Die Bonder 2009 SSI

Operating Manual

Preliminary

Object No:	/	Folder A4 size, standard paper
	Info-Page	CD-ROM
Release Date:	May 29, 2009	
Content Reference:		

Copyright

© 2009 Esec Ltd.

All rights reserved. No part of this publication may be reproduced, stored, in a retrieval system, or transmitted, in any means, electronic, mechanical, photocopying, recording or otherwise, without the prior written permission of the publisher.

The Die Bonder 2009 SSI works as is. Screenshots and descriptions cover the actual behavior as far as possible. The content of this manual does not give any claim to software performance or implemented software features.

Customer Support:

Headquarters Switzerland / Europe & Russia
Esec Ltd.
Hinterbergstrasse 32
CH-6330 Cham / Switzerland
Phone +41 41 749 51 11
Fax +41 41 749 51 77

Besi Northamerica, Inc.
33 East Comstock Drive
Suite 7
Chandler, AZ 85225 / USA

Phone +1 480 - 497 6404
Fax +1 480 - 497 6420

Oerlikon Assembly
Equipment (Taiwan) Ltd
416-1, Sec 3, Chunghsin Rd.
Chutung, HsinChu County
310 Taiwan R.O.C.
Phone +886 - 3 500 1688
Fax +886 - 3 583 8035

Esec (Singapore) Pte. Ltd.
1, Science Park Road
Singapore Science Park 2
#03-10, Capricorn Building
Singapore 117528
Phone +65 - 6303 7000
Fax +65 - 6873 1133

Besi Japan Co. Ltd.
1-35-22-104 Sangenjaya
Setagaya-ku
Tokyo 154-0024
Japan
Phone +81 - 3 6805 2616
Fax +81 - 3 5431 1580

Oerlikon Korea Ltd.
3rd Fl., Jellzone 2 Tower,
159-4, Jeongja-dong,
Bundang-gu, Seongnam-si,
Gyeonggi-do
Korea 463-834
Phone +82 31 785 1300
Fax +82 31 785 1358

SE Oerlikon (Shanghai)
Trading Co. Ltd.
Dong San Road WGQ 33# Bldg
No. 76 Fu Te
Free Trade Zone Pudong
Shanghai 200131
China
Phone +86 21 - 5057 4646
Fax +86 21 - 5057 4647

Imprint:

Die Bonder 2009 SSI Operating Manual

Index:
Master Document (Inno): 300633786
Concept: Armin Mueller
Authoring: Markus Burri, Paul Portmann
Checked: Daniel Kellenberger
Approved: Prasanna Simha
Original Language: English
Web Information: www.esec.com
Template Reference: V1.0.0.10

© 2009 Esec Ltd.

/ (May 29, 2009)

1 Safety

2 Equipment Description

3 Module Description

4 HMI Description

5 Production Setup

6 Calibration

7 Mechanical Preparation

8 Machine Setup

9 Recipe / Statistics

10 Software Handling

11 Material Safety Data Sheets MSDS

12 InfoSheets

Index

© 2009 Esec Ltd.

/ (May 29, 2009)

© 2009 Esec Ltd.

/ (May 29, 2009)

Contents

1 Safety

1.1 Introduction 1-1

1.1.1 Compulsory Reading. 1-1

1.2 Use of Die Bonder 2009 SSI 1-1

1.2.1 Foreseen Use 1-1

1.2.2 Prohibited Use. 1-1

1.2.3 Modifications 1-1

1.3 Personnel Requirements 1-2

1.3.1 Management Responsibilities 1-2

1.3.2 Equipment Operating - Personnel Profile 1-2

1.3.3 Conformation Statement 1-3

1.4 Safety Alerts. 1-3

1.4.1 Safety Signs and Signal Words Used in this Manual 1-3

1.4.2 Safety Labels Attached to System 1-4

1.4.3 Danger Zones and Location of Safety Labels 1-6

1.5.1 Used Directives and Standards. 1-18

1.5.2 Shut-Down Appliances 1-22

1.6 Safety Elements. 1-23

1.6.1 Situation 1-23

1.6.2 Removal of Safety Elements. 1-23

1.7 Specific Warnings 1-24

1.7.1 Moving Parts 1-24

1.7.2 **Software 1-26**

1.7.3 Heat Hazard / High Temperatures 1-26

1.7.4 Material Handling 1-27

1.7.5 Electrical Hazard 1-27

1.7.6 Laser Radiation 1-28

1.7.7 Chemical Hazard. 1-28

1.7.8 Electrostatic Discharge ESD 1-28

© 2009 Esec Ltd.

/ (May 29, 2009)

1.8 Operational Procedure Classification 1-28
1.9 A Place for the Manual, Safekeeping 1-29

2 Equipment Description

2.1 Equipment Overview (for 6“/8“ Wafers) 2-1
2.2 Equipment Application, Purpose 2-2
2.3 Process Description 2-3
2.4 Machine Operation 2-4
2.5 Machine Identification 2-4
2.6 Conformity 2-5
2.7 Delivered Service Kit and Tools 2-6

3 Module Description

3.1 Introduction 3-1
3.2 Leadframe Handling 3-3
3.2.1 Overview 3-3
3.2.2 Power Leadframe Loader (PLL) 3-3
3.2.3 Stack Power (SP) 3-4
3.2.4 Push-In 3-5
3.2.5 Indexer 3-5
3.2.6 Buffered Handler (BH) 3-6
3.2.7 Programmable Dual Wire Dispenser (PDWD) 3-7
3.3 Wafer Handling 3-8
3.3.1 Overview 3-8
3.3.2 Wafer Cassette Lift 3-8
3.3.3 Wafer Handler Gripper 3-9
3.3.4 Wafer Table 3-9
3.4 Pick & Place Unit 3-10
3.4.1 Overview 3-10
3.4.2 Bondhead 3-10
3.4.3 Die Ejector 3-11
3.4.4 Die Pick Up 3-11
3.4.5 Die Placement 3-11

© 2009 Esec Ltd.

3.5 Vision Systems 3-12
3.5.1 Overview 3-12
3.5.2 Pick Vision PVI 3-12
3.5.3 Bond Vision BVI 3-13
3.5.4 Programmable Quality Control TV PQCTV 3-13
3.6 Controls and Supplies 3-14
3.6.1 Electrical Power Supply 3-14
3.6.2 Heat Control System 3-16
3.6.3 Pneumatic Unit 3-17
3.7 The Control Computer 3-18
3.7.1 Hardware Architecture 3-18
3.7.2 System Controller Hardware 3-19
3.7.3 Host Connection 3-20
3.8 Procedures / Tasks on the Machine 3-21
3.8.1 Calibration 3-21
3.8.2 Teaching 3-21
3.8.3 Operating 3-22
3.9 Options 3-23
3.9.1 Leadframe Handling 3-23
3.9.2 Wafer Handling 3-28
3.9.3 Chip Handling 3-29
3.9.4 Gas Supply Feature (GSF) 3-30

4 HMI Description

4.1 User Management 4-1
4.1.1 Introduction 4-1
4.1.2 MS Windows Software User 4-2
4.1.3 ESEC System User Groups 4-3
4.1.4 ESEC System Users 4-3
4.1.5 Assign New / Delete / Change ESEC System Users 4-4
4.1.6 ESEC System User Log-in 4-6
4.2 Monitors 4-7
4.3 Production Keyboard 4-8
4.3.1 Keypad Segments 4-8
4.3.2 Keyboard Placement 4-9
4.4 Alphanumeric Keyboard / Mouse 4-10

© 2009 Esec Ltd.

/ (May 29, 2009)

4.5 Lamp Indicator Post 4-11
4.6 Floppy Disk & DVD/CD-ROM Drive 4-11
4.7 Uninterruptable Power Supply (UPS) 4-12
4.8 Graphical User Interface (GUI) 4-13
4.8.1 Color Definitions / Icons 4-13
4.8.2 Screen Zones 4-17
4.8.3 Control Screens 4-19
4.8.4 Help Functions 4-29
4.8.5 Text Translation 4-29
4.8.6 Changing the Display Formats 4-29

5 Production Setup

5.1 Powering up the Machine 5-1
5.2 Shutting down and Stopping the Machine 5-3
5.2.1 Regular Shut-down 5-3
5.2.2 Emergency Stop 5-4
5.2.3 Un-ordered Stops 5-5
5.2.4 Shut down at Unusual Conditions or Logoff for Service Purposes 5-6
5.2.5 Feedback Report 5-8
5.2.6 Power Failure with UPS 5-11
5.3 Production 5-12
5.3.1 Overview 5-12
5.3.2 Starting the Production 5-13

6 Calibration

6.1 Introduction 6-1
6.1.1 Calibration Procedures Overview 6-2
6.2 Machine Preparation 6-3
6.3 Pick & Place Unit Calibration 6-4
6.3.1 Tools and Equipment 6-4
6.3.2 Bondhead Tilt Calibration 6-5
6.3.3 Die Ejector Calibration 6-7
6.3.4 Bondarm Y- Calibration 6-9
6.3.5 Calibrating the Bondhead Y-Movement 6-11
6.3.6 Force Calibration 6-11

© 2009 Esec Ltd.

/ (May 29, 2009)

6.4 Wafer Handling Calibration 6-14
6.4.1 Tools and Equipment 6-14
6.4.2 Motorized Pick Vision Adjustment and Calibration 6-15
6.4.3 Wafer Table Origin Calibration 6-21
6.4.4 Wafer Table Frame Diameter Calibration 6-23
6.4.5 Wafer Table Load Position Calibration 6-24
6.4.6 Wafer Table Expansion Ring Position Calibration 6-25
6.4.7 Gripper Calibration 6-26
6.4.8 Cassette Lift Calibration 6-26
6.5 Leadframe Handling Calibration 6-29
6.5.1 Tools and Equipment 6-29
6.5.2 Bond Vision (BVI) Adjustment and Calibration 6-29
6.5.3 Heater Calibration 6-34
6.5.4 Indexer Calibration (Top Module) 6-38
6.5.5 Programmable Quality Camera TV PQCTV Calibration (Top Module) 6-40
6.5.6 Programmable Dual Wire Dispenser PDWD Calibration (Top Module) 6-41
6.5.7 Programmable Pre Press Module PPPM Calibration (Top Module) 6-43
6.5.8 Power Leadframe Loader PLL Calibration 6-44
6.5.9 Stack Power SP Calibration 6-47
6.5.10 Top Stack Loader TOS Calibration (Option) 6-47
6.5.11 TOS Push-In Calibration 6-48
6.5.12 Input Magazine Handler Calibration (Option) 6-48
6.5.13 Output Magazine Handler Calibration 6-52
6.5.14 Input Buffered Handler BH-IN Calibration (Option) 6-55
6.5.15 Buffered Handler Push-in Calibration 6-56
6.5.16 Dual Input Handler DINP Calibration (Option) 6-56
6.5.17 Dual Power Leadframe Loader DPLL Calibration (Option) 6-56
6.5.18 Buffered Handler BH Calibration 6-57
6.6 Final Calibration 6-59
6.6.1 Tools and Equipment 6-59
6.6.2 Die Ejector Height Calibration 6-59

7 Mechanical Preparation

7.1 Introduction 7-1
7.1.1 Preparing the Machine 7-2

© 2009 Esec Ltd.

/ (May 29, 2009)

7.2 Leadframe Handling . . . 7-3
7.2.1 Power Leadframe Loader PLL . . . 7-3
7.2.2 Stack Power . . . 7-8
7.2.3 Push-In . . . 7-13
7.2.4 Top Stack Loader Adjustment . . . 7-14
7.2.5 Power Marker Unit PMU4 (Option) . . . 7-19
7.2.6 Indexer . . . 7-20
7.2.7 Programmable Dual Wire Dispenser . . . 7-29
7.2.8 Mount and Change the PPPM Tool . . . 7-32
7.2.9 Buffered Handler . . . 7-34
7.2.10 Output Magazine Handler Adjustment . . . 7-37
7.3 Pick & Place and Wafer Handler . . . 7-38
7.3.1 Pickup Tool and Shank Replacement . . . 7-38
7.3.2 Expansion Unit Replacement . . . 7-38
7.3.3 Wafer Cassette Holder Adjustment . . . 7-41
7.3.4 Needle and Needle Holder Replacement (Standard Die) . . . 7-42
7.3.5 Needle and Needle Holder Replacement (Small Die) . . . 7-44
7.3.6 Camera Mini Adapter Replacement . . . 7-46

8 Machine Setup

8.1 Introduction . . . 8-1
8.1.1 Machine Preparation . . . 8-1
8.2 Power Leadframe Loader PLL . . . 8-2
8.2.1 Gripper Adjustment . . . 8-2
8.2.2 Y-Position Adjustment . . . 8-5
8.3 Stack Power . . . 8-5
8.4 Top Stack Loader . . . 8-6
8.4.1 TOS Positions Teaching . . . 8-6
8.4.2 Paper Separation Teaching . . . 8-9
8.4.3 Leadframe Thickness Measurement . . . 8-10
8.4.4 Leadframe Place Position Teaching . . . 8-11
8.4.5 TOS Parameter Setting . . . 8-12
8.5 Input Magazine Handler (Option) . . . 8-13
8.6 Dual Power Leadframe Loader DPLL (Option) . . . 8-16
8.7 Dual Input Loader DINP (Option) . . . 8-16
8.8 Push-in-Take Over . . . 8-16

© 2009 Esec Ltd.

8.9 Leadframe Identification Sensors 8-17
8.10 Soft Solder Indexer 8-18
8.11 Leadframe Teaching 8-19
8.12 Multichip Bond Positions 8-20
8.13 Programmable Dual Wire Dispenser 8-23
8.14 Prepress Process 8-26
8.15 Power Marker Unit PMU4 (Option) 8-28
8.15.1 PMU4 Parameter Setting 8-28
8.15.2 PMU4 Adjustment 8-28
8.16 Output Buffered Handler BH (Option) 8-31
8.17 Output Magazine Handler 8-33
8.18 Wafer Settings 8-35
8.18.1 Overview 8-35
8.18.2 Wafer Cassette Teaching 8-37
8.18.3 Wafer Cassette Fine-Tuning 8-40
8.18.4 Wafer Properties Teaching 8-43
8.19 Chip Settings and Alignment 8-45
8.19.1 Chip Alignment Structure 8-46
8.19.2 Chip Alignment Street 8-50
8.19.3 Chip Alignment Two Point 8-53
8.20 Inkdot, Quality Tests & Broken Wafer 8-57
8.20.1 Neighbor Check 8-57
8.20.2 Inkdot Test „on“ 8-58
8.20.3 Inkdot Test „pattern“ 8-60
8.20.4 Corner Test „on“ / „pattern“ 8-62
8.20.5 Surface Test 8-64
8.20.6 Broken Wafer 8-65
8.20.7 Alter X, Y Step Mode 8-66
8.21 Production Settings 8-68
8.21.1 Without Local Mapping 8-68
8.21.2 With Local Mapping 8-69
8.22 Test Run Wafer 8-70

© 2009 Esec Ltd.

/ (May 29, 2009)

8.23 Pick & Place Teaching 8-71
8.23.1 Die Ejector Height Offset Setting 8-71
8.23.2 Chip Pickup Teaching 8-72
8.23.3 Chip Sensor Teaching 8-75
8.23.4 Bondhead Height at Bond Position Teaching 8-76
8.23.5 Bond Parameters Setting 8-77
8.23.6 Process Mode & Bond Parameter Adjustment 8-77
8.23.7 PQCTV (Option) 8-79

9 Recipe / Statistics

9.1 Recipe Handling 9-1
9.2 Recipe Manager 9-2
9.2.1 Create Recipe 9-3
9.2.2 Save Recipe 9-3
9.2.3 Load Recipe 9-4
9.2.4 Delete Recipe 9-4
9.2.5 Copy Recipe 9-4
9.2.6 Import Recipe Modules 9-5
9.2.7 Create / Rename Folder 9-5
9.2.8 Print Recipe 9-6
9.2.9 Unplug USB Flash Disk 9-6
9.2.10 Access Rights to Recipes 9-6
9.3 Statistics 9-7
9.3.1 Statistic Settings 9-7
9.3.2 Statistic Lot Handling 9-8
9.3.3 Statistic Main Graph 9-10
9.3.4 Statistic File Manager 9-12

10 Software Handling

10.1 Restore MS Windows 2000 Software 10-1
10.2 Installation of Windows Patches 10-4
10.3 Installation of Nero Burning Software 10-6
10.4 Installation of the Info-Page 10-6
10.5 Installation of SCS Software 10-7
10.5.1 New Installation (First Time Installation) 10-7

© 2009 Esec Ltd.

10.6 Installation of Options Software 10-10
10.6.1 Uninterruptable Power Supply (UPS) 10-10
10.7 Software Updates 10-11
10.7.1 Updating SCS Software 10-11

11 Material Safety Data Sheets MSDS

11.1 MSDS KODAK LENS CLEANER 11-2
11.1.1 A: Chemical Product and Company Identification 11-2
11.1.2 B: Composition/Information on Ingredients 11-2
11.1.3 C: Hazards Identification 11-2
11.1.4 D: First-Aid Measures 11-3
11.1.5 E: Fire Fighting Measures 11-3
11.1.6 F: Accidental Release Measures 11-3
11.1.7 G: Handling and Storage 11-4
11.1.8 H: Exposure Controls/Personal Protection 11-4
11.1.9 I: Physical and Chemical Properties 11-4
11.1.10 J: Stability and Reactivity 11-5
11.1.11 K: Toxicological Information 11-5
11.1.12 L: Ecological Information 11-5
11.1.13 M: Disposal Considerations 11-5
11.1.14 N: Transport Information 11-5
11.1.15 O: Regulatory Information 11-6
11.1.16 P: Other Information 11-6

© 2009 Esec Ltd.

/ (May 29, 2009)

11.2 MSDS METALON HT-1.5 11-7
11.2.1 A1: Company Identification, A2: Chemical Product 11-7
11.2.2 B: Composition / Information on Ingredients, C: Hazards Identification. 11-7
11.2.3 D: First-Aid Measures 11-7
11.2.4 E: Fire-Fighting Measures 11-8
11.2.5 F: Accidental Release Measures 11-8
11.2.6 G: Handling and Storage 11-8
11.2.8 I: Physical and Chemical Properties 11-9
11.2.10 K: Toxicological Information. 11-10
11.2.11 L: Ecological Information 11-11
11.2.12 M: Disposal Considerations 11-11
11.2.13 N: Transport Information 11-11
11.2.14 O: Regulatory Information 11-11
11.2.15 P: Other Information. 11-11
11.3 MSDS MICROLUBE GL261 11-12
11.3.1 A1: Company Identification, A2: Chemical Product 11-12
11.3.2 B: Composition / Information on Ingredients 11-12
11.3.3 C: Hazards Identification 11-12
11.3.4 D: First-aid Measures. 11-13
11.3.5 E: Fire-fighting Measures. 11-13
11.3.6 F: Accidental Release Measures 11-13
11.3.7 G: Handling and Storage 11-14
11.3.8 H: Exposure Controls / Personal Protection 11-14
11.3.9 I: Physical and Chemical Properties 11-14
11.3.10 J: Stability and Reactivity 11-15
11.3.11 K: Toxicological Information. 11-15
11.3.12 L: Ecological Information 11-15
11.3.13 M: Disposal Considerations 11-15
11.3.14 N: Transport Information 11-16
11.3.15 O: Regulatory Information 11-16
11.3.16 P: Other Information. 11-16

© 2009 Esec Ltd.

11.4 MSDS MOLYKOTE (R) PG 602 11-17
11.4.1 A1: Company Identification, A2: Chemical Product 11-17
11.4.2 B: Composition / Information on Ingredients 11-17
11.4.3 C: Hazards Identification 11-17
11.4.4 D: First Aid Measures 11-17
11.4.6 F: Accidental Release Measures 11-18
11.4.7 G: Handling and Storage 11-18
11.4.9 I: Physical and Chemical Properties 11-19
11.4.10 J: Stability and Reactivity 11-20
11.4.11 K: Toxicological Information 11-20
11.4.12 L: Ecological Information 11-21
11.4.13 M: Advice on Disposal 11-21
11.4.14 N: Transport Information 11-21
11.4.15 O: Regulatory Information 11-22
11.4.16 P: Other Information 11-22
11.5 MSDS NEVER SEEZ 11-23
11.5.1 A1: Company Identification, A2: Chemical Product 11-23
11.5.2 B: Composition / Information on Ingredients 11-23
11.5.3 C: Hazards Identification 11-24
11.5.4 D: First Aid Measures 11-24
11.5.5 E: Fire-Fighting Measures 11-24
11.5.6 F: Accidental Release Measures 11-25
11.5.7 G: Handling and Storage 11-25
11.5.8 H: Exposure Controls/Personal Protection 11-25
11.5.9 I: Physical and Chemical Properties 11-26
11.5.10 J: Stability and Reactivity 11-26
11.5.11 K: Toxicological Information 11-27
11.5.12 L: Ecological Information 11-27
11.5.13 M: Advice on Disposal 11-27
11.5.14 N: Transport Information 11-28
11.5.15 O: Regulatory Information 11-28
11.5.16 P: Other Information 11-28

© 2009 Esec Ltd.

/ (May 29, 2009)

11.6 MSDS Loctite 221 (R) Threadlocker 11-29
11.6.1 A1: Company Identification, A2: Chemical Product 11-29
11.6.2 B: Composition / Information on Ingredients 11-30
11.6.3 C: Hazards Identification 11-30
11.6.4 D: First Aid Measures 11-30
11.6.5 E: Fire Fighting Measures 11-31
11.6.6 F: Accidental Release Measures 11-31
11.6.7 G: Handling and Storage 11-31
11.6.8 H: Exposure Controls / Personal Protection 11-32
11.6.9 I: Physical and Chemical Properties 11-33
11.6.10 J: Stability and Reactivity 11-33
11.6.11 K: Toxicological Information 11-33
11.6.12 L: Ecological Information 11-34
11.6.13 M: Disposal Considerations 11-34
11.6.14 N: Transportation Information 11-35
11.6.15 O: Regulatory Information 11-35
11.6.16 P: Other Information. 11-36
11.7 MSDS Loctite 243 (R) Threadlocker 11-37
11.7.1 A1: Company Identification, A2: Chemical Product 11-37
11.7.2 B: Composition / Information on Ingredients 11-37
11.7.3 C: Hazards Identification 11-38
11.7.4 D: First Aid Measures 11-39
11.7.5 E: Fire Fighting Measures 11-39
11.7.6 F: Accidental Release Measures 11-39
11.7.7 G: Handling and Storage 11-39
11.7.8 H: Exposure Controls / Personal Protection 11-40
11.7.9 I: Physical and Chemical Properties 11-40
11.7.10 J: Stability and Reactivity 11-40
11.7.11 K: Toxicological Information 11-40
11.7.12 L: Ecological Information 11-41
11.7.13 M: Disposal Considerations 11-41
11.7.14 N: Transportation Information 11-41
11.7.15 O: Regulatory Information 11-41
11.7.16 P: Other Information. 11-41

© 2009 Esec Ltd.

11.8 MSDS: Multemp PS2 11-43
11.8.1 A: Chemical Product and Company Identification 11-43
11.8.2 B: Composition / Information on Ingredients 11-43
11.8.3 C: Hazardous Identification 11-43
11.8.4 D: First-aid Measures 11-44
11.8.5 E: Fire Fighting Measures 11-44
11.8.6 F: Accidental Release Measures 11-44
11.8.7 G: Handling and Storage 11-45
11.8.8 H: Exposure Controls / Personal Protection 11-45
11.8.9 I: Physical and Chemical Properties 11-45
11.8.10 J: Stability and Reactivity 11-46
11.8.11 K: Toxicological Information 11-46
11.8.12 L: Ecological Information 11-46
11.8.13 M: Disposal Consideration 11-46
11.8.14 N: Transport Information 11-47
11.8.15 O: Regulatory Information 11-47
11.8.16 P: Other Information 11-47

© 2009 Esec Ltd.

/ (May 29, 2009)

12 InfoSheets

i 1 Overview Wafer Tests and Process Modes 12-2
i 2 Selection of an Alignment Method 12-3
i 3 Tips and Tricks Chip Teaching 12-5
i 4 Selection of an Inkdot Test 12-6
i 5 Selection of a Corner Test or Surface Test 12-7
i 6 Gripper 12-8
i 7 Needle and Needle Holder 12-10
i 8 Mini Adapters for Vision Modules 12-11
i 9 Teaching TOS Parameters 12-12
i 10 Pickup Process 12-13
i 11 Bond Process 12-17
i 12 Vision Calibration Procedures 12-19
i 13 Wafer 12-22
i 14 Alignment Method Two Point 12-25
i 15 Alignment Method Structure 12-26
i 16 Alignment Method Street 12-27
i 17 Chip Alignment Settings 12-28
i 18 Corner Test 'on' 12-32
i 19 Corner Test 'pattern' 12-35
i 20 Surface Test 12-38
i 21 Inkdot Test 'on' / 'inverse' 12-41
i 22 Inkdot Test 'pattern' / 'inverse pattern' 12-43
i 23 Quality 12-45
i 24 Street Threshold 12-46
i 25 Optimize Index Step 12-49
i 26 Illumination Setting 12-51
i 27 Alternate Pattern Mode 12-54
i 28 Set Index Step Manually 12-55
i 29 Learn Chip Size 12-57
i 30 Learn Chip 12-59
i 31 Broken Wafer 12-62
i 32 Border Mode 12-63
i 33 Chip Verify 12-66
i 34 Production Settings 12-67
i 35 Local Mapping 12-69

© 2009 Esec Ltd.

/ (May 29, 2009)

i 36 Threshold and Color Mode 12-72
i 37 Special / Alternate Step 12-74
i 38 Force Calibration Unit 12-76
i 39 System Verification before Installation of the SCS Software 12-78
i 40 Calibrating the Indexer Heating Elements 12-80
i 41 Indexer Driver Mechanism Spring Tension 12-81
i 42 Indexer Sensors 12-82
i 43 Buffered Handler Adjustment 12-85
i 44 Indexer Heaters 12-86
i 45 Leadframe Teaching 12-87
i 46 Leadframe Identification 12-89
i 47 Teaching the Wire Dispenser 12-90
i 48 Optimizing Atmosphere and Gas Consumption 12-91
i 49 Dispensing Errors 12-93
i 50 Influencing the Die Tilt 12-96
i 51 Tool Design Considerations 12-102
i 52 Z-Axis Parameters 12-106
i 53 General Prepress Parameters 12-107
i 54 Prepress Process Parameters 12-109

Index

© 2009 Esec Ltd.

© 2009 Esec Ltd.

/ (May 29, 2009)

About this Manual

Purpose

This Operating Manual contains essential information concerning:

- the safe and efficient operating, calibration and teaching of the Die Bonder 2009 SSI

The knowledge of and adherence to the safety regulations and the compliance with additional warning instructions described in this Operating Manual is a basic precondition for a safe and error free work with the Die Bonder 2009 SSI .

This Operating Manual and especially the safety regulations have to be observed by all persons who work with or at the Die Bonder 2009 SSI . Additionally, all local safety and environmental regulations have to be observed.

© 2009 Esec Ltd.

How to Use

In general, this Operating Manual should be used in conjunction with all other relevant documentation provided with the machine. To find specific information quickly, all user informations contain the following features:

- Table of contents
- Index with cross-references
- Cross-references within text
- Margin notes, pictograms, symbols etc.
- Glossary, giving a helpful list of the most frequently used terms in die bonding and other back end processes

Manual Used as Reference Book

This Operating Manual can be used as reference book for working with the equipment. Experienced equipment users can follow the tasks easily and fast. Less experienced equipment users are able to get detailed information either out of the Appendixes or out of the Info Sheets. Esec Ltd. suggests to acquire application knowledge in training courses.

Manual Used as Training Information

This Operating Manual is structured according to the method of performance based equipment training (PBET). Therefore, it can be used as training information to pursue tasks step by step. It will be used in Esec Ltd. training courses.

/ (May 29, 2009)

Pictograms and their Meanings

Various pictograms are introduced in this Operating Manual in order to support the understanding of the text and to increase the efficiency of the practical work.

Note: Safety symbols are shown in section *Safety Signs and Signal Words Used in this Manual* on page *1-3*.

Menu

The meaning of this pictogram is: „select the menu:...“. The corresponding menu with submenu is written next to the pictogram in a hierarchical form.

Example:

Machine Calibration
  Pick & Place
    Pick Vision

Soft Key

The meaning of this pictogram is: „click the soft key ...“. The corresponding soft key is written next to the pictogram.

Example:

Continue

If the soft key is mentioned within a text the pictogram will not be shown.

Tool

Whenever a tool is required to carry out a step in a procedure this pictogram is used. The pictogram is placed next to the corresponding instruction.

Example:

Tighten the fixation screw.

PC Keyboard Input

This pictogram indicates the use of the PC keyboard. Its meaning is: „click on the PC keyboard key ...“

Example:

Y ENTER

Context example: Press ***Y*** and then ***ENTER*** to confirm.

© 2009 Esec Ltd.

Check

When an adjustment or a value has to be checked during a procedure this pictogram is used. The pictogram is placed next to the corresponding instruction.

Example:

☑ Check the alignment.

Hint

This pictogram indicates that a pop up window will appear giving a hint for the current work procedure. The text of the pop up window is written next to the pictogram in a non-proportional font.

Example:

`Remove pin and continue calibration`

If the hint is mentioned within a text the pictogram will not be shown.

Successful Completion

This pictogram indicates that a pop up window will appear if e.g. a calibration or teach procedure is completed successfully. The text of the pop up window is written next to the pictogram in a non-proportional font.

Example:

OK✓ `Y axis calibration successful`

If the Successful Completion is mentioned within a text the pictogram will not be shown.

Information Sheets

Since the step by step procedures are described as short as possible they provide no additional information (i.e. about the reason of adjustment). Still, for some subjects, procedures, etc. more information is available in a special chapter called Information Sheets. All Information Sheets are numbered continuously.

Wherever an Information Sheet provides information a pictogram with the number of the respective Information Sheet is placed next to the text, referring to the appropriate appendix.

Example:

i 2 Define the correct adapter type.

Meaning: information about adapters can be found in Information Sheet No. 2.

© 2009 Esec Ltd.

Text Conventions and their Meanings

Various text styles are used in this Operating Manual in order to support the readability of the text or to emphasize the meaning of text segments.

Meaning	Description / Text Style	Example
Parameters and actual values	Machine parameters and actual values are visualized by bold characters and in the same spelling as in the menu. Also the state of the parameter is written in the same way.	Set the parameter **Chip quality level** to **standard** **Pickup time 5** **Pick force 0.30**
Soft key	Soft keys are context sensitive function keys. They are written in italic and bold using capital and small letters. Normally they are shown together with the respective pictogram (see also section *Pictograms and their Meanings* on page *-xxii*).	If the adjustment is completed click ***Define offset***.
PC keyboard entry	In a text flow, the keys to be pressed are written using same style as the Soft Key.	Press ***Y*** and then ***ENTER*** to confirm.
Menu tree	In a text flow the hierarchy of a menu is visualized by using hyphens and bold characters.	**Machine Calibration - Die Carrier - Wafer Table**
Screen	Screens are written in bold using capital and small letters.	... on **Visualization** screen
Glossary item	Written in blue italic.	... *early lot termination*...
Cross reference	Written in blue italic.	... *see page 4-8* ...
Notifications	Notifications appearing in a pop up window will provide tips, instructions and messages for the current work procedure. They are written in a non-proportional font.	The notification `Align camera to calibpot` appears
Successful completion (Message)	Messages appearing in a pop up window will provide tips, instructions and messages for the current work procedure. They are written in a non-proportional font.	The message `Align Bondarm y-Axis calibration successful` appears.
Note	If a certain subject must be emphasized it is written as a note.	**Note:** Adjust the guide pins symmetrically in X- and Y-direction.

© 2009 Esec Ltd.

Delivery Media (Reproduction Type)

The appropriate Object/Document number you will find on the cover page of this Operating Manual.

- Folder A4 size, standard paper
- PDF and HTML formatted files on Info-Page

Feedback

Please send any feedback in respect of the DB 2009 SSI Operating Manual to:

daniel.kellenberger@besi.com

History

Index	Release Date	Changes
	May 29, 2009	Preliminary version

© 2009 Esec Ltd.

© 2009 Esec Ltd.

/ (May 29, 2009)

1 Safety

1.1 Introduction

1.1.1 Compulsory Reading

This chapter is compulsory reading matter for anyone working with or at the Die Bonder 2009 SSI. Esec Ltd. decline all responsibility for personal injuries or material damages occurring as a result of non-observance of this chapter's instructions and warnings.

1.2 Use of Die Bonder 2009 SSI

1.2.1 Foreseen Use

The Die Bonder 2009 SSI picks an integrated circuit (chip) or other electronic components out of a sawn wafer and attaches it on a leadframe. Only materials especially designed for die attach may be processed. Other materials might have hidden hazards or could damage equipment components.

The Die Bonder 2009 SSI may only be used if it is in perfect working order and if it operates within the specified technical data as defined in the Installation Information. Eliminate all occurring errors and damages immediately.

Esec Ltd. decline responsibility if an attempt is made to use the system for any purpose other than for which it was designed.

1.2.2 Prohibited Use

Not known at issue date.

1.2.3 Modifications

It is forbidden to make any software or hardware modifications or extensions to the Die Bonder 2009 SSI. All modifications require the written consent of the equipment's manufacturer.

© 2009 Esec Ltd.

1.3 Personnel Requirements

WARNING

Any incorrect use of the Die Bonder 2009 SSI, its modules or options can cause severe injury. Therefore, only authorized personnel is permitted to work with or at the Die Bonder 2009 SSI.

1.3.1 Management Responsibilities

The management has to take care, that

- all personnel working with or at the Die Bonder 2009 SSI equipment are well trained in safety aspects and accident prevention and adhere to safety regulations.
- Personnel in training or working under instruction has to bee supervised continuously by authorized personnel.
- no unauthorized personnel can gain access to the Die Bonder 2009 SSI.
- no items of safety system is removed from Die Bonder 2009 SSI.
- bypassing safety elements is strictly prohibited.
- the Die Bonder 2009 SSI equipment is only used in perfect condition and is maintained correctly and safely.
- all safety relevant material is kept in top condition.
- the work habits of the personnel have to be checked on a regular base regarding awareness of security and danger.
- tools and methods for fire-fighting have to be provided and published as well as the location of fire-extinguisher and fire alarms.
- necessary protective equipment (goggles, protective gloves, etc.) is available for the staff.

1.3.2 Equipment Operating - Personnel Profile

Operating the Die Bonder 2009 SSI, its modules or options may only be performed by qualified personnel. Depending on the training completed the user may be certified as level 1 operating personnel or as level 2 operating personnel.

Function of the Level 1 Operating Personnel

- starting/stopping/aborting production
- loading and unloading production material (LF, wafer, solder)
- cleaning the machine

Function of the Level 2 Operating Personnel

- setting-up production
- adjusting processes
- teaching material
- maintenance

© 2009 Esec Ltd.

Level 2 operating personnel is authorized to operate the equipment also in special operating mode as mentioned above. This special operating mode requires appropriate training.

Duties and Responsibilities of all Operating Personnel

- Handles production material in a correct manner.
- Interprets Operating Information correctly.
- Knows how to interpret material safety data sheets (MSDS).
- Interprets hints and errors and takes correct action.
- Follows approved technical methods in the operating of the Die Bonder 2009 SSI, modules or options of it.
- Participates in regular training to maintain the required level of knowledge related to operate equipment and trains subordinate personnel as required.
- Wears and uses protective equipment (goggles, protective gloves, etc.) when working with aggressive substances.

1.3.3 Conformation Statement

All persons who are assigned to work with or at the Die Bonder 2009 SSI have to agree to the following statements before they start working with the Die Bonder 2009 SSI for the first time. They must commit themselves with their signature:

- I agree to observe the regulations regarding safety of work and accident prevention.
- I confirm that I have read and understood the chapter on safety regulations in this manual as well as the warning paragraphs.

© 2009 Esec Ltd.

1.4 Safety Alerts

1.4.1 Safety Signs and Signal Words Used in this Manual

Throughout this manual attention is drawn to safety issues in the following way:

DANGER

Indicates an imminently hazardous situation which, if not avoided, will result in death or serious injury.This signal word is to be limited to the most extreme situations.

WARNING

Indicates a potentially hazardous situation which, if not avoided, could result in death or serious injury.

/ (May 29, 2009)

⚠ CAUTION

Indicates a potentially hazardous situation which, if not avoided, may result in minor or moderate injury. It may also be used to alert against unsafe practices.

NOTICE

Indicates a situation in which property damage is likely (a situation which, if not avoided, may result in equipment or material damage).

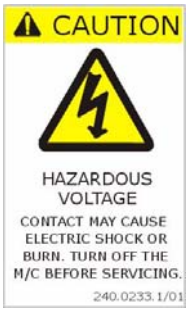
1.4.2 Safety Labels Attached to System

Personnel must be familiar with all the warning symbols and decals fitted to the machine. Failure to recognize a warning and understand the associated safety instructions may result in injury or death.

Note: Check periodically the existence of safety labels on the equipment (see section *Danger Zones and Location of Safety Labels* on page *1-6*). Replace damaged or missing labels immediately.

Meaning of the Safety Labels

The following symbols and decals are used on the machine:

	Moving Parts, Keep Hands Out **Indicates that moving parts in that area can cause serious injury. Always stop the machine prior to removing parts and/or performing adjustments.**
	**Electrical Hazards / Hazardous Voltage** **Indicates an electrical hazard. Contact may cause electric shock or burn. The machine must be switched off before removing any cover with this decal on it.**

© 2009 Esec Ltd.

Electrical Plate For Die Bonder 2009 SSI

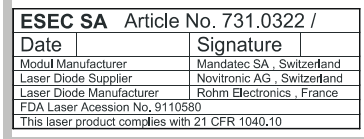
The electrical plate states details such as the supply voltage of the Die Bonder 2009 SSI (Transformer wiring).

Electrical Hazards / Hazardous Voltage

This decal is used to indicate an electrical hazard that remains dangerous even after switching off the machine. The machine must be disconnected from the main power supply before any actions on parts with this decal on it.

Hazardous Laser Beam

Indicates a laser hazard. Do not use optical instruments or look directly into the laser sensor.



ESEC SA	Article No. 731.0322 /		
Date		Signature	
Modul Manufacturer		Mandatec SA , Switzerland	
Laser Diode Supplier		Novitronic AG , Switzerland	
Laser Diode Manufacturer		Rohm Electronics , France	
FDA Laser Acession No. 9110580			
This laser product complies with 21 CFR 1040.10			

Laser Identification Plate

This decal states technical details of the laser used.

Hot Surface

Indicates machine parts that reach high temperatures. Coming into contact with these components may result in serious burns.

Calibration

Indicates machine parts that may only be adjusted for module calibration.

Die Bonder 2009 SSI Illumination

This decal, fitted to the illumination units, indicates the correct direction to remove the unit.

Do not remove the illumination unit while the pick & place is running.

© 2009 Esec Ltd.

Electro Static Discharge (ESD)

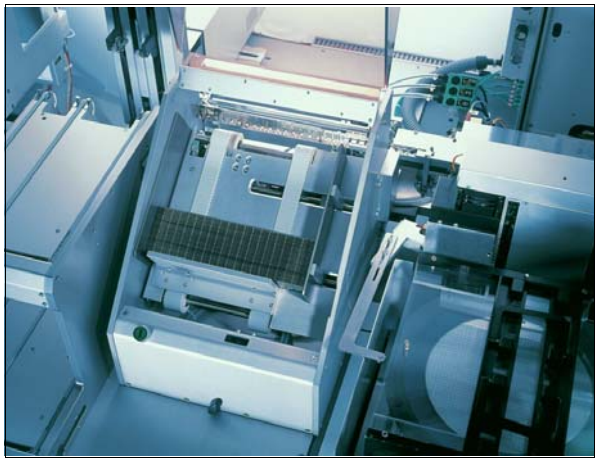
Precautions against electrostatic discharge must be taken to prevent damage to the particular machine or devices.

1.4.3 Danger Zones and Location of Safety Labels

The danger zones are marked with safety labels on the equipment.

Power Leadframe Loader

The leadframe gripper may move unexpectedly, keep hands and loose clothing clear of the load platform.

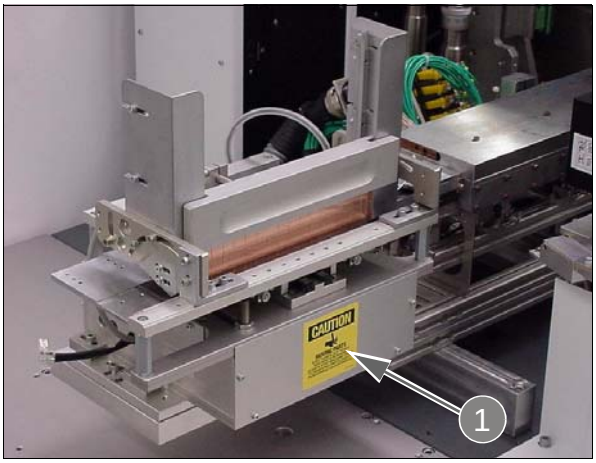


Stack Power

The load platform may move backwards or forwards unexpectedly, keep hands and loose clothing clear of the load platform.

The first index finger may move left or right unexpectedly, keep hands and loose clothing clear of the first index finger.

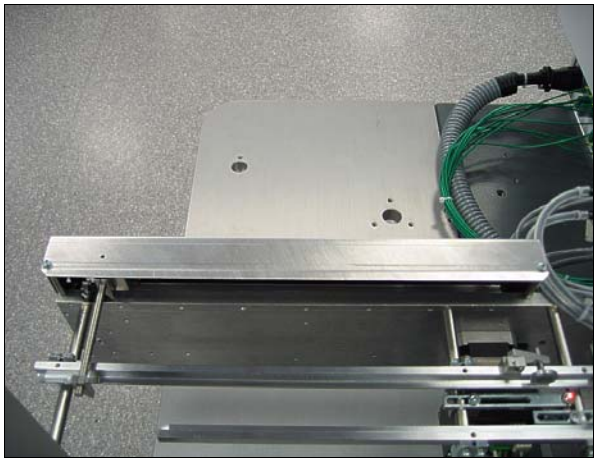
☑ Check that the safety label, indicating “MOVING PARTS” on the stack power is properly in place.



© 2009 Esec Ltd.

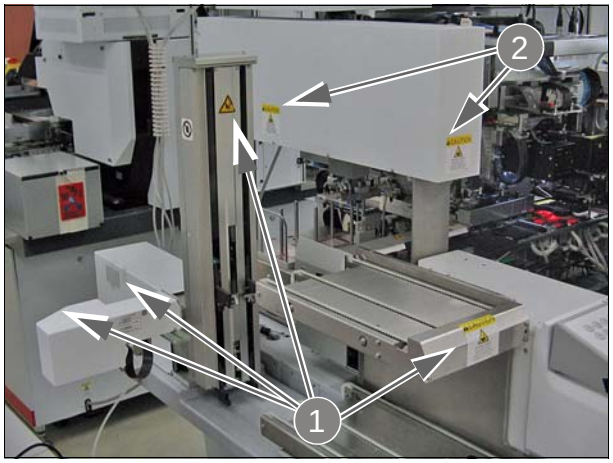
Push-in

The push-in may move unexpectedly, keep hands and loose clothing clear of the load platform.



Input Magazine Handler / Top Stack Loader

The elevator and its clamps of the input magazine handler and the gripper of the top stack loader can move immediately in Y- and Z-direction. The moving parts can cause severe injury.



☑ Check that all safety labels indicating “MOVING PARTS” on the input magazine handler (1), if mounted, and on the top stack loader (2), if mounted, are properly in place.

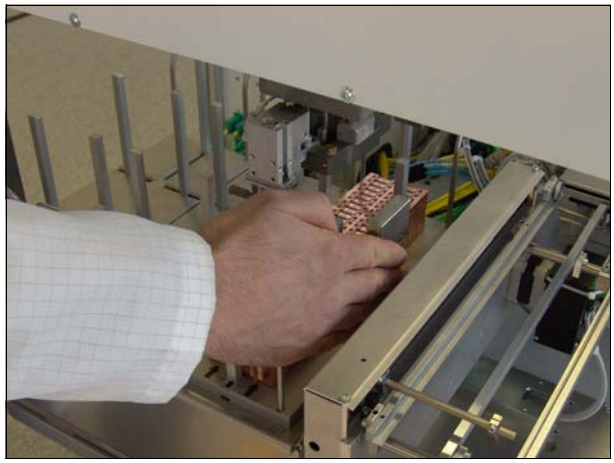
An inattentive grasp between the moving magazine handler and the input platform can cause severe injury.

© 2009 Esec Ltd.

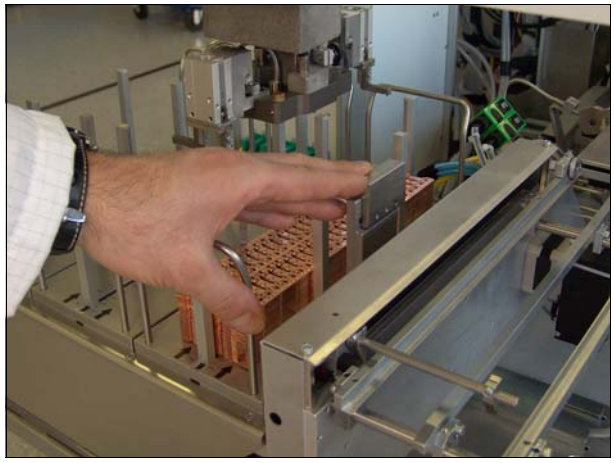
Input Magazine Handler / Top Stack Loader (Cont.)

While the clamps are moving, an inattentive grasp in the open area of the magazine handler clamps can cause severe injury.

An inattentive grasp between the indexer and the top stack loader can cause severe injury.



While the top stack loader is moving, an unattended grasp between the TOS-gripper and the leadframe measurement bar can cause severe injury.

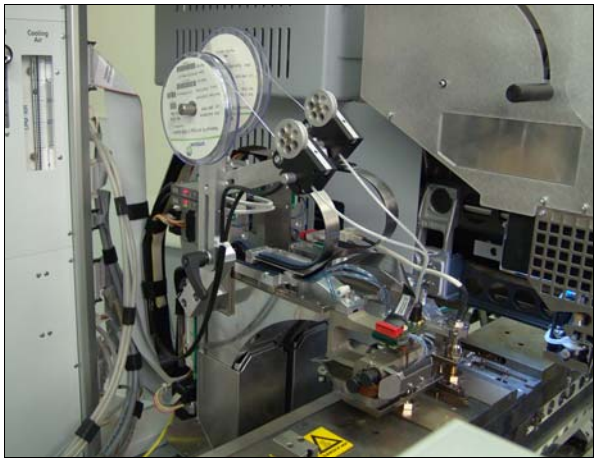


© 2009 Esec Ltd.

Programmable Dual Wire Dispenser

The Programmable Dual Wire Dispenser (PDWD) can move up and down as well as in X-, Y- and Z-direction immediately and fast.

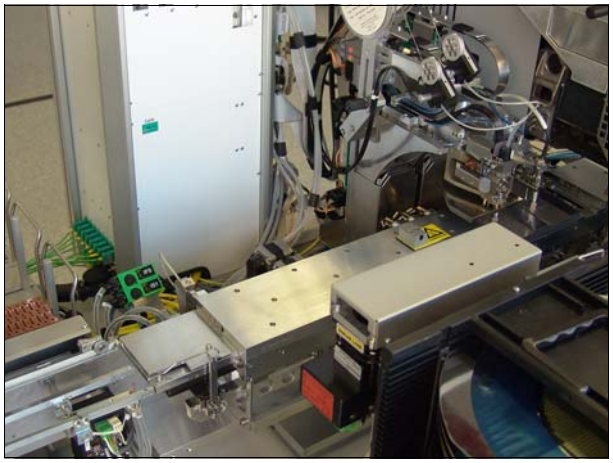
The moving parts can cause severe injury.



Soft Solder Indexer

The indexer may move in X- and Y-direction unexpectedly.

An unattended grasp between the indexer and the power leadframe loader can cause severe injury.

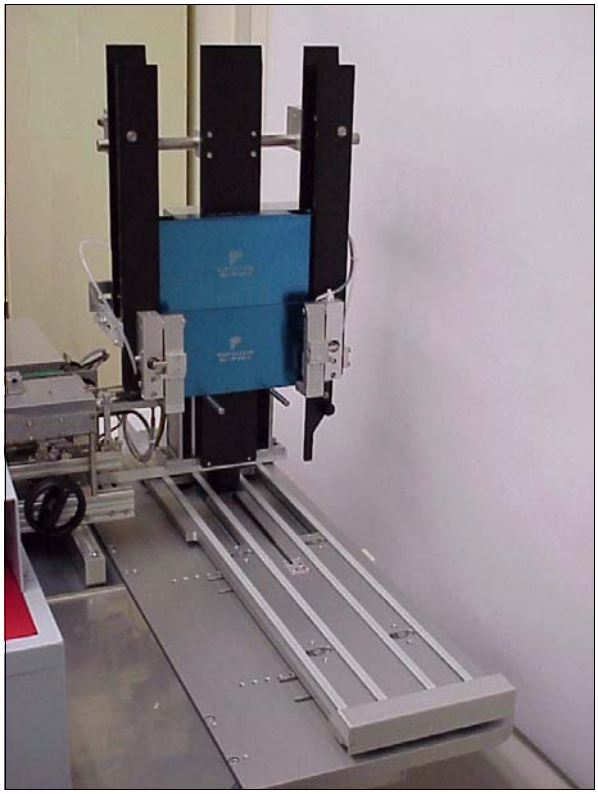


© 2009 Esec Ltd.

Buffered Handler

The magazine lift may move up and down unexpectedly.

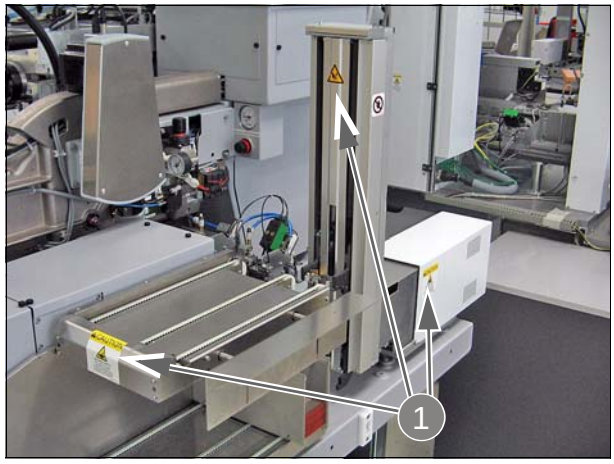
The conveyor belt may move all the magazines on the buffer platform forwards unexpectedly.



Output Magazine Handler / Side Panel

The elevator and its clamps of the output magazine handler can move immediately in Y- and Z-direction. The moving parts can cause severe injury.

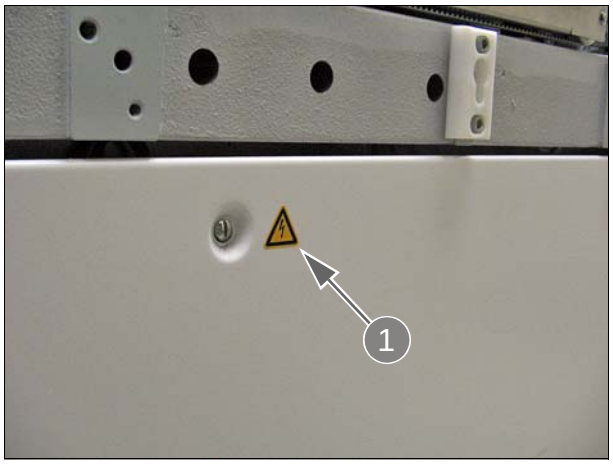
☑ Ensure that all safety labels indicating “MOVING PARTS” (1) on output magazine handler, are properly in place.



© 2009 Esec Ltd.

Output Magazine Handler / Side Panel (Cont.)

☑ Check that the safety label indicating “High Voltage” (1) on the right-hand side panel, is properly in place.



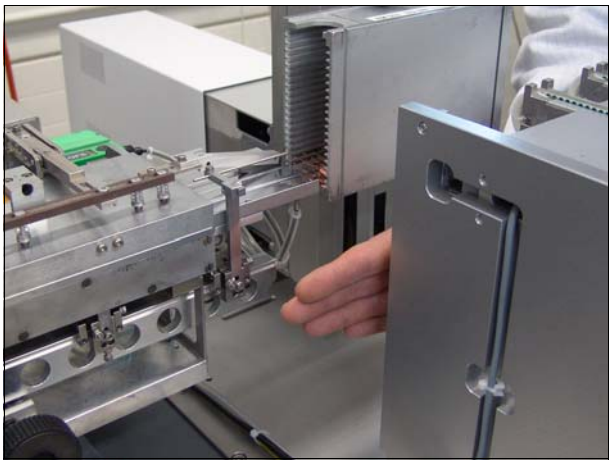
An inattentive grasp between the moving magazine handler and the input platform can cause severe injury.

While the clamps are moving, an inattentive grasp in the open area of the magazine handler clamps can cause severe injury.

© 2009 Esec Ltd.

Output Magazine Handler / Side Panel (Cont.)

While the y-shuttle is moving, an unattended grasp between the indexer y-shuttle and the leadframe output area can cause severe injury.



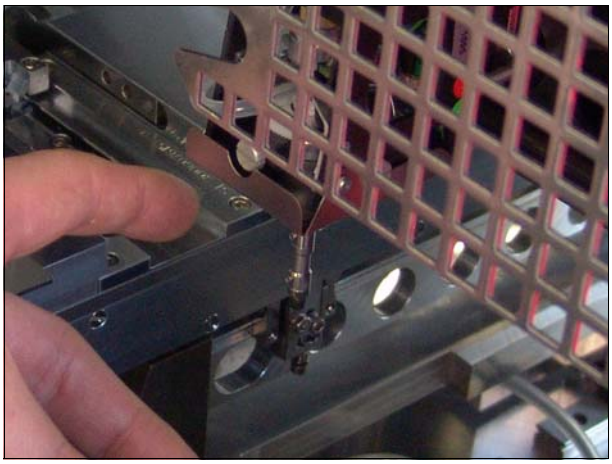
Pick & Place

The bondhead can move with high speed in Y- and Z-direction.

The moving parts can cause severe injury.

☑ Check that the safety label indicating “MOVING PARTS” on the pick & place is properly in place.

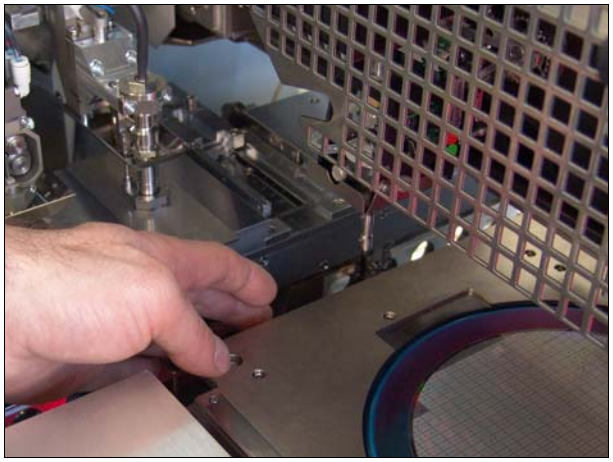
While the pick & place is moving, an inattentive grasp beside the pick & place safety cover at the bond process position, can cause severe injury.



© 2009 Esec Ltd.

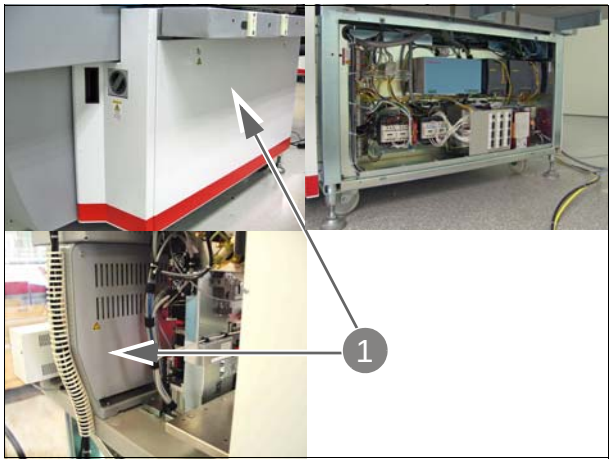
Wafer Table

While the wafer table or the indexer y-shuttle is moving, an inattentive grasp between wafer table and the indexer can cause severe injury.



Power Racks

During installation or maintenance tasks it might be necessary to open the shown covers (1). The machine must be disconnected from the main electrical power supply before removing these covers.



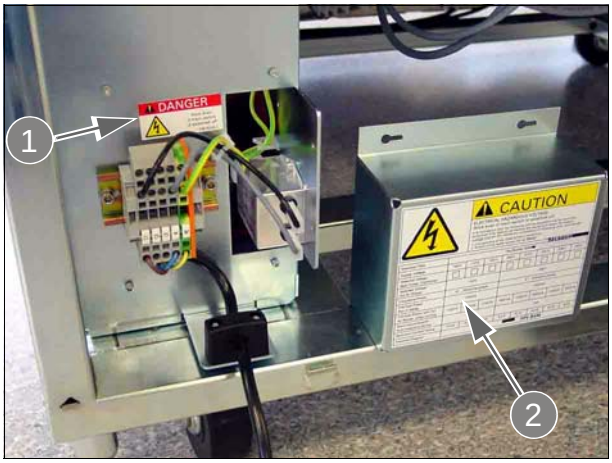
☑ Check that the safety label indicating “DANGER, Alive even if main switch is switched off” on the left-hand side of power rack is properly in place.

© 2009 Esec Ltd.

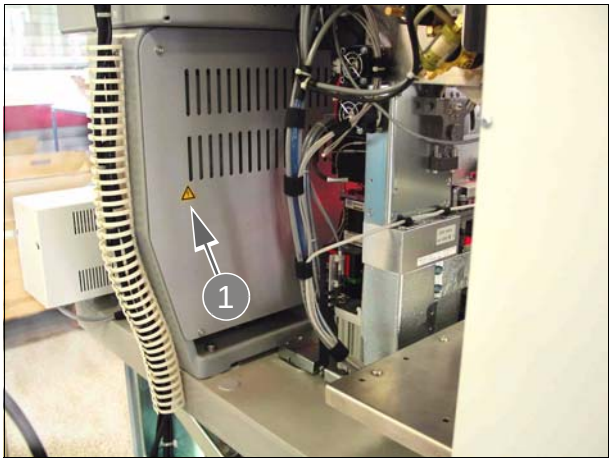
Power Racks (Cont.)

- ☑ Check that the electrical plate is properly in place (1).

- ☑ Check that the safety label indicating “DANGER, Alive even if main switch is switched off”, is properly in place (1).
- ☑ Check that the electrical plate is properly in place (2).



- ☑ Check that the safety label indicating “Electric Shock” on the side panel of the pick & place support is properly in place (1).



© 2009 Esec Ltd.

Power Racks (Cont.)

☑ Check that the safety label indicating “Hazardous Voltage” on the right hand door of cabinet is properly in place (1).

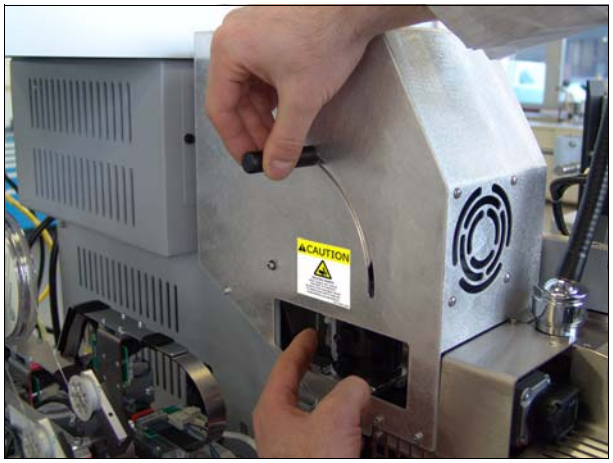
☑ Check that the safety label indicating “Hazardous Voltage” on the machine rear panel is properly in place (1).

Programmable Quality Camera TV Cover

During machine setup it might be necessary to open the PQCTV cover.

While the Y-axis is moving, an inattentive grasp into the opening can cause severe injury.

☑ Check that the safety label indicating “MOVING PARTS” on the pick & place is properly in place.



© 2009 Esec Ltd.

Barcode Reader

☑ Check that the label indicating “CAUTION” is properly in place.

Vision Cameras

☑ Check that the labels close to vision cameras indicating “ADJUST ONLY FOR MODULE CALIBRATION” are properly in place.

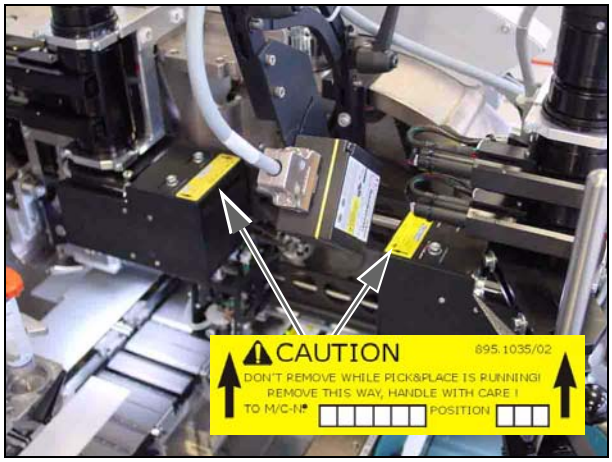
⚠ CAUTION

Never look directly to the flashlight source, as sensitive persons may suffer an epileptic shock (especially meant for epileptics)!

© 2009 Esec Ltd.

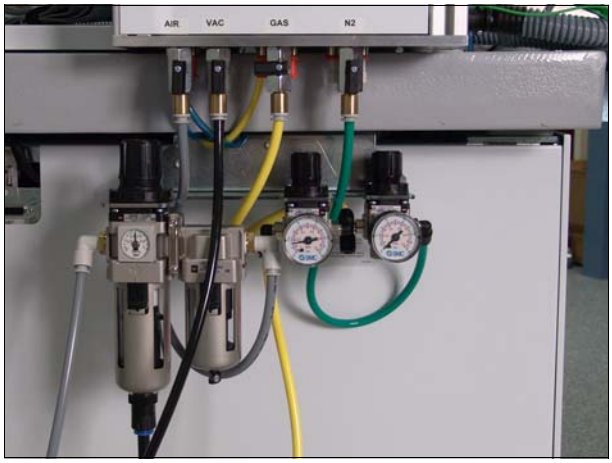
Direct Illumination

- ☑ Check that on each direct illumination a safety label indicating “DON’T REMOVE WHILE PICK&PLACE IS RUNNING” is properly in place.



Maintenance Unit / Air Filter

- ☑ Check that the input pressure is within the permissible range.
- ☑ Check that the gas supply label is properly in place.



Safety Covers

- ☑ Check that the wafer table safety cover is in perfect condition.
- ☑ Check for the safety label. It has to be properly in place.

© 2009 Esec Ltd.

1.5 Safety Concept

1.5.1 Used Directives and Standards

Machinery directive (98/37/EEC)

Old notation 89/392/EEC with the amendments 91/268/EEC, 93/44/EEC, 93/68/EEC as well as the corrections from 1998 with the numbers L31, L36, L40 and L65

Additional for the elaboration of the safety concept and this technical documentation the following legally not binding European standards have been consulted:

Category A Standards	Title	Ratification	In user manual
EN 292-1	Safety of machinery - Basic concepts, general principles for design - Part 1: basic terminology, methodology	1991	Row 1 Cell 4
EN 292-2	Safety of machinery - Basic concepts, general principles of design - Part 2: Technical principles and specifications	1991	EN292
EN 292-2/A1	Safety of machinery - Basic concepts, general principles of design - Part 2: Technical principles and specifications	1995	
EN 1050	Safety of machinery - Principles for risk assessment	1996	EN 1050
EN 1088	Safety of machinery – Interlock devices associated with guards – Principles for design and selection	1995	
EN 574	Safety of machinery – Two-hand control devices - Functional aspects – Principles for design	1996	

EN: European Norm

Category B Standards	Title	Ratification	In user manual
EN 294	Safety of machinery – Safety distances to prevent danger zones being reached by the upper limbs	1992	
EN 349	Safety of machinery – Minimum gaps to avoid crushing of parts of the human body	1993	
EN 418	Safety of machinery - Emergency stop equipment, functional aspects - Principles for design	1992	EN 418
EN 563	Safety of machinery – Temperatures of touchable surfaces - Ergonomics data to establish temperature limit values for hot surfaces	1994	EN 563
EN 811	Safety of machinery – Safety distances to prevent danger zones being reached by the lower limbs	1996	

© 2009 Esec Ltd.

Category B Standards	Title	Ratifi-cation	In user manual
EN 842	Safety of machinery – Visual danger signals – General requirements, design and testing	1996	EN 842
EN 953	Safety of machinery – Guards – General requirements for the design and construction of fixed and movable guards	1997	
EN 954-1	Safety of machinery - Safety-related parts of control systems - Part 1: General principles for design	1996	
EN 981	Safety of machinery – System of auditory and visual danger and information signals	1996	EN 981
EN 1037	Safety of machinery – Prevention of unexpected start-up	1995	
EN 1760-1	Safety of machinery – Pressure sensitive protective devices – Part 1: General principles for the design and testing of pressure sensitive mats and pressure sensi-tive floors	1997	
EN 1837	Safety of machinery – Integral lighting of machines	1999	
EN ISO 9614-1	Acoustics – Determination of sound power levels of noise sources using sound intensity – Part 1: Mea-surement at discrete points (ISO 9614-1: 1993)	1995	
EN 31252	Laser and laser-related equipment – Laser device – Minimum requirements for documentation (ISO 11252: 1993)	1994	EN 31252
EN 31253	Laser and laser-related equipment – Laser device – Mechanical interfaces (ISO 11253: 1993)	1994	
EN 60204-1: 1997 IEC 60'204	Safety of machinery - Electrical equipment of machines - Part 1: General requirements	1992	

EN: European Norm

Category C standards: Must not be considered for this equipment.

Electromagnetic compatibility directive (89/336/EEC)

With the amendments 91/263/EEC, 92/31/EEC, 93/68/EEC and 93/97/EEC

Additional for the elaboration of the safety concept and this technical documentation the following legally not binding European standards have been consulted:

© 2009 Esec Ltd.

Standard	Title	Ratifi-cation	In user manual
EN 50065-1	Signalling on low-voltage electrical installation in the frequency range 3 kHz to 148.5 kHz Part 1: General requirements, frequency bands and electromagnetic disturbances. Amendment A1: 1992, A2: 1995, A3: 1996	1991	
EN 50081-1	Electromagnetic compatibility – Generic emission standard – Part 1: Residential, commercial and light industry	1992	EN 50081
EN 50081-2	Electromagnetic compatibility – Generic emission standard – Part 2: Industrial environment	1993	
EN 50082-1	Electromagnetic compatibility – Generic immunity standard – Part 1: Residential, commercial and light industry	1992 1997	EN 50082
EN 50082-2	Electromagnetic compatibility – Generic immunity standard – Part 2: Industrial environment	1995	
EN 50091-2	Un-interruptible power systems (UPS) – Part 2: EMC requirements	1995	
EN 55020	Immunity from radio interference of broadcast receiv-ers and associated equipment	1988	
EN 61000-3-2	Electromagnetic compatibility (EMC) – Part 3: Limits – Section 2: Limits for harmonic current emissions (equipment input current up to and including 16 A per phase) Amendment A1 & A2: 1998	1995	EN 61000
EN 61000-3-3	Electromagnetic compatibility (EMC) – Part 3: Limits – Section 3: Limitation of voltage fluctuations and flicker in low voltage supply systems for equipment with rated current up to and including 16 A	1995	

Low voltage directive (73/23/ECC)

With the amendment 93/68/EEC

Additional for the elaboration of the safety concept and this technical documentation the following legally not binding European standards have been consulted:

Standard	Title	Ratifi-cation	In user manual
EN 50091-1	Uninterruptible power systems (UPS) – Part 1: Gen-eral and safety requirement	1992	
EN 60204-1	Safety of machinery - Electrical equipment of machines - Part 1: General requirements, IEC 204-1: 1992	1992	

© 2009 Esec Ltd.

Standard	Title	Ratifi-cation	In user manual
EN 60950	Safety of information technology equipment, including electrical business equipment, IEC 950: 1991	1992	
EN 61010-1	Safety requirements for electrical equipment for measurement, control and laboratory use – Part 1: General requirements, IEC 1010-1: 1990	1993	
EN 61010-2	Safety requirements for electrical equipment for measurement, control and laboratory use – Part 2: Particular requirements for laboratory equipment IEC 1010-2: 1992	1994	

EN: European Norm

US standards

Additional for the elaboration of the safety concept and this technical documentation the following legally not binding US standards have been consulted:

Standard	Title	Ratifi-cation	In user manual
UL 3101	The Standard for Safety of Laboratory Use, Electrical Equipment General Equipment		UL 61010
NFPA 79	Electrical Standard for Industrial Machinery		NFPA 79
NFPA 704	Standard System for the Identification of the Hazards of Materials for Emergency Response		NFPA 704

UL: Underwriters Laboratories
NFPA: National Fire Protection Association

SEMI standards

Additional for the elaboration of the safety concept and this technical documentation the following legally not binding semiconductor industry standards have been consulted:

© 2009 Esec Ltd.

Standard	Title	Ratifi-cation	In user manual
SEMI E30-1000	Generic model for communications and control of manufacturing equipment (GEM)	2000	
SEMI E37-0298	High-speed SECS message services (HSMS) generic services	1998	
SEMI S1-701	Safety guideline for equipment safety labels (visual hazard alerts)	2001	
SEMI S2-0200	Environmental, health and safety guideline for semi-conductor manufacturing equipment	2000	
SEMI S9-95	Electrical test methods for semiconductor manufactur-ing equipment	1995	
SEMI S10-1296	Safety guideline for risk assessment	1996	SEMI S10
SEMI 13-0298	Safety guidelines for operation and maintenance man-uals used with semiconductor manufacturing equipment	1998	
SEMI 14-0200	Safety guidelines for fire risk assessment and mitiga-tion for semiconductor manufacturing equipment	2000	SEMI S14

SEMI: Semiconductor Equipment and Materials International

1.5.2 Shut-Down Appliances

Way of Shut-Down	Effect
Via "System Shut-down" in the “Overview” Menu and then turn the Main Switch	The shutdown command will halt the machine. The main switch will switch off the electrical power supplies. Power between inlet and main switch is still alive.
Emergency Switch on P&P housing.	Pressing the Emergency Switch will immediately halt the machine. Electrical power supplies are switched off. Power between inlet and main switch is still alive.
Main Switch	Turning the Main Switch will immediately halt the machine. Electrical power supplies are switched off. Power between inlet and main switch is still alive.

© 2009 Esec Ltd.

1.6 Safety Elements

1.6.1 Situation

Additional Safety Elements

- Motor overcurrent protection
- Wafer handler safety cover
- Safety post

1.6.2 Removal of Safety Elements

DANGER

Never remove safety elements in “Operation” mode.

Only in “Maintenance” mode, when all the necessary precautions have been taken, authorized maintenance personnel is permitted to remove safety elements. After completion of maintenance all safety elements must be installed and tested again.

Note: If any safety element has been removed, the security of the Die Bonder 2009 SSI is not guaranteed anymore.

© 2009 Esec Ltd.

1.7 Specific Warnings

Specific warnings are included throughout this manual in the relevant procedures. As a general warning the following areas of the system present a particular caution during setting-up and operation:

1.7.1 Moving Parts

⚠ CAUTION

Keep hands and loose clothing away from all moving parts.

Stack Power (SP)	The load platform may move backwards or forwards unexpectedly, keep hands and loose clothing clear of the load platform. The first index finger may move left or right unexpectedly, keep hands and loose clothing clear of the first index finger.
Power Leadframe Loader (PLL)	The leadframe platform may move up and down and the gripper may rotate unexpectedly.
Top Stack Loader (TOS-W)	The gripper may move backwards, forwards, up or down unexpectedly. Keep hands and loose clothing clear of the gripper and stack magazines.
Magazine Handler (MH-IN, MH-OUT)	The magazine lift may move up, down, forwards or backwards unexpectedly. Keep hands and loose clothing clear of the magazine lift. Never attempt to remove a leadframe from a magazine until the magazine has been unloaded onto the buffer platform. Never put your fingers inside a part-filled magazine.
Push-in	The push-in may operate unexpectedly. Keep hands and loose clothing clear of the push-in.
Indexer	The indexer transport fingers may move left, right, up or down unexpectedly. Keep hands and loose clothing clear of all indexer parts.
XY-shuttle (XYS)	During the teach procedure and when multichip leadframes are used in production, the optional XY-shuttle will move in the X and Y-axis thereby causing the indexer to move left, right backwards or forwards. Keep hands and loose clothing clear of the indexer.

© 2009 Esec Ltd.

Wafer Handler	The wafer gripper may operate unexpectedly. Keep hands and loose clothing clear of the wafer gripper. The wafer cassette holder may move up or down unexpectedly and can move down to the machine bed. Never place your hand under the cassette holder. Keep hands and loose clothing clear of the wafer cassette holder. The wafer table may move up, down, forwards, backwards, to the left or right unexpectedly. Never operate the machine without the plastic cover in place. The expander table may open or close unexpectedly. Never operate the machine without the plastic cover in place.
Programmable Wire Dispenser (PWD, PDWD)	The dispenser may move up and down unexpectedly.
Programmable Motorized Pre Press Module (PPPM)	The head may move up and down unexpectedly.
Power Marker Unit (PMU4)	When fitted, the power marker unit may move up or down unexpectedly.
Bondarm	The bondarm may move forwards or backwards unexpectedly. Keep hands and loose clothing clear of the bondarm. The bondhead may move up or down unexpectedly. Keep hands and loose clothing clear of the bondhead.
Programmable Quality Camera TV (PQCTV)	The camera may move forth and back unexpectedly.
Buffered Handler (BH2)	The magazine lift may move up, down and forwards or backwards unexpectedly. Keep hands and loose clothing clear of the magazine lift. The conveyor belt may move all the magazines on the buffer platform forwards unexpectedly. Never attempt to remove a leadframe from a magazine until it has been unloaded onto the buffer platform. Never put your fingers inside a part filled magazine.
Push-out	The push out may operate unexpectedly. Keep hands and loose clothing clear of the push-out.
Init / Reset	When the ***Init*** or ***Reset*** soft keys are operated, the software exercises all moving parts within the system.

© 2009 Esec Ltd.

1.7.2 Software

The software uses a system of menus for calibrating, setting-up, operating and debugging the system. Menus containing functions that require special knowledge or skills are protected by a secure system of user authorization. The authorization level must be maintained to ensure only authorized personnel have access to calibration, setting-up and debugging operations.

Do not change menu parameters unless the effects are understood. Do not operate soft keys or function keys unless the resultant actions are known.

When moving modules with the soft keys always move the mouse cursor off the soft key after use. Many soft keys have a toggle action and touching a mouse button will cause the module to move again.

1.7.3 Heat Hazard / High Temperatures

WARNING

High temperatures can ignite chemical substances. Avoid any contact of chemical substances with hot surfaces.

The indexer and its immediate vicinity may reach operating temperatures in excess of 450°C. Avoid contact with the indexer.

Always wear protective gloves when working in the vicinity of the indexer.

The indexer heaters are turned on and off by the main machine On/Off switch. When switched to "I" (On) the indexer area can reach very high operating temperatures. Specific warnings are included throughout this manual in the relevant procedures. As a general warning the following areas of the machine present a particular danger during setting-up and operation:

Indexer	The indexer and its immediate vicinity may reach operating temperatures in excess of 450°C, coming into contact with it will result in serious burns. When operating the drive motor knob, be very careful not to come into contact with any part of the indexer. The downholders become hot. Always use the handles and be very careful not to come into contact with any other part of the downholder. The indexer covers become hot. Always use two insulated screwdrivers, or similar tools, to remove the covers.
Programmable Pre Press Module (PPPM)	The cavity tool becomes hot, coming into contact with it will result in serious burns.
Programmable wire dispenser (PWD, PDWD)	The dispensing tip and nozzle area becomes hot, coming into contact with it will result in serious burns.
Magazine Handler	Make sure that filled magazines have cooled sufficiently before removing them from the buffer platform.

© 2009 Esec Ltd.

Buffered Handler (BH2)	Make sure that filled magazines have cooled sufficiently before removing them from the buffer platform. Never attempt to remove a leadframe from a magazine until it has been unloaded onto the buffer platform.
General	The heated elements and their immediate vicinity will remain hot for some time after the power is switched off, coming into contact with them may result in serious burns. Where possible, allow them to cool before carrying out any set-up or other task and/or wear protective gloves.

1.7.4 Material Handling

CAUTION

The strips / leadframes can have sharp edges and can cause cuts on hand and clothing.

1.7.5 Electrical Hazard

The system operates from a 200V to 415V main electrical supply. Specific warnings are included throughout this manual in the relevant procedures. As a general warning the following precautions must always be applied.

DANGER

The system must be disconnected from main electrical power supply when this decal is encountered during installation, maintenance or setting-up.

Only qualified personnel should carry out any work on the system power supplies.

The monitors use high voltage. Only qualified personnel should carry out any work on the monitors. The monitors should only be exchanged, not repaired.

Never touch any component behind a cover or door where this label is located before the machine is disconnected and locked against re-powering from the main electrical power supply.

© 2009 Esec Ltd.

1.7.6 Laser Radiation

The sensors at the bond and dispense position comply with the radiation limits of class 1 laser sensors. During normal production the direct (maximum) radiation of each laser sensor will not exceed 300 µW. These sensors present a radiation hazard to the naked eye.

The bar code reader laser comply with the radiation limits of class 2 lasers. During normal production the direct (maximum) radiation of the bar code reader laser will not exceed 1.0 mW. This laser present a radiation hazard to the naked eye.

WARNING

Do not use optical instruments or look directly into the laser sensors.

1.7.7 Chemical Hazard

Some substances used during operation, service or maintenance (adhesives, cleaners, purifying agents, lubricants, greases, etc.) may cause health hazards when used without protection. Some substances can ignite coming into contact with hot surfaces.

WARNING

Consult and obey the material safety data sheets (MSDS) of the corresponding supplier and use protective equipment if necessary.

Avoid any contact of chemical substances with hot surfaces.

1.7.8 Electrostatic Discharge ESD

Precautions against ESD must be taken to prevent damage to the particular machine or devices.

NOTICE

Ensure that the operating environment is protected against ESD.

Do not touch electronic circuits whilst unpacking.

Always use a grounded wrist strap whilst handling electronic circuits.

1.8 Operational Procedure Classification

All operating procedures are Type 2 procedures. The equipment is energized, live circuits are covered or insulated.

Certain maintenance procedures are Type 3 procedures. The equipment is energized, live circuits are exposed and accidental contact is possible.

© 2009 Esec Ltd.

1.9 A Place for the Manual, Safekeeping

The owner of the equipment is responsible for ensuring that this Operating Manual Manual is available at all times. As a general rule it is kept close to the machine, visible and easily accessible.

© 2009 Esec Ltd.

/ (May 29, 2009)

© 2009 Esec Ltd.

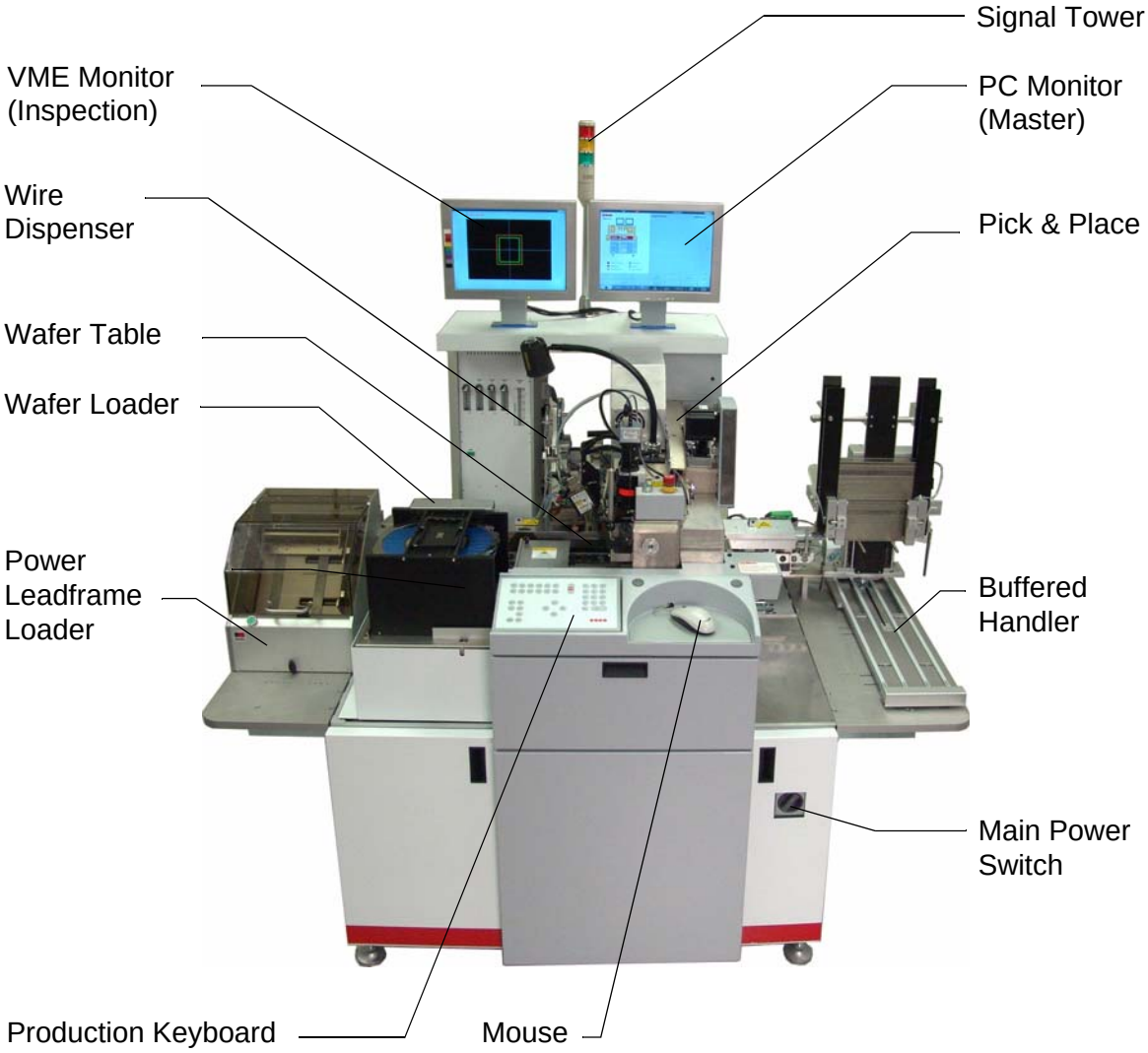
/ (May 29, 2009)

2 Equipment Description

CAUTION

For better visibility of subjacent functions covers have been removed before taking pictures. In standard operating mode all covers have to be in place at any times (see Safety Chapter).

