



AUTOMATIC TEST EQUIPMENT FOR
SEMICONDUCTOR & ELECTRONICS INDUSTRIES

NTF Tallinn 26.-27. November 2013

COMPASS: The repair software and quality assurance software for all test systems

Summary



Who

SPEA is



What

we do



How

we partner



Our

support



Who SPEA is

Who SPEA is

FACTS



Established	1976
Worldwide sales	'12: €91 million
	'13: €100 million (forecast)
R&D investment	20% (average)
Facility Building	14,700 sqm
ISO certifications	9001:2008 14001:2004 17025:2005



SPEA worldwide



 **Headquarters – SPEA Italy**

 **Support Facilities & Offices**
Germany - Singapore - China -
Hong Kong - Japan - Korea - USA

 **Agents & Distributors**

Who SPEA is

SPEA Germany



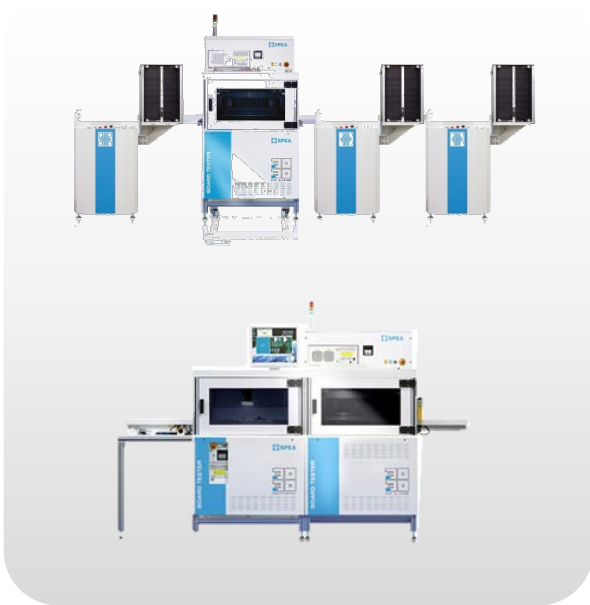
- Foundation: 1982
- Head office: Fernwald (near Frankfurt)
13.600 m² area / 3.500 m² buildings
- Employees: 51
- Offices: Berlin, Munich, Paderborn
- Service: application- and service center
instruction- und training center



What we do

What we do – Electronics Industry

Integrated Test Cells



Bed-Of-Nails Testers



Flying Probe Testers



What we do – Semiconductor Industry

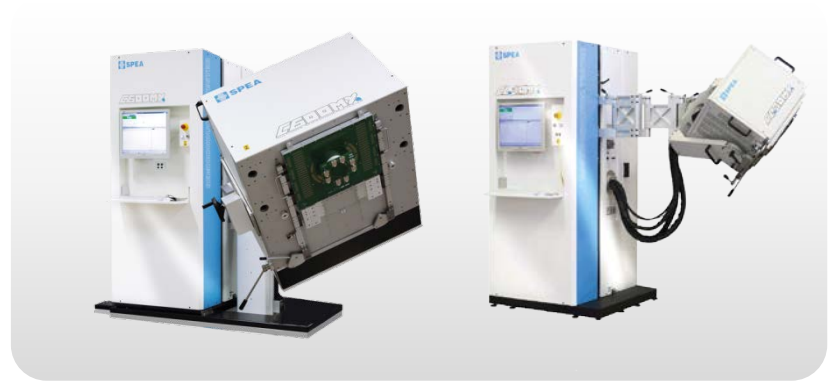
Test Cells & Handlers

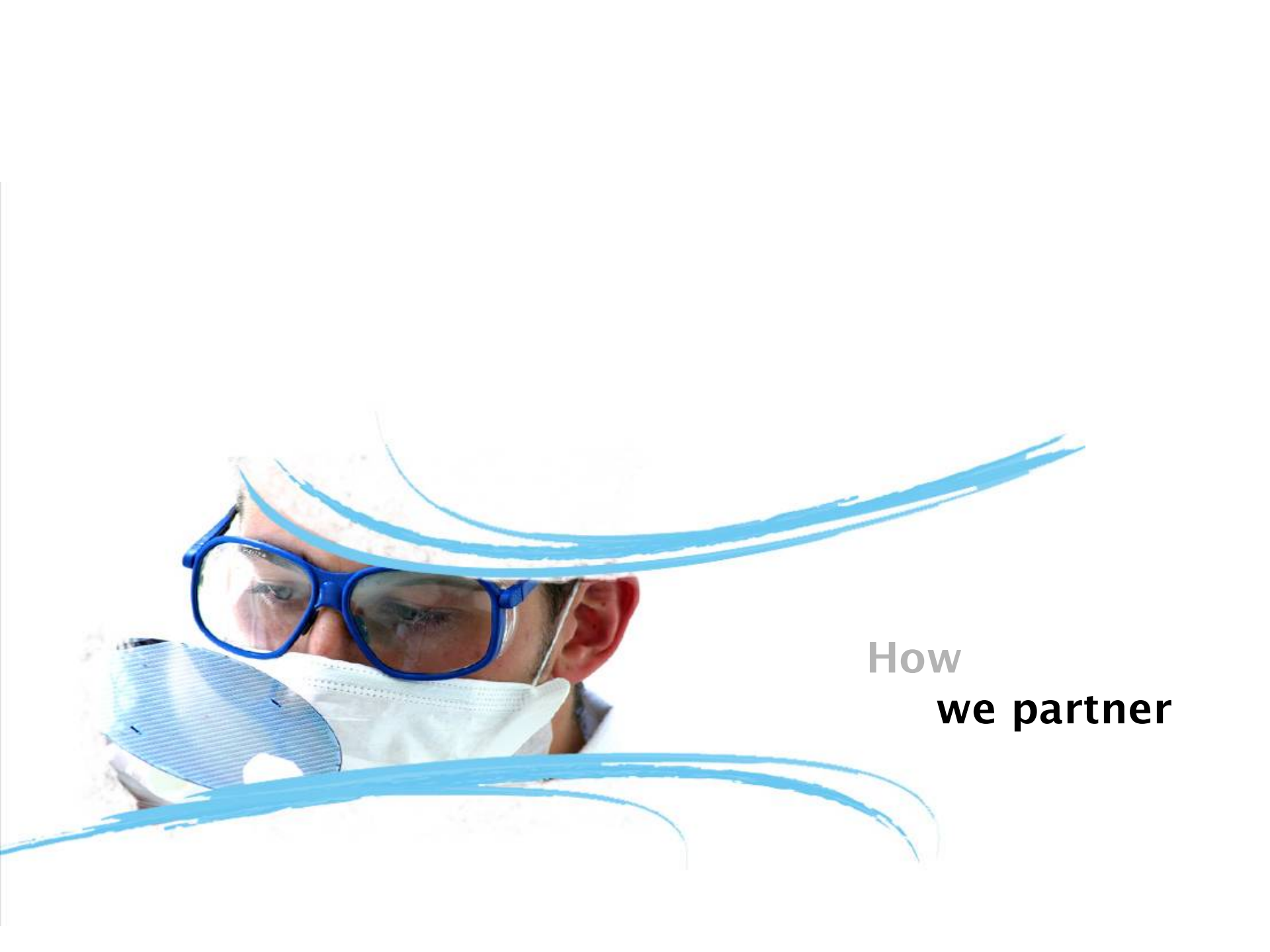
- For **MEMS, SMART CARD modules, Power Modules**
- **Production / Engineering** models
- **Stimulus & Measurement** units
- Pick&Place, In-Line, Tape&Reel **Handling**



Analog Mixed Signal Testers

- Power & Discretes
- MEMS & sensors
- Power management ICs
- Automotive
- Lighting ICs & LED drivers
- Audio & video
- Identification
- Medical





