2007 Session 7

ARCHIVE 2007

EXPLORING HANDLER, SOCKET & DEVICE INTERFACING

"The Importance of the Mechanical Interface in Final Test Efficiency"

Mark Stenholm
Antares Advanced Test Technologies

"Effects of Handler Insertion Variations on Contactor Performance for Pb-Free Devices"

Jeff Sherry
Johnstech International Corporation

"Contacting Solution for Optical Sensor IC – HD DVD Application"

Gerhard Gschwendtberger
Multitest elektronische Systeme GmbH

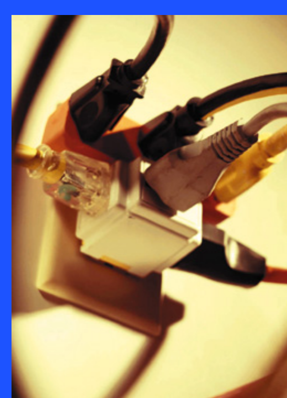
The Importance of the Mechanical Interface in Final Test Efficiency

2007 Burn-in and Test Socket Workshop
March 11 - 14, 2007

Mark Stenholm
Antares Advanced Test Technology

Test Interfaces

Most of the attention in Final Test is given to the Electrical Interface



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Test Interfaces

But the success or failure of the Mechanical Interface is equally important

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What is the Mechanical Interface?

- Physical Interface
- Transferring of devices within the test cell

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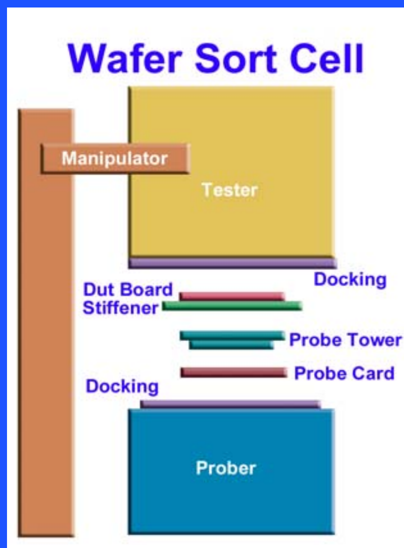
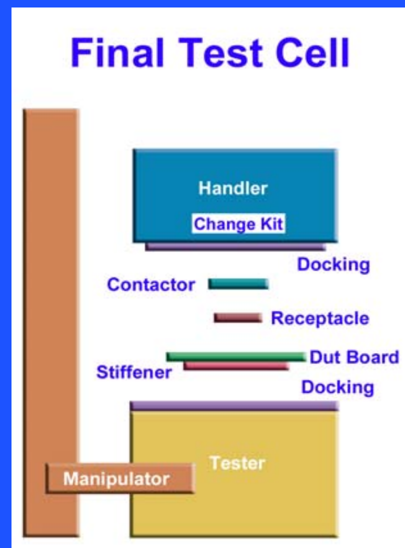
What is the Mechanical Interface?





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What is the Mechanical Interface?

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2 Words That Define Final Test

- **Yield:**
  A measure of the efficiency of production

  Directly tied to profit and cost-of-test

- **Tolerance:**
  The accuracy required to attain yield

  Its application directly contributes to yield (+/-)

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3 Types of Mechanical Interfaces

1 **Machine Interface**
(Tester, Handler, Prober, etc.)

2 **Kit Interface**
(Device to Handler)

3 **Contactor Interface**
(Device to Socket)

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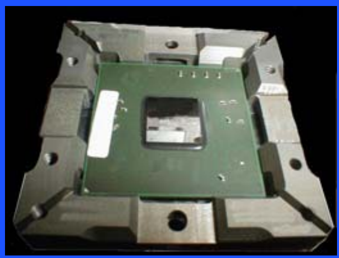
Mechanical Interface

Interface Goal:

Locate the leads of the device within the tolerance of the test contacts



Pretty simple, right?

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Mechanical Interface

Locate the leads of the device within the tolerance of the test contacts

Now do it correctly every ½ second!

Now do it correctly with devices at 85 degrees C!

Now do it correctly with devices at –40 degrees C!

Now do it correctly with JEDEC device tolerances!

And don't damage my parts!

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Mechanical Interface

Problems often manifest as:

Reduced Yield ($ to $$$)

Reduced Kit Life ($)

Reduced Contactor Life ($ to $$)

Device Damage (apparent or latent) ($$$)

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Mechanical Interface

Problems often manifest as:

Reduced Yield ($ to $$$)

Reduced Kit Life ($)

Reduced Contactor Life ($ to $$)

Device Damage (apparent or latent) ($$$)

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Machine Interface

Joining of different pieces of test equipment:

Handler

Tester

Prober

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Machine Interface

The actual physical joining together of the Tester and Handler (or Prober) is as important as any other interface in the test cell

Tester costs can exceed $2M

Handler costs can exceed $500K

Interfaces can cause each to be ***worthless*** or ***priceless***

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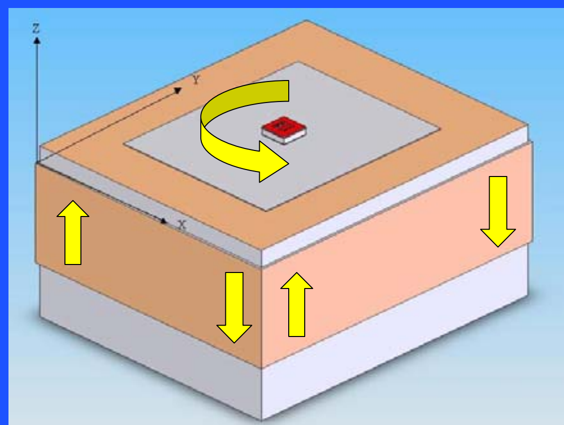
Machine Interface

Inaccuracies that can cause errors



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Machine interface

Case study #1

Problem:

Customer had highly inconsistent results testing HF device on a high performance contactor

No apparent cause, thought to be board or contactor related

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Machine Interface

Case study #1

Symptom:
Yield varied between 16% and 88% sporadically

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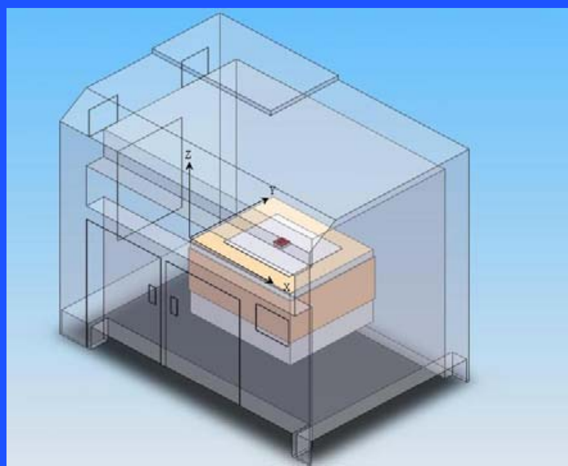
Machine Interface

Case study #1

Diagnosis:

Existing interface allowed the equipment to flex when the raised floor flexed



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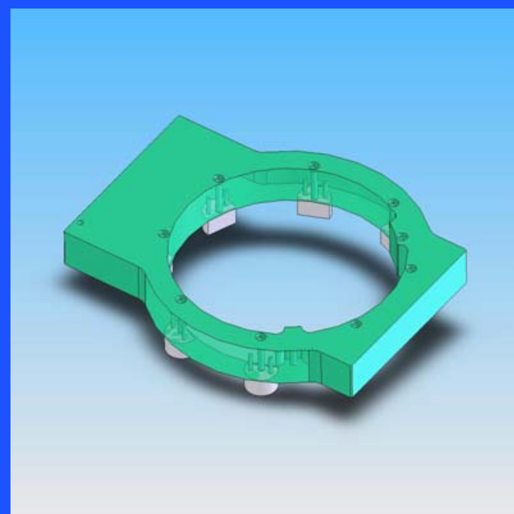
Machine Interface

Case study #1

Solution:

A custom fixture was made to stabilize the test site.



