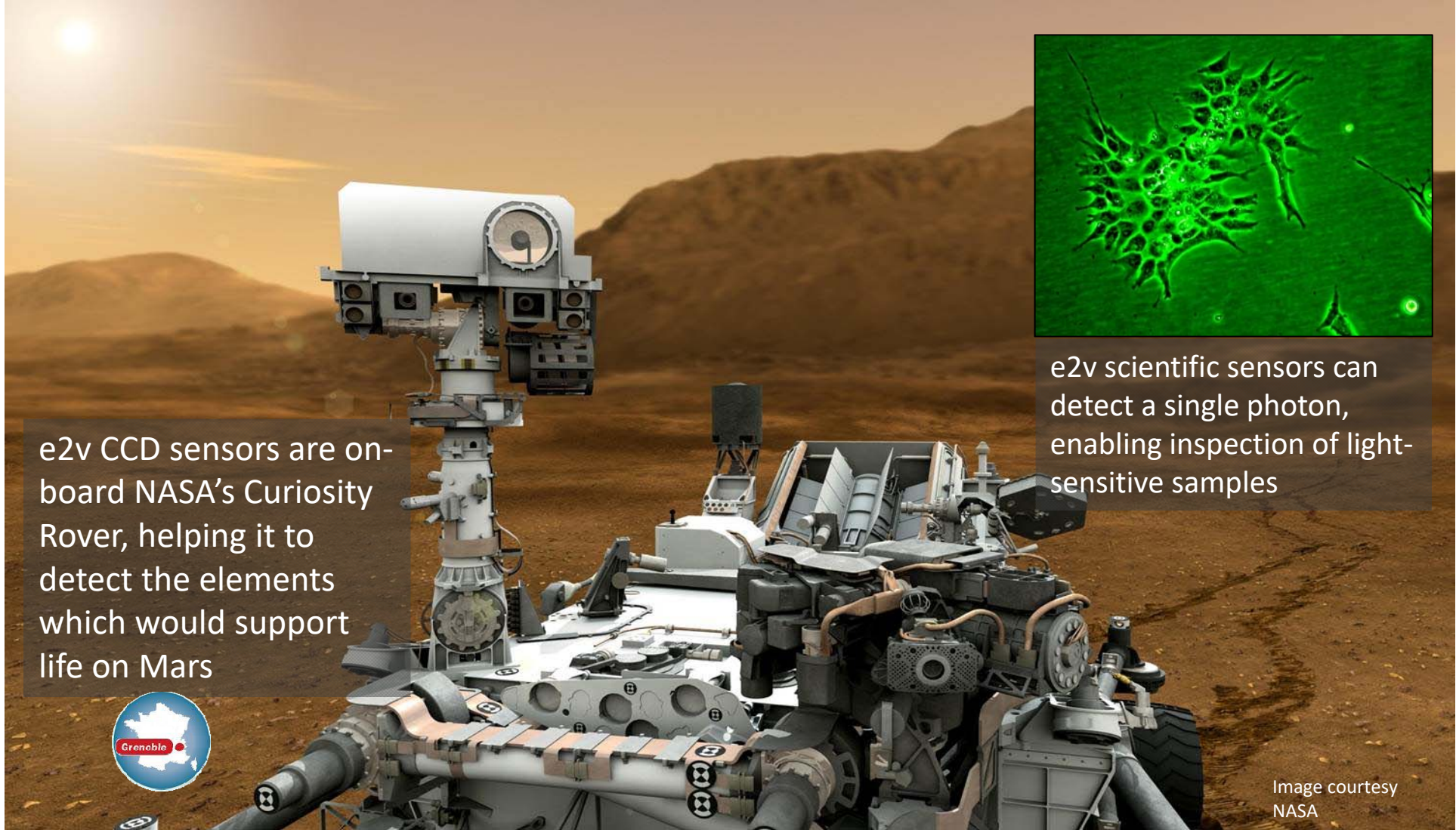
e2v - Improving health

e2v's intra-oral x-ray sensors deliver fast and detailed digital images at 10% of the dosage of traditional film