How
we partner

How we partner with our customers

CUSTOMER'S NEED

PARTNERSHIP MODEL

RESULT

Standard
need



Joint selection of
best product



Standard
product

Innovation
need



Joint engineering
approach for
best solution



Enhanced
product

Disruptive
Innovation
need



Joint fast learning
approach for
fast solution



Innovative
product



Our
support

Applications, Service & Support



Installation

- Assistance for site preparation
- Equipment installation & Factory integration
- Production start- up
- On- site engineering support



Education

- Programming training
- Use & maintenance training
- Test Jig & Fixture development & maintenance training



Application

- Testability & Test cost analysis
- Test application development
- Test application migration from other equipment
- Test Jig & Fixture, design, manufacturing, maintenance



Monitoring

- Equipment performance monitoring
- Production data analysis
- Yield increase action planning
- On- site support for production improvement



Service

- Help desk & Remote control support
- Calibration
- Maintenance, repair, fast part replacement
- Spare parts, On- site customer service



- All products are **conceived, designed and developed in- house**
- All systems are fully **manufactured at SPEA's headquarters in Italy**



A Long Path To The Future

1976 1980 1984 1988 1990 1992 1994 1996 1998 2000 2002 2004 2006 2007 2008 2009 2010 2011 2012



SPEA Italy



SPEA Germany



SPEA America



SPEA Asia Pacific



SPEA China



SJP Japan



SKR Korea



First ICT Tester



First Combi Power/ICT Tester



First Flying Probe Tester



3030 series ICT Board & Power Testers