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Machine Interface

Case study #1

End Result:
Yield returned to 88%-90%

Additional cost of test:
$13,725 (tester, technician time)

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Kit Interface

The interface of the device and the various parts of the change kit:

Soak Buffers

Shuttles

Blade-Paks

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Kit Interface

Case study #2

Problem:

Customer reported inconsistent placement of devices into shuttle with about 1% misplaced

Handler had to be slowed to 60% of speed

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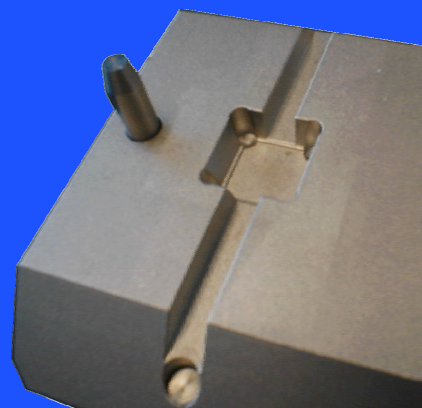
Kit Interface

Case study #2

Symptom:

Part would catch on pocket ledge

Operator had to stand by to fix placement and clear machine error



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Kit Interface

Case study #2

Diagnosis:

Kit was built for a different but similar device (to save money - $1,200)

Difference between devices was “only” .004 inches – this difference is HUGE for pockets whose tolerances can be as small as +/-.0005

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Kit Interface

Case study #2

Solution:

Required new shuttles and Blade-Paks designed to the correct parts and tolerances

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Kit Interface

Case study #2

End Result:

Machine throughput increased by 55%

Saving $1,200 cost this customer $4,892
(correct kit parts vs. increased tester time)

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Contactor Interface

Case study #3

Problem:

Customer reported premature "failure" of spring probe contactor

New socket "solved" problem

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Contactor Interface

Case study #3

Symptom:

Contactor worked fine at first, then quickly began to generate open failures

Life of pins was only about 15% of expectation

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Contactor Interface

Case study #3

Diagnosis:

Hardstop / Workpress relationship was designed incorrectly

Device would make enough contact at first to work, then as springs lost some of their rate, balls would no longer make sufficient contact

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Contactor Interface

Case study #3

Solution:

Built new docking plate and workpress with correctly designed “CHAT” *

By aiming for near maximum compression and tolerancing to ensure no over compression, maximum contactor life and consistency are achieved

*Contact Height At Test

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Contactor Interface

Case study #3

End Result:

Downtime due to contactor replacement decreased by 85%

Total cost of problem $2,925 (tester time)

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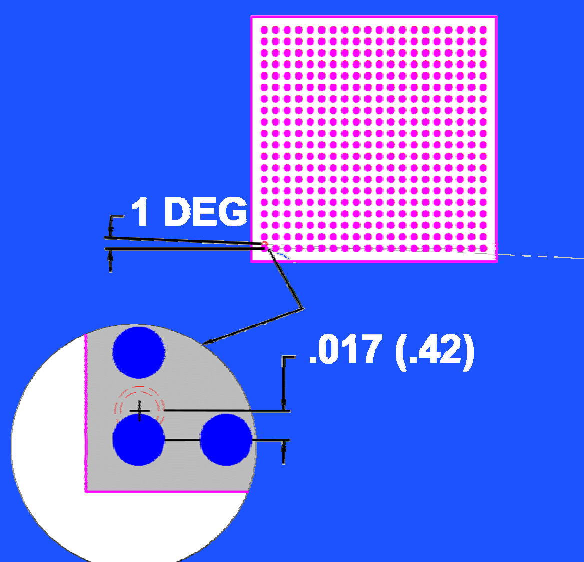
Common Interface Issues

Rotational

Errors:

BGA



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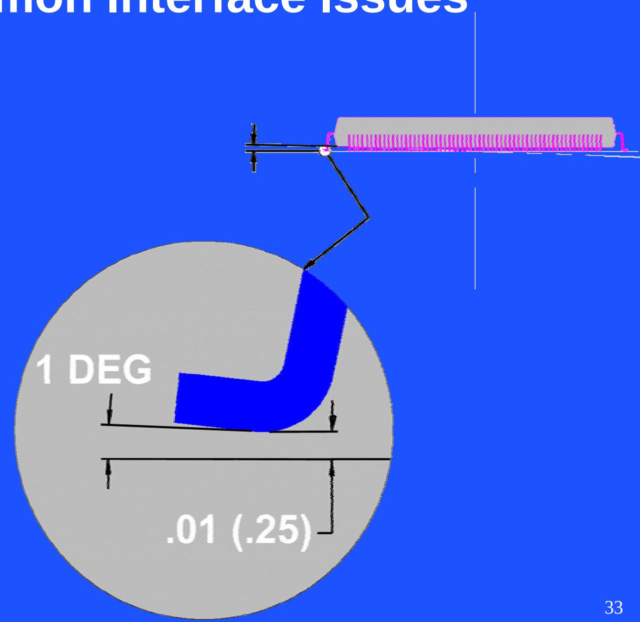
Common Interface Issues

Rotational
Errors:
QFP



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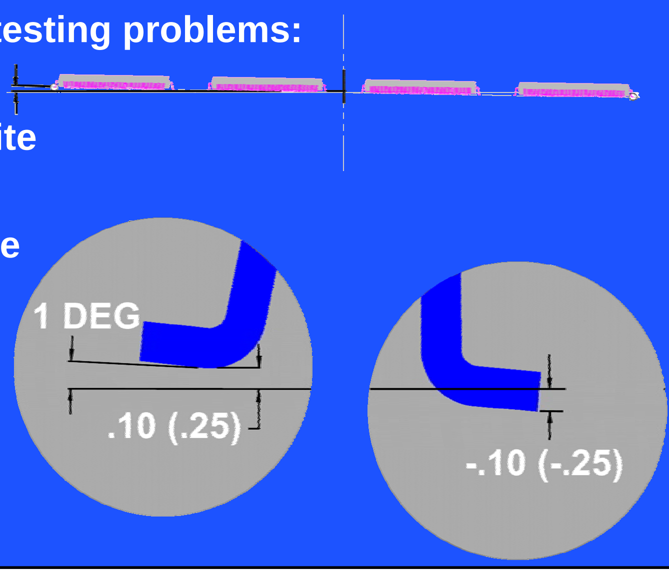
Common Interface Issues

Parallel testing problems:

Single Site
vs.
Quad Site



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Common Interface Issues

Other problems caused when tolerances are missed:

Wear

Contamination

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Mechanical Interface Conclusions

- Correct positioning of the device can only be achieved with an understanding of tolerances
- Tolerances are important as design rules and as manufacturing standards
- The ability to achieve desired tolerances can result in increased yields, and can significantly decrease the cost of test

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Questions?

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Effects of Handler Insertion Variations on Contactor Performance for Pb – Free Devices

2007 Burn-in & Test Socket Workshop
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Jeff Sherry
Johnstech International

Testing Objectives

- Understand the influences of handler variation, insertion orientation and insertion speed on contactor performance
- Determine if contactors can be configured for optimal performance in the face of these handler variations

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Agenda

- Handler Interfaces and Requirements
  - Vertical Interface
  - Horizontal Interface
  - Other
- Contact Descriptions
- Effects of Contactor Design on Interface

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Agenda, Cont'd...

- Test Data with Different Handler Setups
  - Different Technologies
  - Different Insertion Speeds
  - Different Platings
  - Configurations
    - Single
    - Redundant Contacts (Two contacts in same slot)
- Conclusion

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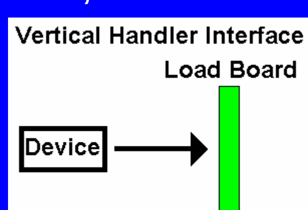
Handler Interfaces & Requirements

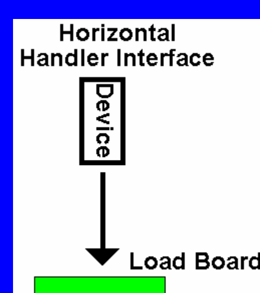
- Vertical Handlers (Sideways Device Insertion)
- Horizontal Handlers (Vertical Device Insertion)
- Vertical Angle Handlers
- Test Requirements
  - Strip (Upward Device Insertion)
  - Thermal Ranges
  - Insertion Speeds and Index Speeds
- Air Flow Requirements
- Docking Hardware

Vertical & Horizontal Interface Handlers

Vertical Test Plane
(Sideways Part Insertion)
Delta, Daymarc, Aseco, Aetrium, Synax/Multitest, Rasco, etc...



Horizontal Test Plane
(Downward Part Insertion)
FSA, Aseco, Atrium, TESEC Advantest, V-tek, Kuwano, Ismeca, Multitest, Simeca, Seiko Epson, Mirae, etc...