90% of cancer radiotherapy systems depend on e2v high power RF technology

Image courtesy of Elekta

e2v - Enabling discovery

e2v CCD sensors are on-board NASA's Curiosity Rover, helping it to detect the elements which would support life on Mars

e2v scientific sensors can detect a single photon, enabling inspection of light-sensitive samples

Image courtesy NASA

e2v - Connecting the world

Our high performance and energy-efficient data converters are enabling a new generation of smaller and more cost-effective telecoms satellites

e2v's hi-reliability microprocessors control the avionics systems of the Boeing 787 Dreamliner and the Airbus A350

Image courtesy Boeing

e2v - Protecting assets

e2v's compact and versatile electronic countermeasures detect and deceive incoming hostile threats

e2v guarantees long-term supply of hi-reliability semiconductors through our SLiM programme, supporting platform life extension and counterfeit avoidance
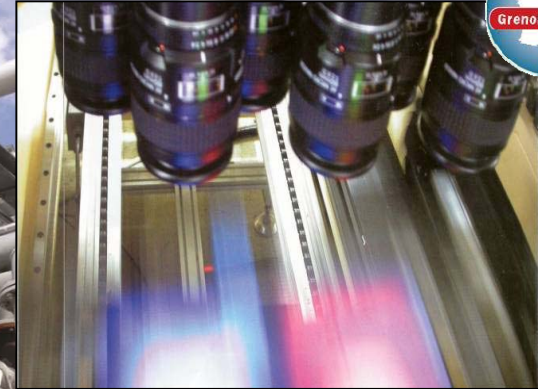
Image courtesy Raytheon

e2v - Transforming industrial processes

RF generators developed by e2v will enable Rio Tinto to improve the efficiency of mineral recovery from previously discarded ore.

e2v provides the world's fastest, highest resolution machine vision cameras, used to inspect flat panel television screens

Image courtesy Rio Tinto

e2v - Seeing the big picture

Earth observation satellites take detailed pictures, captured by e2v imaging sensors, to help scientists monitor environmental change

e2v's power tubes and microwave systems power radar on land, ships and planes

Uluru (Ayres Rock) Australia
Image courtesy
CNES Pleiades

Uluru (Aye's Rock), Uluru-Kata Tjuta National Park, Australia © CNES 2012 - Distribution Astrium Services/ Spot Image

2-what is the context ?

- **Optimize our test platforms**

  – Agility between production and engineering

  Final test   **Wafer probe**

  – Dual function

For image sensors in different package format

Wafer to Package test position

2-what is the context ?

- **Constraints coming from image sensors and tester configuration**

Management and people constraints
Quick change between configurations
Security and ergonomics

Material and process constraints
Flip sensor during test for illuminator configuration
Avoid contact with the glass lid
Pin integrity
Protective film

Equipment and environmental constraints
Accurate docking between positions for wafer and final test
Clean Room, and ESD compatibility

2-what is the context ?

- ## Safety Share

Initial condition
Manual test devices of qty > 1k parts/lot
-> repetitive motion with precise amplitude is pathogenic

Operators suffers from musculoskeletal disorders.
Turnover needed

2-what is the context ?