New Flying Probe Range



New Bench Top ICT Tester



First system for IC Incoming Inspection



First Compst Mixed-Signal Tester



First Reel-to-reel and Pick&Place handlers



Integrated Test Cells for MEMS & smart card modules



C600MX Mixed-Signal Tester



Tri-Temp Stimulus for MEMS Testing



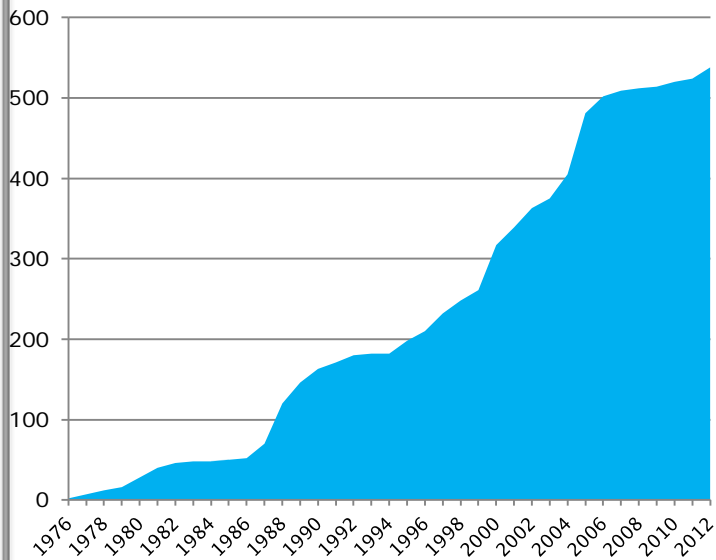
Test Equipment for Power Modules



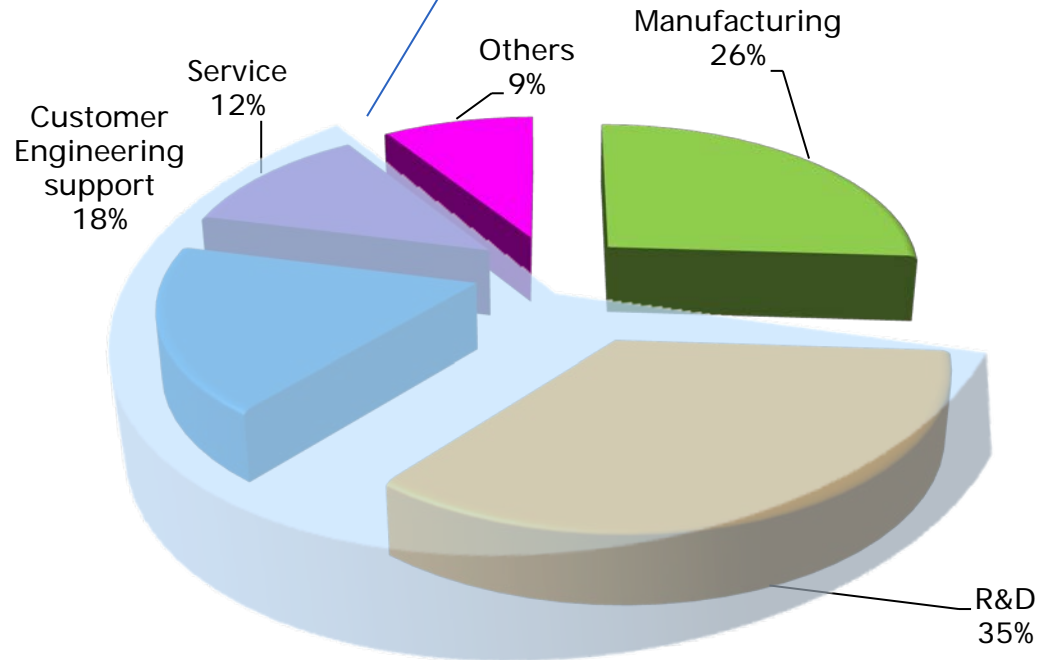
High productivity Pick & Place handler



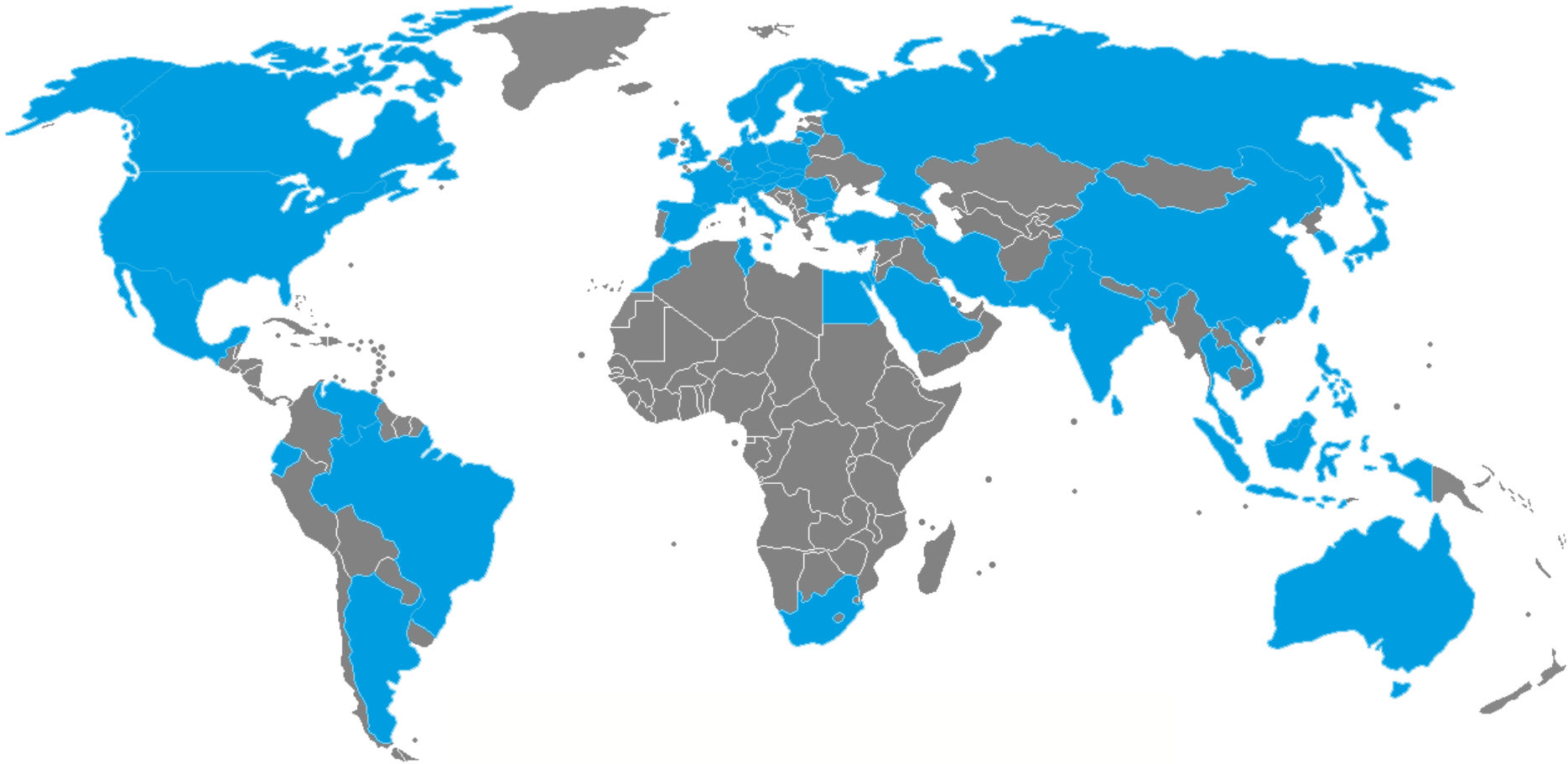
Personnel Growth Worldwide



65% of the company employees are R&D and hi-level engineers



SPEA customers distribution



SPEA products have been sold in more than **85 countries worldwide**

Testers for Electronic Boards

FLYING PROBE TESTERS



4060

Full- performance tester with maximum expandability



4030

High- throughput system for fast testing



4020

High- performance tester for maximum savings

IN-CIRCUIT BOARD & POWER TESTERS



3030 Bench Top

Bench Top 19" modular tester



3030 Rack

Embedded tester



3030 Compact

2048ch manual loading tester



3030 Multimode

4086ch manual loading tester



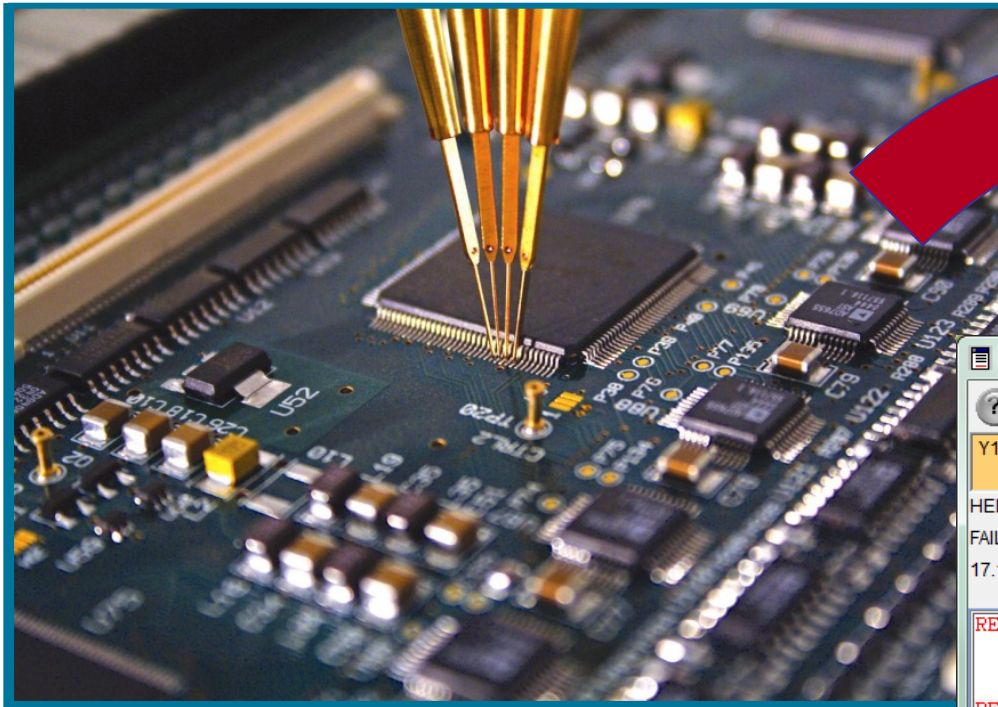
3030 In- Line

High- throughput in- line tester

Quality & Environment



Test - Repair - Analysis - Traceability



FLYING_PROBER FL

Y1001 **Repair protocol**

HEL0565

FAIL ADMINISTRATOR HEL0565

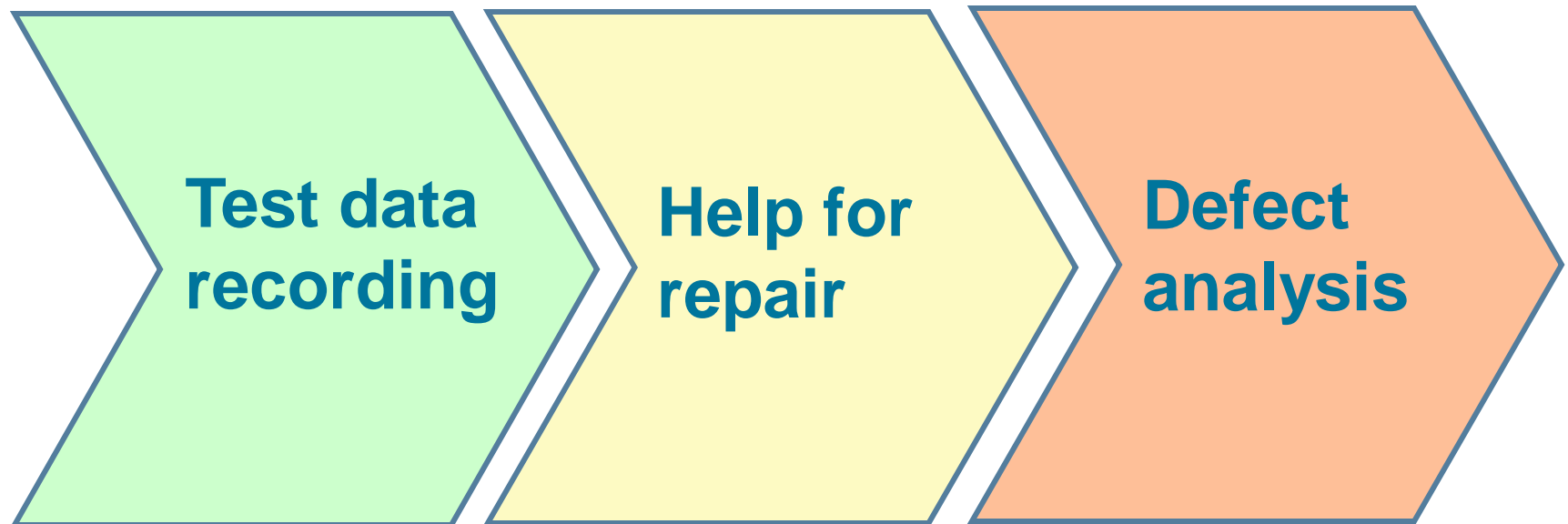
17.10.2011 14:39:38 Test 1

RESR1 4.7K 5%		
R1	Measured: 47 K	
Limits:	4.465 K	4.935 K
RESR4 330hm 5%		
R4	Measured: 87 Ohm	
Limits:	31 Oh	35 Oh
CAPC1 100nF 10%		
C1	Measured: 207 nF	
Limits:	85 nF	115 nF
INDL1 10uH 50%		
L1	Measured: 22 uH	
Limits:	5 uH	15 uH