Angled Test Plane Multitest, MCT

Strip Test (Upward Insertion)
MCT, Rasco, Multitest, TESEC

Various Handler Interfaces

* Courtesy www.mektra.com, www.aetrium.com, sales@firfaxsystems.co.uk

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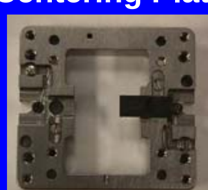
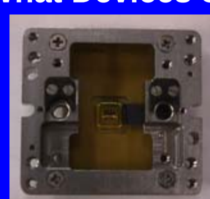
Handler Interface Hardware

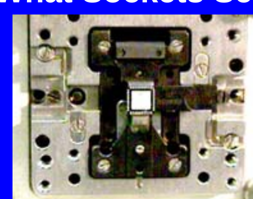
Centering Plate



What Devices See

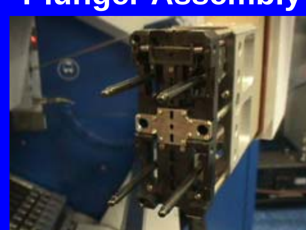


What Sockets See



Operator Side of Handler

Plunger Assembly



Dual Site Plunger Assembly

* Courtesy Johnstech Archives

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Test Contact Descriptions

Contact	Description	Contact Material/Plating	Status
A	Redundant Contact — Pseudo Kelvin	Gold	R&D
B	Optimized Pad Contact	Gold	R&D
C	Pad ROL200 Fine Tip	Eco™-1	Released
D	Pad ROL200 Full Tip	Eco™-1	Released
E	Pad ROL200 Fine Tip	Gold	Released
F	Pad ROL200 Fine Tip	Gold / Rhodium*	R&D
G	Pad 2mm "S" Contact	Gold	Released
H	Leaded 2mm "S" Contact	Gold	Released
I	Pad 2mm "S" Contact	Gold / Rhodium*	R&D

* Same Contact as the Gold-Plated Contact with an extra Rhodium Plating applied.

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Test Matrix

Design of Experiments Test Matrix

Contact	Status	Contact Material or Plating	Insertion Speeds	Elastomers	Device Platings	Device Insertion
A	R&D	Gold	3.0 in/sec - 5.2 in/sec	Standard	Matte Tin	Downward
B	R&D	Gold	8 in/sec - 11 in/sec	Low Force	NiPdAu	Sideways
C	Released	Eco-1™				Upward
D	Released	Eco-1™				
E	Released	Gold				
F	R&D	Gold/Rhodium*				
G	Released	Gold				
H	Released	Gold				
I	R&D	Gold/Rhodium*				

All tests were run with stiffener behind load board, one insertion per device. Cleaning was done at 100K or 200K intervals for Matte Tin and at 300K for NiPdAu device testing.

* Same contact as Gold plated part with extra Rhodium plated applied.

- Over 20 Million Contact – Device Insertions
- 68 Different Combinations Tested
- "January 20th Declared Johnstech Holiday"

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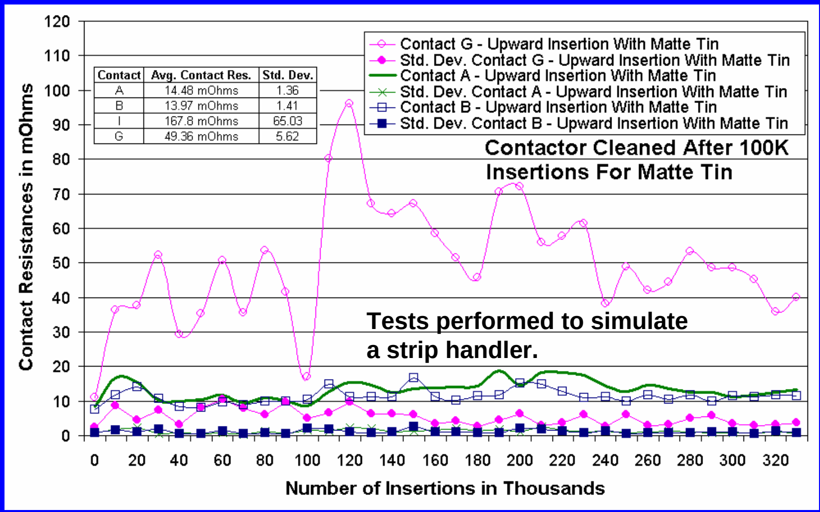
Pad 2mm vs. Pad ROL200 Contacts with Matte Tin Devices



Contact	Avg. Contact Res.	Std. Dev.
A	14.48 mOhms	1.36
B	13.97 mOhms	1.41
I	167.8 mOhms	65.03
G	49.36 mOhms	5.62

Pad R&D Contact performed better than Pad 2mm.

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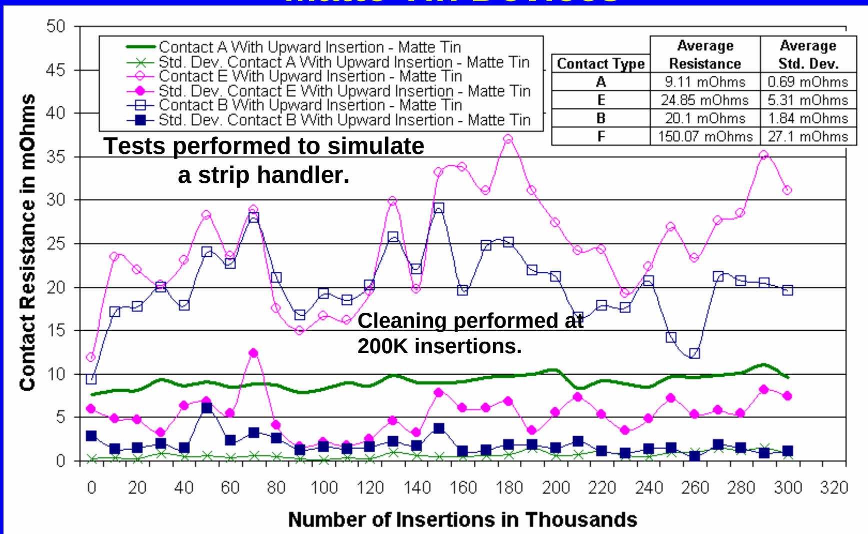
Pad ROL200 Contacts – Matte Tin Devices



Contact Type	Average Resistance	Average Std. Dev.
A	9.11 mOhms	0.69 mOhms
E	24.85 mOhms	5.31 mOhms
B	20.1 mOhms	1.84 mOhms
F	150.07 mOhms	27.1 mOhms

Redundant Contact performed the best.

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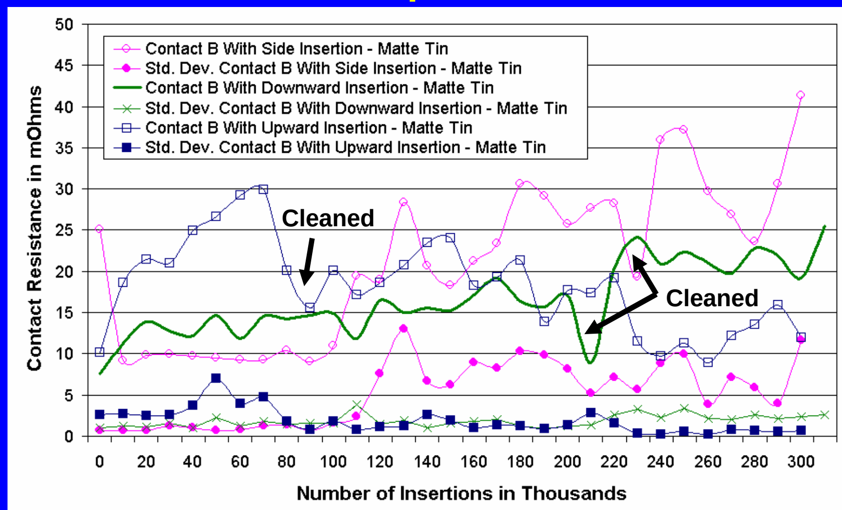
Optimized Contacts with Different Handler Set-Ups — Matte Tin Devices



Different cleaning cycles. (100K or 200K)