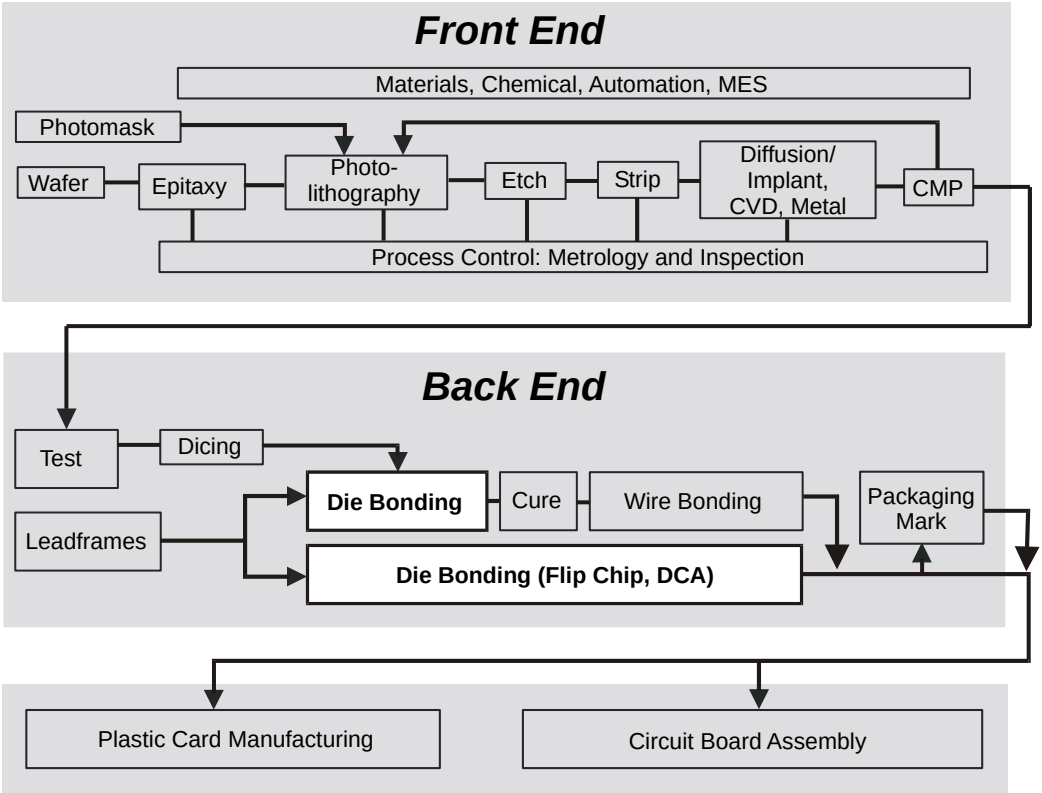
2.1 Equipment Overview (for 6“/8“ Wafers)



© 2009 Esec Ltd.

2.2 Equipment Application, Purpose

Coming into being of an integrated circuit requires numerous process steps. Within this process chain the Die Bonder 2009 SSI picks an integrated circuit out of the sawn wafer and attaches it on a leadframe. See table for simplified material flow and process steps. The Die Bonder 2009 SSI, with all its components, is designed for die bonding applications. Use only materials specially designed for die bonding. Other materials might have hidden hazards or could damage equipment components. In any case, take notice of Material Safety Data Sheets (MSDS).



Substrate

Solder

Wafer

Die bonded, quality controlled substrate contained in magazine

© 2009 Esec Ltd.

2.3 Process Description

The complete die bonding process is repeated continuously and automatically, it includes the co-ordination of the main production items; the leadframe, the chip (die), and the wafer so that only good chips are removed from the wafer and accurately bonded onto the leadframe pads. Leadframes are handled by the top stack loader (or optional input magazine handler), the indexer and finally the output magazine handler. The wafer is handled by the automatic wafer loader and the XY wafer table. The chip is handled by the pick & place unit and the bondhead.

Leadframe Handling

The leadframes onto which individual chips are to be bonded are transported from the input handler (on the left of the machine) to the indexer.

The indexer transports the leadframes through an oven where they are continuously heated and surrounded with forming gas. At the dispense position, the leadframe is accurately positioned while a defined amount of soft solder (preform) is placed onto the bond pad by the wire dispenser. The leadframe is then moved on through the oven to the bond position where it is positioned by a centering unit before a chip is placed onto the bond pad.

After bonding, the leadframes are advanced, through the cooling area of the oven, to the right of the machine where they are received by the output handler.

Wafer Handling

The automatic wafer loader uses a carrier frame to remove a wafer from a cassette and place it into the expansion module of the XY wafer table. The foil of the wafer is expanded by a hot air fan, then the wafer is moved underneath the automatic die positioning system.

The high resolution video automatic die positioning system controls the movement of the XY wafer table, moving the wafer to the pickup position, there it consecutively selects and positions all good chips so that they are lifted by the pickup tool located at the front of the bondarm.

Chip Handling

The pick & place unit moves the bondarm (which carries the digital bondhead) to the wafer in the pickup position. The bondarm descends and the pickup tool uses vacuum to pick up a chip. This action is assisted by the die ejector, a module positioned inside the wafer table. This uses one, or several needles, to push the chip up towards the pickup tool.

As the bondarm moves back after a pickup, a nanoscan checks that it has successfully picked up a chip.

The bondarm moves back to the indexer where the pickup tool descends at the bond position and places the chip onto the leadframe's bond pad. It automatically corrects any theta error and can rotate to any user-specified angle.

If selected, a scrub may be activated. This causes the bondarm to vibrate at a user selected frequency and amplitude.

© 2009 Esec Ltd.

2.4 Machine Operation

The Die Bonder 2009 SSI (standalone version) is designed to operate on front side. All material can be loaded and unloaded from front except stacked substrates, they are loaded to one side of the machine. In case of maintenance it's suggested to have enough space on each side of the machine. To operate the machine, all safety covers have to be in place and safety interlocks have to work properly.

2.5 Machine Identification

Name Plate

Open the right hand door of cabinet. The name plate is located at machine bed.

© 2009 Esec Ltd.

2.6 Conformity

EG-KONFORMITÄTSERKLÄRUNG / EC-DECLARATION OF CONFORMITY DECLARATION CE DE CONFORMITE / DICHIARAZIONE CE DI CONFORMITÀ

(gemäss EG-Maschinenrichtlinie 98/37/EG, Anhang II, Teil A / according EC-Directive 98/37/EC, Annex II, Part A /
conformément à la directive 98/37/CE, Annex II, Part A / conformemente alla direttiva 98/37/CE, Annesso II, Parte A)

Name und Adresse der Firma Name and address of the firm Nom et adresse de l'entreprise Nome e indirizzo della ditta	Unaxis International Trading Ltd. Hinterbergstrasse 32 CH-6330 Cham Switzerland

Wir erklären in alleiniger Verantwortung, dass / We declare under our sole responsibility that /
Nous déclarons sous notre propre responsabilité que / Dichiara sotto la propria responsabilità che

ESEC Die Bonder _____

Serial no. _____

Bezeichnung, Typ, Modell, Seriennummer/Name, type, model, serial number/
Nom, type, modèle, numéro de série/nome, tipo, modello, numero di serie

konform ist mit den einschlägigen Bestimmungen der EG-Bestimmungen/ is in conformity with the relevant regulations of the EC-directives/
est conforme aux dispositions des directives CE suivantes/ soddisfa tutte le disposizioni della direttiva CE che lo riguardano

- Maschinenrichtlinie 98/37/EG mit der Änderung 98/79/EG / Directive 98/37/EC, amendment 98/79/EC / Directive 98/37/CE, modification 98/79/CE/ Direttiva 98/37/CE, modifica 98/79/CE
- Niederspannungsrichtlinie 73/23/EWG mit der Änderung 93/68/EWG / Low voltage equipment 73/23/EEC, amendment 93/68/EEC /
  Directive "basse-tension" 73/23/CEE, modification 93/68/CEE / Direttiva "bassa tensione" 73/23/CEE, modifica 93/68/CEE
- EMV – Richtlinie 89/336/EWG mit den Änderungen 91/263/EWG, 93/31/EWG und 93/68/EWG / Electromagnetic compatibility 89/336/EEC, amendments 91/263/EEC, 93/31/EEC and 93/68/EEC / Compatibilité électromagnétique 89/336/CEE, modifications 91/263/CEE, 93/31/EEC et 93/68/CEE / Compatibilità elettromagnetica 89/336/CEE, modifica 91/263/CEE, 93/31/EEC e 93/68/CEE

Angewendet wurden folgende harmonisierten Normen / The following standards have been applied /
Les normes harmonisées suivantes sont appliquées / Le seguenti norme armonizzate sono applicate

- EN 292-1 (11.91), EN 292-2 (06.95), EN 60204-1 (97+Corrigendum/ correction/ correzione)
- _____

Normative Verweise / Normative references / Références normatives / Riferimenti normativi

- SEMI Standard S2-0200, S8-0701
- _____

Cham, January 04, 2007
Ort, Datum / Place, date / Lieu, date / Luogo e data

Unterschrift / Signature / Signature / Firma
Signature / Firma

M. Limacher

Angaben Bevollmächtigter/ Authorized Person
Authorized Person
Personne autorisée / Persona autorizzata:
Persona autorizzata:

Unterschrift / Signature /

Angaben Bevollmächtigter/

Personne autorisée /

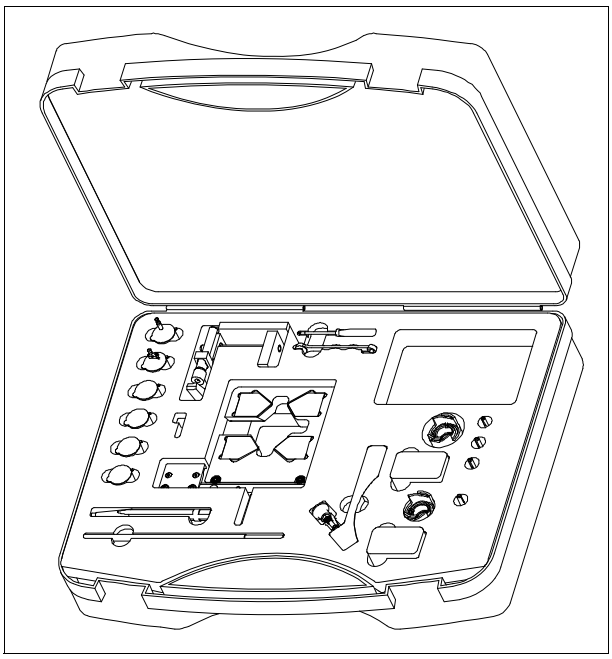
© 2009 Esec Ltd.

/ (May 29, 2009)

2.7 Delivered Service Kit and Tools

Product Setup Kit

- Needle setting gauge
- Die ejector set standard
- Allen key 0.89 mm for pickup tool
- Tool adaptor d=1.58 mm
- Straight edge
- Calibration pin
- Z height gauge
- Screw 2x2.5 mm
- Adjustment gauge for bondhead
- LED indirect illumination PVI
- Indexer cover handle
- Wrench 5.5 mm

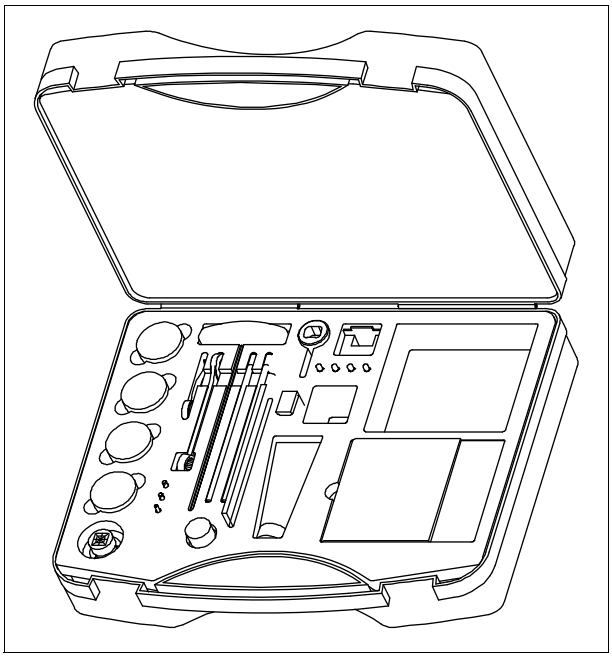


Optional (depending on fitted option and ordered accessories):

- Die ejector set 12-20 mm
- Magazine handler gripper element (MH)
- TOS rider (TOS)
- Stamp set 0-9 (PMU)
- Centering tool (PPPM)
- Tool (PPPM)
- Fiberglass eraser (PPPM)

Calibration and Maintenance Tool Case

- Screwdriver
- Wrenches 5.5, 7, 8, 10 and 13 mm
- Allen keys 1.5 mm ... 6 mm
- Hexagon key 3x200 mm
- Extraction tool for fibre optic links
- Calibration pins for indexer
- Calibration pepper pot
- Adjustment pins for pick & place
- Calibration tool for wafer handler gripper
- Grease Molykote PG 602
- Grease Never Seez
- Grease Microlube GL 261
- Grease Multemp PS2
- Grease Metalon HT1.5
- Adjustment tool for vision
- Lens cleaning set



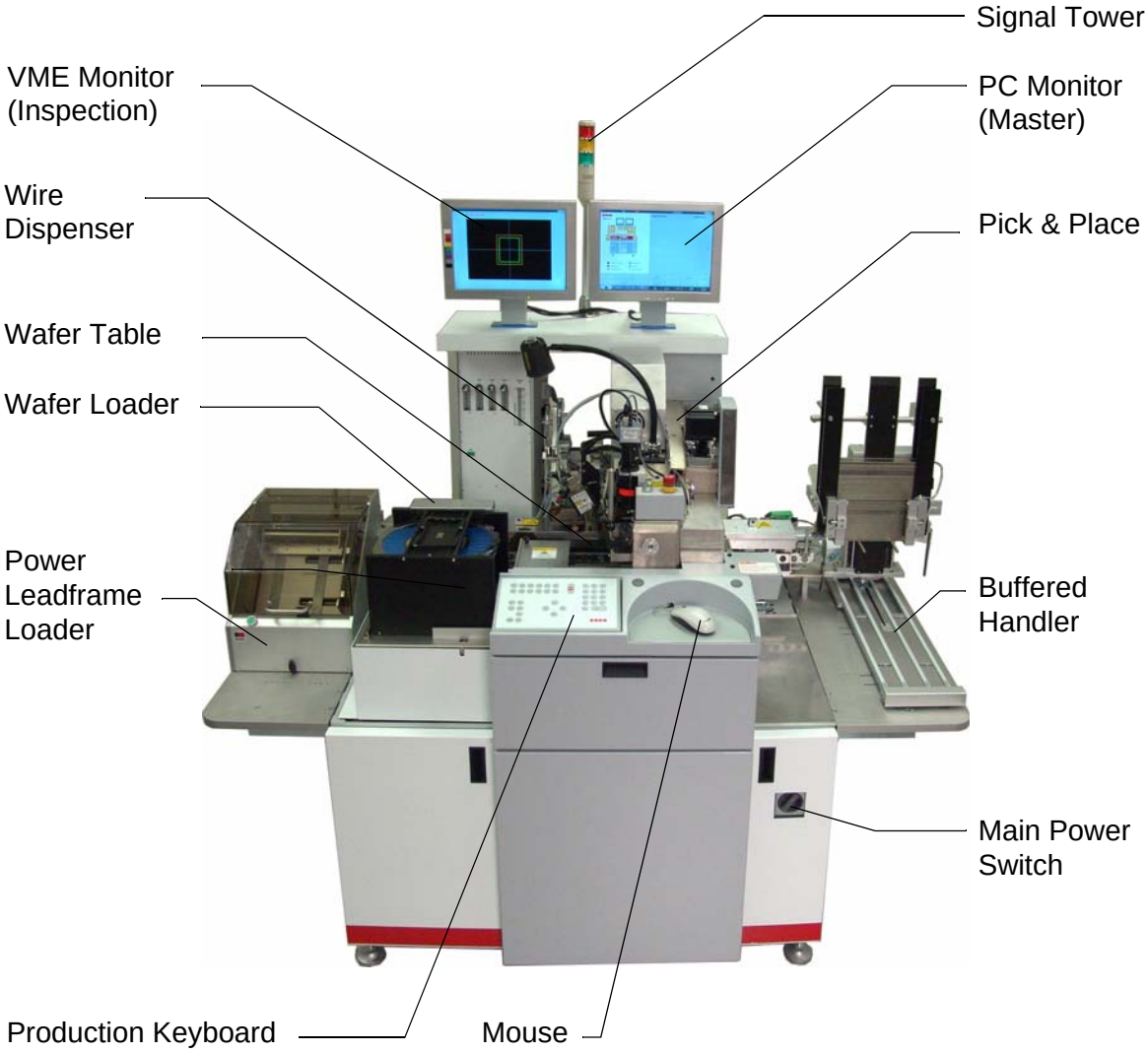
© 2009 Esec Ltd.

3 Module Description

⚠ CAUTION

For better visibility of subjacent functions covers have been removed before taking pictures. In standard operating mode all covers have to be in place at any time (see Safety Chapter).

3.1 Introduction



© 2009 Esec Ltd.

The Die Bonder 2009 SSI is a leader in high precision, quality and production. The three modules of the machine provide high speed and accuracy:

- The leadframe handler automatically loads and transports leadframes through the bonding process.
- The wafer handler loads wafers out of a wafer cassette and passes them to the pick position.
- The pick & place unit picks chips up from the wafer and moves them to the leadframe at bond position by the bondarm respectively the bondhead.

Using a keyboard, mouse and two display monitors, the operator controls the setup of the machine for each leadframe, chip size and bonding process. The setup parameters can be saved as a 'recipe' for future use.

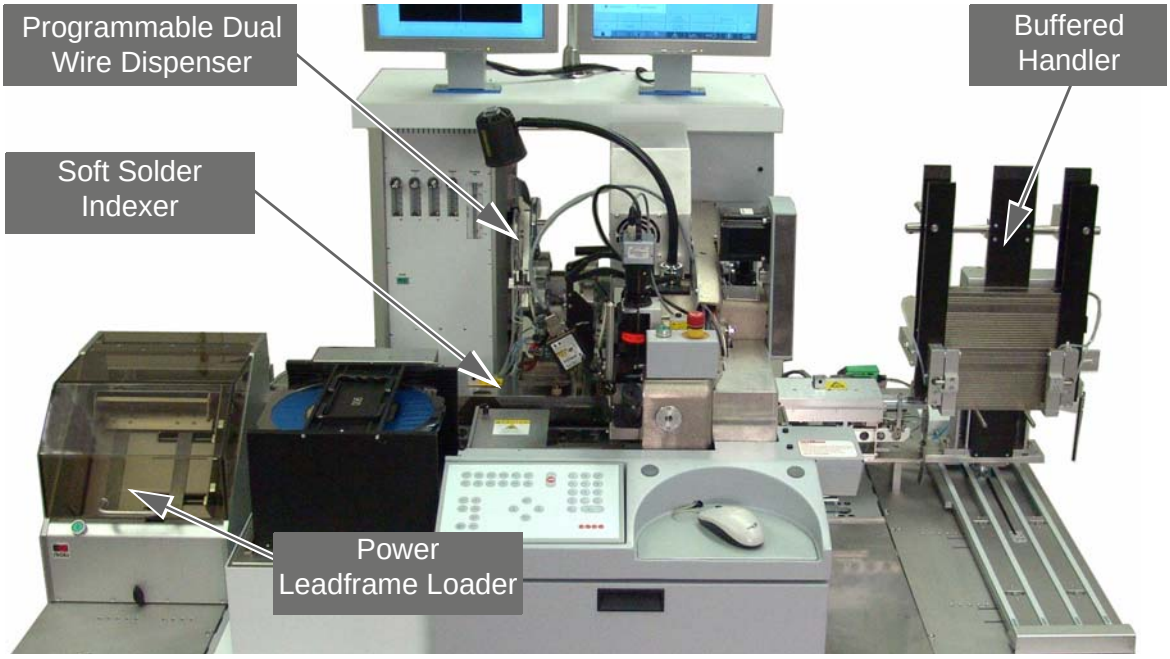
The purpose of the Die Bonder 2009 SSI is to provide the highest productivity and the highest chip placement accuracy.

© 2009 Esec Ltd.

3.2 Leadframe Handling

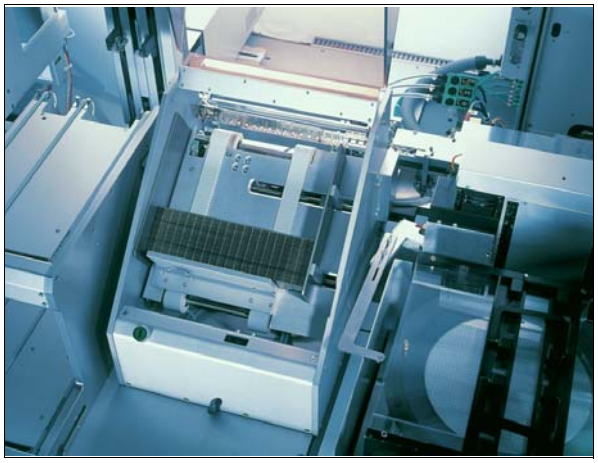
3.2.1 Overview

The leadframe handler takes the leadframes from the input handler (TOS, PLL, MH) and moves them onto the indexer. On the indexer, the leadframes are stepped through several heating zones. At the dispense position, solder is applied and at the bond position, the dies are bonded to the leadframe. Finally, the leadframes pass the cooling zones and are stepped to the output handler.



3.2.2 Power Leadframe Loader (PLL)

The Power Leadframe Loader PLL allows to load a wide range of power leadframes onto the indexer using a gripper arm equipped with suction cups.



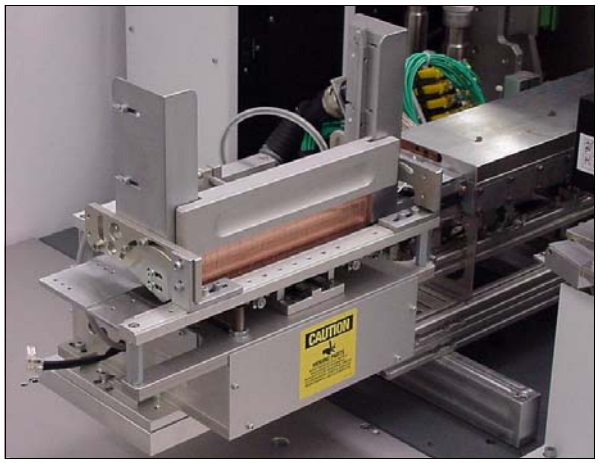
By applying vacuum during the pick-up on the rear of the pad the leadframe is separated from the leadframe stack and checked for any vacuum leakage by means of a vacuum sensor. After an optional shake cycle the leadframe is placed onto to the push-in platform.

The fully safety compliant loading buffer can be reloaded during the production by pressing the green Load Request Button. The module will acknowledge the request by flashing the green button. As soon as the buffer is in the lower load position the light will turn green and unlock the safety cover in order to load the buffer with leadframes.

© 2009 Esec Ltd.

3.2.3 Stack Power (SP)

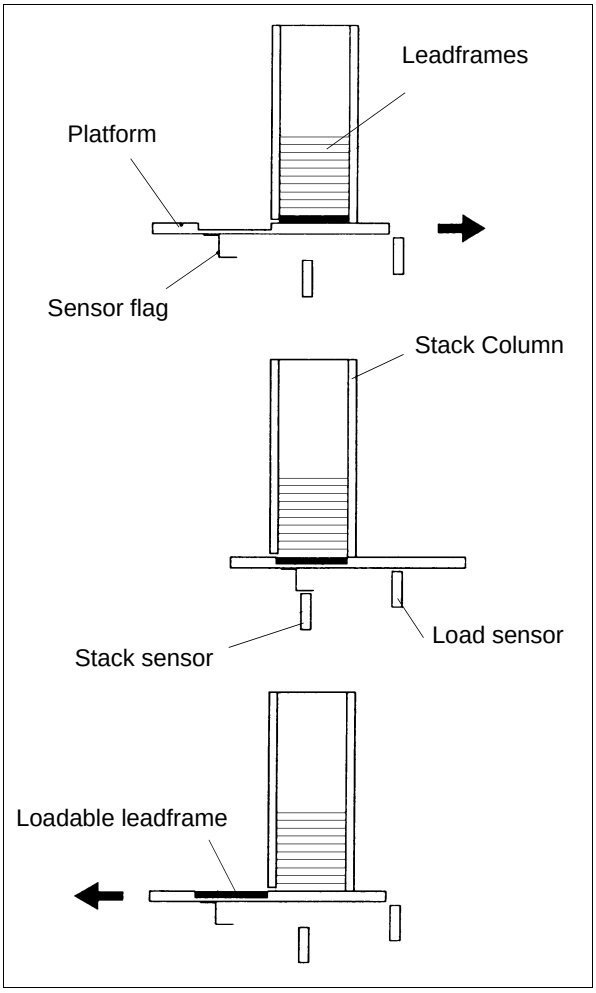
The stack power transports one leadframe after the other from the bottom of a stack, contained within a pair of column guides, to the indexer. The operator can top up the stack at any time, without stopping the machine, thus ensuring a continuous supply of leadframes to the indexer.



The stack of leadframes rest on a platform which moves in the Y-direction. The platform has a machined bed with a cutout under, and running parallel with, the leadframes.

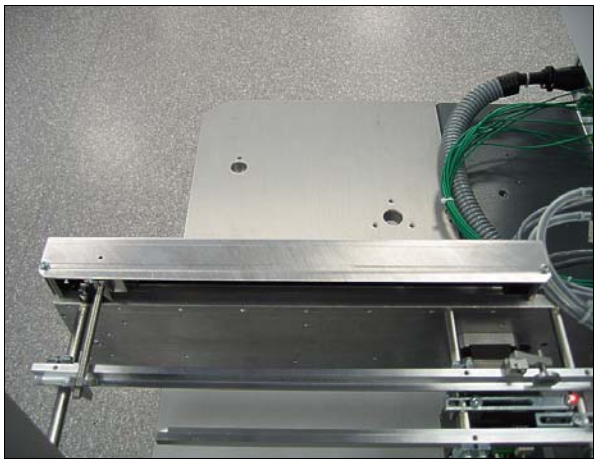
To feed a leadframe on to the indexer, the platform moves to the right. This positions the cutout under the stack of leadframes, allowing the lowest leadframe to drop into it.

The platform then moves back to position the leadframe in line with the indexer where the first indexer finger will pull in the leadframe into the indexer. This cycle is repeated whenever a leadframe is required.



© 2009 Esec Ltd.

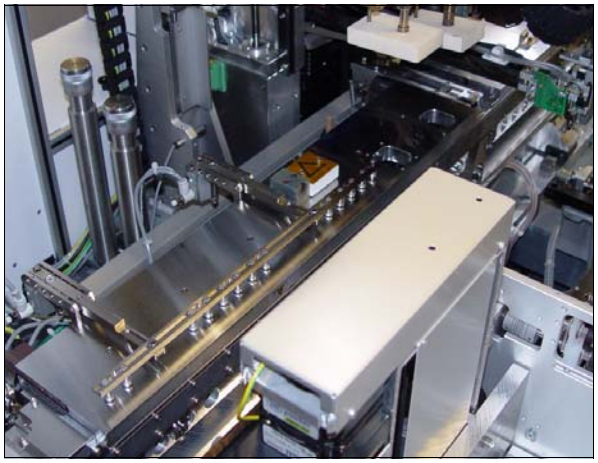
3.2.4 Push-In



This type of Push-in is mainly used in conjunction with the Top Stack Loader TOS and the Power Leadframe Loader PLL. It is used to push the leadframe onto the indexer once the input loader has placed the leadframe onto the platform.

In addition, the Push-in features an adjustable jam detection, which will immediately cut the motor's power supply in order to prevent major leadframe deformations.

3.2.5 Indexer



The purpose of the SSI indexer is to handle a wide range of power leadframes ranging from SOT-223 to Power SO-36 leadframes with width of up to 72 mm.

The indexer is based on a camshaft driven finger transport system stepping the leadframe through a tunnel furnace with 8 individually programmable heating zones under a controlled forming gas atmosphere. The cooling on the input and output side is achieved using compressed air flowing through sealed cooling plates mounted underneath the indexer.

The leadframe positioning at the bond position is achieved by a centering unit, which is consisting mainly of an arm with a centering pin engaging into a suitable leadframe hole after each index cycle.

The SSI indexer is individually designed for every leadframe product allowing to handle many non-standard power leadframes. The heater block, covers, leadframe inserts and the centering unit are all customer specific parts.

The photograph shows an SSI indexer with downholder mechanism ensuring efficient heat transfer from the indexer track to the leadframe.

© 2009 Esec Ltd.

XY-Shuttle

When the XY-shuttle is fitted, the complete indexer assembly is mounted on it and it moves the entire indexer in X and Y under software control.

This allows leadframes with two or more bond positions per index step to be handled (multi chip operation).

The XY-shuttle can also be used to correct the chip position according to a user-specific entry.

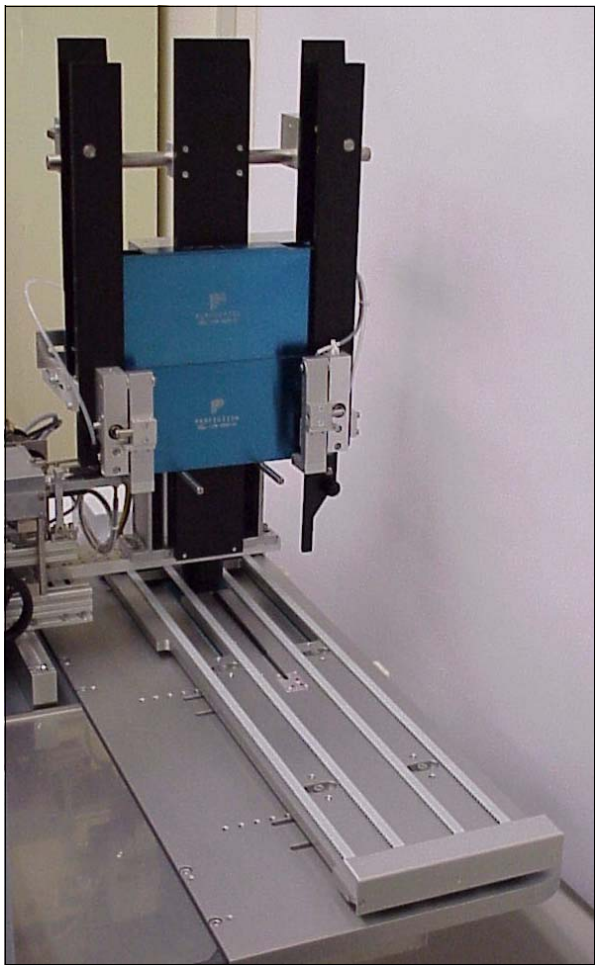
3.2.6 Buffered Handler (BH)

The buffered handler stores the leadframes after bonding. The handler allows continuous operation of the machine and cooling of the hot leadframes.

Up to four empty magazines may be held in the guide rails of the buffered handler. The lowest magazine rests on dowel pins attached to the elevator. During operation, leadframes are pushed into the lowest slot of the bottom magazine, a signal then activates the elevator to move one step down and position the magazine at the next slot.

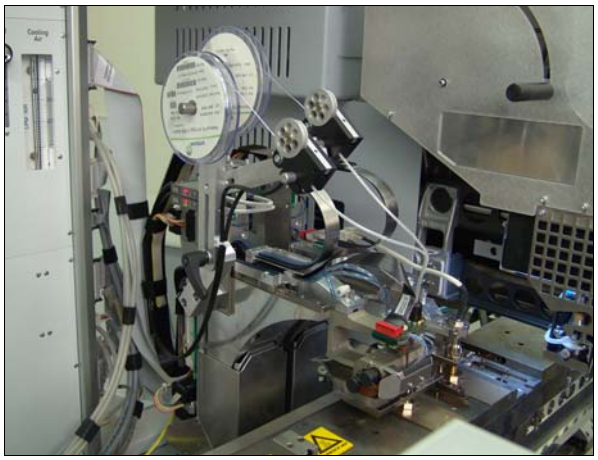
When the magazine is full, the clamping system is activated to hold the second magazine in place while the full magazine is lowered by the elevator onto the buffer platform where it is moved forward, clear of the dowel pins, by the transport belts. The elevator dowel pins then move up under the second magazine. The clamping system is released and the second magazine now rests on the dowel pins. The machine does not stop during these operations.

The operator may refill the buffered handler with empty magazines or remove full ones at any time. If magazines are not removed when the buffer platform becomes full, the machine will stop automatically.



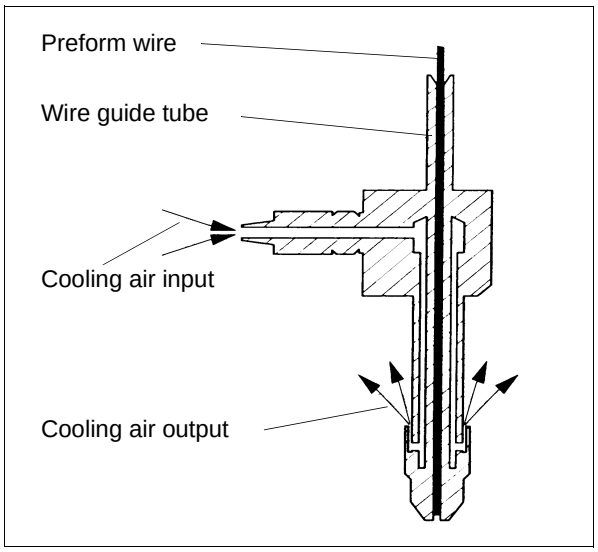
© 2009 Esec Ltd.

3.2.7 Programmable Dual Wire Dispenser (PDWD)



The programmable dual wire dispenser is used, in conjunction with the heated indexer, to melt two measured quantities of soft solder (preform) onto the leadframe's bond pad before the chip is attached.

The preform is supplied from two reels mounted on the top of the module. Each has a brake to prevent overshooting, rollers, and sensor contact drive wheels. The reel assemblies are controlled by two individually controlled closed loop DC motors with drive and idler wheels. The wires from both reels are guided down through wire guide tubes to a dual dispensing tip.



The drive system consists of a closed loop DC motors, the drive wheels and the idler wheels. The motors turn the drive wheels via a toothed belt. A spring pulls the idler against the drive wheels, gripping the preform wire in between. The wire is then guided down through the wire guide tubes to the dispensing tips.

The module can be positioned accurately in X, Y and Z by programming in the teach menu. The dispensing head can be rotated from 0° to 45° or 90° allowing the solder dots to be positioned in the orientation required.

The software indicates when either reel is empty, or if there is a difference of more than 30 ms between the two wires touching down.

For access to the dispense position, the head of the programmable dual wire dispenser can be sent to a service position by pressing a softkey.

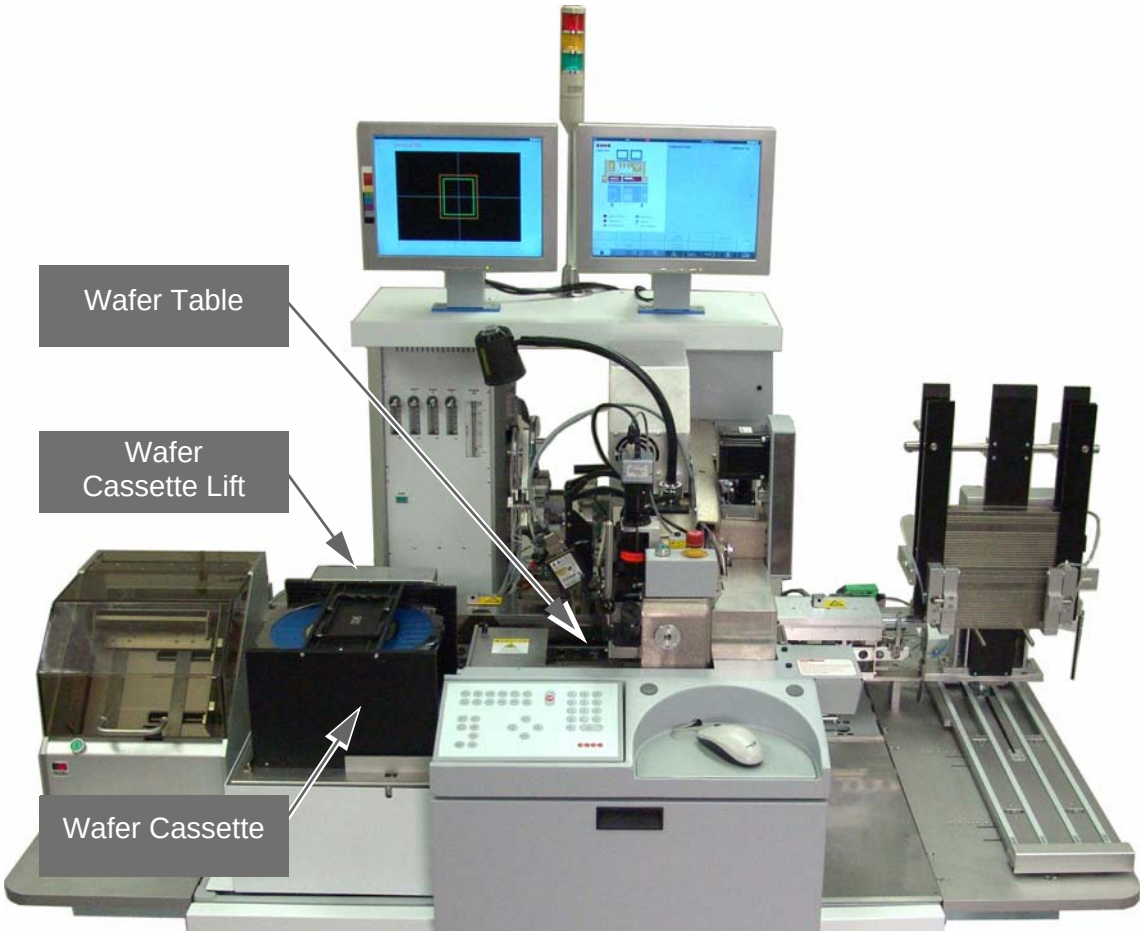
If required, the programmable dual wire dispenser can operate in a single wire mode just by selecting the wire 1 or wire 2 mode in the teach menu.

© 2009 Esec Ltd.

3.3 Wafer Handling

3.3.1 Overview

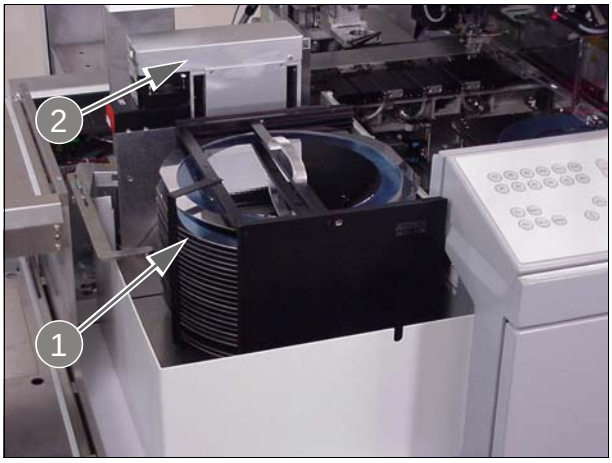
The wafer handler module moves wafer frames out of a cassette into the expansion unit. Then the wafer is positioned exactly at the pick up position. Wafers up to 200 mm (8”) in diameter can be handled on a standard machine.



3.3.2 Wafer Cassette Lift

Wafer cassettes (1) containing wafers are placed on the cassette platform.

This platform is moved up and down by the cassette lift (2).



© 2009 Esec Ltd.

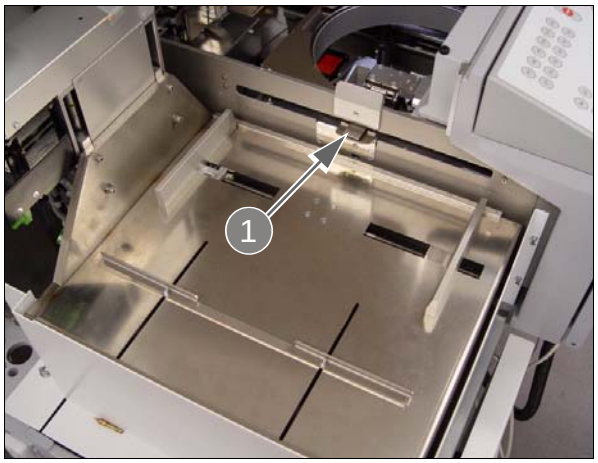
3.3.3 Wafer Handler Gripper

The cassette lift moves the wafer to the correct height.

During loading the gripper (1) pull the wafer from the cassette to the expansion unit.

During unloading the gripper (1) push the wafer from the expansion unit into the cassette.

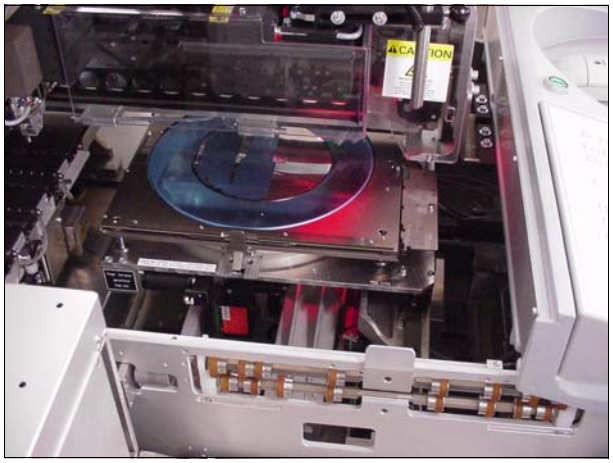
Wafer diameter: max. 8 inches



3.3.4 Wafer Table

The expansion unit of the wafer table holds and expands the wafer foil for more efficient chip removal.

The wafer table uses 5-phase motors to position the wafer. So it can be aligned properly for the pick up process.

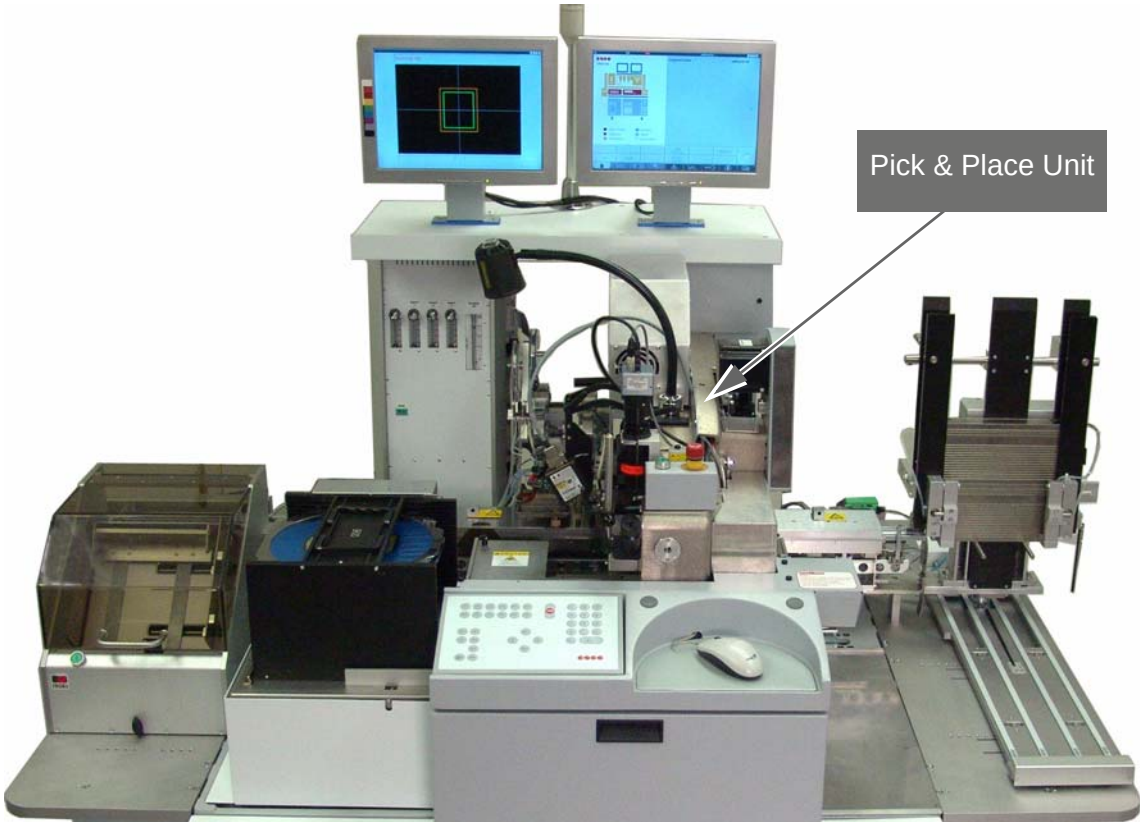


© 2009 Esec Ltd.

3.4 Pick & Place Unit

3.4.1 Overview

The pick & place unit moves the constant force bondhead from the pickup position to the bond position. At these positions the bondhead descends to either pick up or place a die. The pickup process is supported the die ejector which is located underneath the wafer table.



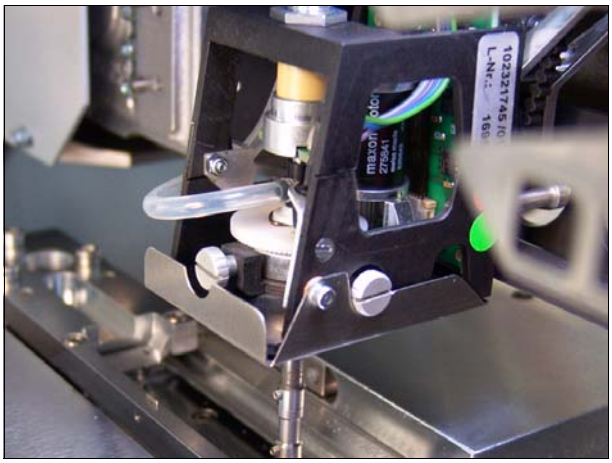
3.4.2 Bondhead

The constant force bond head (CFBH) is the key mechanical component of the pick & place unit.

It provides very fast and accurate chip transfer from the wafer to the leadframe.

- With standard configuration a vacuum sensor controls the presence of a picked chip.
- As an optional configuration for small die applications a laser sensor controls the die presence.

The integrated force control ensures a constant pick- and bond-force.

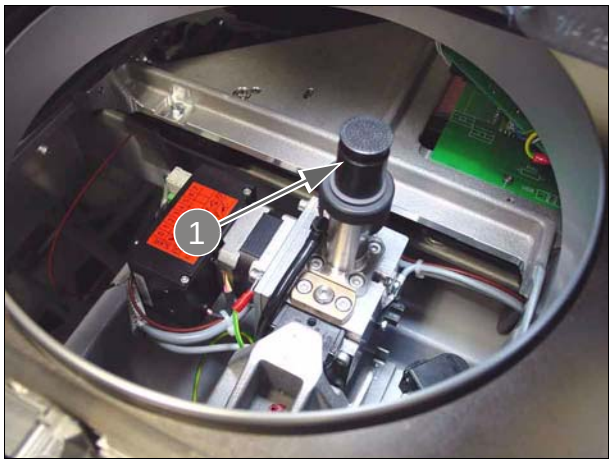


© 2009 Esec Ltd.

3.4.3 Die Ejector

The die ejector, underneath the wafer foil, uses (a) needle(s) to push the chip off the foil.

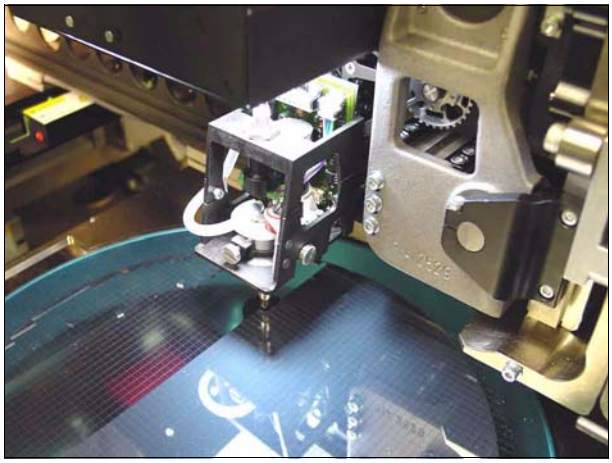
The pepperpot (1) provides counterforce for the bondhead and a vacuum to hold down the foil.



3.4.4 Die Pick Up

At the pick position, the bondhead adjusts its position to match the pickup angle of the chip.

Then, it moves down to the wafer and picks up a die.



3.4.5 Die Placement

At the bond position, the bondhead places the die with a constant force onto the lead-frame pad.

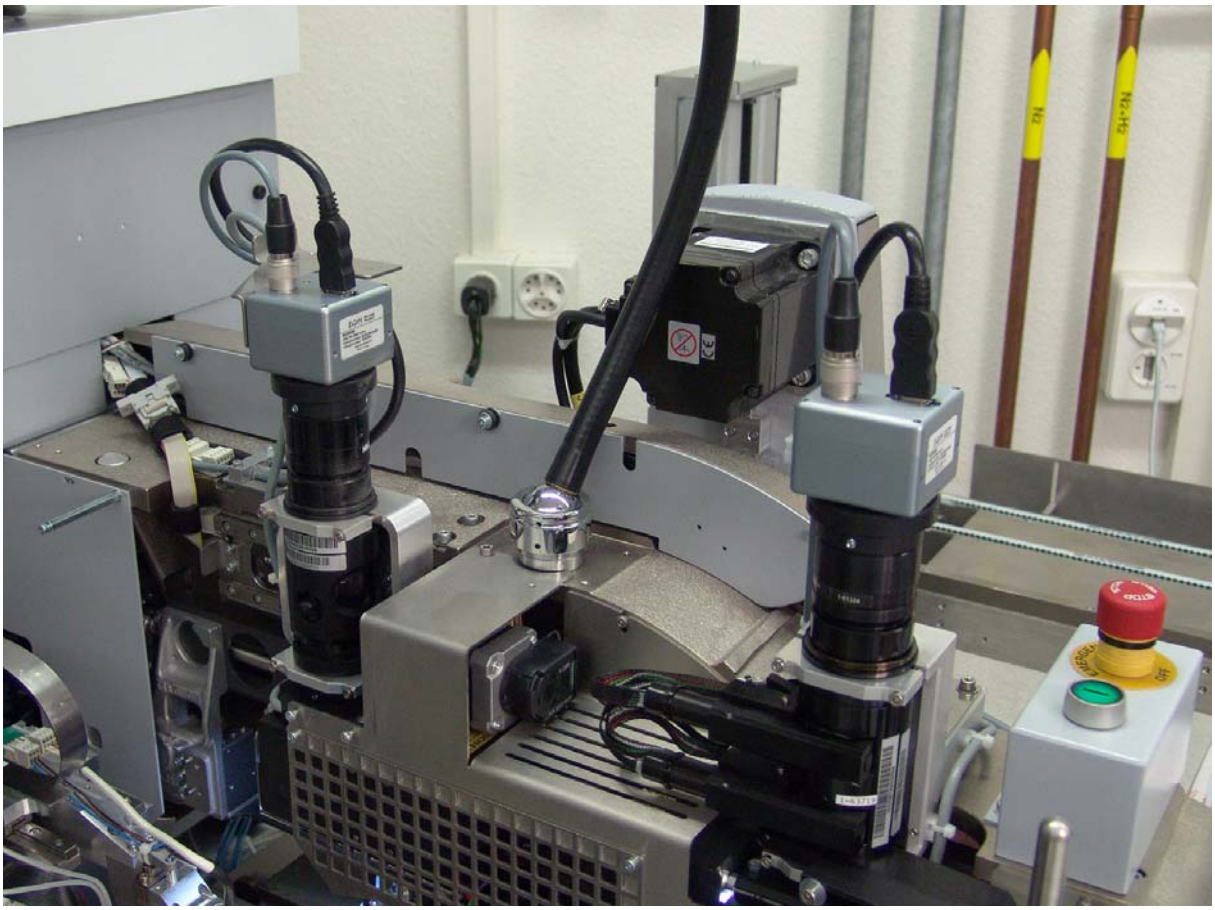
© 2009 Esec Ltd.

3.5 Vision Systems

3.5.1 Overview

Several vision systems provide high precision chip pick up and placement. Various quality checks can also be carried out by means of vision systems.

The vision system uses motorized fast vision cameras with fire wire connectors.



3.5.2 Pick Vision PVI

The pick vision (PVI) is used to locate the position of a chip on a wafer. After learning a new chip, the pick vision recognizes rejects due to inkdots, chipped corners or pattern mismatch.

The pick vision consists of a miniature, high resolution video camera with a zoom lens and mechanical focus adjustment and a direct/indirect illumination system.

© 2009 Esec Ltd.

3.5.3 Bond Vision BVI

The bond vision system (BVI) is installed over the bond position. It consists of a miniature, high resolution video camera with a mechanical zoom focus and a direct/indirect illumination system.The bond vision system is used for the optical bond centering and for the post bond quality control (post bond IQC).

The optical bond centering improves the alignment of the chip and leadframe at the bond position.

The post bond IQC is used for quality control of each individual leadframe pad after bonding.

3.5.4 Programmable Quality Control TV PQCTV

The quality control TV camera provides a visual inspection facility of chip attachment at the bond position. It can also be used to check the consistency of the solder dispensing or leadframe centering. This magnified view is displayed on the inspection monitor.

The QCTV system hardware consists of a miniature, high resolution video camera with a zoom lens and mechanical focus adjustment and an illumination lamp.

© 2009 Esec Ltd.

/ (May 29, 2009)

3.6 Controls and Supplies

Control and supply equipment covers all items contained in the Die Bonder 2009 SSI not described elsewhere in this chapter. These items are:

- Main electrical power supply.
- Pneumatic systems.
- Servo pack.

3.6.1 Electrical Power Supply

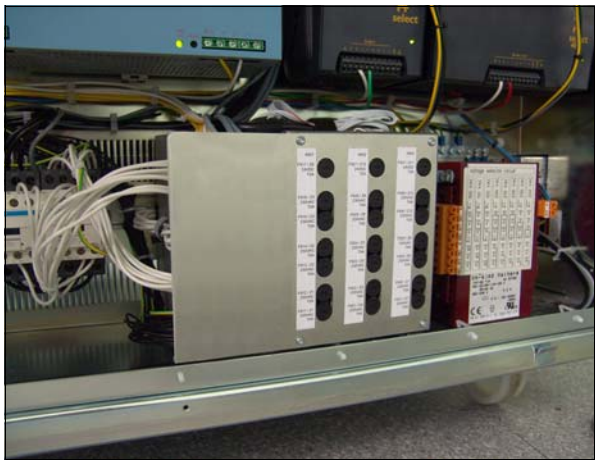
The system's power distribution network provides the range of voltages required to operate all the various modules within the machine. The major components are a main power transformer and a control and distribution panel. The power source is connected directly to the main power transformer.

Main Power Transformer

The main power transformer is located behind the large panel at the right-hand side of the machine (viewed from the front of the machine). It provides the range of voltages required to operate all the various modules within the machine.

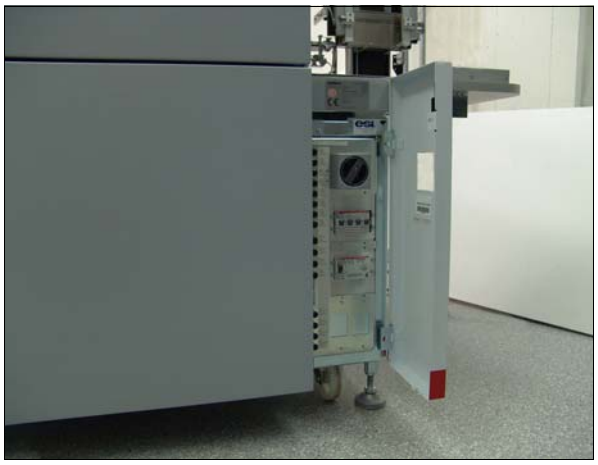
Tappings on the transformer enable supply voltages ranging from 200 to 240 V (between neutral and line or phase-to-phase) at either 50 or 60 Hz. These are made available to the operating modules via the control and distribution panel.

To gain access to the main power transformer, remove the two screws from the large panel on the right-hand side of the machine and lift the panel from its retaining hooks.



© 2009 Esec Ltd.

Control and Distribution Panel



The control and distribution panel is located behind a hinged door to the right of the center front access panel of the machine. The main On/Off switch for the Die Bonder protrudes through a hole in the door.

In addition to the main On/Off switch, the control and distribution panel contains a number of fuses and test points each of which is clearly labelled. Each fuse is identified by its:

Function: TRAFO (transformer)
OUTPUT 36VAC,
INDEXER 48VDC etc.

Rating: 12.5AT etc.

Circuit diagram location: F195 etc.

ESEC Part No.

The function of the test points is indicated by a schematic diagram.

Within the Die Bonder modules, the various voltages are generally used as follows:

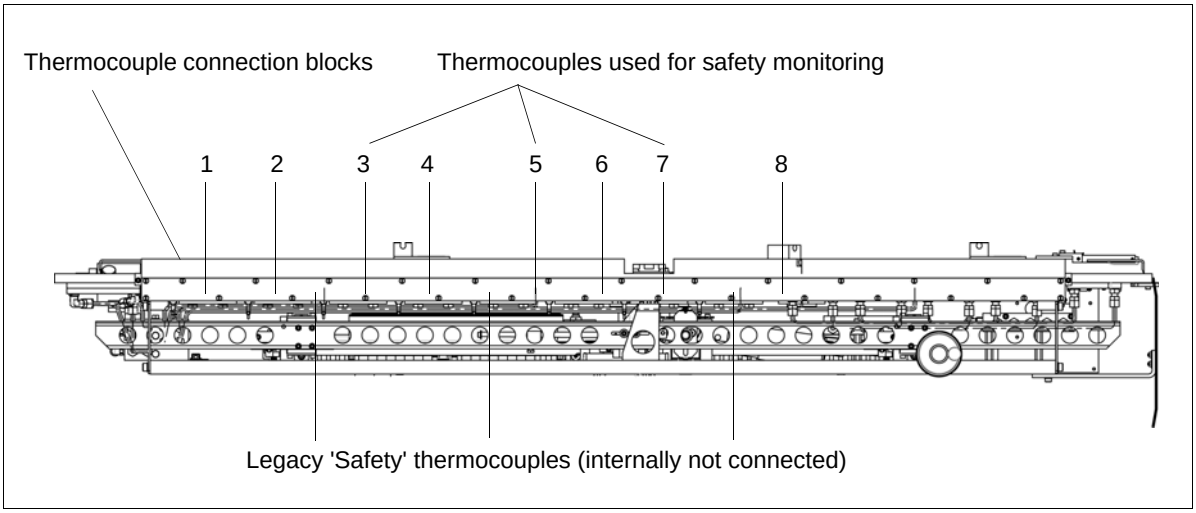
48 Volts DC	Illumination PCBs.
36 Volts DC	5-phase motors.
24 Volts DC	PCB power supplies.

© 2009 Esec Ltd.

3.6.2 Heat Control System

The indexer heater system operates directly from the 3-phase input. User control of this power supply is described in section *3.6.1* on page *3-14*.

Over Temperature Protection



The machine contains an over-temperature protection system. This measures the temperature of the indexer furnace using 3 thermocouples which are connected to an additional independent heater controller.

The over-temperature protection system automatically stops production and switches off the power to the heaters if the temperature at any of the three safety thermocouples rises above 530°C. This maintains product quality and protects the machine from overheating and consequent damage, even if the heater control system itself becomes defective or a short circuit occurs in a heater element.

Standby Mode

A standby, or energy saving mode, which switches the heaters to a lower temperature setting, is also provided. This can be selected by the user when the machine is to be stopped for some time (for example overnight).

© 2009 Esec Ltd.

3.6.3 Pneumatic Unit

The DB 2009 SSI pneumatic system is responsible to control the supply of compressed air, vacuum, forming gas and optionally nitrogen used to operate various modules within the machine. The services are clearly labeled with different colors through the machine. Grey for vacuum, black for vacuum, yellow for forming gas and green for nitrogen.

Each service is fed into system through a hand operated on/off valve and its own pressure/vacuum control unit. The pre-settable control units will signal to the master system in case the minimum required pressure or vacuum is not met.

The total production flow rates of the air cooling is indicated on the front and regulated on the manifold located on the indexer input or output. The forming gas flow rate supplied to each of the 3 main indexer zones is regulated and indicated by 3 separate flow meters also located on the front.

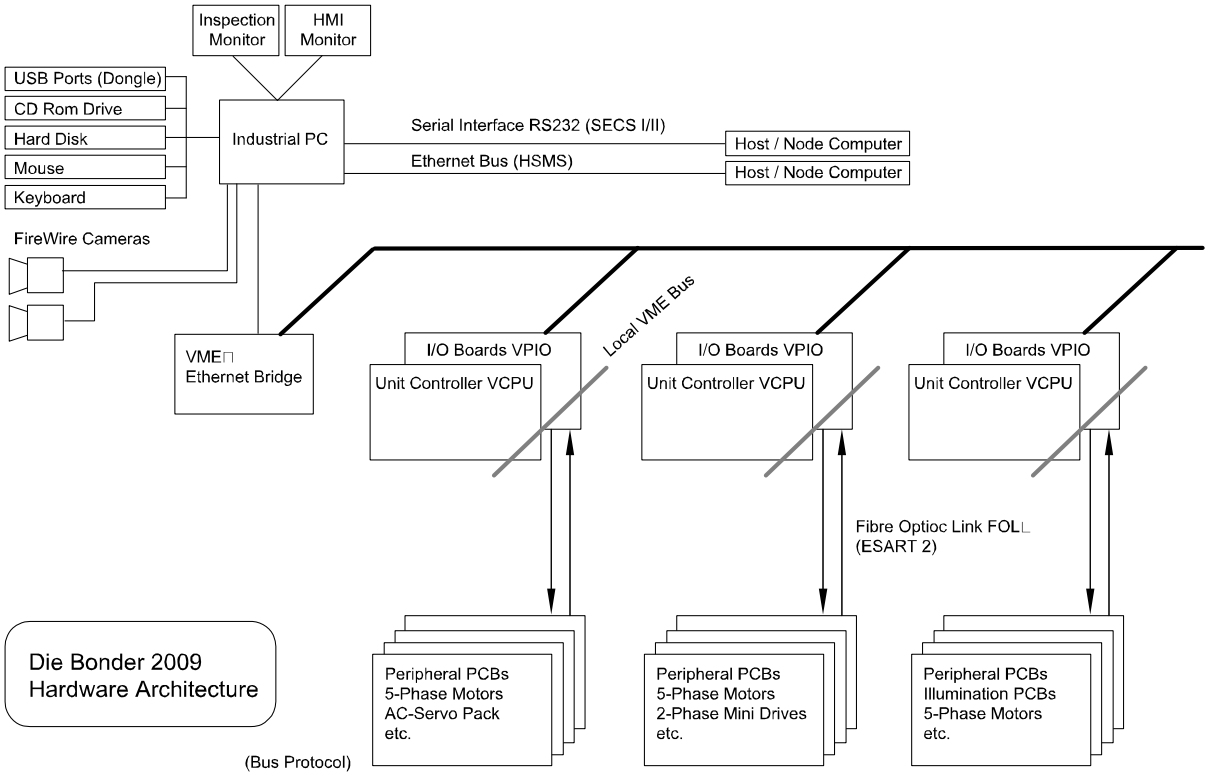
The system has additionally a gas safety valve fitted which will cut off the forming gas supply in case the indexer temperature will drop below 200°C

© 2009 Esec Ltd.

3.7 The Control Computer

The DB 2009 SSI is controlled by a built-in computer system, the main functional units of which are shown below.

3.7.1 Hardware Architecture



The DB 2009 SSI hardware architecture is based on a VME bus system, which inter-connects the four main functional units to a master unit via an ethernet bridge.

The master unit consists of a standard industrial computer controlling the communication between the pick & place, leadframe handler and wafer handler function controllers. In addition, the master unit enables the data input and output (e.g. keyboard, monitor), data storage and the system's software upgrade capability.

Each function controller runs its application software on a separate real time operating system communicating with various I/O board on its own local VME bus.The I/O boards of each unit communicate with the peripherals such as motors via an optical high-speed serial link, minimizing interference on the equipment.

© 2009 Esec Ltd.

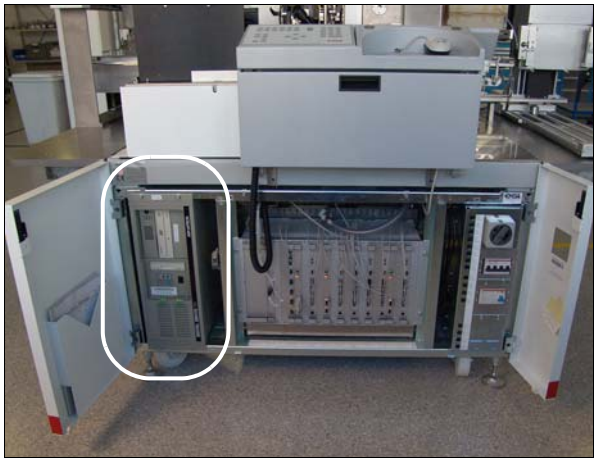
3.7.2 System Controller Hardware

The system controller hardware consists of a number of printed circuit boards (PCBs) and interconnection circuits. All PCBs are housed in a number of racks. These are mainly the:

- Industrial PC
- Main card rack
- Peripheral rack

Industrial PC

A standardized industrial PC is mounted at the left-hand side of the machine and can be accessed by opening the front left door.



The PC provides all necessary hardware to start a Windows based master system. It allows to operate the machine and to display the machine information on the two screens. The industrial PC enables communication to the main card rack via Ethernet on one side and to an external network on the other side. In addition, USB interfacing to external devices is used to access dongle protected options. Finally, a built-in frame grabber communicates with the various inspection cameras via firewire.

Main Card Rack

The main card rack is fitted behind the center front access panel of the machine.

The following PCBs are fitted in the main card rack:

- 3 Function Controllers
- 5 Input/Output Controllers
- 1 Ethernet Bridge
- 1 Power Supply

© 2009 Esec Ltd.

The Peripheral Rack

The peripheral rack is located towards the rear of the machine, above the pick & place unit. It contains the PCBs which control:

- the bondhead
- the chip sensor
- the illumination of the vision systems
- the machine monitoring

3.7.3 Host Connection

The Die Bonder may be connected to a host computer via a standard computer RS 232C serial link. This should be fitted to the Die Bonder on the rear panel connector labelled HOST. The maximum distance between the host and the Die Bonder, without additional signal enhancement equipment is 25 meters (75 feet).

Die Bonder - Host Communication

The communications interface between the Die Bonder and the host is in accordance with the SEMI Equipment Communication Standards SECS-I and SECS-II. The Die Bonder‘s interface also conforms to the SEMI GEM E30-93 standard, Generic Model for Communications and Control, as revised by the amendment proposed in Ballot #2123, of 20 November 1992.

© 2009 Esec Ltd.

3.8 Procedures / Tasks on the Machine

3.8.1 Calibration

In the context of this operating information, ’calibration‘ means the adjustment of the Die Bonder so that the mechanical references are set to ‚standard‘ values. Mechanical references are i.e. certain position values, distances etc. on the machine. These values are saved in the software and during production used as basic references for an accurate process.

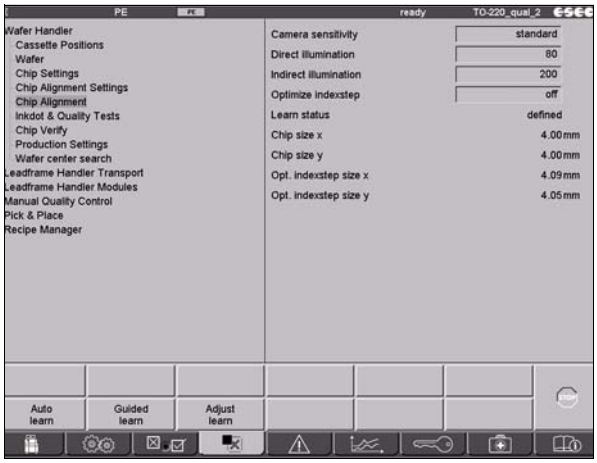
Every machine is calibrated at the factory prior to shipment but a complete recalibration is recommended after installation. When the machine components have been changed, added or removed a calibration of the individual module is necessary.

The operation of each module depends on the function and alignments of other modules. The physical location of all modules are directly or indirectly related to the bond or pick position.

For detailed description of calibration procedures refer to chapter *6*, *Calibration*.

3.8.2 Teaching

Before production begins the system is 'taught'; that is the parameters required to handle a particular leadframe and wafer (including all chip details) are entered under user control. Many of these parameters are 'programmable' which means that once taught, they can be saved in a 'recipe'. Thereafter, whenever the same leadframe and/or wafer is again used for production, the recipe can be recalled by the operator and the system automatically resets itself to the parameters required.



The main advantage of this system is that once a chip-leadframe pair has been taught, most of the settings required; leadframe handling, chip placement, and so on, are quickly and accurately recalled and the machine reset.

Where one of the production elements is new, a recipe containing the details of the 'known' element can be recalled. Then, the details of the new item can be entered and all parameters saved as a new recipe. The built-in hard disk gives internal storage capacity for many hundreds of recipes.

© 2009 Esec Ltd.

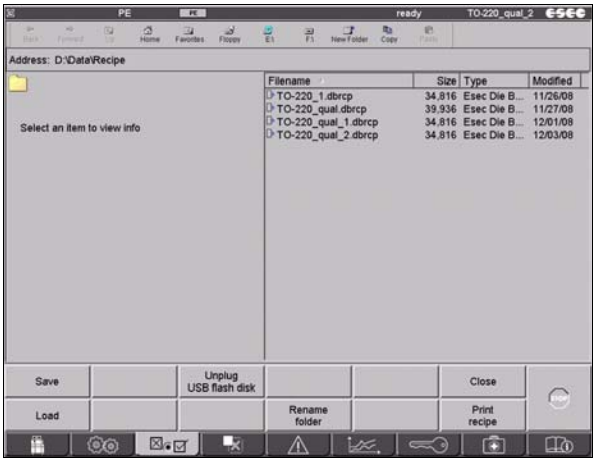
Another major advantage is transportability. The built-in floppy diskette drive allows recipes to be transferred from one machine to another, where they can be stored and used from the second machine's hard disk. This not only saves set up time, but improves control of quality.

Note: Where a number of DB 2009 SSI are in use it is particularly important that they are calibrated to the same standard values. Any recipe can then be run on any machine and produce accurate results. If, however, one machine is calibrated differently, recipes produced on the other machines would have to be adjusted, likewise, any recipe produced on it would require adjustment before it would run accurately on the others.

The fact that many of the DB 2009 SSI's functional units are programmable provides another major advantage, many of the teaching routines can be carried out automatically. This is not only much faster than traditional methods, it also removes the possibility of human error.

3.8.3 Operating

When the operator calls up a recipe, the machine first displays a set of 'recipe notes'. These are produced at the same time as the recipe and contain detailed instructions on setting up the machine; such as the pickup tool and solder type to be used.



While running, the system produces a continuously updated report of its status, if problems are encountered, plain language messages are displayed to assist the user. Management statistics are stored and can be displayed or printed when required.

© 2009 Esec Ltd.

3.9 Options

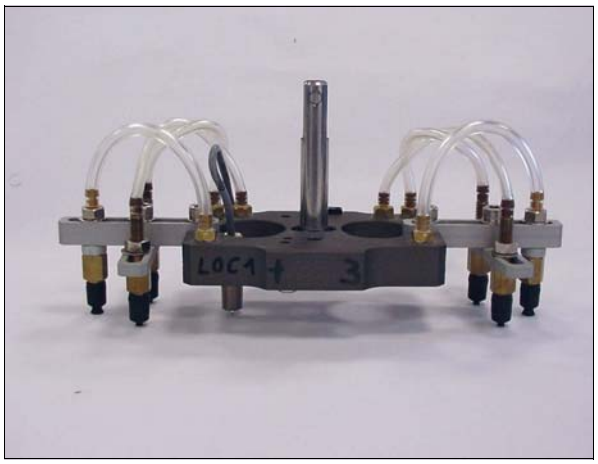
A number of optional items and facilities are available with the Die Bonder 2009 SSI. These may be specified when an order is placed, or obtained and added later.

3.9.1 Leadframe Handling

Top Stack Loader (TOS)

The top stack loader transports one leadframe after the other from the top of a stack magazine onto a pre-centering platform fitted to the left of the indexer. There is provision for up to three stack magazines, the operator can replace empty magazines at any time, without stopping the machine.

When the machine starts, the leadframe gripper is above the first stack. The gripper moves down, picks up a leadframe, then moves up and shakes the leadframe to make sure that only one has been picked up. It then moves to the thickness inspection station, if the thickness corresponds with a specified value, the gripper moves to the pre-centering platform where it deposits the leadframe in line with the push-in unit (see section *Push-in for Top Stack Loader* on page *3-24*).



If the thickness is not correct, the gripper moves to the trash bag to deposit what it has picked up (e.g., two leadframes instead of one, or an interleaved paper). If no trash bag is configured, the machine stops.

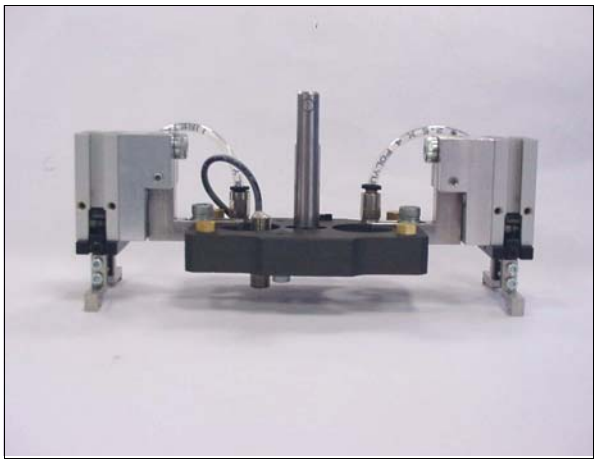
Having placed the leadframe, the gripper returns to the stack magazine. When only a predefined number of leadframes remain in the stack, the yellow 'material' warning lamp starts to blink. When the first stack magazine is emptied, the gripper moves to the second to pick up the next leadframe and continues as described above.

© 2009 Esec Ltd.

/ (May 29, 2009)

Top Stack Loader (TOS) (Cont.)

The gripper uses vacuum suction cups and/or compressed air operated clamps to pick up leadframes and interleave papers. Its movement is programmable in X, Y and Z.



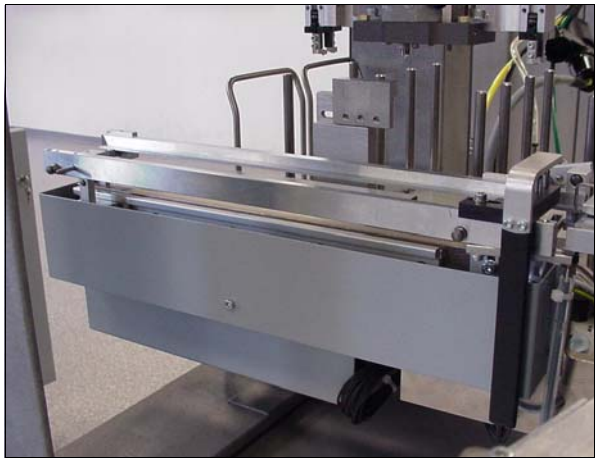
Push-in for Top Stack Loader

When the machine is fitted with a top stack loader as the leadframe input device, a push-in unit is also fitted.

This unit is located to the left of the input handler and pushes the leadframe from the push-in platform onto the indexer to align it with the first transport finger. The push-in action is provided by a toothed belt.

The toothed belt is driven by a 5-phase motor.

The park, wait and push positions are individually programmable.



Magazine Handler (MH)

Machines with an XY-shuttle can be fitted with magazine handlers for the input and/or output of leadframes. The input and output units are very similar.

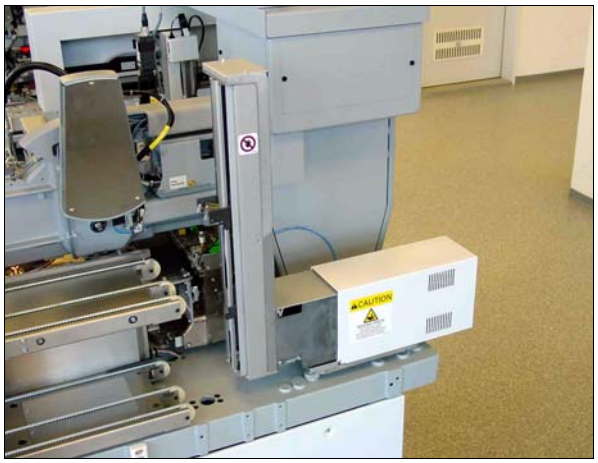
When used as an **input** device, the magazine handler takes a full magazine from the load buffer and aligns it with the indexer so that the push-in unit can remove the lowest leadframe. It then moves the magazine downwards one slot at a time so that a new leadframe is always presented to the indexer. When the magazine is empty, the lift transports it to the unload buffer, then returns to the load buffer for a full one.

The input magazine handler can also be used as part of a dual power leadframe loader (see section *Dual Power Leadframe Loader (DPLL)* on page *3-26*).

© 2009 Esec Ltd.

Magazine Handler (MH) (Cont.)

When used as an **output** device, the magazine handler takes an empty magazine from the load buffer and aligns it with the indexer. It then moves the magazine downwards one slot at a time so that each leadframe is presented with an empty slot as it is pushed out. When the magazine is full, the lift transports it to the unload buffer, then returns to the load buffer for an empty one.



Push-in Unit for Magazine Handler

When the machine is fitted with one of the optional handlers as the leadframe input device, a push-in unit is also fitted.

This is located to the left of the input handler and pushes the leadframes from the magazine, onto the indexer to align it with the first transport finger. The push-in action is provided by a steel tape housed on a tape reel. The tape is concave in shape to make it stronger and is very similar to a steel tape measure. The tape reel is controlled by a 5-phase motor; the start and stop push positions are individually programmable.

Dual Input Handler (DINP)

In addition to the top stack loader (TOS), the machine can also be fitted with an input magazine handler as a second leadframe input device.

This allows the Die Bonder to bond two (or more) different types of chip onto a single leadframe.

© 2009 Esec Ltd.

Dual Input Handler (DINP) (Cont.)

The leadframes are first loaded via the TOS and chips are bonded in the normal way. The output magazines from this process can then be loaded onto the input buffer of the magazine handler on the input side. The wafer and recipe are then changed and chips of a second type are then bonded onto the leadframes.

The input magazine handler is the a mirrored version of the output handler (see section *Magazine Handler (MH)* on page *3-24*).

Operating automatically, the magazine handler takes a full magazine from the load buffer and aligns it with the indexer. As each slot is emptied, it moves the magazine downwards one slot at a time so that a leadframe is always presented to the indexer. When the magazine is empty, the lift transports it to the unload buffer and then returns to the load buffer for an full one.

The operator can remove empty magazine and load full ones without stopping the machine. The yellow 'material' warning lamp starts to flash when the load buffer is emptied, or the unload buffer becomes full.

Dual Power Leadframe Loader (DPLL)

In addition the standard stack power, the machine can also be fitted with a magazine handler unit (see section *Magazine Handler (MH)* on page *3-24*).

This allows the Die Bonder to bond two (or more) different types of chip onto a single leadframe.

The leadframes are first loaded via the stack power and chips are soldered onto the pads in the normal way. The output magazines from this process can then be loaded onto the input buffer of the magazine handler on the input side. The wafer and recipe are then changed and chips of a second type are then bonded onto the leadframes.

© 2009 Esec Ltd.

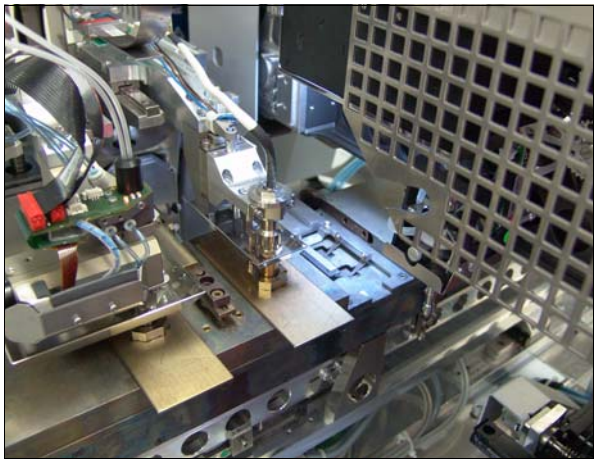
Leadframe Identification

Some leadframes carry a hole code which allows to identify a leadframe out of a leadframe family. If the code on the leadframe is not equal to the code learned during teaching, the machine stops and triggers an alarm.

The leadframe identification is available for the magazine handler as well as for the top stack loader.

Programmable Pre Press Module (PPPM)

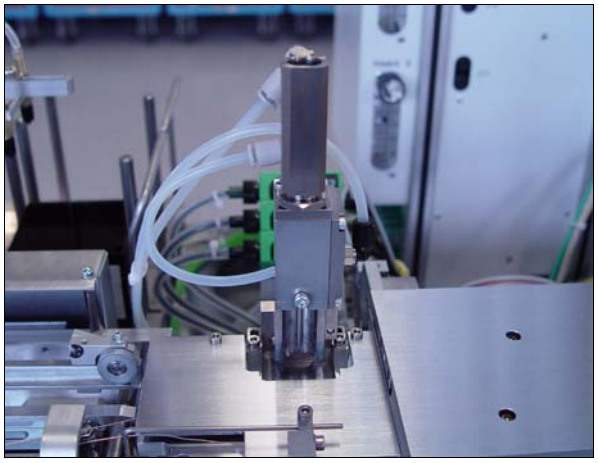
The PPPM is a system for spreading dispensed solder dots into a defined solder distribution by pressing down a tool with a specially designed bottom surface (cavity) onto the solder dot. There are different tools for the spreading of the solder available, which are dedicated to the specific applications.



Power Marker Unit (PMU4)

The power marker unit PMU4 is a pneumatically actuated unit allowing to stamp leadframes with up to 5 characters or numbers.

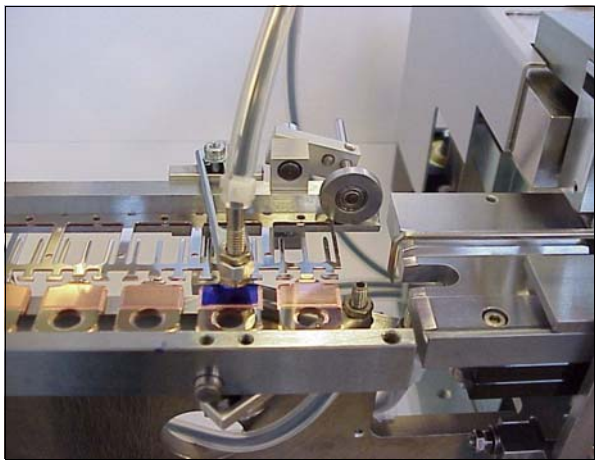
The unit is mounted on the input side of the indexer track but can, upon request, be mounted on the output side of the indexer track.



© 2009 Esec Ltd.

Rejected Pad Sensor (RPS)

The sensor is mounted at the beginning of the indexer. When a rejected pad identification mark is detected that pad is not supplied with solder and the bondhead does not attempt to bond that position.