- **Constraints coming from image sensors and tester configuration**

DIB

L2CIS

TEST HEAD
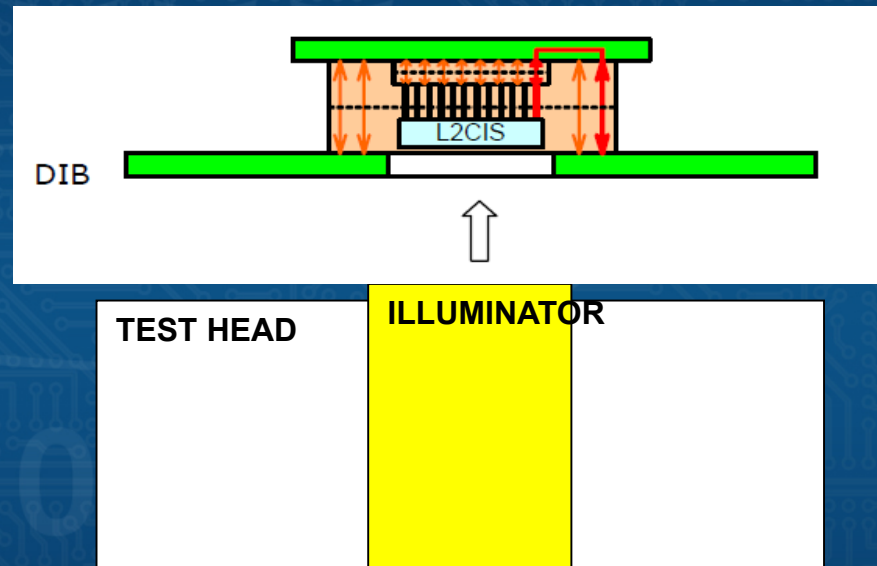
ILLUMINATOR

Illumination from bottom side of test head

2-what is the context ?

- **Different solutions**
  - Handler
  - Robot

- **Different strength, weakness and opportunities**
  - Autonomy vs field service in low volume production area

3-Why a robot ?

- **Robot**

  6 axis for socket movement

  Custom in-line modules

  Fast development for new product, by program.

- **Handler**

  Limited movements

  Thermal option

  Specific kit: 20 k€

3-Why a robot ?

- **Small lot size needs SMED approach**

    Configuration setup time < 5min

- **Precision & 6 sigma**

    6 sigma study for hinge manipulator tilt repeatability

    Sigma < 100μ @ socket position

- **Agility: custom development & reusable**

4-How ?

- **Socket approach**
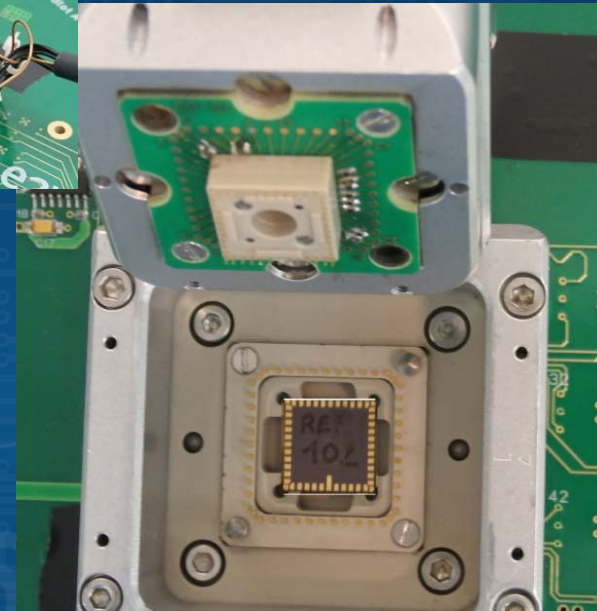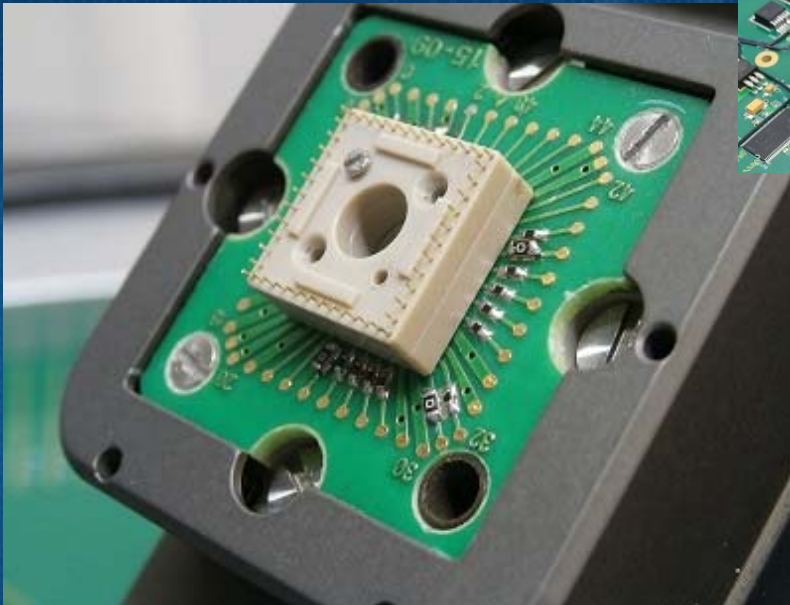
✓Backside contact necessary as the component is in dead bug position