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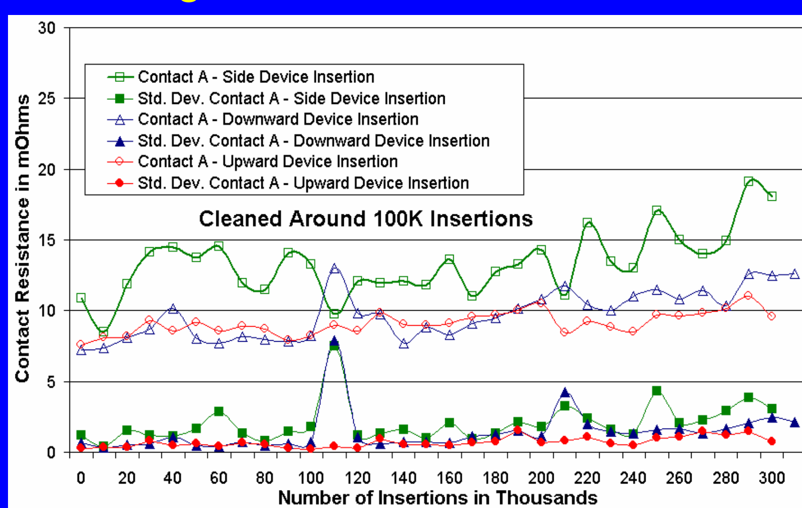
Redundant Contacts with Different Handler Configurations – Matte Tin Devices



Redundant Contact very repeatable for Matte Tin.

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Contact Summary for Handler Orientations — Matte Tin Devices

Handler Interface Vertical - Debris Collects on one side in Contactor - Sideways Device Insertion

Contact Types	Contact Yield	Average Resistance	Std. Dev. Resistance	Yield < 20 mOhms
B	99.04%	19.64 mOhms	13.00 mOhms	68.69%
E	99.97%	21.32 mOhms	10.21 mOhms	68.97%
A	99.90%	14.39 mOhms	4.39 mOhms	88.21%
F	99.34%	128.83 mOhms	60.63 mOhms	0.81%

Handler Interface Horizontal - Most Debris Collection in Contactor - Downward Device Insertion

Contact Types	Contact Yield	Average Resistance	Std. Dev. Resistance	Yield < 20 mOhms
B	100.00%	16.22 mOhms	4.45 mOhms	80.02%
E	100.00%	38.30 mOhms	23.51 mOhms	27.80%
A	99.99%	12.35 mOhms	4.78 mOhms	87.95%
F	100.00%	157.20 mOhms	68.20 mOhms	1.27%

Handler Interface Horizontal - Debris Collects on Device - Upward Device Insertion

Contact Types	Contact Yield	Average Resistance	Std. Dev. Resistance	Yield < 20 mOhms
B	100.00%	19.65 mOhms	4.98 mOhms	53.41%
E	100.00%	24.20 mOhms	8.84 mOhms	44.11%
A	100.00%	11.009 mOhms	2.10 mOhms	99.14%
F	100.00%	160.88 mOhms	73.00 mOhms	0.56%

Redundant Contacts perform best.

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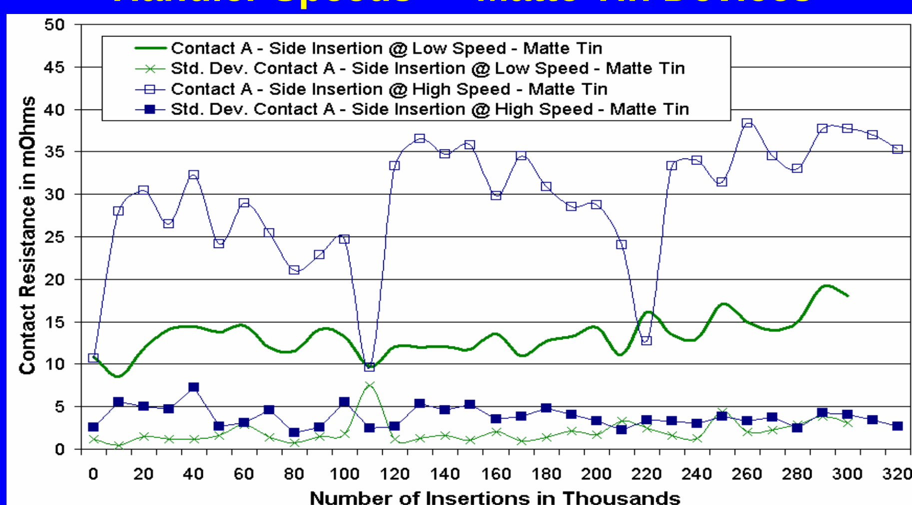
Redundant Contact Tested at Different Handler Speeds — Matte Tin Devices



High Insertion Speed had to be cleaned more often.

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Best vs. Worst Case w/ and w/o Cleaning by Handler Set-ups — Matte Tin Devices

First 100K Insertions Without Cleaning and Matte Tin Devices - Standard Elastomers

Contact Types	Contact Yield	Average Resistance	Std. Dev. Resistance	Yield < 20 mOhms
B	100.00%	12.93 mOhms	2.40 mOhms	99.28%
E	100.00%	21.26 mOhms	10.66 mOhms	60.47%
A	100.00%	8.65 mOhms	1.08 mOhms	99.97%
F	100.00%	112.84 mOhms	42.33 mOhms	3.44%

- Handler Interface Horizontal - Most Debris Collection in Contactor - Downward Device Insertion

300K Insertions Without Cleaning after 100K and Matte Tin Devices - Standard Elastomers

Contact Types	Contact Yield	Average Resistance	Std. Dev. Resistance	Yield < 20 mOhms
B	100.00%	16.22 mOhms	4.45 mOhms	80.02%
E	100.00%	38.30 mOhms	23.51 mOhms	27.80%
A	99.99%	12.35 mOhms	4.78 mOhms	87.95%
F	100.00%	157.20 mOhms	68.20 mOhms	1.27%

- Handler Interface Horizontal - Most Debris Collection in Contactor - Downward Device Insertion

First 100K Insertions Without Cleaning and Matte Tin Devices - Lower Force Elastomers

Contact Types	Contact Yield	Average Resistance	Std. Dev. Resistance	Yield < 20 mOhms
B	99.97%	14.28 mOhms	18.94 mOhms	95.39%
E	99.82%	52.73 mOhms	26.9 mOhms	8.98%
A	100.00%	16.65 mOhms	6.73 mOhms	86.40%
F	95.85%	303.75 mOhms	120.25 mOhms	1.42%

- Handler Interface Horizontal - Debris Collects on Device - Upward Device Insertion

300K Insertions Without Cleaning after 100K and Matte Tin Devices - Lower Force Elastomers

Contact Types	Contact Yield	Average Resistance	Std. Dev. Resistance	Yield < 20 mOhms
B	99.98%	71.73 mOhms	73.02 mOhms	40.19%
E	99.94%	92.78 mOhms	58.75 mOhms	7.64%
A	100.00%	26.79 mOhms	14.6 mOhms	41.10%
F	73.53%	336.17 mOhms	153.93 mOhms	0.77%

- Handler Interface Horizontal - Debris Collects on Device - Upward Device Insertion

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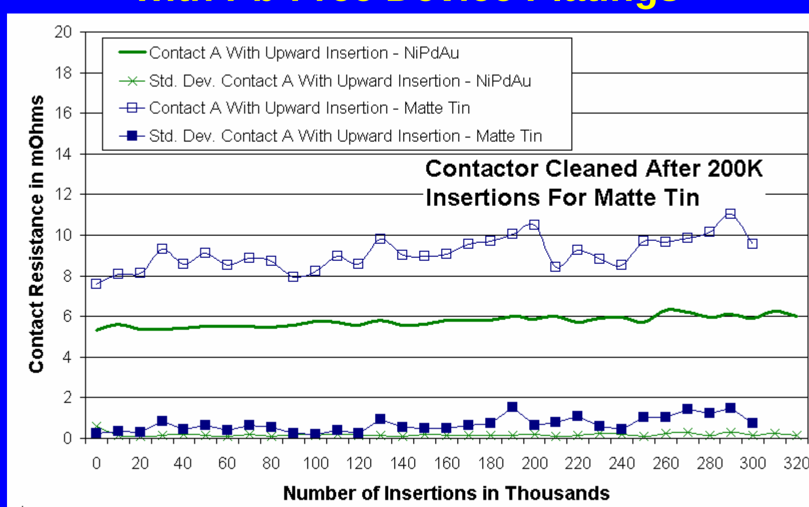
Redundant Contacting (Pseudo Kelvin) with Pb-Free Device Platings



* Redundant Contacts work well for Matte Tin and NiPdAu.