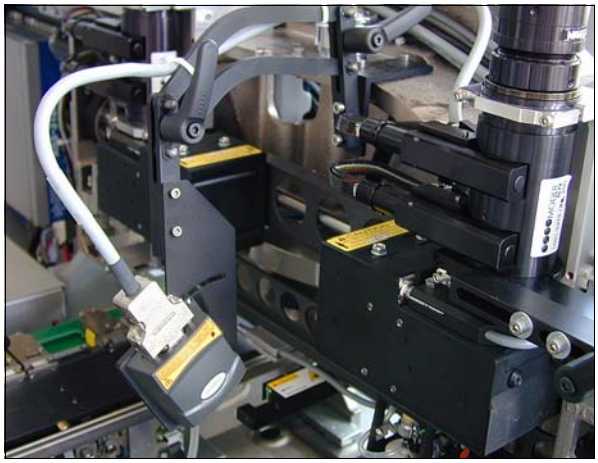
The RPS distinguishes reflective from non-reflective areas. The sensor state to be rejected (reflective or non-reflective) is programmable.

3.9.2 Wafer Handling

Wafer Mapping (WMP)

Wafer mapping uses a computer link to record the results of the Wafer Prober's tests in the form of a computer 'map'. During production this map is sent to the Die Bonder which uses this data to select only the 'good' chips from the wafer. This technique provides many potential benefits to the user, increases in UPH, yield, quality and so on.

Traditionally, the prober marks all 'failed' chips with an ink dot. During production, the Die Bonder scans the wafer for ink dots and only those without a dot are picked. Wafer mapping replaces the inking process and enhances device categorization by the use of 'inkless binning'. It also provides much improved quality related data, which allows better correlation of processes, improved planning and increased yield.



Problems associated with the inking process; ink splatter, potential ink contamination, poor ink dot contrast against the chip's surface and clogged ink impellers, are avoided, thus increasing accuracy and product quality. Wafer mapping also makes production faster, because 'failed' chips do not have to be found by the Die Bonder's automatic die positioning system.

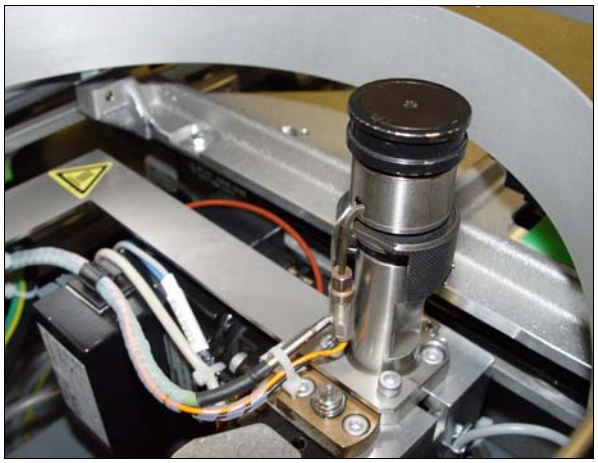
Additionally, where ink dot marking allows chips to be placed in just two categories, a simple pass or fail; wafer mapping allows up to 34 categories to be specified. This improvement in both the range and level of tests that can be carried out can provide considerable increases in yield and even allow improvement in device specification range. For example:

- Non-functional, or less functional device categories can be identified, for example 4 megabyte memory chips may be picked for 1, 2 or 4 megabytes of serviceable memory.
- Devices could be tested and categorized by their actual operating speed.
- Tests could establish suitability for military or commercial use.

© 2009 Esec Ltd.

3.9.3 Chip Handling

Integrated Thin Die Pickup Option ITDP



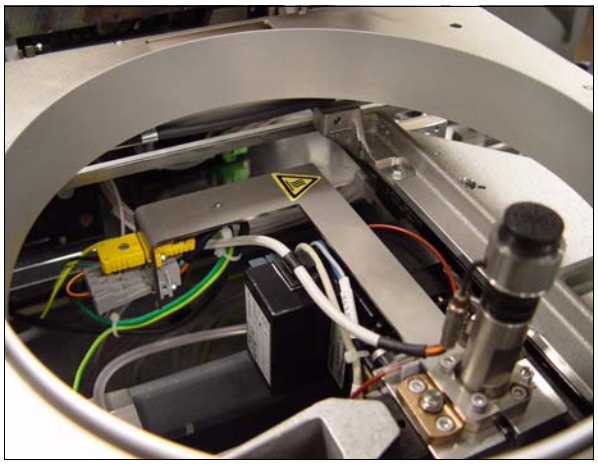
The integrated thin die pickup option ITDP is used for the needleless handling of very thin dice with a thickness between 50 µm and 100 µm.

The ITDP option is also used to handle dice where needle marks have to be avoided absolutely.

The option replaces the standard pepper pot and may be used with or without heated pepper pot (see below).

Because no needles are used to separate the dice from the wafer foil, the adhesive strength of the wafer foil must not exceed 500 mN / 25 mm.

Programmable Heated Pepper Pot PHPP



With the normal pick-up process, the pick-up tool area should be as big as possible. However, there are limits which depend on the stickiness of the wafer foil.

With the heated pepper pot, temperatures of up to 100°C can be achieved thus helping to detach the chip from the UV wafer foil.

The heated pepper pot can be used with the standard, needle-based die ejector process as well as with the needle-less process using the integrated thin die pickup ITDP option (see above).

© 2009 Esec Ltd.

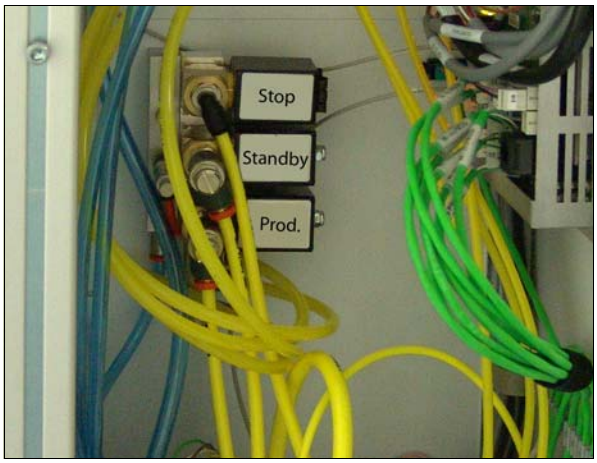
3.9.4 Gas Supply Feature (GSF)

The gas supply feature provides economy when using forming gases containing a mixture of nitrogen and high levels of hydrogen. It allows different gas mixtures to be used by the Die Bonder as follows:

Stop: Standard forming gas or Nitrogen flow.

Standby: Reduced forming gas or Nitrogen flow (adjustable).

Production: Reduced forming gas or Nitrogen flow (adjustable).



© 2009 Esec Ltd.

4 HMI Description

CAUTION

For better visibility of subjacent functions covers have been removed before taking pictures. In standard operating mode all covers have to be in place at any time (see Safety Chapter).

(**HMI** = **H**uman **M**achine **I**nterface)

4.1 User Management

4.1.1 Introduction

This chapter provides information about the interface between operator and machine.

The Die Bonder 2009 SSI provides various ESEC system user groups with appropriate access rights assigned. In addition an individual identity can be given each single ESEC system user. A few ESEC system users are already predefined per default (see section *ESEC System Users* on page *4-3*). This individual user can be assigned to one or more user groups. This action will assign the appropriate access rights of the group(s) to the individual user.

After system startup or after shift change, the current user has to log-in with his own identifier (see page *4-6*). According to the active user group the access to the parameters is defined.

© 2009 Esec Ltd.

4.1.2 MS Windows Software User

Note: Under regular circumstances the MS Windows Software User is set automatically to “DefaultUser” and has not to be of interest to operate the machine. Changing the MS Windows Software User is necessary just for particular cases such as software updates etc.

Two users are defined for MS Windows:

a) DefaultUser

b) Administrator

A regular start-up of the machine will automatically log-in the “DefaultUser” as MS Windows Software User.

Change from DefaultUser to Administrator and back

Press **Alt** + **Tab** keys simultaneously to get the **ESEC Starter** menu.

Stop ESEC system and logoff

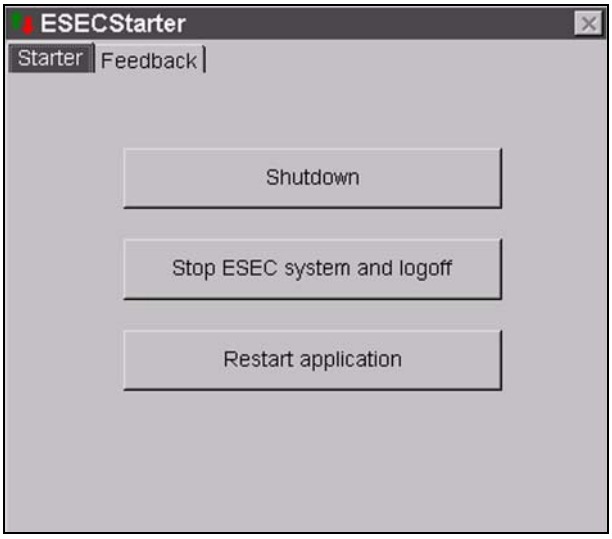
This can take a few minutes.

Enter the User name and the password for Administrator.

OK

The ESEC system will not start automatically.

The screenshot to the right shows the **ESEC Starter** menu when logged in as DefaultUser.



To change back from Administrator to Default User, choose one of the following procedure:

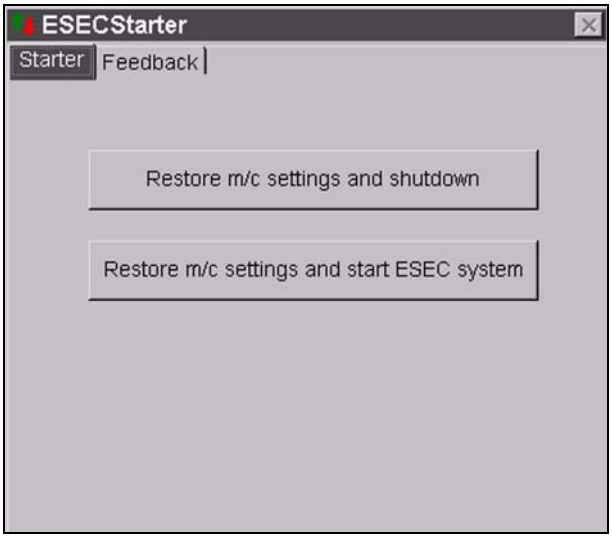
Restore m/c settings and shutdown

This will shutdown the PC and restore the settings in such a way as the next start-up of the machine will automatically log-in the “DefaultUser”.

Restore m/c settings and start ESEC system

This will logoff the Administrator, login the DefaultUser and start the ESEC system.

The screenshot to the right shows the **ESEC Starter** menu when logged in as Administrator.



© 2009 Esec Ltd.

4.1.3 ESEC System User Groups

The following user groups are predefined. It is not possible to change the group or to add groups.

Pos.	User group	Description
1	Default user	For anonymous user, which is logged on as default after start-up of the equipment and after a "logout" was proceeded (with the GUI function).
2	Operator/Line Engineer	For a person who operates the equipment to perform its intended function (e.g. processing) [SEMI E30]. He makes the setup for production, maintains production by adding and removing material, loading recipes, resolve error conditions and optimizes a production process. Also the teaching of basic recipes may be the task of the operator.
3	Equipment Engineer	For an engineer who performs configuration, calibration, and maintenance of the equipment (mechanics / electronics).
4	Process Engineer	For an engineer who solves problems concerning the process and knows how to realize it with an equipment. He creates and qualifies recipes.
5	System Administrator	For a person who installs and configures the equipment software. He sets up access rights, exception handling, communication interfaces etc. to be conform to factory guidelines.

© 2009 Esec Ltd.

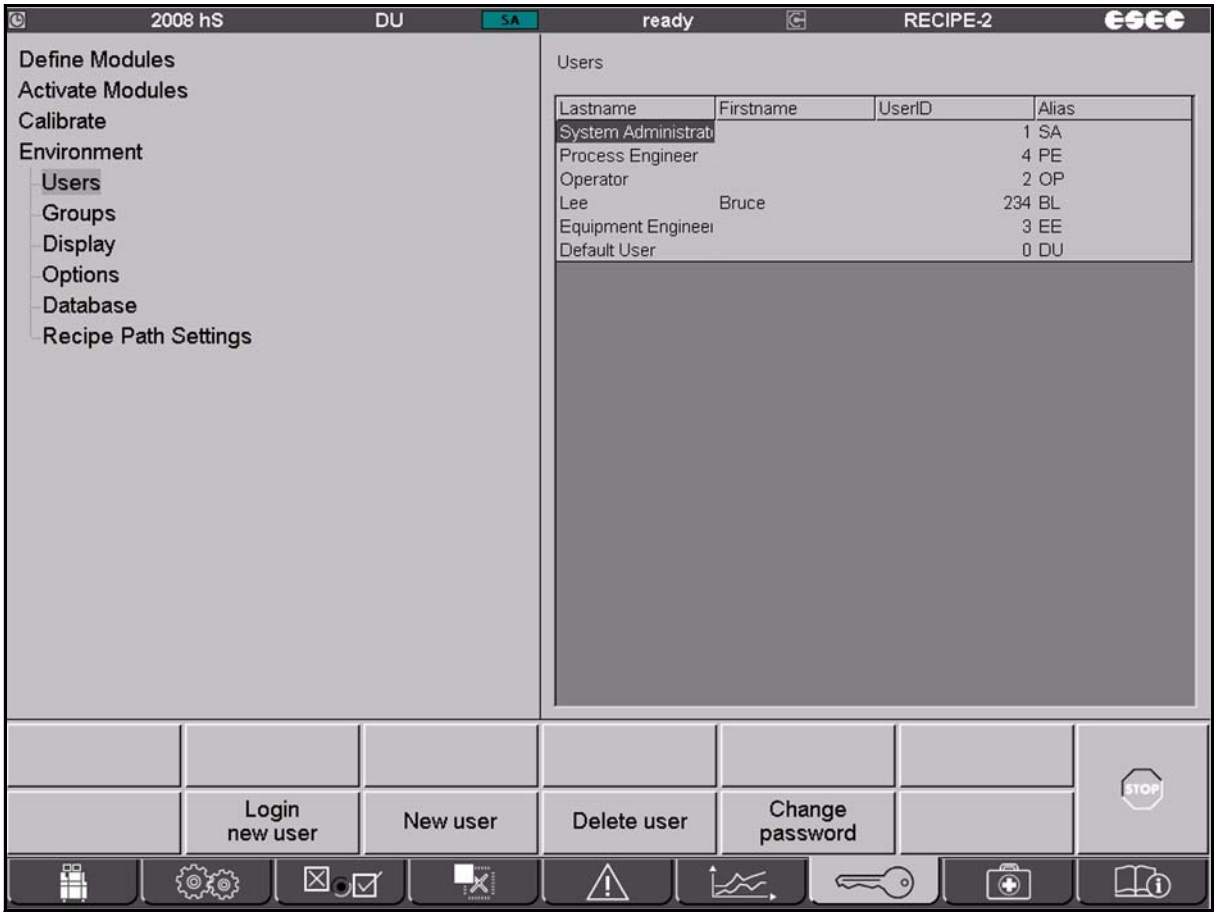
4.1.4 ESEC System Users

The following users are predefined per default. Additionally for each individual user a user name, an alias and user groups affiliation can be defined.

ID	User name	Alias	Member of user group
0	Default User	DU	Default user / System administrator / Operator / Equipment engineer / Process engineer
1	System Administrator	SA	System administrator
2	Operator	OP	Operator
3	Equipment Engineer	EE	Equipment engineer
4	Process Engineer	PE	Process engineer

/ (May 29, 2009)

4.1.5 Assign New / Delete / Change ESEC System Users

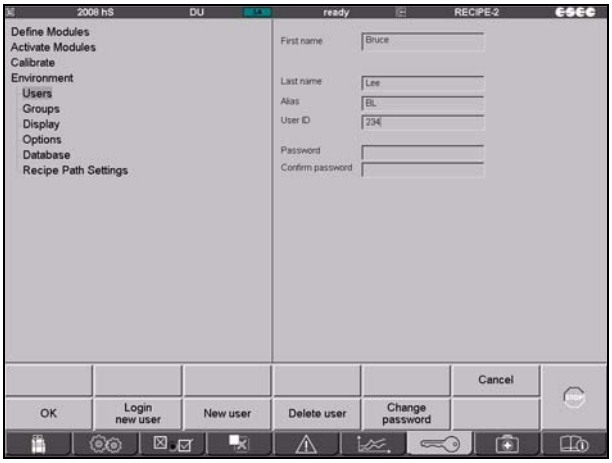


Assign a New User

click ***New user***

Enter **First name**, **Last name**, **Alias**, **User ID**, and **Password** (optional) on appropriate submenu.

click ***OK***



Delete Existing User

Select the user which has to be deleted (the user which is logged-in cannot be deleted).

click ***Delete user***

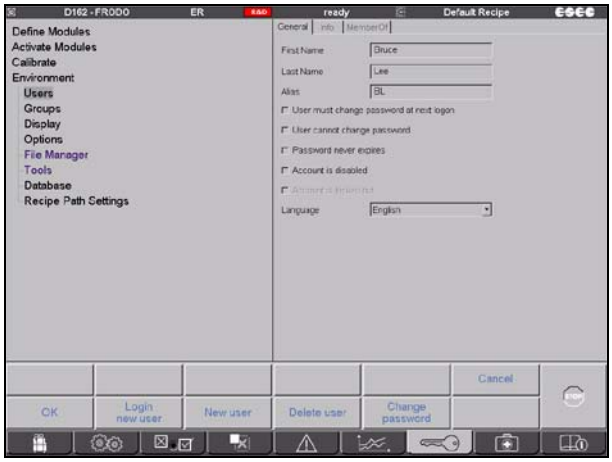
© 2009 Esec Ltd.

Change User Data

Select the desired user by double clicking.
Select the ***General*** tab.

Change the data values.

click ***OK***



Change Password

WARNING

Menus containing functions that require specialist knowledge or skills are protected by the password. The password must therefore not be made available to unauthorized personnel.

click ***Change password***
Type in old password and new password twice.

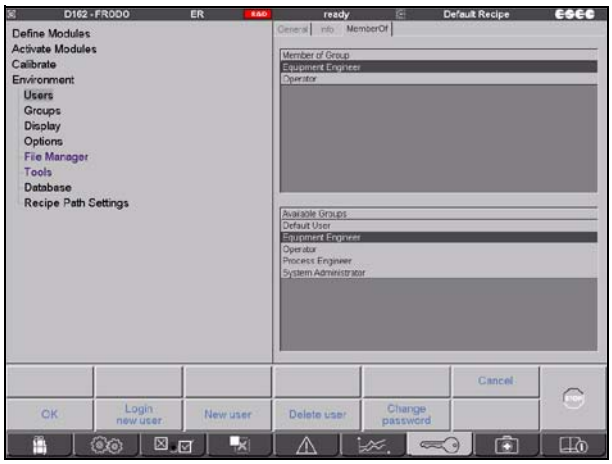
Note: If a password is lost the user “system administrator” has the authority to delete the user and create a new user. If the system administrator has loosen the password, the machine software has to be reinstalled. The default password is “system”

Assign a New User Group to a User

Select the desired user by double clicking.
Select ***MemberOf*** tab.

Double click one or more available group(s) to assign it to the desired user.

click ***OK***

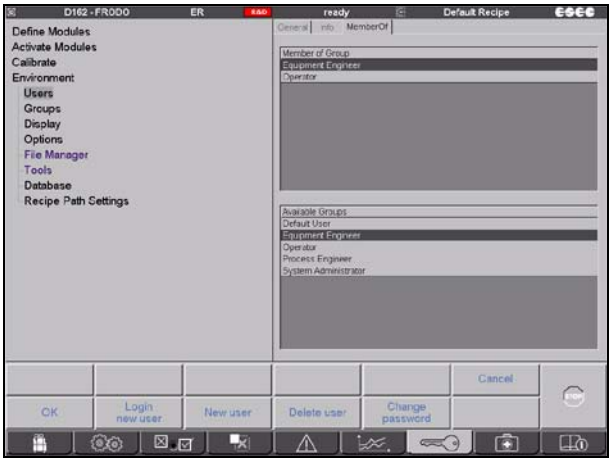


© 2009 Esec Ltd.

Remove User Group(s) Assigned to a User

Select the desired user by double clicking.
Select ***MemberOf*** tab.

Select the desired user by double clicking.
Double click one or more group(s) to remove it.



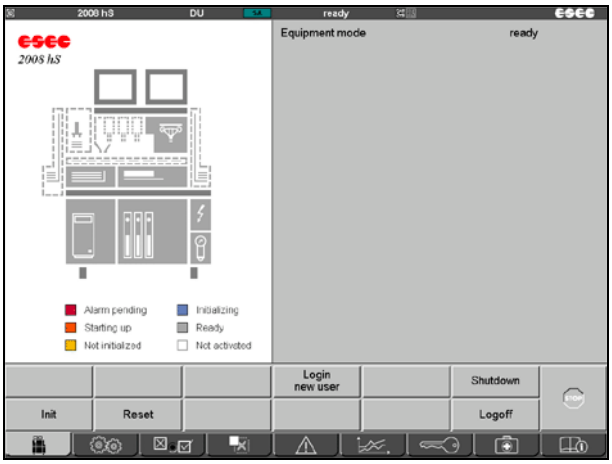
4.1.6 ESEC System User Log-in

Change ESEC System User

Login new user

Enter **Alias** and **Password** of new ESEC system user.

OK



© 2009 Esec Ltd.

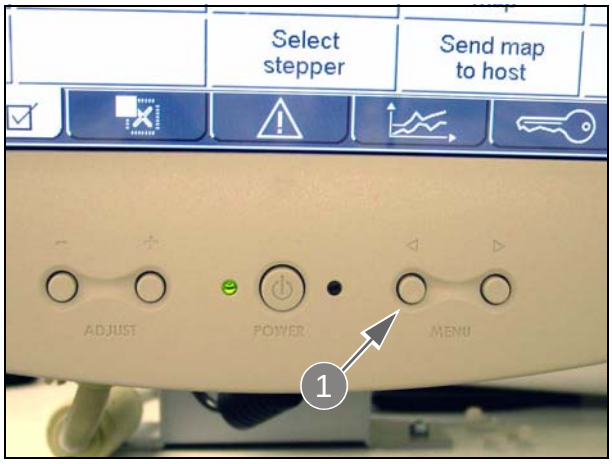
4.2 Monitors

Two color LCD TFT monitors are mounted on top of the machine.

- Inspection monitor (on the left) shows life video image.
- Master monitor (on the right) shows all the machine control screens.

Set-up

Use the menu buttons (1) to adjust contrast and brightness.



Tilt

The flat screen monitors are mounted on a support. It is possible to give it a tilt, by loosening the lever (1).

Screen Layout

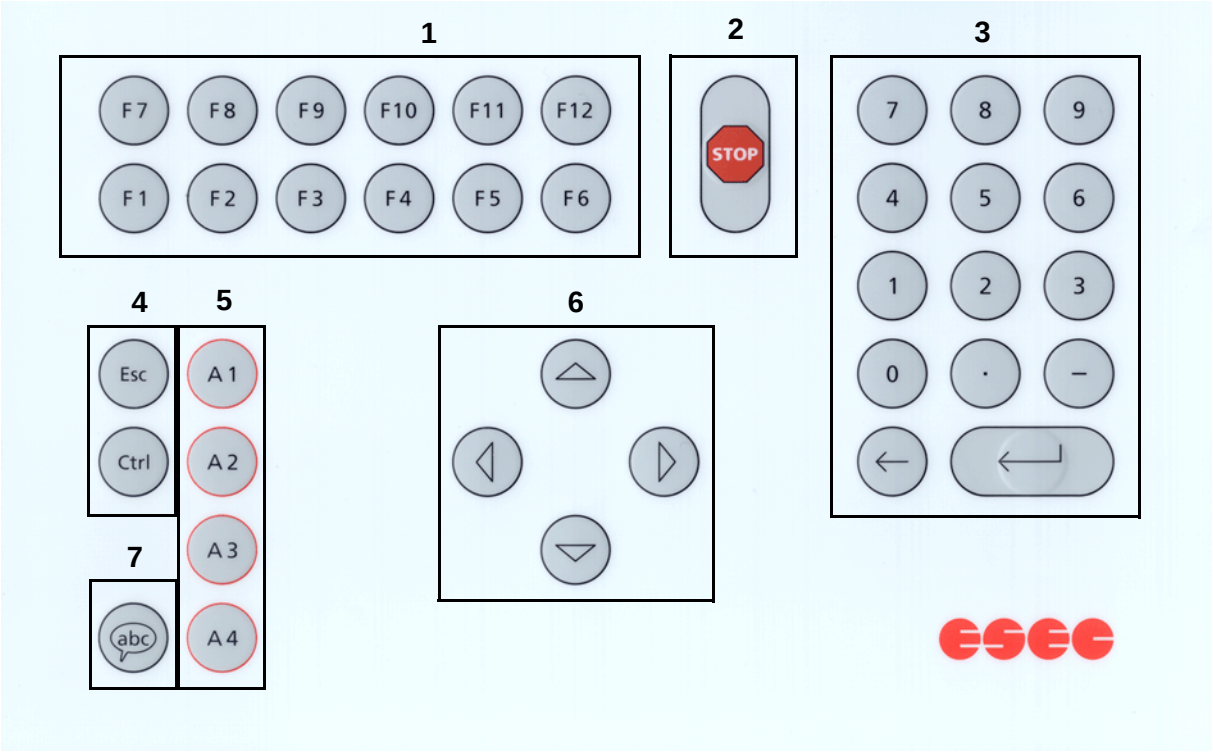
See *Graphical User Interface (GUI)* on page *4-13*.

© 2009 Esec Ltd.

4.3 Production Keyboard

4.3.1 Keypad Segments

The keypad is optimized for the use in customer‘s production line by the operator. Several keys allow direct access to the most used assist functions in production without any navigation on the GUI.



Pos.	Description
1	Function Keys Might be used as an alternative to the mouse to clicking the soft keys. The position of the function keys correspond with the position of the soft keys on the monitor.
2	Stop Key Might be used as an alternative to the mouse to clicking the stop soft key.
3	Numeric Keypad Is used to enter numeric values in dialogue boxes when defining parameters and adjusting the machine (corresponding to number keys in the **alphanumeric** section of the PC keyboard). Pressing BS (back space) deletes the character to the left of the cursor. The ENTER key may be used as an alternative to the mouse to clicking the OK button.

© 2009 Esec Ltd.

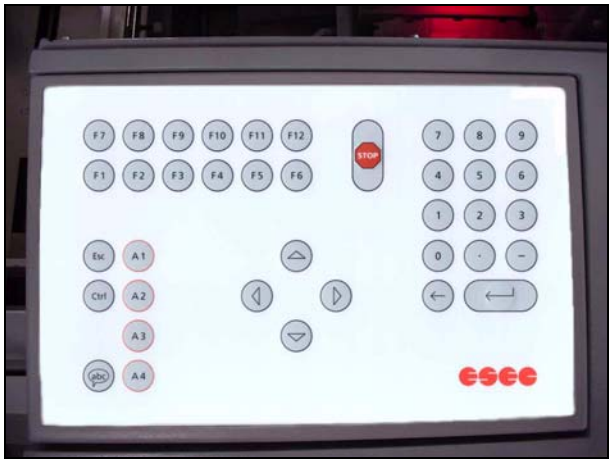
/ (May 29, 2009)

Pos.	Description
4	Screen Control Keys Esc (Escape): selects the previous menu or within a dialogue box it cancels any changes made. Ctrl (Control): changes the function of the soft keys. In any menu, pressing the Ctrl key will result in the following soft keys: • **Color mode / Monochr. mode:** selects the pseudo-color image on the camera currently selected on the inspection monitor. After using the soft key toggles to "Monochr. image", which returns the monitor to the standard black and white image. • **Cam. Fn:** toggles selected camera between real time and shutter mode. • **Sel. cam:** changes the camera currently selected for display on the inspection monitor. • **Ejector:** moves the die ejector in the desired direction.
5	Alarms (similar to diagnostic message buttons (soft keys))
6	Motor Cursor Keys Used to control the movement of the motorized units during calibration and teaching, i.e. moving the dispensing nozzle up and down or moving the TOS forwards and backwards. Depending on what unit is currently selected, the movement will be in X, Y or Z axes.
7	Language Key Toggles between the various languages

© 2009 Esec Ltd.

4.3.2 Keyboard Placement

Usually the production keyboard is placed in its tray. It is provided with a 3m cable.

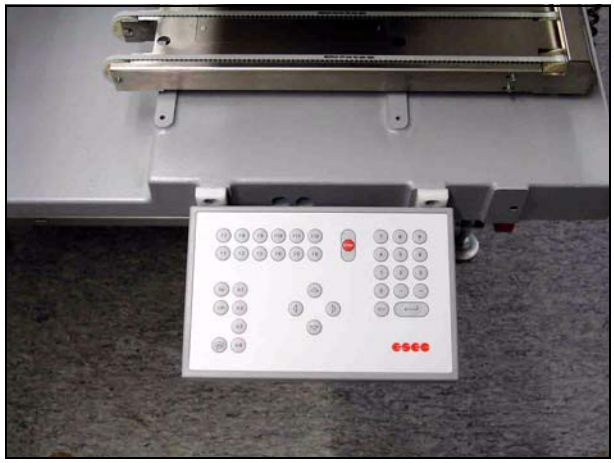


/ (May 29, 2009)

The production keyboard can be removed from its tray and used remotely.

This is particularly useful when making visual alignments at various points around the machine.

On input and output side of the machine, supports are mounted to hang the production keyboard to free the operator's hands for adjustment tasks.



© 2009 Esec Ltd.

4.4 Alphanumeric Keyboard / Mouse

A standard alphanumeric keyboard (1) is placed in back of the cover below the mouse pad. It is used for entering text (strings) and has some shortcut combinations for special functions.

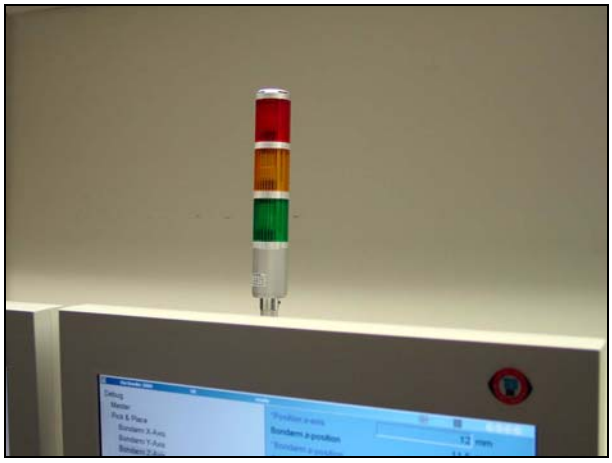
Mini mouse (2) with two mouse buttons and a scroll wheel is used for the navigation on the GUI to select menus, parameters, sliders etc.

/ (May 29, 2009)

4.5 Lamp Indicator Post

The programmable signal lamp provides visual warnings of the machine status.

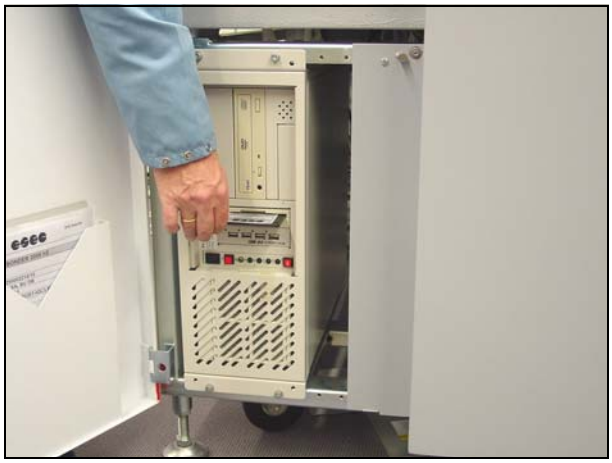
An audible signal is also built in.



4.6 Floppy Disk & DVD/CD-ROM Drive

The floppy disk drive allows to store recipe files and machine data on diskette.

It also provides a possibility of updating the control software.



The DVD/CD-ROM drive allows to install control software, recipes and to transfer data.

© 2009 Esec Ltd.

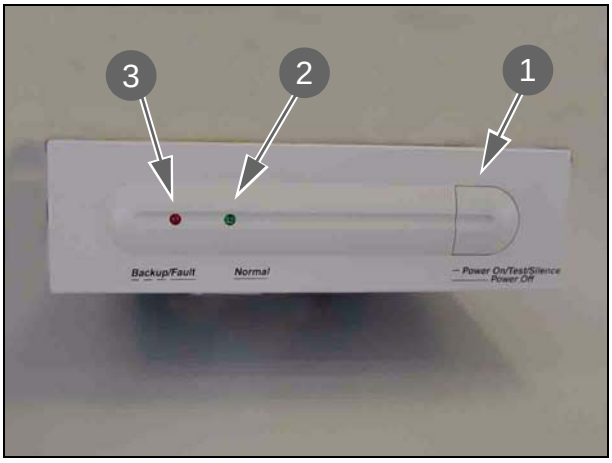
4.7 Uninterruptable Power Supply (UPS)

The UPS EPD 330i is an option and not installed on standard machines.

Power on / off switch (1)

Green LED (2), regular operation

Red LED (3) and beeper
- 1 beep per 2 seconds -> backup mode
- 4 beeps per second -> low battery
- continuous beep -> overload



© 2009 Esec Ltd.

4.8 Graphical User Interface (GUI)

In addition with keyboard and mouse the GUI represents the interface between machine and its users.

The guidelines are based on:

1) The SEMATEC user interface style guide

2) The windows interface guidelines for software design ISBN: 1556156790

3) ESEC internal concepts and guidelines for corporate identity

4.8.1 Color Definitions / Icons

General Screen Layout

Object	Colour
Windows Background	grey
Title bar	blue
Alarm / Alarm Pending / Stop	red
Start	green

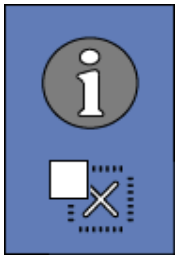
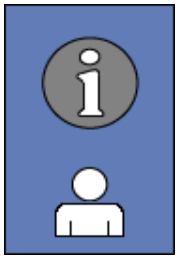
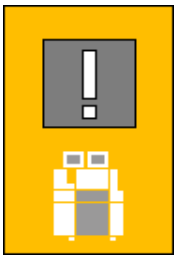
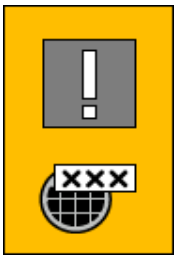
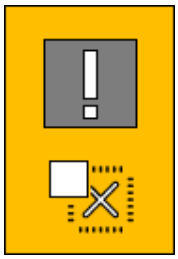
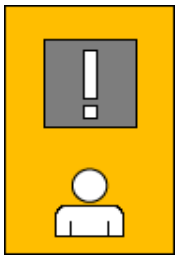
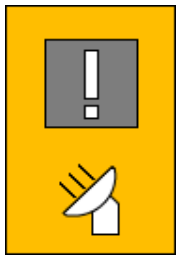
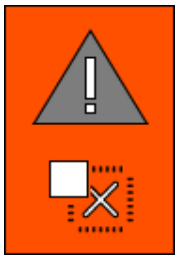
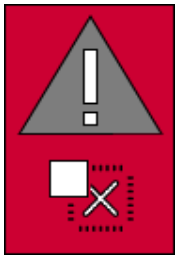
Overview Screen

Status	Colour
Inactive machine component	grey
Machine component not initialized	yellow
Machine component not calibrated	orange
Special mode (information etc.)	red

© 2009 Esec Ltd.

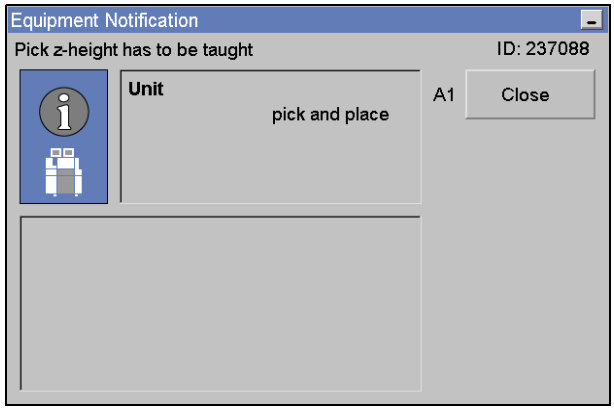
Alarm Screen Messages (Diagnostic Conditions)

The diagnostic messages are divided into 4 severity levels which are recognizable with the used background colors and 5 categories recognizable with the used symbols.

Severity	Equipment	Material	Process	Operator	Host
Notifications (blue)					
Warnings (yellow)					
Failures (orange)					
Alarms (red)					

Notifications

Information only. All hints and messages related to the operation of the equipment with no impact to production and no direct consequences to the bond process. Also usable as a dialog (step) within a wizard like sequence.



© 2009 Esec Ltd.

Notifications (Cont.)

Equipment notification: information about issues related to actions of the equipment. Result messages form terminated actions.

Material notification: information about issues related to material handling and consumables.

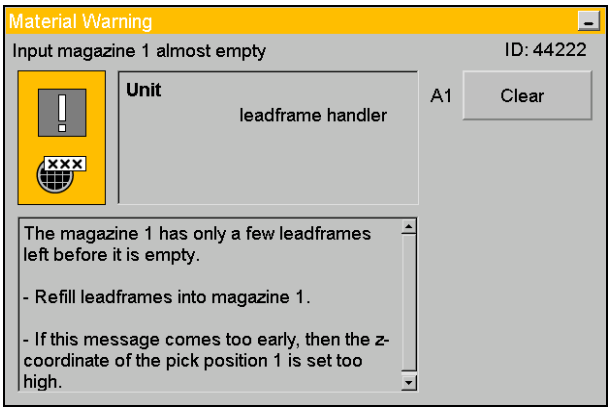
Process notification: information about issues related to process and its setup.

Operator notification: information about issues related to equipment operation (e.g. navigation, entering data or selecting modes).

Host notification: information about issues related to host (e.g. messages from host or from equipment about host issues).

Warnings

Message to prevent a potential failure. hints and messages with consequences to the bond process.



Equipment warning: any issues that are supervised by the system likely to cause any errors if no user action will be taken.

Material warning: detection of consumables warning limits exceeding. Detection of any unexpected value out of a measurement done in connection with the material handling.

Process warning: bond quality analyzer (BQA) detects exceeding limits. Detection of any unexpected value out of a measurement done in connection with the process.

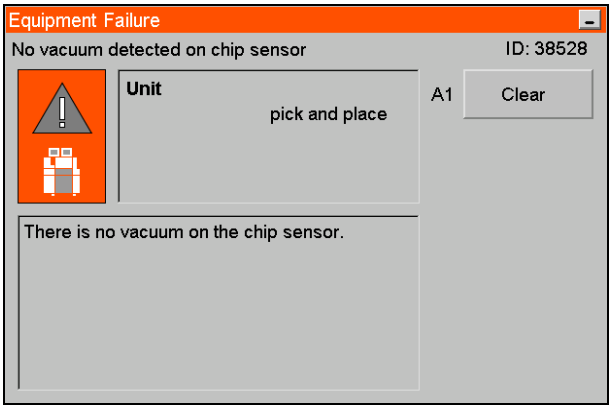
Operator warning: operator actions, that are not allowed in the current context and may lead to a failure if continued or repeated.

Host warning: host actions, that are not allowed in the current context and may lead to a failure if continued or repeated (to inform the user). And: warnings from host (or host operator) to machine operator.

© 2009 Esec Ltd.

Failures

Failures which have to be solved by user interaction to continue production or any running command. Escalation of warnings.



Equipment failure: failures that are caused by the equipment itself or the facilities, leading to an immediate interruption of any actions / commands running.

Material failure: any material related equipment stops as crashes and unexpected behavior of modules involved into a material transport command.

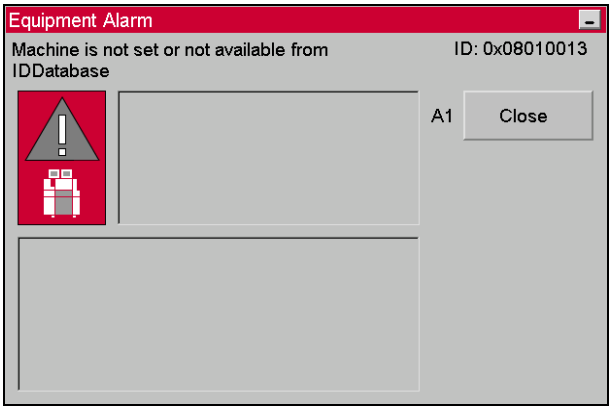
Process failure: any interrupts of a wire cycle at a non-safe position (all positions except after a correctly formed tail). Any PRS actions after non successful auto-recoveries/retries as specified in the current settings.

Operator failure: any interrupts of any commands caused by the operator. Actions, that are not allowed in the current context and already caused some actions that are not possible to undo.

Host failure: any interrupts of any commands caused by the host (i.e. the equipment informs the operator about a host failure). Also to use for communication failures (retry timeout expired).

Alarms

Mistakes that may lead to damage of equipment or injuries / hazard of personnel.



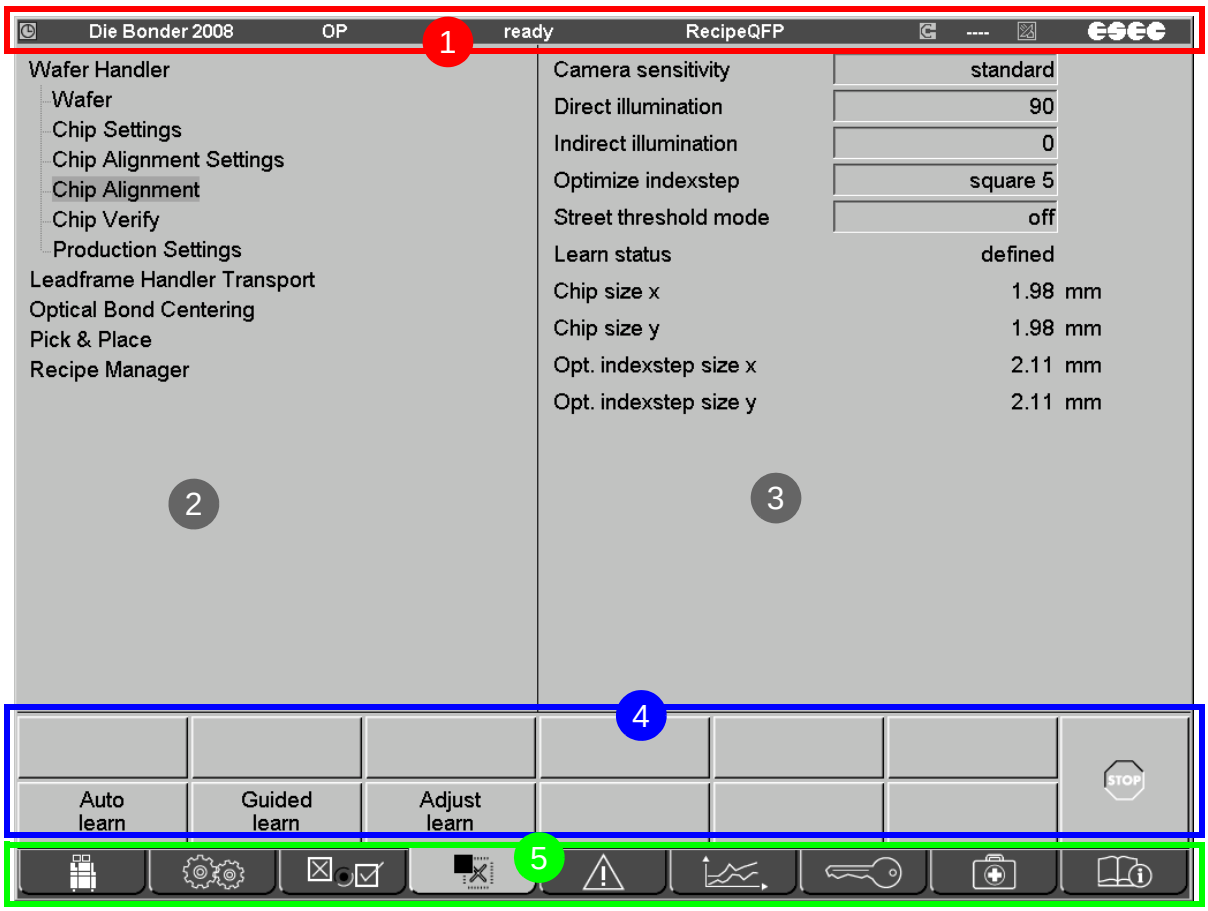
Equipment alarm: mistakes that may lead to damage of equipment. Mostly not solvable by software actions, i.e. may require corrective actions by equipment user.

Operator alarm: mistakes that may lead to injuries or hazard of personnel. Specially all the safety relevant diagnostic conditions.

© 2009 Esec Ltd.

4.8.2 Screen Zones

The screen is divided into five main sections. This structure will appear on most of the screens.



(1) Title bar

- Clock (tool-tip will show actual time)
- Equipment name (assigned name)
- User (tool-tip will show whole name)
- Equipment mode
- Recipe name
- Host communication

(2/3) Information panel

- (2) Navigation (menu tree)
- (3) Parameter list

(4) Function panel

- Depending on the shown menu or procedure, the function keys are assigned to various commands. The function bar shows the appropriate assignment.

© 2009 Esec Ltd.

(5) Control panel

1 2 3 4 5 6 7 8 9

Pos.	Tab Name	Description
1	Overview	Machine status, default view, log in/out
2	Produce	Production, production monitoring
3	Setup	Recipe management, production setup, assists, adjustments, optimize production, production aspects
4	Teach	Recipe management, creating and modifying recipes, optimize process
5	Alarms	Alarm manager (history)
6	Statistics	Monitoring, RTC, SPC
7	System	Equipment configuration and calibration, system administration (software installation, users / user levels)
8	Debug	Status, testing functions, debugging, tracing
9	Info Page	Direct access to all help information, access to e-paper version of manuals

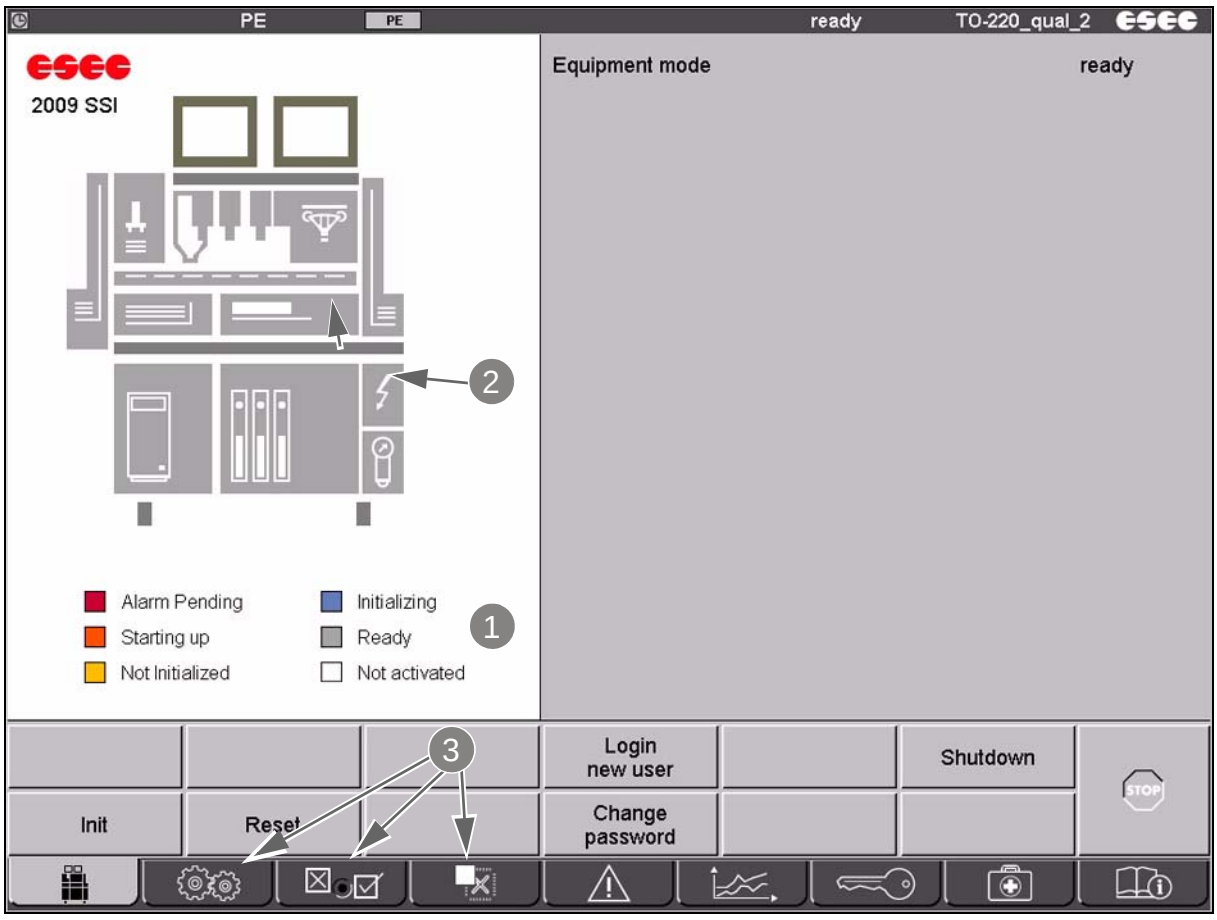
© 2009 Esec Ltd.

4.8.3 Control Screens

Zap the Control Screens Back and Forth

While changing the screens (control tabs), state and inputs will always be kept.

Overview

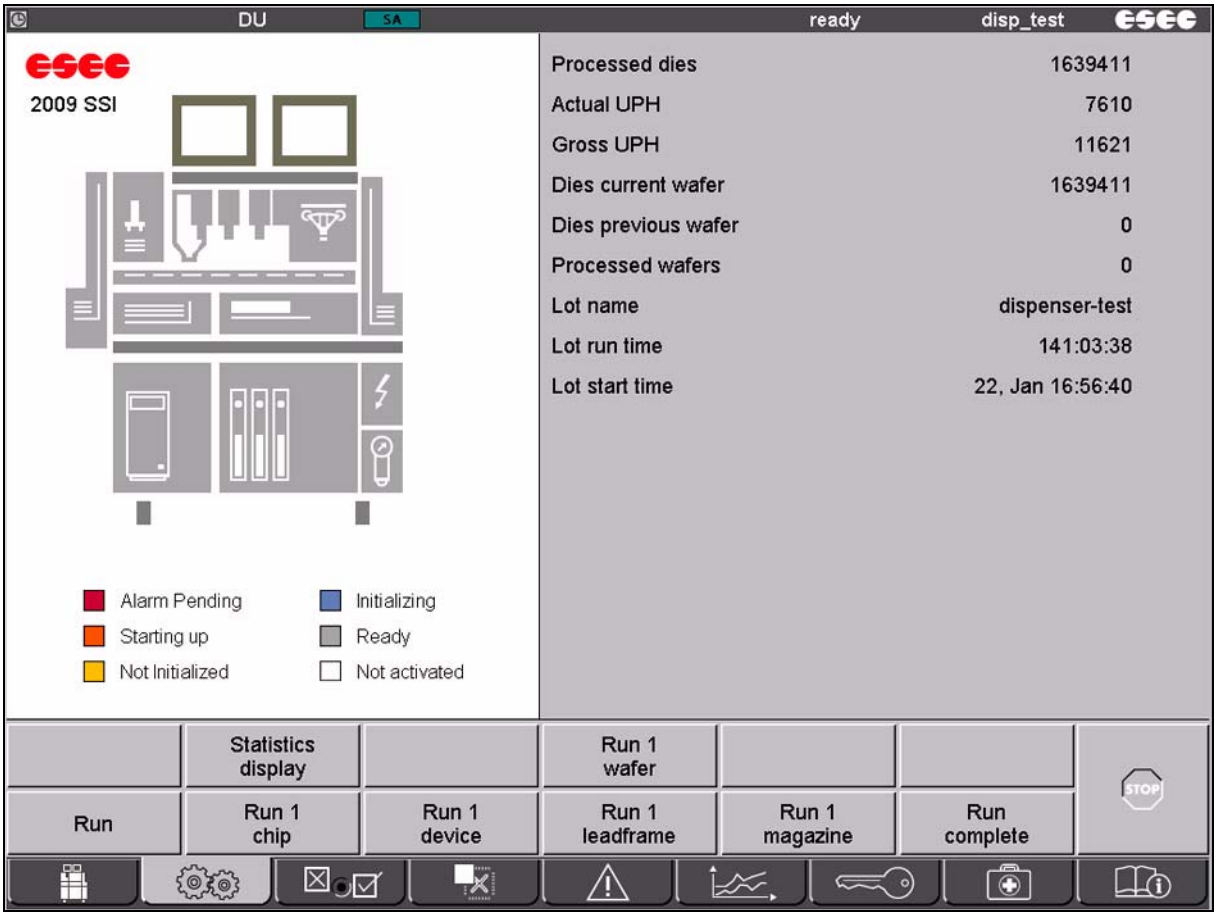


On the overview screen the colour indicates the status of the appropriate module.

Legend (1)	describes the various status with its color assignment (see also *Color Definitions / Icons* on page *4-13*).
Tool-tip (2)	Verbal status description, shown when mouse cursor is over the module.
Control tabs (3)	Some control tabs are inactive, as long as not all modules are ready

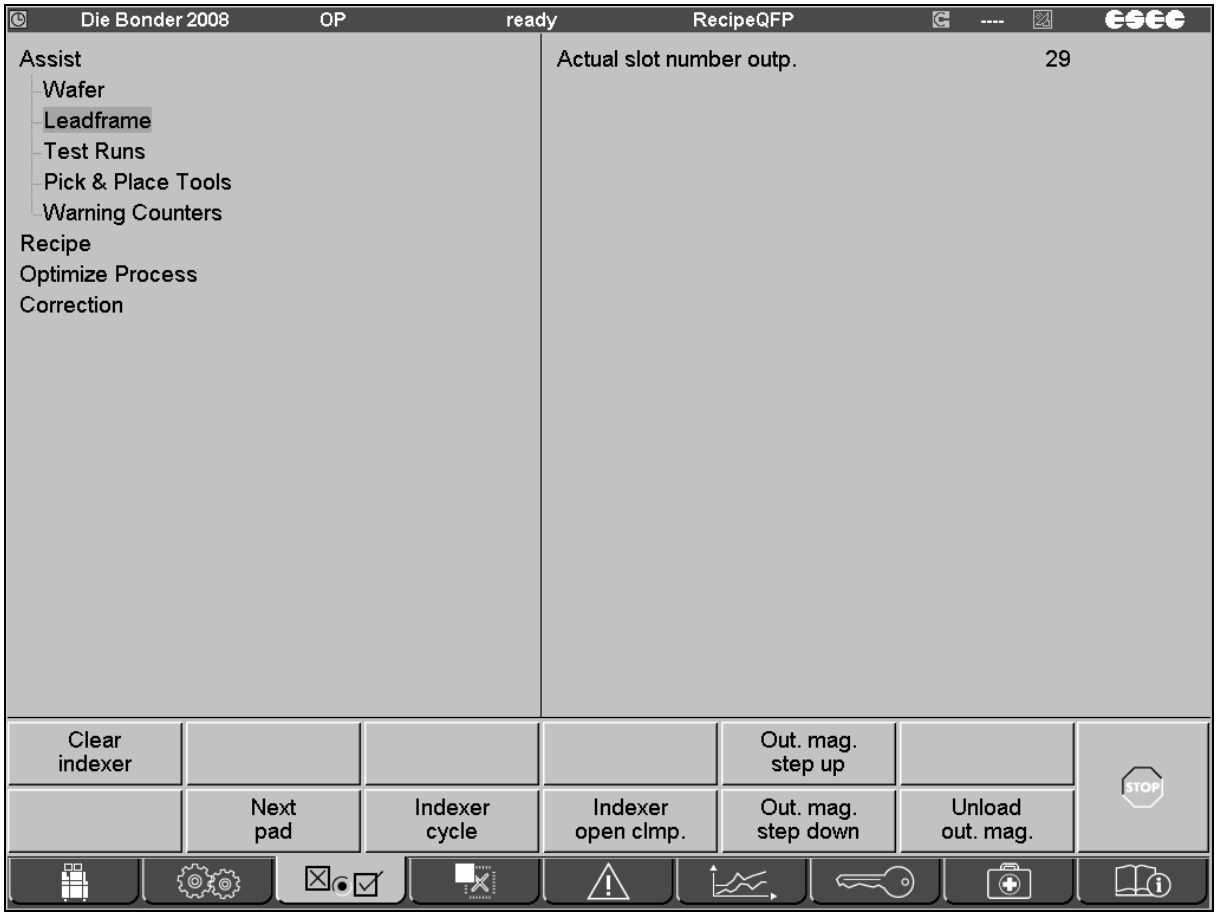
© 2009 Esec Ltd.

Produce



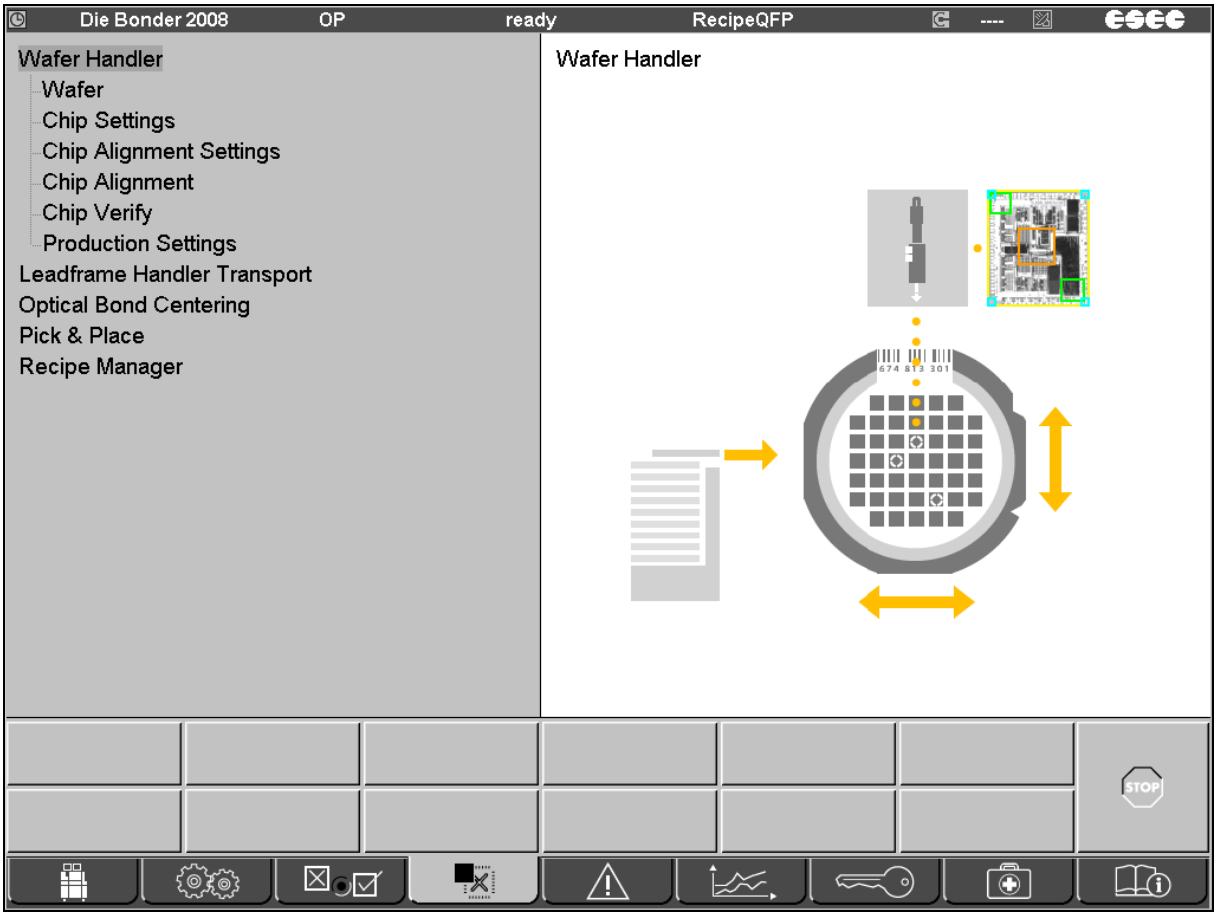
© 2009 Esec Ltd.

Setup



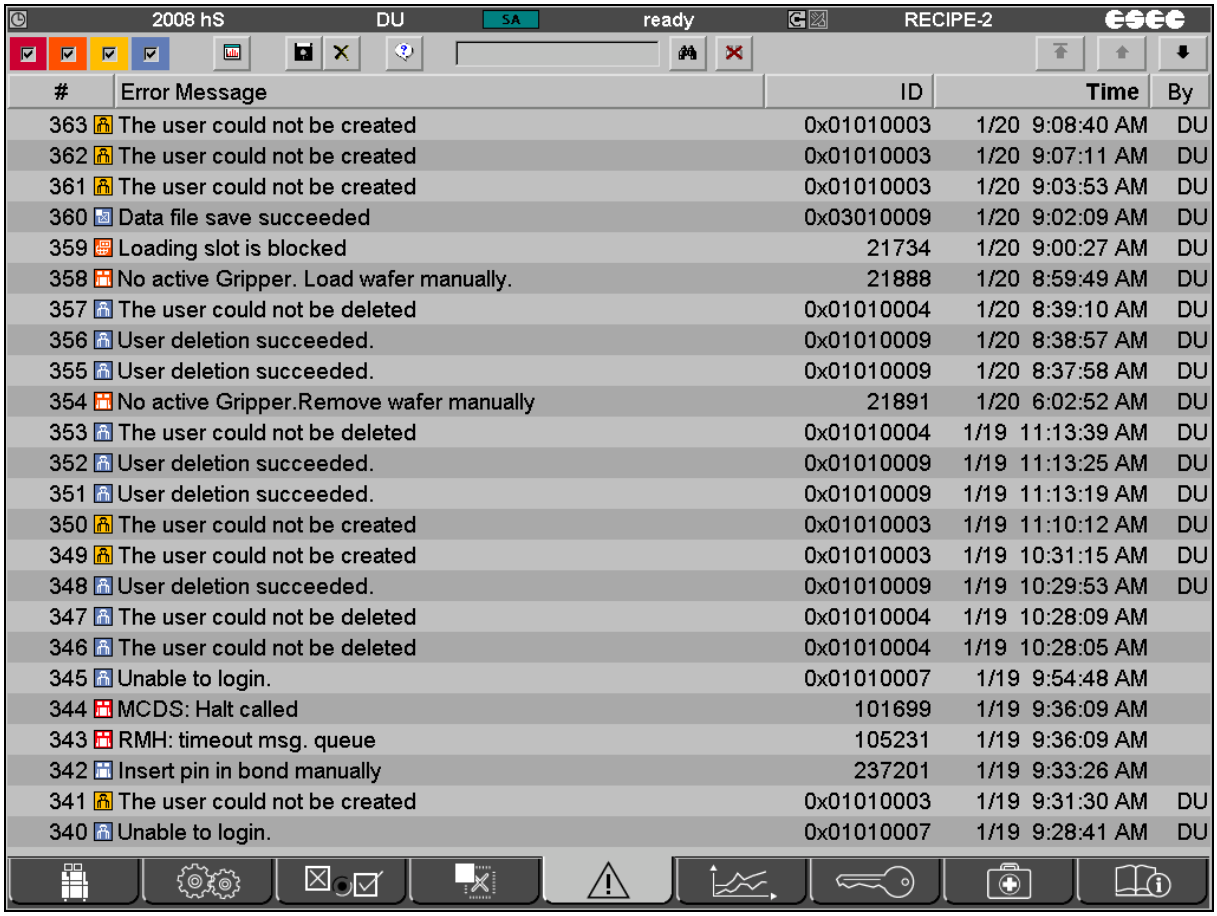
© 2009 Esec Ltd.

Teach



© 2009 Esec Ltd.

Alarm

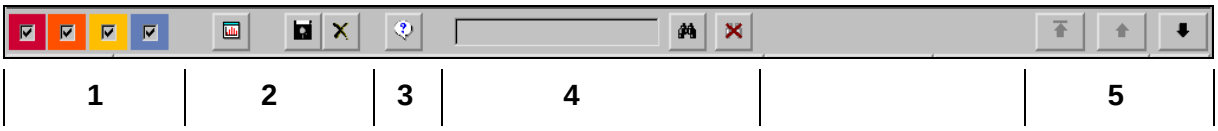


#	Error Message	ID	Time	By
363	The user could not be created	0x01010003	1/20 9:08:40 AM	DU
362	The user could not be created	0x01010003	1/20 9:07:11 AM	DU
361	The user could not be created	0x01010003	1/20 9:03:53 AM	DU
360	Data file save succeeded	0x03010009	1/20 9:02:09 AM	DU
359	Loading slot is blocked	21734	1/20 9:00:27 AM	DU
358	No active Gripper. Load wafer manually.	21888	1/20 8:59:49 AM	DU
357	The user could not be deleted	0x01010004	1/20 8:39:10 AM	DU
356	User deletion succeeded.	0x01010009	1/20 8:38:57 AM	DU
355	User deletion succeeded.	0x01010009	1/20 8:37:58 AM	DU
354	No active Gripper.Remove wafer manually	21891	1/20 6:02:52 AM	DU
353	The user could not be deleted	0x01010004	1/19 11:13:39 AM	DU
352	User deletion succeeded.	0x01010009	1/19 11:13:25 AM	DU
351	User deletion succeeded.	0x01010009	1/19 11:13:19 AM	DU
350	The user could not be created	0x01010003	1/19 11:10:12 AM	DU
349	The user could not be created	0x01010003	1/19 10:31:15 AM	DU
348	User deletion succeeded.	0x01010009	1/19 10:29:53 AM	DU
347	The user could not be deleted	0x01010004	1/19 10:28:09 AM	
346	The user could not be deleted	0x01010004	1/19 10:28:05 AM	
345	Unable to login.	0x01010007	1/19 9:54:48 AM	
344	MCDS: Halt called	101699	1/19 9:36:09 AM	
343	RMH: timeout msg. queue	105231	1/19 9:36:09 AM	
342	Insert pin in bond manually	237201	1/19 9:33:26 AM	
341	The user could not be created	0x01010003	1/19 9:31:30 AM	DU
340	Unable to login.	0x01010007	1/19 9:28:41 AM	DU

The alarm screen displays a history list of failures for a selectable period of time generated by the alarm manager. All failure categories can be shown separately or together by selecting the red, orange, yellow or blue checkboxes.

© 2009 Esec Ltd.

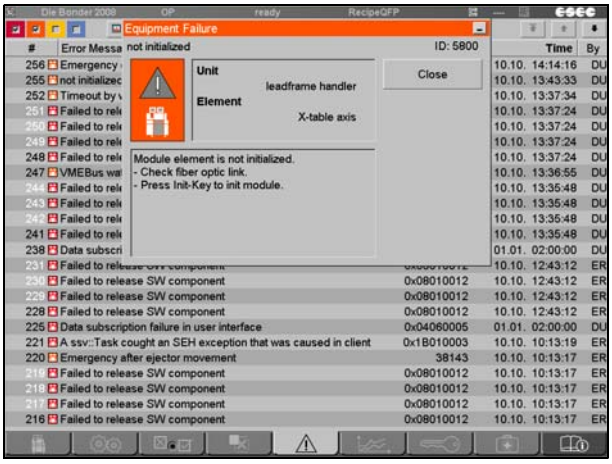
Alarm Screen Toolbar



Pos.	Tab Name	Description
1	Severity Filter	Only messages with ticked severity will be displayed, see *Alarm Screen Messages (Diagnostic Conditions)* on page *4-14*
2	History Graph Export History Delete History	Toggle button for graphical display of message frequency
3	View Diagnostic Conditions List	
4	Full Text Search	
5	Scroll Buttons	

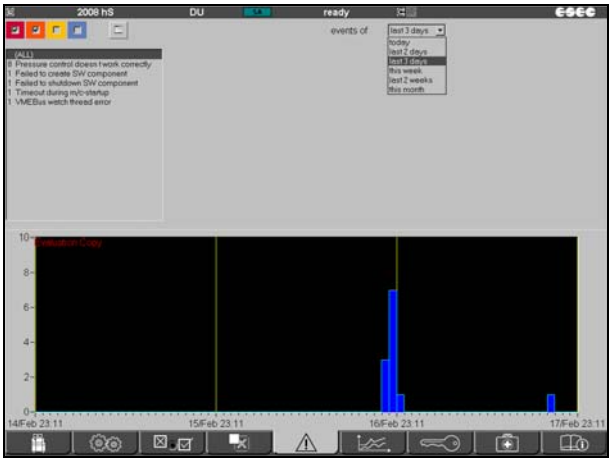
Clicking on a specific alarm will show detailed information.

For color meanings and diagnostic conditions see *Alarm Screen Messages (Diagnostic Conditions)* on page *4-14*.



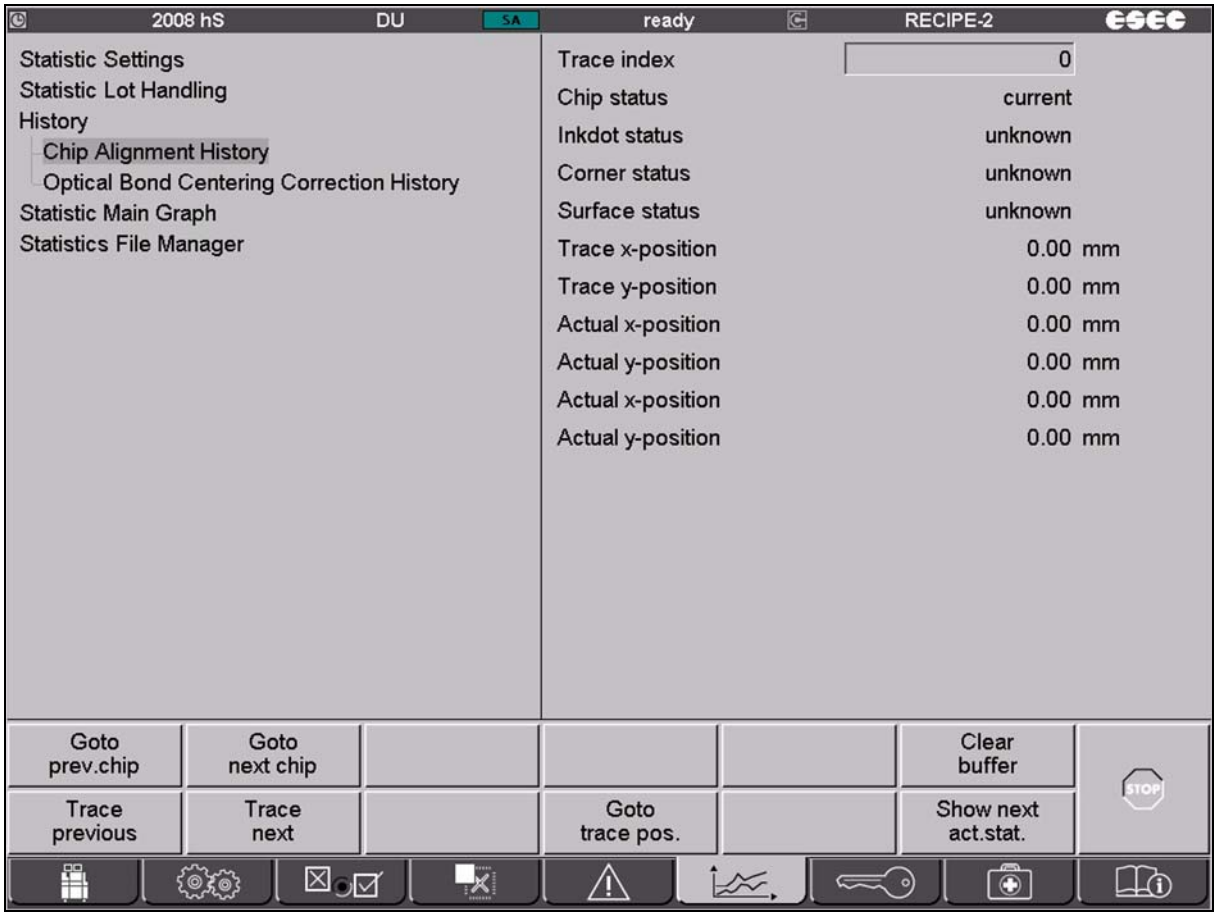
Clicking the ***History Graph*** toggle button will show the frequency of the various messages.

Click the button again to leave the screen and go back to the alarm screen.



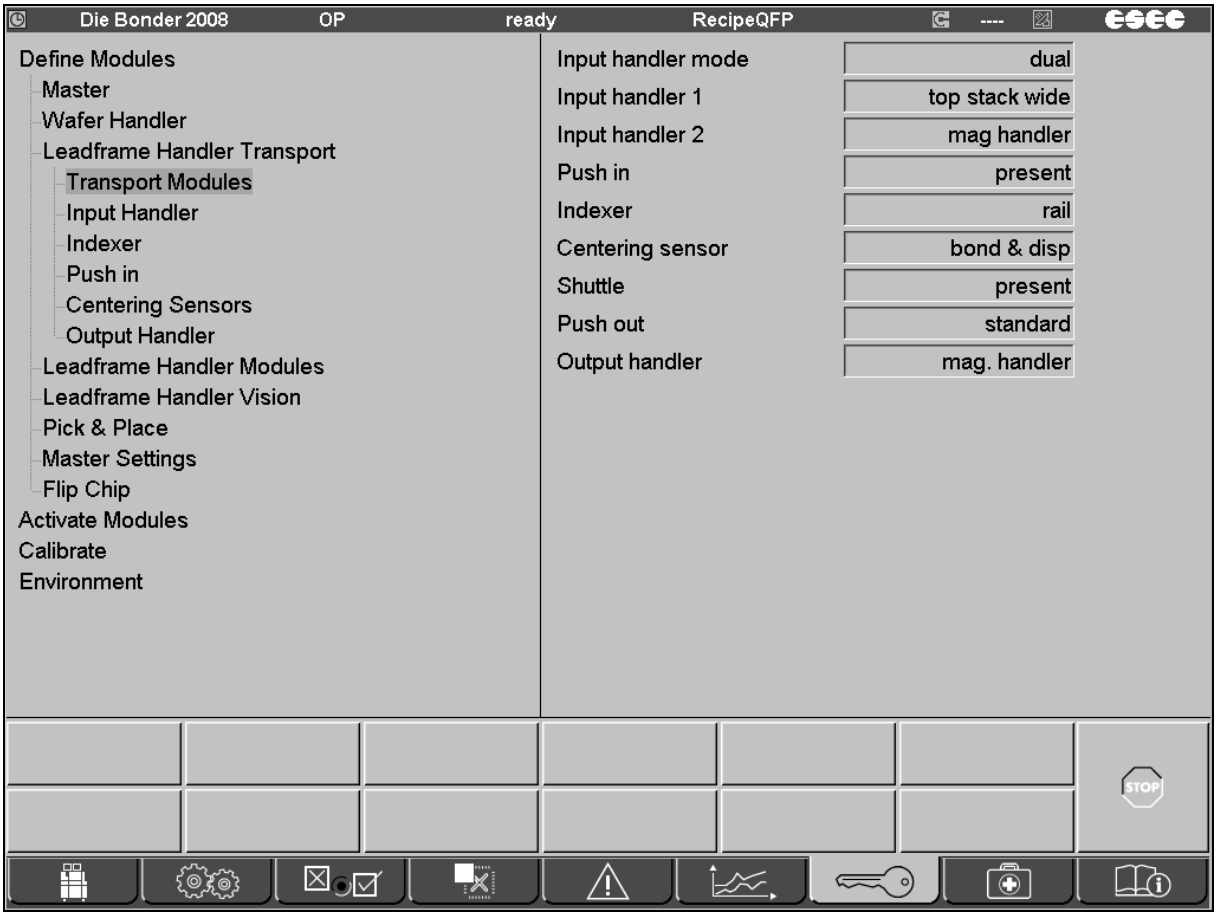
© 2009 Esec Ltd.

Statistics



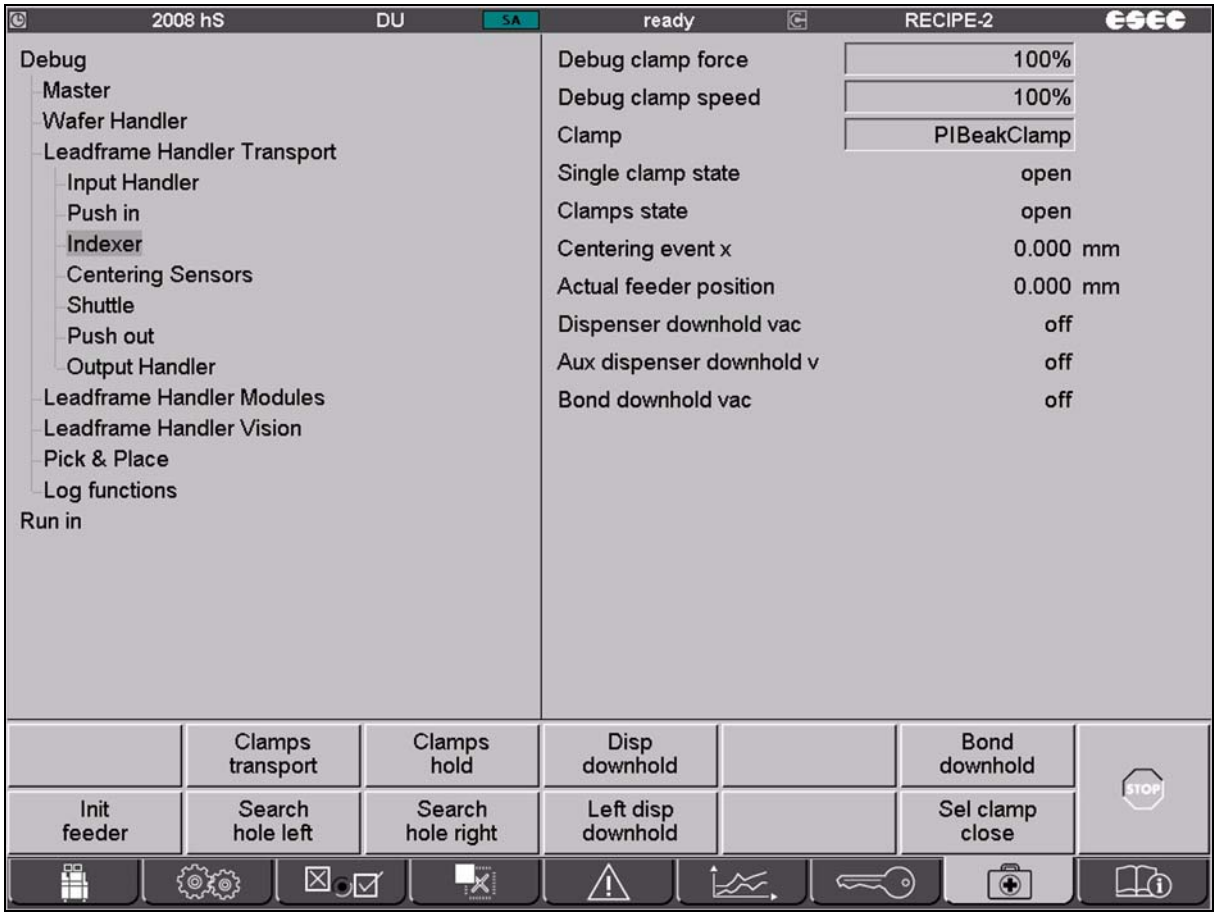
© 2009 Esec Ltd.

System



© 2009 Esec Ltd.

Debug



© 2009 Esec Ltd.

Info Page

The Info Page contains several user information as e-paper media:

- Installation Manual
- Operating Manual
- Maintenance & Service Manual
- Spare Parts Manual
- Schematic Manual
- Option Manuals
- Retrofit Kit Instructions
- Animations
- Video sequences
- Overviews

© 2009 Esec Ltd.

4.8.4 Help Functions

Help on Information and Function Panel

Right mouse button on navigation panel or on a parameter in the parameter panel pops-up three selections:

Translation
Help
About

Translation to translate the parameter name, navigation point or key to another language.

Help to get context sensitive help of the parameter, navigation point or the key.

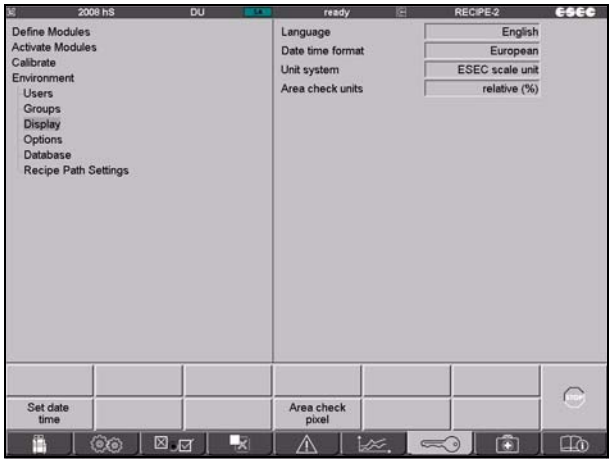
About to get information about the software.

4.8.5 Text Translation

To translate parameter names, navigation or menu points and soft keys follow the *Help Functions* on section *4.8.4* on page *4-29*.

4.8.6 Changing the Display Formats

Environment
Display



Language:
Switch between languages.

Date time format:
Change the date or time format.

Unit system:
Switch between ESEC default settings and customized settings for each parameter's unit of measure.

Area check units:
Toggle between relative or absolute presentation.

© 2009 Esec Ltd.

© 2009 Esec Ltd.

/ (May 29, 2009)

5 Production Setup

CAUTION

For better visibility of subjacent functions covers have been removed before taking pictures. In standard operating mode all covers have to be in place at any time (see Safety Chapter).

5.1 Powering up the Machine

WARNING

Before switching the machine on make sure that:

- ***All personnel in the vicinity of the machine are clear of potentially hazardous machine equipment, and are aware that the machine is to be switched on.***
- ***All screws are in place and secure.***
- ***All protective covers are in place and correctly secured. Protective covers are:***
  - ***The cover of the wafer table***
  - ***All pick and place covers***
  - ***The automatic wafer loader apron***
  - ***All side and back covers.***
- ***The centre drawer is closed and locked.***
- ***All electrical and pneumatic system connections are properly made or isolated.***
- ***All loose items (tools, materials etc.) are removed from the machine.***
- ***Replace any missing or damaged warning decals. The part numbers are:***
  - ***Electrical hazard 100.0017.1***
  - ***Moving parts 240.0119.1***

When the soft key Init is pressed, parts of the machine will move for initialization. Keep hands, loose clothing and tools clear of all moving parts.

© 2009 Esec Ltd.

/ (May 29, 2009)

Powering up the Machine

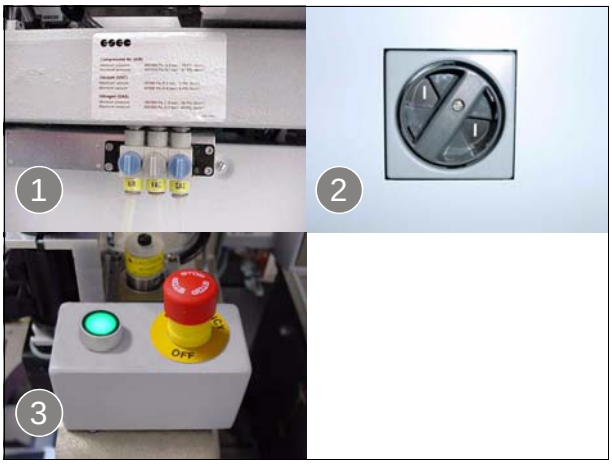
Set the compressed air, gas and vacuum valves to on (1).