✓Actuation of pogo contact on device by rotating lock without plunger

✓The socket top ensure alignment, Z actuation and contacting

4-How ?

- **Socket approach**
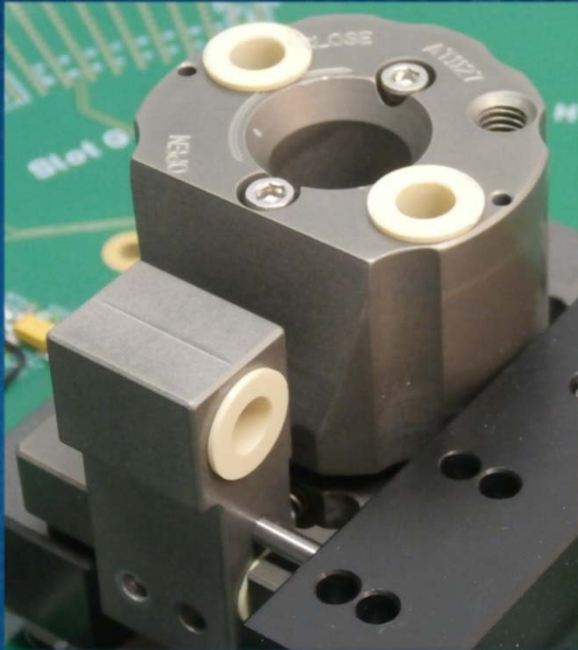
Compatibility between manual
and automatic mode
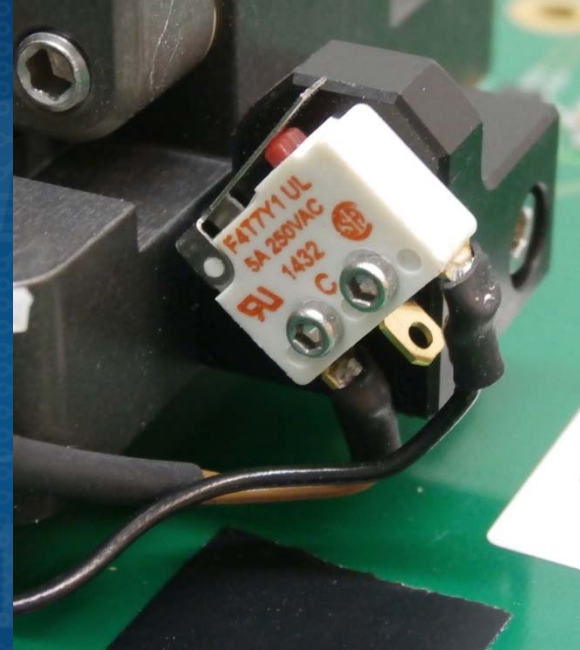
Secure with
in position sensors

4-How ?