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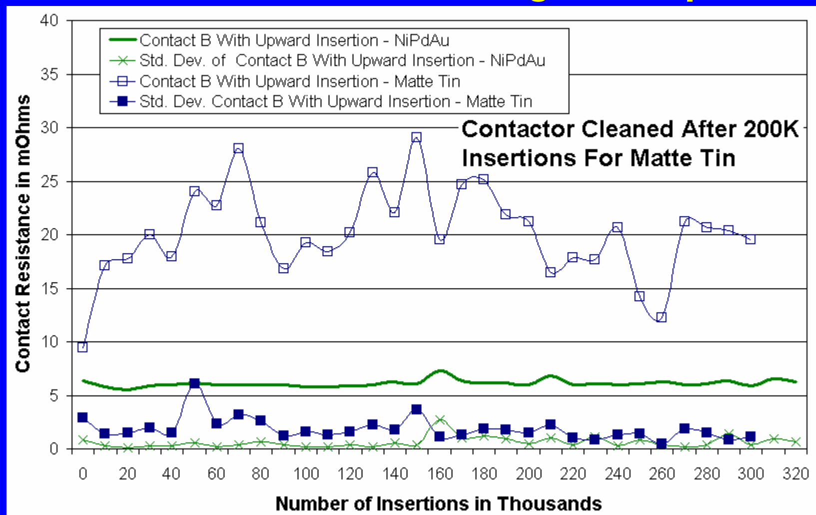
Optimized Contacts with Pb-Free Device Platings – Strip Test



NiPdAu had lower contact resistance with less variance.

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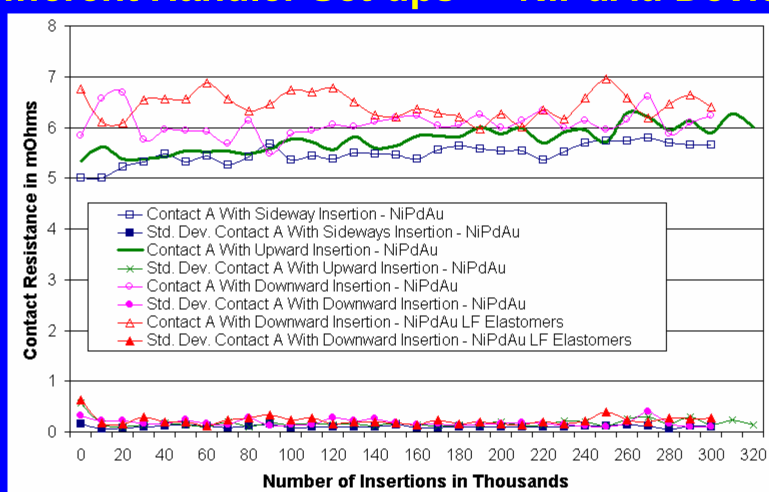
Redundant Contacts with Different Handler Set-ups — NiPdAu Devices



Different elastomers and handler set-ups without cleaning.

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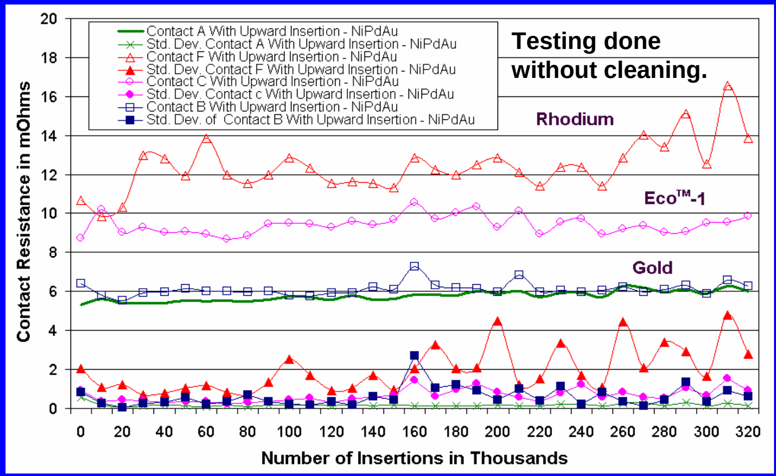
Comparison of Different Contact Materials — NiPdAu Devices



Higher conductivity materials result in lower contact resistance.

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Different Handler Set-ups w/o Cleaning — NiPdAu Devices

300K Insertions Without Cleaning and NiPdAu Devices - Standard Elastomer

Contact Type	Contact Yield	Average Resistance	Std. Dev. Resistance	Yield < 20 mOhms
A	100.00%	5.5 mOhms	0.28 mOhms	100.00%
F	99.98%	12.67 mOhms	11.63 mOhms	92.37%
C	98.92%	31.25 mOhms	53.81 mOhms	68.13%
D	99.99%	6.82 mOhms	0.51 mOhms	99.99%

- Handler Interface Vertical - Debris Collects on one side in Contactor - Sideways Device Insertion

300K Insertions Without Cleaning and NiPdAu Devices - Low Force Elastomer

Contact Type	Contact Yield	Average Resistance	Std. Dev. Resistance	Yield < 20 mOhms
A	99.97%	5.89 mOhms	0.52 mOhms	99.97%
F	99.84%	13.4 mOhms	4.46 mOhms	94.30%
C	99.95%	10.15 mOhms	3.18 mOhms	98.97%
D	99.84%	10.91 mOhms	10.62 mOhms	94.51%

- Handler Interface Horizontal - Debris Collects on Device - Upward Part Insertion

300K Insertions Without Cleaning and NiPdAu Devices - Standard Elastomer

Contact Type	Contact Yield	Average Resistance	Std. Dev. Resistance	Yield < 20 mOhms
A	99.97%	6.26 mOhms	0.38 mOhms	99.95%
F	99.96%	10.32 mOhms	7.99 mOhms	99.20%
C	99.04%	10.93 mOhms	13.21 mOhms	98.25%
D	99.05%	12.51 mOhms	8.44 mOhms	97.90%

- Handler Interface Horizontal - Most Debris Collection in Contactor - Downward Device Insertion

300K Insertions Without Cleaning and NiPdAu Devices - Low Force Elastomer

Contact Type	Contact Yield	Average Resistance	Std. Dev. Resistance	Yield < 20 mOhms
A	99.99%	6.4 mOhms	0.42 mOhms	99.99%
F	99.92%	12.22 mOhms	5.34 mOhms	98.67%
C	99.98%	9.85 mOhms	2.29 mOhms	99.86%
B	99.94%	6.5 mOhms	3.51 mOhms	99.77%

- Handler Interface Horizontal - Debris Collects on Device - Upward Part Insertion

Hander Set-up and elastomer configuration affect performance.

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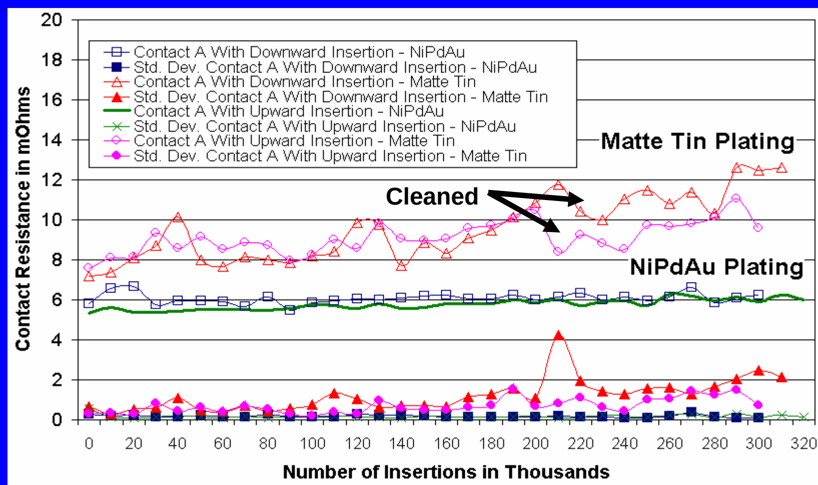
Redundant Contact Summary for Different Platings and Handler Set-ups



NiPdAu has lower contact resistance.