Turn the main power switch to on “I” (2).

- the green release button (3) is illuminated.
- the PC, machine control and peripherals remain off.
- the UPS starts charging the accumulator (with UPS only).

Press the green release button (3).

The PC, machine control, peripherals and the machine operating system starting up now.



In case the dialogue box **Enter User Name and Password** appears, enter the following:

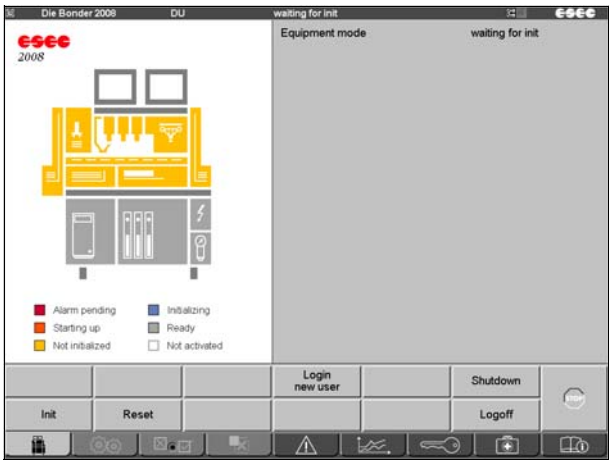
User Name: Defaultuser
Password: esec

OK

Wait until the start up sequence is finished and the title bar shows `Waiting for init`.

Init

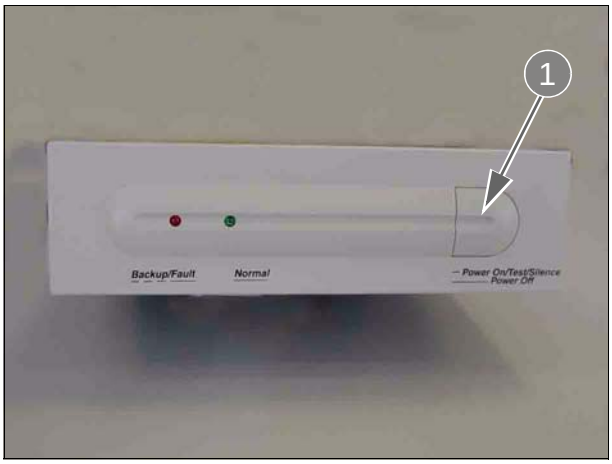
The machine is now initializing. It checks all the modules and moves the axes to the init position.



Error Recovery with UPS

In case of complete discharge of the accumulator or replacement of the accumulator it may be required to manually turn on the UPS by pressing the Power On button (1).

The UPS is located at the rear of the machine, close to the power connection.



© 2009 Esec Ltd.

5.2 Shutting down and Stopping the Machine

5.2.1 Regular Shut-down

Run complete

The machine will continue processing all the leadframes on the indexer, but the input handler will stop the leadframes. After doing so the machine will stop.

Use the **Assist** menu to unload the materials if required.

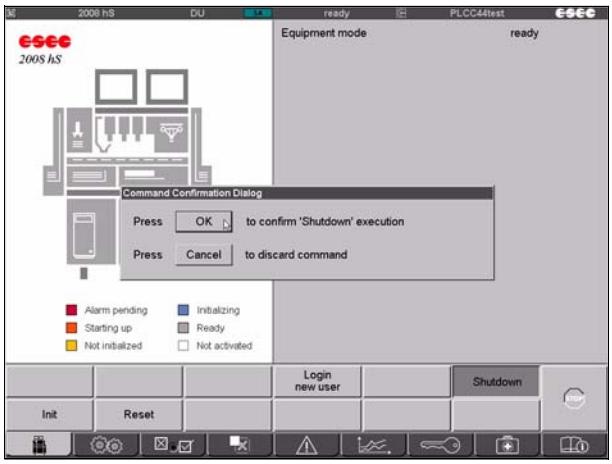
Overview

Shutdown

OK

The operating system is now shutting down.

Wait until the monitors turns to black (no signal).



Note: Clicking the soft key ***Shutdown*** on User Interface (HMI) will perform a controlled shutdown of the PC only. The VME unit still has power as long as the mains switch stays on.

NOTICE

To prevent damages to the PC wait until the system shutdown has completed (monitors turns to black) before the mains switch is switched off to disconnect the power.

Turn off the main switch „0“.

When the main switch is turned off, all modules of the machine will be off power.

Note: The accumulator of the UPS will not be charged as long as the main switch is turned off (UPS only).

If you want to restart the machine, wait at least 20 seconds to turn on the main switch and continue the procedure according to section *Powering up the Machine* on page *5-1*.

© 2009 Esec Ltd.

5.2.2 Emergency Stop

Actuating the Emergency Stop

In case of emergency, press the red emergency stop button.

The red emergency stop button is located in front of the pick and place unit.

The machine immediately stops all the mechanical movements to prevent operator injury or damage of the equipment.

The PC and the monitors are still under power.

Note: Pressing the emergency stop button disconnects the power to the VME units. This will lead to alarms like `VMEBus watch thread error` etc.

Release Emergency Stop and Restart Machine

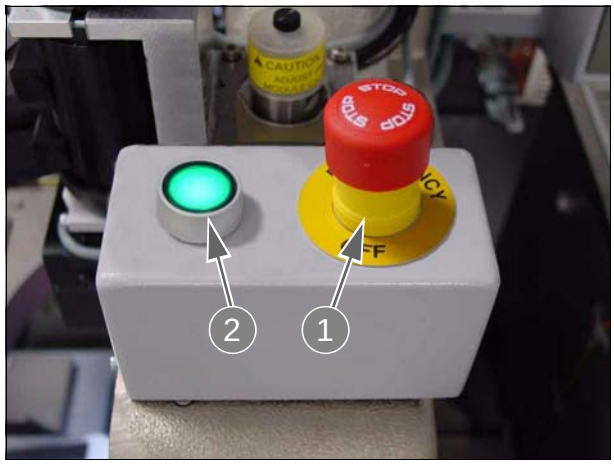
WARNING

Before recovering the emergency stop remedy all causes of the emergency stop.

After the red emergency stop button has been pressed, the machine can be recovered as follows:

Release the emergency stop button (1). Turn the red cap of the emergency stop button clockwise until the switch snaps in the released position.

Press the green release button (2).



© 2009 Esec Ltd.

Release Emergency Stop and Restart Machine (Cont.)

Press **Alt** + **Tab** keys simultaneously to get the **ESEC Starter** menu.

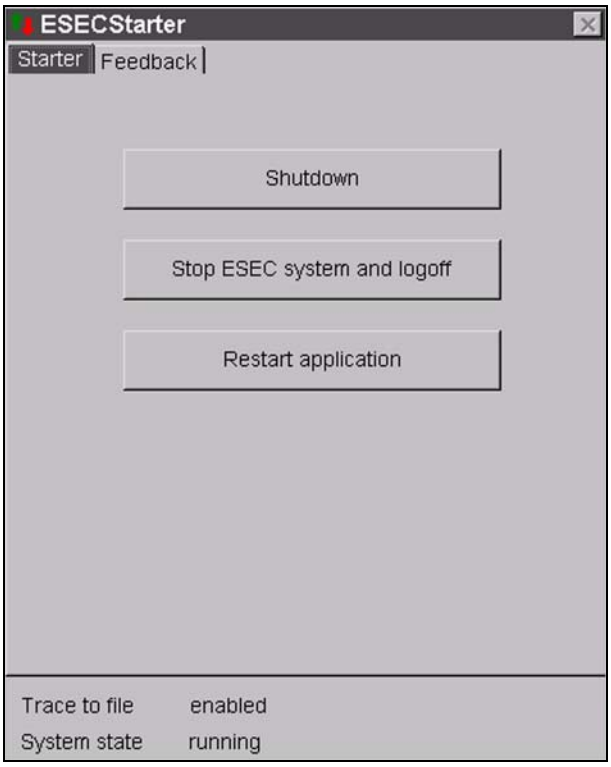
Restart application

The ESEC system will start up again

Wait until the startup process is finished and the title bar shows `Waiting for init`.

Init

Now the machine is initializing. It checks all modules and moves the axes to the init position.



5.2.3 Un-ordered Stops

If during normal production, the machine stops for any reason, the red signal lamp lights up to indicate that the machine has stopped and requires operator intervention.

This may happen for a number of reasons, i.e., due to an error - such as a jammed leadframe or shortage of material (no leadframes or solder), or it may be planned, i.e., to allow the operator to enter the wafer mapping reference location. Whatever the reason for stopping, a dialogue box is displayed on the screen. These details give the cause of the stop.

The action taken depends upon the type of problem. For example, if it is a material error, i.e., no leadframes, all that is required is replenishment of the material required, followed by clicking on ***Run***, production will then continue normally.

If the problem is more serious, such as a jammed leadframe, the help key on the alarm box should be used to obtain further information for troubleshooting. If the problem is resolved by actions such as removing a leadframe from the indexer by hand, ***Clear indexer*** must be used before ***Run***. This is because the machine tracks the progress of each leadframe and the counters must be reset to zero before restarting.

Likewise, ***Clear indexer*** should always be used before ***Reset*** is operated.

© 2009 Esec Ltd.

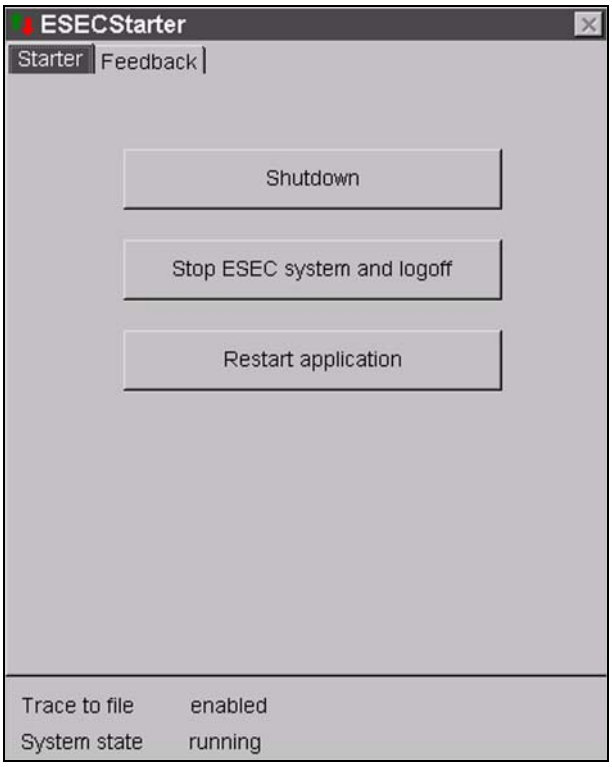
5.2.4 Shut down at Unusual Conditions or Logoff for Service Purposes

ESEC Starter Menu when Logged in as DefaultUser

The **ESEC Starter** program is always running on background and can be used:

- to shutdown all,
- to shutdown the ESEC system,
  and switch between the two MS Windows users,
- to restart the ESEC system after a crash,
- or to enter the Internet Explorer.

For a better understanding, the various possibilities are explained in the table below.



Shutdown	Shutdown the ESEC system and MS Windows software. This soft key has the same function like the ***Shutdown*** key on the overview screen.
Stop ESEC system and logoff	Shutdown the ESEC system. This soft key is used to switch from MS Windows User “DefaultUser” to “Administrator” (see section *MS Windows Software User* on page *4-2*).
Restart application	Shutdown the ESEC system only and restart it afterwards. This soft key is used after system crashes or unstable behavior.

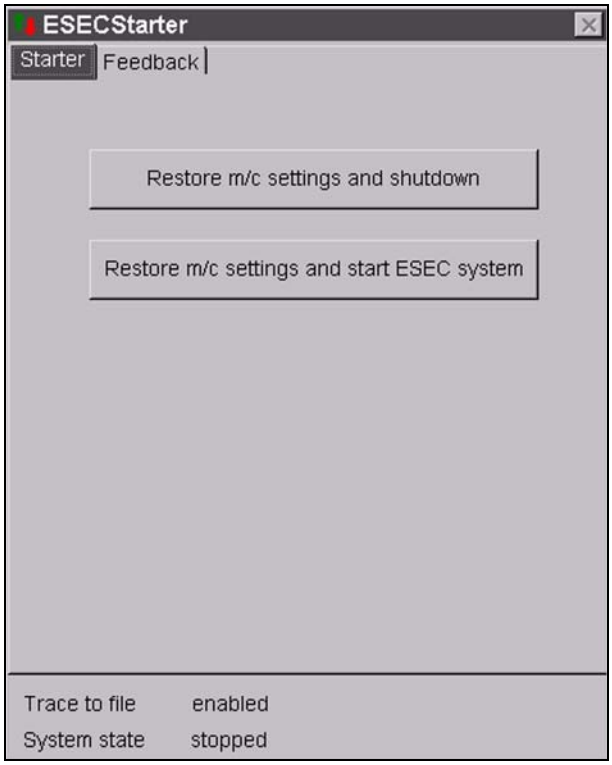
© 2009 Esec Ltd.

ESEC Starter Menu when Logged in as Administrator

The **ESEC Starter** program is always running on background and can be used:

- to shutdown the PC,
- to start the ESEC system
- or to enter the Internet Explorer.

For a better understanding, the various possibilities are explained in the table below.



Restore m/c setting and shutdown	This will shutdown the PC and restore the settings in such a way as the next start-up of the machine will automatically log-in the "DefaultUser".
Restore m/c setting and start ESEC system	This will logoff the Administrator, login the DefaultUser and start the ESEC system.

© 2009 Esec Ltd.

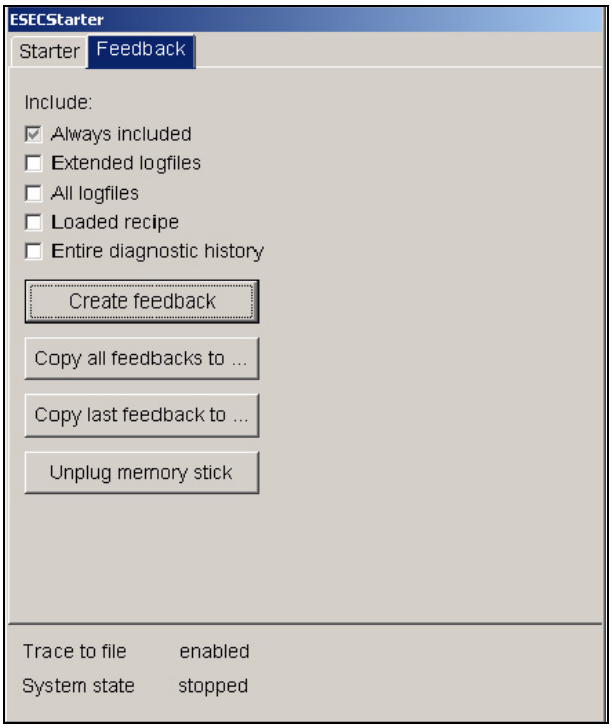
5.2.5 Feedback Report

Description

The feedback report (FBR) is a new feature of SCS12.0.

Feedback report handling is part of the ESECStarter and its user interface is entered by selecting the 'Feedback' tab.

Note: FBRs are very helpful for analyzing SW related problems!



Data Included in an FBR

An FBR contains a "snapshot" of the current M/C state as well as some history data (during production approx. 15min-30min depending on UPH, during menu mode like Teach, Assist etc. up to several hours).

Always included:

- Info file with operator name and comments if provided
- Screen shot of the Master screen (HMI) at the time when the FBR is created
- Operation logfile(s)
- Last 100 Diagnostic conditions (Alarms, Failures, Warnings, Notifications)
- Internal message logfiles etc.

Creation of an FBR

There are automatically created FBRs by any Alarm condition or at pressing 'Shutdown' from the Overview page of the user interface.

These FBRs do no require any operator information/comment to entered.

On the other hand there are also FBRs created by executing 'Shutdown', 'Stop ESECSystem and logoff' or 'Restart application' via ESECStarter by pressing <Alt> <Tab>.

These FBRs as well as the manual creation of a FBR via the ESECStarter tab 'Feedback' button 'Create feedback' allow the operator to enter her/his name and any information/comment which could be useful for further analyze at ESEC.

© 2009 Esec Ltd.

Creation of an FBR (Cont.)

Note: Please **enter the reason** in the comment window of the message box why you think it was necessary e.g. to do a 'Restart application' etc.

It is not necessary to describe the complete key sequence pressed on the HMI since this is part of the log files. But it cannot be found out from the log files **why the operator/technician decided** e.g. it was necessary to execute a 'Restart application'. Therefore a useful comment would be e.g. "Restart due to SW hang up at unload wafer"

Note: An FBR can be created manually at any time. This should be done to report any unusual behavior.

To keep the file size of a standard FBR to a reasonable size not all the data available is included but it is sufficient for analyzing the majority of problems. Additionally several options for including extra information can be chosen.

Optional Data to be Included in an FBR

The option 'Extended log files' should be ticked in case of installation or wafer mapping problems.

The option 'All log files' includes all files in D:\Data\log including all subdirectories and therefore should only be ticked in case at this location are other files stored (e.g. manually copied) which are of interest for analyzing the problem.

The option 'Loaded recipe' should only be ticked if the problem is related to a specific setup of the M/C.

The option 'Entire diagnostic history' should not be ticked in normal cases, since for analyzing a problem situation it is seldom necessary to have the history of a longer period.

© 2009 Esec Ltd.

Retrieving FBR from M/C for Analyze

After the FBR is created it will be stored on the M/Cs harddisk drive in D:\Data\FeedbackReports.

The maximum number of FBRs can reach 100; then the oldest FBR will be deleted as soon as a new one is created. The size per FBR varies between approx. 2MB and 8MB.

The FBRs are named according to the scheme:

a) Automatically created (without user input name/comment)

<YYYYMMDD>_<hhmmss>_DC_<AlarmID>.tgz

<YYYYMMDD>_<hhmmss>_ShutdownViaHMI.tgz

<YYYYMMDD>_<hhmmss>_ESECSysStartError.tgz

<YYYYMMDD>_<hhmmss>_AutomaticRestart.tgz

<YYYYMMDD>_<hhmmss>_ImproperShutdown.tgz

b) Manually created via Alt Tab -> ESECStarter (incl. user input name/comment)

<YYYYMMDD>_<hhmmss>_UserViaESECStarter.tgz

<YYYYMMDD>_<hhmmss>_UserInitLogoff.tgz

<YYYYMMDD>_<hhmmss>_UserInitRestart.tgz

<YYYYMMDD>_<hhmmss>_UserInitShutdown.tgz

The easiest way to retrieve a FBR from the M/C is to insert a USB memory stick right after the FBR was created. With the button 'Copy last feedback to..' this FBR can be copied to the memory stick.

Always press 'Unplug memory stick' and stop the USB memory device before unplugging in order to prevent data corruption on the memory stick.

Note: 'Copy all feedbacks to...' is not recommended since the data can reach several 100MB!

For retrieving a particular FBR it is necessary to 'Stop ESECSystem and Log off' and copy the FBR(s) via Windows explorer.

© 2009 Esec Ltd.

Sending the FBR to ESEC for Analyze

In case the file size of the FBR is not too big (approx. <4MB) you can directly attach it to a email describing the problem and send it your ESEC contact person.

For bigger file sizes or multiples FBRs it is recommended to transfer them via ftp. Inform your ESEC contact person via email describing the problem. Ask for ftp server name, user and password.

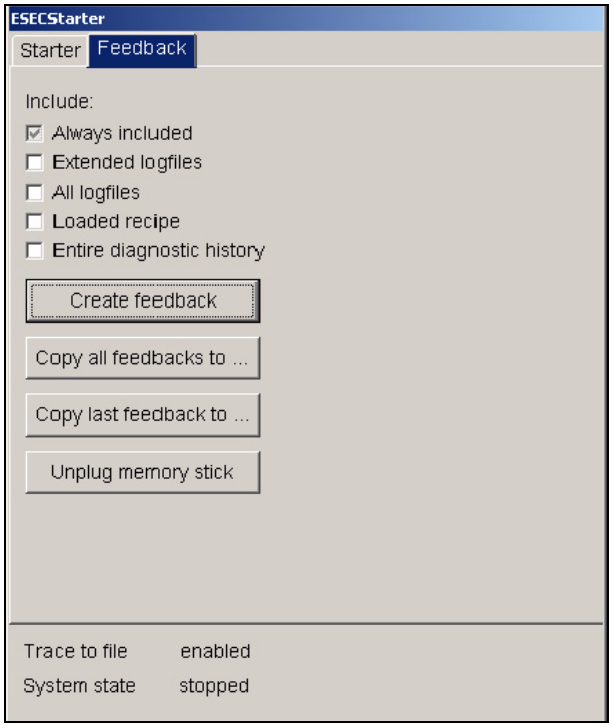
Keys

Create feedback
Generates a feedback report containing the files selected above with the checkbox.

Copy all feedback to…
Will copy all current feedbacks to the directory selected with the Files browser. Note that total file size may exceed several 100Mbyte.

Copy last feedback to...
Will copy the last feedback to the directory selected with the Files browser.

Unplug memory stick
To safely unplug the memory stick.



5.2.6 Power Failure with UPS

In case of power failure or voltage drop the control system and the monitors shut down. The PC remains on to safe statistical data. The PC is powered by the UPS. An acoustical signal indicates the UPS activity. After completing data saving the PC shuts down automatically.

© 2009 Esec Ltd.

5.3 Production

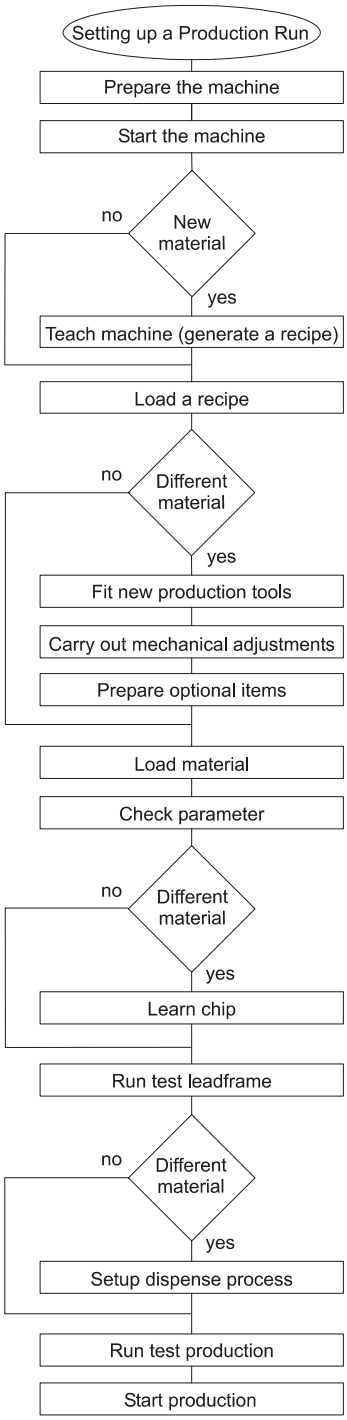
5.3.1 Overview

This section describes all necessary steps to start the production of a lot. Depending on whether the same material must be produced again or new/different material is to be handled the entire procedure or only a selection of steps must be performed.

New material is a chip and/or leadframe never handled on the system before. Therefore the system must be taught for the new material according to chapter *8*, *Machine Setup*. The teaching results in a recipe file for this particular material.

Different material in this context means that a material changeover is being performed. The system must be set-up in order to handle material that is different from the previous lot. The chip and leadframe have already been taught to the system. Therefore a recipe file is already existing.

The flowchart on the right provides an overview of the starting procedure while details are given on the following pages.



© 2009 Esec Ltd.

5.3.2 Starting the Production

WARNING

When operating soft keys keep hands, loose clothing and tools clear of all moving parts.

Always move the mouse cursor off the soft key after use. Many soft keys have a toggle action and touching a mouse button will cause the module to move again.

Preparing the Machine

Check if correct expansion unit is mounted.

If necessary:

- Change the expansion unit.
- Change the parameter **Frame size** in the menu **Install - *Define modules*** / **Wafer handler/Modules** (see section *Calibration* on page *6-1*).
- Calibrate the expansion unit according to section *Calibration* on page *6-1*.

Powering up the Machine

Follow the procedure *Powering up the Machine* on page *5-1*.

Load a Recipe

Recipe Manager

Select the desired recipe by clicking on it.

click ***Load*** to load all the recipe parameters from the hard disk.

When complete, read the recipe notes.

Overview

click **Init**

The system initializes.

Fitting the Production Tools

Fit the appropriate production tools according to the recipe notes:

- Shank with rubber tip or die collet
- Die ejector needle(s) and pepperpot
- Dispenser with correct nozzle (PSD) or capillary (PPD)
- Gripper
- Rider of inspection station on TOS

© 2009 Esec Ltd.

Mechanical Preparations

Carry out the following mechanical preparations:

- Adjust the rider of the inspection station.
- Adjust the y-push-in according to the leadframe width.
- Adjust the push-out according to the leadframe size.
- Adjust position of the wafer loader roller and expansion unit according to wafer type.
- Adjust the wafer push-in lever.
- Prepare optional items, i.e. leadframe marking unit, wafer mapping etc.

⚠ CAUTION

Full wafer cassettes can be heavy.

The wafer cassette must have SEMI S8 (Safety Guidelines for Ergonomics) compatible handles.

Load Material

Load the following material:

- Leadframes to the input handler (observe the orientation)
- Wafer cassette
- Empty magazines

Insert the solder reel(s).

Check Parameters

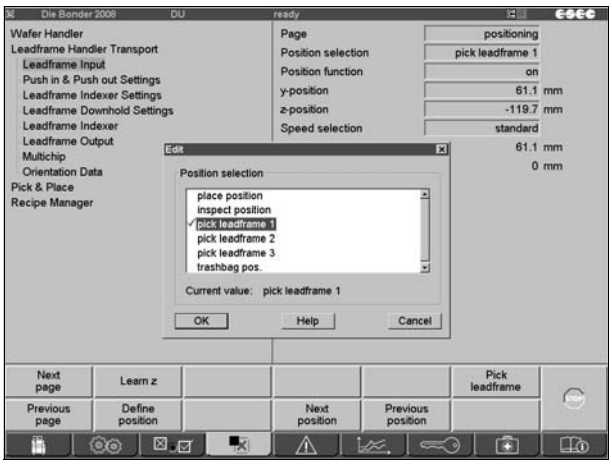
If using a TOS:

Leadframe Handler Transport
Leadframe Input

Set parameter **Position selection** to **inspect pos.**

Relearn the Z-height of

- inspection station
- leadframe magazine
- place position



© 2009 Esec Ltd.

Check Parameters (Cont.)

Assist
Wafer

Load wafer to check easy loading of wafer.

Recipe
Adjust Pickup

Bondarm to pick

Bondhead to touch

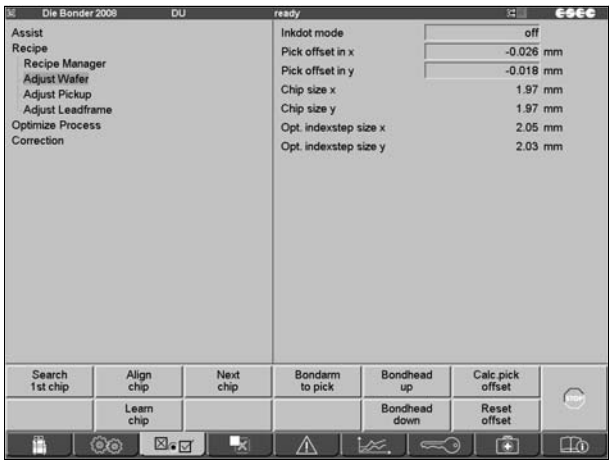
Check the pickup centre at the inspection monitor.

Learn Chip

Recipe
Adjust Wafer

Use cursor keys to align a chip and adjust the pick vision camera zoom setting, then drive the wafer to centre a good chip on the monitor.

Learn chip to re-learn the chip.



Test Run Leadframe

Assist
Test Runs

Test run leadframe

Check that leadframes are correctly handled from input to output; if necessary adjust the Y-pushin and push-out.

Note: If manual QCTV is present, adjust the zoom and focus of the QCTV camera and illumination.

© 2009 Esec Ltd.

Test Run Production

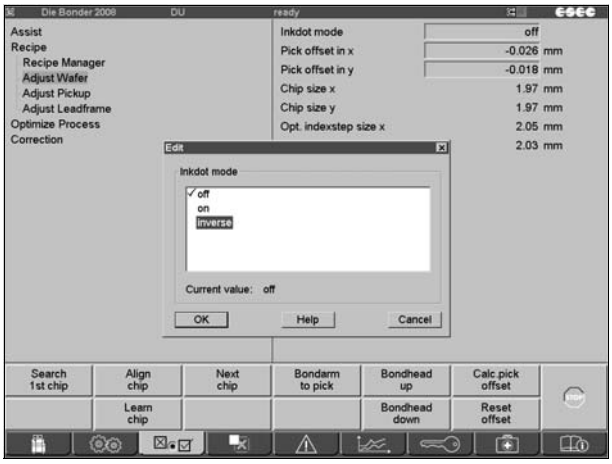
Recipe
Adjust Wafer

Set parameter **Inkdot mode to inverse**.

Produce

Run 1 leadframe

The system will bond chips with inkdots onto a leadframe (testing the setup without wasting good chip).



Inspect Results

Inspect leadframe, carry out fine tuning as necessary.

Repeat the step *Test Run Production* on page *5-16* and inspect again until satisfactory results are always obtained.

Reset Inkdot Mode

Recipe
Adjust Wafer

Set the Parameter **Inkdot mode** to **on** (or **off**).

Note: The machine is now ready for production.

Start Production

To start the machine:

Produce

Run

The machine will start the production.

© 2009 Esec Ltd.

6 Calibration

CAUTION

For better visibility of subjacent functions covers have been removed before taking pictures. In standard operating mode all covers have to be in place at any time (see Safety Chapter).

6.1 Introduction

This chapter describes the calibration of all models of the Die Bonder 2009 SSI machine.

Note: Calibration is particularly important where several Die Bonder 2009 SSI are in use. If all machines are calibrated to the same standard values, all recipes may be used to produce accurate results. However, if one machine is calibrated differently, the recipes produced on other machines have to be adjusted, and likewise, any recipe produced on a machine with a different calibration requires adjustment before it runs correctly on the other machines.

In this manual *'calibration'* means the adjustment of the machine, using calibration tools, so that the mechanical references are set to 'standard' values.

Calibration procedures have to be performed after initial installation and after all service and maintenance works on the machine.

For a successful calibration prepare your work carefully according to section *6.2* on page *6-3*.

Follow the order given in this chapter to make a complete machine calibration.

If only one unit or sub-unit has to be calibrated, it is possible to start with the corresponding section. However, the preceding sections have to be completed correctly. Start a calibration procedure only at the beginning of a section. Even after aborting a calibration procedure, restart the calibration procedure at the beginning of the section.

© 2009 Esec Ltd.

/ (May 29, 2009)

6.1.1 Calibration Procedures Overview

Calibration procedures must be carried out as specified in the Maintenance Manual and in the following table.

after:	Bondarm Y	Force Sensor	Die Ejector Height	Bondarm Xmm	Indexer Disp./Bond Position	Magazine Handler	Dispenser Height, Position, Tilt	Motorized Downset	Wafer Table Origin	Wafer Table Frame Diameter	Expansion Ring Height	Expansion Unit Load Height	Wafer Load Position	Wafer Roller Sensor	Gripper, Z-Alignment	Cassette Lift	PGV Position	Pick Vision	Bond Vision	Motozoom Prebond Vision	Motozoom Dispense Vision
Initial Installation																					
Change of control Software																					
Replacement or repair in the pick & place area																					
Replacement of the pepperpot																					
Replacement or repair in the indexer area																					
Preparation for use with very small leadframes																					
Replacement or repair in the dispenser area																					
Replacement or repair in the wafer handler area																					
Replacement or repair in the pick vision area																					
Replacement or repair of the process platform																					

Overview of calibration procedures

© 2009 Esec Ltd.

6.2 Machine Preparation

WARNING

When operating soft keys keep hands, loose clothing and tools clear of all moving parts.

Always move the mouse cursor off the soft key after use. Many soft keys have a toggle function and touching a mouse (or trackball) button will cause the module to move again.

Do not change parameters, or operate soft keys or function keys unless the resultant action is known.

Failure to read and obey the safety instructions may result in serious injury or death of personnel and damage to equipment.

Before starting any of the calibration procedures detailed in this chapter, carry out the following checks:

1. Make sure the machine is clear of all material, tools, etc.
2. Make sure that standard tools (screwdrivers, allen keys) are available as required.
3. Make sure the required calibration tools are available (as stated at the beginning of each section).

For preparation the procedures described in the following sections are only required,

- if the machine must be calibrated completely
- or if one of the following modules has been replaced:
  - Indexer
  - Bondhead
  - Die ejector

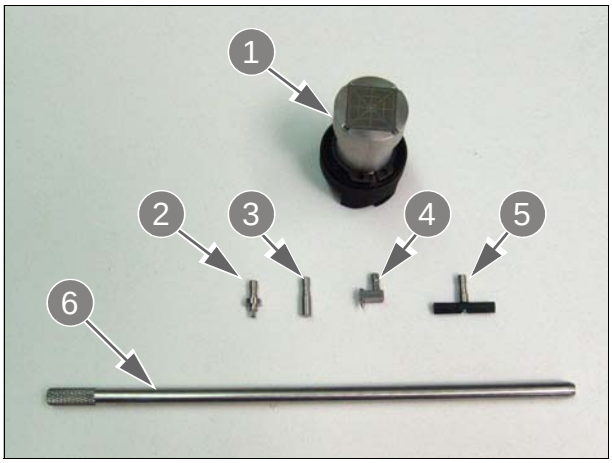
© 2009 Esec Ltd.

6.3 Pick & Place Unit Calibration

6.3.1 Tools and Equipment

The following tools and equipment are required to calibrate the pick & place unit:

1. Calibration pot
2. Shank
3. Bondhead Z calibration tool
4. Bondhead tilt calibration tool
5. Die ejector tilt calibration tool
6. Adjustment pin



7. Force calibration unit

WARNING

When operating soft keys keep hands, loose clothing and tools clear of all moving parts.

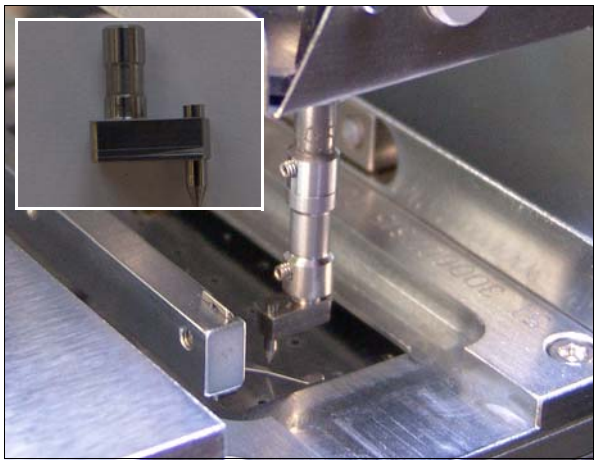
Always move the mouse cursor off the key after use. Many soft keys have a toggle function and touching a mouse (or trackball) button will cause the module to move again.

© 2009 Esec Ltd.

6.3.2 Bondhead Tilt Calibration

Tilt Measurement

Install the bondhead tilt calibration tool to the bondhead.



Pick & Place
Bond Process

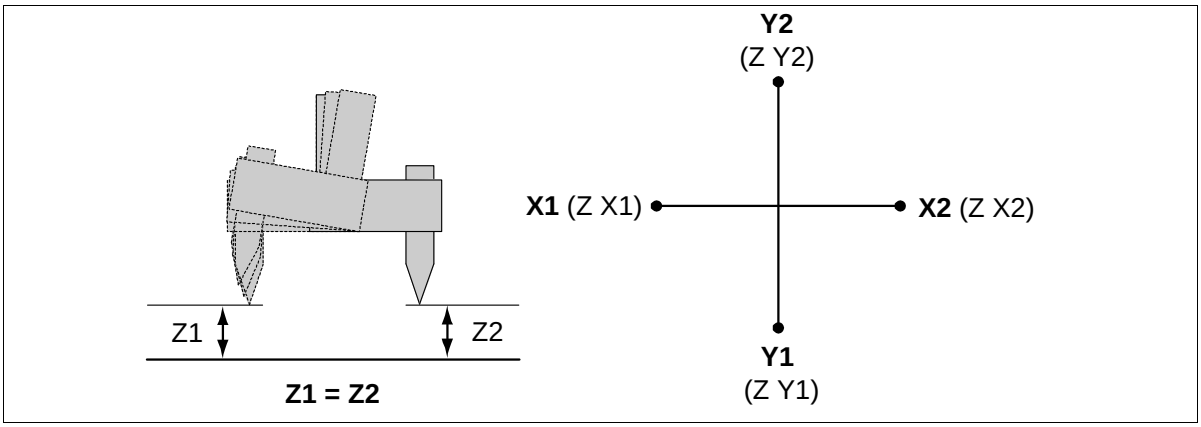
Teach Z at bond

`Note down Z value`

Note the value of **Bondarm z-position**.

Manually turn the calibration tool by 180°.

Repeat the procedure in the other direction (e.g. at point X2) and evaluate the delta value (X1 - X2).

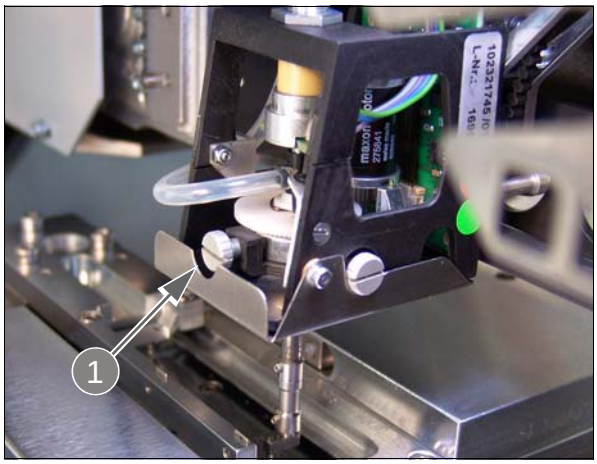


If available use the automated measurement procedure in:

Leadframe Handler Transport
Additional Functions

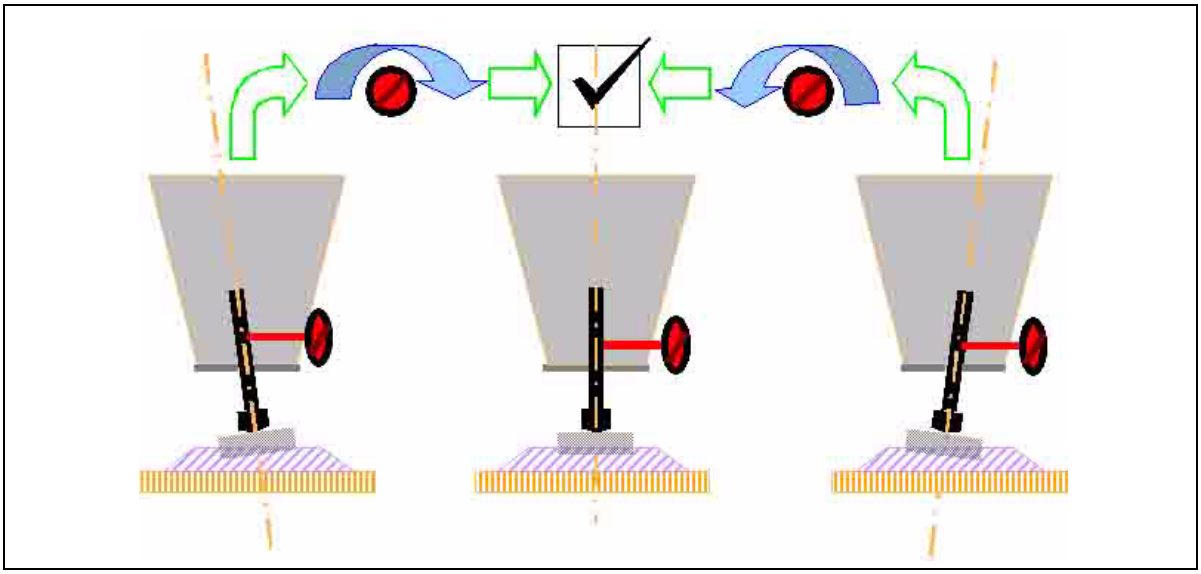
Adjusting in X-Direction

Turn the adjusting screw (1) on the notch hinge until the bondhead is precisely parallel to the support plate in X.



© 2009 Esec Ltd.

Adjusting in X-Direction



When adjusting the tilt in the X-direction consider the sense of rotation of the adjusting screw.

Adjusting in Y-Direction

Turn the calibration tool by 90°.

Teach Z at bond

`Note down Z value`

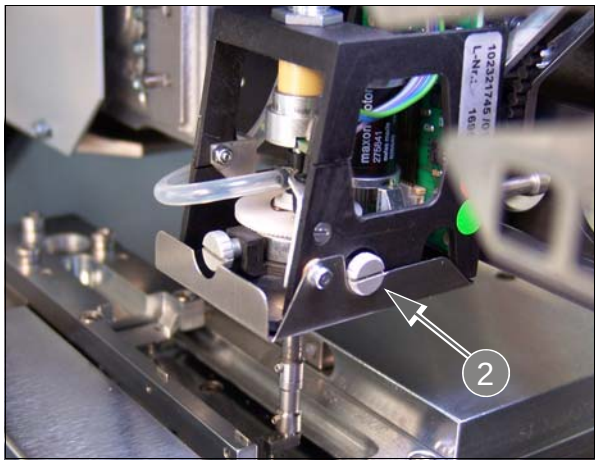
Note the value of **Bondarm z-position**.

Manually turn the calibration tool by 180°.

Repeat the procedure in the other direction (e.g. at point Y2) and evaluate the delta value (Y1 - Y2).

Turn the adjusting screw (2) on the notch hinge until the bondhead is precisely parallel to the support plate in Y.

When adjusting the tilt in the Y-direction consider the sense of rotation of the adjusting screw (see above).



© 2009 Esec Ltd.

6.3.3 Die Ejector Calibration

Checking in X-Direction

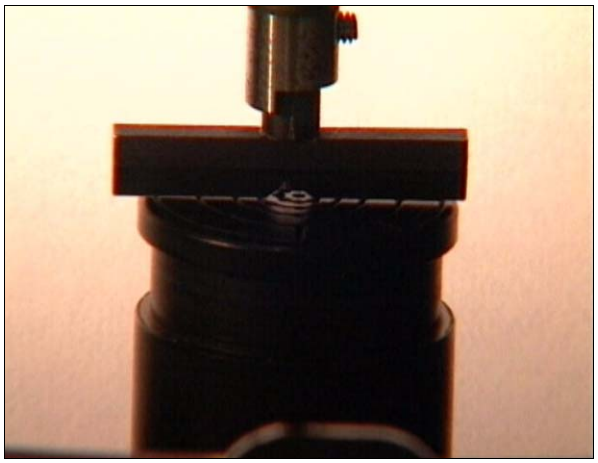
Install the die ejector tilt calibration tool on the bondhead.

Move the bondhead manually to the pick position.

Place a sheet of white paper behind the pepperpot to see better.

Move down the bondhead manually to just above the pepperpot.

☑ Check the light gap.



Aligning in X-Direction

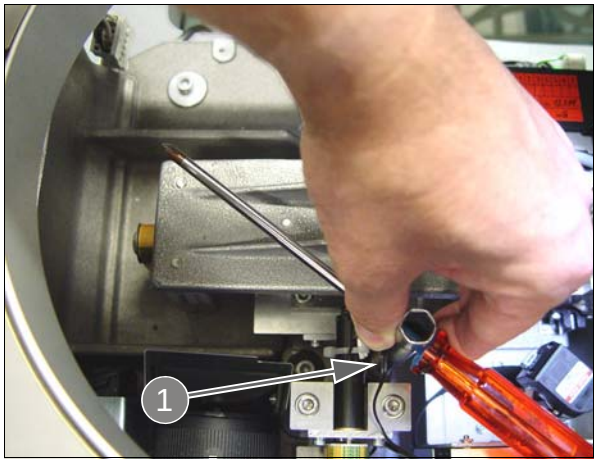
Move the bondhead to the bond position.

Loosen the fastening (Allen) screws.

To adjust the die ejector in X-direction slightly turn the (hexagon headed) adjusting screw (1).

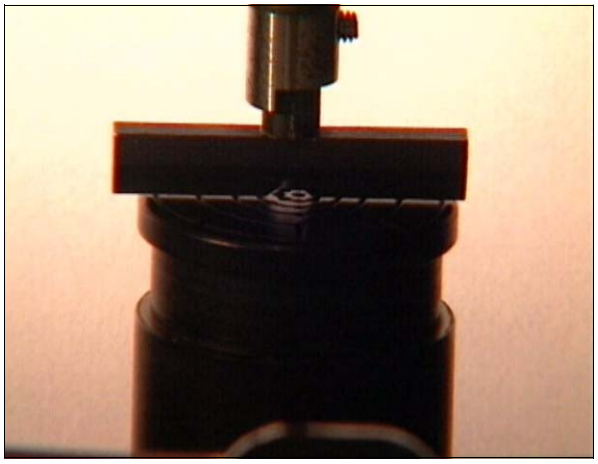
Tighten the fastening screws.

Move the bondhead to the pick position.



☑ Check the gap after adjustment.

If the adjustment is correct move the bondhead away and remove the paper.



© 2009 Esec Ltd.

Checking in Y-Direction

Turn the bondhead manually by 90°.

Again place a sheet of paper behind the die ejector.

Lower the bondhead and check the gap in the Y-direction.

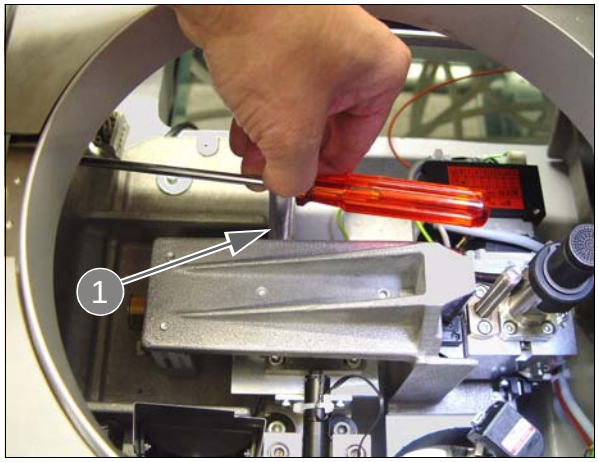
Aligning in Y-Direction

Loosen the fastening (Allen) screws.

To adjust the die ejector in Y-direction slightly turn the (hexagon headed) adjusting screw (1).

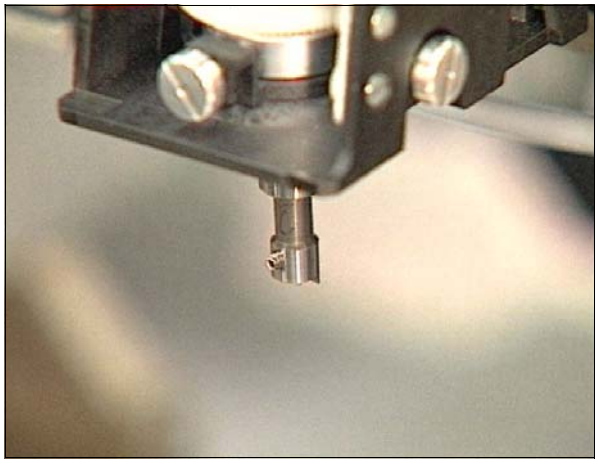
Tighten the fastening screws.

Move the bondhead to the pickup position and check the alignment.



If the alignment is correct, remove the paper and any tools.

Remove the calibration tool.



Start up the machine according to section *Powering up the Machine* on page *5-1*.

WARNING

When operating the Die Bonder 2009 SSI keep hands, loose clothing and tools clear of all moving parts.

Note: The soft key ***Abort Calibration*** becomes available as soon you have started the calibration. Use this function to leave the calibration procedure whenever necessary. All parameters are set to their previous setting. If used, restart calibration.

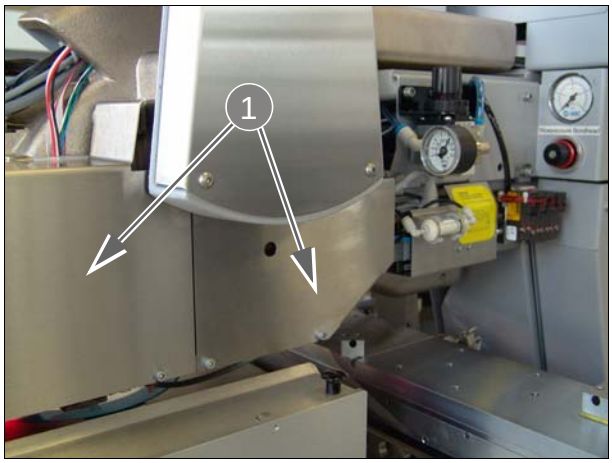
© 2009 Esec Ltd.

6.3.4 Bondarm Y- Calibration

Preparations

Make sure the pick & place area is free from obstructions.

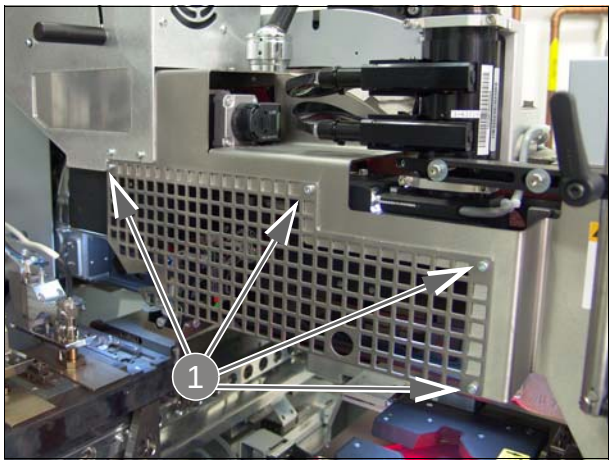
Remove the two covers (1) from the output side of the pick & place.



Assist
Leadframe Handler Tools

Prepress to standby

Loosen the four screws (1) and remove the protective cover from the pick & place.



Calibrate
Pick & Place
Bondarm

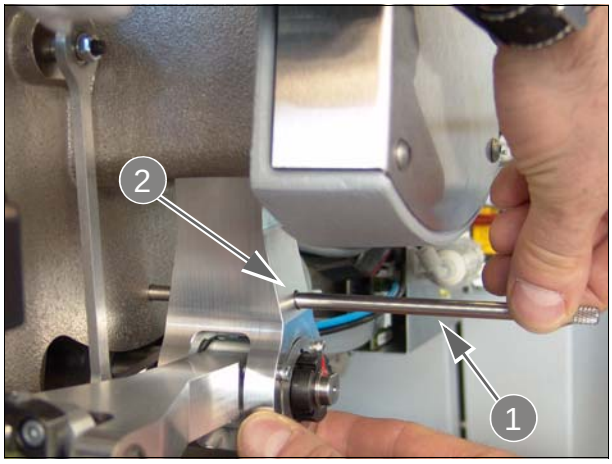
Defining the Rocker Arm Pick Position

Start y calibr.

The bondarm moves to the pick position.

`Insert pin and define rocker arm pick position`

Insert the adjustment pin (1) into the calibration hole on the rocker (2).



Note: If the pin cannot be inserted, move the lever manually up and down until the pin fits.

Define rocker arm pick pos.

`Remove pin and continue calibration`

Remove the adjustment pin.

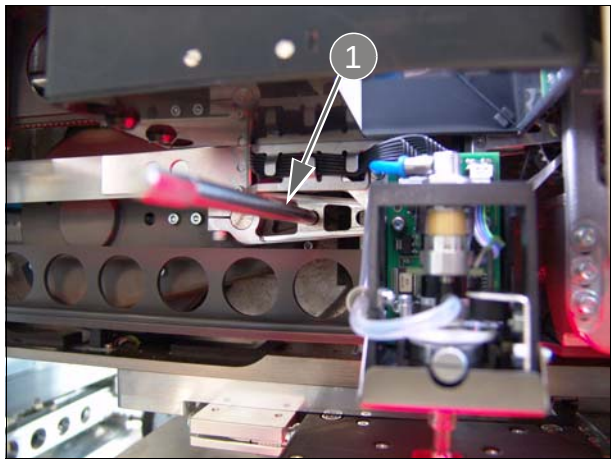
© 2009 Esec Ltd.

Defining the Pick Position

Continue

`Insert pin and define pick position`

Insert the adjustment pin (1) through the designated hole in the cover into the calibration hole on the rocker.



Note: If the pin cannot be inserted, move the lever manually up and down until the pin fits.

Define pick pos.

`Remove pin and continue calibration`

Remove the adjustment pin.

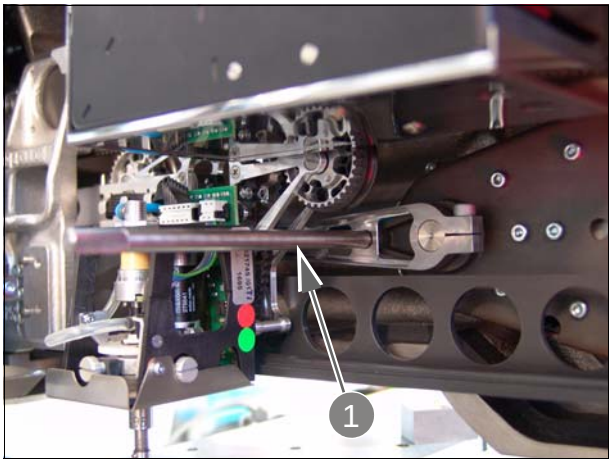
Defining the Bond Position

Continue

The bondarm moves to bond position.

`Insert pin and define bond position`

Insert the adjustment pin (1) through the designated hole in the cover into the calibration hole on the rocker.



Note: If the pin cannot be inserted, move the lever manually up and down until the pin fits.

`Do not remove BAY pin`

Define bond pos.

`Remove BAY pin and continue`

Remove the adjustment pin.

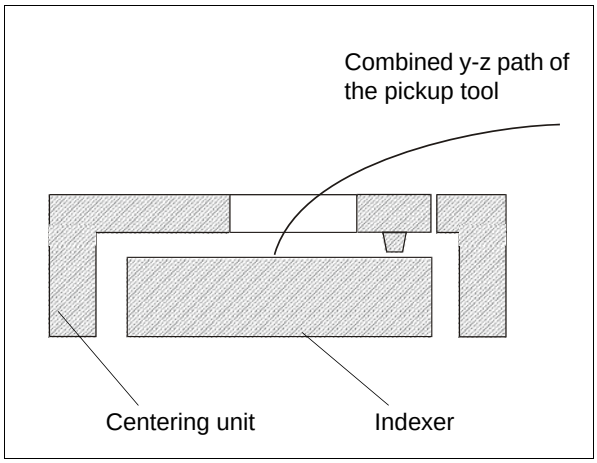
Complete

`Bondarm y-axis calibration successful`

© 2009 Esec Ltd.

6.3.5 Calibrating the Bondhead Y-Movement

Make sure that the largest pickup tool that will be used during any production runs is fitted to the bondhead tool carrier.



Calibrate
Pick & Place
Centering Unit

Start SSI calibr.

`Make sure Y-axis movements are calibrated.`

Continue

`Set centering unit to work position.`

Continue

`Move tool to top of centering unit.`

If necessary use the left/right cursor keys to align the pickup tool with any part of the flat area on top of the centering unit. Then use the down cursor key to lower the pickup tool until it just touches the centering unit.

Complete

Remove the pickup tool from the bondhead.

6.3.6 Force Calibration

Connecting the Force Calibration Unit

Open then left front door.

Connect the RS232 cable to COM0 socket of the Pick & Place.

© 2009 Esec Ltd.

Connecting the Force Calibration Unit (Cont.)

i 38 Connect the other end of the cable to force calibration unit (1).

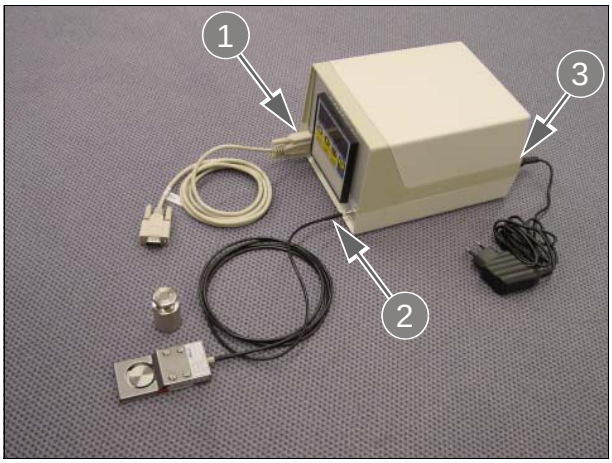
Connect the load cell to force calibration unit (2).

Connect the power supply to the force calibration unit (3).

Plug the power supply to the power supply connection at the rear of the Die Bonder 2009 SSI.

As soon as plugged in, the control unit turns on automatically and carries out a self test. After doing so, the force display should show 0 (zero).

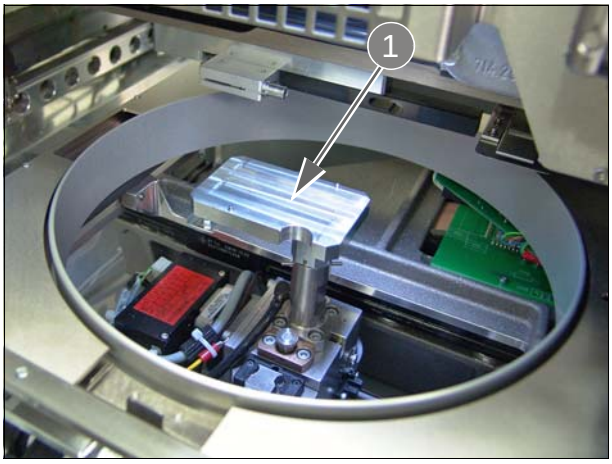
If not, press the ***ZERO*** button on the control unit.



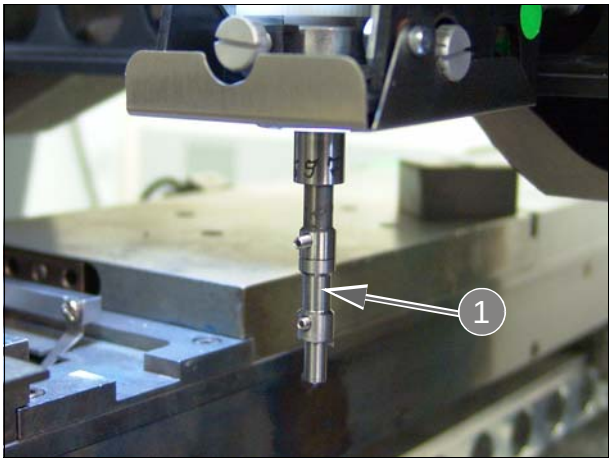
Preparing the Calibration

Remove the indirect illumination of the pick vision.

Remove the pepperpot and mount the adaptor (1) for the force sensor onto the die ejector.



Fit the Z calibration tool (1) to the bondhead tool holder.



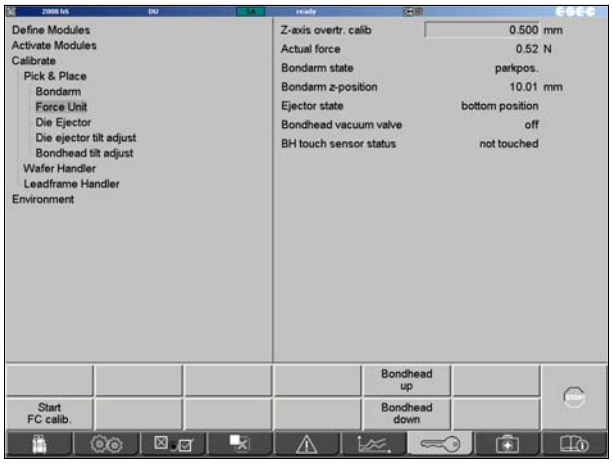
© 2009 Esec Ltd.

Calibration Sequence

Calibrate
Pick & Place
Force Unit

`Set and connect the calib. system on m/c`

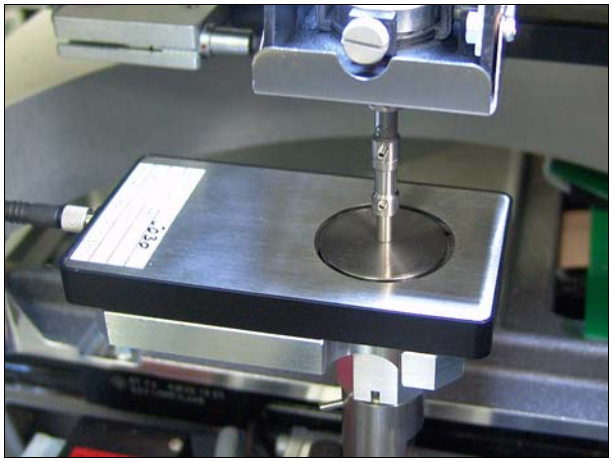
Start FC calib.



`Situate sensor at the pick pos. and center`

Place the load cell onto the die ejector at the pick position and center it to the pickup tool center.

Make sure that the load cell has a stable rest on the die ejector.



Continue

CAUTION

Keep the hands out of the machine during the auto calibration sequence. The bond-arm is moving during this sequence.

Continue

`Please ensure no hands on the m/c`

Continue

The system executes an automatic calibrating procedure to calibrate the force.

`Measurement taken, remove the calib. system`

Complete

`Force calibration successful`

Finishing

Remove the force calibration unit from the Die Bonder 2009 SSI and close the left front door.

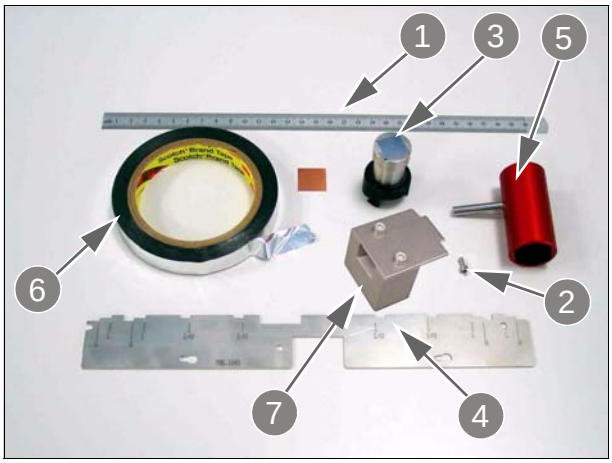
© 2009 Esec Ltd.

6.4 Wafer Handling Calibration

6.4.1 Tools and Equipment

The following tools and equipment are required to calibrate the wafer handler:

1. Steel ruler
2. Bondhead calibration pin 730.1641
3. Calibration pot 843.112
4. Calibration rake (for AWL only) (mounted on expansion unit)
5. Vision adjusting tool 895.0140
6. Copper pad or metallic tape
7. Cassette lift calibration tool



WARNING

When operating soft keys keep hands, loose clothing and tools clear of all moving parts.

Always move the mouse cursor off the soft key after use. Many soft keys have a toggle function and touching a mouse (or trackball) button will cause the module to move again.

Note: When carrying out a complete calibration make sure to start the calibration with the pick & place unit.

© 2009 Esec Ltd.

6.4.2 Motorized Pick Vision Adjustment and Calibration

Calibration

Define modules
Wafer Handler
Image Processing Settings

Set the parameter **Pick camera adapter** according to the labeling at the adapter of the pick vision module (PVM):

- **0.5 x**
- **0.67 x**
- **1.00 x**
- **1.33 x**
- **2.00 x**

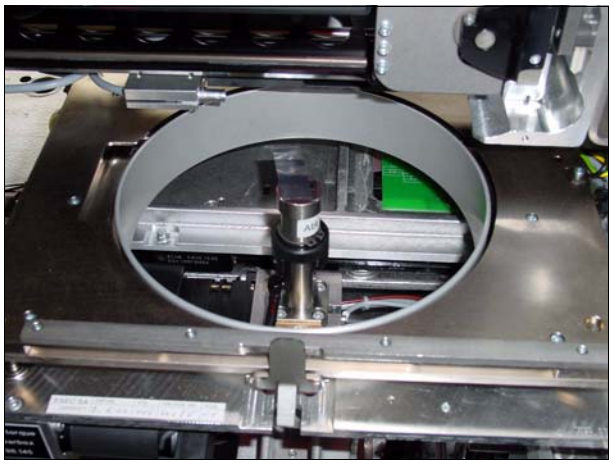
Calibrate
Wafer Handler
Pick Position

Start calib.

`Mount calib. tool and pepperpot`

Mount the calibration pot onto the die ejector.

Mound the calibration pin onto the bondhead.



Continue

`Mount imprint pad/tape to pepperpot`

Remove the indirect illumination and make sure the direct illumination of the pick vision PVM) is installed.

Fix a substrate/pad on top of the calibration pot or use a metallic tape.

Optimize illumin. if necessary.

Focus left and ***Focus right*** if necessary to adjust the focus.

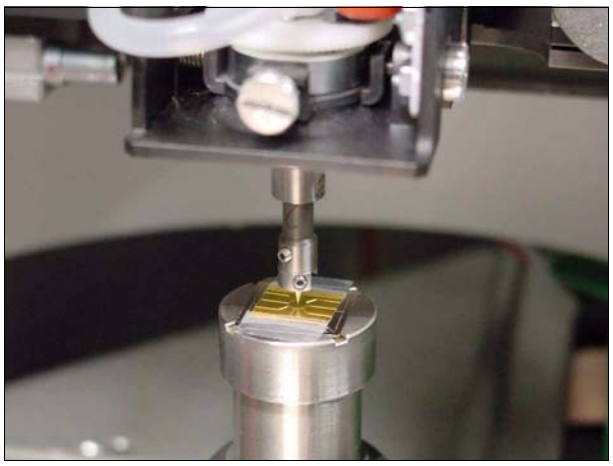
Continue

`Set imprint force and press Auto imprint`

Enter the parameter **Imprint force** (default 0.6N).

Auto imprint

The machine produces four imprints.



`Imprint successfully done`

© 2009 Esec Ltd.

Calibration (Cont.)

Continue

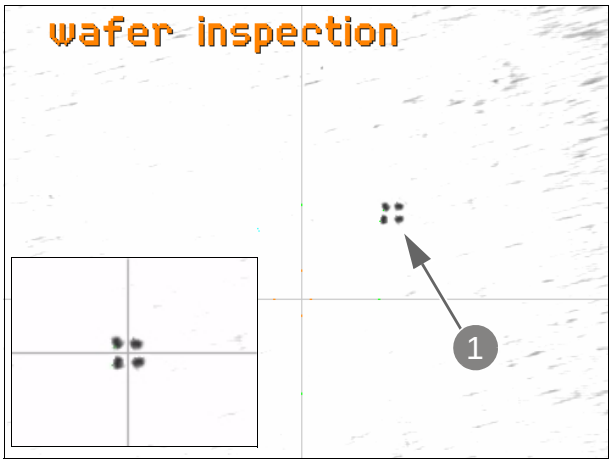
`Place center finder and calculate center`

Drag and drop and resize the green window on inspection monitor to enclose the imprint completely.

Find center to align the center of the green crosshair to the imprint.

`Verify the calculated center`

In case the automatic function doesn't find the center, use the cursor keys to align the crosshair manually.



Continue

`Remove imprint pad/tape from pepperpot`

Remove the imprint pad/tape from the pepperpot.

Continue

`Align pepperpot to center -> calc.offset`

Place the center of the pepperpot to the crosshair center by using ***Ctrl F4***, ***Ctrl F5***, ***Ctrl F6, Ctrl F11*** buttons.

Calc. offset

`Pick offset successfully calibrated`

Continue

`Remove calib. tool and calib. pepperpot`

Note: Do not move any part of the pick vision module (PVM)!

Remove the calibration tool and the calibration pepperpot (you have not to remove the calibration tool and the calibration pepperpot, if you continue with the calibration).

Complete calib.

`Calibration successfully completed`

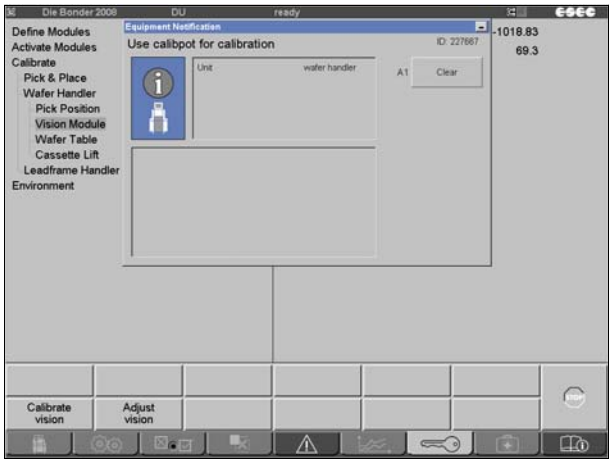
© 2009 Esec Ltd.

Focus at Minimum FOV

Calibrate
Wafer Handler
Vision Module

`Use calib. pot for calibration.`

- If a new software has been loaded only continue with step *Completing the Calibration* on page *6-21*.
- If any mechanical changes have been made on the pick vision module (PVM) continue below:



click ***Adjust Vision***

`Autofocus in progress/Check focus and continue`

Check the focus.

If the focus is not ok, adjust the focus using the cursor keys ***left/right***.

Focus at Maximum FOV

click ***Continue*** when the focus is ok.

The motorized zoom moves out at maximum FOV (Field of view).

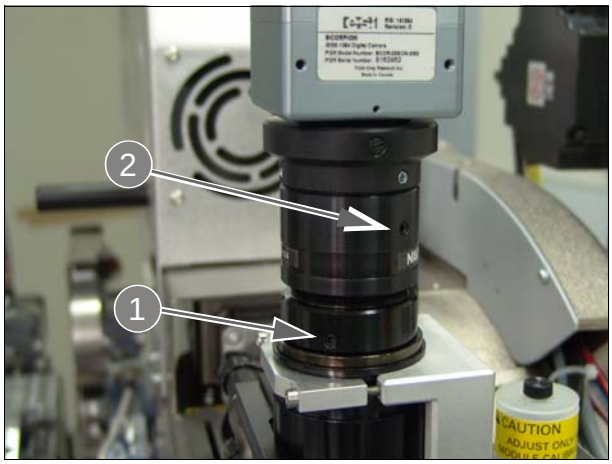
`Adjust camera distance with mini adapter`

Check the focus, if the focus is not ok:

Loosen the three screws (1) of the lower adapter ring.

Loosen the two locking screws (2) of the upper adapter ring.

Hold the upper adapter ring and turn the lower adapter ring until the focus is ok.



© 2009 Esec Ltd.

Focus at Maximum FOV (Cont.)

Tighten the three screws of the lower adapter ring and the two locking screws (2) of the upper adapter ring.

Note: Keep camera rotation as low as possible during all adjustments!

To verify the adjustment:

Zoom in and check minimum FOV focus.

If the focus is not ok, click the soft key ***Auto focus.***

Zoom out and check focus again.

If the focus is not ok, repeat step *Focus at Maximum FOV* on page *6-17*.

Adjusting the Camera Rotation

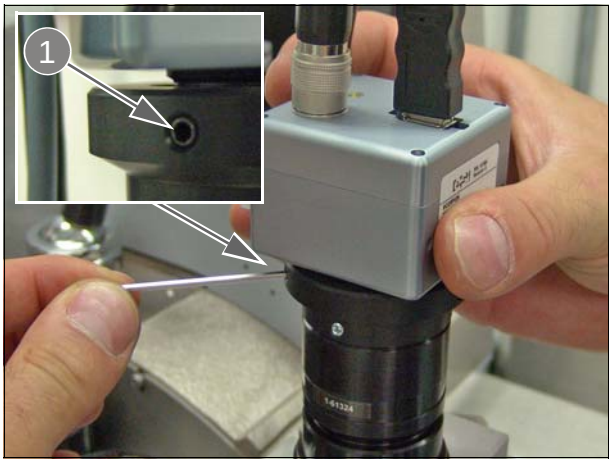
Continue

`Adjust camera rotation to calibpot.`

Loosen the (Allen) locking screw (1) of the camera adjusting ring.

Turn the camera until the crosshair is approximately aligned to the calibpot.

Tighten the locking screw (1).



Aligning the Pick Vision Camera

Continue

`Measurement of optical axis proceeding.`

The motorized zoom moves in and out for different measurements.

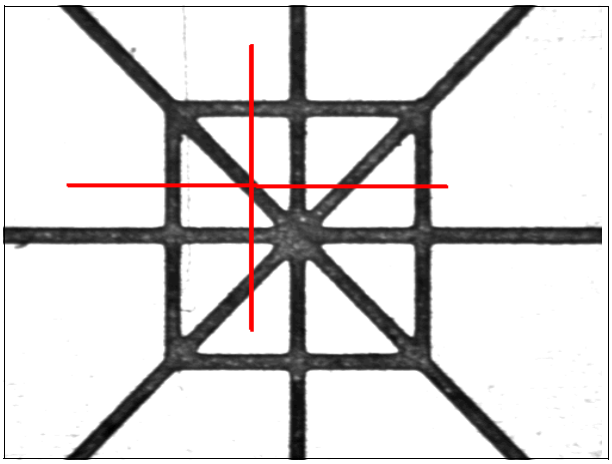
`Align camera to calib pot center`

The inspection monitor shows a red crosshair.

If the measurement is not successful:

Autocalc center

If the crosshair is not centered:



© 2009 Esec Ltd.

Aligning the Pick Vision Camera (Cont.)

- Loosen the (Allen) locking screw (1) of the camera adjusting ring.
- Turn the two X/Y-adjusting screws (2) until the red crosshair covers the center of the calibration pot.
- Tighten the locking screw (1).

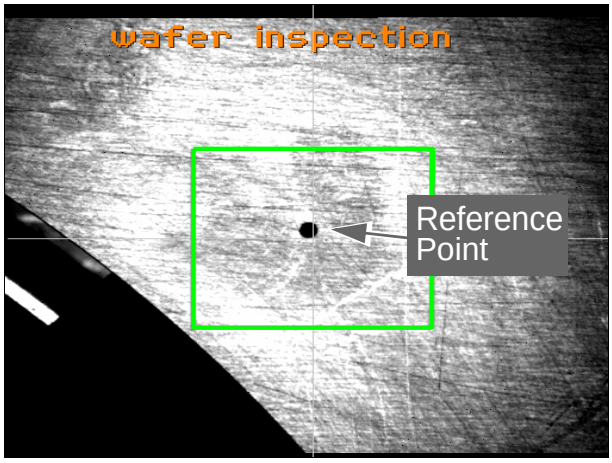
Checking the Camera Rotation

- ***Continue***
- `Define adjust pos. for camera rotation`

  The wafer table moves near the reference point.
- ***Optimize illu.*** if necessary.

  Use the cursor key to move the reference point to the crosshair.
- ***Define adjust pos.***
- ***Continue***

  The wafer table moves continuously back and forth along the Y-axis.
- `Adjust the camera rotation`



Note: Do not shift the X/Y-adjustments of the camera during this procedure!

© 2009 Esec Ltd.

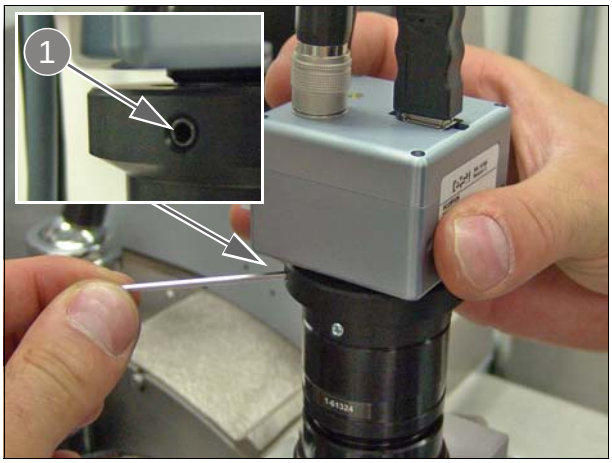
Checking the Camera Rotation (Cont.)

Loosen the (Allen) locking screw of the camera adjusting ring (1).

Carefully turn the camera until the reference point moves exactly in parallel with the crosshair. Watch the displayed angle on monitor, it must be less than ±0.1° (the optimum is 0°).

Tighten the locking screw (1) of the camera adjusting ring.

Stop to stop the wafer table movement.

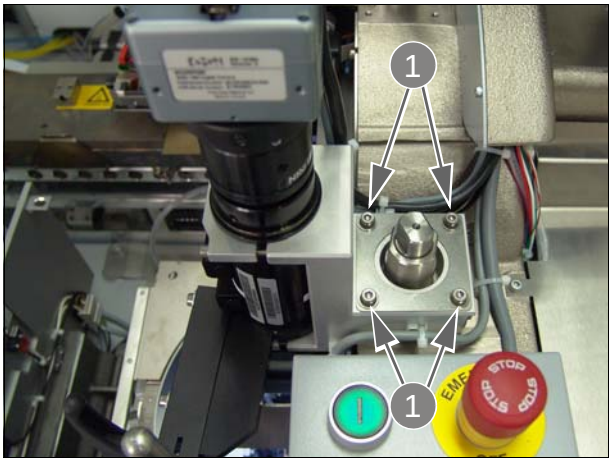


Centering the Pick Vision Module

Continue

`Align vision module to calib pot center`

Slightly loosen the four fixing screws of the camera support (1).



NOTICE

Only use the supplied vision adjusting tool for this adjustment.

Any other tool may damage the equipment.

Turn the X-adjusting screw using the vision adjusting tool to align the crosshair to the center of the calibration pot center lines in X-direction.

The sense of rotation is shown on the screws!

Note: Do not shift the X/Y-adjustments of the camera during this procedure!

© 2009 Esec Ltd.

Centering the Pick Vision Module (Cont.)

Turn the Y-adjusting screw using the vision adjusting tool to align the crosshair to the center of the calibration pot center lines in Y-direction.

Firmly tighten the four fixing screws.

Completing the Calibration

click ***Continue*** or ***Calibrate vision***

`Calibration of optical axis`

After different measurements and preparations the hint `Camera successfully calibrated` appears.

click ***Complete calib.***

`Calibration is finished` indicates that the procedure is finished.

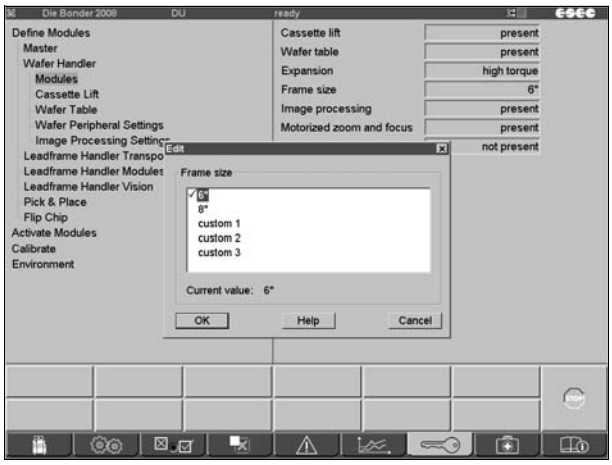
Remove calib pot and replace needle(s) and pepperpot.

6.4.3 Wafer Table Origin Calibration

Preparations

Define Modules
Wafer Handler
Modules

Set the parameter **Frame size** according to the installed expansion unit.



© 2009 Esec Ltd.

Preparations (Cont.)

Note: Four calibration data sets for various expansion units can be saved on the equipment. Each data set contains the following parameters:
- **Wafer table origin**
- **Frame diameter**
- **Wafer load position**
- **Expansion ring height definition**
- **Barcode read position (option)**

Calibrate
Wafer Handler
Wafer Table

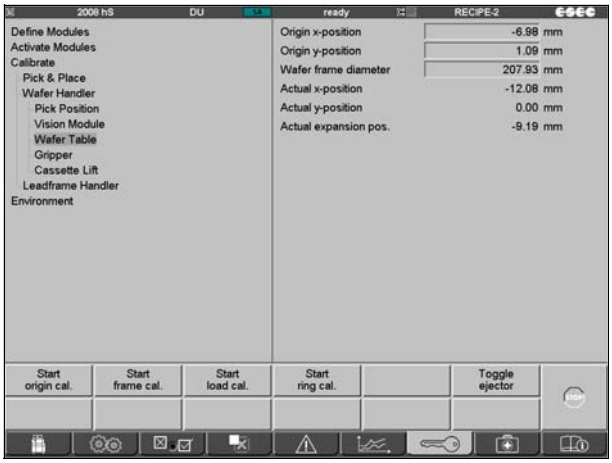
Start origin cal.

`Continue presents the actual origin`

Remove the indirect illumination of the wafer handler to the front.

Continue

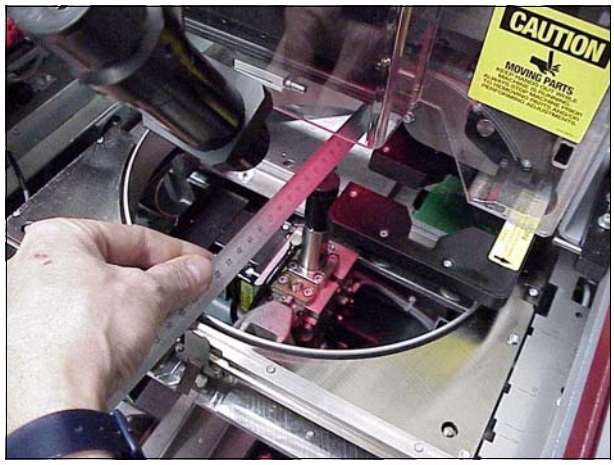
`Set expansion ring centric to pepperpot`



Defining the Origin

Use the cursor keys to move the wafer table to position the die ejector in the exact centre of the expansion ring.

Use the steel ruler to measure and adjust the radius of the expansion ring in X- and Y-direction.



Define origin

The new values will be displayed in the parameters **Origin x-position** and **Origin y-position**, while the parameters **Actual x-position** and **Actual y-position** are reset to zero.

`Origin successfully defined`

Complete

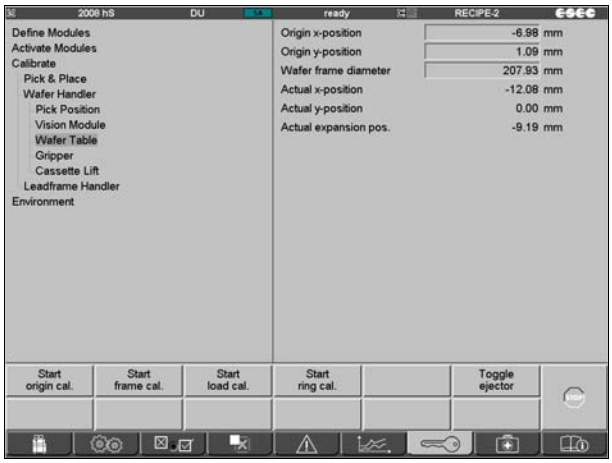
`Calibrate wafer frame diameter next`

© 2009 Esec Ltd.