- ## Socket approach
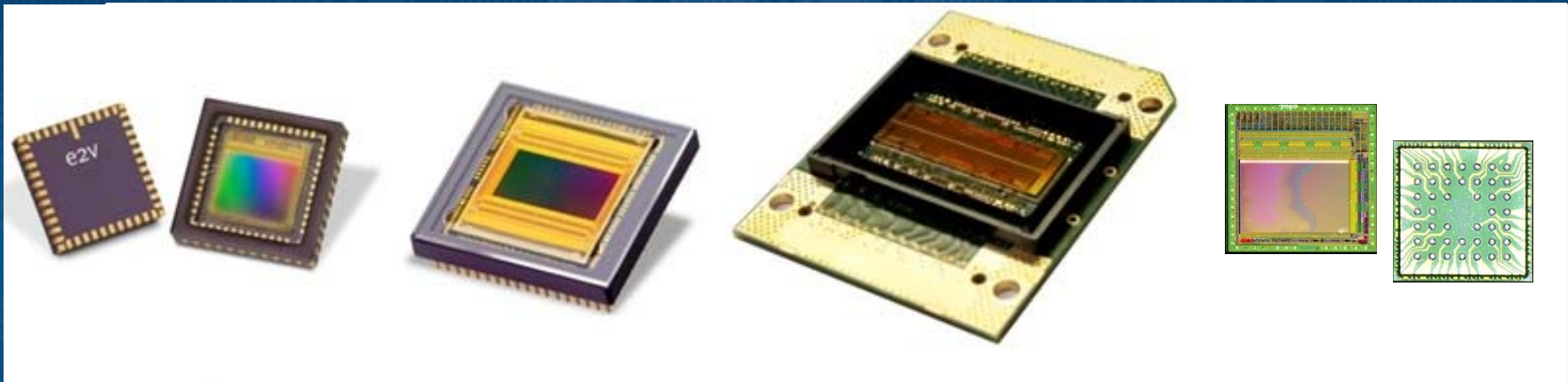
High accuracy of
positioning by design of
socket.
Tolerance less than
0.050mm