Nordic Test Forum

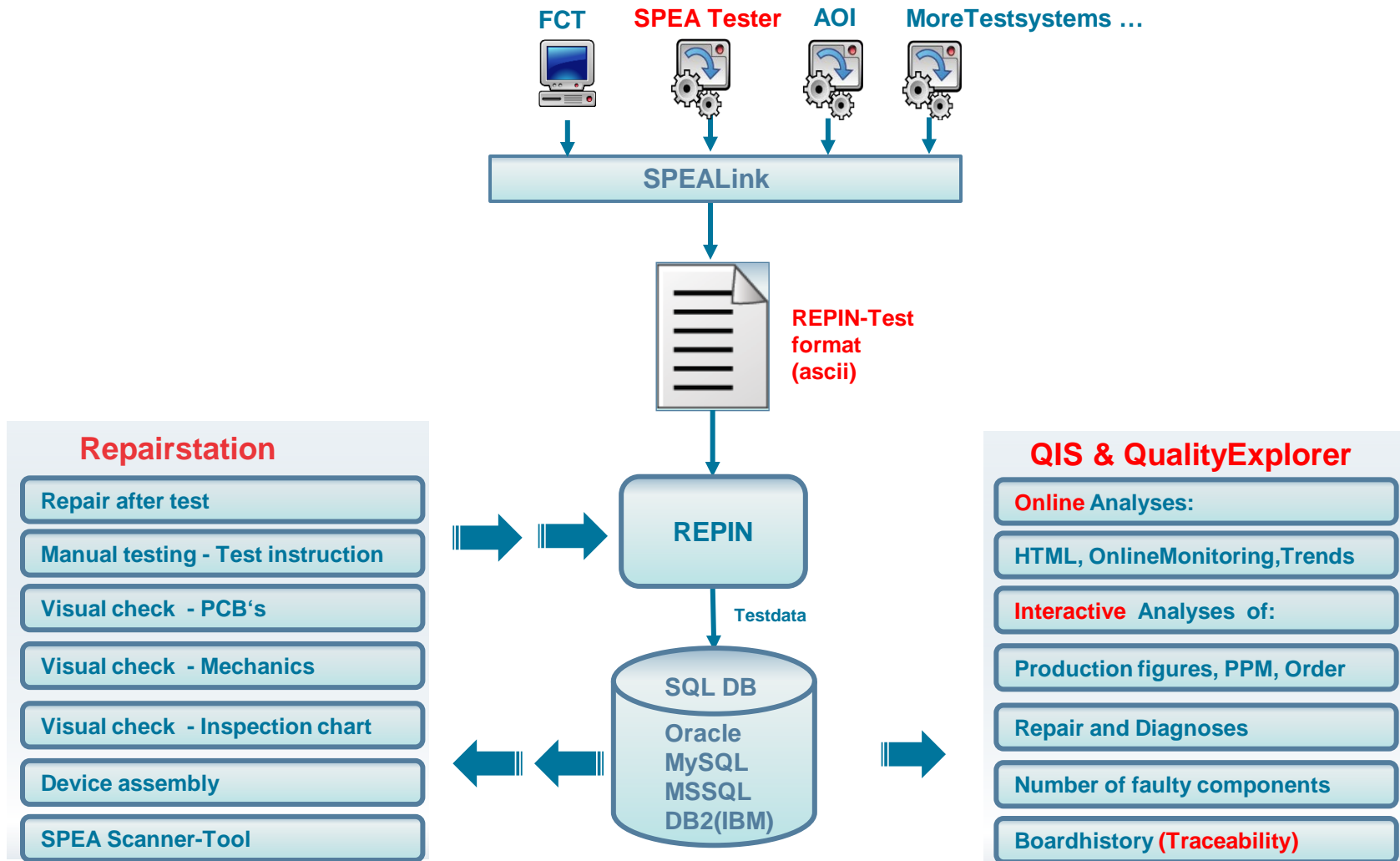
Tallin, November 26th - 27th 2013

Concept of 3 basic modules:



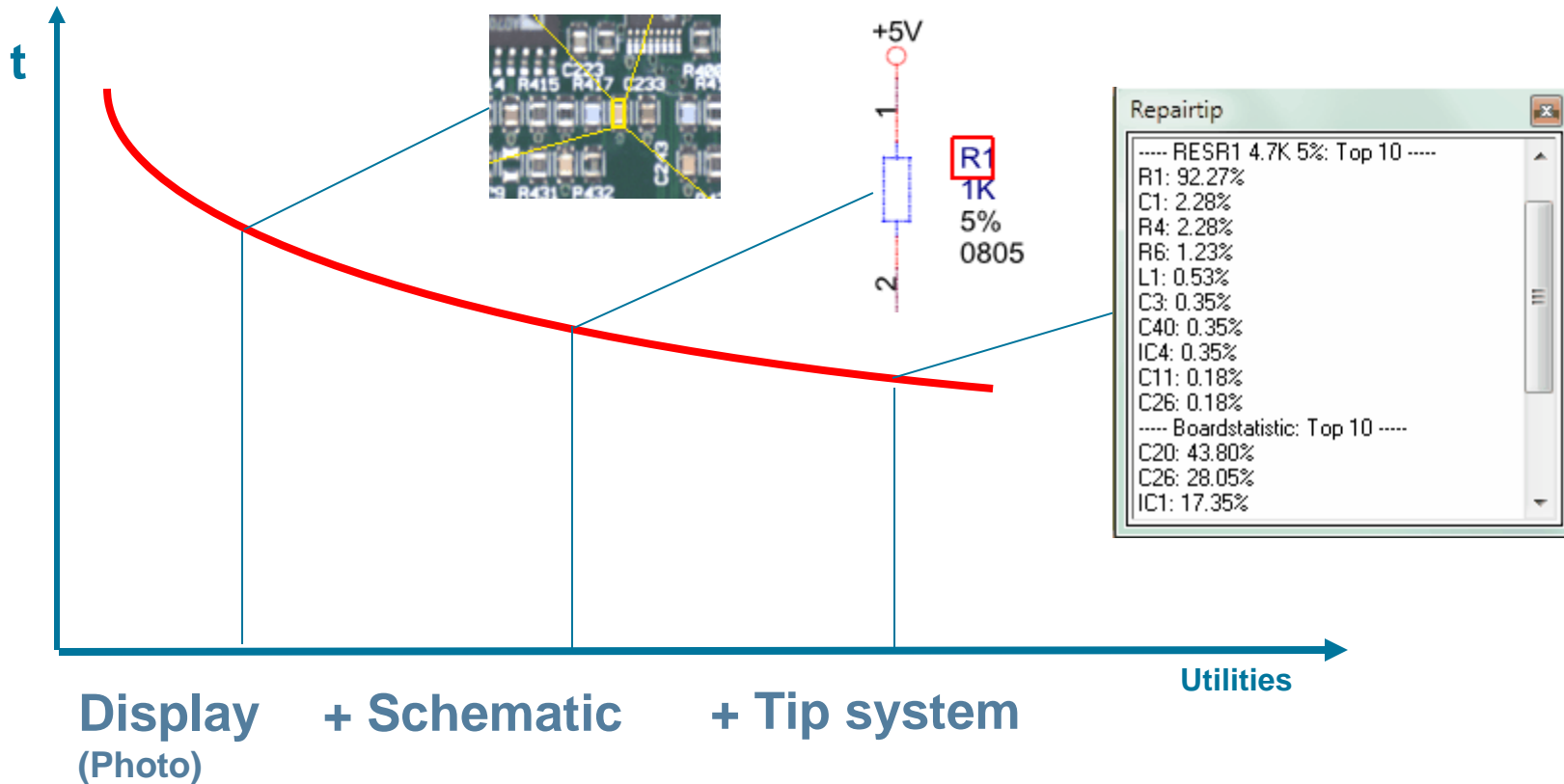
- **Error detection as early as possible and so error avoidance**
- **The possibility to assess the production process and to optimize it**
- **Saving of time, material and finally costs**