6.4.4 Wafer Table Frame Diameter Calibration

Calibrating the Frame Diameter

Calibrate
Wafer Handler
Wafer Table

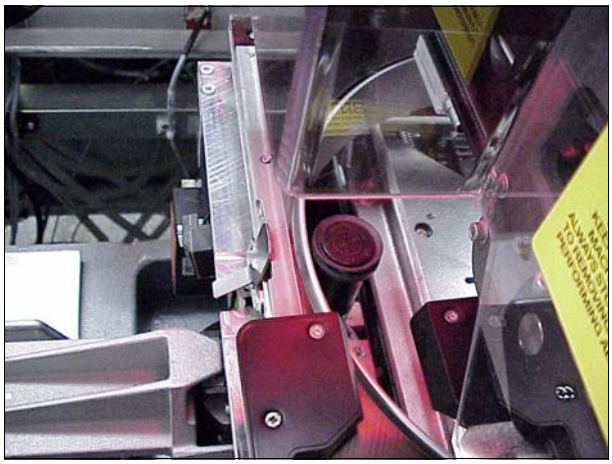


Start frame cal.

`Continue presents the actual origin`

Continue

`Adjust ring close to pepperpot carefully`



Use the cursor key to move the wafer table to the right until the bayonet locking of the pepperpot is as close as possible to the left inside face of the expansion ring without touching it.

Define frame

`Frame diameter successfully defined`

The new value is displayed in the **Wafer frame diameter** line of the menu.

Complete

`Calibrate load position next`

© 2009 Esec Ltd.

6.4.5 Wafer Table Load Position Calibration

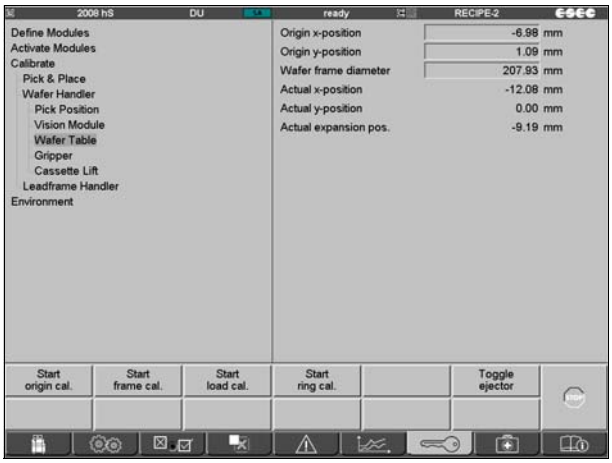
Preparations

Calibrate
Wafer Handler
Wafer Table

Start load cal.

`Make sure no wafer cassette is on the lift`

Continue



Defining the Load Position

The protruding length of the pin must be X=21mm.

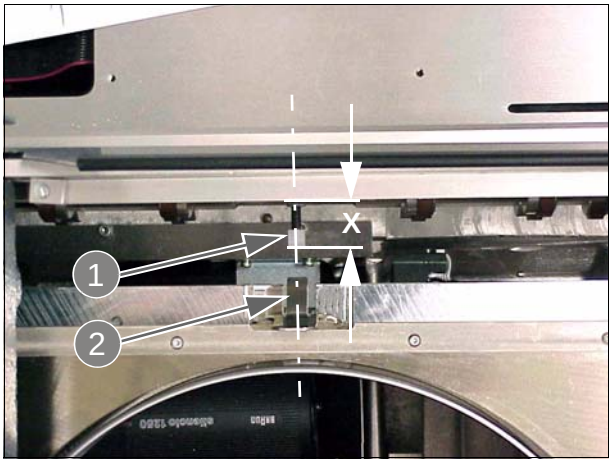
`Position WT to the center of the lift`

Use the cursor keys to adjust the y-position of the wafer table.

The plastic head (1) of the operating pin must be aligned to the center of the frame latch (2).

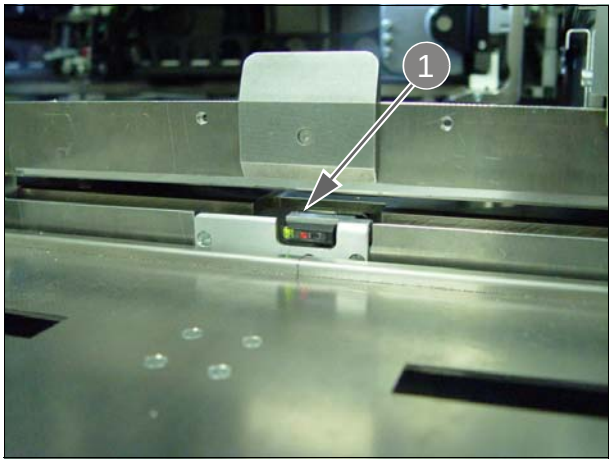
Continue

`Adjust table to open clamps`



Use the cursor keys to move the expansion unit in X-direction until the operating pin folds down the latch (1).

The frame latch must be in its fully down position so that a wafer can be pulled onto the expansion unit through the wafer entrance slot.



© 2009 Esec Ltd.

Defining the Load Position (Cont.)

Define load to define the load position.

`Load position successfully defined`

The new values are displayed in the menu.

Complete

`Calibrate the ring position next`

Note: The expansion ring height adjustment is described at the end of this chapter (see section *6.6.2* on page *6-59*).

6.4.6 Wafer Table Expansion Ring Position Calibration

Defining the Wafer Expansion Ring Position

Calibrate
Wafer Handler
Wafer Table

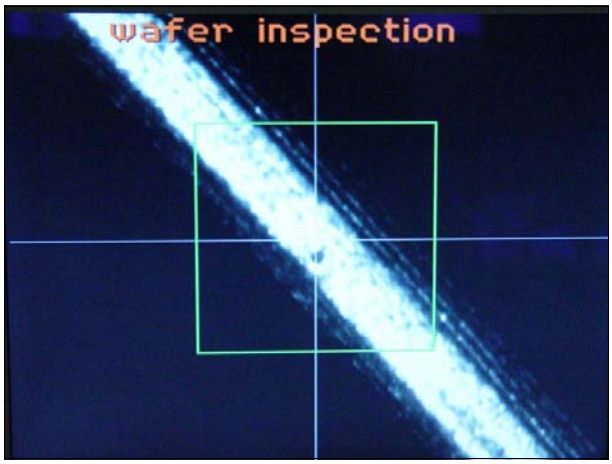
Start ring cal.

Continue

Using the cursor keys, move the top of the expansion unit ring to the centre of the wafer inspection cross hairs.

Define ring pos.

Complete



© 2009 Esec Ltd.

6.4.7 Gripper Calibration

Defining the Gripper Position

Calibrate
Wafer Handler
Gripper

Start calib

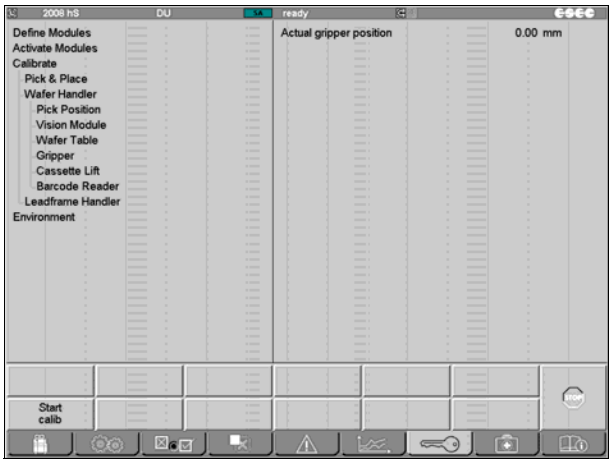
`Continue calibrates sensor position`

Continue

The Z-height sensor and the frame transport sensor is learned.

Complete

`Gripper is successfully calibrated`



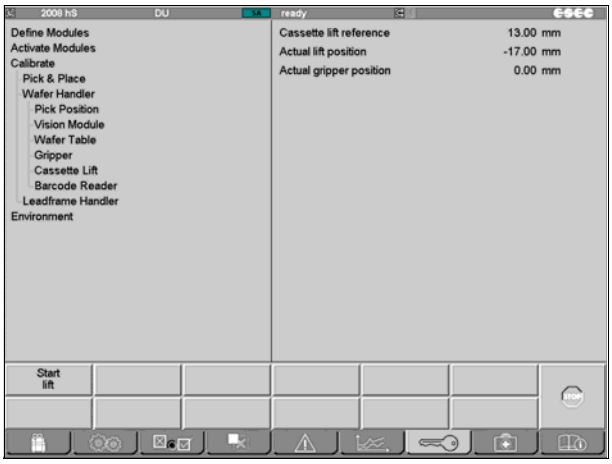
6.4.8 Cassette Lift Calibration

Preparation

Calibrate
Wafer Handler
Cassette Lift

Start lift

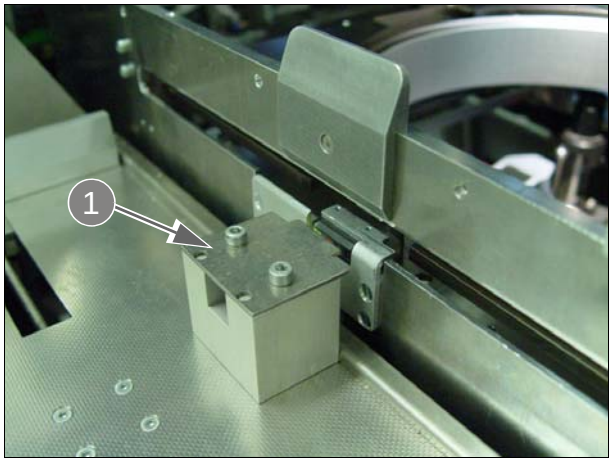
`Insert calib tool on the platform`



© 2009 Esec Ltd.

Defining the Wafer Present Sensor

Place the cassette lift calibration tool (1) on the platform.



Continue

`Move calib tool to the below gripper level`

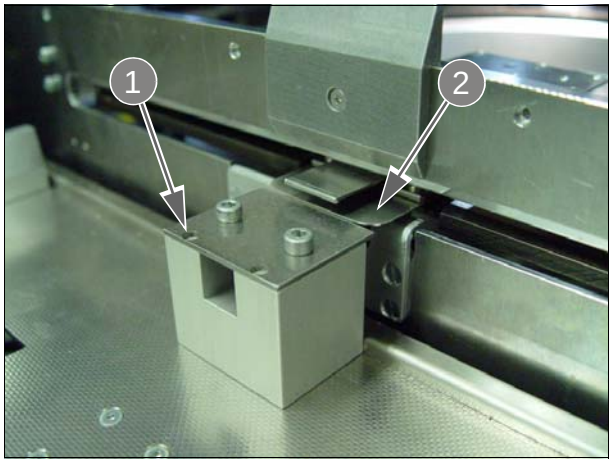
Use the cursor keys to move the cassette lift below the gripper level.

Continue

`Align calib tool in Z to gripper`

Defining the Gripper Level Position

Use the cursor keys to move the platform carefully so that the cassette lift calibration tool (1) is below the gripper (2).



Carefully rise the platform until the cassette lift calibration tool just touches the lower side of the gripper.

Define lift pos.

`Gripper level successfully defined`

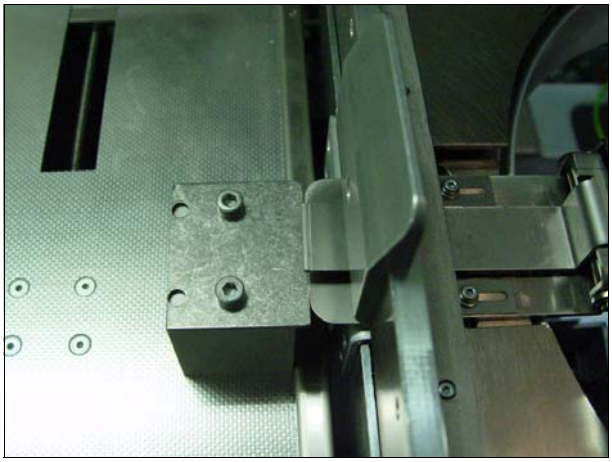
Continue

`Align gripper in X to calib tool shoulder`

© 2009 Esec Ltd.

Defining the Gripper Shoulder Position

Use the cursor keys to move the gripper so that the calibration tool rear shoulder is at the same position as the gripper clamp edge.



Define shoulder

`Shoulder position successfully defined`

Continue

`Remove calib tool from platform`

Remove the calibration tool from the cassette lift platform.

Complete

`Cassette lift successfully calibrated`

© 2009 Esec Ltd.

6.5 Leadframe Handling Calibration

6.5.1 Tools and Equipment

The following tools and equipment are required to calibrate the leadframe handling.

1. Customer leadframe
2. Thermocouple and cable, Esec part No. 240.0132.1
3. Bondhead calibration pin, Esec part No. 730.1641
4. Steel ruler
5. Vision adjusting tool 895.0140

Note: Make sure the pick & place unit is already calibrated when carrying out a full calibration of the leadframe handler.

6.5.2 Bond Vision (BVI) Adjustment and Calibration

Note: If any mechanical changes have been made at the BVI module or the BVI software is installed for the first time continue with section *Adjusting the Bond Vision* on page *6-30*.
Otherwise continue with section *Calibrating the Bond Vision* on page *6-29*.

Calibrating the Bond Vision

Checking the Focus

Calibrate
Leadframe Handler
Bond Position

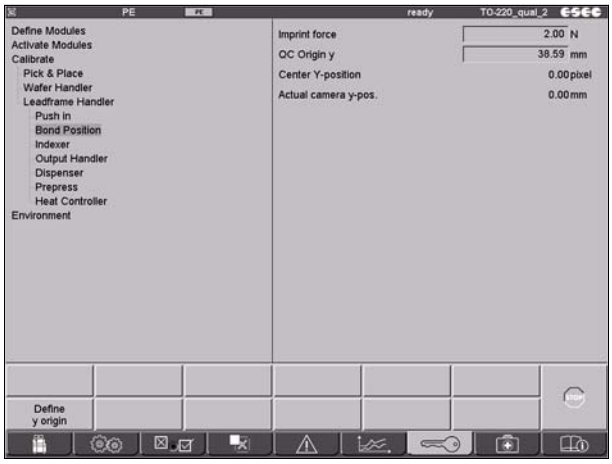
click ***Calibrate vision***

`Autofocus in progress... / Check focus and continue.`

Check the focus.

If the focus is not ok:

click ***Auto focus*** or use cursor keys ***left/right*** to adjust until the focus is correctly adjusted.



Note: If the focus can not be adjusted correctly by the cursor keys adjust the BVI camera according to section *Adjusting the Bond Vision* on page *6-30*.

© 2009 Esec Ltd.

Final Calibration of BVI

Continue

The motorized zoom moves to different positions.

`Calibration of optical center proceeding.../Calibration of magnification proceeding.../ Magnification successfully calibrated`

Complete calibration

`Successfully calibrated, remove strip`

The calibration of the bond vision is now finished.

Remove the calibration strip.

i 8 Adjusting the Bond Vision

Adjusting the Focus at Minimum Field of View (FOV)

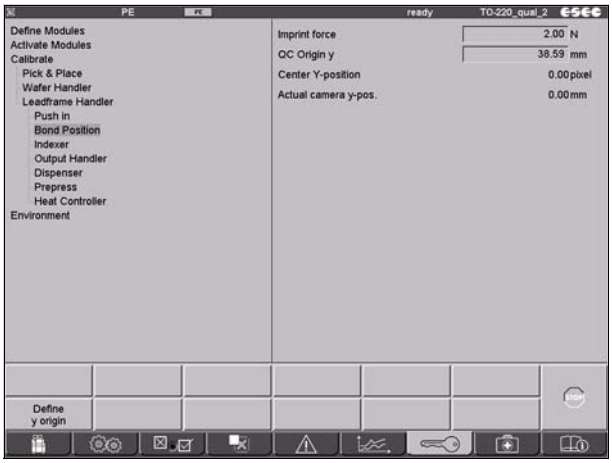
Calibrate
Leadframe Handler
Bond Position

Adjust vision

Check the focus.

If the focus is not ok:

Auto focus or use cursor keys ***left/right*** to adjust until the focus is correctly adjusted.



Adjusting the Focus at Maximum FOV

Continue

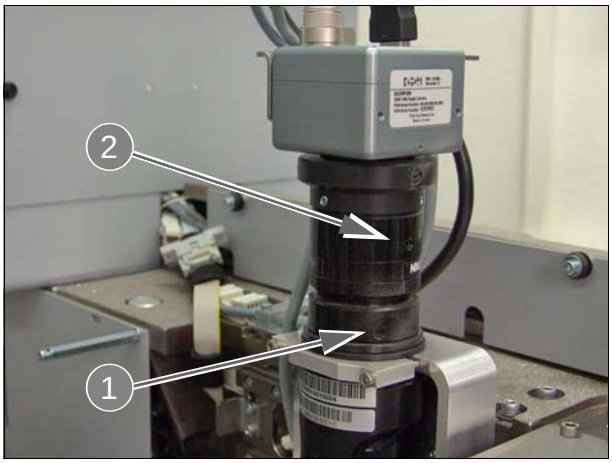
The motorized zoom moves out at maximum FOV.

`Adjust camera distance with mini adapter.`

Check focus, if the focus is not ok:

Loosen the three screws (1) of the lower adapter ring.

Loosen the two locking screws (2) of the upper adapter ring.



© 2009 Esec Ltd.

Adjusting the Focus at Maximum FOV (Cont.)

Hold the upper adapter ring and turn the lower adapter ring until the focus is ok.

Tighten the three screws (1) of the lower adapter ring and the two locking screws at the upper adapter ring.

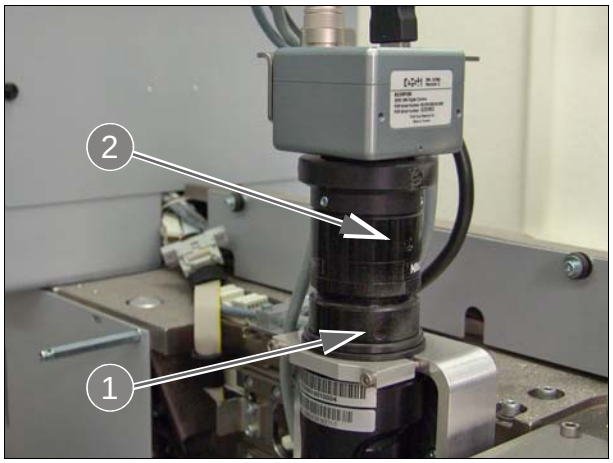
To verify the adjustment:

Zoom in and check the focus.

If the focus is not ok repeat step *Checking the Focus* on page *6-29*.

Zoom out and check focus again.

If the focus is not ok repeat step on page *6-31*.

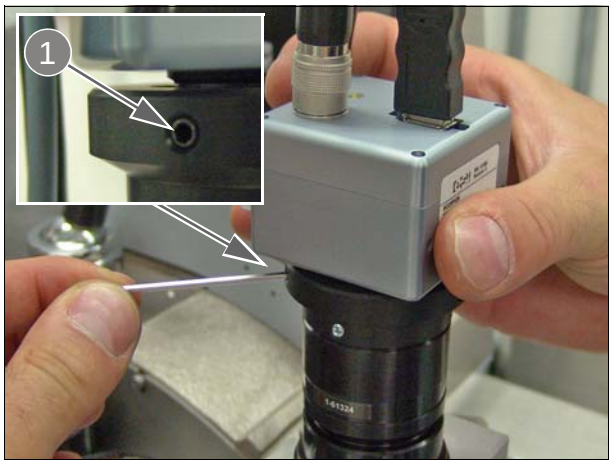


Adjusting the Camera Rotation (to be verified)

Continue

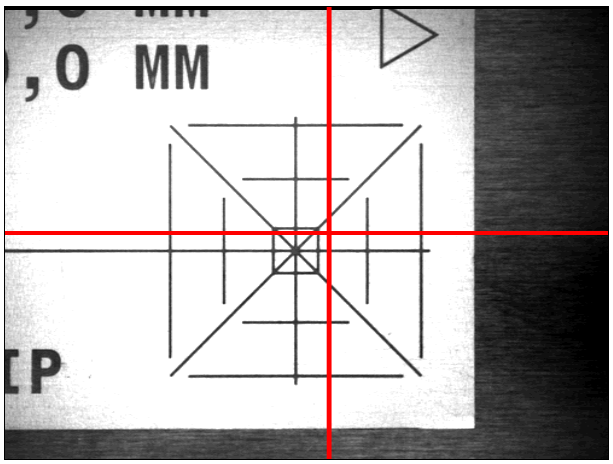
`Adjust camera rotation to calib strip.`

Loosen the (Allen) locking screw (1) on the camera adjusting ring.



Turn the camera until the crosshair is parallel with the center lines of calibstrip.

Tighten the locking screw on the camera adjusting ring.



© 2009 Esec Ltd.

Adjusting the Camera Alignment (to be verified)

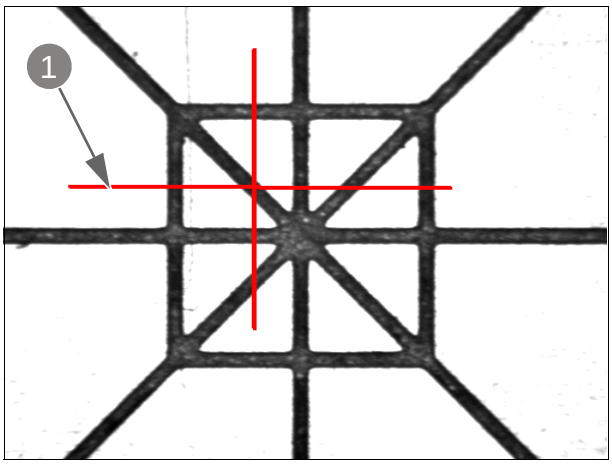
Continue

`Measurement of optical axis proceeding.`

The motorized zoom moves in and out for different measurements.

`Align camera to calib strip center.`

The inspection monitor shows a red crosshair (1).



If the measurement is not successful:

Autocalc center

If the crosshair still not centered, go ahead with mechanical adjusting steps *Centering the BVI Module (to be defined)* on page *6-32* and click ***Autocalc center*** again.

Loosen the (Allen) locking screw (1) of the camera adjusting ring.

Turn the two X/Y-adjusting screws (2) until the red crosshair covers the bond center and rotate the camera until the crosshair is parallel with the calib strip.

`Align camera to calib strip center`

Continue

`Adjust camera rotation to calib strip`

If required loosen the locking screw (1) and rotate the camera until the red crosshair is parallel with the calibstrip.

Centering the BVI Module (to be defined)

© 2009 Esec Ltd.

Final Calibration of BVI

Continue

The motorized zoom moves to different positions.

`Calibration of optical center proceeding.../Calibration of magnification proceeding../ Magnification successfully defined`

Complete calibration

`Successfully calibrated, remove strip`

The calibration of the bond vision is now finished.

Remove calibration strip.

© 2009 Esec Ltd.

6.5.3 Heater Calibration

i 40 This procedure must only be carried out after any change of control software.

WARNING

When an Install menu is opened, the software moves the appropriate hardware module(s) to prepare them for operation. Keep hands, loose clothing and tools clear of all moving parts.

When operating soft keys keep hands, loose clothing and tools clear of all moving parts.

Always move the mouse cursor off the soft key after use. Many soft keys have a toggle action and touching a mouse (or trackball) button will cause the module to move again.

WARNING

The indexer and its immediate vicinity may reach temperatures in excess of 450°C, coming into contact with it will result in serious burns.

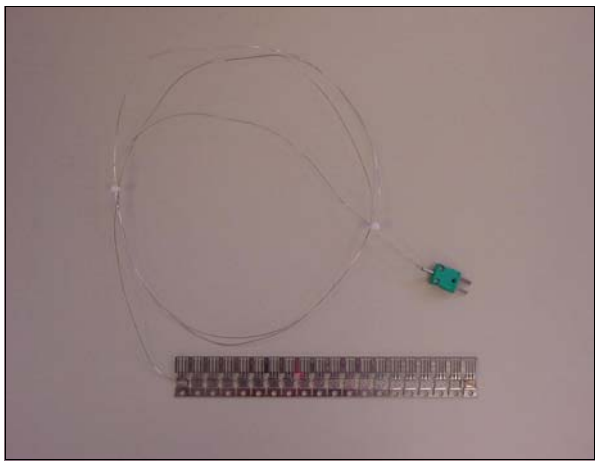
Always wear protective gloves when working in the vicinity of the indexer.

Making Up the Heater Calibration Leadframe

A thermocouple (ESEC No. 240.0132.1) and a connecting cable can be ordered separately. This must be welded to a leadframe of the type used on the machine.

Select a leadframe of the correct type, it must be in first class condition.

Using a suitable spot welding technique, fix the thermocouple wire onto the pad on the leadframe at which the temperature is to be measured (the first pad is recommended).



The weld must be flat to allow the leadframe and wire to pass through the furnace without becoming jammed.

For additional security, a second weld (on the last pad) is recommended.

When made up, the calibration tool must be safely stored for all future use.

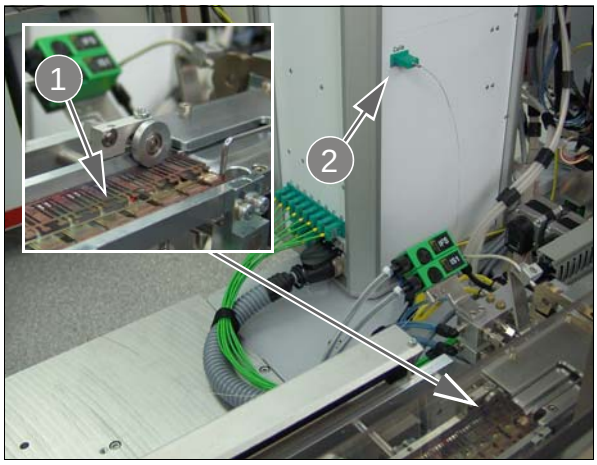
© 2009 Esec Ltd.

Static Calibration of the Heaters

Make sure that the system has attained working temperature. This takes approx. 20 minutes after switching the system power on.

Place the heater calibration leadframe (1) on the loader with the first transport hole aligned with the first transport finger.

Connect the thermocouple lead to the **Calib** connector (2) on the heater control panel and to the wire attached to the heater calibration leadframe.



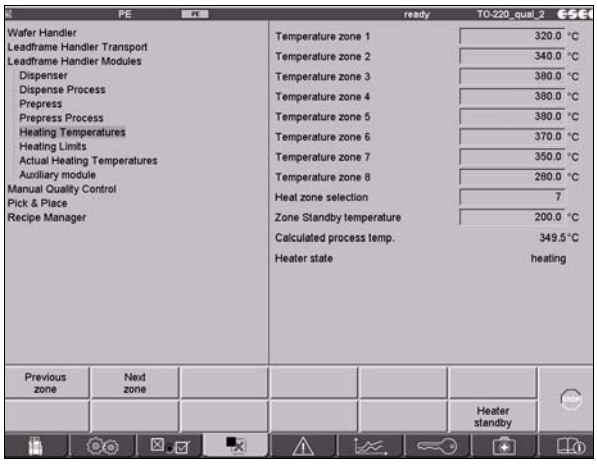
NOTICE

Make sure that the thermocouple wire is looped out to the left of the machine, clear of all obstructions and is not twisted.

The leadframe will be fed right through the furnace and the thermocouple wire will be drawn through with it. It must not become trapped or snagged during this movement.

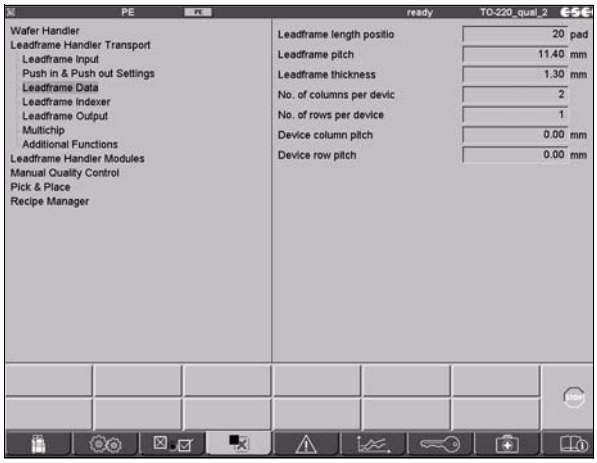
Leadframe Handler Modules
Heating Temperatures

Check whether there is stored a useful temperature profile (i.e. temperatures that can be achieved by the heaters). If not, edit the profile.



Leadframe Handler Transport
Leadframe Data

Check whether the parameter **Leadframe pitch** is set as required.



© 2009 Esec Ltd.

Static Calibration of the Heaters (Cont.)

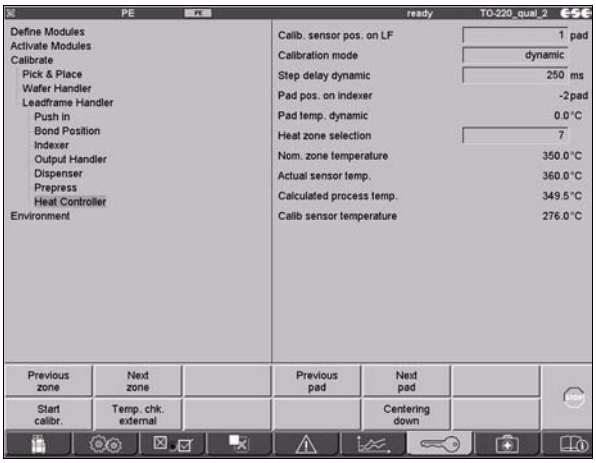
Calibrate
Leadframe Handler
Heat Controller

Calib. sensor pos. on LF

Set the parameter **Calibration mode** to **static**.

Auto calibr.

```
Preparing system for
calibration...
```



Note: If the temperature profile is set in a way that the temperature in individual zones cannot settle within a range of ±2.5°C of the set value the system will not continue.

After the set temperatures are achieved, the leadframe is automatically fed right through the furnace to the output side.

Optimize temperature

This automatically applies the correction factor calculated to the temperatures set.

Note: The required temperatures, as displayed in the teach menus, do not change, but the calibration factor of each zone is automatically adjusted in order to compensate the heat loss through the insert in the work holder.

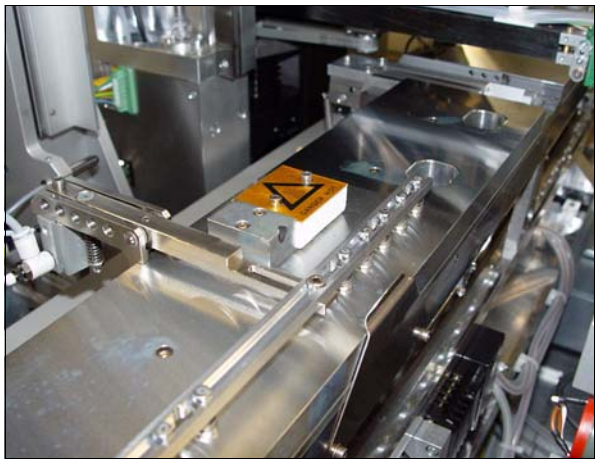
Downholder up

Centering up

WARNING

The calibration leadframe and thermocouple wire will be hot.

Pull the calibration leadframe back to the loader to remove it from the indexer.



Note: The heater controller requires 30 minutes to adjust the temperature levels.

Perform the dynamic calibration of the heaters according to section *Dynamic Calibration of the Heaters* on page *6-37*.

© 2009 Esec Ltd.

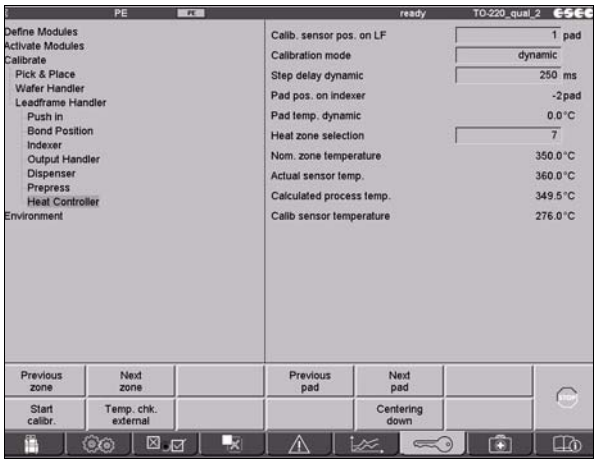
Static Calibration of the Heaters (Cont.)

Place the heater calibration leadframe on the loader with the first transport hole aligned with the first transport finger.

Set the parameter **Calibration mode** to **dynamic**.

Set the parameter **Step delay dynamic** to **10'000 ms**.

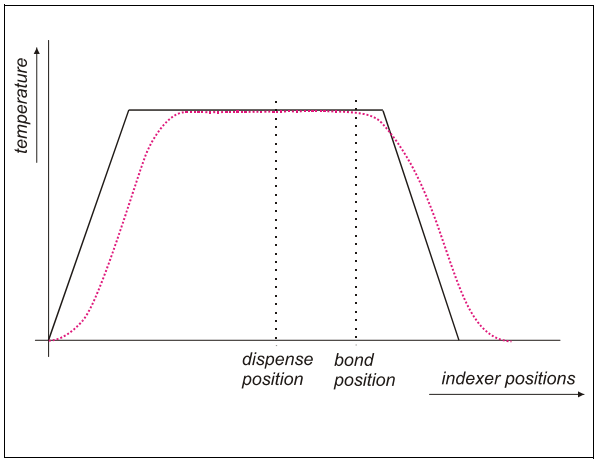
Connect the thermocouple to an external temperature recorder.



click ***Temp. chk. external***

The leadframe is automatically fed right through the furnace to the output side in steps of ten seconds per index position. During this movement the temperature recorder records the temperature at each index position along the whole length of the indexer and plots the temperature curve.

Check the static temperature profile.



Note: It is possible to manually optimize the individual static calibration factors.

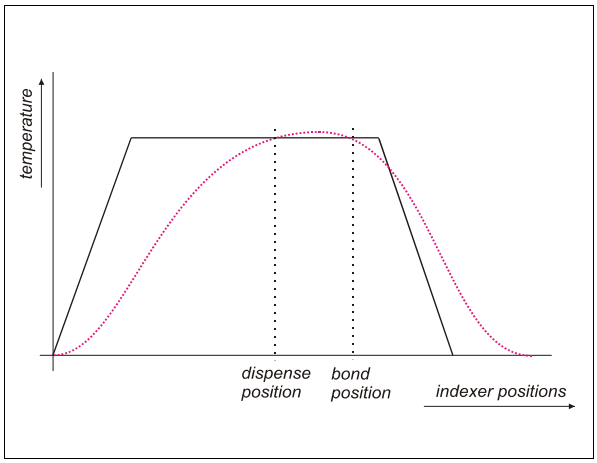
Dynamic Calibration of the Heaters

Set the parameter **Step delay dynamic** to **800 ms** to perform a real time test.

click ***Temp. chk. external***

The leadframe is automatically fed right through the furnace to the output side in real time.

✓ Check the dynamic temperature profile i.e. check whether the set temperature has been achieved at the dispense position. Also check whether the temperature at the output magazine has dropped to the required level.



© 2009 Esec Ltd.

Dynamic Calibration of the Heaters (Cont.)

If not satisfied repeat the test above with a increased or decreased step delay.

Downholder up

Centering up

WARNING

The calibration leadframe and thermocouple wire will be hot.

6.5.4 Indexer Calibration (Top Module)

WARNING

When an Install menu is opened, the software moves the appropriate hardware module(s) to prepare them for operation. Keep hands, loose clothing and tools clear of all moving parts.

When operating soft keys keep hands, loose clothing and tools clear of all moving parts.

Always move the mouse cursor off the soft key after use. Many soft keys have a toggle action and touching a mouse (or trackball) button will cause the module to move again.

WARNING

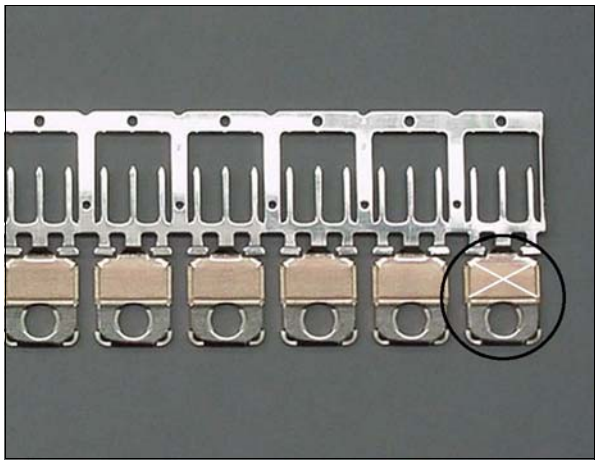
The indexer and its immediate vicinity may reach temperatures in excess of 450°C, coming into contact with it will result in serious burns.

Always wear protective gloves when working in the vicinity of the indexer.

Making a Calibration Strip

Select a leadframe of the correct type, it must be in first class condition.

Using a suitable marking implement, mark a cross on the first (most right) pad of the leadframe, the center of the cross must be positioned very accurately at the center of the pad.



Note: If a matrix leadframe is to be processed, the bottom right pad is used as the reference pad.

© 2009 Esec Ltd.

Making a Calibration Strip (Cont.)

Mark the leadframe so that it can be readily identified as the calibration tool for that type of leadframe.

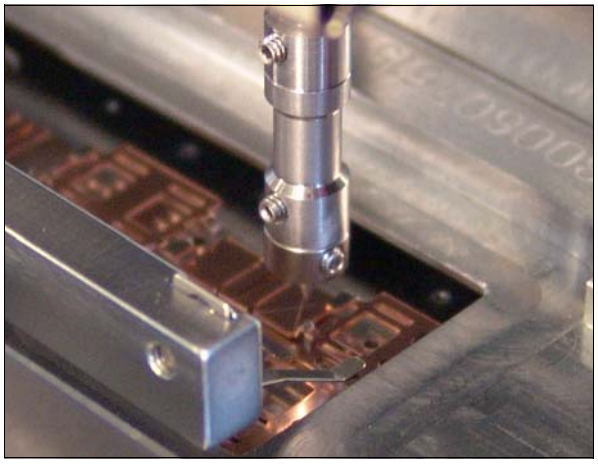
When made up, the calibration tool must be safely stored for all future use.

Make sure that the system has attained working temperature. This takes at least 20 minutes after switching the system power on, and may take much longer.

Make sure the position of the centering unit and of all transport fingers is adjusted correctly according to section *7.2.6* on page *7-20*.

Calibrating the Zero Position

Calibrate
Leadframe Handler
Indexer



Place the calibration strip into the input handler.

Load leadframe

Fit the calibration pin in the bondhead pickup tool carrier.

Bondhead down

Use the cursor keys to move the XY-shuttle, align the target pad exactly with the point of the calibration pin.

Def xy origin

Check the accuracy of the setting by moving down the bondhead very carefully until the calibration pin makes a small imprint on the target pad.

Exit the menu, then re-select it. Make sure that the calibration pin aligns exactly with the imprint made in the previous step.

When satisfied, remove the calibration strip from the indexer:

Unload leadframe

Remove the calibration pin from the bondhead.

© 2009 Esec Ltd.

6.5.5 Programmable Quality Camera TV PQCTV Calibration (Top Module)

Calibrating the PQCTV

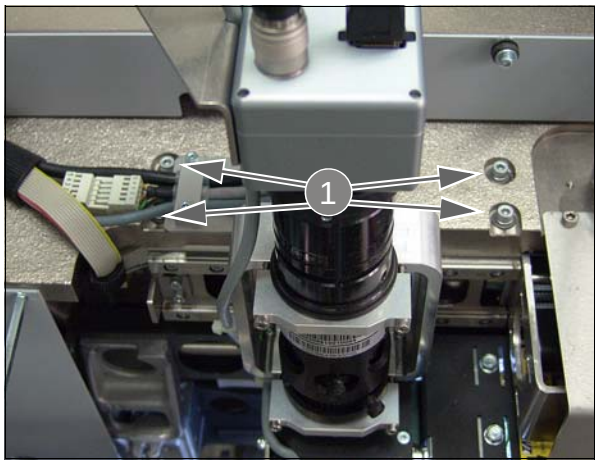
Calibrate
Leadframe Handler
Bond Position

Loosen the three screws at the input side and remove the QCTV camera.

Use the ***up/down*** cursor key to move the camera in the Y-direction.

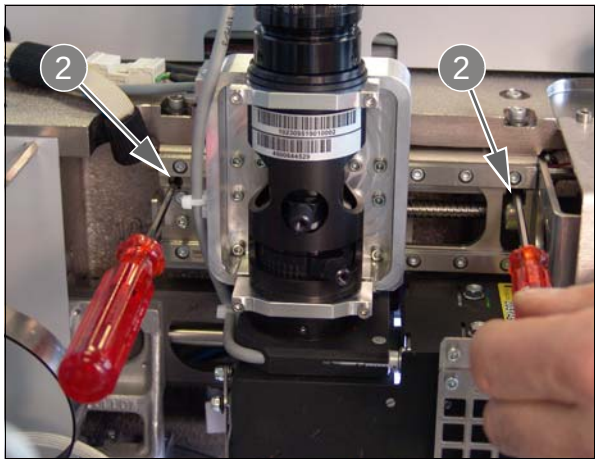
Define Y origin

Loosen the four fixing screws (1) of the camera.



Adjust the X-position by turning the two adjusting screws (2).

Tighten the four fixing screws.

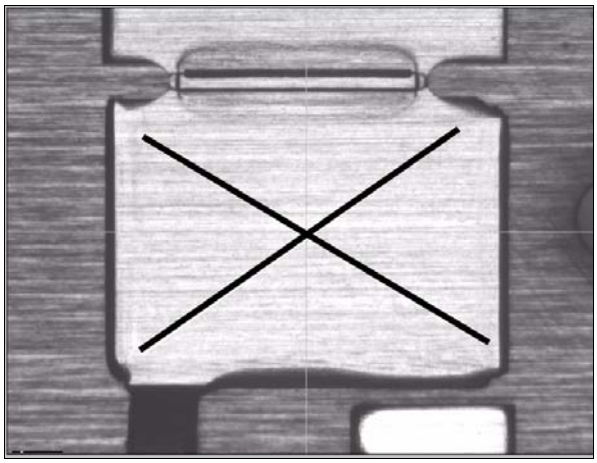


© 2009 Esec Ltd.

Calibrating the PQCTV (Cont.)

Using the up and down cursor keys, adjust the PQCTV camera in Y.

Check that the crosshair is precisely aligned with the center mark of leadframe in X and Y.



Mount the PQCTV cover.

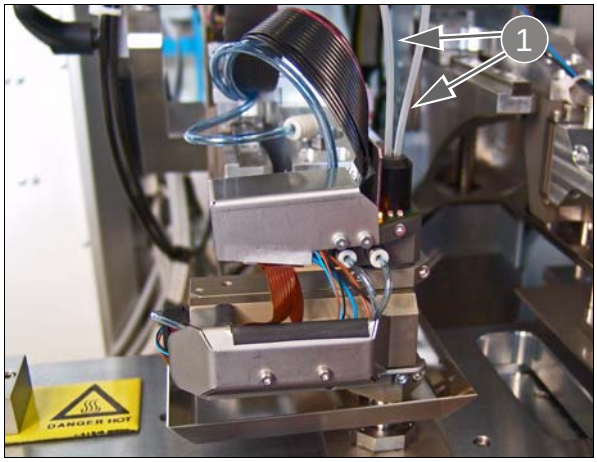
6.5.6 Programmable Dual Wire Dispenser PDWD Calibration (Top Module)

Calibrating the PDWD

Calibrate
Leadframe Handler
Dispenser

Load leadframe

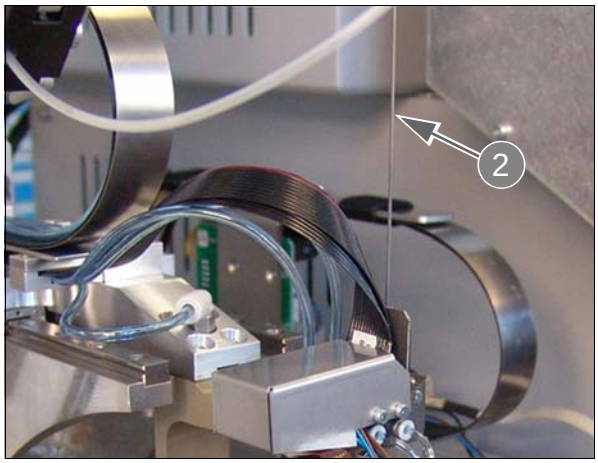
Remove both wires and guide tubes (1) from the PDWD.



© 2009 Esec Ltd.

Calibrating the PDWD (Cont.)

Insert a calibration wire (2) into the left wire hole.



z move down

Using the cursor keys move the PDWD in X- and Y-direction.

Define xy origin

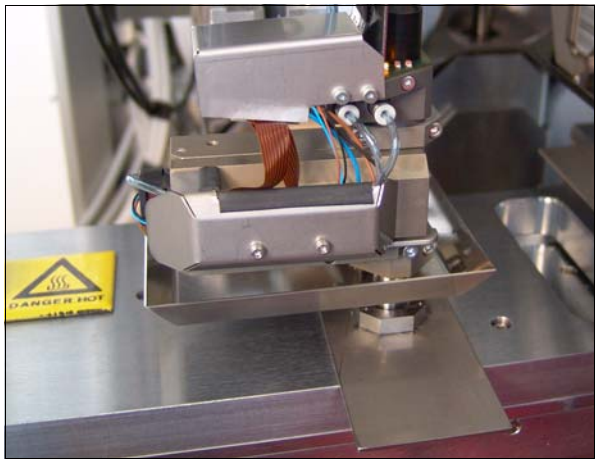
Remove the calibration wire.

Unload leadframe

z move down until touchdown

The yellow LED must be on.

Define z origin



© 2009 Esec Ltd.

6.5.7 Programmable Pre Press Module PPPM Calibration (Top Module)

Calibrating the PPPM

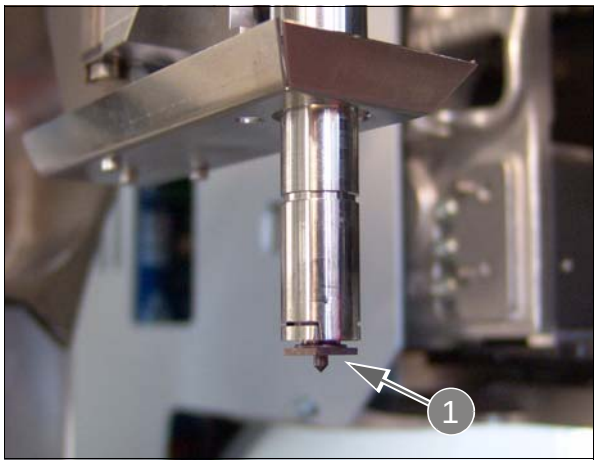
Calibrate
Leadframe Handler
Prepress

Remove the PPPM cover horizontally.

Load leadframe

Mount the calibration pin (1) on the PPPM.

z move down



Using the cursor keys to move the PPPM with the calibration pin to the xy position.

Define xy origin

Unload leadframe

Prepress to service

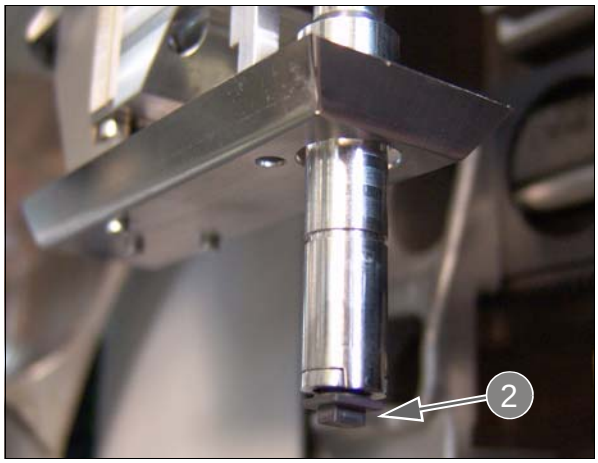
© 2009 Esec Ltd.

Calibrating the PPPM (Cont.)

Remove calibration pin and mount a standard PPPM tool (2).

Learn z-height

Mount the PPPM cover.

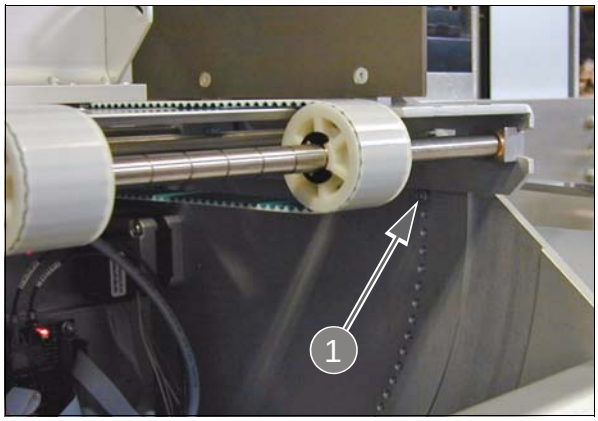


6.5.8 Power Leadframe Loader PLL Calibration

Calibrating the Gripper Axis

Remove both hex socket screws (1) supporting the buffer.

Insert both screws at the top position in order to position the buffer exactly horizontal.



Make sure the gripper arm is roughly in the position as shown so that only the flat portion of the gripper arm bracket (1) is touching the toothed wheel shaft (2).

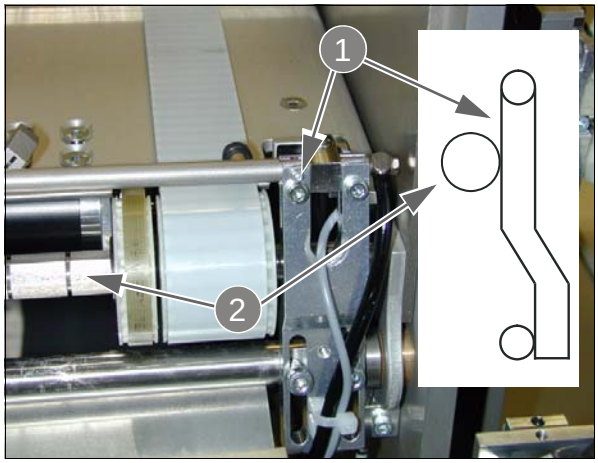
Calibrate
Leadframe Handler
Input Handler

Start calib

When prompted set the buffer horizontal.

Continue

The gripper will now calibrate itself on the toothed wheel shaft. It will only allow to be in a certain range on order to prevent from wrong calibration.

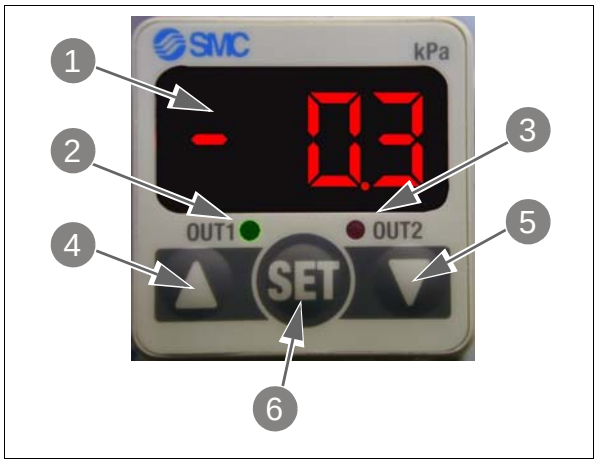


© 2009 Esec Ltd.

Vacuum Sensor Setting

Operating Elements

1. 3 $^{1}/_{2}$ digit display
2. Switch status of output 1, green LED, black wire
3. Switch status of output 2, green LED, white wire
4. UP button, used to change values
5. DOWN button, used to change values
6. SET button, used to change mode and to confirm values in the menus

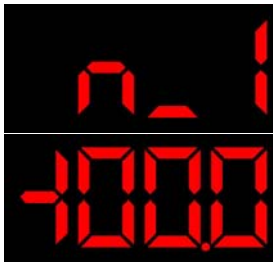
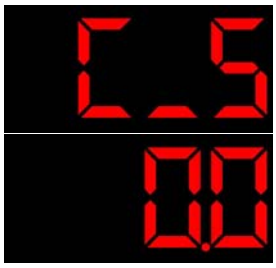


Initial Setup

Action	Expected value	Meaning	Action if another value is required
Press SET for more than 2 seconds		The unit displayed is Kilo Pascal (kPa).	Step through the parameters using the UP or DOWN button.
Press SET		Output 1 is working using normally closed mode. Note: Vacuum not present output 1 high.	Step through the parameters using the UP or DOWN button.
Press SET		Not used. Leave at default value	N/A
Press SET		Response time of measurement	Step through the parameters using the UP or DOWN button.
Press SET		Vacuum sensor is working in manual set mode	Step through the parameters using the UP or DOWN button.
Press SET			

© 2009 Esec Ltd.

Pressure Set Mode

Action	Alternating values displayed	Meaning	Action if another value is required
Press SET shortly		The system indicates the maximum vacuum limit. Set to -100.0kPa	Adjust the parameter using the UP and DOWN buttons.
Press SET		The system indicates the minimum vacuum limit. Set to -60.0kPa	Adjust the parameter using the UP and DOWN buttons.
Press SET		Not used. Leave at default value.	N/A
Press SET		Not used. Leave at default value.	N/A
Press SET		This item allows correcting a possible offset by applying a correction factor. Leave at default 0.0.	Adjust the parameter using the UP and DOWN button.
Press SET			

© 2009 Esec Ltd.

Resetting to Ambient Temperature

Action	Value indicated	Meaning	Action if another value is required
Press the UP and DOWN buttons simultaneously.		It is possible to reset to 0.0 if the pressure/vacuum is within ±7 kPa.	

Unlocking / Locking Buttons

Action	Value indicated	Meaning	Action if another value is required
Press SET for more than 4 seconds.		Buttons are locked.	Step through the parameter using the UP and DOWN button.
		Buttons are unlocked	
Press SET			

6.5.9 Stack Power SP Calibration

No calibration is necessary. Make sure that the unit is correctly aligned and adjusted for correct operation.

6.5.10 Top Stack Loader TOS Calibration (Option)

No calibration is necessary. Make sure that the unit is correctly aligned and adjusted for correct operation.

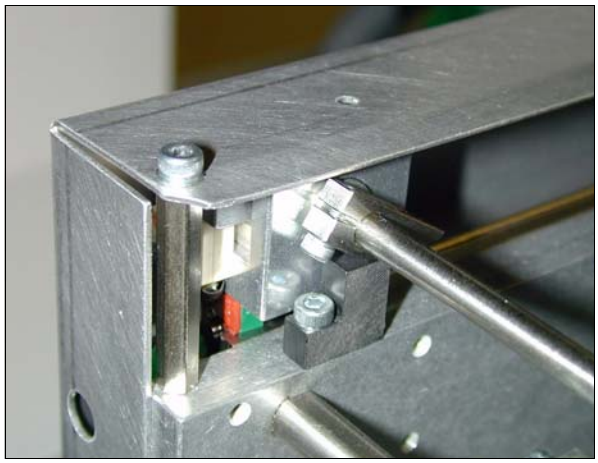
© 2009 Esec Ltd.

6.5.11 TOS Push-In Calibration

Calibrating the Park Position

Calibrate
Leadframe Handler
Push in

Using the cursor keys, move the push-in until its rear lever rests on the black plastic block.



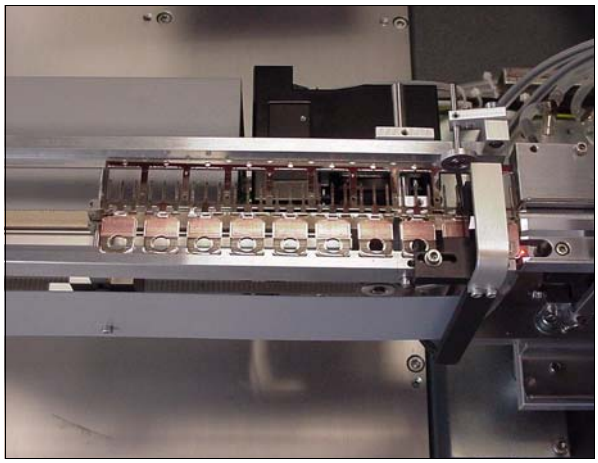
Note: The hole in the cover should be in line with the set screw of the push-in lever jam sensor.

Define park pos.

Calibrating the Calib Position

Using the cursor keys, move the push-in, complete with a leadframe, to the beginning of the indexer track.

Define calib pos.



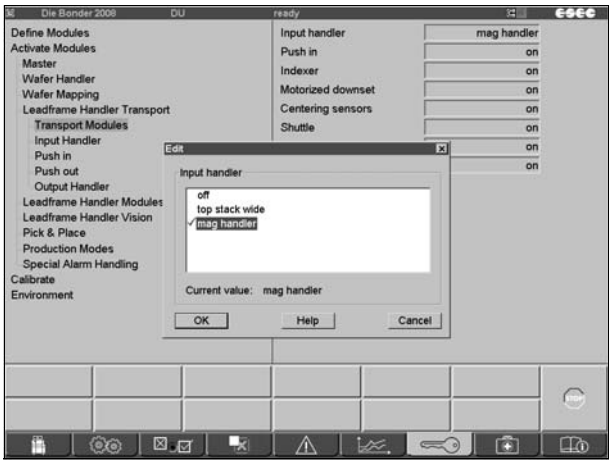
6.5.12 Input Magazine Handler Calibration (Option)

Activating the Module

Activate Modules
Leadframe Handler Transport
Transport Modules

Set the parameter **Input handler** to **mag. handler**.

Note: If necessary, init the Die Bonder 2009 SSI



© 2009 Esec Ltd.

Preparations

Make sure that there is no magazine on the input handler.

Calibrate
Leadframe Handler
Input Handler

Mechanical Adjustments

Perform the mechanical adjustment according to section *Mechanical Adjustments* on page *6-52*, which is written for the Output Magazine Handler.

Defining the Work Reference

Move to work ref. to move the pull-in clamp automatically to the Init position.

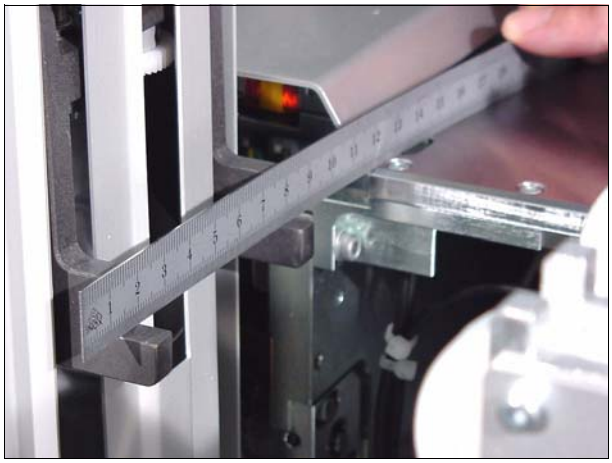
Place a steel ruler on the indexer, between the jaws of the clamps, make sure it is pushed back against the rail.

Slide the steel ruler to the left so that the leading edge partly exceeds the indexer.

Use the cursor keys to align the lift to the work reference position. First, align the Y-reference so that the rear edge of the ruler is exactly aligned to the Y-reference edge of the clamp assembly.

Now align the Z-reference edge of the clamp assembly so that it is aligned with the bottom of the ruler.

Define work ref. and remove the ruler from the indexer.



© 2009 Esec Ltd.

Defining the Load Position

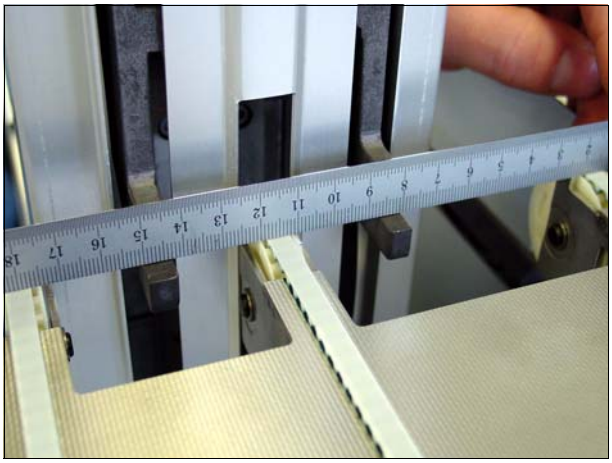
Move to load pos.

Place a steel ruler on the load buffer against the platform end stop.

Use the ***left*** (forward) and ***right*** (backward) cursor keys to move the lift in Y-direction until there is no gap between the steel ruler and the load buffer stops of the platform.

Use the ***up*** and ***down*** cursor keys to adjust the height of the lift as accurately as possible. There may be no gap between the lower clamp and the steel ruler.

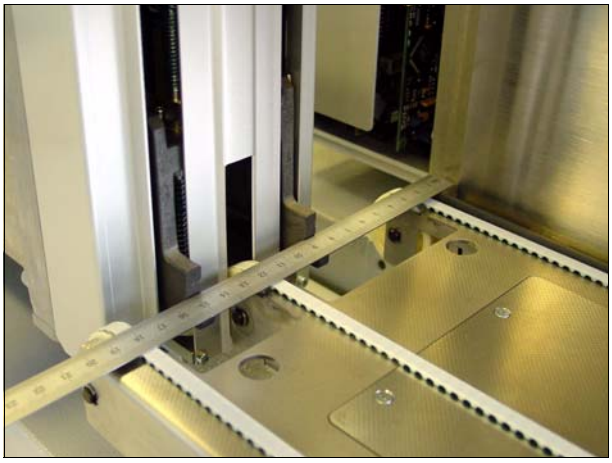
Define load



Defining the Unload Position

Move to unload

Place the steel ruler on the rear end of the unload platform. The rear of the magazine should be just in front of the belt roller fixing screws.

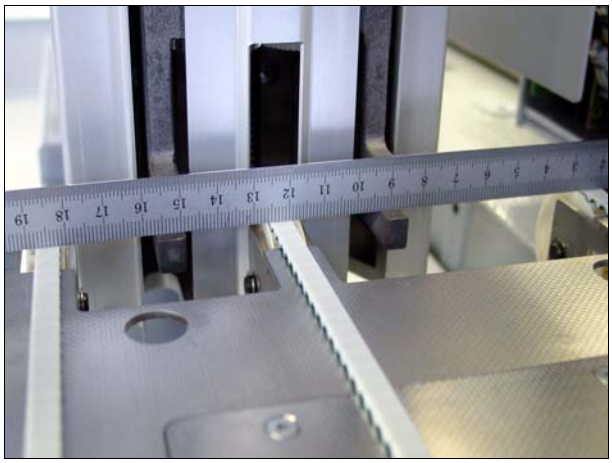


© 2009 Esec Ltd.

Defining the Unload Position (Cont.)

Adjust the height of the clamp so that its top edge is exactly on the same height as the unload buffer belts.

Define unload

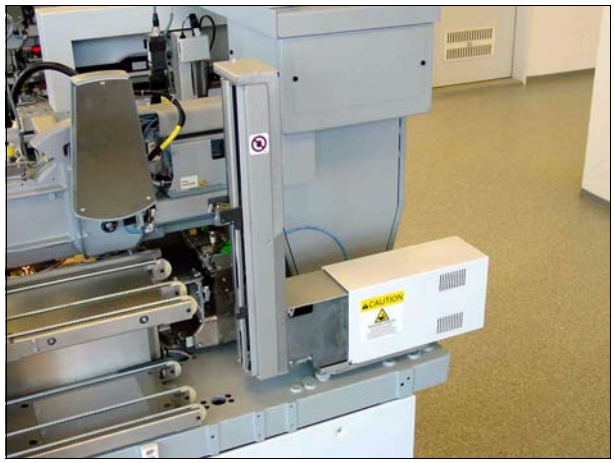


© 2009 Esec Ltd.

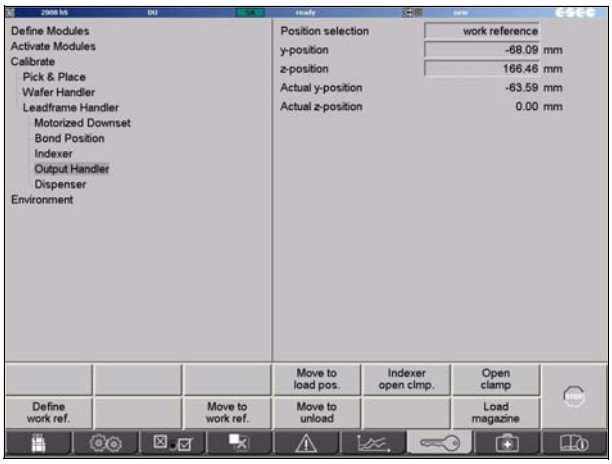
6.5.13 Output Magazine Handler Calibration

Preparations

Make sure that there is no magazine on the output handler.



Calibrate
Leadframe Handler
Output Handler

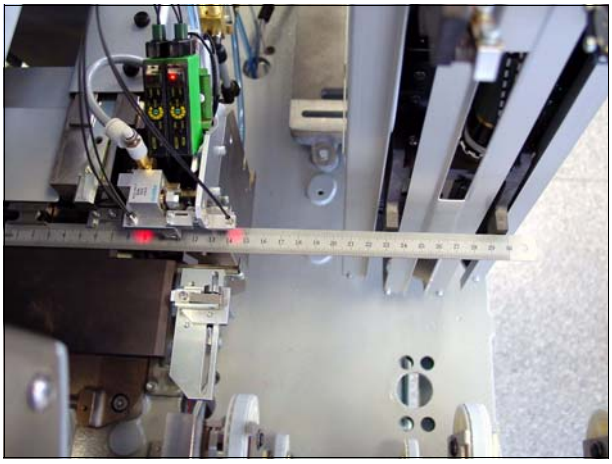


Mechanical Adjustments

Place a steel ruler parallel to the feeder rollers on the output of the indexer.

Move the lift close to the steel ruler by means of the cursor keys.

Check the parallelism of the lift with the indexer by observing the distance of the left and right clamp to the steel ruler.



© 2009 Esec Ltd.

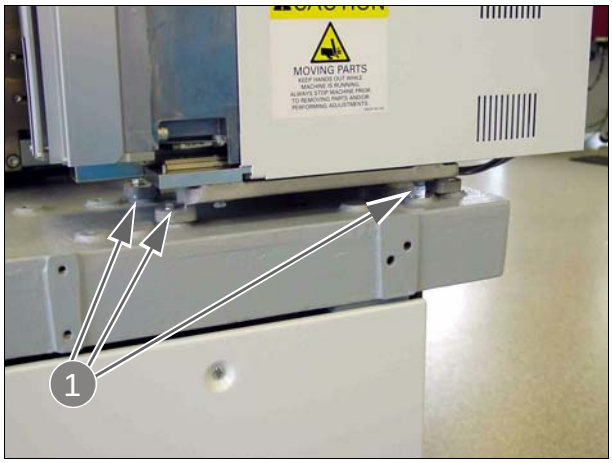
Mechanical Adjustments (Cont.)

If parallelism is not ok:

Loosen the four fixation screws (1).

Move lift manually and adjust parallelism of the lift.

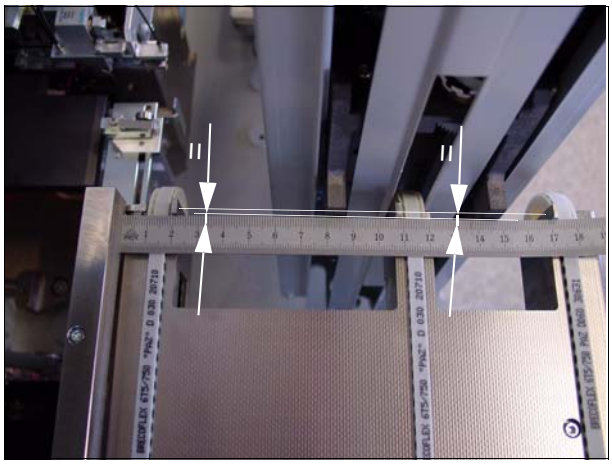
Tighten the fixation screws.



Place a steel ruler at the load buffer stops.

Use the cursor keys to move the lift close to the buffer.

Check the parallelism of the lift to the buffer by observing the distance of the left and right clamp to the steel ruler.



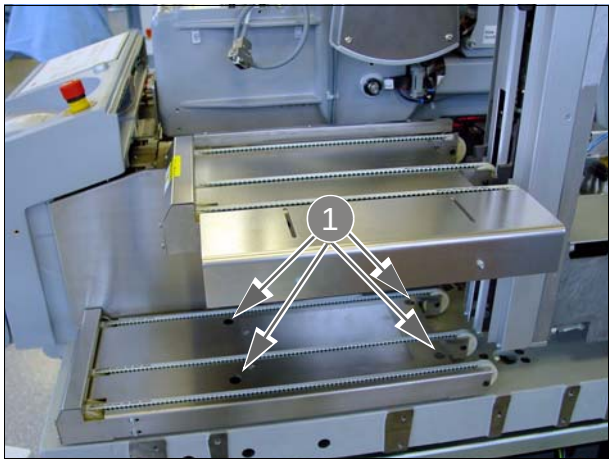
If parallelism is not ok:

Loosen the four hex screws (1) of the buffer.

Move the buffer manually and adjust the parallelism.

Observe the collision areas between the lift and the buffer in X-direction.

Tighten the four hex screws.



© 2009 Esec Ltd.

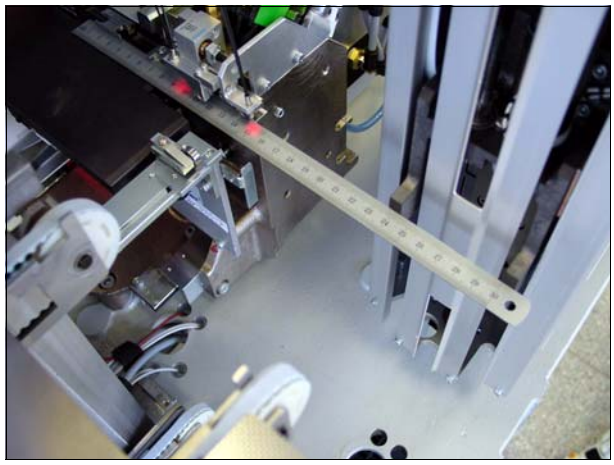
Defining the Work Reference

Move to work ref.

Place the steel ruler on the output side of the indexer.

Make sure it is pressed against the indexer rail and is lying flat along the whole length.

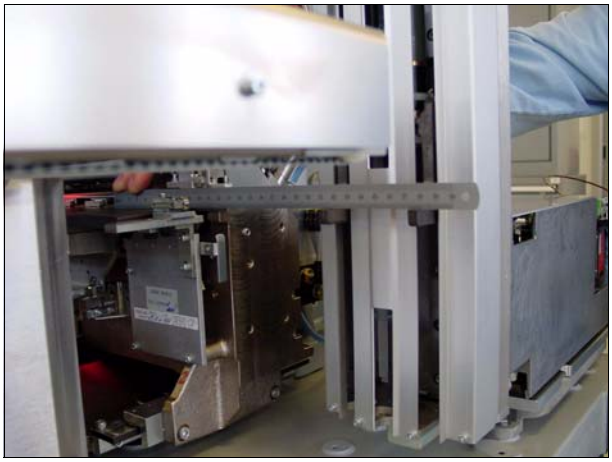
Position the lift by means of the ***left*** (forward) and ***right*** (backward) cursor keys so that the Y-reference edges of the clamp are exactly aligned to the rear edge of the steel ruler.



Use the ***up/down*** cursor keys to adjust the height of the bottom clamp so that its top edge of the bottom clamp assembly is exactly aligned with the bottom of the steel ruler.

Define work ref.

Remove the steel ruler.

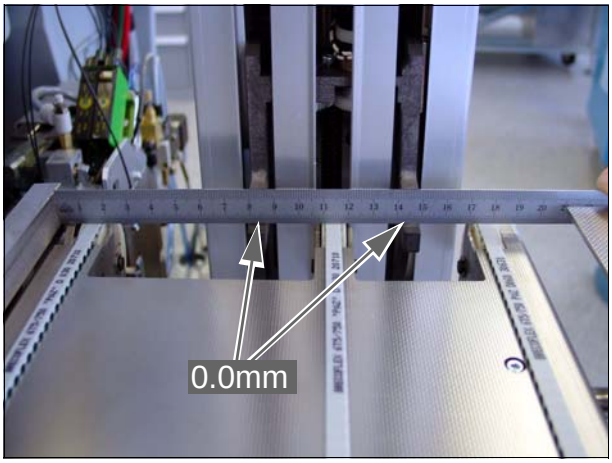


Defining the Load Position

Move to load pos.

Place a steel ruler on the load buffer against the platform end stop.

Adjust the height of the lift as accurately as possible by means of the ***up/down*** cursor keys. There must be no gap (0.0 mm) between the lower clamps and the steel ruler.

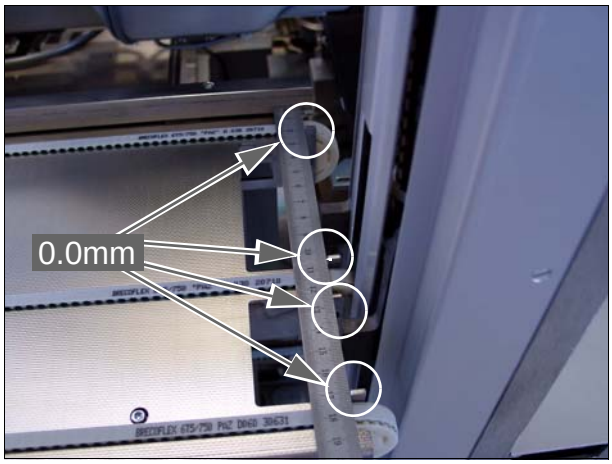


© 2009 Esec Ltd.

Defining the Load Position (Cont.)

Use the ***left*** (forward) and ***right*** (backward) cursor keys to move the lift in Y-direction until there is no gap (0.0 mm) between the steel ruler and the load buffer stops of the platform.

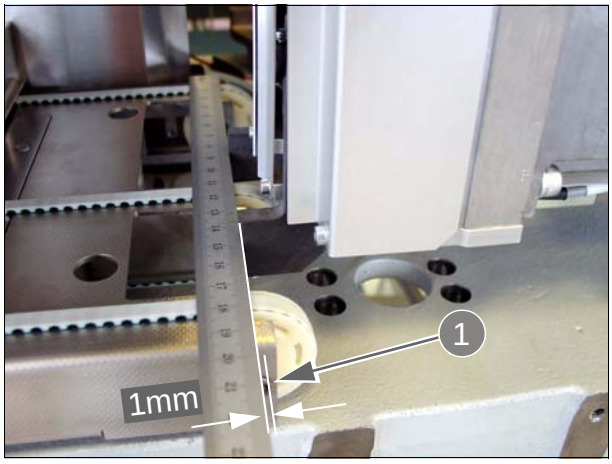
Define load



Defining the Unload Position

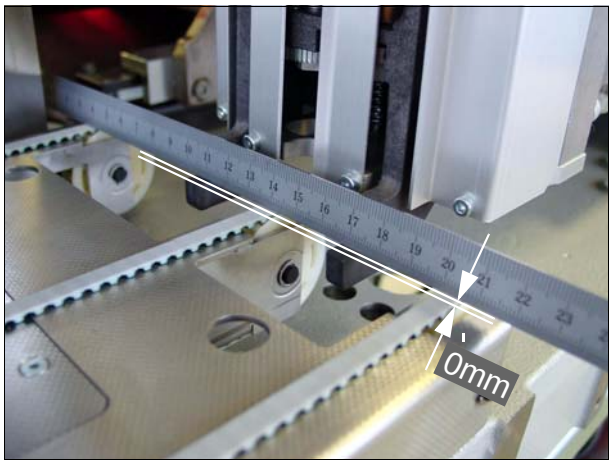
Move to unload

Place the steel ruler on the rear end of the unload platform. The rear of the magazine should be just in front of the belt roller fixing screws (1).



Use the ***up/down*** cursor key to adjust the height of the clamp so that its top edge is levelled with the unload buffer belts.

Define unload



6.5.14 Input Buffered Handler BH-IN Calibration (Option)

Calibrate the input buffered handler according to the section *Buffered Handler BH Calibration* on page *6-57*.

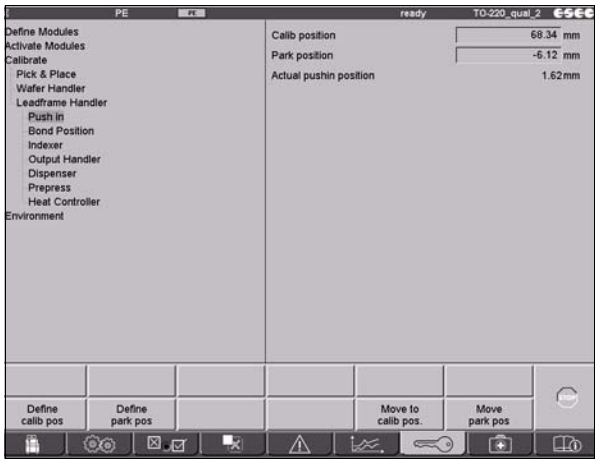
© 2009 Esec Ltd.

6.5.15 Buffered Handler Push-in Calibration

Calibrate
Leadframe Handler
Push in

Using the cursor keys, move the push in block, complete with a leadframe, to the beginning of the indexer rack.

click ***Define calib pos.***



6.5.16 Dual Input Handler DINP Calibration (Option)

Calibrating the Top Stack Load TOS for DINP

No calibration is necessary. Make sure that the unit is correctly aligned and adjusted for correct operation.

Calibrating the Magazine Handler for DINP

To calibrate the work, load and unload positions refer to the section *Input Magazine Handler Calibration (Option)* on page *6-48*.

6.5.17 Dual Power Leadframe Loader DPLL Calibration (Option)

Calibrating the Stack Power for DPLL

No calibration is necessary. Make sure that the unit is correctly aligned and adjusted for correct operation.

Calibrating the Magazine Handler for DPLL

To calibrate the work, load and unload positions refer to the section *Input Magazine Handler Calibration (Option)* on page *6-48*.

© 2009 Esec Ltd.

6.5.18 Buffered Handler BH Calibration

This procedure must be carried out:

- On initial installation:
- As specified during periodic maintenance
- After any change of control software
- After any replacement/repairs in indexer area

WARNING

When an Install menu is opened, the software moves the appropriate hardware module(s) to prepare them for operation. Keep hands, loose clothing and tools clear of all moving parts.

When operating soft keys keep hands, loose clothing and tools clear of all moving parts.

Always move the mouse cursor off the soft key after use. Many soft keys have a toggle action and touching a mouse (or trackball) button will cause the module to move again.

WARNING

The indexer and its immediate vicinity may reach temperatures in excess of 450°C, coming into contact with it will result in serious burns.

Always wear protective gloves when working in the vicinity of the indexer.

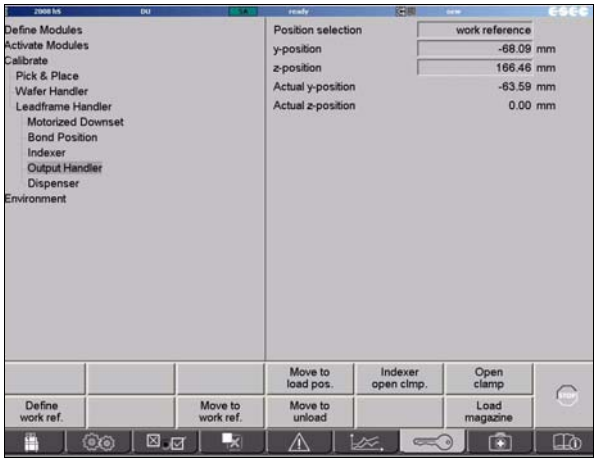
© 2009 Esec Ltd.

Calibrating the Buffered Handler

Calibrate
Leadframe Handler
Output Handler

Make sure there is no magazine on the output handler. To unload a magazine, click

Unload magazine

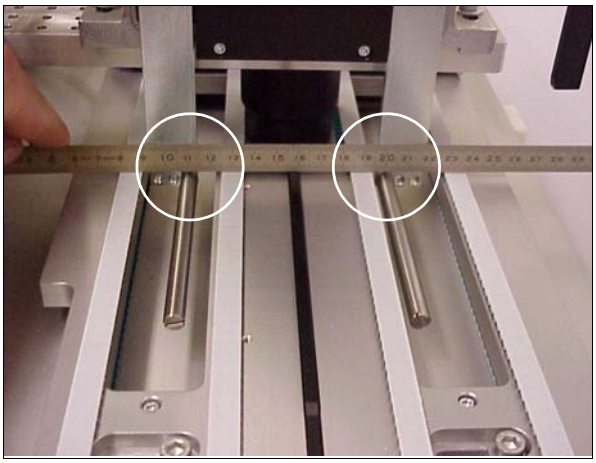


Calibrating the Buffered Handler (Cont.)

Move to unload

Place a steel ruler (or suitable straight edge) on the buffer platform across the four belts.

Using the up and down cursor keys, adjust the height of the lift until the top of the dowel pins are 1 mm (40 mil) below the bottom of the ruler.

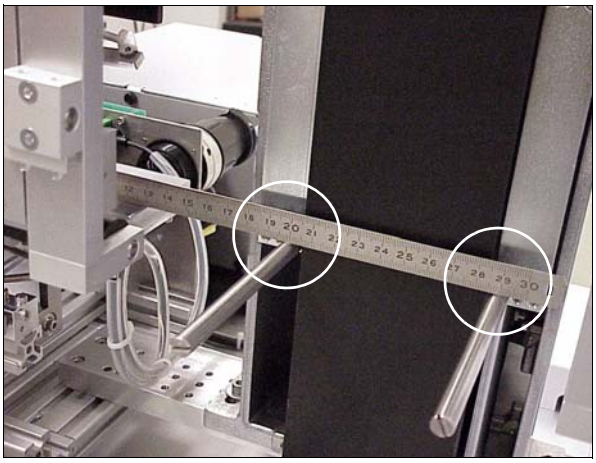


Define unload

Move to work ref.

Place the steel ruler (straight edge) on the indexer, make sure it is pressed against the rear guide and is laying flat along the whole length available.

Using the up and down cursor keys, adjust the height of the lift until the top of the dowel pins just touch the bottom of the rule. Make this adjustment as accurately as possible, by making sure that the rule is straight across both pins while still in correct contact with the indexer.



Define work ref.

Remove the steel rule.

© 2009 Esec Ltd.

6.6 Final Calibration

6.6.1 Tools and Equipment

The following tools and equipment are required to calibrate the die ejector:

1. Steel ruler
2. Calibration pot

WARNING

When operating soft keys keep hands, loose clothing and tools clear of all moving parts.

Always move the mouse cursor off the soft key after use. Many soft keys have a toggle function and touching a mouse (or trackball) button will cause the module to move again.

Note: When carrying out a complete calibration make sure the pick & place unit and the leadframe handler is already calibrated.