Less constraint
for robot

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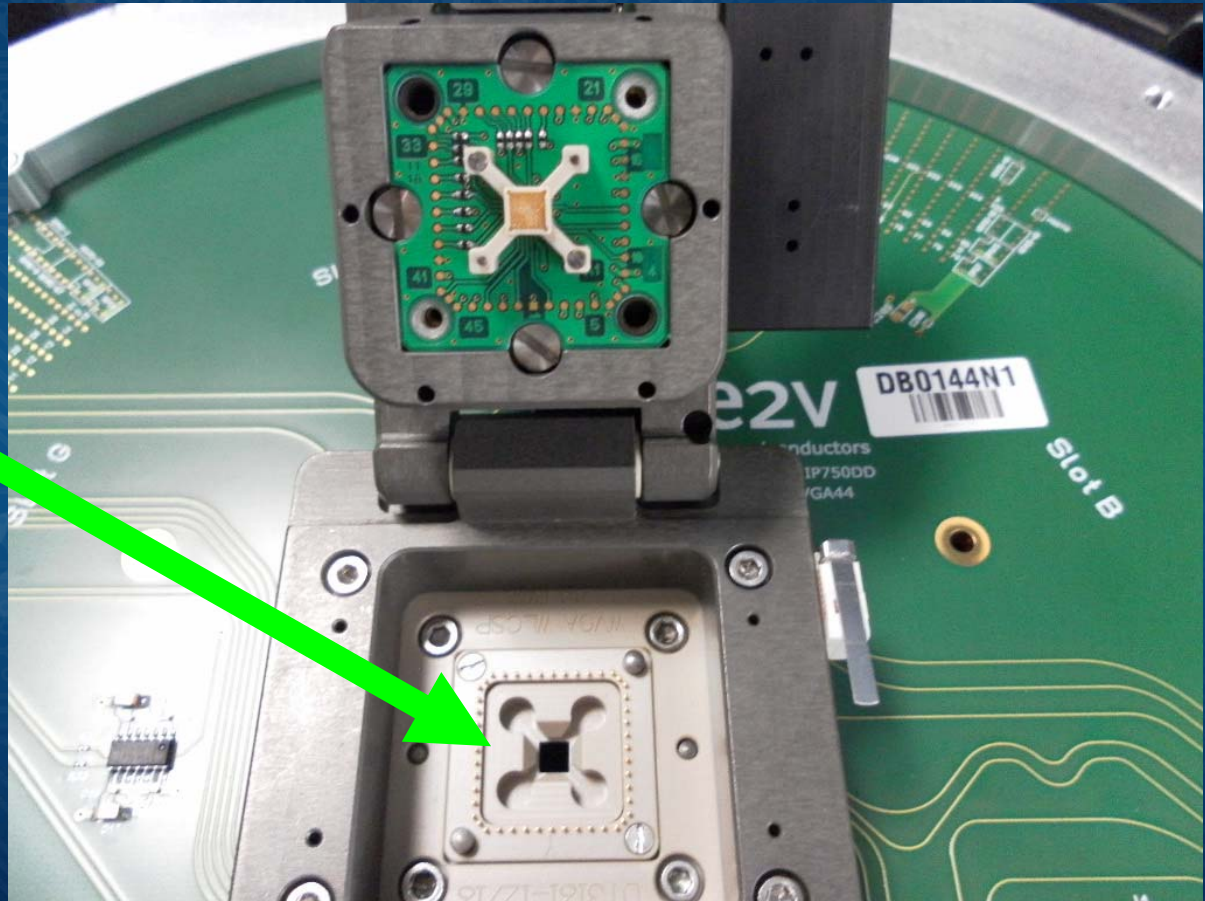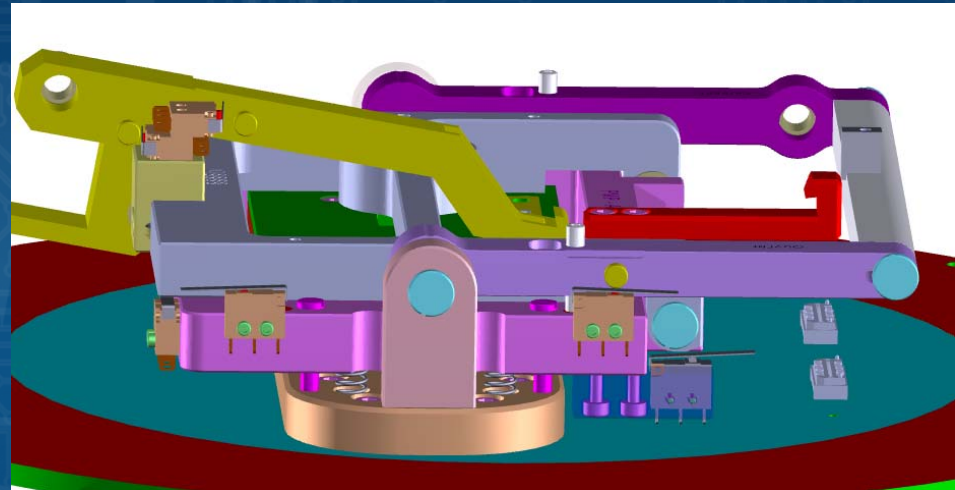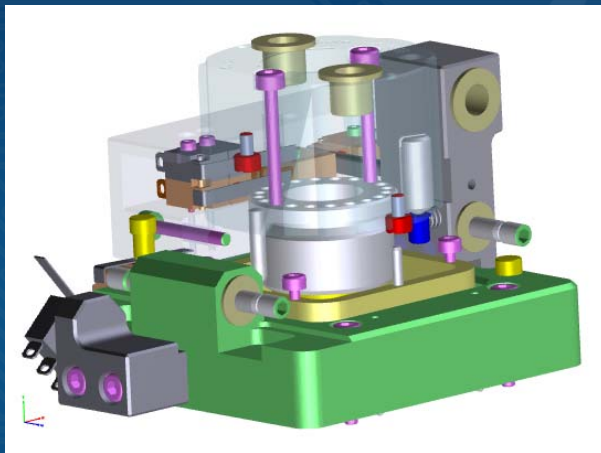
2-what is the context ?

- **Socket approach**

Several kinds of packaging :

CLCC, Micro-PGA, Chip On Board, WLCSP

4-How ?