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Load Board Comparison at 300K Insertions Low vs. High Insertion Speed

Standard Contact with Gold Plating @ High Speed

Redundant Contact @ High Speed

Optimized Contact @ High Speed

Redundant Contact @ Low Speed

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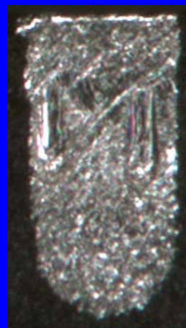
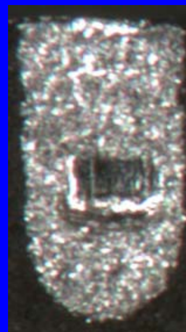
Matte Tin vs. NiPdAu Device Witness Marks

Matte Tin	Matte Tin	Matte Tin	NiPdAu
			
Optimized Contact Initial Contact	Redundant Contact Initial Contact	Standard Contact Initial Contact	Redundant Contact Initial Contact

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Redundant vs. Optimized Contacts

Contact A — Redundant Contact - NiPdAu

	Performance of Insertion Type	
Pseudo Kelvin (Redundant Contact)	Sideways	Downward
Average Contact Resistance	5.5 mOhms	6.26 mOhms
Std. Dev.	0.28 mOhms	0.38 mOhms
Contact Yield	100%	99.97%
Yield < 20 mOhms	100%	99.95%

Summary After 300K Insertions With NO Cleaning
With NiPdAu Plated Devices

Max Positive Deviation: +0.0141
Max Negative Deviation: -0.0118

Minimal wear after 300K Insertions!!

Contact B — Optimized Contact – Matte Tin

	Standard Elastomers	Low Force Elastomers
Optimized Contact	Performance	Performance
Average Contact Resistance	12.93 mOhms	14.28 mOhms
Std. Dev.	2.4 mOhms	7.118 mOhms
Contact Yield	100%	99.97%
Yield < 20 mOhms	99.28%	95.39%
Electrical Performance	Performance	Performance
Insertion Loss	-0.47 dB @ 20 GHz	
	-1 dB @ 31.6 GHz	
Return Loss	-20 dB @ 16.8 GHz	
Crosstalk	-20 dB @ 22 GHz	

Max Positive Deviation: +0.0182
Max Negative Deviation: -0.0084

Data summary is for 300K insertions w/o cleaning.

*Results measured by GateWave Northern, Inc.

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Contact Wear Summary by Contacts and Platings @ 300K Insertions

Contact	Device Plating	Avg. Wear	Min. Wear	Max. Wear	Min. Wear Scenario	Max. Wear Scenario
E	Matte Tin	-0.0080	-0.0045	-0.0119	Up	Down
E	NiPdAu	-0.0297	-0.0287	-0.307	Up	Up
H	Matte Tin	-0.0168	-0.0162	-0.0174		
I	Matte Tin	-0.0126	-0.0093	-0.0158		
G	Matte Tin	-0.0212	-0.0162	-0.0269	Up	Down
D	NiPdAu	-0.0293	-0.0249	-0.0371	Down	Side
C	Matte Tin	-0.0136	-0.0118	-0.0145	Side	Down
C	NiPdAu	-0.0296	-0.0117	-0.0600	Up-Low	Side
B	Matte Tin	-0.0109	-0.0042	-0.0296	Up-Low	Side-High
B	NiPdAu	-0.0209	-0.0102	-0.0290	Up-Low	Up
F	Matte Tin	-0.0107	-0.0079	-0.0145	Side	Side-High
F	NiPdAu	-0.0224	-0.0106	-0.0545	Side	Side-High
A	Matte Tin	-0.0117	-0.0098	-0.0188	Side	Down
A	NiPdAu	-0.0229	-0.0087	-0.0393	Up-Low	Side

Patents Pending

FINDINGS:

—NiPdAu platings increase contact wear 50-100%
—Pad ROL200 contacts wear less than Pad 2mm contacts
—Lower-force elastomers reduce contact wear
—Downward part insertion increases contact wear and debris formation
—Redundant and Optimized Contacts provide the best results

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General Conclusions

- Contactors can be configured to optimize performance
- Test Contactor performance is influenced by insertion orientation and device plating
- Handler insertion speed affects performance, life and MTBA of contactor
- Handler device insertion direction affects MTBA of contactor and debris buildup

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Conclusions After 20M Insertions

- Rhodium-Plated contacts are ineffective and perform poorly for Matte Tin plated devices
- Rhodium plating (1,000X harder than Gold) does not work on contacts with sharp edges but could be used as selective board plating or on contacts interfacing to NiPdAu device pads, for longer life
- Optimized contacts and Redundant (Pseudo Kelvin) contacts work well and need less maintenance on Matte Tin applications
- Redundant contact results and performance are very repeatable and may be good enough for many applications requiring low and stable contact resistance over large cycle counts

For more information contact www.johnstech.com

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Contacting Solution for Optical Sensor IC - HD DVD Application

2007 Burn-in and Test Socket Workshop
March 11 - 14, 2007

Gerhard Gschwendtberger
Multitest elektronische Systeme GmbH

Agenda

- Optical Sensor IC - HD DVD Application
- Test Requirements
- Handling Considerations
- Contactor Concept and Design
- Thermal Considerations
- Conclusion

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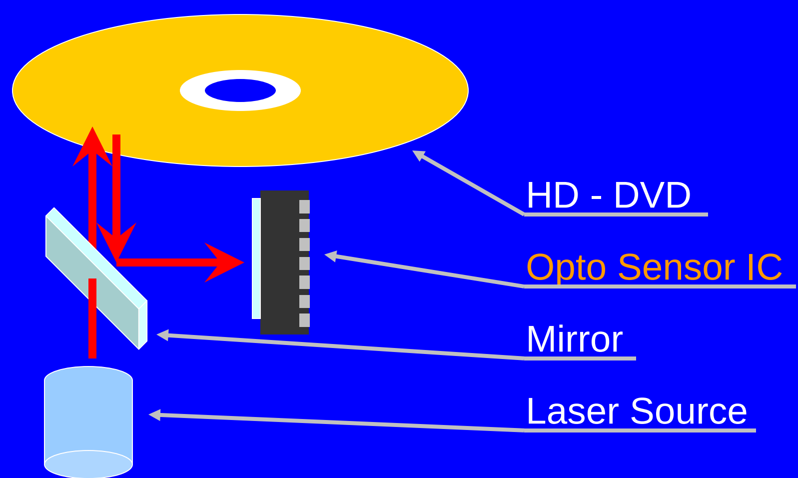
Optical Sensor IC



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Test Requirements (extract)

Optical requirements:
→ Distance IC to laser source maximum 25mm
→ All optic parts to be suitable for 635nm wavelength

Thermal requirements:
→ Temperature range -55°C to +155°C
→ Temperature accuracy DUT +/- 3°C

Mechanical requirement
→ Compatibility to existing gravity handling equipment

Electrical requirements
→ Contactor Yield > 99,9%

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Handling Considerations

Gravity Handling for
Leadless Package Types

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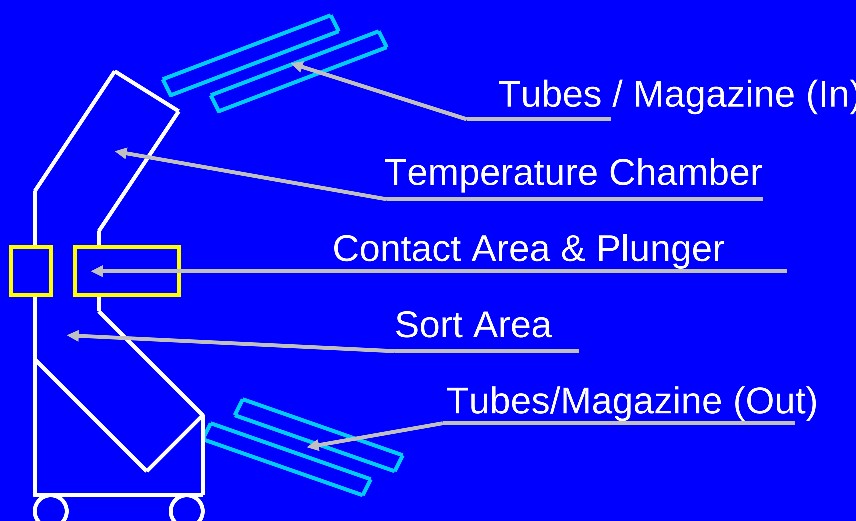
Handling Considerations