6.6.2 Die Ejector Height Calibration

Preparations

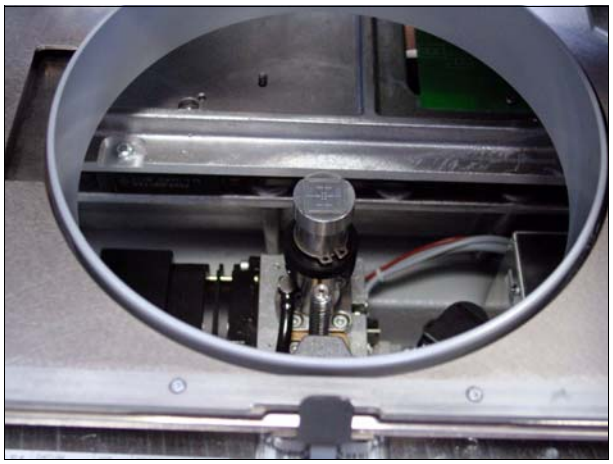
Fit a pickup tool with shank in the bondhead tool holder.

Remove the rubber tip.

Remove the indirect illumination of the pick vision (PVI).

Remove the pepper pot and the die ejector needle(s).

Mount the calibration pot.



© 2009 Esec Ltd.

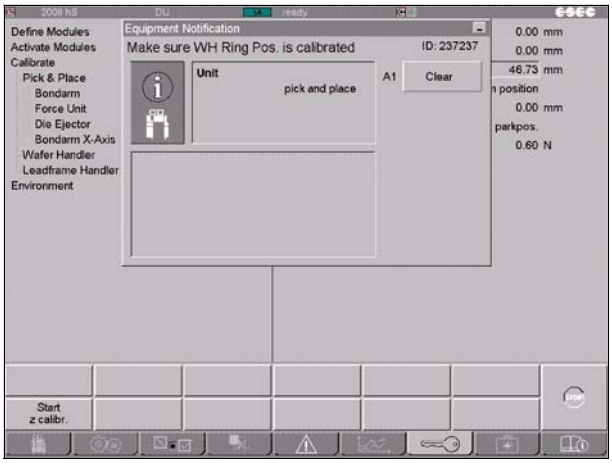
Select Height Reference

Calibrate
Pick & Place
Die Ejector

Set the parameter **Height reference** to **Calib to WH**.

The reference height for the pick & place z-calibration is measured at expansion ring of the wafer handler.

`Make sure WH Ring Pos. is calibrated`



Calibration

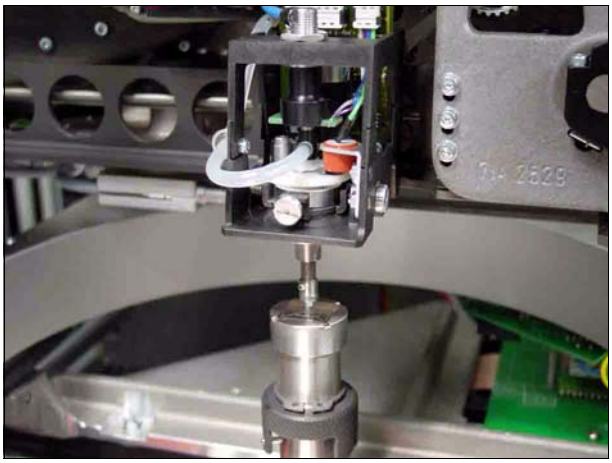
Start z calibr.

The bondhead moves down to the expansion ring, measures its height. The bondhead moves up and the expansion away. The bondhead is moving down to the pick height. The die ejector moves up until it just touches the pickup tool. The bondhead returns to the park position.

`DE calibration successfully completed`.

Remove the calibration pot and replace the pepper pot.

Mount the protective cover of the pick & place.



© 2009 Esec Ltd.

7 Mechanical Preparation

CAUTION

For better visibility of subjacent functions covers have been removed before taking pictures. In standard operating mode all covers have to be in place at any time (see Safety Chapter).

7.1 Introduction

This chapter describes the procedures to be carried out when changing the type of wafers and/or the type of leadframes.

This involves:

- **Mechanical preparation for the leadframe handling**
  Changing production tools and adjusting components of the leadframe handling.
- **Mechanical preparation for the wafer handling**
  Changing production tools and adjusting components of the wafer handling.
- **Teaching Procedures** (see *chapter 8*, *Machine Setup*)
  Entering and storing the parameters related to the wafer type and/or leadframe type. This is done via the menus on the master monitor.

Once the Die Bonder 2009 SSI system software has been taught the parameters for a particular chip/leadframe pair are saved in a recipe. This recipe can also be saved onto a floppy disk.

When changing the chip/leadframe to be produced again, only the mechanical preparation has to be carried out. The teach procedures can be skipped and the appropriate recipe can be loaded.

If a new chip is to be used with a known leadframe, the user can save time by loading the leadframe recipe, saving it under a new name and teaching the chip details only. This procedure can also be used for a new leadframe and an existing chip.

For details about saving and loading recipes refer to chapter *9*, *Recipe / Statistics*.

Note: 1. It is strongly recommended that procedures are carried out in the order defined in this manual and by each of the menus.
2. After each intervention in the mechanical functions of the machine, the parameters must be re-checked and, if necessary, adjusted.

© 2009 Esec Ltd.

/ (May 29, 2009)

7.1.1 Preparing the Machine

WARNING

When operating soft keys keep hands, loose clothing and tools clear of all moving parts.

Always move the mouse cursor off the soft key after use. Many soft key have a toggle action and touching a mouse (or trackball) button will cause the module to move again.

Do not change parameters, or operate soft keys or function keys unless the resultant action is known.

Failure to read and obey the safety instructions may result in serious injury, or death of personnel and damage to equipment.

Before starting any of the setting up procedures detailed in this chapter carry out the following checks:

Make sure the machine is calibrated as described in this operating information.

Make sure the following Die Bonder tools are available as required, they must be of the correct type to suit the materials to be used:

- pickup tools
- die ejector needle
- top stack gripper
- leadframe magazines
- single or dual wire guide
- PPPM tool
- wafer cassette
- wafer
- gram gauge 100-0-100
- gram gauge 1000-0-1000

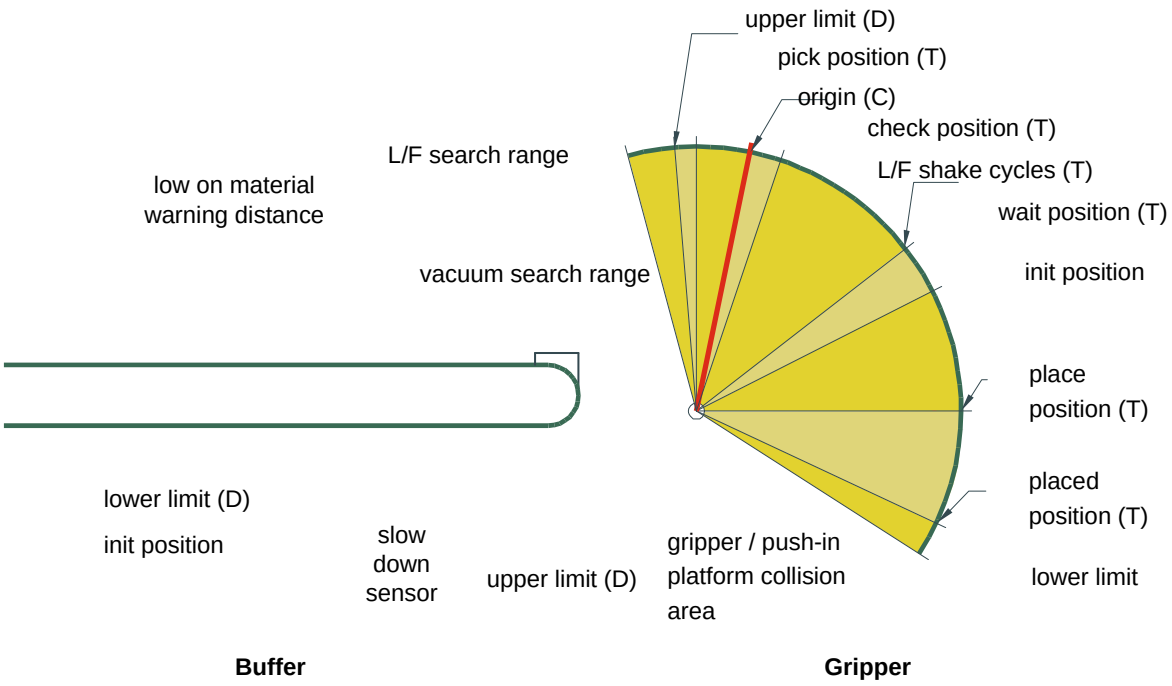
Start up the machine according to section *Powering up the Machine* on page *5-1*.

© 2009 Esec Ltd.

7.2 Leadframe Handling

7.2.1 Power Leadframe Loader PLL

Process Chart



(D): Define values

(C): Calibrate values

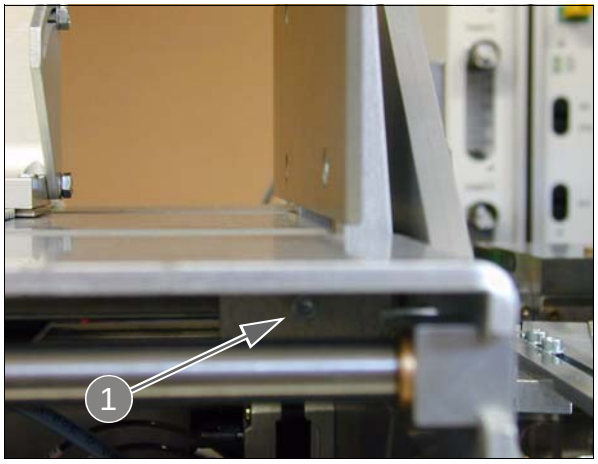
(T): Teach values

Buffer Adjustment

Loosen both column locking screws (1).

Adjust the width of the buffer stack column to the corresponding leadframe length.

Tighten both column locking screws.

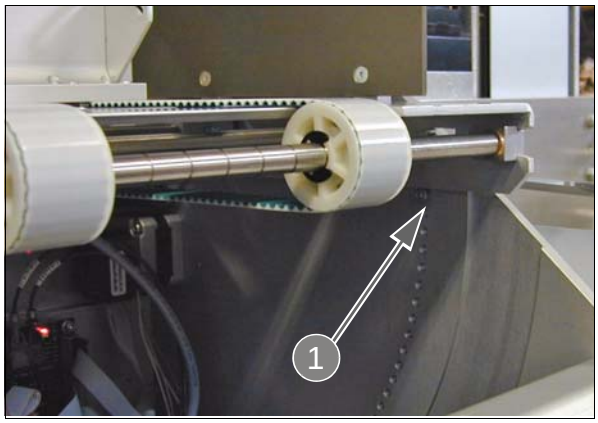


© 2009 Esec Ltd.

Buffer Adjustment (Cont.)

Relocate the two screws (1) on each side of the buffer in order to adjust the buffer angle.

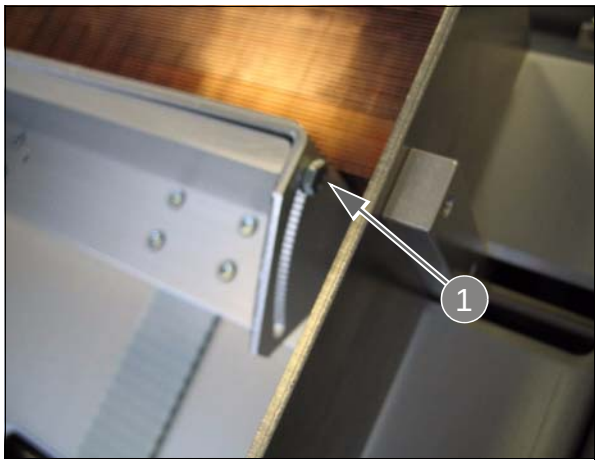
Make sure that the leadframes are stacking nicely in the fully filled buffer and are not falling over.



Loosen the two hex screws (1) to adjust the angle bracket.

Make sure to exactly fit the angle to the lower part of the leadframe stack in order to achieve a maximum of support.

Tighten the two hex screws (1).



Gripper Pick Position Adjustment

Leadframe handler transport
Leadframe input

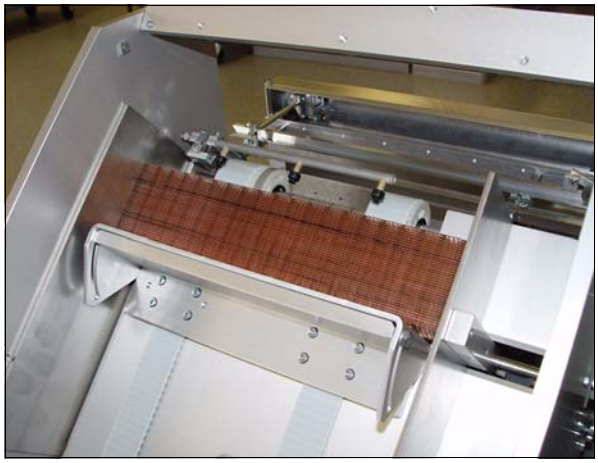
Set the parameter **Select axis** to **Gripper**.

Set the parameter **Position selection** to **pick position**.

Cursor the gripper arm holder until it is perpendicular to buffer platform.

click ***Define position***

Note: Picture shown without safety cover.



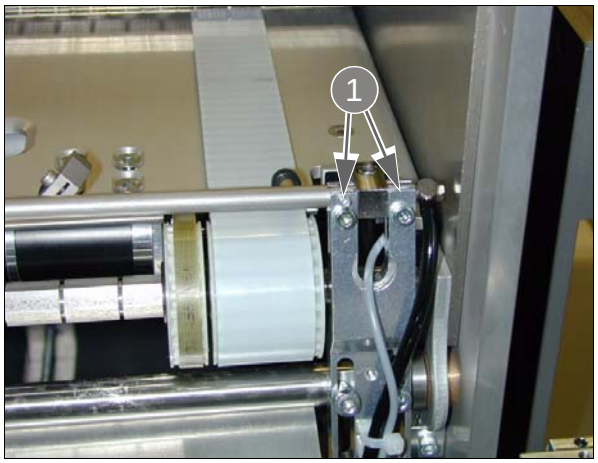
© 2009 Esec Ltd.

Gripper Pick Position Adjustment (Cont.)

Loosen the two screws (1) on the gripper arm.

Adjust the gripper so that the suction cups are parallel to the pad.

Adjust the gripper to the center of the pad.

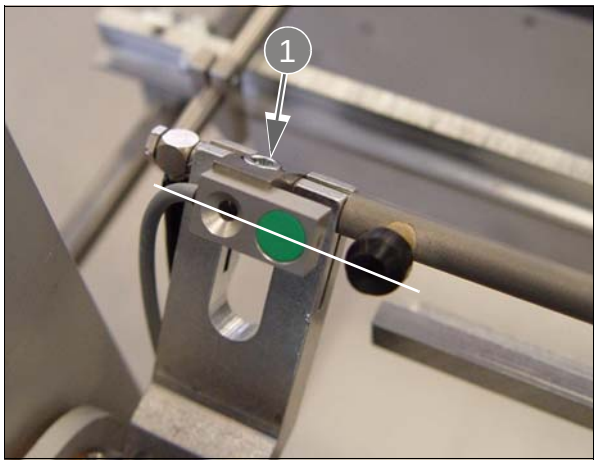


Loosen the sensor holder fixing screw (1)

Adjust the sensor holder to be inline with the suction cups.

Tighten the sensor holder fixing screw.

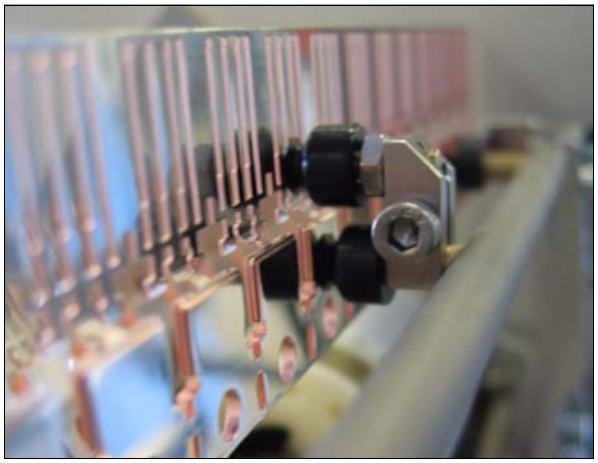
Tighten the two screws on the gripper arm.



Adjust the additional gripper support (dummy suction cup) to a suitable position on the leads or similar and adjust its Z-height offset according to the leadframe down set.

To adjust Z-height offset slide the support bracket on the main suction tube or if necessary adjust the threaded suction cup holder.

Next position



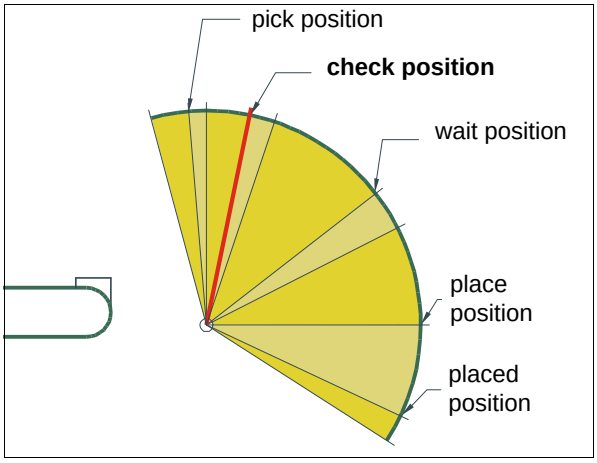
© 2009 Esec Ltd.

Gripper Check Position Adjustment

Cursor the gripper a few degrees towards the push-in platform.

Define position

Next position

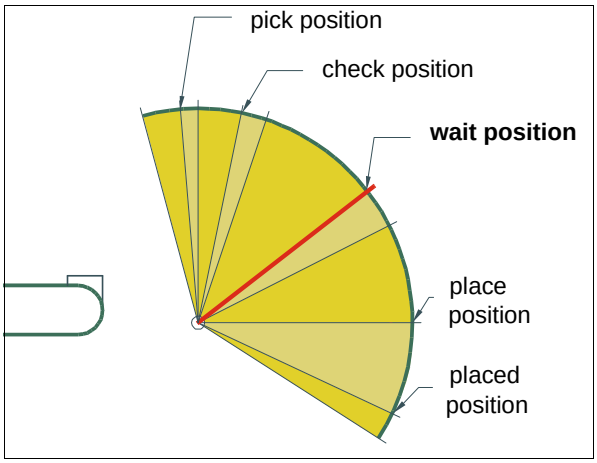


Gripper Wait Position

Cursor the gripper to a position close to the push-in platform. Make sure that the leadframe on gripper cannot collide with the leadframe on the push-in platform.

Define position

Next position

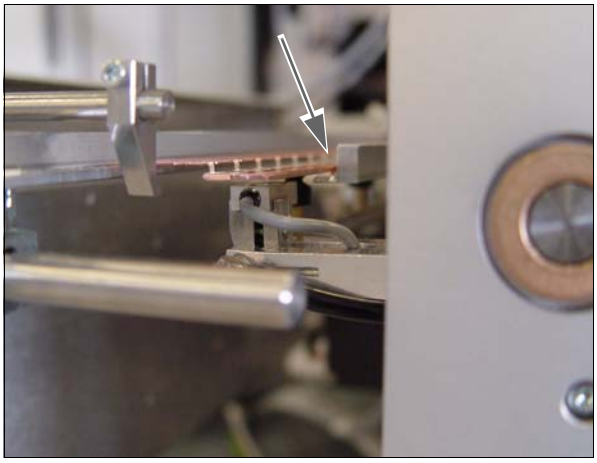


Gripper Place Position Adjustment

Cursor the gripper to a position where the leadframe just touches the push-in rails.

Define position

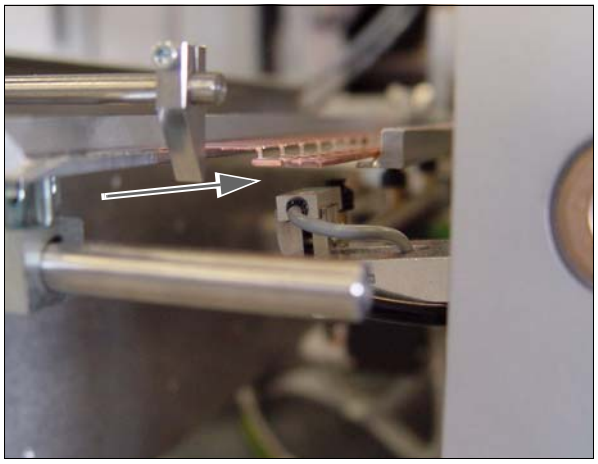
Next position



© 2009 Esec Ltd.

Gripper Placed Position Adjustment

Cursor the gripper to a position where the suction cups of the gripper are clear of the leadframe so that it can be pushed onto the indexer.



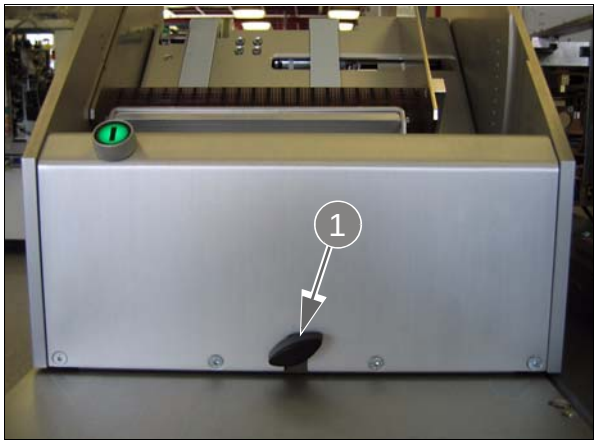
click ***Define position***

click ***Next position***

Y-Position Adjustment

Because the PLL is mounted on the input plate it is sometimes necessary to adjust its Y-position if a large chip correction on the indexer is carried out.

Turn the knob (1) located in center of the PLL front panel to adjust the Y-position. A clockwise rotation moves the PLL to the rear.

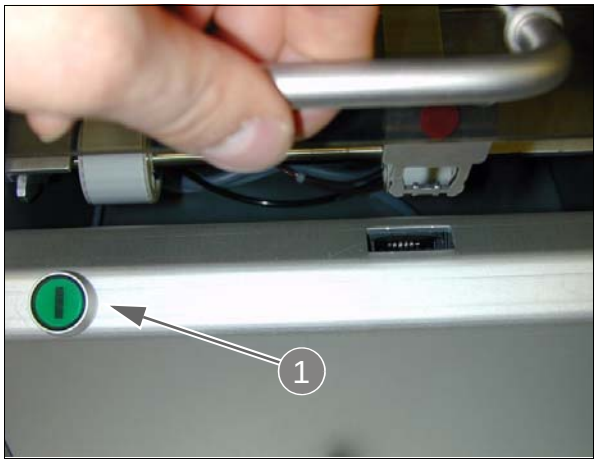


Loading the Buffer

Press the green load request button (1).

Loading request is acknowledged by flashing the load request button.

When the buffer has reached the loading position the load request button goes go on and the safety cover is unlocked.



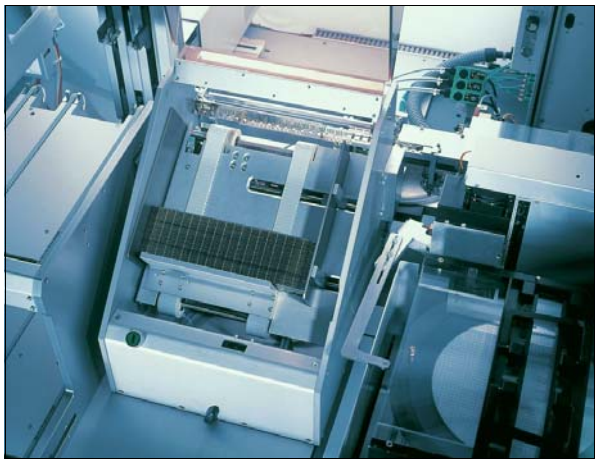
© 2009 Esec Ltd.

Loading the Buffer (Cont.)

Open the safety cover and add leadframes to the stack.

When finished close the cover.

The system will automatically lock and reteach the leadframe stack still continuing the production.



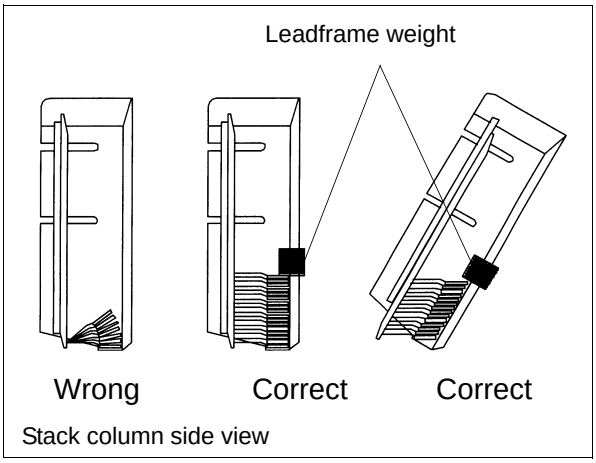
7.2.2 Stack Power

Defining the Column Guide Slant Angle

The design of the stack power unit allows the column guides, which support the stack of leadframes, to be set at angles varying from -15° to +35°. This feature permits operation with stacks of leadframes of different designs and shapes.

Check the type of leadframe to be used and proceed with the adjustments as follows.

Note: Use of the leadframe weight is recommended for all types of leadframe.

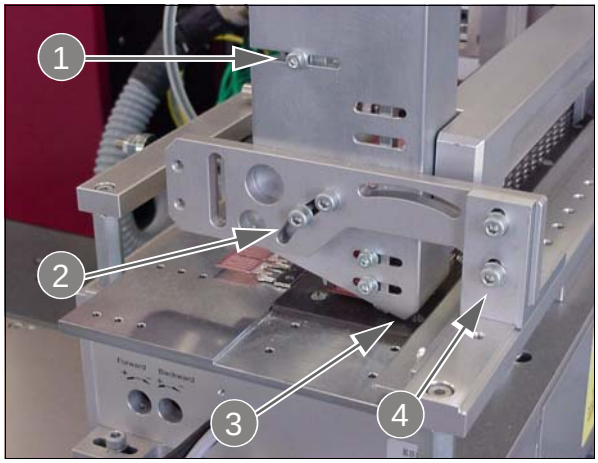


Remove the four screws retaining the two leadframe vertical guides (1) and remove the guides (they are refitted later according to section *Adjusting the Leadframe Vertical Guides* on page *7-10*.

Loosen the four angle adjustment screws (2) and adjust the angle between both of the column guides and the crossbar to suit the shape of the leadframe.

When satisfied, tighten the four angle adjustment screws.

Push the load platform towards the rear, to position the leadframe supporting plate under the column guides.



© 2009 Esec Ltd.

Defining the Column Guide Slant Angle (Cont.)

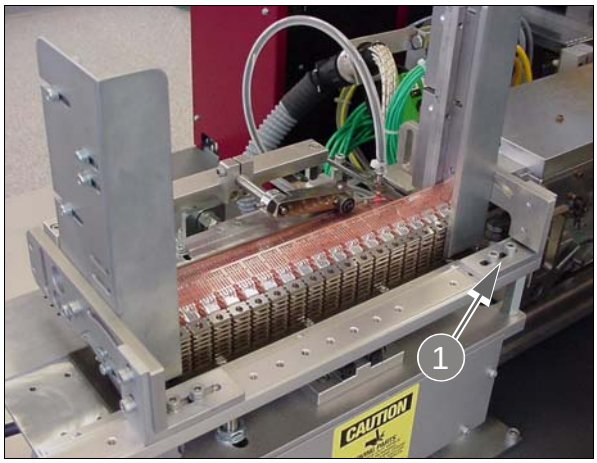
The gap between the bottom of the guides and the leadframe supporting plate (3) should be 0.1 mm (4 mil).

To adjust this gap, loosen the four screws connecting the crossbar with the angle poles (4). Adjust the height of the column guides by shifting the crossbar vertically.

When satisfied, tighten the four crossbar fixing screws.

Adjusting the Column Guides to the Leadframe Length

The width between the column guides must be set 10 mm (400 mil) wider than the leadframe length.

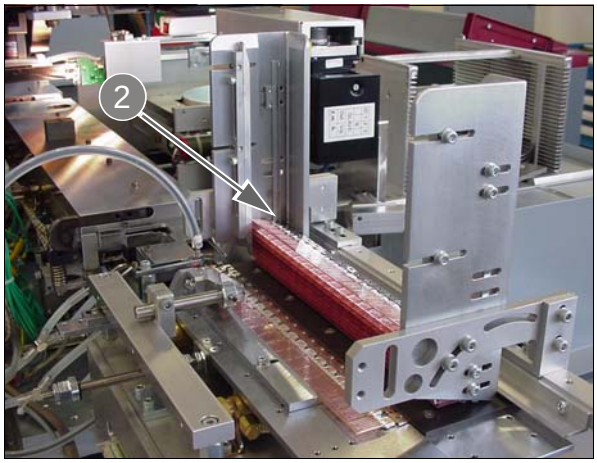


Place a leadframe between column guides and make sure there is a gap of approximately 10 mm (400 mil) between the end of the leadframe and the guides.

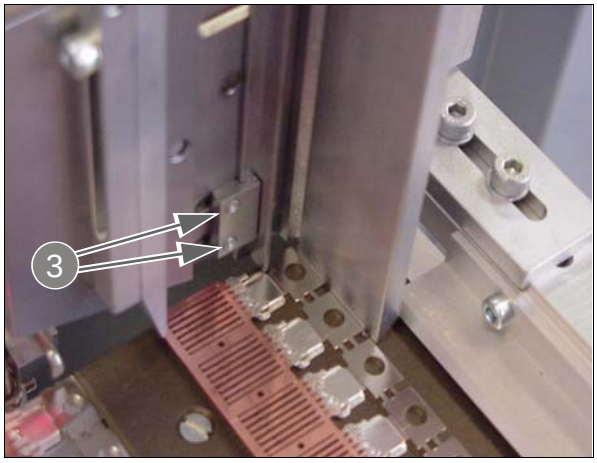
If adjustment is required, loosen the two adjustment screws (1) and shift the crossbar etc. outward to increase the gap, inward to reduce it.

Tighten the two screws.

Push the leadframe into the corner of the right-hand column guide and check the position of the separation bracket (2) in both height and the Y-direction. The bracket must engage the notch on the side of the leadframe heat sink and be level with the bottom of the column guide, i.e., 0.1 mm (4 mil) above the leadframe support plates.



If adjustment is necessary, loosen the two locking screws (3) and move the bracket to the position required.



Tighten the two locking screws.

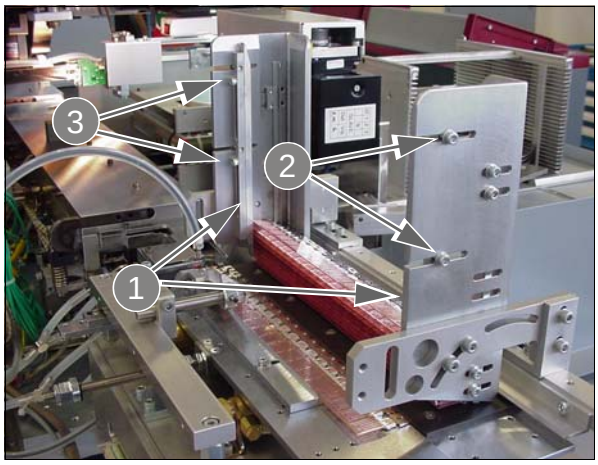
Check the left column guide and, if necessary, adjust it the same way as the right column guide.

Shift the crossbar back towards the right-hand column guide, making sure that the leadframe can be moved 0.1 mm (4 mil) in both X and Y directions.

© 2009 Esec Ltd.

Adjusting the Leadframe Vertical Guides

Place a number of leadframes between the column guides.



Fit both vertical leadframe guides (1) loosely. Adjust their position in Y so that there is a small gap between them and the leadframes, set them a little slanted, with the smaller gap towards the bottom of the column guide. For Y-adjustment loosen the fixing screws (2)

Check that there is a clearance of approximately 0.5 mm (20 mil) between the X-direction leadframe slide and the leadframe guide. If X-adjustment is required, loosen the two hexagon socket screws on the front of the vertical guide slide (3) and adjust the height of the leadframe guide.

CAUTION

Setting the leadframe vertical guides too low can cause a collision with the X-direction leadframe slide.

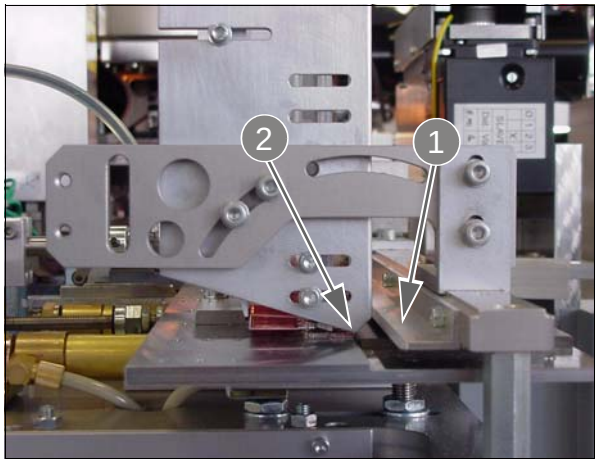
Fully tighten all screws.

Aligning the Platform

Push the X-slide fully forward.

Check the alignment of the leadframe supports and the bottom edges of the column guide.

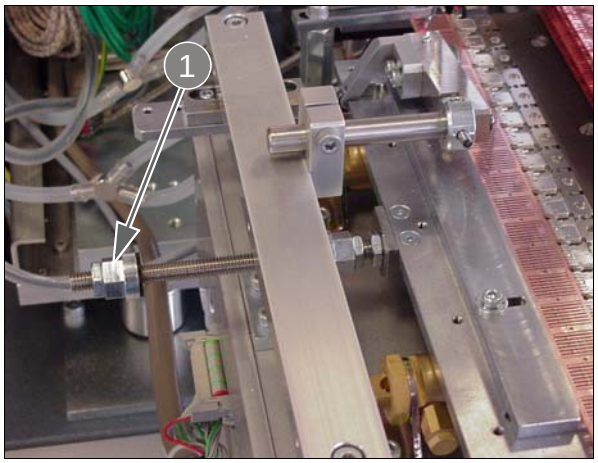
The leadframe supports (1) should be 0.1 mm (4 mil) behind the column edges (2).



© 2009 Esec Ltd.

Aligning the Platform (Cont.)

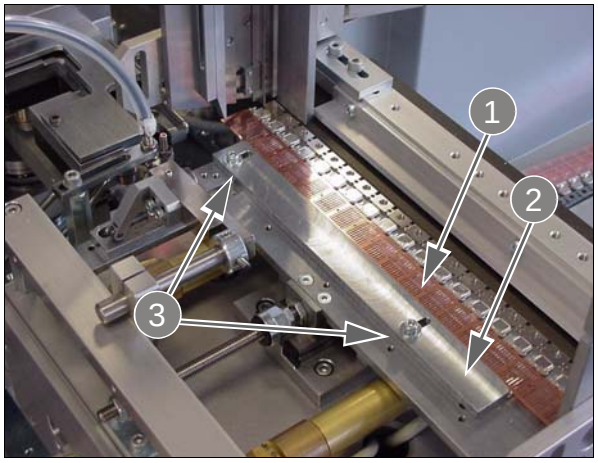
- If adjustment is required, loosen the outer lock nut of the slide stopper (1).
- Increase or decrease the length of the threaded bar as required to obtain the correct setting.
- Tighten the lock nut.



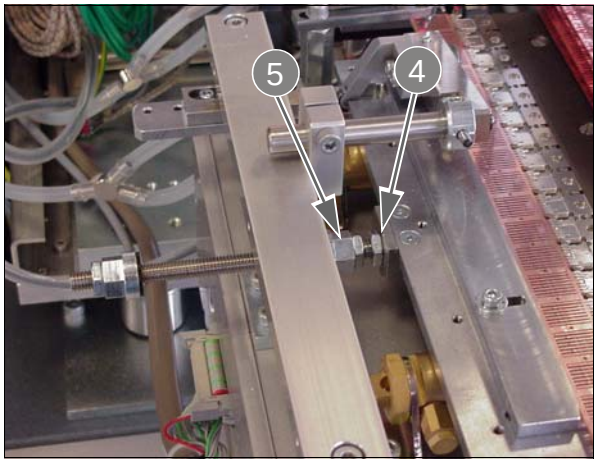
Aligning the Platform X-Slide

Place a leadframe on the platform.

- Make sure that the slide is perfectly parallel with the leadframe and that there is a gap of 0.3 mm (12 mil) between the leadframe (1) and the X-slide (2).
- To adjust parallelism, loosen the two hexagon socket screws fastening the leadframe X-slide (3) and push the platform towards the rear against the stopper.



- To adjust the gap, loosen the inner lock nut of the stopper (4) and adjust the length of the threaded bar by turning the adjustment nut (5) until the leadframe can enter the indexer station freely and the clearance of 0.3 mm is achieved.
- When satisfied, tighten the lock nut and the X-slide fastening screws.



Adjusting the Platform Stroke Speed

The platform must move fast enough to maintain the machine's output rate, however, it must not be set so fast that the platform bangs against the stopper.

Set the compressed air supply to on.

© 2009 Esec Ltd.

Adjusting the Platform Stroke Speed (Cont.)

WARNING

When an Install menu is opened, the software moves the appropriate hardware module(s) to prepare them for operation. Keep hands, loose clothing and tools clear of all moving parts.

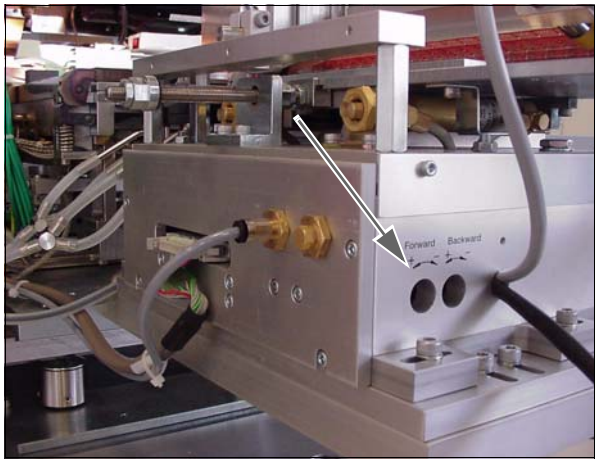
When operating soft keys keep hands, loose clothing and tools clear of all moving parts.

Always move the mouse cursor off the soft key after use. Many soft keys have a toggle action and touching a mouse (or trackball) button will cause the module to move again.

Leadframe Handler Transport
Input Handler

Toggle draw to move the slide.

Adjust the stroke speed of the platform by means of air restrictors fitted on the two pneumatic cylinders located on the left side of the stack power module. The restrictors are marked '+' to increase the stroke speed and '-' to reduce speed.



Sensor Function Check

The loader is fitted with four sensors. To check them for correct operation:

WARNING

When an Install menu is opened, the software moves the appropriate hardware module(s) to prepare them for operation. Keep hands, loose clothing and tools clear of all moving parts.

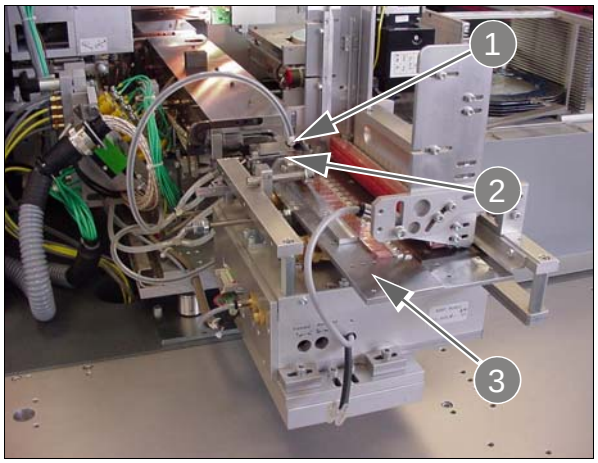
When operating soft keys keep hands, loose clothing and tools clear of all moving parts.

Always move the mouse cursor off the soft key after use. Many soft keys have a toggle action and touching a mouse (or trackball) button will cause the module to move again.

© 2009 Esec Ltd.

Sensor Function Check (Cont.)

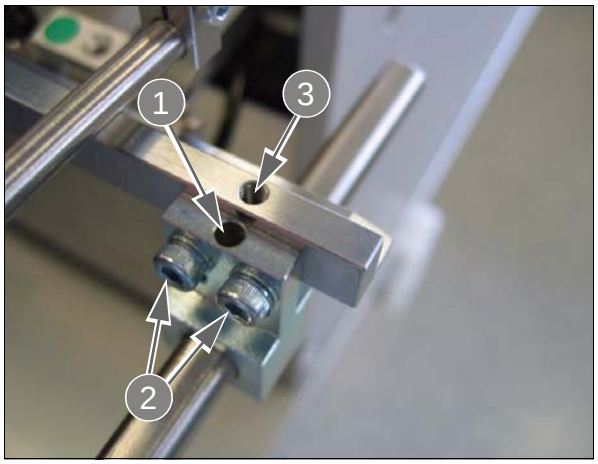
Leadframe Handler Transport
Input Handler



- Check the correct operation of the material sensor (1) and the input frame sensor (2) under the plate. This is done by covering each sensor in turn with the tip of a screwdriver while watching the menu, the current status (**covered** or **uncovered**) is shown on the display.
- Check the correct operation of the two draw valve sensors (3) under the plate using the ***Toggle draw*** soft key.

7.2.3 Push-In

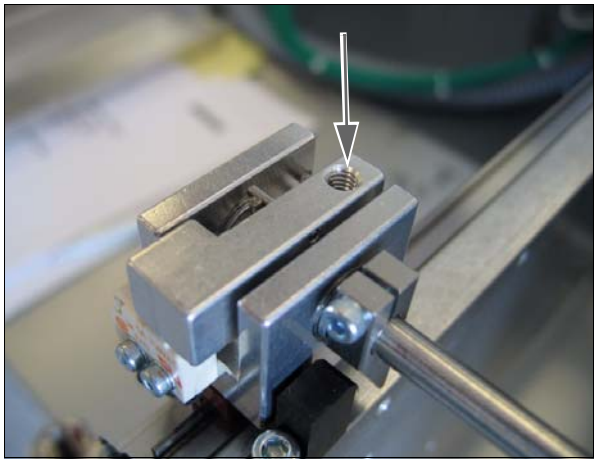
Adjusting the Width and the Height



- Loosen the Y locking screw (1) and the Z locking screws (2) on all the push-in connecting assemblies.

  Adjust the push-in rails to align with the input track of the indexer in the Y and Z direction.
- Turn the Z adjustment screw (3) to adjust the height of the push-in rails to the indexer.
- Tighten all locking screws.

Setting the Jam Spring Force



- Using an Allen key, turn the push-in jam detection force adjusting screw. Turn the screw clockwise to increase the force.

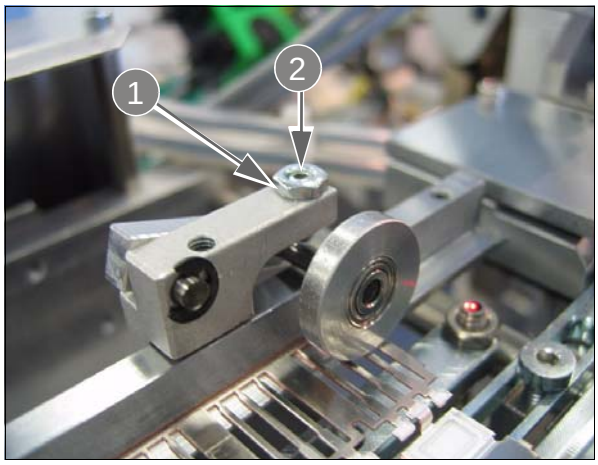
Note: It is possible to access this screw without removing the push-in cover given the park position was properly calibrated.

© 2009 Esec Ltd.

Adjusting the Push-in Roller

The push-in roller can be adjusted so that the maximum leadframe thickness to pass is limited.

This prevents the push-in from pushing more than one leadframe onto the indexer track. If the leadframe is too thick (or more than one leadframe is pushed in) the push-in cycle will be safely stopped by the push-in jam detection mechanism.



- Loosen the hexagonal roller locking nut (1).
- Push a leadframe manually against the roller and adjust the Allen set screw (2) until the leadframe just passes underneath the roller.
- Tighten the locking nut.

7.2.4 Top Stack Loader Adjustment

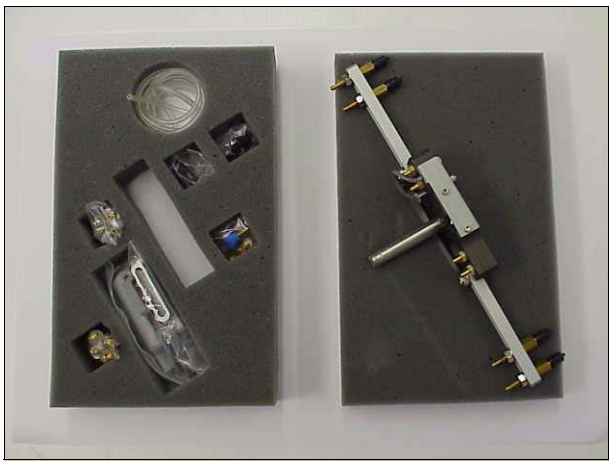
Gripper Kit

The gripper kit is delivered in a cardboard box.

i 6 If necessary, assemble a gripper out of the different parts of the gripper kit.

For correct assembly and adjustment of the gripper see the following steps.

Note: It is recommended to have one correctly adjusted gripper for each type of leadframe to save time during set up of new material.

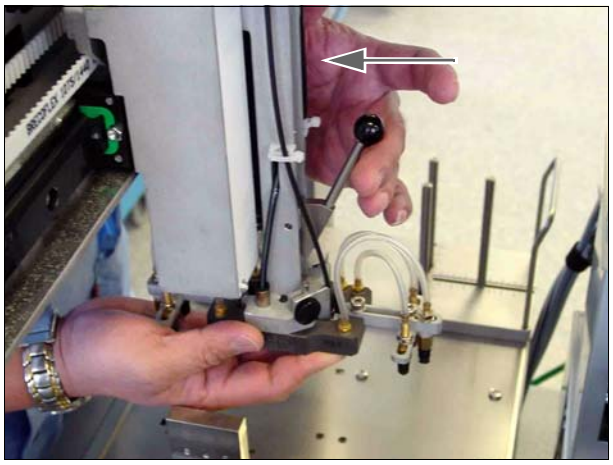


© 2009 Esec Ltd.

Exchanging the Gripper

Support the gripper with your hand and move the lever in the direction of the arrow.

This releases the gripper assembly so it can be removed and replaced entirely.

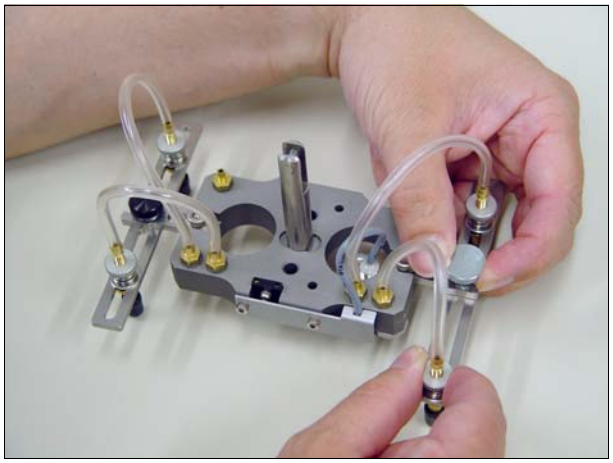


Adjusting the Gripper Suction Cups

i 6 Select the appropriate type of cantilever according to the leadframe type.

Choose the appropriate number of suction cups according to the leadframe type. If necessary fit additional suction cups to the cantilever or remove existing.

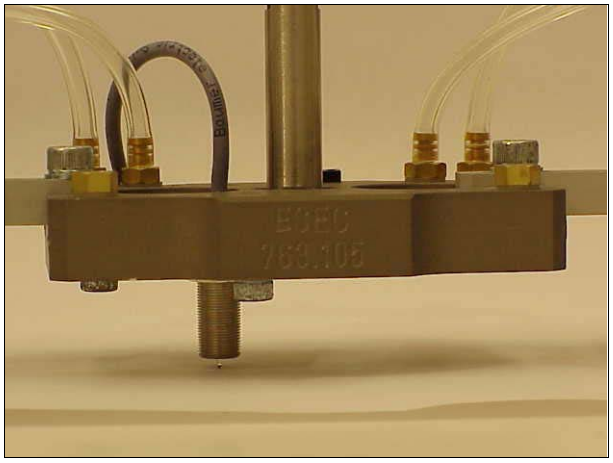
Loosen the fixing screws to adjust the position of the suction cups on the gripper to fit the different leadframes.



Adjusting the Gripper Sensor

i 6 Adjust the height of the inspection sensor so that it just touches the leadframe surface when the suction cups are compressed by 0.5 mm (20 mil).

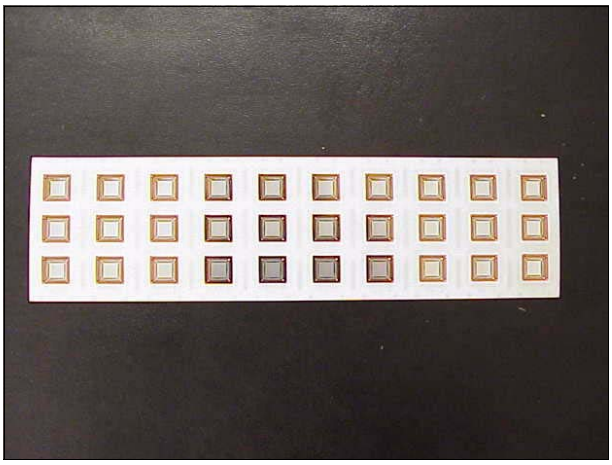
Note: The position of the inspection sensor in the X direction must correspond with the position of the rider on the inspection station (*section Adjusting the Position of the Inspection Station Rider* on page *7-17*).



© 2009 Esec Ltd.

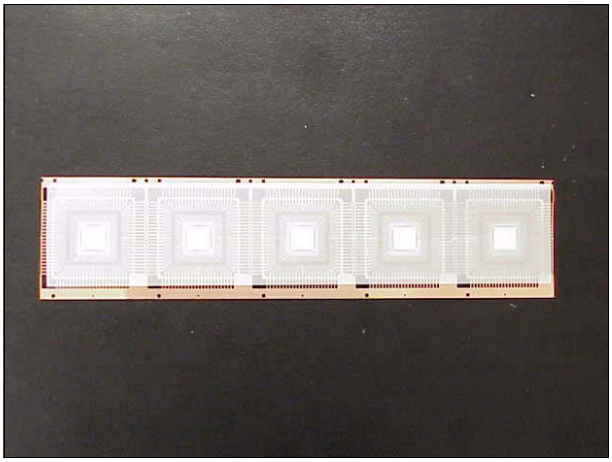
Setting the Gripper for Interleaf Papers

Where type A papers are used, adjust the leadframe vacuum connectors to align to the pads and the paper vacuum connectors to align to the paper.



Where type B papers are used, adjust both types of vacuum connector to align with the leadframe pads.

Where no interleaf papers are used, adjust the leadframe vacuum connectors to align with the leadframe frame, do not connect the paper vacuum line.



© 2009 Esec Ltd.

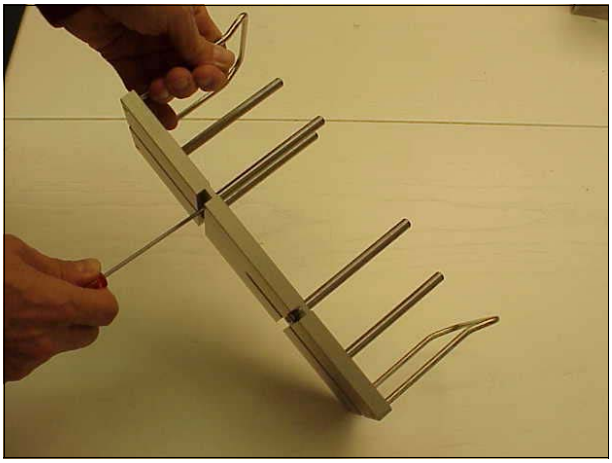
Adjusting and Positioning the Stack Magazines

Loosen the adjusting screws of the guide pins on the bottom of the stack magazine.

Adjust the guide pins to the width and length of the leadframe plus 0.5 mm (20 mil).

Tighten the adjusting screws.

Note: Adjust the guide pins symmetrically in X- and Y- direction so that the centre of the base plate corresponds to the centre of the leadframe.



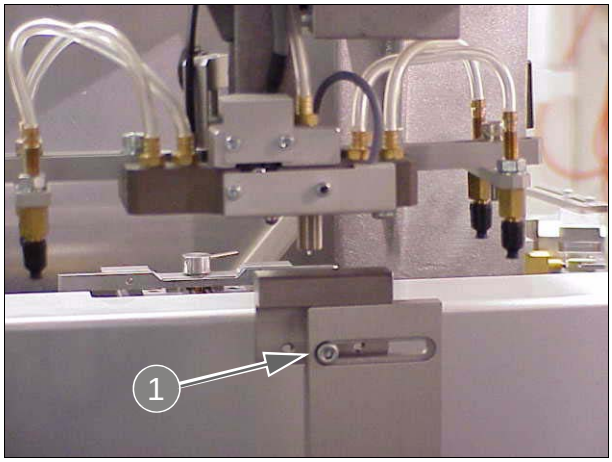
/ (May 29, 2009)

Adjusting the Position of the Inspection Station Rider

Adjust the inspection station rider in X-direction according to the inspection sensor on the gripper.

If the leadframe could be deformed by contact with the standard rider, the small rider must be used.

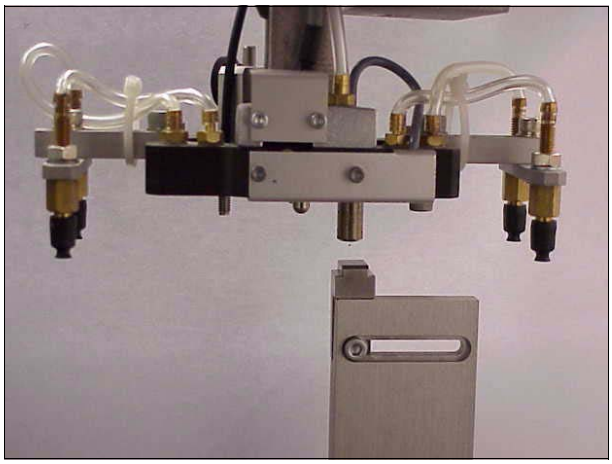
To fit the small rider remove the adjusting screw (1).



Remove the standard rider and replace it with the small rider.

Set it to the correct X-position before fully tightening the adjusting screw.

Note: The position of the rider in the X-direction must correspond with the position of the inspection sensor on the gripper.

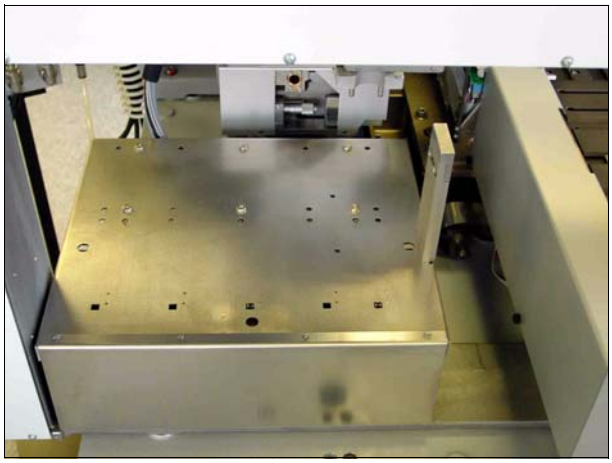


Adjusting the Stack Configuration

The stack configuration may have to be changed according to the leadframe width:

- 3 stack configuration for leadframe widths up to 90 mm
- 5 stack configuration for leadframe widths up to 46.5 mm.

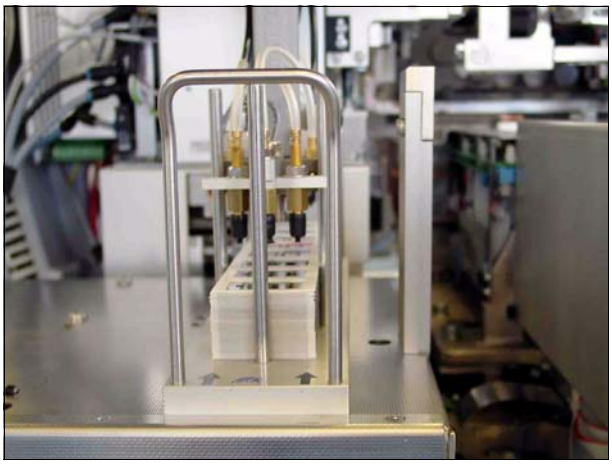
Note: If the system is configured with no trash bag, it stops if two leadframes, or a faulty leadframe is picked up.



© 2009 Esec Ltd.

Adjusting the Frame Sensor

To adjust this position, place a leadframe in the magazine.



Leadframe Handler Transport
Leadframe Input

Use the cursor keys to move the gripper down to 20 to 30 mm.

Adjust the potentiometer (1) until the red and the green lights are on.

© 2009 Esec Ltd.

7.2.5 Power Marker Unit PMU4 (Option)

WARNING

The indexer and its immediate vicinity may reach temperatures in excess of 450°C, coming into contact with it will result in serious burns.

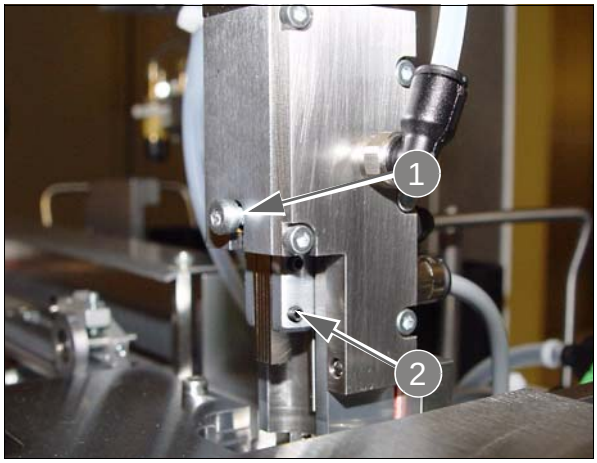
Always wear protective gloves when working in the vicinity of the indexer.

Activating the PMU4

Activate Modules
Leadframe Handler Modules

Set the parameter **Auxiliary module** to **on**.

Changing the Stamps



Loosen the screw (1) by $^{1}/_{4}$ turn.

Remove the entire stamp holder from the PMU4.

Loosen the screw (2) in order to fit the numbers or letters to be stamped on the leadframes vertically into the holder, with the characters towards the bottom. A maximum of five characters can be used.

Make sure each character is pressed firmly against the top plate.

Tighten the screw (2) and insert the stamp holder in the PMU4.

Tighten the screw (1).

© 2009 Esec Ltd.

7.2.6 Indexer

WARNING

The following mechanical adjustments must be carried out with the system at normal operating temperature.

The indexer and its immediate vicinity may reach temperatures in excess of 450°C, coming into contact with it will result in serious burns.

Always wear protective gloves when working in the vicinity of the indexer.

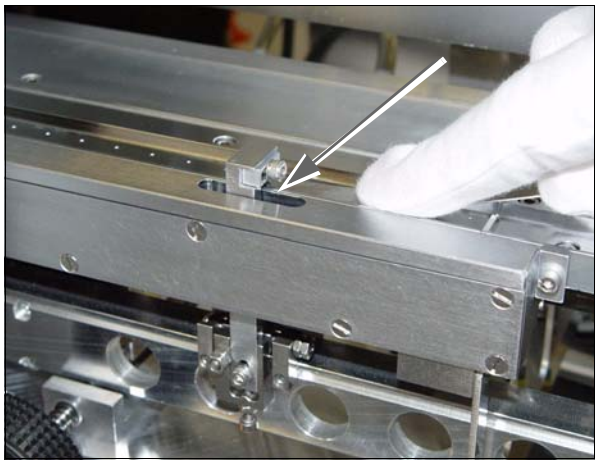
NOTICE

When screws are removed from any part of the heated indexer, always use heat resistant grease ESEC Part No. 240.0012.1 on the threads before refitting them.

This grease will prevent oxidation and therefore jamming of the screws in the indexer.

Adjusting the Height of the Transport Fingers

Note: This procedure must be carried out with the machine at its normal operating temperature.



Turn the driver motor knob clockwise until the transport fingers move down, continue to turn until the finger carrier is approximately in the center of its travel.

Using a feeler gauge, check the Z clearance of each transport finger. There should be a gap of 0.2 mm (8 mil) between the indexer surface and the tip of the transport finger locating pin.

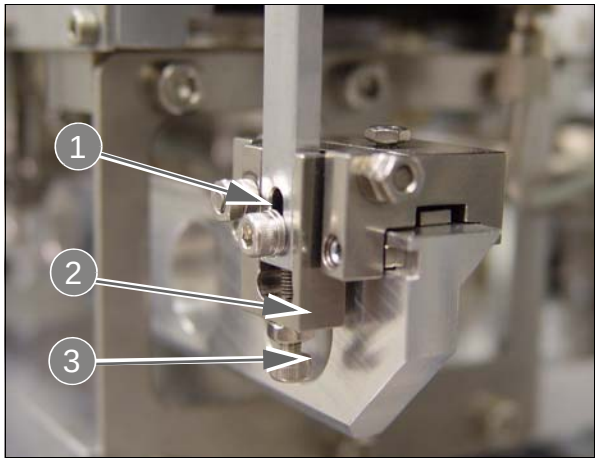
If necessary adjust the height of each finger:

Loosen the Z locking screw (1) a quarter turn.

Loosen the counter nut (2)

Slide the finger assembly up or down by turning the adjustment screw (3).

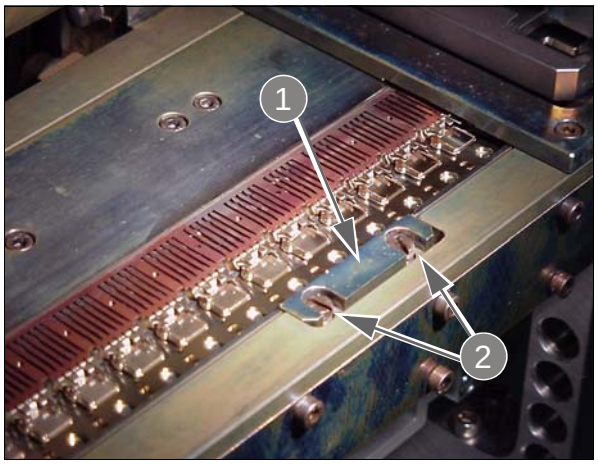
Tighten the counter nut (2) and the locking screw (1).



© 2009 Esec Ltd.

Adjusting the Y-Guides

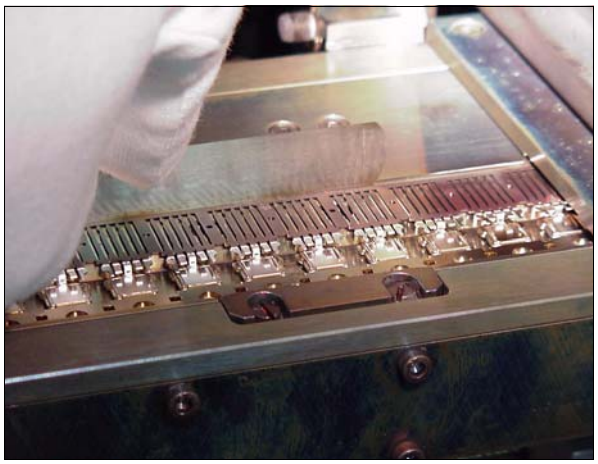
Note: Spring loaded Y-guides do not require adjustment.



To gain access, lift the cover plate.

Place a leadframe on the indexer in line with each gap restrictor in turn.

Adjust all fixed Y-guides (1) in the Y-direction, as necessary, by loosening the fixing screws (2) and sliding the restrictor forward or backwards.



Add a play of 0.05 mm (2 mil) to the leadframe width, plus an operating tolerance. For example:

Leadframe width	30.00 mm (1200 mil)
Operating tolerance	+0.10 mm (4 mil)
Added play	+0.05 mm (2 mil)
Adjust Y-guide to	30.15 mm (1206 mil)

Check the clearance with a feeler gauge.

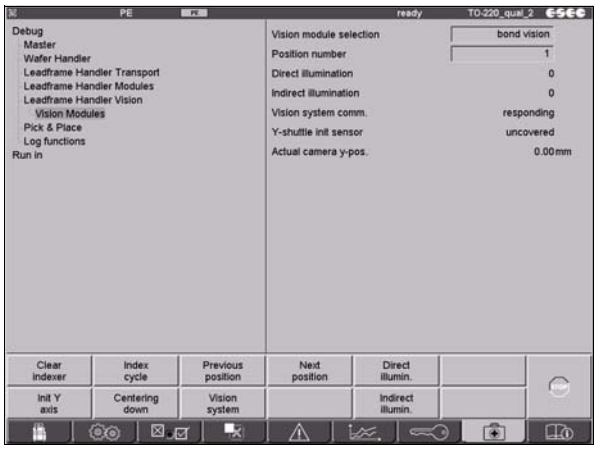
Tighten the fixing screws.

Setting the Pitch Length

Checking the Pitch Length

Make sure the PQCTV 2 camera is correctly aligned.

Leadframe Handler Vision
Vision Modules



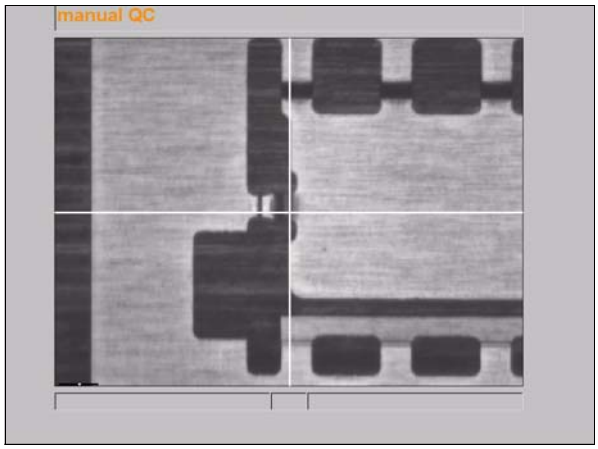
Using the cursor keys to align the leadframe to a distinctive visible edge.

click ***Centering up*** to lift the centering unit pneumatically.

© 2009 Esec Ltd.

Checking the Pitch Length (Cont.)

With a leadframe on the indexer (the leadframe with a pad in the bond position), adjust the crosshairs of the inspection monitor to exactly match a good visible edge on the leadframe pad.



Turn the driver motor knob clockwise while observing the leadframe movement on the screen of the monitor.

After performing one full cycle, the next bond pad on the leadframe must appear at exactly the same position under the crosshairs and the transport finger must enter the exact center of the centering hole.

NOTICE

Do not perform any motor driven cycle without the heater covers fitted. The leadframe would overshoot and correct adjustments will not be possible.

When set up, increasing or decreasing the driver mechanism speed will also influence the accuracy of the leadframe positioning.

Adjusting the Pitch Length

Should any adjustment of the pitch length be necessary locate the transport crank in the indexer base.

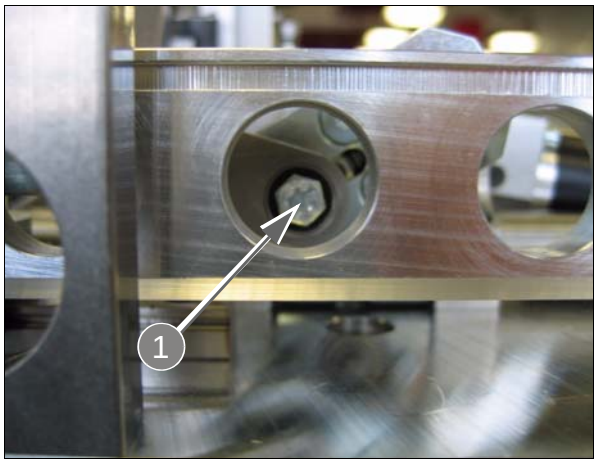
© 2009 Esec Ltd.

Adjusting the Pitch Length (Cont.)

Loosen the crank locking screw (1).

Leadframe Handler Transport
Indexer

click ***Centering down*** to lower the centering unit pneumatically.



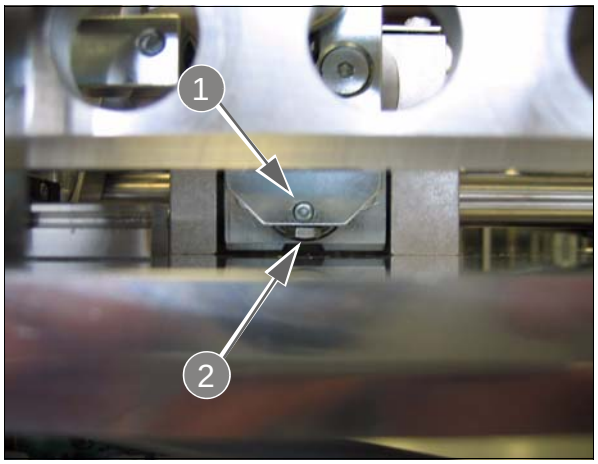
Loosen the pitch adjustment locking screw (1).

Using a ring spanner turn the hexagon headed screw (2) on the crank.

Turning the screw counter clockwise (loosening) increases pitch length, turning clockwise (tightening) decreases pitch length.

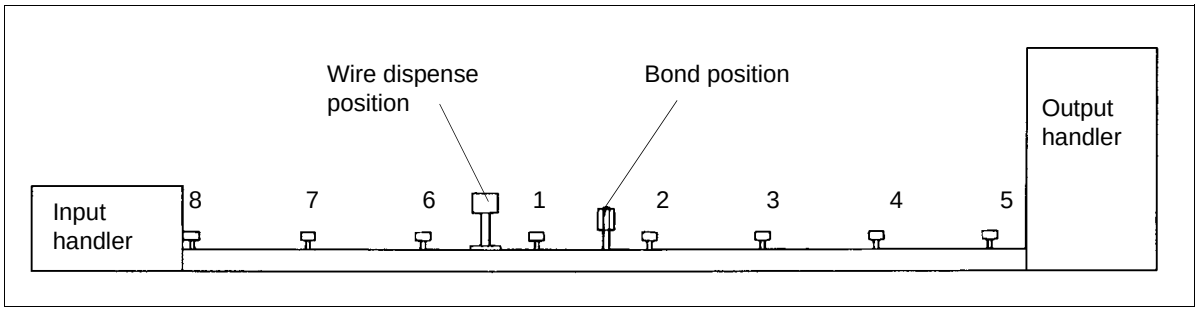
Before trying another index step, first tighten the adjustment locking screw and then the crank locking screw.

Repeat the procedure until the pitch length is correct and constant.



Adjusting the Centering and Transport Finger Positions

Note: When calibrating the transport fingers it is important to start with the finger in position 1 and to continue with finger 2, etc. in the order shown.



© 2009 Esec Ltd.

WARNING

When an Install menu is opened, the software moves the appropriate hardware module(s) to prepare them for operation. Keep hands, loose clothing and tools clear of all moving parts.

When operating soft keys keep hands, loose clothing and tools clear of all moving parts.

Always move the mouse cursor off the soft key after use. Many soft keys have a toggle action and touching a mouse (or trackball) button will cause the module to move again.

The indexer and its immediate vicinity may reach temperatures in excess of 450°C, coming into contact with it will result in serious burns.

Checking the Centering

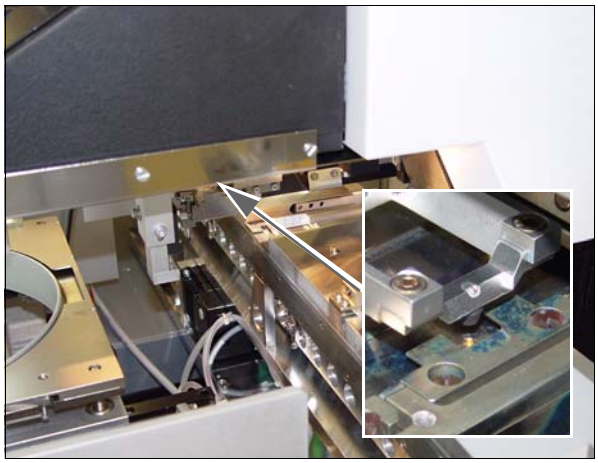
Leadframe Handler Transport
Indexer

Centering down

Make sure the centering pin is aligned with the centering hole of the insert.

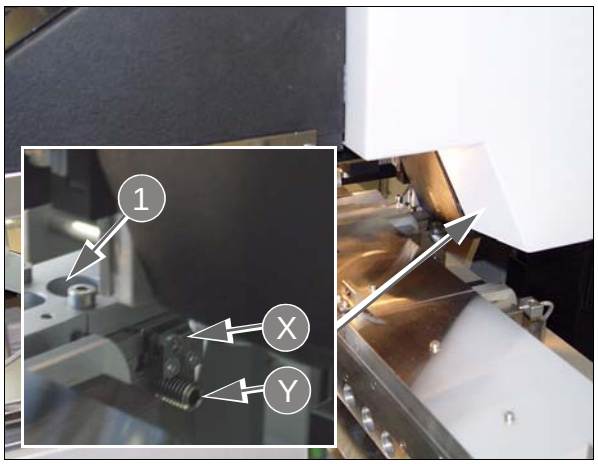
Centering up to lift the centering unit pneumatically.

Note: It might become necessary to remove the bond cover in order to see the hole in the insert.



© 2009 Esec Ltd.

Adjusting the Correct Centering XY-Position

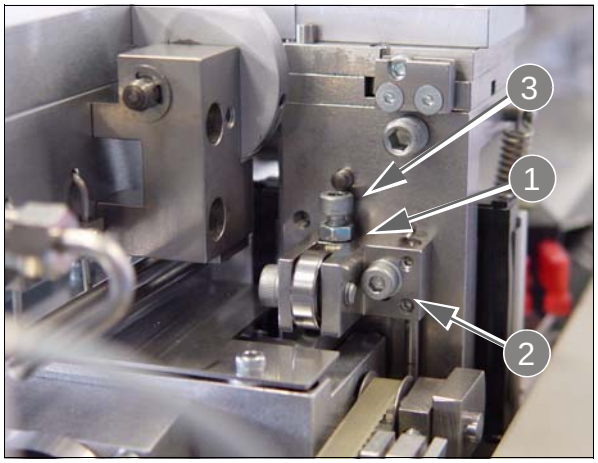


- Loosen the XY adjustment locking screw (1) by $^1/_8$ turn.
- Use a 2.5 mm Allen key to adjust the centering unit in X. Turning the screw clockwise moves the centering unit to the right.
- Use a 4 mm Allen key to adjust the centering unit in Y. Turning the screw clockwise moves the centering unit to the rear.

  If necessary, readjust the QCTV 2 camera to align the monitor crosshairs with the leadframe pad.
- Tighten the XY adjustment locking screw (1).

Note: Make sure that the centering pin always has enough clearance in the insert cut out in order not to break off the pin.

Adjusting the Z-Height



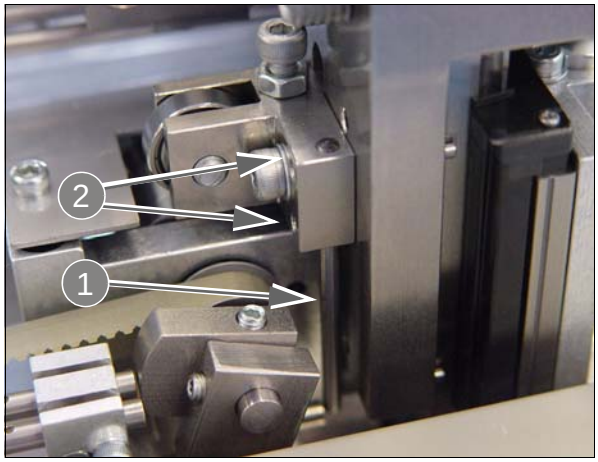
- ☑ Make sure that the centering XY-position is adjusted before adjusting the Z-height.
- ☑ Make sure that the cam of the centering has reached its lower position. This is the case if you have done a proper transport cycle.
- Leadframe Handler Transport
  Indexer
- click ***Centering down*** to lower the centering unit pneumatically.
- Loosen the locking nut (1).
- Slightly loosen the pin locking screw (2)
- Turn the height adjustment screw (3) until the centering pin is just engaging in the centering hole and the leadframe is slightly pressed.
- If satisfied tighten the locking nut and pin locking screw.
- ☑ With the centering down check whether the pin engages properly in the hole of the leadframe, i.e. the leadframe cannot be moved in X or Y.

  Remove the leadframe.
- ☑ Check the leadframe for deformation around the centering hole.

© 2009 Esec Ltd.

Adjusting the Centering Sensor

Adjust the centering sensor pin (1) while the centering pin is engaged in the leadframe.



Leadframe Handler Transport
Indexer

Slightly loosen both locking screws (2) and lower the pin (1) until the status **Centering sensor** just changes to **down**.

Lower the pin by another 0.1 to 0.2mm and tighten the locking screws.

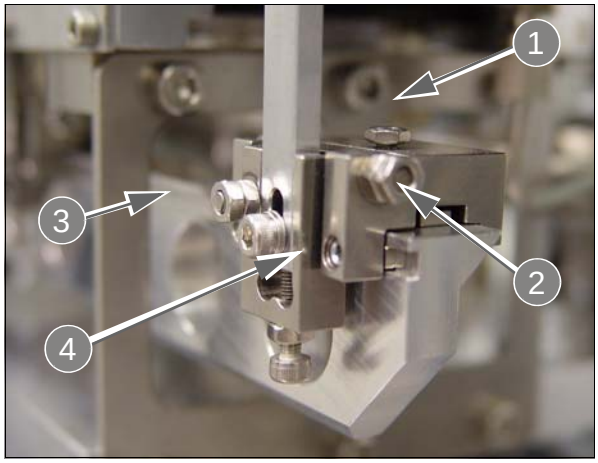
Put a leadframe at bond position.

Centering down

Check whether the parameter **Centering sensor** shows **down**.

Checking and Adjusting the Transport Fingers

Center a leadframe with the centering unit.



Loosen the locking screw (1) of the transport finger 1 by $^1/_4$ turn.

Adjust the X-position of finger 1 to align with a leadframe transport hole by turning the hexagon nut (2). Turning the screw clockwise moves the finger to the right.

Adjust the Y-position of finger 1 to align with a leadframe transport hole by turning the hexagon nut (3). Turning the screw clockwise moves the finger to the rear.

Note: If the machine has to be setup to handle another type of leadframes and therefore the transport fingers have to be moved to other positions also loosen the two locking screws (4) at the front of the finger holder.

© 2009 Esec Ltd.

Checking and Adjusting the Transport Fingers (Cont.)

Note: Make sure the correct leadframe transport hole is used.

Finger 1 must be able to hand over the leadframe to finger 2.

When satisfied, tighten the locking screw.

Use the drive motor knob to perform indexer steps while observing the monitor screen. The leadframe must align correctly with the centering unit on every step.

If necessary, repeat the procedure.

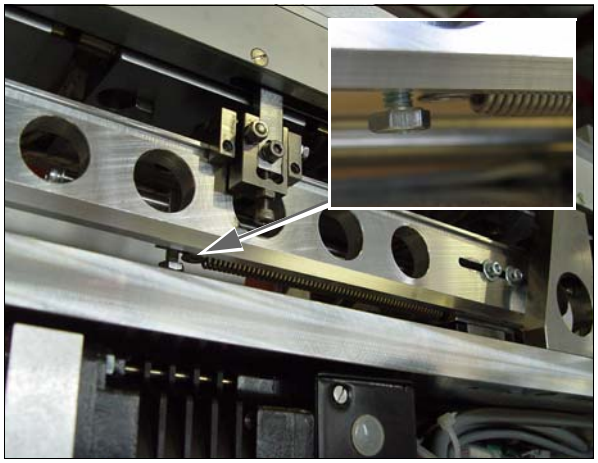
The transport finger in position 2 must take over the leadframe from finger 1. Check and adjust the position of finger 2 in the same way as finger 1.

Note: Depending on the leadframe length, two fingers can be engaged in the same leadframe. In this case the right-hand of the two fingers must pull the leadframe along the indexer.
The remaining transport fingers have the same function and are adjusted in the same way as fingers 1 and 2.

When satisfied, tighten all locking screws.

Adjusting the Jam Sensor Spring Force

Locate the jam sensor spring locking screw (1) in the indexer base.



Using a 7 mm spanner loosen the locking screw by $^{1}/_{8}$ turn. The spring will gradually retract and therefore reduce the jam spring force.

i 41 To increase the spring force, push the locking screw including its assembly to the left while loosening the locking screw and re-tighten if the spring force is satisfying.

Note: The bar carrying the tensioning assembly is designed with a slanted flat area allowing the locking screw to catch on while the spring is retracting (moving to the right-hand side).

© 2009 Esec Ltd.

Adjusting the Input/Output Frame and Indexer Sensors

i 42 On the indexer, several sensors check the presence and movement of the leadframes.

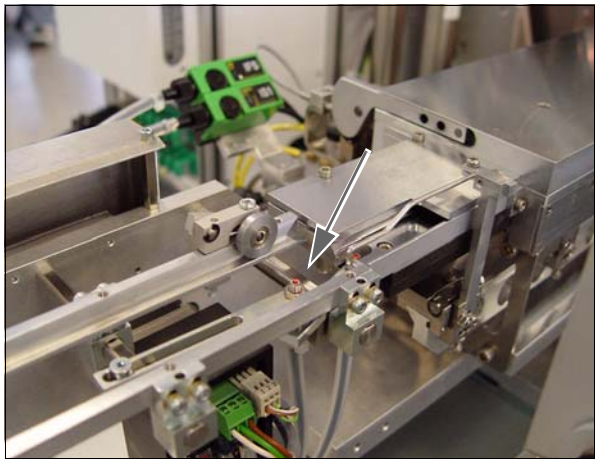
Input Frame Sensor

The operating distance between the sensor and leadframe must be between 1 and 3 mm.

When the sensor is covered, both of the LEDs in the fibre optic box are on.

When the sensor is not covered, both of the LEDs in the fibre optic box are off.

☑ Check the position and sensitivity of the sensor and adjust as necessary.



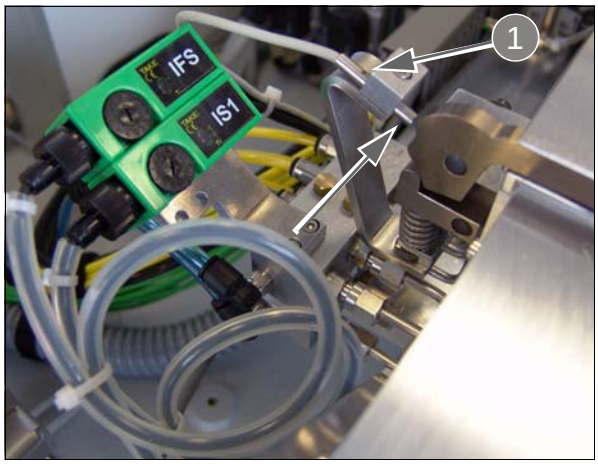
Furnace Cover Sensor

The operating distance between the sensor and the cover hinge must be approx. 0.4 mm.