- **Socket approach**
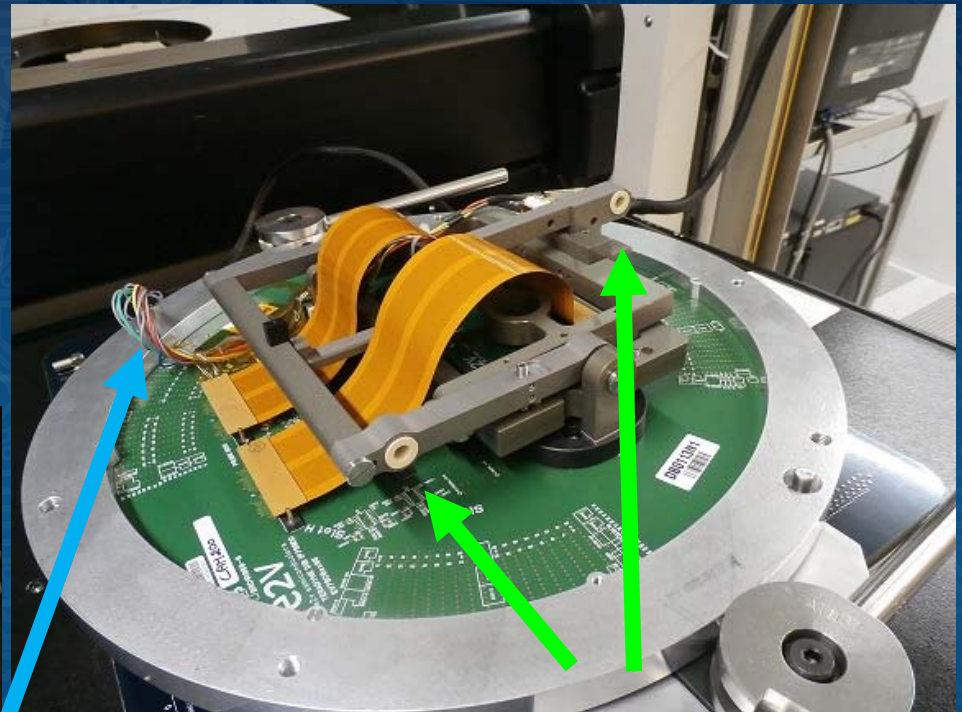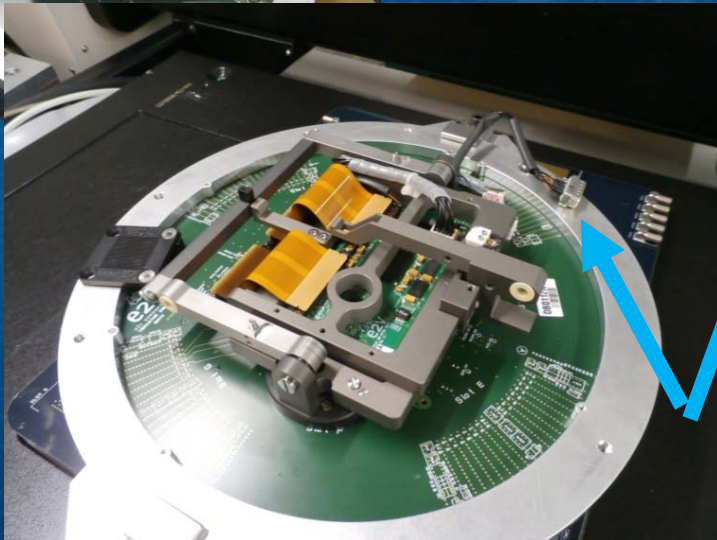

Only 2 kinds of sockets, Auto/manual contactor Clamshell with :

➢horizontal rotation actuation, due to double pogo pins connection
➢vertical rotation actuation, due to Flex connection