- Save repair time up to 50%
- Collects test data from test systems, visual control systems and functional test - **paperless**
- Realtime report of trends
- OnlineMonitoring directly to your desk
- Board traceability and check of validity



Summary

Save repair time approx. 50%



Repair protocol from test:

FLYING_PROBER FLYINGPROBE1

Y1001

HEL0565

FAIL ADMINISTRATOR HEL0565

17.10.2011 14:39:38 Test 1

RESR1 4.7K 5%		
R1	Measured: 47 K	
	Limits: 4.465 K	4.935 K
RESR4 330hm 5%		
R4	Measured: 87 Ohm	
	Limits: 31 Oh	35 Oh
CAPC1 100nF 10%		
C1	Measured: 207 nF	
	Limits: 85 nF	115 nF

Summary of repair actions

- 7 x C1 PnP SMT|component wrong fitting position
- 2 x R1 PnP SMT|other
- 2 x R1 PCB|dirt, dust
- 2 x R1 PnP SMT|component wrong fitting position
- 2 x R4 Waveloother
- 2 x R6 PnP SMT|component wrong fitting position
- 1 x C1 Wavelsolder stud
- 1 x R1 PnP SMT|component lost
- 1 x R1 Comp. THT|wrong version
- 1 x L1 PnP SMT|component reverse poled

Repairtip (for error C1!)

- R12: spea3450088011 caused by wrong R12
- CAPC1 100nF 10%: Top 10
- C1: 92.17%
- R1: 2.76%
- R4: 1.61%
- R6: 1.15%
- R2: 0.69%
- L1: 0.46%
- R20: 0.46%
- C11: 0.23%
- C26: 0.23%
- C3: 0.23%
- Boardstatistic: Top 10
- C20: 43.80%
- C26: 28.05%
- IC1: 17.35%
- C27: 3.22%
- IC8: 2.25%

Schematic (PDF)

Expert tip

Handling of panels: **Single serial numbers of boards are available**
or serial numbers are automatically generated by RepIN / Spea Link

Different diagnosis for several panels

The screenshot displays the COMPASS software interface. The main window shows a photograph of a circuit board with a red circle highlighting a component. A diagnostic window titled 'FLYING_PROBER FLYINGPROBE1' shows test results for 'Y1005', including 'SPEA_EDDRIS10', 'FAIL', 'ADMINISTRATOR', 'EDDRIS', and '17.10.2011 16:10:37 Test 1'. Below this, it lists 'RES R30 47k 5%' with measured and limit values, and 'RES AR6 1k 5%' with measured and limit values. A 'Choose one module to repair' dialog box is open, showing a table with columns for Panel ID, SN, and FRAME. A 'Panel' window shows four panels, with panel 2 highlighted in red.

	Panel ID	SN	FRAME
1	1	Y1004	599A4AF0
2	2	Y1005	599A4AF0
3	3	Y1006	599A4AF0
4	4	Y1007	599A4AF0

NEW!

Parameter for maximum number of repair actions (i.e. 3)

BE: TOP

FLYING_PROBER FLYINGPROBE1

Y1001

HEL0565

FAIL ADMINISTRATOR HEL0565

17.10.2011 Test 1

RESR1 4.7K 5%

R1
Measured: 47 K
Limits: 4.465 K 4.935 K

RESR4 330hm 5%

R4
Measured: 87 Ohm
Limits: 31 Oh

CAPC1 100nF 10%

C1
Measured: 207 nF
Limits: 85 nF

INDL1 10uH 50%

L1
Measured: 22 uH
Limits: 8 uH

Attention!

Repairs: allowed 3; already recorded 3

Number	ID	Repairation	Drawing referenc
1	1	2504 PnP THT component reverse poled	C1
2	1	2004 PnP SMT component reverse poled	R1
3	1	3507 Wave flooded	R4

Number of allowed repairs for project HEL0565

3

no limits

1

2

3

4

5

6

7

8

9

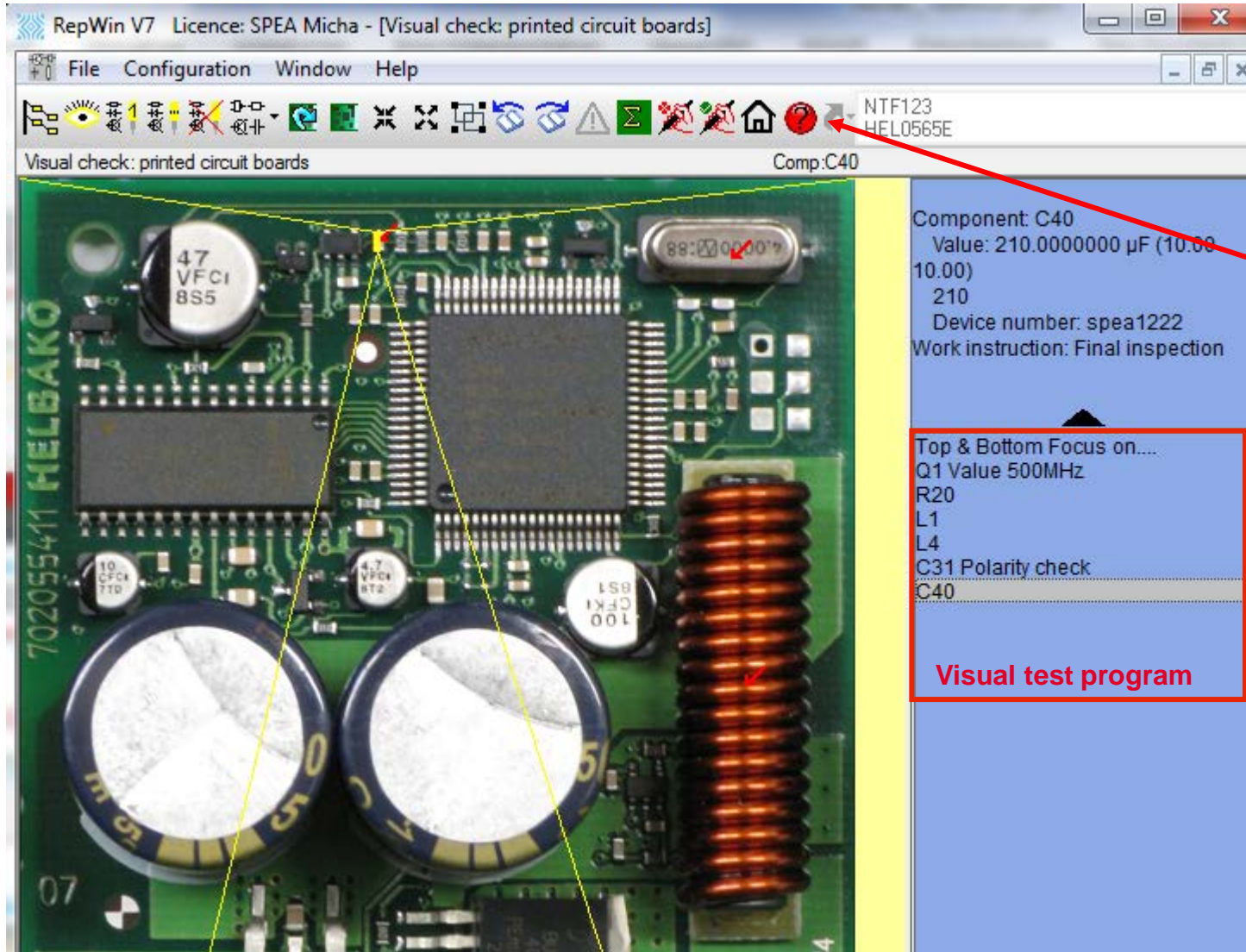
10

11

12

13

OK



Test status
e.g. **FAIL**

Visual test program

All repair actions are taken in the database!