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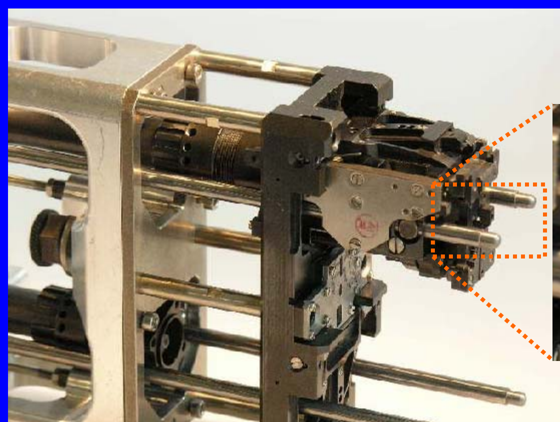
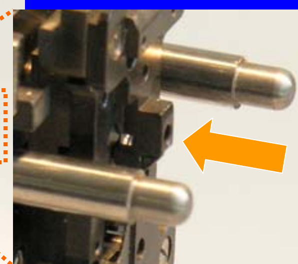
Handling Considerations

Gravity Handling - Vacuum Plunger



Detail:
Vacuum Pocket



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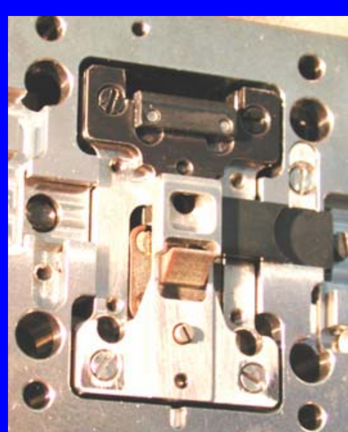
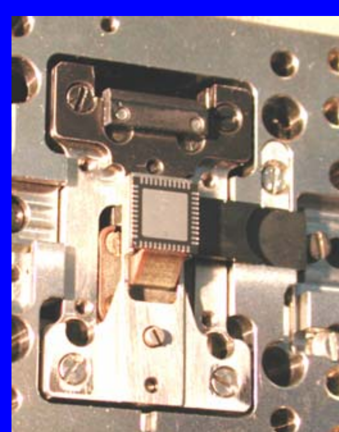
Handling Considerations

Gravity Handling - Vacuum Plunger





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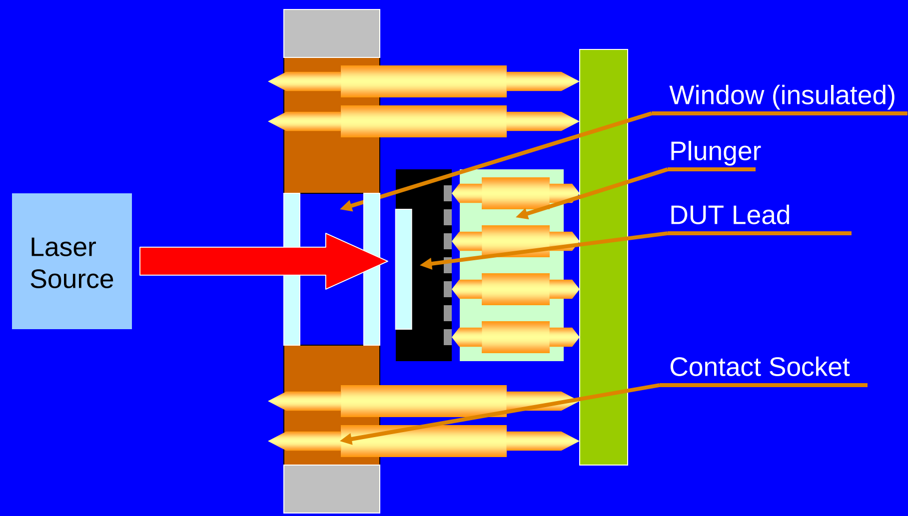
Contactor Concept – Version 1



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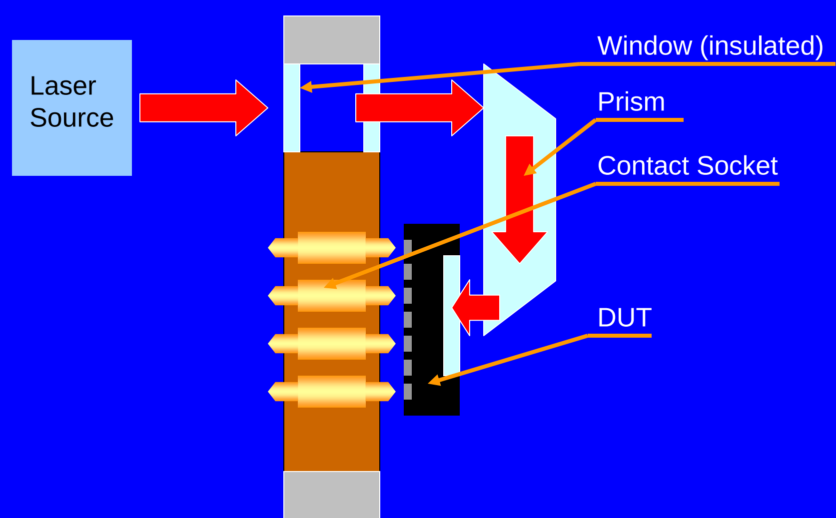
Contactor Concept – Version 2



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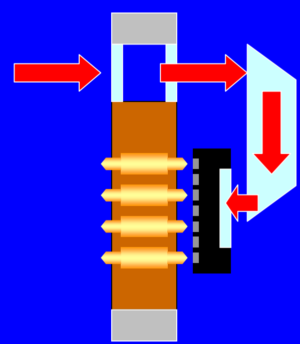
Version 2 - STD Lead Orientation



Pro

→ no double contacting principle
→ short contact length
→ no internal PCB necessary
→ compatible to existing plunger principle

Contra

→ optical length is critical
→ prism/mirror to be part of plunger
→ additional optical parts – risk of particles on prism mirrors

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Hurdles & Challenges

→Integration of a prism into the existing plunger hardware

-> Distance between IC and laser source

-> Thermal insulation (thickness)

-> Contamination of optical parts due to particles

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Hurdles & Challenges

-> Safety requirements for laser source

-> Temperature accuracy DUT during test

-> Integration of a window into the contact socket

-> Lifespan / cleaning cycles in high volume environment

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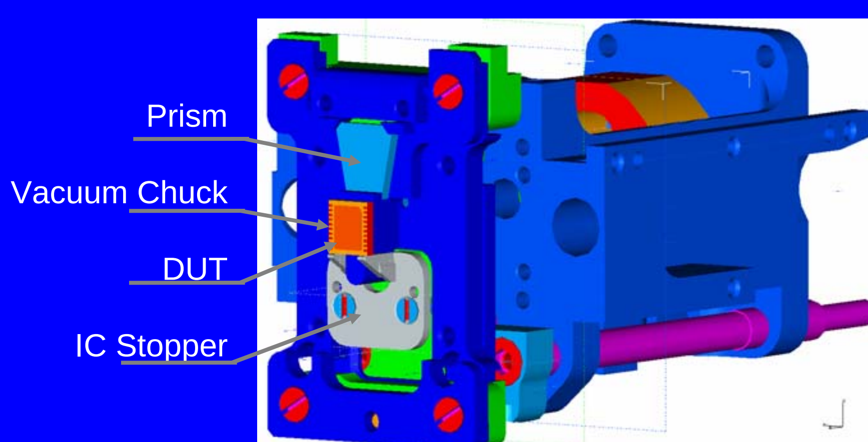
Handler Plunger Design

Detail - plunger with integrated prism



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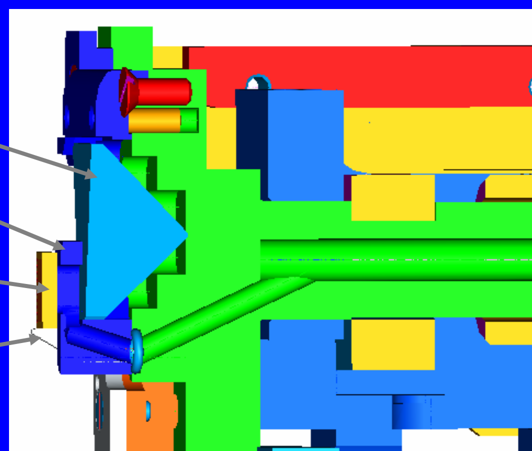
Handler Plunger Design