4-How ?
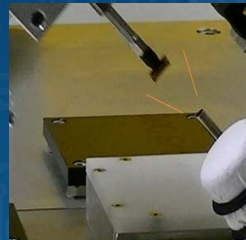
- **Socket approach**

Holes for handling with Roby-One

Communication Socket <-> Roby-One

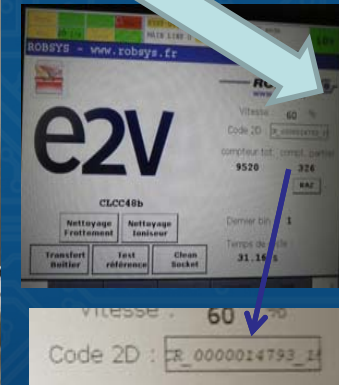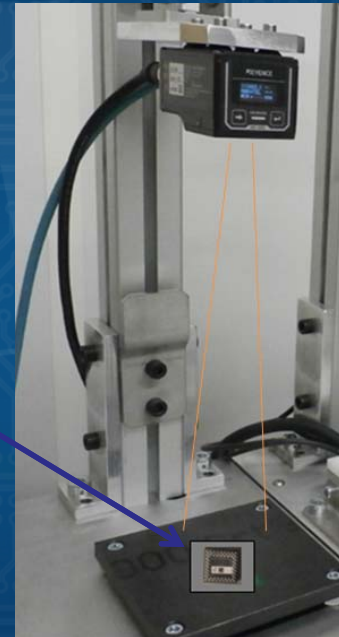Example of socket with vertical rotation actuation, due to Flex connection

4-How ?

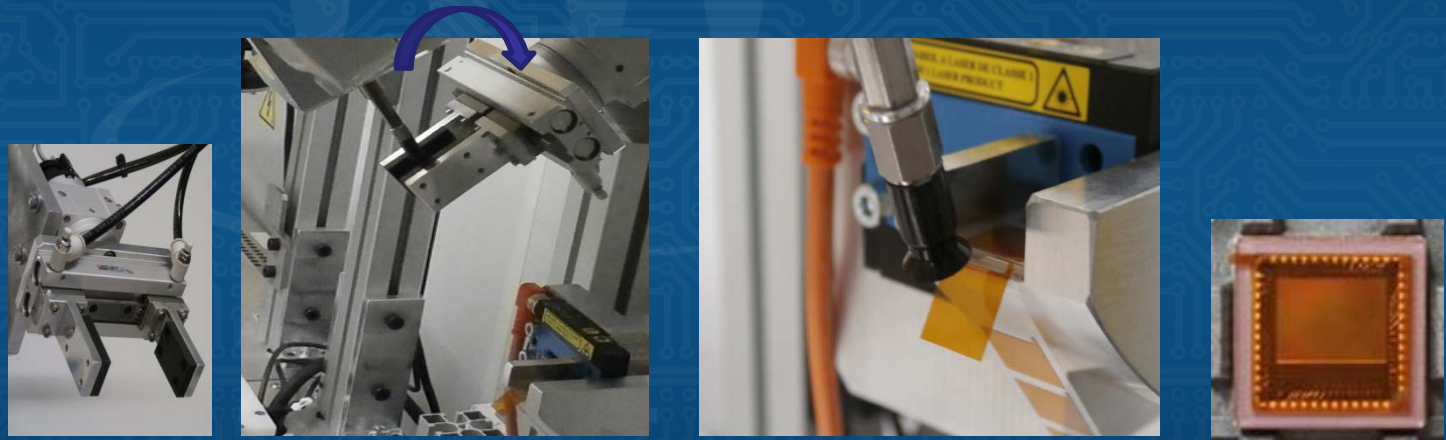Able to do something else during test

Blow or sweet cleaning..

Id reading….

4-How ?

Able to do something else during test

Protective film positioning..

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4-How ?

- Specific tool design

Tray handling tool

Flip station

Conclusion

- **Today : comfortable working conditions and cycle time improvement**

- **3 products transferred in production**

With > 8 hours of autonomy without operator intervention

Conclusion Roby One

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