For individual work or inspection steps a constrained mode can be activated!

The steps can also capture measurements.

Each test step can be assigned to two images.

QualityInformationSystem & QualityExplorer



Interactive evaluation*)¹ to answer the following questions:

- **What** has just produced and **where**?
- Which are frequent **error diagnoses**?
- **Where is a problem?** Testsystem "A"? Board "A"?
- Which **component part numbers** are often faulty?
- Which **repair actions** are there on a board?
- How is my **Yield** about all test steps of the board "A"??

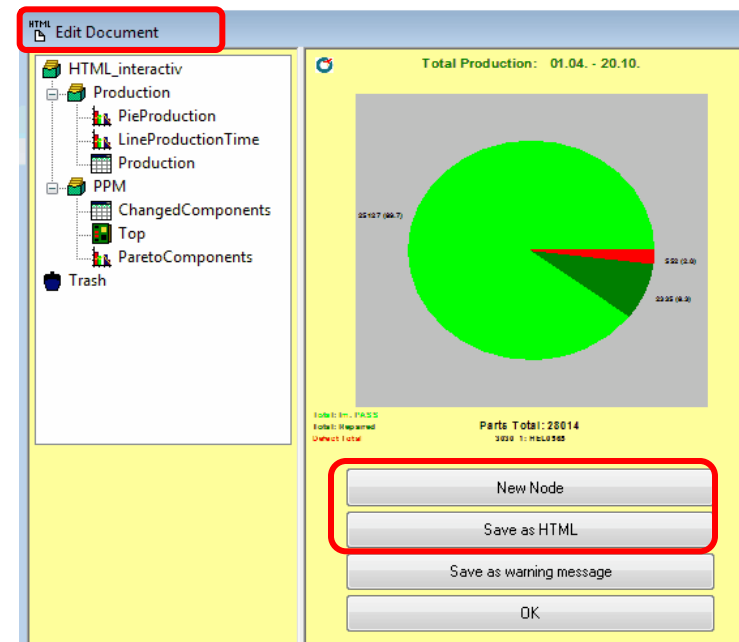
*)¹ more than 120

The QualityInformationSystem (QIS) with:



QualityExplorer for **interactive** analysis and **interactive HTML**

- Production
- Quality value,
- PPM Analysis
- FirstPassAnalysis
- Test summary
- Board summary
- Faulty components
- Repair actions
- Trend
- Measured values



File Queries Configuration Window Help

Interactive Online Open OLM Tables Diagrams Figures Repaircodes Navigator DB Status: MS connecte Interactive: C:\SPEARV Online: C:\SPEARWIN

- Group Comparisons
- Repairactions
- Boardname-> Lot
- Evaluations
 - Summary
 - Testsummary
 - Boardsummary
 - Repaired partnumbers
 - Repaired packages
 - Repair Groups
 - Repair Actions
 - Machine overview
 - Boards
 - Production Index
 - Error Rate
 - Error Diagnosis
 - Error Diagnosis SN combined
 - Repaired Components**
 - Repaired partnumbers
 - Repaired packages
 - Repair Rate
 - Repair Groups
 - Repair Actions
 - Repair Actions - Operator
 - Repairactions on Component
 - Chart Shorts
 - chart Floatings
 - Trend

List of error messages. Every error message is counted even if it occurred several times for one serial number. It can be determined on which days and/or at which times the selected error message occurred by double clicking in the error messages column. The measured values are also listed for the most frequent error

Top

ParetoComponents

Pareto repaired components: 01.04. - 18.10.

Production

	in % (average)	Output	Total	Yield	in %	FPT	in %	FPY
3	10.30	135	27056	135	97.83	124	89.86	12
4	10.31	136	26921	136	98.55	124	89.86	12

LineProductionTime

PieProduction

- Time Interval
- Systemfamily
- System ID
- Boards
- Projects
- Single Groups
- Group Comparisons
- Repairactions
- Boardname-> Lot
- Evaluations
 - Summary
 - Machine overview
 - Boards
 - Production Index
 - Error Rate
 - Error Diagnosis
 - Error Diagnosis SN combined
 - Repaired Components
 - Repaired partnumbers
 - Repaired packages
 - Repair Rate
 - Repair Groups
 - Repair Actions
 - Repair Actions - Operator
 - Repairactions on Component
 - Chart Shorts
 - chart Floatings
 - Trend

List of error messages.
Every error message is counted even if it occurred several times for one serial number. It can be determined on which days and/or at which times the selected error message occurred by double clicking in the error messages column.
The measured values are also listed for the most frequent error messages (Top25).

Filters taken into account: Time interval.

DiagComponents

Pareto diagnosed components: 01.04. - 18.10.

Diagnosis

	RE	%	Diagnosis(+)	Component
1	A	47.234	CAPC20 100NF 10%	C20
2	A	33.275	CAPC26 100NF 10%	C26

PieProduction

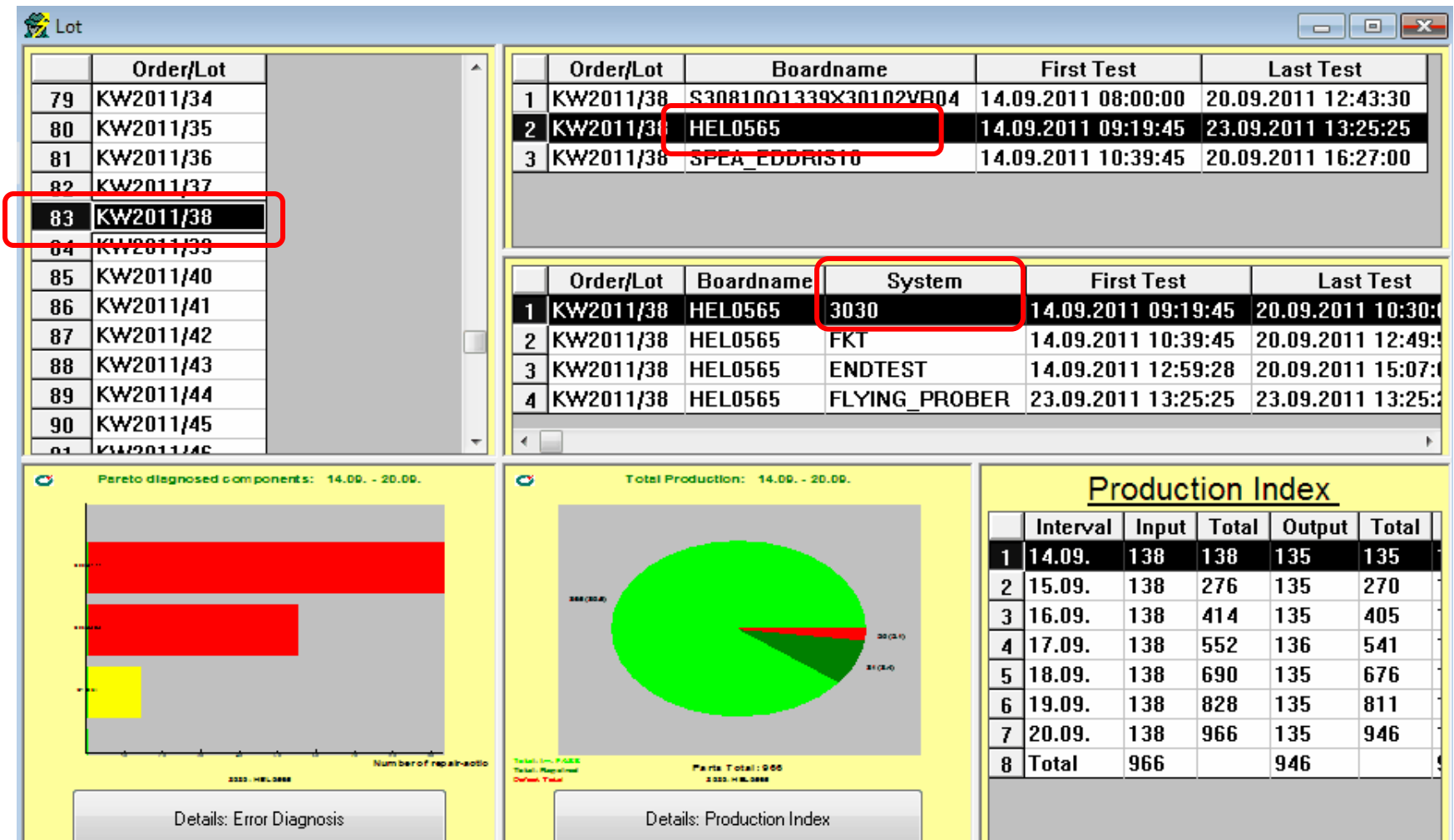
Total Production: 01.04. - 18.10.