A soon as the cover is opened, the sensor is covered and the yellow LED on the sensor (1) is lit.

When the sensor is not covered (furnace cover closed), the LED is off.

☑ Check the position and sensitivity of the sensor and adjust as necessary.



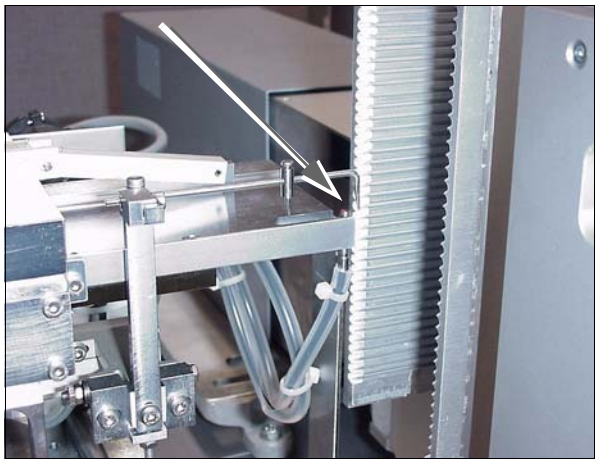
Output Frame Sensor

The operating distance between the sensor and leadframe is between 1 and 3 mm.

When the sensor is covered, both of the LEDs in the fibre optic box are On.

When the sensor is not covered, both of the LEDs in the fibre optic box are Off.

☑ Check the position and sensitivity of the sensor and to adjust as necessary.



© 2009 Esec Ltd.

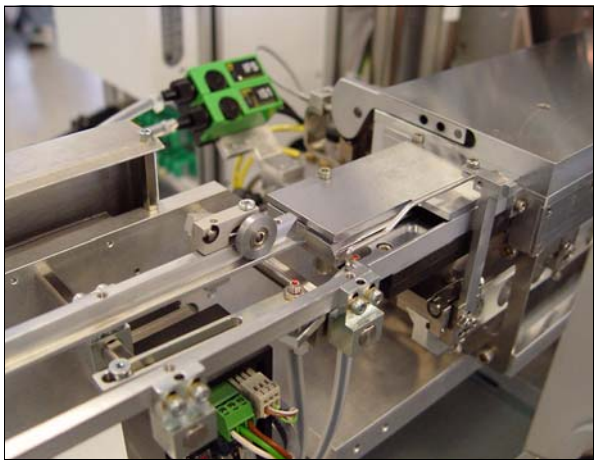
Index Sensor

The operating distance between the sensor and leadframe is between 1 and 3 mm.

When the sensor is covered, both of the LEDs in the fibre optic box are On.

When the sensor is not covered, both of the LEDs in the fibre optic box are Off.

☑ Check the position and sensitivity of the sensor and to adjust as necessary.



7.2.7 Programmable Dual Wire Dispenser

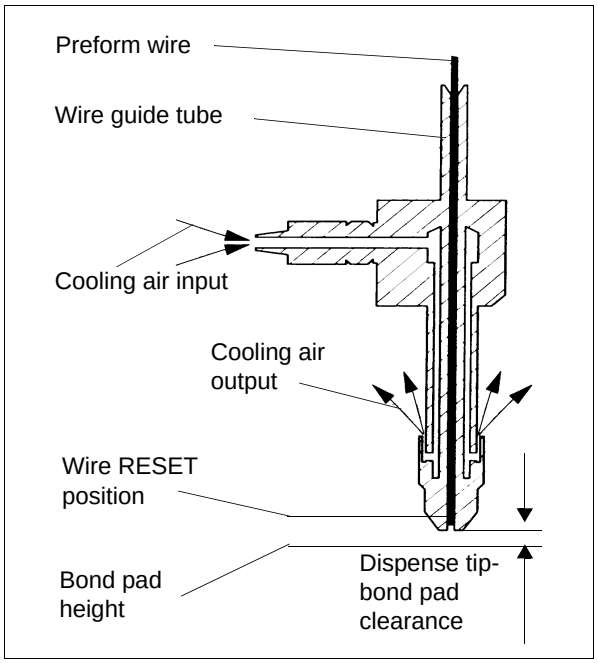
Changing the Wire Guide Nozzle

Select the wire guide nozzle which matches the diameter of the preform wire to be used. Nozzles are available for 20, 30, 40 and 50 mil round preform wires.

Disconnect the cooling air hose from the wire guide nozzle.

Loosen the two screws located in the bottom face of the nozzle and withdraw the nozzle vertically downwards.

Fit the selected wire guide nozzle using the reverse procedure.



Note: The correct cooling air pressure (preform specific) must be set on the air pressure control unit. This prevents the preform melting as it hovers above the hot leadframe between dispense cycles.

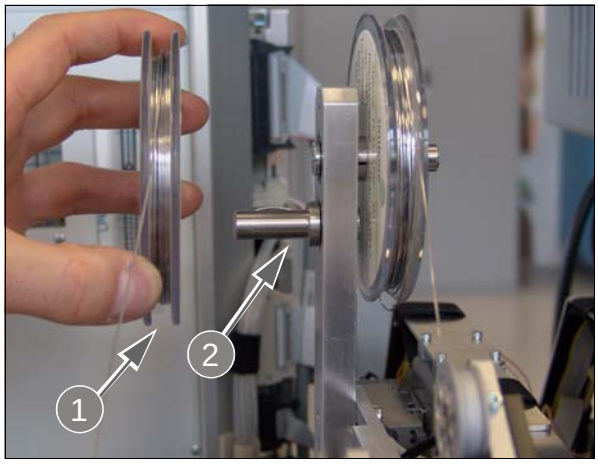
NOTICE

Make sure that the leadframe leads will not collide with the dispensing tip when the indexer performs a step.

© 2009 Esec Ltd.

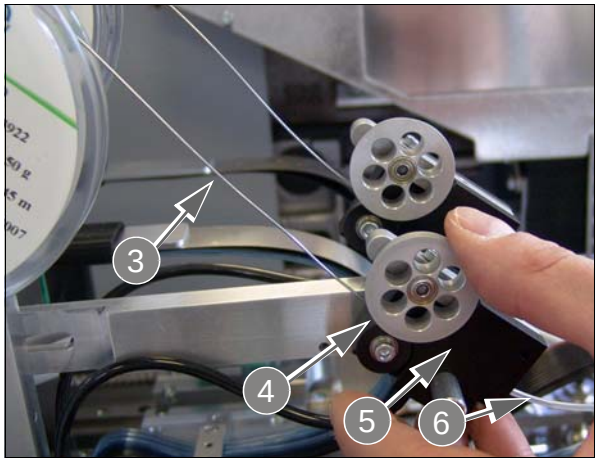
Loading the Preform Reel on the PDWD

Mount the reel of preform (1) on the reel holder (2) and secure the reel with the knurled screw.



Draw the preform wire (3) through the rollers (4) and the sensor contact leaf springs (5), down between the drive and the idler wheels and through the wire guide tube (6), until it emerges through the dispensing tip.

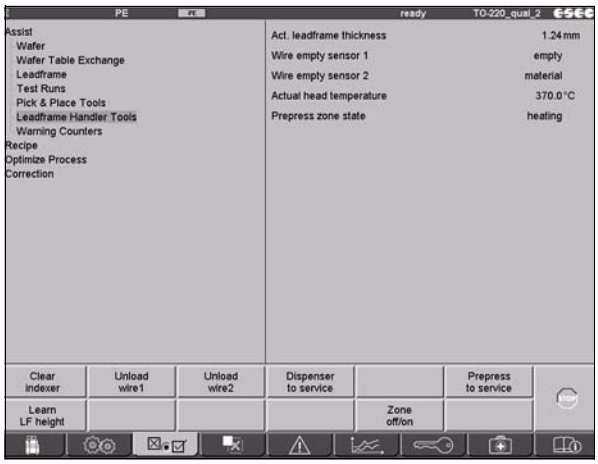
Make sure the preform wire does not enter the rollers in a sharp bend. If necessary, correct the position of the reel by loosening the clamp lever and shifting the reel holder backwards or forwards.



Turn the reel until a resistance is noticeable.

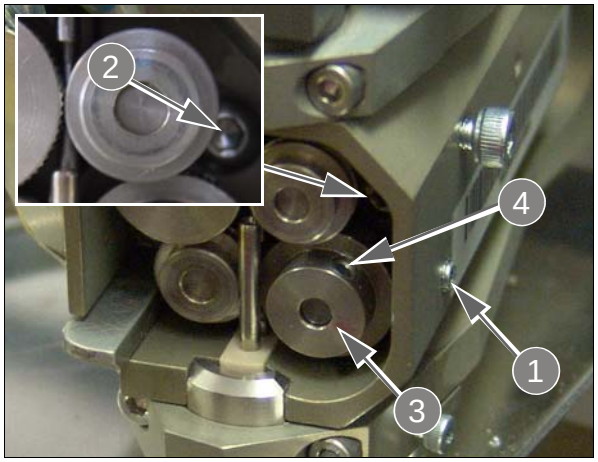
Assist
Leadframe Handler Tools

Load wire (1 or 2)



© 2009 Esec Ltd.

Aligning the Wire Drive Wheel 1 (Wire Left)



- ☑ Make sure the wire drive 1 assembly set screw (1) touches the plate (set to stop).
- Loosen the wire drive 1 lock screw (2).

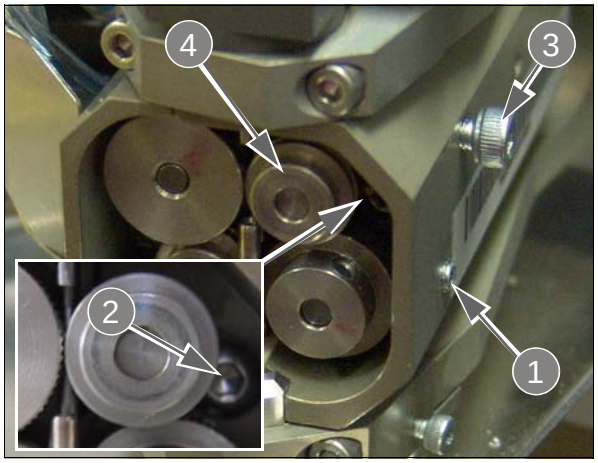
  Push the drive wheel (3) against the wire.
- Turn the adjusting screw (1) until a slight imprint is obtained on the wire.

Note: Instead of a wire, a straight steel wire can be used as an adjustment gauge (0.7 mm steel wire for a 0.76 mm / 30 mil solder wire).

- Tighten the lock screw (2).
- ☑ Check that the wire drive wheel is pushed against the set screw.

  If required, adjust the lateral position of the wire drive wheel:
- Loosen the lock screw (4) and reposition the drive wheel (3).
- Tighten the lock screw (4).

Aligning the Lateral Jockey Wheel 2 (Wire Right)



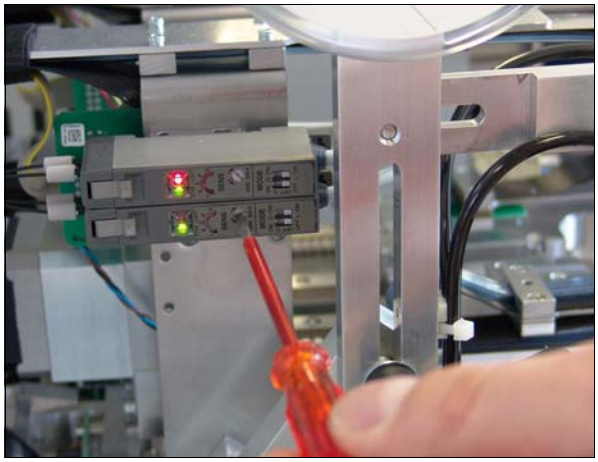
- ☑ Make sure the wire drive 1 assembly set screw (1) touches the plate (set to stop).
- Loosen the wire drive 1 lock screw (2).
- Loosen the jockey wheel 2 lock screw (3).

  Align the jockey wheel (4) laterally with the wire and the wire guide.
- Tighten the wire drive 1 lock screw (2).
- Firmly tighten the jockey wheel lock screw (3).
- ☑ Make sure the jockey wheel lock screw is tightened firmly and the jockey wheel stays in position.

© 2009 Esec Ltd.

Adjusting the Wire Detect Sensor Sensitivity of the PDWD

Sensor sensitivity is correctly adjusted when both of the LEDs are On and Off at the same time, when changing state from covered to uncovered.



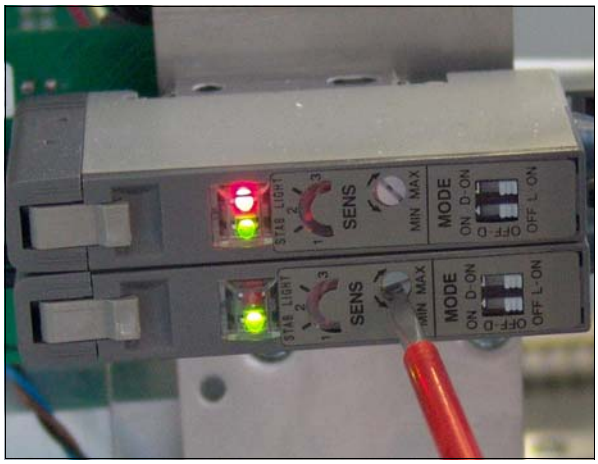
To check the sensitivity of the sensor carry out the following:

Set the fibre optic sensor switch to light mode.

Set the fibre optic sensor switch to normal mode.

Locate the preform wire at the operating position.

Adjust the sensitivity as necessary as shown on the picture:



Preform wire at operating position:

Red LED	On
Green LED	On

No preform wire:

Red LED	On

or

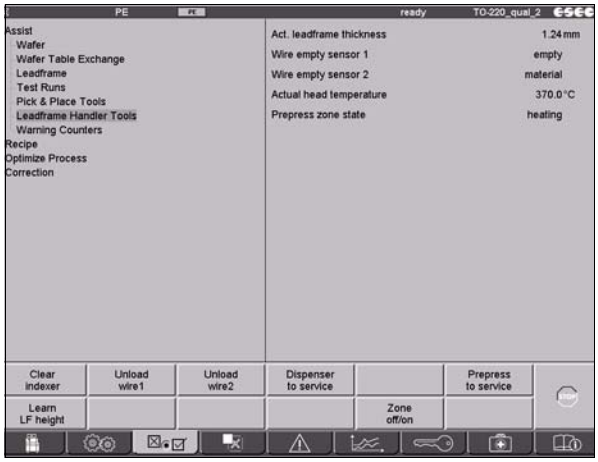
Red LED	Off
Green LED	Off

7.2.8 Mount and Change the PPPM Tool

Changing the Cavity Tool

Assist
Leadframe Handler Tools

Prepress to service



© 2009 Esec Ltd.

Changing the Cavity Tool

Clamp the tool with the gripper and press it carefully into the head. The flat sides of the tool correspond to the pins within the MPPM head.

Lock the tool by a quarter turn and release it.

Prepress to standby

to move the module up to the operating position.

Setting up the PPPM Using the Easy Mode

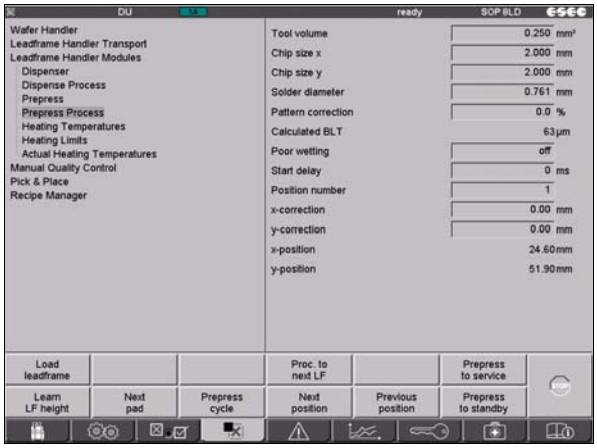
Leadframe Handler Modules
Prepress

Set **Process mode** to **easy mode**.

Leadframe Handler Modules
Prepress Process

Enter the following information:

- **Tool volume** (volume of the cavity tool)
- **Chip size x**
- **Chip size y**
- **Solder diameter**



The machine calculates the solder feed length in order to achieve the target bondline thickness BLT.

Prepress cycle

Check the bondline thickness.

If required:

- Adjust the **Pattern correction**. The BLT will be recalculated accordingly.
- Optionally, the **Poor wetting** can be activated.

Prepress cycle

Check the bondline thickness.

© 2009 Esec Ltd.

7.2.9 Buffered Handler

WARNING

The magazine lift will move up and down. Keep hands and loose clothing clear of all moving parts.

The transport belts will move all the magazines on the platform forwards.

Never attempt to remove a leadframe from a magazine until it has been unloaded onto the buffer platform.

Never put your fingers inside a partly-filled magazine.

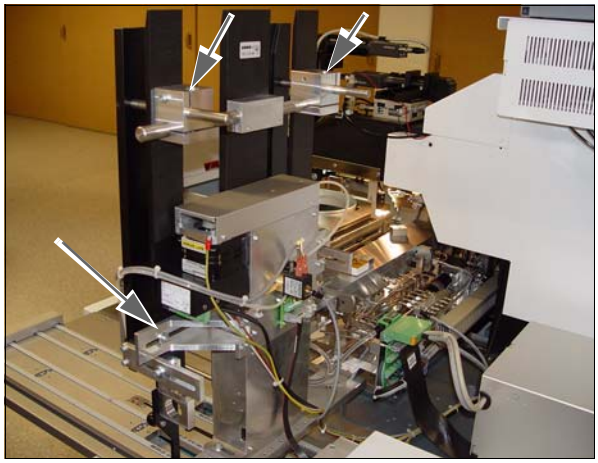
i 43 The guide rails of the buffered handler must be adjusted to the size of the leadframe magazine.

Adjusting the Guide Rails to the Magazine Length

Loosen the four screws connecting the guide rails to the top and bottom cross spars.

Slide the guide rails along the cross spars to set them to the magazine length, centered on the support pin position. Include a small clearance to allow the magazine to slide freely up and down.

Tighten the four screws.



Adjusting the Guide Rails to the Magazine Width

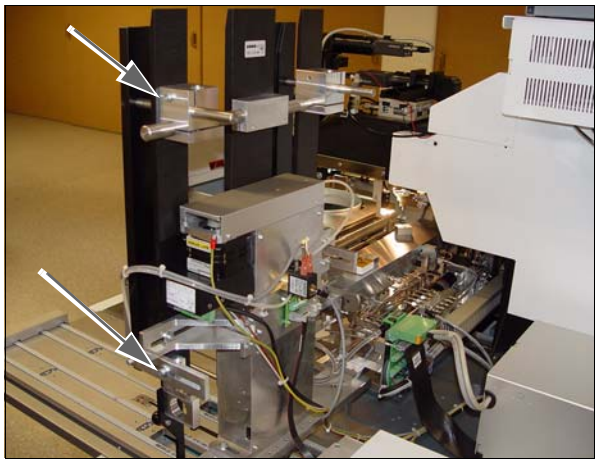
Loosen the four front guide fixing screws.

Slide the front guide rails in or out as required.

Check the clearance by inserting a magazine vertically and holding it against the back plate. The clearance between the magazine and the guide rails must allow the magazines to slide up and down without jamming.

Tighten the fixing screws.

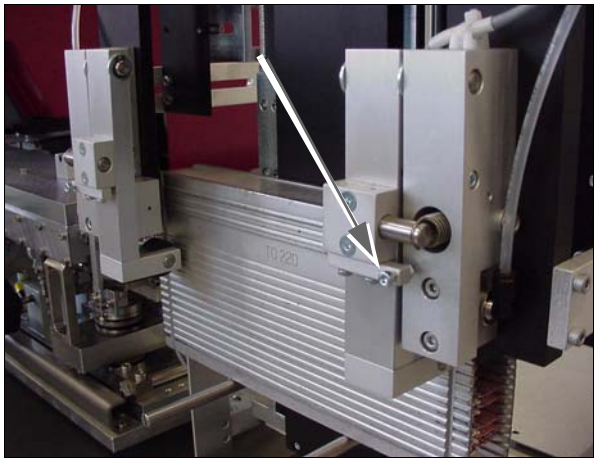
The magazine detector microswitch must operate whenever a magazine pushes the roller lever.



© 2009 Esec Ltd.

Checking the Magazine Detector Microswitch

Slide the magazine up and down past the roller lever and listen for the clicking sound of the microswitch operating.

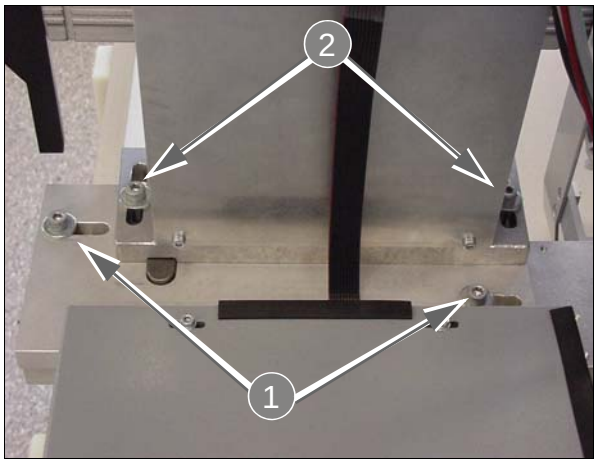


If there is no sound, loosen the microswitch adjustment lock nut and adjust the setting.

When satisfied, tighten the lock nut.

Adjusting the Buffered Handler Position

Remove the two X position fixing screws connecting the elevator with the indexer base plate.



i 43 Lift the whole elevator unit and shift it to the position required.

Tighten the fixing screws.

If necessary, adjust the Y position of the rear guide rail to allow for the magazine side thickness:

Loosen the two Y position fixing screws (2) and shift the rear guide rail to the position required.

Align a magazine with the indexer in Z. Push a leadframe through the magazine and, if possible, into the indexer.

Slide the guide rail assembly backwards or forwards on the base until the rear of the leadframe is aligned with the rear face of the indexer. Include a small clearance to allow the leadframe to slide freely between the indexer and the magazine.

When satisfied, tighten the fixing screws.

© 2009 Esec Ltd.

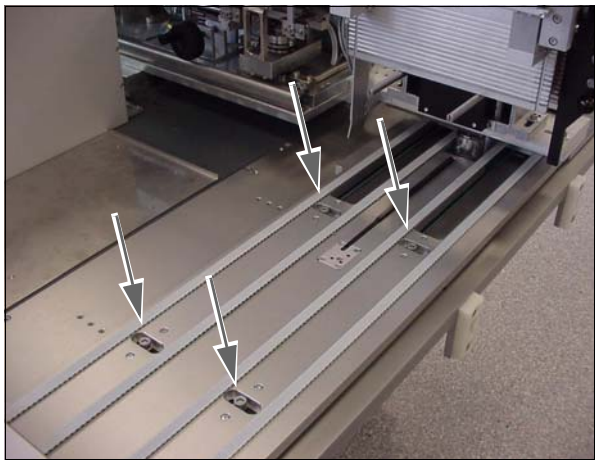
Adjusting the Output Platform

Loosen the four fixing screws in the base of the platform.

i 43 Slide the output platform in X to align it with the centre of the elevator.

Note: The magazine support pins must be able to fully enter the recess slots in the output platform.

When satisfied, tighten the platform fixing screws.



Adjusting the Magazine Step Sensor

Make sure that the sensor is positioned so that it is free from the possibility of collision during magazine load/unload and step up/down operations.

i 43 For correct operation, the magazine step sensor must be covered and the LED in the fibre optic box On, when the leadframe is correctly pushed into the output magazine.

The operating distance between the sensor and leadframe is between 1 and 3 mm.

When the sensor is covered, both of the LEDs in the fibre optic box are On.

When the sensor is not covered, both of the LEDs in the fibre optic box are Off.

Check the position and sensitivity of the sensor and adjust as necessary.

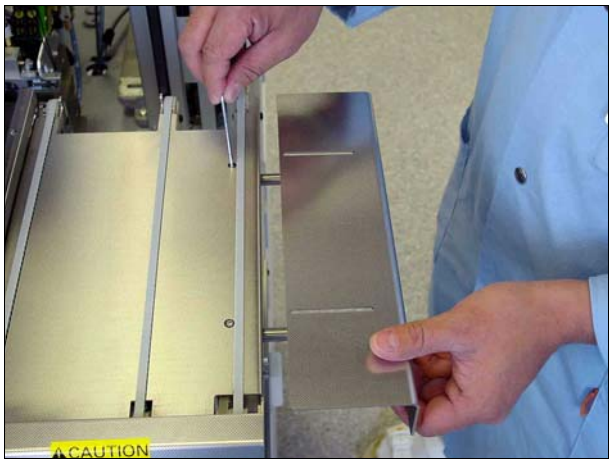
© 2009 Esec Ltd.

7.2.10 Output Magazine Handler Adjustment

Adjusting the Load Buffer Width

- Adjust the magazine stopper plate according to the magazine length.
- Loosen the two fixing screws and adjust the fence to the magazine length plus 1 mm (40 mil).

  For magazines of more than 250 mm (10“) in length, dismount the fence completely.
- Tighten the fixing screws.



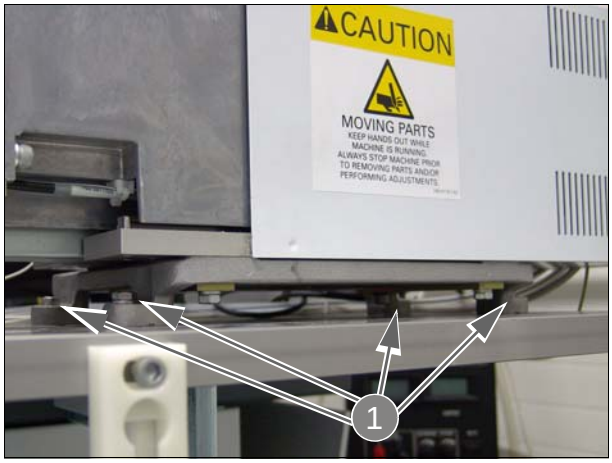
Adjusting the Lift in X-Direction

For extra long magazines the position of the lift can be changed in X-direction.

- Loosen the four hexagon screws (1) on the underside of the base plate.

  Manually move the lift to its slots on the right-hand side of the load buffer and observe parallelism of lift to buffer.

  After this adjustment calibrate the magazine handler according to procedure in section *6.5.13* on page *6-52*.



© 2009 Esec Ltd.

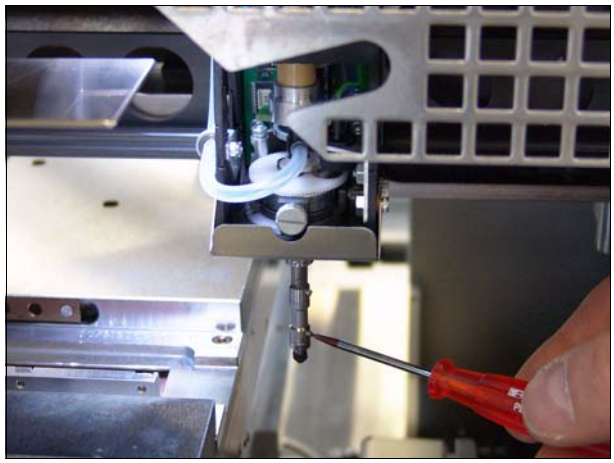
7.3 Pick & Place and Wafer Handler

7.3.1 Pickup Tool and Shank Replacement

Support the pickup tool with one finger.

Slightly loosen the grub screw located in the lower part of the bondhead.

Fit the new pickup tool with shank required and tighten the grub screw.



7.3.2 Expansion Unit Replacement

Removing the Expansion Unit

Assist
Wafer

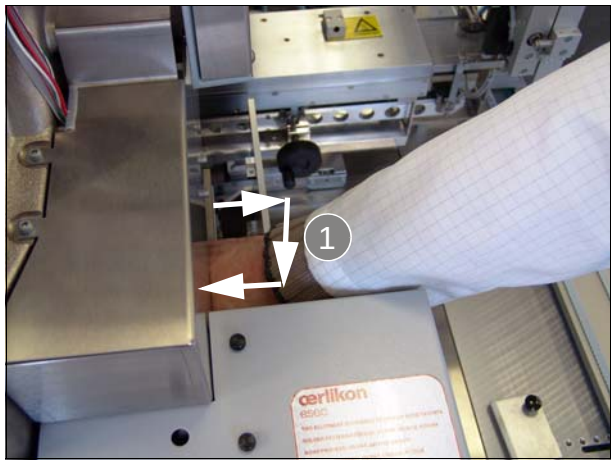
If a wafer is loaded:
Unload wafer to remove it from the table.

If the cassette has not been set-up, the wafer must be supported by hand as it passes out.

Dummy load

The expansion unit moves to the origin position.

Remove the indirect illumination of PVM (1).



Assist
Wafer Table Exchange

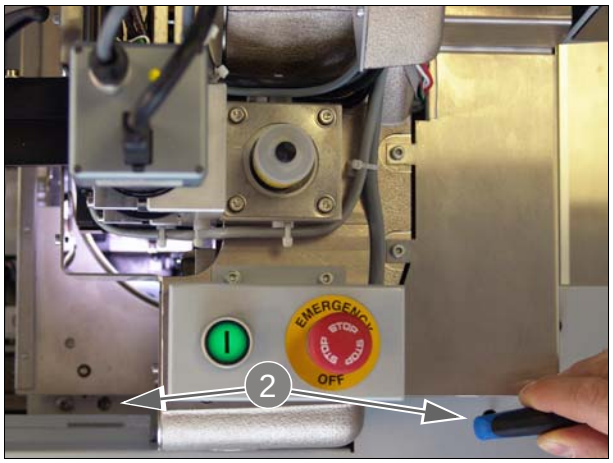
Start Exchange

Follow the hint-led procedure.

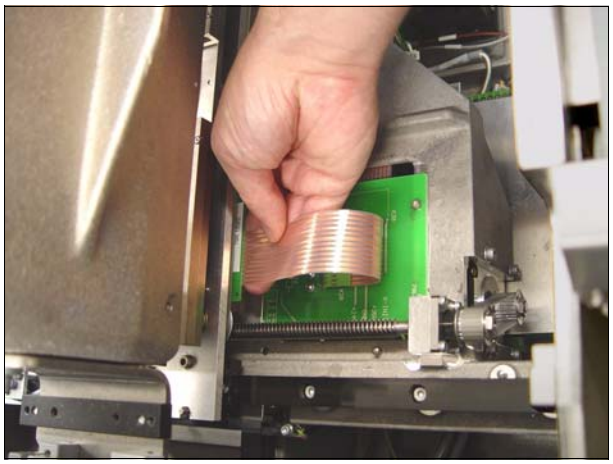
© 2009 Esec Ltd.

Removing the Expansion Unit (Cont.)

Unscrew the two fixing screws (2).



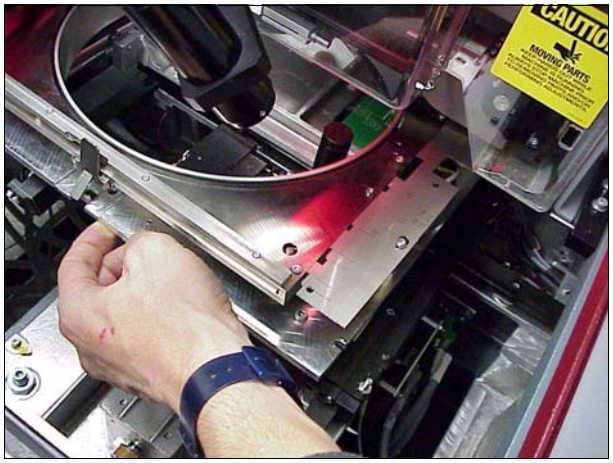
Unplug the flat ribbon cable from the expansion unit.



Carefully lift the front of the expansion table to disengage the locating pin.

Move the table to the rear to disengage the X-axis bearing from its slider.

Lift and remove the expansion unit.

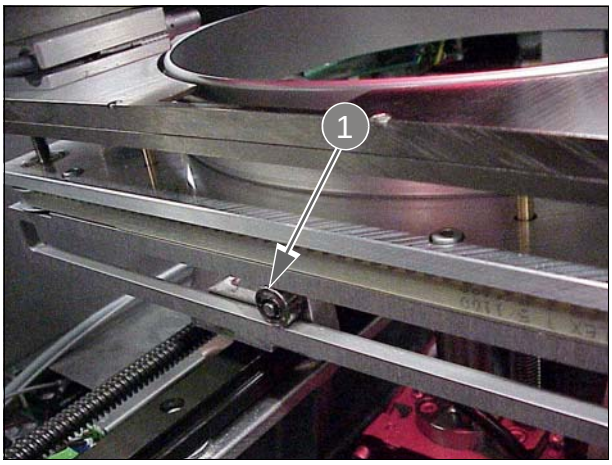


© 2009 Esec Ltd.

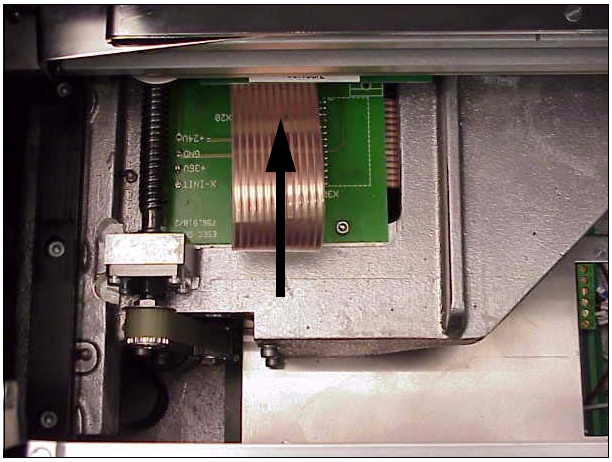
Mounting the New Expansion Unit

Carefully lower the rear of the expansion unit and engage the bearing (1) in the slider.

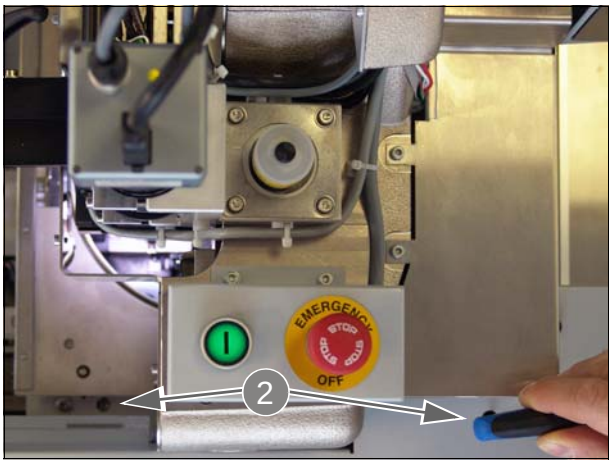
Lower the front of the unit and engage the locating pin.



Plug in the flat ribbon cable to the expansion unit.



Insert and tighten the two fixing screws (2).



© 2009 Esec Ltd.

Mounting the New Expansion Unit (Cont.)

Note: If the new expansion unit is mounted the very first time on the machine, proceed with the following calibration procedures:

section *Wafer Table Origin Calibration* on page *6-21*

section *Wafer Table Frame Diameter Calibration* on page *6-23*

section *Wafer Table Load Position Calibration* on page *6-24*

section *Wafer Table Expansion Ring Position Calibration* on page *6-25*

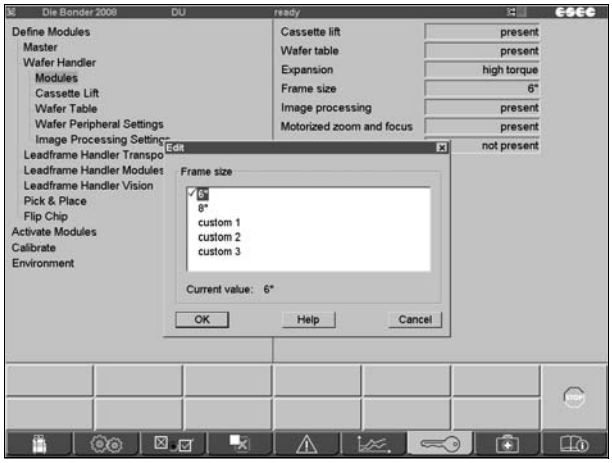
Selecting the Frame Size

Define Modules
Wafer Handler
Modules

If necessary:

Set the parameter **Frame size** according to the expansion unit.

Note: The Unit has to be previously calibrated on this machine!

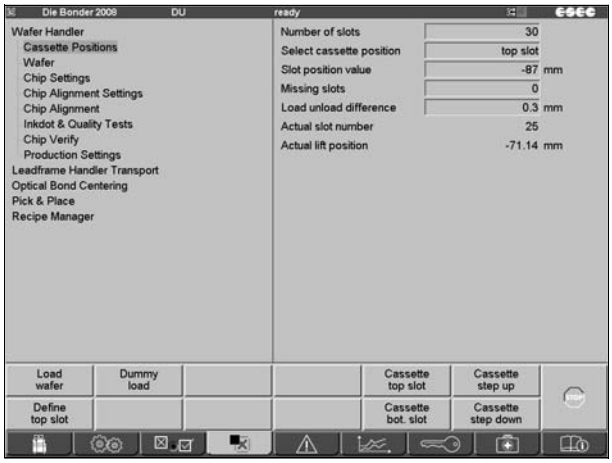


7.3.3 Wafer Cassette Holder Adjustment

Preparations

Wafer Handler
Cassette Positions

Note: The X-guides of the cassette platform must hold the wafer cassette firmly but not too tight.
If necessary, adjust these guides according to cassette size.



© 2009 Esec Ltd.

Adjusting the Y-Guides

Debug
Wafer Handler
Cassette Lift

Close the guides by turning the Y-adjusting screw counterclockwise until the wafer cassette present switch is activated.

Turn the Y-adjusting screws one more turn (360°) counterclockwise.

Tighten the two fixing screws on the rear Y-guide.

7.3.4 Needle and Needle Holder Replacement (Standard Die)

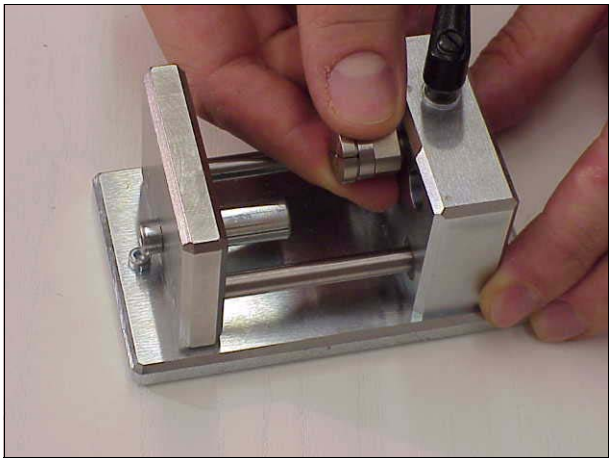
Note: Depending on the chip size, it may be necessary to change the die ejector needles. When changing needles, make sure the distance between the threaded shoulder on the chuck nut and the tip of the ejector needles is 20.3mm (812mil). To achieve this, a special tool called the needle setting device (ESEC Part No. 841.014) is used.

Preparations

Gently pull the pepperpot vertically upwards off the die ejector. Pull the needle-chuck upwards out of its sleeve.

Place the needle-chuck into the needle setting device. Make sure the rear of the threaded shoulder rests against the front face of the chuck holder.

Tighten the top clamp.

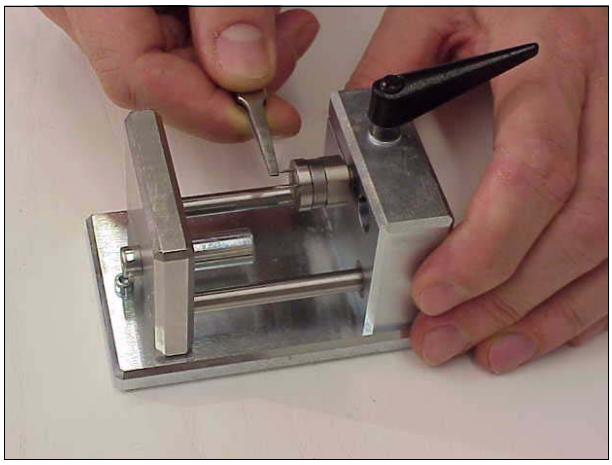


© 2009 Esec Ltd.

Replacing the Needles

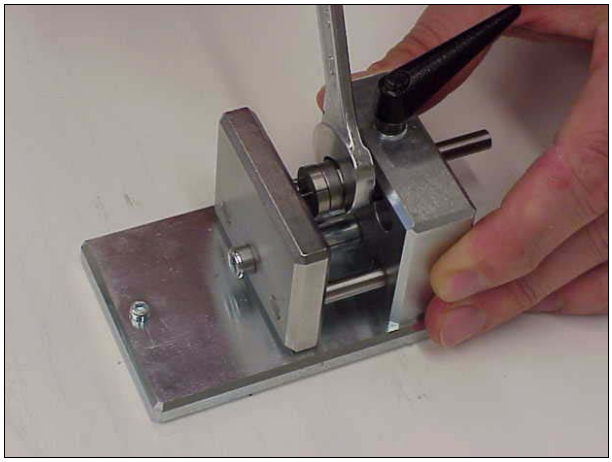
Loosen the needle retaining nut and remove the needles with a pair of tweezers.

Insert the new needles into their predetermined positions in the chuck.
Make sure that the needles slide backward and forward easily, but without too much free play.



Carefully slide the stop plate as far as possible towards the chuck.
Make sure that each needle makes contact with the stop plate.

Tighten the needle retaining nut.



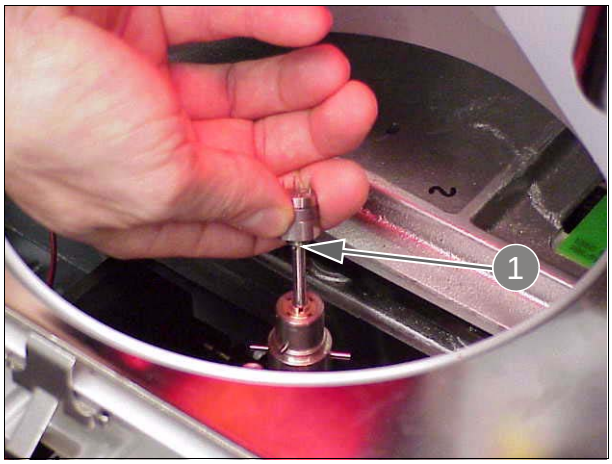
Adjusting the Needles

Refit the needle-chuck to the die ejector making sure that the pin (1) below the shoulder slots into one of the grooves.

Push the chuck fully home.

Refit the pepperpot on the die ejector.

Note: When the die ejector is in the reference position with correctly installed needles, the tips of the needles must be level with the top of the pepperpot. If this is not the case the reference position must be calibrated.



© 2009 Esec Ltd.

7.3.5 Needle and Needle Holder Replacement (Small Die)

Note: Depending on the chip size, it may be necessary to change the small die kit (option).

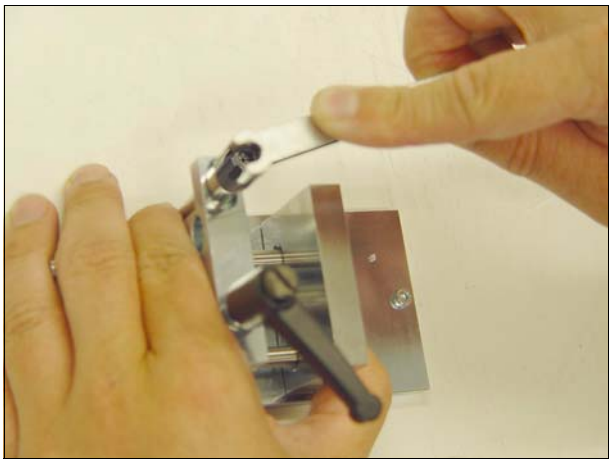
Removing the Needle

Gently unscrew the pepperpot from the die ejector.

Pull the needle-holder upwards out of its sleeve.

Place the needle-holder into the needle setting device.

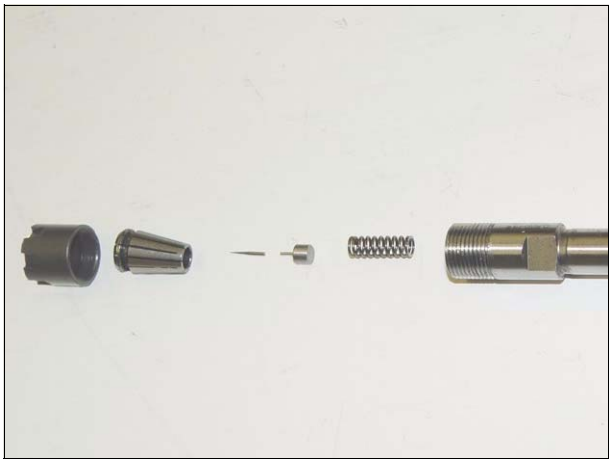
Loosen the retaining nut.



Remove the retaining nut and the needle-chuck.

Note: Make sure that the collet of the needle-chuck is not separated.

Remove all parts from the push rod.



© 2009 Esec Ltd.

Installing the Needle

Insert the needle-chuck into the retaining nut.

Note: Make sure that there is no clearance between the needle-chuck and the retaining nut.

Insert the needle-stop and the spring into the needle-chuck.

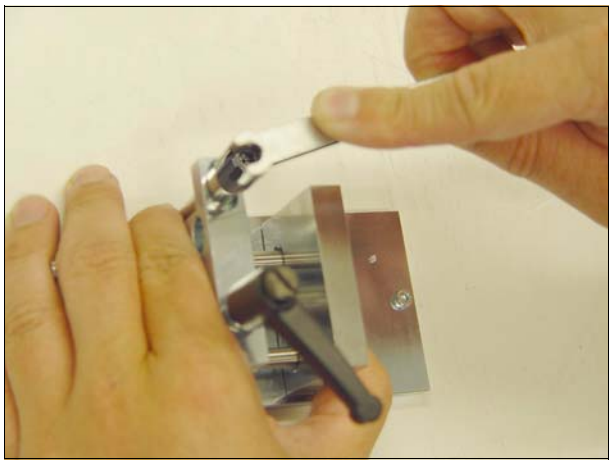
Note: Make sure that the spring, the needle-stop, the needle-chuck and the retaining nut are assembled.

Screw the these parts onto the push rod.

Insert the new needle into the needle-chuck.

Place the needle-holder into the needle setting device.

Tighten the retaining nut.



NOTICE

Recently manufactured die ejectors use needles with a 10° tip angle. Owners of older ESEC Die Bonders should note that the 20° needles used previously must not be used with new pepperpots. Doing so will cause damage.

If the pepperpot is changed to one with a different outside diameter, the frame diameter must be re-calibrated in accordance with ***section 6.4.4 on page 6-23******.***

© 2009 Esec Ltd.

7.3.6 Camera Mini Adapter Replacement

Preparations

Define the correct mini adapter type.

Note the position and orientation of the camera.

Removing the Adapter

Slightly loosen the three screws at the camera adapter ring.

Remove the camera carefully.

Slightly loosen the three screws at the mini adapter ring.

Remove the adapter carefully.

© 2009 Esec Ltd.

Mounting the Adapter

Adjust the length of the new mini adapter to 44 ±0.5 mm (is factory set).

Place the mini adapter onto the zoom.

Tighten the three screws at the mini adapter ring.

Place the camera correctly onto the zoom adapter ring.

Tighten the three screws at the camera adapter ring.

Align and calibrate the camera according to procedure detailed in section *6.4.2* on page *6-15*.

© 2009 Esec Ltd.

© 2009 Esec Ltd.

/ (May 29, 2009)

8 Machine Setup

CAUTION

For better visibility of subjacent functions covers have been removed before taking pictures. In standard operating mode all covers have to be in place at any time (see Safety Chapter).

8.1 Introduction

This chapter details, in the correct order, all the procedures required when teaching new materials (wafer, chip and/or leadframe).

However, in many cases (particularly when a recipe for a similar product is loaded first) many of these procedures are not required, while others always are. For example, if a new chip has to be processed, but the correct wafer and chip dimensions, bondline thickness etc. are already saved in the existing recipe, the bondhead height, cassette etc. need not to be taught, but the chip details must always be taught again.

© 2009 Esec Ltd.

8.1.1 Machine Preparation

WARNING

When operating soft keys keep hands, loose clothing and tools clear of all moving parts.

Always move the mouse cursor off the soft key after use. Many soft key have a toggle action and touching a mouse (or trackball) button will cause the module to move again.

Do not change parameters, or operate soft keys or function keys unless the resultant action is known.

Failure to read and obey the safety instructions may result in serious injury, or death of personnel and damage to equipment.

/ (May 29, 2009)

☑ Before starting any of the setting up procedures detailed in this chapter carry out the following checks:

1. Make sure the machine is calibrated as described in this operating information.

2. Make sure the following Die Bonder tools are available as required, they must be of the correct type to suit the materials to be used:
   - pickup tools
   - die ejector needle
   - top stack gripper
   - leadframe magazines
   - dispense nozzle for Programmable Showerhead Dispenser (PSD)
   - capillaries for Programmable Pneumatic Dispenser (PPD)
3. Mechanical preparation must be completed as described in chapter *7*.
4. Start up the machine according to section *Powering up the Machine* on page *5-1*.

Note: For more details of the parameters and soft keys please refer to the help text.

8.2 Power Leadframe Loader PLL

8.2.1 Gripper Adjustment

Gripper Pick Position

Leadframe Handler Transport
Leadframe Input

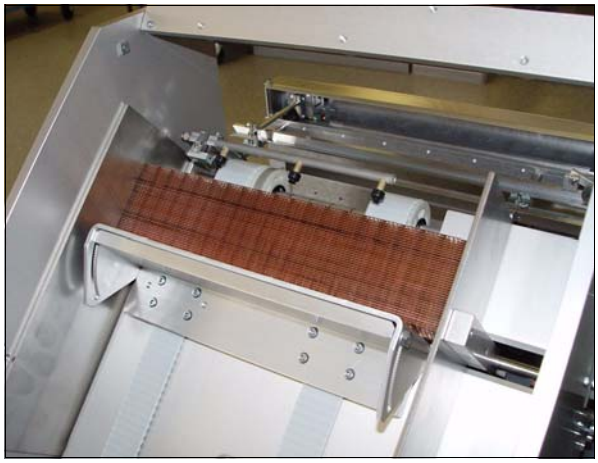
Set the parameter **Select axis** to **gripper**.

Set the parameter **Position selection** to **pick position**.

Cursor the gripper arm holder until it is perpendicular to the buffer platform.

click ***Define position***

Note: Picture shown without safety cover.



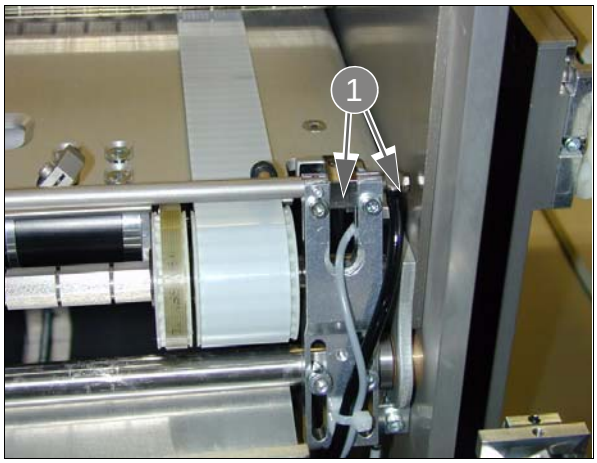
© 2009 Esec Ltd.

Gripper Pick Position (Cont.)

Loosen the two screws (1) on the gripper arm.

Adjust the gripper so that the suction cups are parallel to the pad.

Adjust the gripper to the center of the pad.

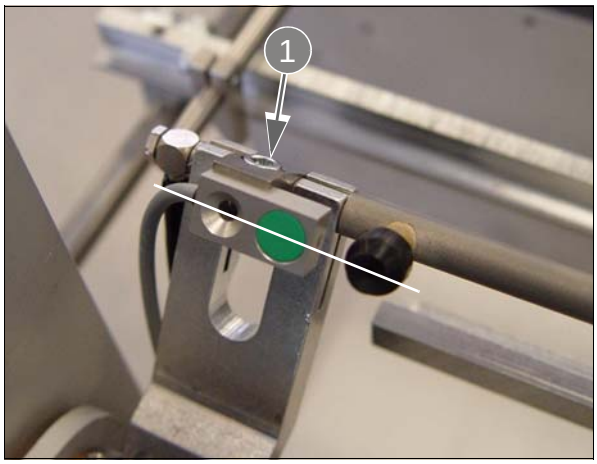


Loosen the sensor holder fixing screw (1)

Adjust the sensor holder to be inline with the suction cups.

Tighten the sensor holder fixing screw.

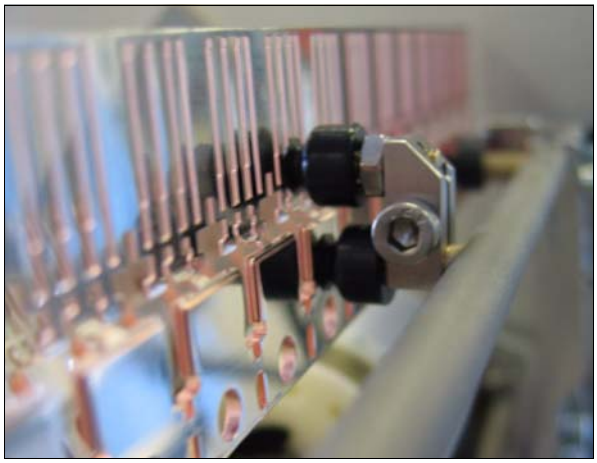
Tighten the two screws on the gripper arm.



Adjust the additional gripper support (dummy suction cup) to a suitable position on the leads or similar and adjust its Z-height offset according to the leadframe down set.

To adjust Z-height offset slide the support bracket on the main suction tube or if necessary adjust the threaded suction cup holder.

Next position



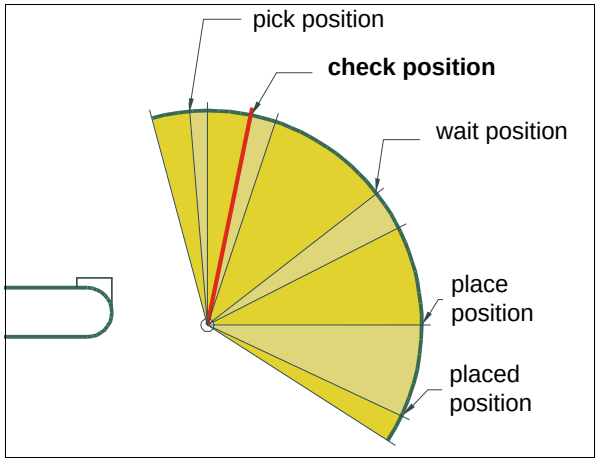
© 2009 Esec Ltd.

Gripper Check Position

Cursor the gripper a few degrees towards the push-in platform.

Define position

Next position

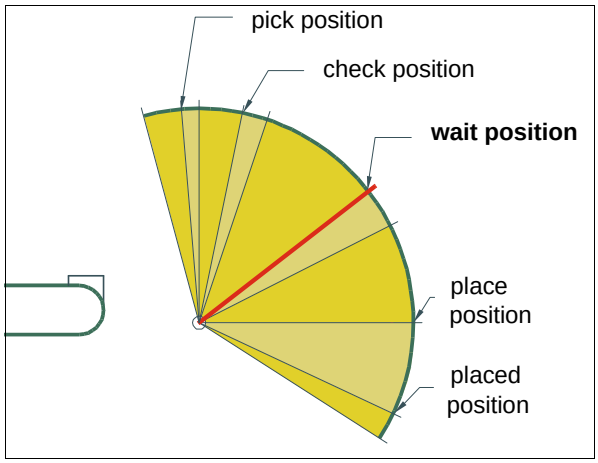


Gripper Wait Position

Cursor the gripper to a position close to the push-in platform. Make sure that the leadframe on gripper cannot collide with the leadframe on the push-in platform.

Define position

Next position

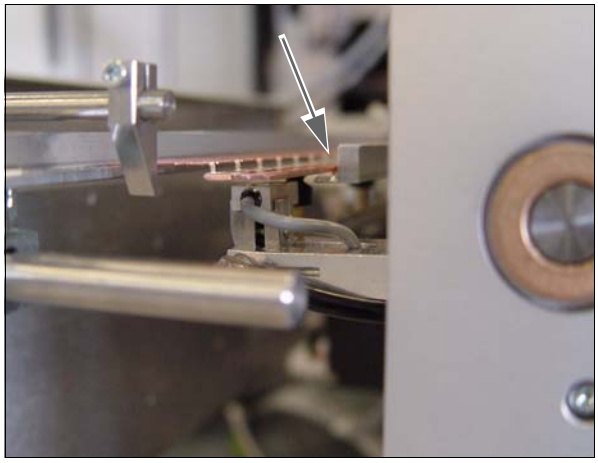


Gripper Place Position

Cursor the gripper to a position where the leadframe just touches the push-in rails.

Define position

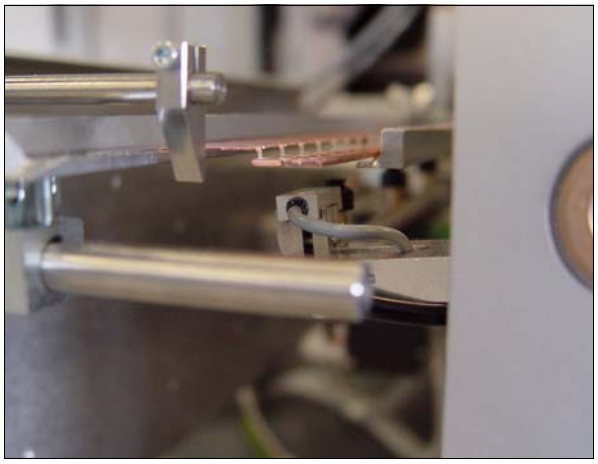
Next position



© 2009 Esec Ltd.

Gripper Placed Position

Cursor the gripper to a position where the suction cups of the gripper are clear of the leadframe so that it can be pushed onto the indexer.



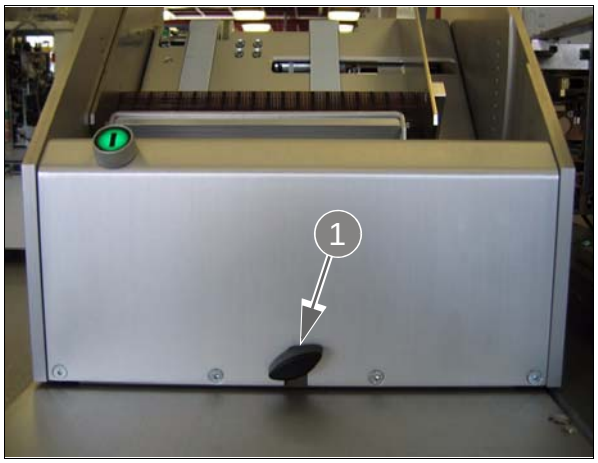
click ***Define position***

click ***Next position***

8.2.2 Y-Position Adjustment

Because the PLL is mounted on the input plate it is sometimes necessary to adjust its Y-position if a large chip correction on the indexer is carried out.

Turn the knob (1) located in center of the PLL front panel to adjust the Y-position. A clockwise rotation moves the PLL to the rear.



8.3 Stack Power

No teaching procedures are necessary for the stack power unit, only mechanical adjustment is required.

© 2009 Esec Ltd.

8.4 Top Stack Loader

Before teaching the top stack loader (TOS) check the following:

- All mechanical preparations have been completed, in accordance with section *7.2.4* on page *7-14*.
- All stack magazines are empty and positioned on the top stack loader.

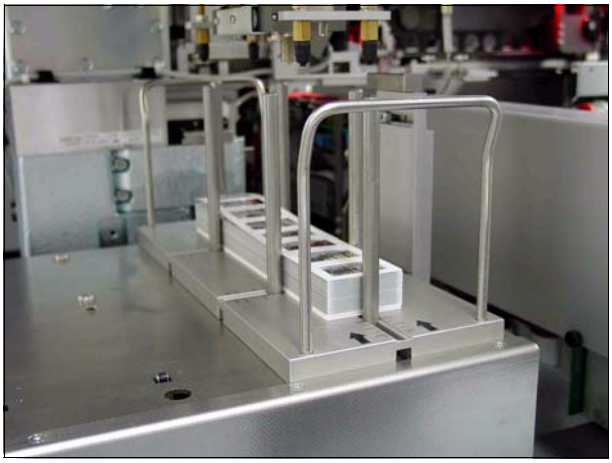
8.4.1 TOS Positions Teaching

Teaching the Leadframe Pickup Position One

Leadframe Handler Transport
Leadframe Input

Select the parameter **Page to positioning** as required.

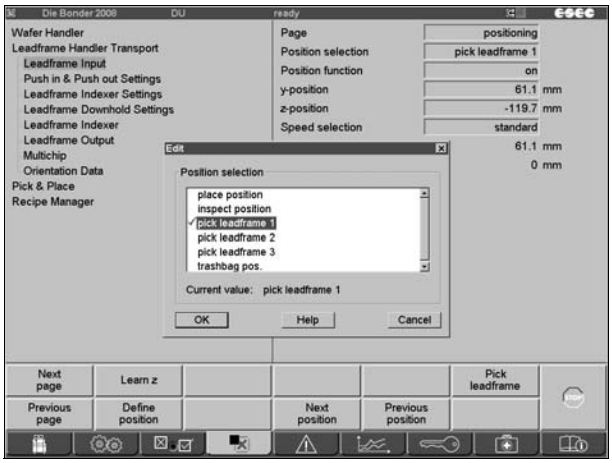
Place a short stack of leadframes, approximately 10 mm (400 mil) in height, into stack magazine one.



Set the parameter **Position selection** to **pick leadframe 1**.

The system moves the gripper automatically to the stack 1 area.

Set the parameter **Position function** to **on**.



Remove the keyboard and mount it on the left side of the Die Bonder 2009 SSI.

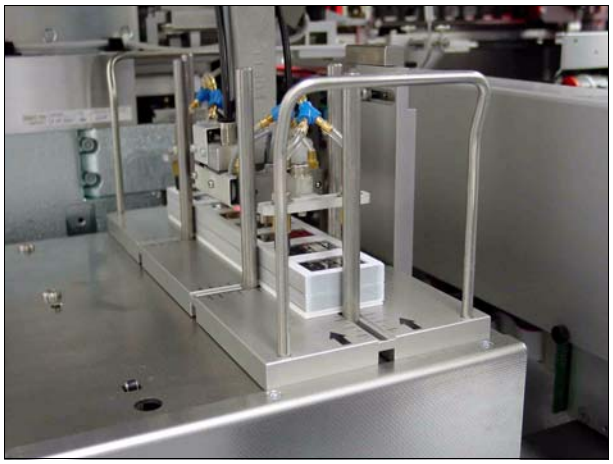
© 2009 Esec Ltd.

Teaching the Leadframe Pickup Position One (Cont.)

Use the cursor keys ***left*** and ***right*** to move the gripper roughly to the centre (in the Y-sense) of stack magazine one.

Use the cursor key ***down*** to move the gripper carefully downwards into the stack magazine to a position approximately 0.1mm (4mil) above the leadframe stack.

Align the gripper as accurate as possible in the Y-direction relative to the centre of the magazine leadframe guide-pins.



Define position

The gripper moves up clear of the magazine.

Remove all the leadframes from the magazine.

Learn z

The gripper automatically moves down to the bottom of the magazine and then moves up again. The bottom height of the magazine is now defined and saved by the software.

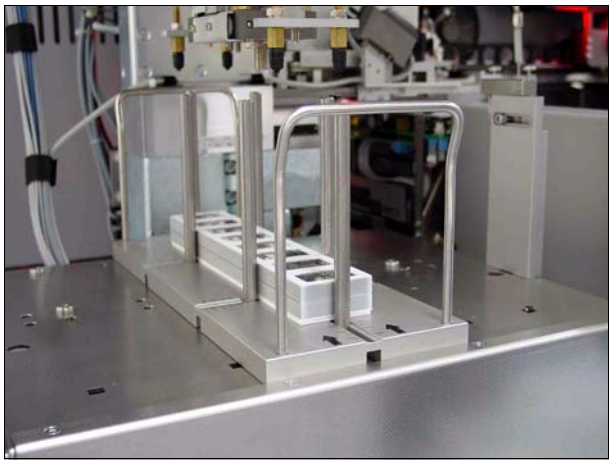
Teaching the Leadframe Pickup Position Two (and Position Three)

Place a short stack of leadframes, approximately 10mm (400mil) in height, into stack magazine two (and three).

Next position

The parameter **Position selection** shows **pick leadframe 2 (3)** and the gripper moves automatically to the stack two (three) area.

Define the position of stack two (three) in the same way as described for stack one.



Note: If the machine is to be configured for two pickup magazines and one trash bag, set the parameter **Position function** for **pick leadframe 3** to **off**.
If the Die Bonder 2009 SSI is to be configured for three pickup magazines and no trash bag, set the parameter **Position function** for **trash bag** to **off**.

© 2009 Esec Ltd.

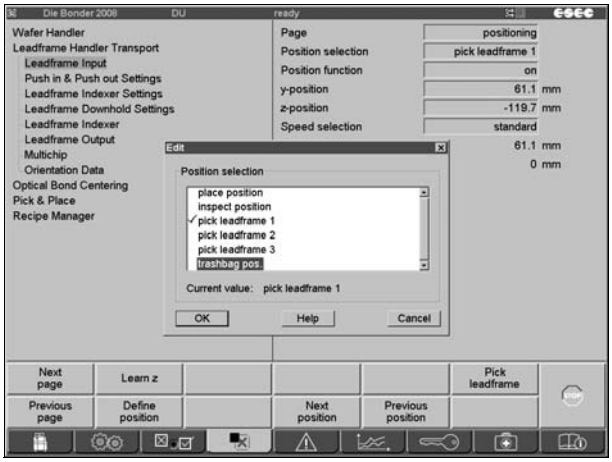
Teaching the Trash Bag Position

Leadframe Handler Transport
Leadframe Input

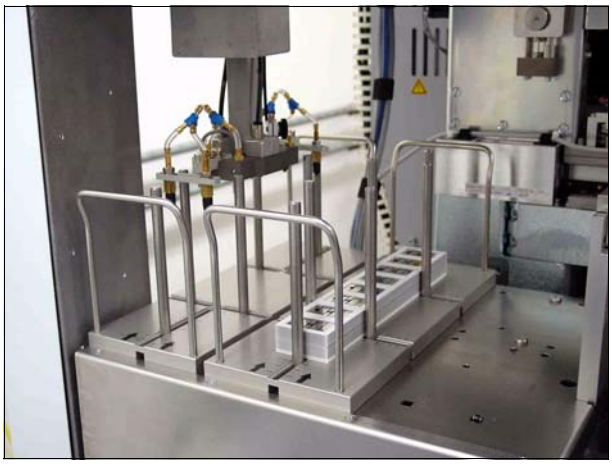
Set the parameter **Position selection** to **trash bag pos.**

The gripper moves to the trash bag area.

Set the parameter **Position function** to **on**.



Use the cursor keys ***left*** and ***right*** to align the gripper in Y-direction.



Note: Any up and down movement at the trash bag slows the production, therefore material should be released as high as possible.

Define position

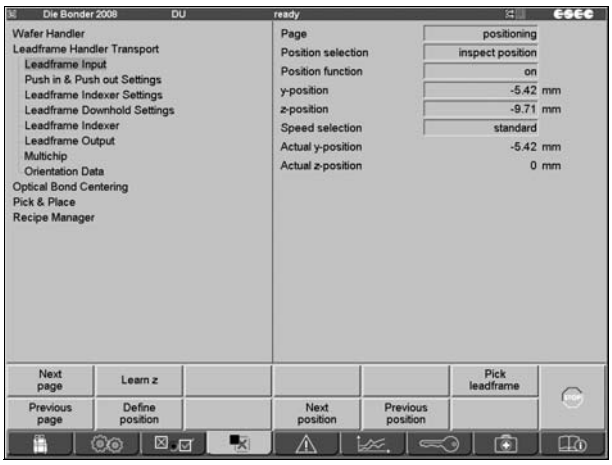
Teaching the Leadframe Inspection Position

Leadframe Handler Transport
Leadframe Input

Set the parameter **Position selection** to **inspect position**

The gripper moves to the inspection position area.

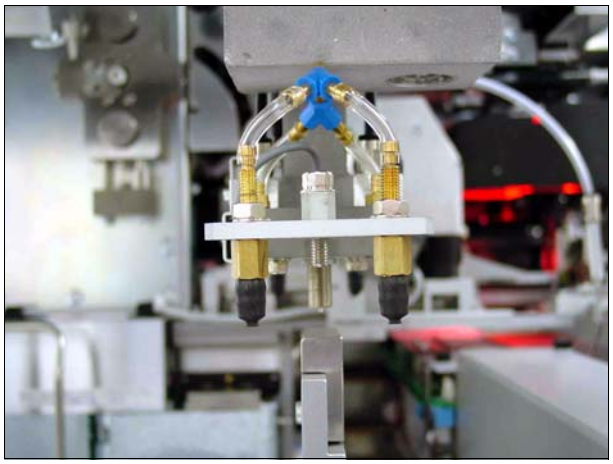
Set the parameter **Position function** to **on**.



© 2009 Esec Ltd.

Teaching the Leadframe Inspection Position (Cont.)

Use the cursor keys to move the gripper in the Y-direction until the inspection microswitch, located at the underside of the gripper, is in the centre of the inspection platform.



Note: In some cases (e.g. with a small inspection station rider platform) it may be necessary to move the rider in the X-direction in order to center the microswitch (see section *7.2.4* on page *7-14*).

click ***Define position***

click ***Learn z***

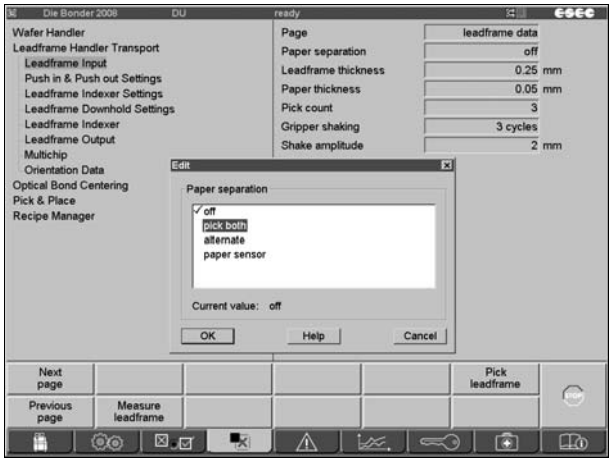
The system moves the gripper down to learn and save the Z-height.

8.4.2 Paper Separation Teaching

Leadframe Handler Transport
Leadframe Input

Set the parameter **Page** to **leadframe data**.

Set the parameter **Paper separation** to either **off** / **pick both** / **alternate** / **paper sensor** as required.



- With setting **pick both** the system will pick up an interleave paper and a leadframe at the same time. It will then check them both or the leadframe only at the inspection position, place the leadframe on the indexer and the paper in the trash bag.
- With setting **alternate** the system will pick up an interleave paper and place it straight in the trash bag, then pick up a leadframe, check it at the inspection position and place it on the indexer.
- With setting **off** no interleaf paper is used.
- With setting **paper sensor** an additional sensor (option) detects interleaf papers on top of the stack and throws them in the trash bag.

The selection depends on the layout (design) of the interleaf paper.

© 2009 Esec Ltd.

8.4.3 Leadframe Thickness Measurement

Preparations

This feature makes sure that only one leadframe at a time and no interleaf paper is placed on the indexer.

Make sure that there are a few leadframes in the magazine.

Paper Separation - Off

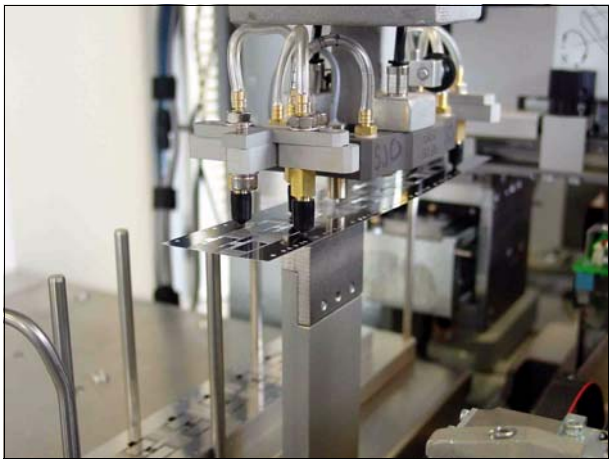
Leadframe Handler Transport
Leadframe Input

Set the parameter **Page** to **leadframe data**.

Measure leadframe

A leadframe is picked up and transported to the inspection station rider, measured and placed in the trash bag.

The result is shown on the menu as **Leadframe thickness**.



Paper Separation - Alternate / Pick Both / Paper Sensor

Make sure that there are a few leadframes and papers in the magazine. There must be an interleaf paper on top of the stack.

Start Measure

Measure paper

The interleaf paper is picked up and transported to the inspection position, measured and placed in the trash bag. The result is shown at the menu as **Paper thickness**.

Measure leadframe

A leadframe is picked up and transported to the inspection position, measured and placed in the trash bag.

The result is shown at the menu as **Leadframe thickness**.

© 2009 Esec Ltd.

8.4.4 Leadframe Place Position Teaching

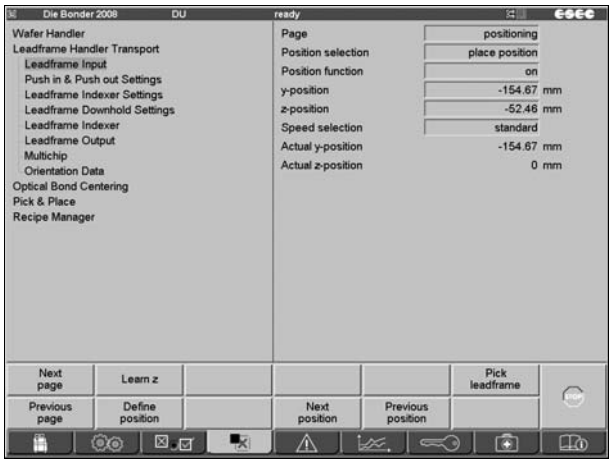
Preparations

Place a few leadframes in the magazine.

click ***Pick leadframe*** to pick up a leadframe from the stack.

i 9 Set the parameter **Position selection** to **place position**.

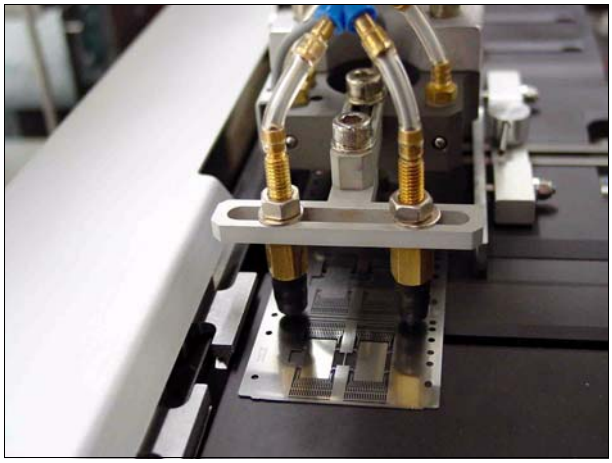
Set the parameter **Position function** to **on**.



Defining the Position

Use the cursor key ***down*** to move the gripper downwards until the leadframe is approximately 1 mm (40 mil) above the indexer.

Use the cursor keys ***left*** and ***right*** to move the gripper in the Y-direction until there is a gap of approximately 2 mm (80 mil) between the rear edge of the leadframe and the push-in clamp.



click ***Define position***

The place position is now defined and saved by the software.

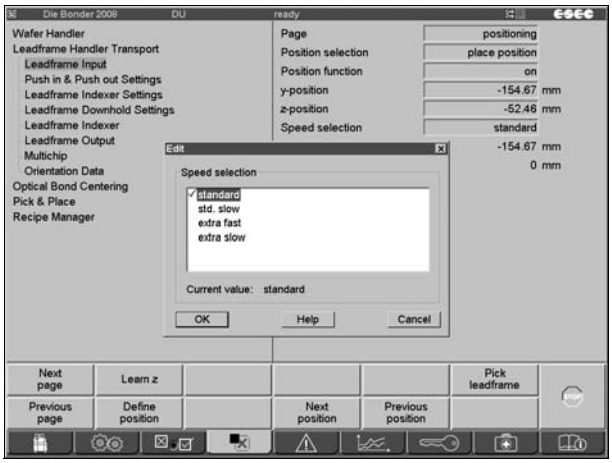
click ***Learn z***

click ***Discharge leadframe***

© 2009 Esec Ltd.

8.4.5 TOS Parameter Setting

Leadframe Handler Transport
Leadframe Input



click ***Next page*** until the parameter **Page** is set to **positioning**.

Set the parameter **Speed selection** as required.

click ***Next page*** until the parameter **Page** is set to **leadframe data**.

Set the following parameters as required:

- **Pick count**
- **Gripper shaking**
- **Shake amplitude**

© 2009 Esec Ltd.

8.5 Input Magazine Handler (Option)

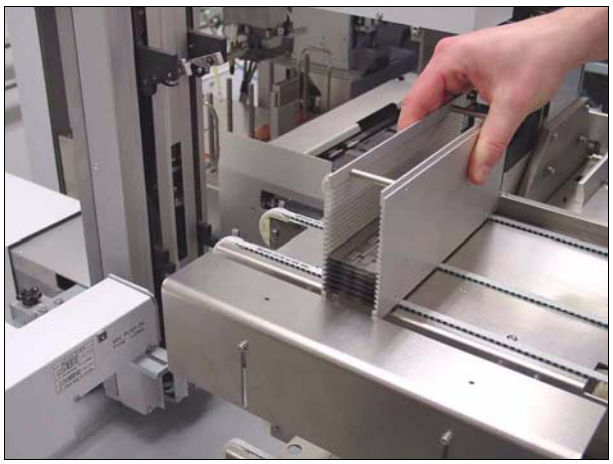
Preparations

Leadframe Handler Transport
Leadframe Input

Place an empty magazine on the load buffer.

Load magazine

Set the parameter **Number of slots** to the appropriate number.



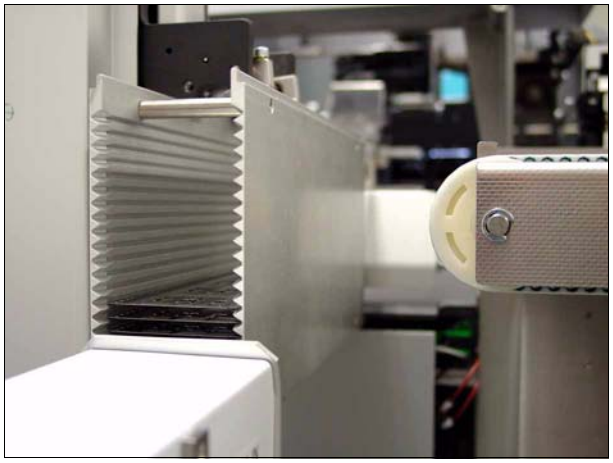
Defining the Slot Positions

Use the cursor keys ***up*** and ***down*** to align the bottom slot of the magazine with the indexer (in Z). Use the leadframe as a reference.

Position the bottom of the slot approximately 0.1 to 0.2 mm (4 to 8 mil) below the indexer surface.

If satisfied, remove the leadframe.

Define bot. slot



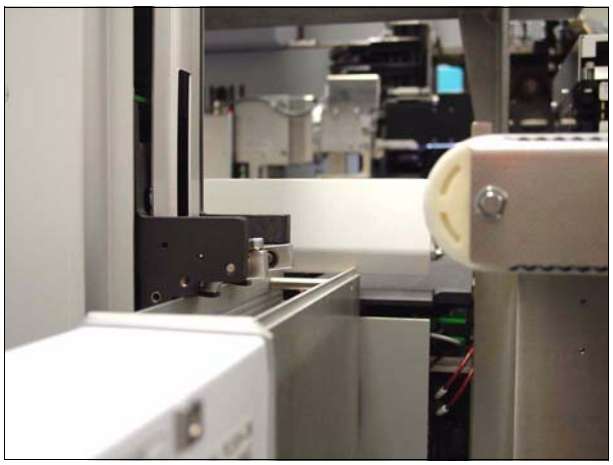
Insert the leadframe into the top slot.

Magazine top slot

The magazine moves to its programmed top slot.

Use the cursor keys ***up*** and ***down*** to adjust the top slot in the same way as the bottom slot until satisfied.

Define top slot



Note: Do not move Y-position during this procedure!

© 2009 Esec Ltd.

Defining the Magazine Side Thickness

Insert a leadframe into the bottom slot and check that it is aligned to the indexer rail. If it is not, adjust it by re-defining the magazine side thickness.

In order to allow the setup to be completed accurately it may be necessary to perform preliminary adjustments in the Z-direction.

If the adjustment is satisfying:

Define mag. side

Checking the Adjustments

Magazine step up and ***Magazine step down*** to test a number of slot positions.

Adjust the parameter **Magazine side thickness**, when the leadframe does not enter the magazine properly.

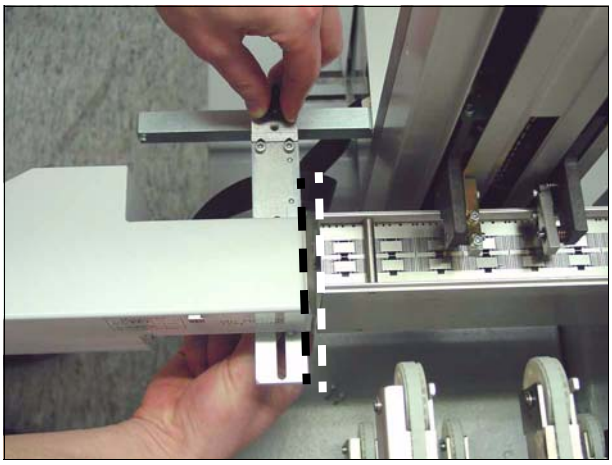
Enter the magazine side thickness in mm, plus x mm (where x is half the clearance between the leadframe width and the slot width) to provide a small clearance between the leadframe and the slot.

Unload magazine

Remove magazine from buffer.

Adjusting the MH-pushin

Mechanically adjust the MH-pushin module in Y-direction to the center of the leadframe and in X-direction close to the magazine. Make sure there is a small gap between magazine and MH-pushin.



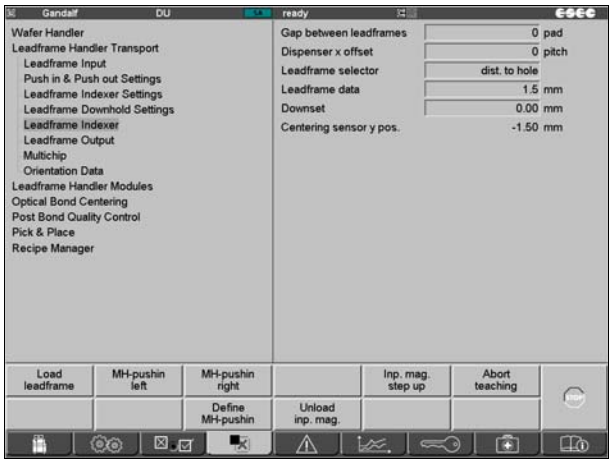
© 2009 Esec Ltd.