Sectional view - plunger with integrated prism



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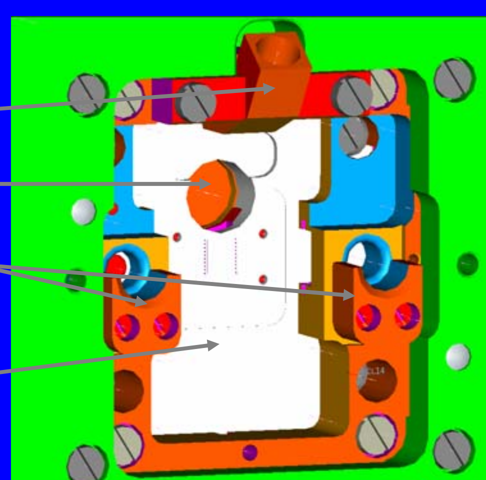
Contactor Design



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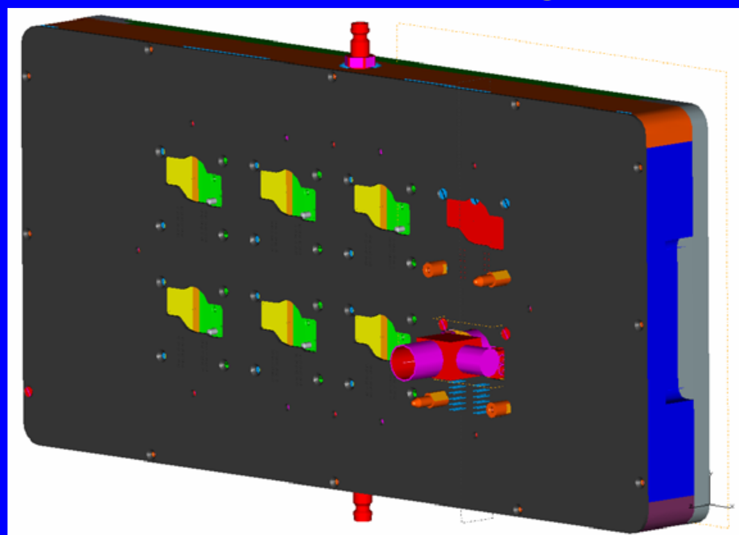
Contactor Design



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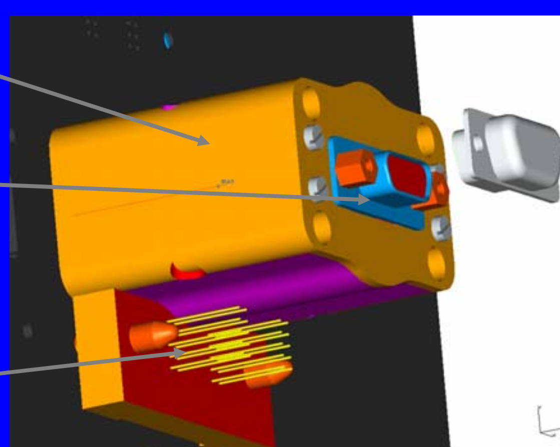
Contactor Design - Interface

Laser source housing

Interface for laser source and safety features

Extension pins from contact socket



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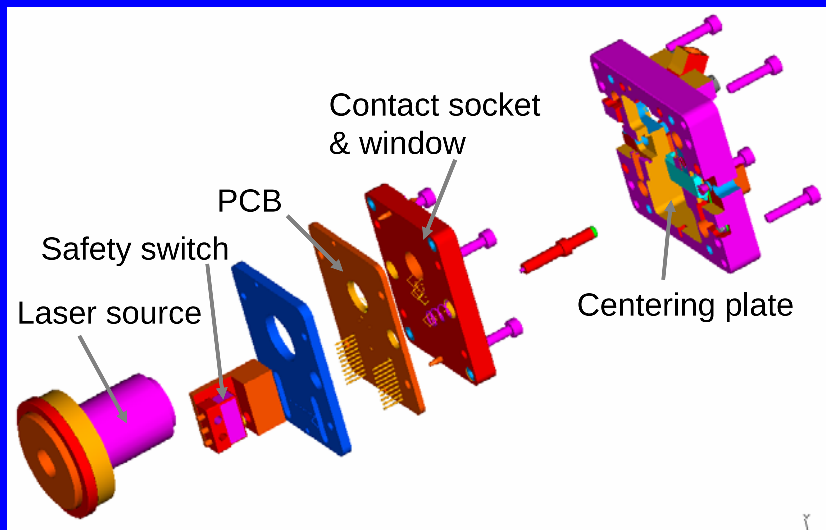
Contactor Design



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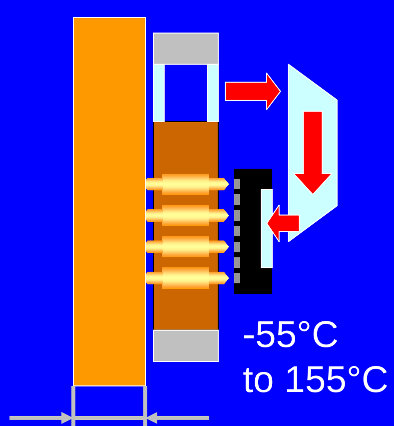
Thermal Considerations

Maximum distance laser source to IC defines thickness of temperature insulation



Challenge:
Maximum insulation thickness of ~ 10mm

Standard thickness usually is ~ 20...25mm

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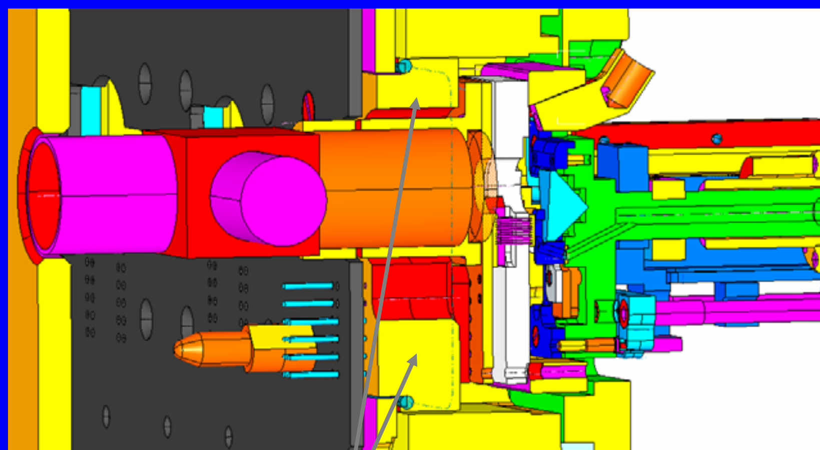
Thermal Considerations



Thermal insulation

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Thermal Considerations

Insulation materials

Standard hardfoams	Nano porous materials "aerogel"
Thermal conductivity	Thermal conductivity
~ 20…25 mW/m-K	~ 10-12 mW/m-K

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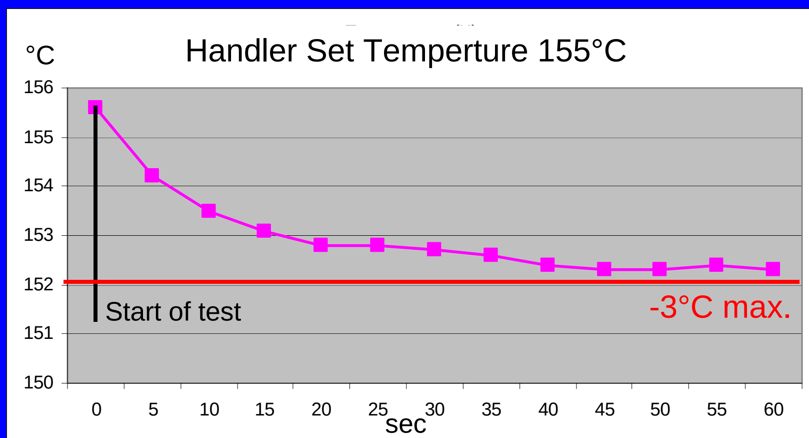
Thermal Considerations

Measurement - DUT Temperature



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Conclusion

- → All optical/safety requirements have been fulfilled
- → Temperature accuracy has been achieved by using new nantotech based materials
- → Optical repeatability has been checked
- → Contact yield is comparable to standard applications
- → After a few month production, cleaning of the windows/prisms is needed every 15 - 20k
- → Mechanical lifespan is still to be defined

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