Total: Im. PA 88
Total: Repaired
Defect Total

Parts Total: 27738
3030_1: HEL0606 (HEL0606)

Repaired components

Production



	PARETO	%	Partnumber(+)	Number of repair-actions
1	A	42.255	V39351-Z2104-K2	10857
2	C	1.327	V39243-Z6330-J	341
3	C	0.899	V20810-S20-S500	231
4	B	18.892	V20810-S20-S370	4854
5	C	0.187	spea3490088044	48
6	C	0.004	spea3480088033	

Analysis over **all** boards
and **all** testsystems in time intervall

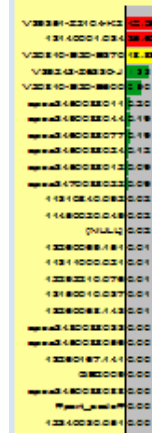
Repair groups

	V39351-Z2104-K2	11	15	20	25	Total
1	S30810Q1339X3010		541	3001	24	3566
2	SPEA_EDDRIS10			1		1
3	HEL0565	4	993	6265	28	7290

Repair actions

	V39351-Z2104-K2	106	1503	2005	2006	2007	2099	2501	2502	Total
1	S30810Q1339X3010		541	1740	901	268	92	22	2	3566
2	SPEA_EDDRIS10					1				1
3	HEL0565	4	993	3751	1995	382	137	27	1	7290
4	Total	4	1534	5491	2896	651	229	49	3	10857

Pareto repaired components (partnum): 01.04. - 18.10.



ParetoParts Info

BnPartRactCrossClassified Info

QualityInformationSystem & QualityExplorer



Automatic evaluations for immediate interventions in the process

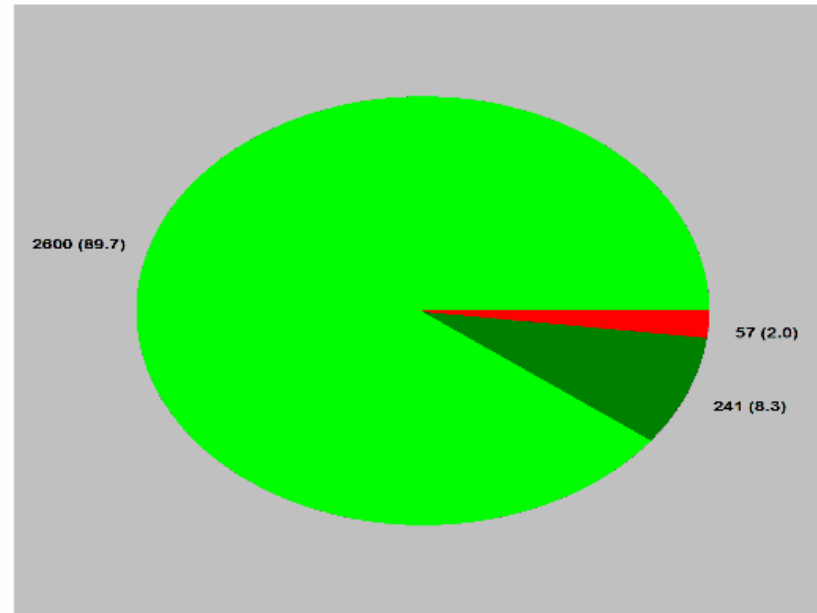
- **OnlineMonitoring** in Realtime
- **Trend** of PASS & Fail
- Automatic generation of **HTML report**

- [-] SPEA OnlineView 21.10.2011 14:48
 - [-] QIS_ONLINE
 - [-] HEL0565
 - [-] 3030_1
 - [-] 2011
 - [-] MONTH
 - [-] 10_October
 - BarFirstpass
 - BarInput
 - BarNotRepaired
 - BarOldRepair
 - BarPass
 - BarRepaired
 - BarTeststarts
 - BarYield
 - LineFailPassRep
 - LineFailPassRepRelative
 - LineFailPassTests
 - LineFailTests10Log
 - LineInOutRepTests
 - LineProductionTime
 - PieProduction
 - Production
- [-] ENDTEST1
- [-] FKT1
- [-] FLYINGPROBE1
- [-] MECHANICAL_INSPECTION
- [-] MULTIPLE_UUT
- [-] QS2009



PieProduction

Total Production: 01.10. - 21.10.



Total: Im. PASS

Total: Repaired

Defect Total

Parts Total: 2898

3030_1: HEL0565 (HEL0565)

Monthly calculation in year 2011:

October

HEL0565

on 3030_1

[SPEA Homepage](#)

[separate Window](#)

TesterStatus 17:56 18.10.2011

VISUAL CONTROL
Pass Boards

85

Pre-Warnlevel = 90
Warnlevel = 80

HEL0686

Valid repaircodes (true errors)

Drawingreference	Number
CS7	1
R1	1
T8	1

Invalid repaircodes (pseudofail)

Drawingreference	Number

Tested Boards = 7
Testresults = 10

2011/08/23,18:00:02 -
2011/10/18,17:40:04

Visual Control

TesterStatus 17:56 18.10.2011

FLYINGPROBE1
Pass Boards

100

Pre-Warnlevel = 90
Warnlevel = 80

HEL0686

Tested Boards = 9
Testresults = 10

2011/10/18,17:51:53 -
2011/10/18,17:58:10

ICT

PieProduction 1...

Total Production: 18.10. - 18.10.

OK REPAIR FAIL

2011/10/18
Total Produced
Total Total

PARA TOTAL 19
FLYINGPROBE1 (9) (9) (10)

PieProduction Info

TesterStatus 17:56 18.10.2011

FUNCTIONAL TEST
Pass Boards

100

Pre-Warnlevel = 90
Warnlevel = 80

HEL0686

Valid repaircodes (true errors)

Drawingreference	Number
C24	1

Invalid repaircodes (pseudofail)

Drawingreference	Number

Tested Boards = 9
Testresults = 10

2011/10/18,09:53:22 -
2011/10/18,17:50:23

Functional test

TesterStatus 17:56 18.10.2011

MECHANICAL INSPECTION
Pass Boards

80

Pre-Warnlevel = 90
Warnlevel = 80

HEL0686

Tested Boards = 10
Testresults = 10

2011/04/12,11:16:41 -
2011/10/18,17:46:11

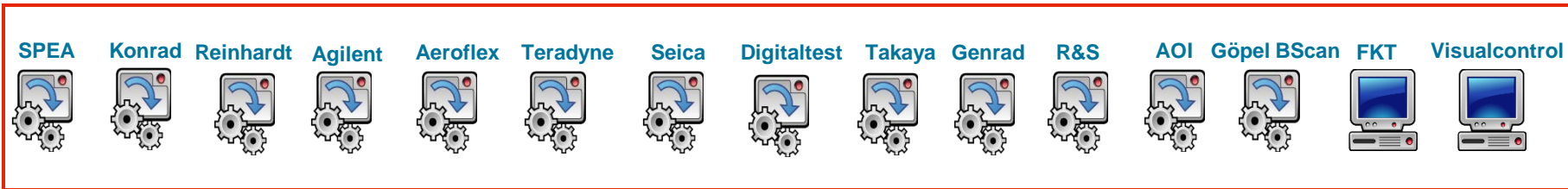
Bild_Top 19:12 ...

Production 17:56 18.10.2011

Interval	Input	Total	Not repaired	in %	Total	First
1	18.10.	19	19	3	15.79	3
2	Total	19		3	15.79	

ParetoCom...

Start for COMPASS is the first scanning of the serial number of a board!



Then COMPASS records all events !

- ✓ all tests
- ✓ all error diagnostics from visual control stations
- ✓ all error diagnostics from testsystems and AOI's
- ✓ all repair actions

QualityInformationSystem & QualityExplorer

Interactive evaluation



Automatic evaluation

Boardtraceability

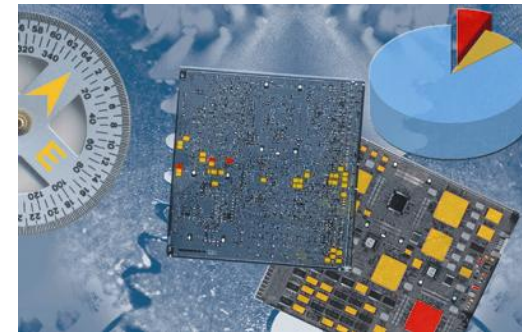
Board History								
	Serialnumber	Boardname	Date	Time	Result	Remark	Operator	Station
1	sn109876	HEL0565	18/10/2011	17:39	FAIL		MS	VISUAL CONTROL
2					OPEN	REPAIRED: R1 IDC=1001 R1		
3					REP_ACTION	R1 1001 Comp.SMT fault	MS	
4	sn109876	HEL0565	18/10/2011	17:40	PASS		MS	VISUAL CONTROL
5	sn109876	HEL0565	18/10/2011	17:40	FAIL		ADMINIST	FLYINGPROBE1
6					FAIL	RESR1 4.7K 5% R1		
7					FAIL	CAPC1 100nF 10% C1		
8					FAIL	INDL1 10uH 50% L1		
9					REP_ACTION	C1 1003 Comp.SMT crooked pin	MS	
10					REP_ACTION	L1 2003 PnP SMT component wrong	MS	
11	sn109876	HEL0565	18/10/2011	17:42	PASS		ADMINIST	FLYINGPROBE1
12	sn109876	HEL0565	18/10/2011	17:42	FAIL		MS	FUNCTIONAL TEST
13					FAIL	00 Diagnose: FKT 1 Fail		
14					FAIL	Comp.THT wrong tolerance C24		
15					REP_ACTION	C24 1102 Comp.THT wrong tolerance	MS	
16	sn109876	HEL0565	18/10/2011	17:43	PASS		MS	FUNCTIONAL TEST
17	sn109876	HEL0565	18/10/2011	17:45	PASS		MS	MECHANICAL INSPECTION

COMPASS: records data of all test and repair systems independent of manufacturer,
saves repair time approx. up to 50%,
enables OnlineMonitoring directly from your desk,
is ready for board traceability and shows the complete history.

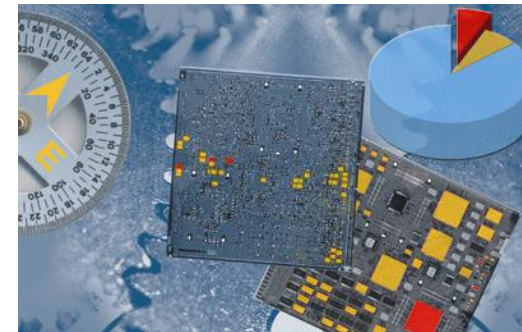
Thank you for your interest.

- **ATE interfaces**
- **AOI interfaces**
- **CAD interfaces**

- SPEA
- HP-Anbindung, *HP Log records*
- Marconi/Aeroflex-Anbindung
- Genrad-Anbindung, *Tracs Interface Protocol*
- Teradyne-Anbindung, *Tokenlog file*
- Digitaltest-Anbindung, *MTS Log file*
- Dr. Eschke Tester
- Reinhardt Tester
- Rohde & Schwarz-Anbindung, *TSx-Datalogging*
- Takaya FlyingProbe (APT) (1/2008)
- Seica Pilot FlyingProbe
- Göpel BScan
- Agilent Röntgensystem 5DX
- Sicalis QS System
- Konrad-Anbindung
- Adaptronic, NT-Serie



- AOI Modus
- AOI VI
- AOI Orbotech
- AOI Schneider&Koch Laservision
- AOI Viscom
- AOI Göpel Opticon
- AOI Saki
- AOI Marantz
- AOI TR7550 (TRI Taiwan)



Test protocol

```

spealink.dat
#
.version 2
0 600
2 ANWENDERTREFFEN2011 1
3 2011KW32
4 HELO565
6 24
7 15
8 HELO565
9 TEST
10 0
13 12.08.2011
14 12:28:34
15 ADMINISTRATOR
16 FAIL
17 1.00
18 0
19 12.08.2011
20 12:28:34
21 1-1

?
1 164
2 RESR1 4.7K 5%
3 +47.00000
4 K
5 +4.93500
6 +4.46500
7 FAIL
8 (65).(23)
13 K
14 K
21 1
    
```

Header-Block

Event-Block

No.	Contents
1	Test step No.
2	Remark
3	Measured value
4	Measurement unit
5	Upper limit
6	Lower limit
7	Type of error
8	Test point list
9	Part name / drawing reference
10	Digital section
11	Digital step
12	Digital RefLib
13	Unit of 5
14	Unit of 6
15	Repair operator
16	Task name
17	Repair number
18	Repair code
19	PinCount
21	Panel ID
25	Repair time
30	Measured value description
31	Measured alue
27	Station ID of rep. station
28	Reference number
29	Housing type
101	Supplement lot number
102	Supplement consumption



Repair protocol

```
#
.version 2
2      ANWENDERTREFFEN2011 1
3      2011KW32
4      HEL0565
6      24
7      15
13     12.08.2011
14     12:28:34
15     MS
16     R
24     1028518
25     20110812 124348
30     1028518

?
7      APPEND
9      R1
15     MS
17     1
18     3206
21     1
27     1
28     spea3490088044
29     sm_bvs_r
```

Header-Block (lines 2-30)

Event-Block (lines 7-29)

No.	Contents
1	Test step No.
2	Remark
3	Measured value
4	Measurement unit
5	Upper limit
6	Lower limit
7	Type of error
8	Test point list
9	Part name / drawing reference
10	Digital section
11	Digital step
12	Digital RefLib
13	Unit of 5
14	Unit of 6
15	Repair operator
16	Task name
17	Repair number
18	Repair code
19	PinCount
21	Panel ID
25	Repair time
30	Measured value description
31	Measured alue
27	Station ID of rep. station
28	Reference number
29	Housing type
101	Supplement lot number
102	Supplement consumption



Thank you for your interest.