Adjusting the MH-pushin (Cont.)

Leadframe Handler Transport
Leadframe Indexer

MH-pushin right

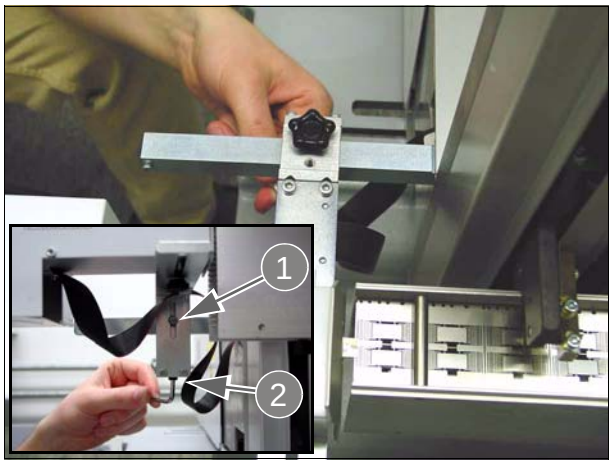
Move the MH-pushin to the right until it touches the leadframe.



Loosen the locking screw (1). Mechanically adjust the height of the MH-pushin by turning the height adjusting screw (2) until it's leveled to the leadframe in the actual slot.

Tighten the locking screw (1).

Recheck height of MH-pushin.



Leadframe Handler Transport
Leadframe Indexer

MH-pushin right

Move the MH-pushin to the right until the leadframe has reached the clamps of the pushin.

Define MH-pushin

Use the cursor keys to move the pushin clamps to the load position.

Define load pos.

Load Leadframe

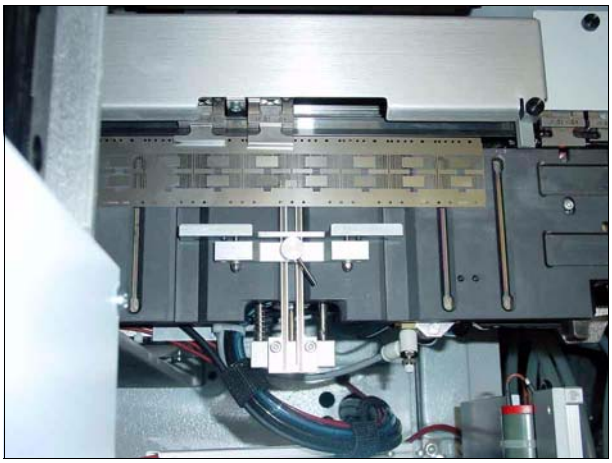
The system pulls the leadframe one stroke and reclamps the leadframe.

© 2009 Esec Ltd.

Adjusting the MH-pushin (Cont.)

Use the cursor keys to move the leadframe to the blow position. The leadframe has to be centered to the Y-pushin.

Define blow pos.



8.6 Dual Power Leadframe Loader DPLL (Option)

DPLL - Stack Power

No teaching procedures are necessary for the stack power unit, only mechanical adjustment is required.

DPLL - Magazine Handler

Teach the magazine handler according to section *8.5* on page *8-13*.

8.7 Dual Input Loader DINP (Option)

DINP - Top Stack Loader TOS

Teach the TOS according to section *8.4* on page *8-6*.

DINP - Magazine Handler

Teach the magazine handler according to section *8.5* on page *8-13*.

8.8 Push-in-Take Over

If a dual input loader DINP is used, the push-in take over has to be calibrated.

© 2009 Esec Ltd.

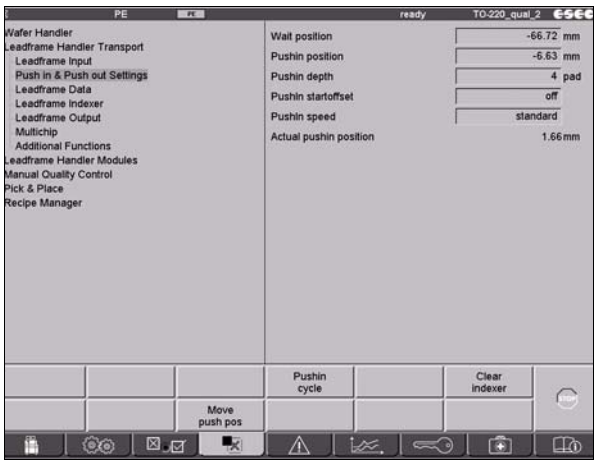
8.9 Leadframe Identification Sensors

Leadframe Handler Transport
Push in & Push out Settings

click ***Load leadframe***

click ***Teach LF ID***

i 46 Check whether the learned code corresponds with the code on the leadframe.

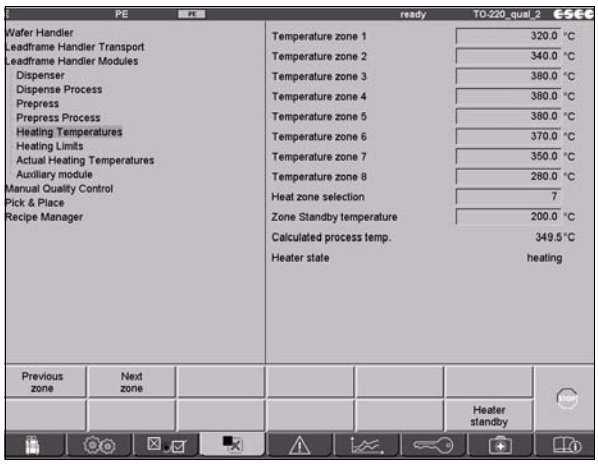


© 2009 Esec Ltd.

8.10 Soft Solder Indexer

Teaching the Operating Temperatures

Leadframe Handler Modules
Heating Temperatures



click ***Previous zone*** or ***Next zone*** to select the parameter **Temperature zone 1**.

Make sure the parameter **Zone state** is shown as **on**.

i 44 Use the dialogue box to set the zone to the operating temperature required.

Select the parameter **Standby temperature** and set to the zone to the temperature required in energy saving mode.

click ***Next zone***

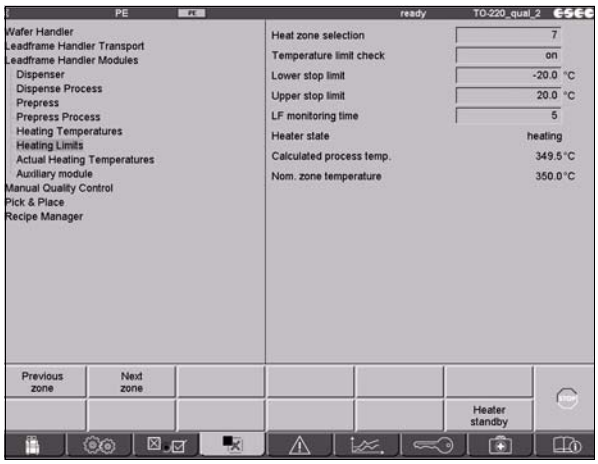
This defines the temperatures of zone 1 and selects the parameter **Temperature zone 2**.

Repeat the procedure for zones 2 to 8.

Note: The ***Heater standby*** soft key sets all zones to the energy saving mode temperature defined.

Teaching the Heating Limits

Upper and lower heat control limits should be set for each of the eight heater zones.



Leadframe Handler Modules
Heating Limits

click ***Previous zone*** or ***Next zone*** to set the parameter **Heat zone selection** to **1**.

If necessary, click

click ***Turn on heating*** to set the zone to **on**.

Set the parameter **Temp. limit check** to **on**.

Select the parameter **Lower stop limit** and set the temperature at which production should stop due to the zone temperature reducing to an unacceptably low level.

Select the parameter **Upper stop limit** and set the temperature at which the machine will stop and switch off, due to the zone temperature reaching an unacceptably high level.

click ***Next zone***

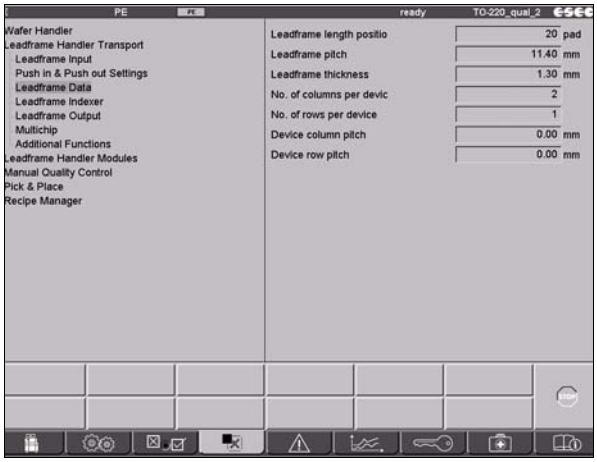
This defines the temperatures of zone 1 and sets the parameter **Heat zone selection** to **2**.

Repeat the procedure for zones 2 to 8.

© 2009 Esec Ltd.

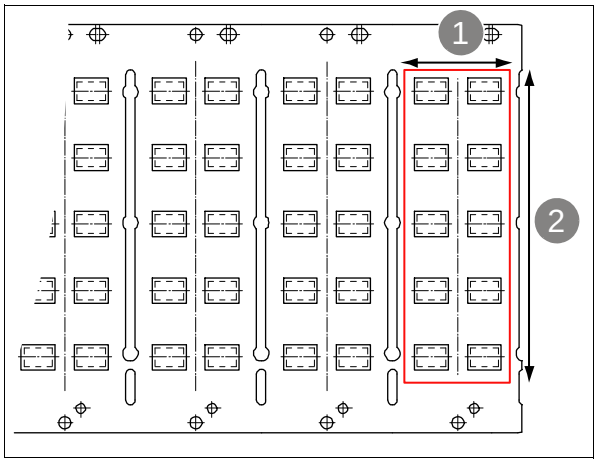
8.11 Leadframe Teaching

Leadframe Handler Modules
Leadframe Data



Define the number of columns and rows of the used leadframe.

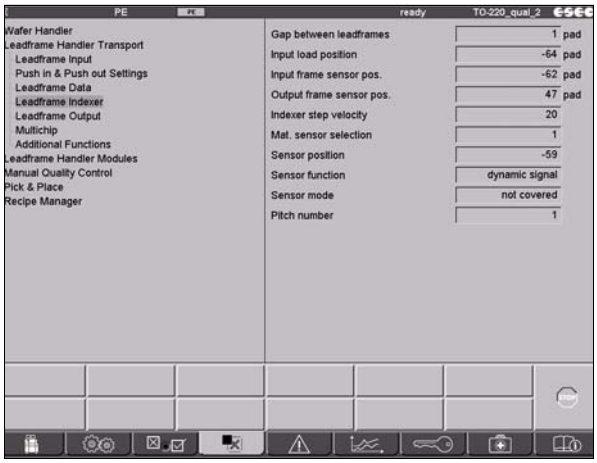
1. Number of columns
2. Number of rows



Leadframe Handler Modules
Leadframe Indexer

i 45 Set the following parameters as required:

- Leadframe dimension (number of pads)
- Sensor position
- Indexer step velocity
- Gap between leadframes
- Material sensor selection
- Pitch number



© 2009 Esec Ltd.

8.12 Multichip Bond Positions

This teaching step is only required if two or more chips are to be placed for one leadframe pitch.

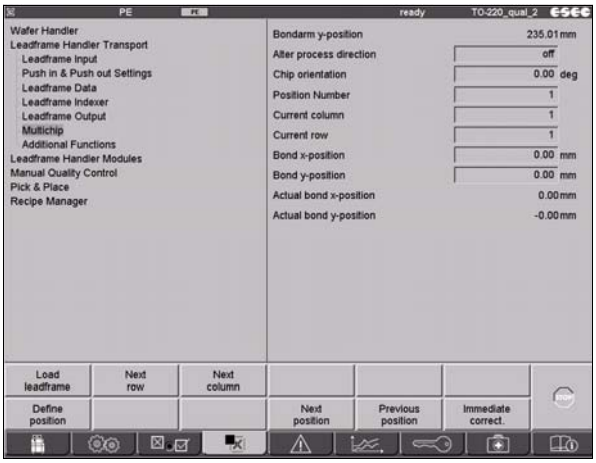
During matrix operations, the ‚origin position' is the XY-position of the pad set during *Indexer Calibration (Top Module)* on page *6-38* and has to be the most front right position on the leadframe (corresponding to position 1).

Introduction

Leadframe Handler Transport
Multichip

Put a small stack of leadframes into the first stack magazine.

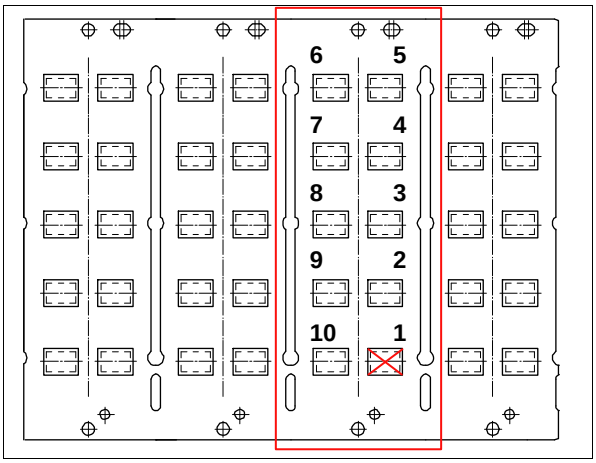
click ***Load leadframe***



Initial layout:

A symmetrical matrix leadframe will have the layout shown beside if device and row pitch have been entered correctly in the leadframe data menu.

Position1 = origin position (calib position)



© 2009 Esec Ltd.

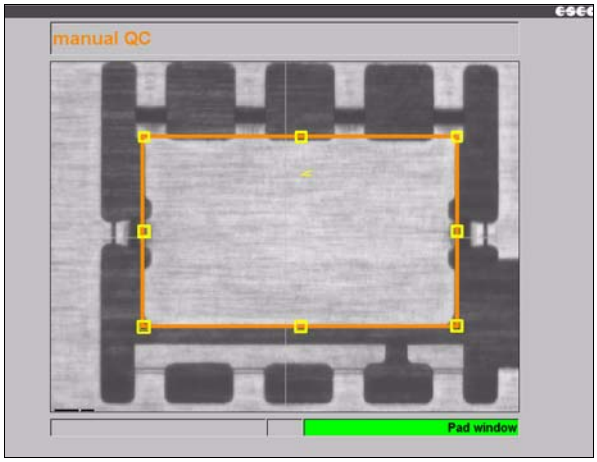
Setting Next Position(s) with Inspection Monitor

Manual Quality Control

Next position

Set the pad window around significant edges of the bondable area.

Learn pad window



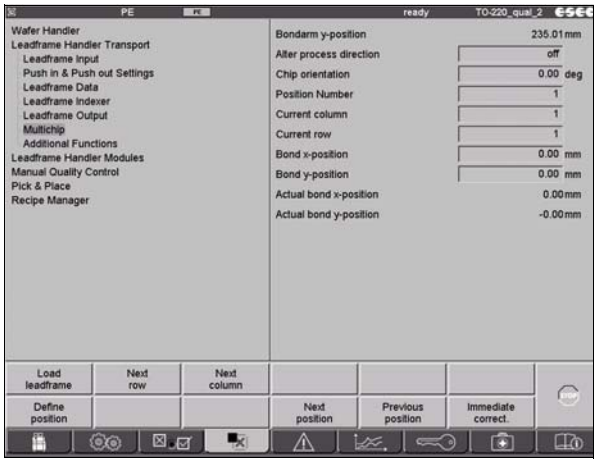
Leadframe Handler Transport
Multichip

Next position

Check that the pad window properly frames the pad. If not satisfied move the position using the cursor keys or enter the bond position numerically.

Define position

Repeat this procedure for each bond position on this leadframe.



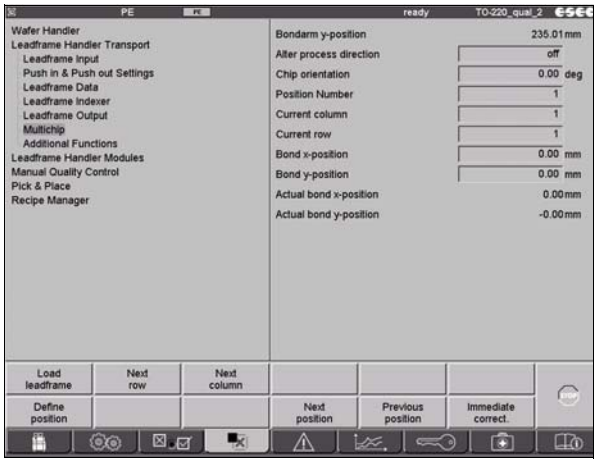
Chip Orientation

Leadframe Handler Transport
Multichip

Set the parameter **Chip orientation** as required to enter the theta angle for the chip.

Repeat this step for each **Position number** entered before.

Next position or ***Previous position*** or enter the number manually to select the **Position number**.



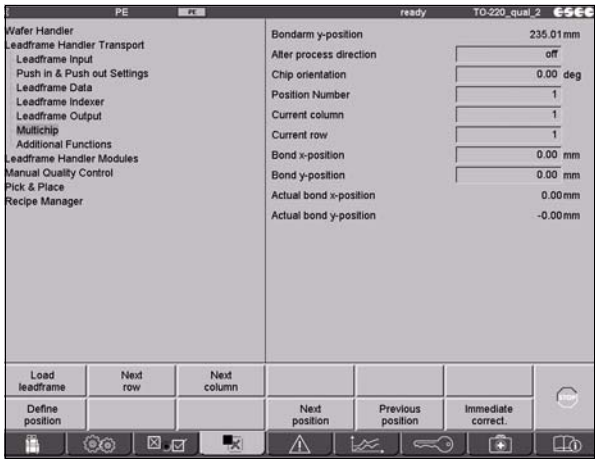
Note: If the matrix has changed, go back to leadframe data menu to redefine the matrix.

© 2009 Esec Ltd.

Process Direction

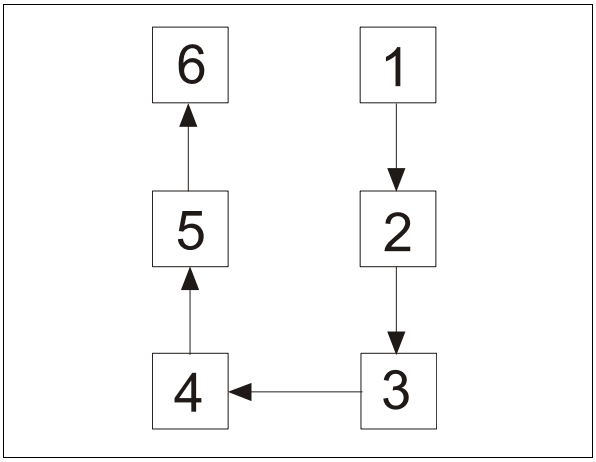
Set the parameter **Alter process direction** to **off** or **on** as required.

On means that the bond order will be reversed after each indexer step. This can decrease bondhead travelling time and thereby increase UPH.



Note: Positions are always processed in the order in which they are specified, therefore specifying in the wrong order will reduce UPH.

If there are different positions in X, it is important that the positions on the far left have the highest position numbers and the parameter **Alternate process direction** is set to **off**.



© 2009 Esec Ltd.

8.13 Programmable Dual Wire Dispenser

WARNING

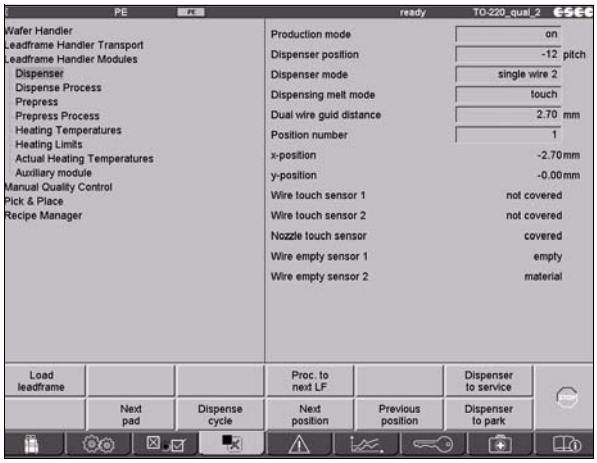
When operating soft keys keep hands, loose clothing and tools clear of all moving parts.

Always move the mouse cursor off the soft key after use. Many soft keys have a toggle action and touching a mouse (or trackball) button will cause the module to move again.

The wire dispenser, indexer and their immediate vicinity may reach temperatures in excess of 450°C, coming into contact with them will result in serious burns.

Setting Up the PDWD

Note: Mechanical setup and calibration must be done in advance.



Make sure that the mechanical preparation (see section *7.2.7* on page *7-29*) has been completed correctly, the correct wire guide has been fitted and that it is clean.

Leadframe Handler Modules
Dispenser

i 47 Select the parameter **Dispenser position** and enter the number of indexer steps between the bond position and the dispenser.

Set the parameter **Dispenser mode** to **single** or **dual** as required.

Dual wire:
Single wire 1 = left wire
Single wire 2 = right wire

Set the parameter **Dispensing melt mode** to **touch** or **distance** as required.

Note: The dual wire guide distance depends on the nozzle design.

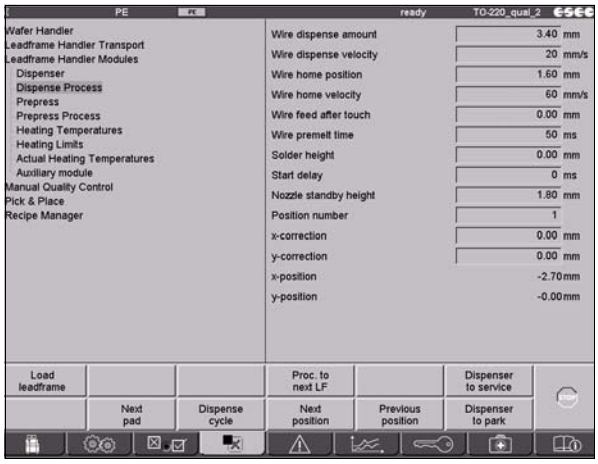
Leadframe Handler Modules
Dispense Process

Set up the parameters as detailed in section *Touch Mode* on page *8-24* or section *Distance Mode* on page *8-25*.

© 2009 Esec Ltd.

Touch Mode

Make sure that the settings detailed in section *8.13* on page *8-23* have been completed correctly.



Set the parameter **Wire dispense amount** to the amount of wire to be fed during each cycle.

Set the parameter **Wire dispense velocity** to the speed of wire movement required during the "amount of wire" action.

Select the parameter **Wire home position** and enter the height required (in millimeters) of the wire above the leadframe between each cycle.

Set the parameter **Wire home velocity** to the speed (in millimeters per second) of wire movement required between the touch down position and back to the "home position".

Set the parameter **Wire feed after touch** to the amount of wire to be fed after touch down. This parameter defines the amount of solder pre-melted onto each pad on the leadframe.

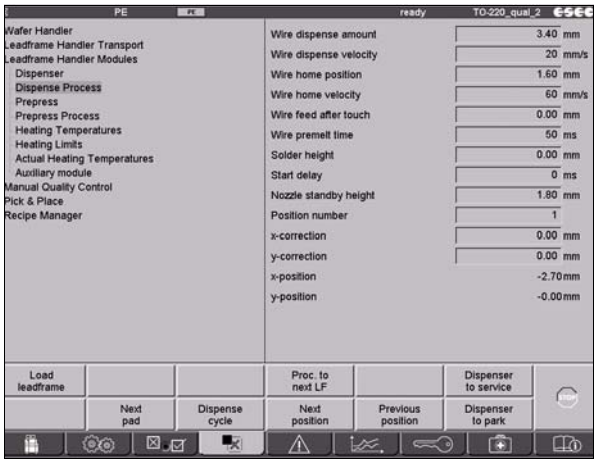
Select the parameter **Wire premelt time** and enter the time required between the wire touching down on the leadframe and the start of the wire "amount of wire" action.

Set the **Nozzle standby height** which defines the height of the nozzle above the bond pad

© 2009 Esec Ltd.

Distance Mode

Make sure that the settings detailed in section *8.13* on page *8-23* have been completed correctly.



Set the parameter **Wire dispense amount** to the amount of wire to be fed during each cycle.

Set the parameter **Wire dispense velocity** to the speed of wire movement required during the "amount of wire" action.

Select the parameter **Wire home position** and enter the height required (in millimeters) of the wire above the leadframe between each cycle.

Select the parameter **Wire home velocity** and set it to the speed required (in millimeters per second) of wire movement between the "home position", the initial touch down position and back to the "home position".

Set the parameter **Solder height** to the height of the solder spot required after the melt off.

Select the parameter **Wire premelt time** and enter the time required between the wire touching down on the leadframe and the start of the wire "amount of wire" action.

Set the **Nozzle standby height** which defines the height of the nozzle above the bond pad

i 49 **Note:** For the handling of dispensing errors refer to info sheet.

© 2009 Esec Ltd.

8.14 Prepress Process

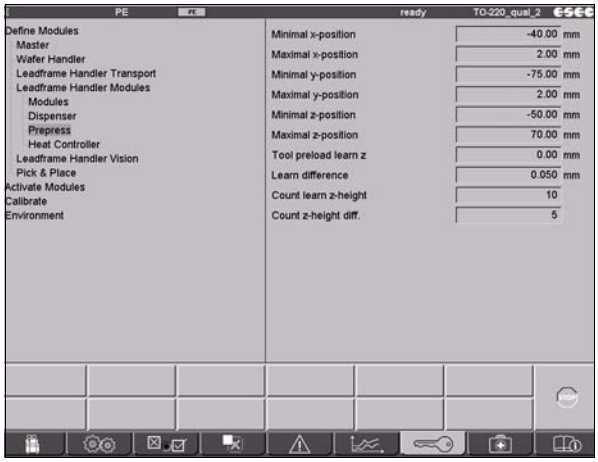
WARNING

The PPPM tool may reach temperatures in excess of 450°C. Coming into contact with it will resent serious burns.

Setting the Z-Axis Parameters

Define Modules
Leadframe Handler Modules
Prepress

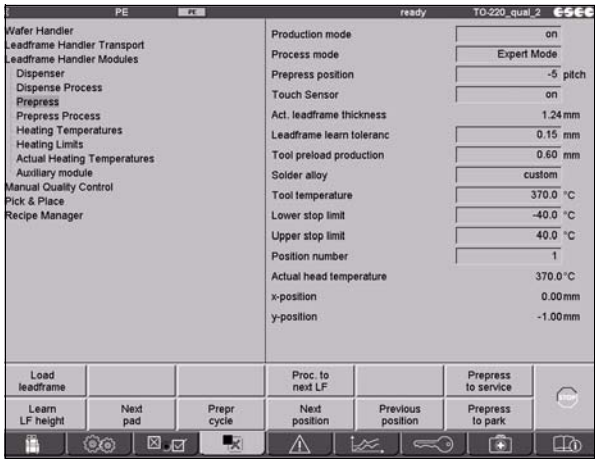
i 52 Set the Z-axis parameters as required.



Setting General Prepress Parameters

Leadframe Handler Modules
Prepress

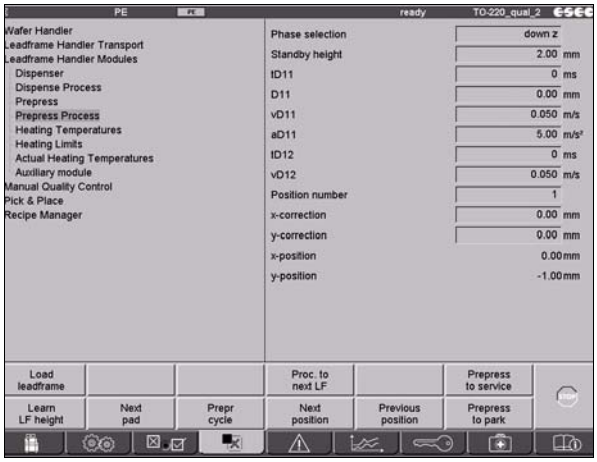
i 53 Set the general prepress parameters as required.



© 2009 Esec Ltd.

Setting Prepress Process Parameters

Leadframe Handler Modules
Prepress Process



Set the **Phase selection** to **down z**.

i 54 Set the parameters for the down motion as required.

Set the **Phase selection** to **spank z**.

i 54 Set the parameters for the spank motion as required.

Set the **Phase selection** to **up z**.

i 54 Set the parameters for up motion as required.

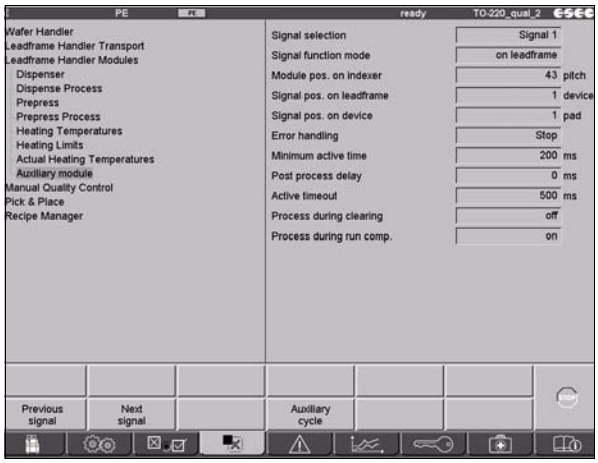
click ***Prep cycle*** to manually perform several MPPM cycles in order to check for correct parameter setting.

© 2009 Esec Ltd.

8.15 Power Marker Unit PMU4 (Option)

8.15.1 PMU4 Parameter Setting

Leadframe Handler Modules
Auxiliary Module



Set the **Signal selection** to **Signal 1**.

Set the **Signal function mode** to **on leadframe**. (Standard mode for the PMU4.)

Select the parameter **Module pos. on indexer** and enter the position where the PMU4 is mounted, relative to the bond position.

Select the parameter **Signal pos. on leadframe** and enter the number of the device opposite which the stamp mark is to be placed.

Set the parameter **Minimum active time** to the required time between 50 and 100 ms.

Set the parameter **Active timeout** to **200 ms**.

8.15.2 PMU4 Adjustment

Preparation

Leadframe Handler Modules
Auxiliary Module

click ***Next signal*** until **Signal selection** shows **Signal 1**.

click ***Auxiliary cycle***. This operates the PMU4 through one complete cycle.

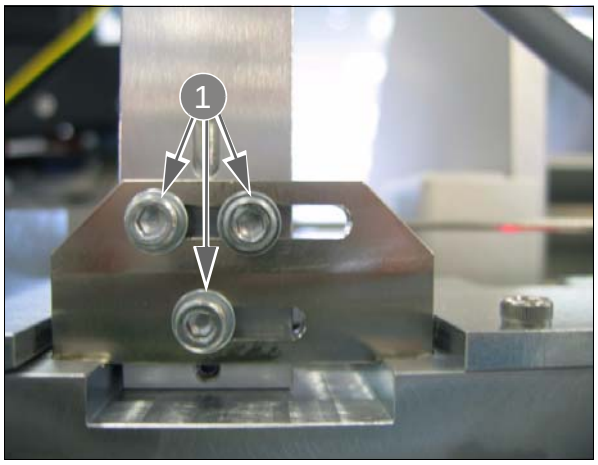
WARNING

The indexer and its immediate vicinity may reach temperatures in excess of 450°C, coming into contact with it will result in serious burns.

© 2009 Esec Ltd.

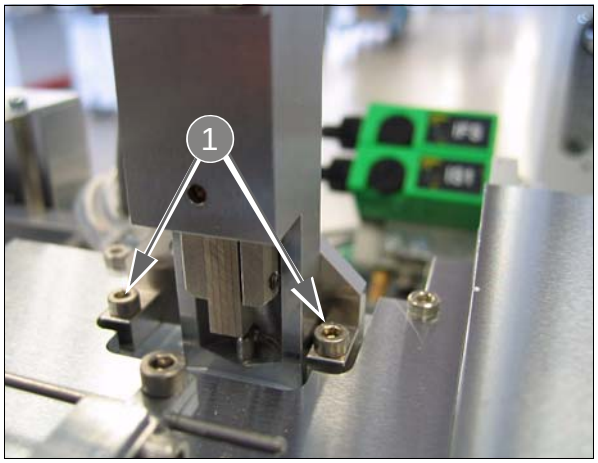
Adjusting the X Position

- Check the position of the PMU3 in the X axis.
- If adjustment in X is required slightly loosen the three screws (1) and slide the PMU3 unit to the position required.
- Tighten the three screws.

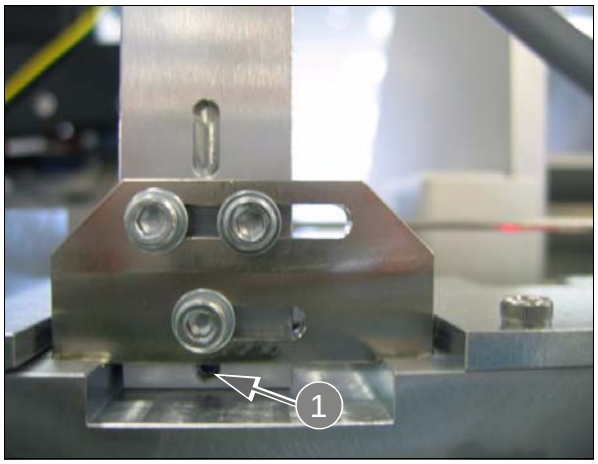


Adjusting the Z Position

- Check the position of the PMU3 in the Z axis.
- If adjustment in Z is required, loosen the two PMU3 fixing screws (1).



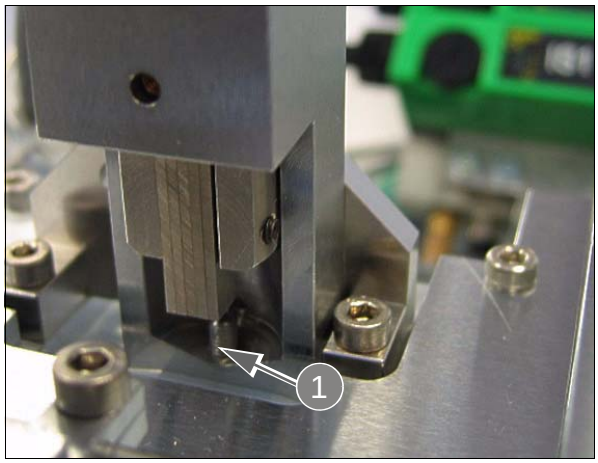
- Loosen the Z locking screw (1).



© 2009 Esec Ltd.

Adjusting the Z Position (Cont.)

- To adjust the height of the PMU3 turn the set screw (1) from underneath until a nice imprint is achieved without deforming the top rail of the leadframe.
- If satisfied first tighten the Z locking screw and then tighten the two fixing screws.



© 2009 Esec Ltd.

/ (May 29, 2009)

8.16 Output Buffered Handler BH (Option)

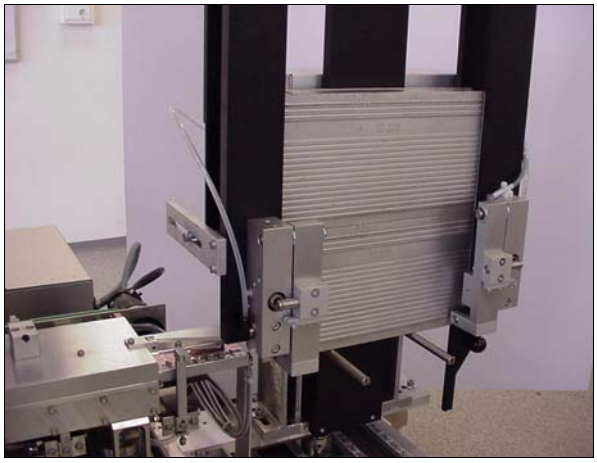
WARNING

When opening and closing menus, or operating soft keys keep hands, loose clothing and tools clear of all moving parts.

Always move the mouse cursor off the soft key after use. Many soft keys have a toggle action and touching a mouse (or trackball) button will cause the module to move again

Defining Slot Positions

Leadframe Handler Transport
Leadframe Output

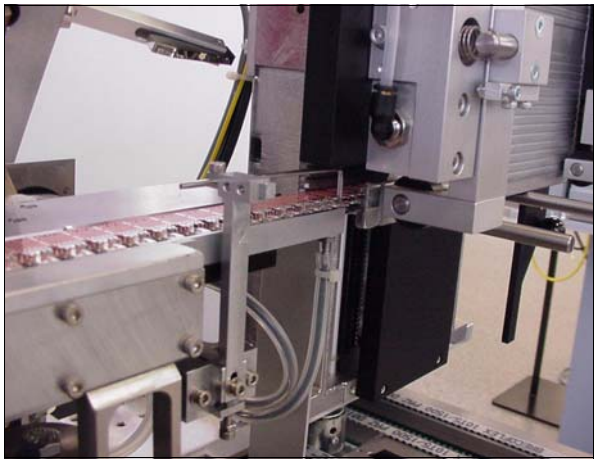


Place two magazines, each with a leadframe in the top and bottom slots, into the buffered handler guide rails.

Select the parameter **Number of slots** and enter the appropriate number.

click ***Magazine bot. slot***

The lift will move the lower magazine to its programmed bottom slot position.



Push a leadframe into the bottom slot and check that it is centered with the indexer in Y; if it is not, adjust as described in section *7.2.9* on page *7-34*.

In order to allow the setup to be completed accurately, it may be necessary to carry out preliminary adjustments in the Z direction.

Using the cursor keys, move the bottom slot to align with the indexer (in Z), using the leadframe as reference. Make sure that the slot is approximately 0.02 to 0.05 mm (8 to 20 mil) above the indexer surface.

When satisfied with both the Y and Z position, click

click ***Define bot. slot***

This defines and records the position of the bottom slot.

© 2009 Esec Ltd.

Defining Slot Positions (Cont.)

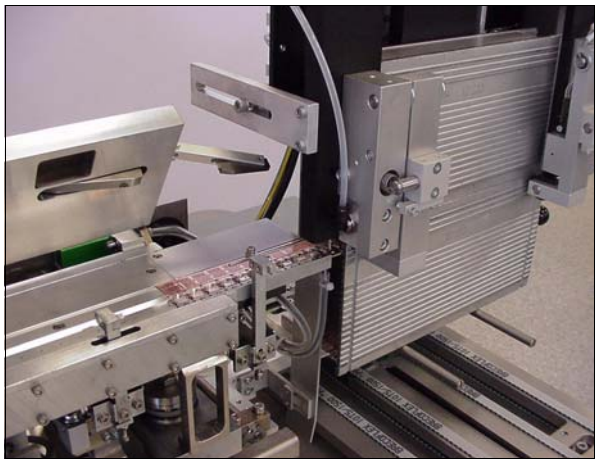
Magazine top slot

The lift will move the lower magazine to its programmed top slot position.

Push the leadframe into the top slot and use the cursor keys to adjust the top slot in the same way as the bottom slot.

When satisfied, click

Define top slot to define and record the top slot position.



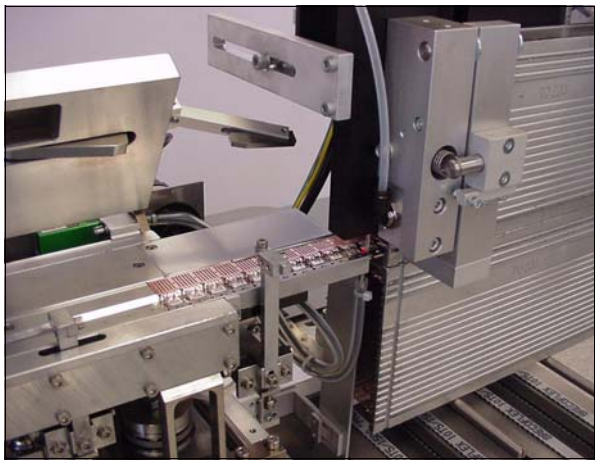
Upp. mag. bot. slot

The lift will move the upper magazine to its programmed bottom slot position.

Push the leadframe into the bottom slot of the upper magazine and use the cursor keys to adjust the slot position in the same way as for the lower magazine.

When satisfied, click

Define upp. mag. to define and record the distance between the top slot of the lower magazine and the bottom slot of the upper magazine.



Unload magazine

The lower magazine is placed on the unload buffer. Remove the magazine. If required, the upper magazine may be left in position to begin production.

© 2009 Esec Ltd.

8.17 Output Magazine Handler

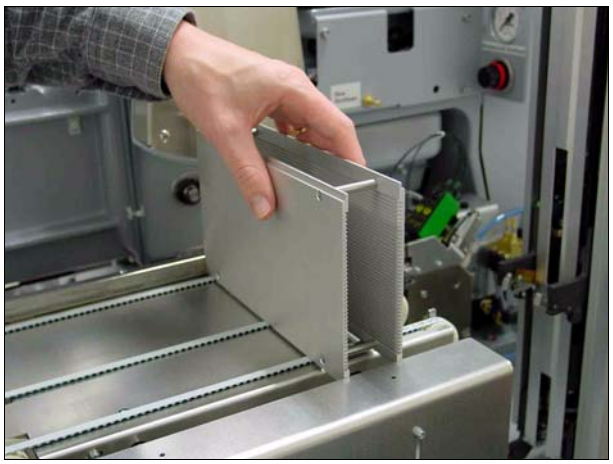
Preparations

Leadframe Handler Transport
Leadframe Output

Place an empty magazine on the load buffer.

Load magazine

Set the parameter **Number of slots** to the appropriate number of slots of the magazine.



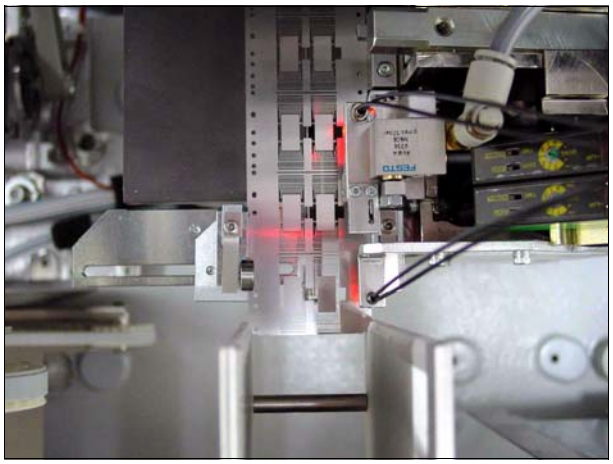
Indexer open clmp.

Insert a leadframe into the bottom slot and check that it is centered in Y-direction to the indexer. If it is not, adjust it by re-defining the magazine side thickness.

In order to allow the setup to be completed accurately it may be necessary to perform preliminary adjustments in the Z-direction.

If the adjustment is satisfying:

Define mag. side



Use the cursor keys ***up*** and ***down*** to align the bottom slot of the magazine with the indexer (in Z). Use the leadframe as a reference.

Position the bottom of the slot approximately 0.1 to 0.2 mm (4 to 8 mil) below the indexer surface.

If satisfied, remove the leadframe.

© 2009 Esec Ltd.

Defining Slot Positions

Define bot. slot

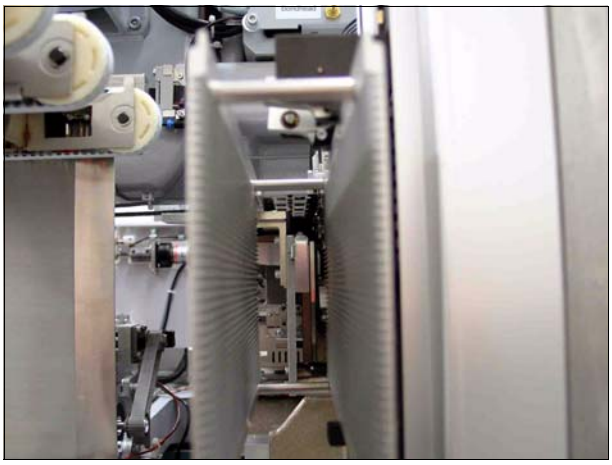
Magazine top slot

The magazine moves to its programmed top slot.

Insert the leadframe into the top slot.

Use the cursor keys ***up*** and ***down*** to adjust the top slot in the same way as the bottom slot until satisfied.

Define top slot



Note: Do not move Y-position during this procedure.

Magazine step up and ***Magazine step down***
to test a number of slot positions.

Adjust the parameter **Magazine side thickness**, when the leadframe does not enter the magazine properly.

Enter the magazine side thickness in mm, plus x mm (where x is half the clearance between the leadframe width and the slot width) to provide a small clearance between the leadframe and the slot.

Unload magazine

Remove magazine from buffer.

Assist
Warning Counters

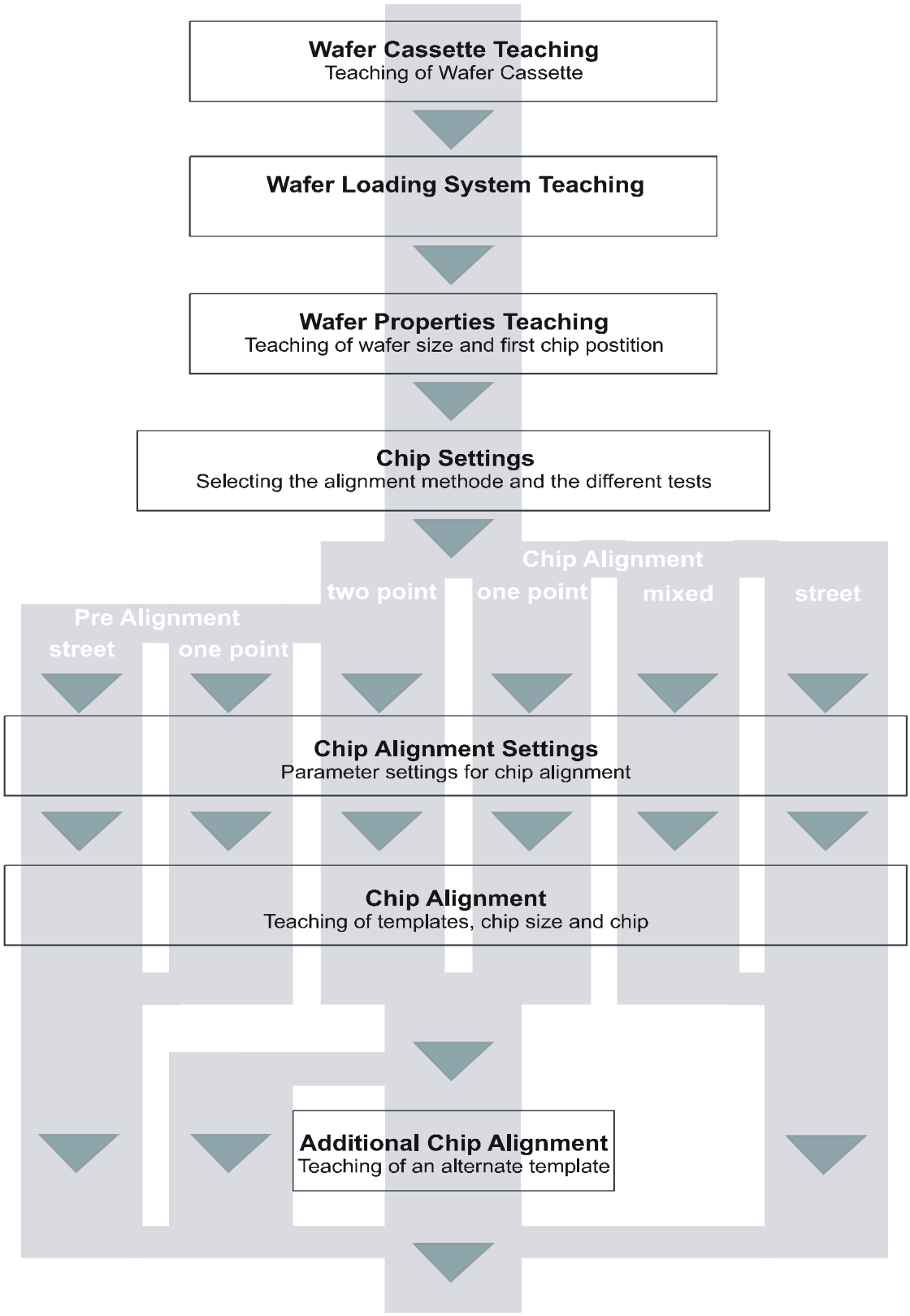
Set the parameter **LF output warning count** as required.

© 2009 Esec Ltd.

8.18 Wafer Settings

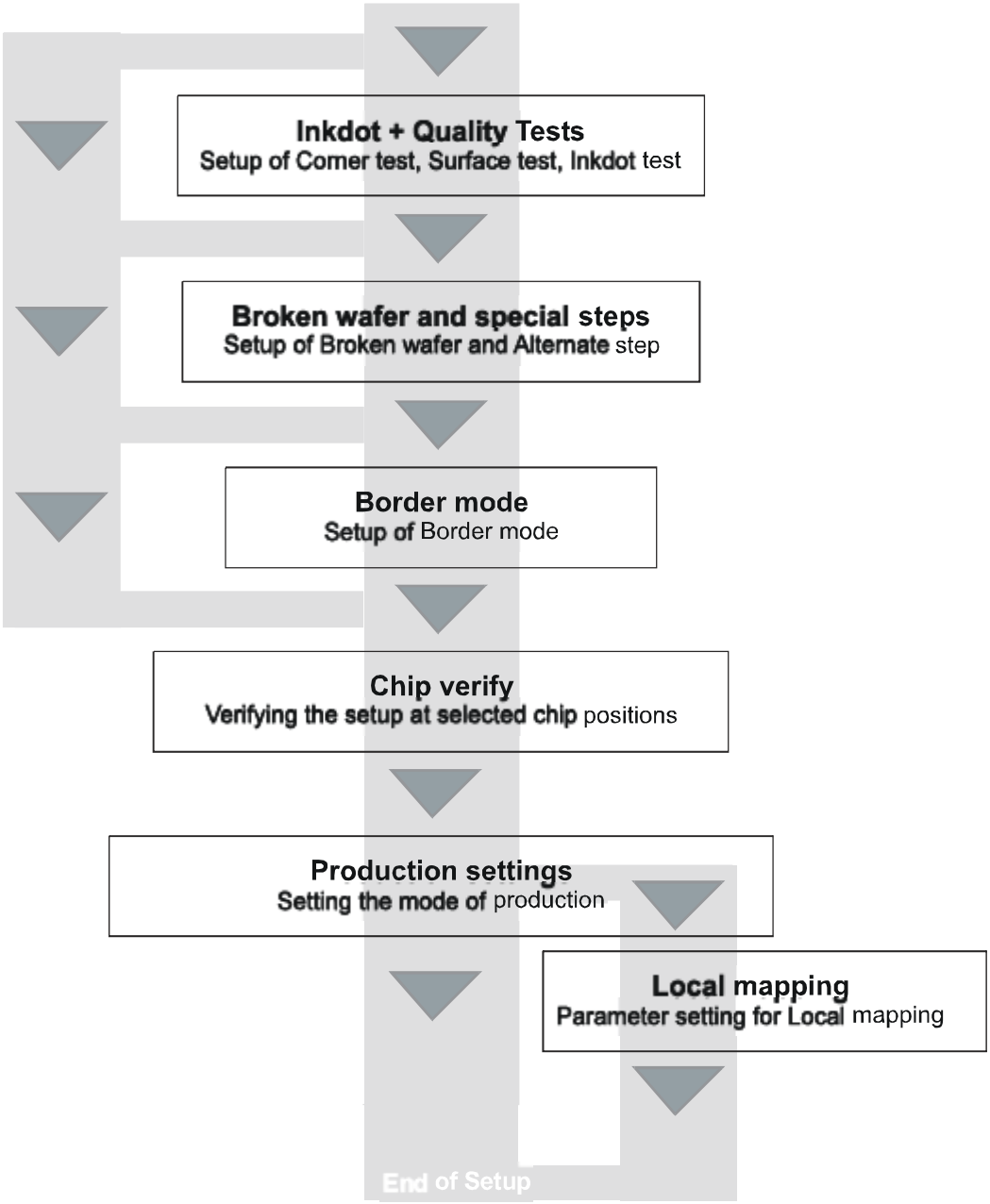
8.18.1 Overview

Course of Chip Set Up Procedure



© 2009 Esec Ltd.

Course of Chip Set Up Procedure



© 2009 Esec Ltd.

8.18.2 Wafer Cassette Teaching

CAUTION

Full wafer cassettes can be heavy.

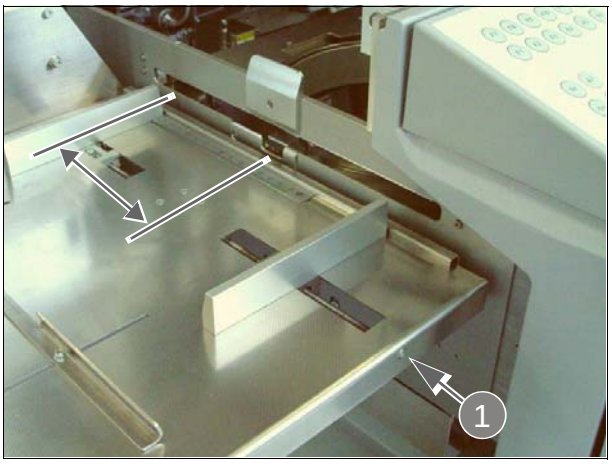
The wafer cassette must have SEMI S8 (Safety Guidelines for Ergonomics) compatible handles.

Centering the Wafer Cassette

Measure the width of the wafer cassette to be used.

Use a ruler to measure the distance between the center of the wafer loader platform and the rear guide. The distance must be half the width of the wafer cassette.

Turn the adjusting screw (1) to adjust the position of the rear guide accordingly.



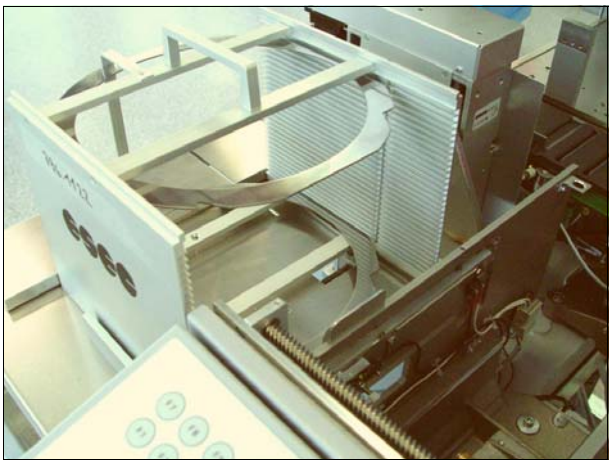
Teaching the Number of Wafer Frame Slots

Wafer Handler
Cassette Positions

Place a cassette onto the loading platform.

Make sure there is a wafer frame in the top slot and in the bottom slot. All other slots must be empty.

Note: To ensure reliable production the frames used for the setup must be absolutely flat.



Start cassette

Note: To abort the teach procedure you may press ***Abort*** at any time.

`Check param: number of slots`

Enter the number of slots in the wafer cassette.

Continue

© 2009 Esec Ltd.

Defining the Cassette Bottom Slot Position

`Put frame into top and bottom slot`

Continue

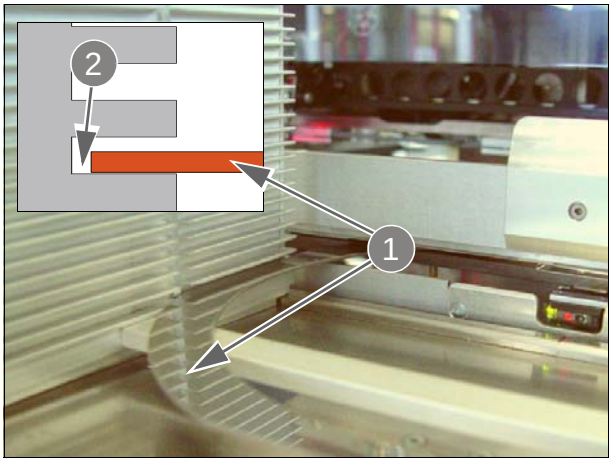
The expansion unit moves to the load position.

The cassette lift moves to the bottom slot position.

`Adjust lift: bottom slot to exp. level`

The wafer frame (1) must be flush with the lower edge of the slot (2).

Use the cursor keys ***up*** and ***down*** to adjust the cassette position.



Define bot. slot

`Bottom slot defined`

Continue

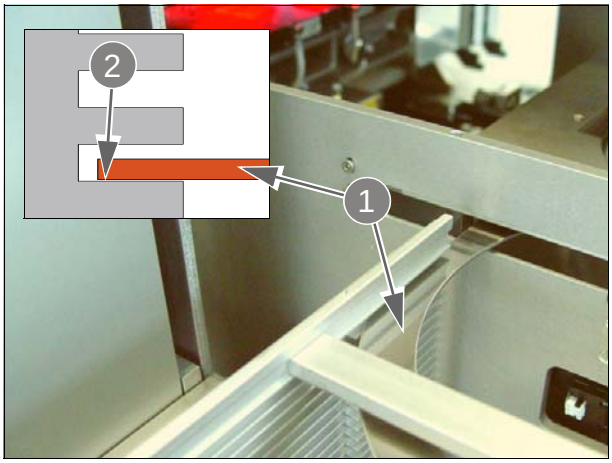
The cassette lift moves to the top slot position.

Defining the Cassette Top Slot Position

`Adjust lift: top slot to expansion level`

The wafer frame (1) must be flush with the lower edge of the slot (2).

Use the cursor keys to adjust the cassette position.



Define top slot

`Top slot defined`

Continue

The gripper moves to the open clamp position.

Complete teach

© 2009 Esec Ltd.

Defining the Gripper Open Clamp Position

Start grip

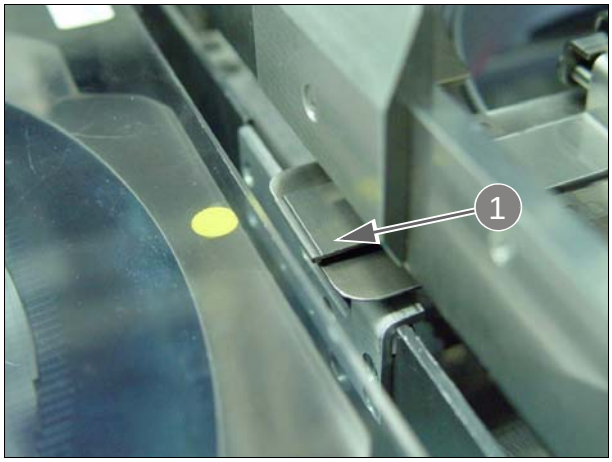
`Make sure cassette positions are taught`

Continue

`Adjust gripper: open clamp position`

Check that the gripper clamp (1) is within the wafer loading slot.

Use the cursor keys to move the gripper into this position.



Def. open clamp pos.

`Open clamp position defined`

Continue

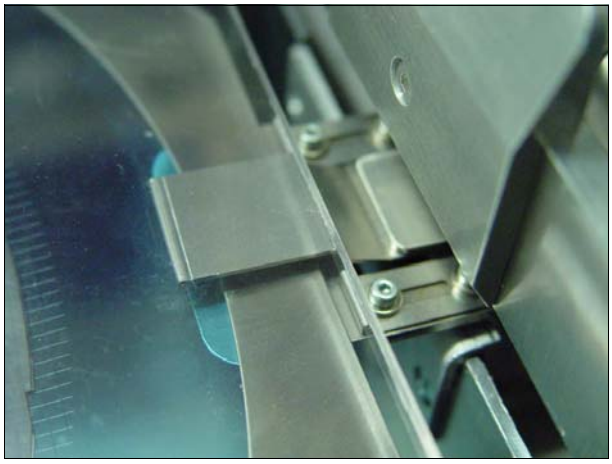
Defining the Gripper Get Position

`Adjust gripper: take pos. inside cassette`

Push the wafer frame fully to the back of the cassette.

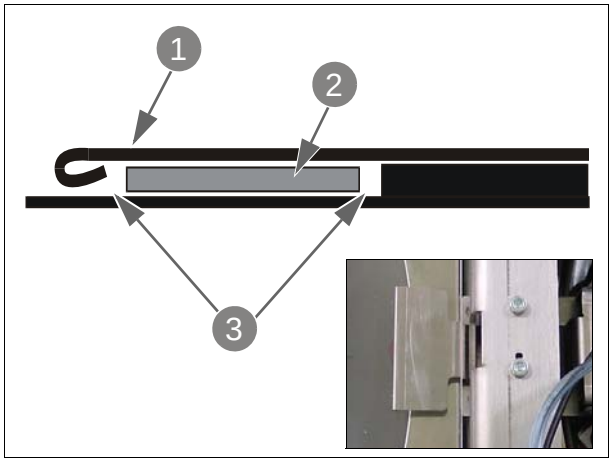
Use the cursor keys ***up*** and ***down*** to move the cassette lift up or down to adjust the height as follows:

The wafer frame must be right under the gripper clamp without any space between the clamp and the frame.



Use the cursor keys to move the gripper back or forth to make the following adjustment:

The clamp (1) must be closed and the wafer frame (2) must be exactly in the center of the clamp so there is an even gap (3) on both sides of the wafer frame.



Define get pos.

`Get position defined`

Toggle clamp (get/take) to verify the get position.

Continue

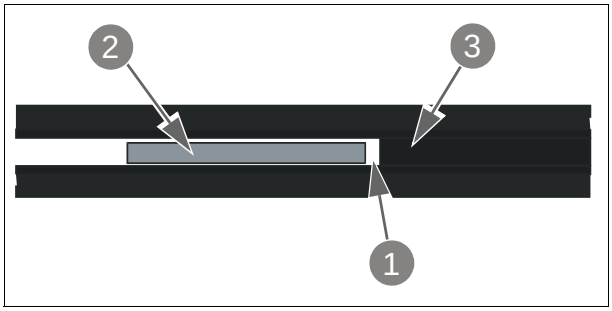
The gripper loads the wafer.

© 2009 Esec Ltd.

Defining the Gripper Let Position

`Adjust gripper: pull frame to let pos.`

Check whether there is a gap (1) between the loaded wafer frame (2) and the back of the expansion unit (3).



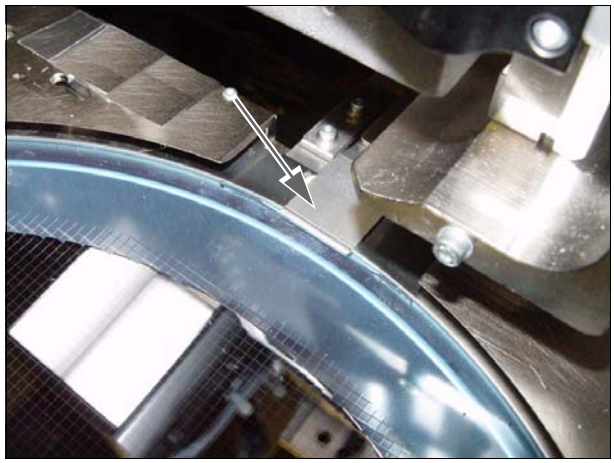
Use the cursor keys ***left*** and ***right*** to move the gripper backward or forward to align the gripper position.

Define let pos.

`Let position defined`

Continue

The gripper unloads the wafer.



Complete teach

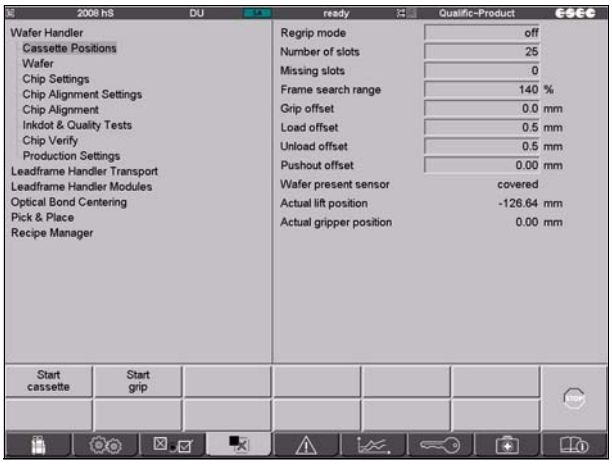
`Gripper position successfully taught`

8.18.3 Wafer Cassette Fine-Tuning

There are a number of additional parameters that can be set to fine-tune the taught parameters.

Set the following parameters as required:

- **Missing slots**
- **Frame search range**
- **Grip offset**
- **Load offset**
- **Unload offset**
- **Pushout offset**



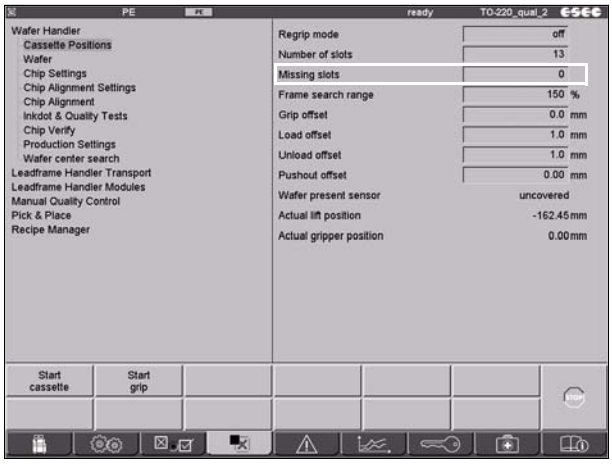
© 2009 Esec Ltd.

Missing Slots

If no wafer is found (loaded) from the actual slot the cassette lift moves to the next slot and tries to load a wafer again in this very next slot.

Enter the number of tries to find a wafer in the next cassette slot before stopping the system.

A corresponding message appears on the screen.

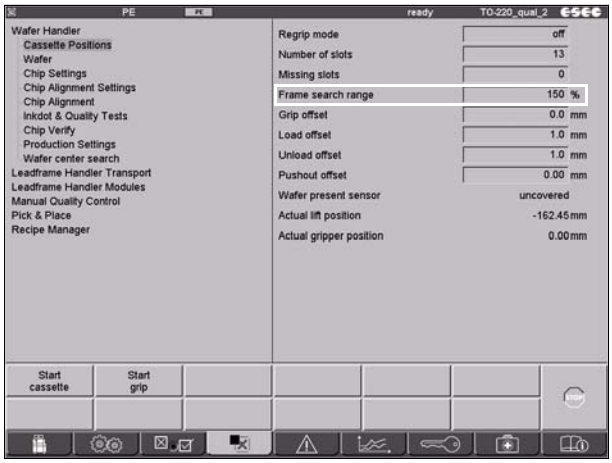


Frame Search Range

This parameter sets the range in Z-direction within which the frame is searched in one particular slot.

If the parameter is set to **100%** the frame is searched between “half a slot too high“ and “half a slot too low“.

Note: The recommended Value for the frame search range is at 150%.

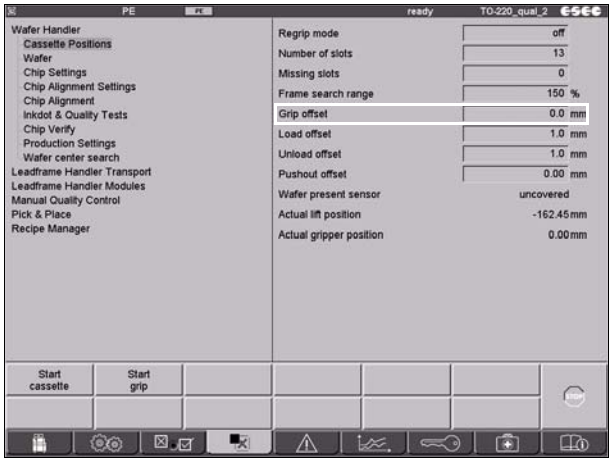


Grip Offset

The cassette lift will move up the value set with this parameter during the grip sequence when loading a frame and during the let sequence when unloading a frame.

This is used to:

- avoid crashes between the lower lip and the wafer frame when loading.
- avoid a pull-back of the frame by the lower lip when unloading.



© 2009 Esec Ltd.

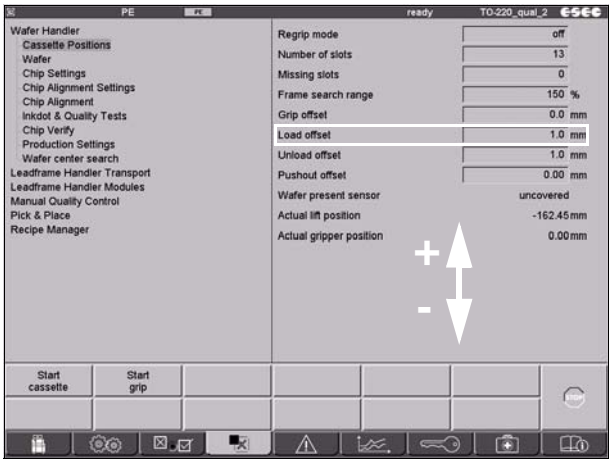
Load Offset

When loading a wafer it is recommended that the wafer frame is a little bit higher than the expansion unit entrance to avoid collision.

With this parameter the taught value can be adapt to your needs.

positive value = higher cassette position

negative value = lower cassette position



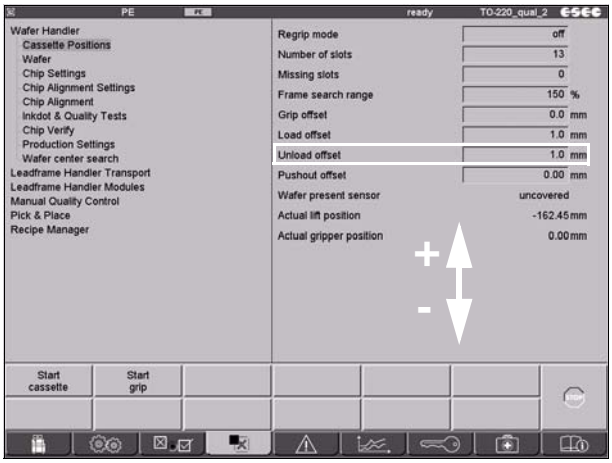
Unload Offset

When unloading a wafer it is recommended that the wafer cassette slot is a little bit lower than the wafer frame to avoid collision.

With this parameter the taught value can be adapt to your needs.

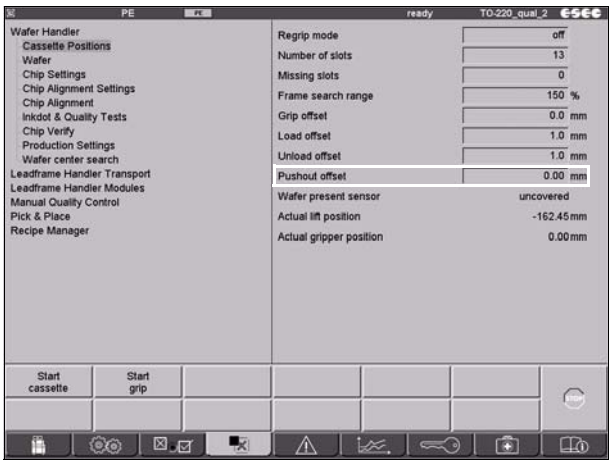
positive value = lower cassette position

negative value = higher cassette position



Pushout Offset

This parameter defines the offset between the let position of the frame on the wafer table (loading) and the get position (unloading).



© 2009 Esec Ltd.

8.18.4 Wafer Properties Teaching

CAUTION

Full wafer cassettes can be heavy.

The wafer cassette must have SEMI S8 (Safety Guidelines for Ergonomics) compatible handles.

i 13 **Note:** For more information about this subject, please refer to the info sheet.

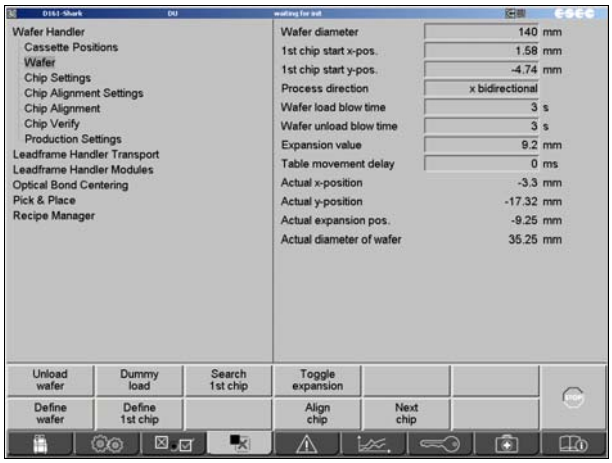
Setting the Parameters

Wafer Handler
Wafer

i 13 Set the parameter **Process direction** to **x bidirectional** (or **y bidirectional** or **unidirectional**) as required.

Set the following parameters as required:

- **Wafer load blow time**
- **Wafer unload blow time**
- **Expansion value**
- **Table movement delay**



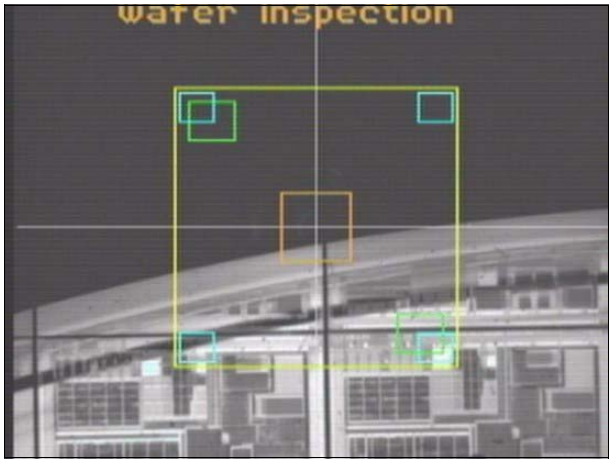
Defining the Wafer Diameter

click ***Load wafer*** to load a wafer.

Use the cursor keys to move the wafer table to the wafer edge. Observe the inspection monitor, while moving the wafer to the wafer edge.

click ***Define wafer***

The software defines and saves the wafer diameter. The new value appears on the menu.



© 2009 Esec Ltd.

i 13 Defining First Chip

Use the cursor keys to move the table approximately to the first chip position.

Note: It is recommended to select the first chip at the upper side of the wafer.

Define 1st chip

The software defines and saves the first chip position.

`First chip position successfully defined`

The newly defined value appears on the menu.

© 2009 Esec Ltd.

8.19 Chip Settings and Alignment

Parameter Settings

Wafer Handler
Chip Settings

Note: The settings of the parameters in this menu depend very much on the requirements and the material. For more information refer to section *Overview* on page *8-35*.

Select the appropriate mode for the following parameters:

i 2 • **Alignment method**
- **Exclusion area**

i 4 • **Inkdot mode**

i 5 • **Corner mode**

i 5 • **Chip surface test**

The following additional chip alignment functions are seldom used dedicated functions:

i 27 • **Alternate pattern mode**

i 31 • **Broken wafer check**

i 37 • **Alter x step mode**

i 37 • **Alter y step mode**

i 32 • **Border mode**

i 35 • **Local mapping** (only if the parameter **Inkdot mode** is set to **on**)
- **Last line mode**

Depending on the chosen Alignment method proceed either with:

- section *Chip Alignment Structure* on page *8-46*
- section *Chip Alignment Street* on page *8-50*
- section *Chip Alignment Two Point* on page *8-53*

© 2009 Esec Ltd.

8.19.1 Chip Alignment Structure

i 15 **Note:** For more information about this subject refer to the info sheet.

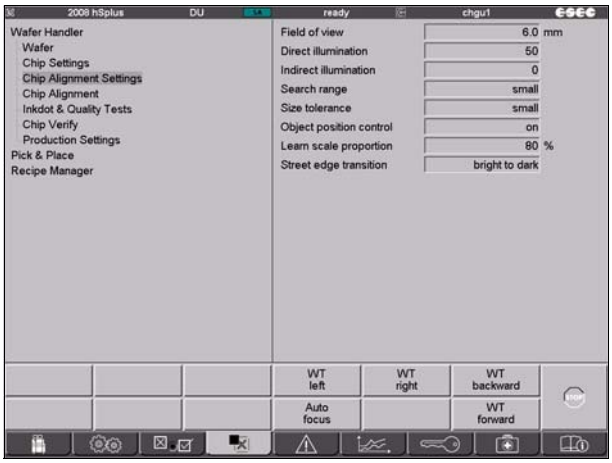
Preparation

Wafer Handler
Chip Settings

Set the parameter **Alignment Method** to **Structure**.

Parameter Settings

Wafer Handler
Chip Alignment Settings



Set the parameter **Direct illumination** to a value that a chip is visible.

i 17 Adjust the parameter **Field of view**.

If manual pick vision is installed:

- adjust the focus manually.

If motorized pick vision is installed:

click ***Auto focus***

or

Adjust the focus manually by using the cursor keys ***left*** and ***right***. After manual adjustment:

click ***Define zoom/foc.*** to define the correct settings.

i 17 Set the following parameters according to the chip size, chip structure etc.:

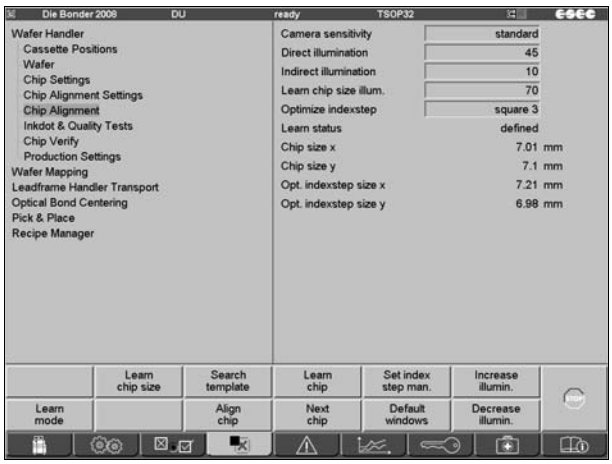
- **Alignment filter**
- **Search range**
- **Object position control**

  Normally the templates can not be moved outside the chip window. If this feature is deactivated the templates and the corner windows can be moved outside the chip window.
- If the uniqueness of the chip is normal, set the parameter **Structure mode** to **normal**.
- **Learn scale proportion**

© 2009 Esec Ltd.

i 29 **Learn Chip Size**

Wafer Handler
Chip Alignment



i 26 Adjust the parameter **Direct illumination** and **Indirect illumination** so that the structure of the chip has as many gray values as possible.

If necessary adjust the parameter **Camera sensitivity**.

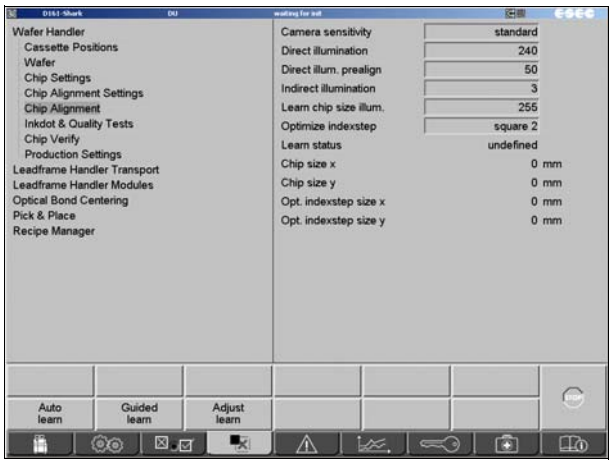
i 25 Set the parameter **Optimize indexstep** correctly.

i 28

Set the parameter **Learn chip size illum.** so that there is a good contrast between the chip and the saw cut.

The wafer handler provides three different modes to learn the chip:

- Auto learn
- Guided learn
- Adjust learn



Note: Teaching the chip details can be performed automatically with the provided function. Due to the fact that each product requires its dedicated setup and therefore a series of judgements must be made to meet the user's requirements, it is normally recommended to perform the teaching manually.

Select the desired learn mode by clicking the respective soft key.

Learn mode will bring you back to the selection screen as shown in the screenshot above.

- ***Auto learn*** provides a fully automatic function to learn the chip.
- ***Guided learn*** guides the operator through the different calibration steps. The key ***Continue*** always brings the operator to the next step.
- ***Adjust learn*** is ideal to try and adjust. It is fully manual and not guided.

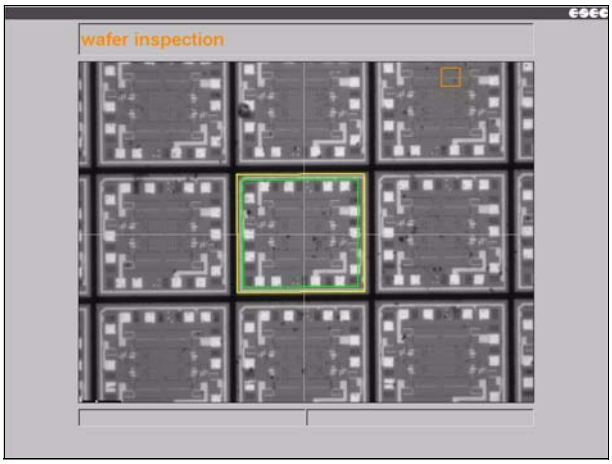
The following step-by-step description is based on the learn mode ***Adjust learn***.

click ***Adjust learn***

© 2009 Esec Ltd.

Learn Chip Size (Cont.)

Set the yellow chip window around the chip and adjust it correctly.



Note: The chip window must be smaller than the chip itself.

click ***Learn chip size***

✓ Check that actual **Learn status** shows **size learned.**

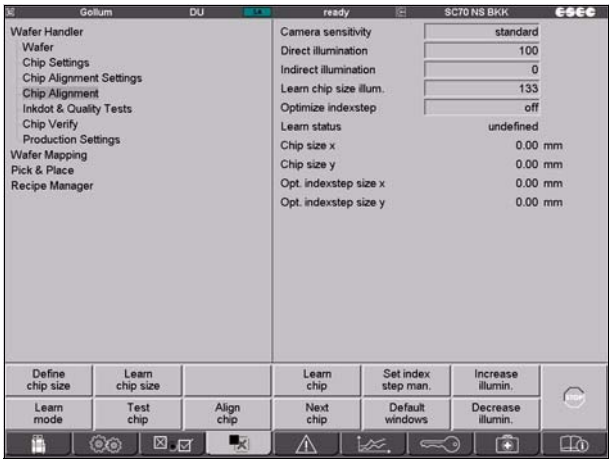
If ok, continue with section *Learn Chip* on page *8-48*.

If not ok, optimize the parameter **Learn chip size illum**. and if necessary set the chip window once again.

click ***Learn chip size***

Repeat this procedure until the chip size is learned successfully.

click ***Default windows***

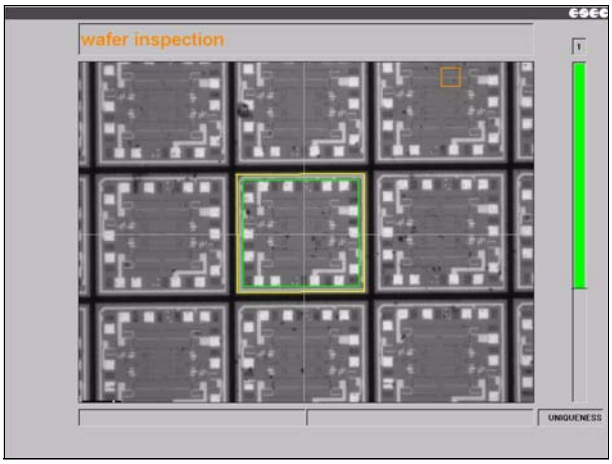


Learn Chip

i 30 Set the green template window as big as possible inside the chip.

✓ Check that the uniqueness bar on the inspection monitor is on the green level!

click ***Learn chip***



© 2009 Esec Ltd.

Learn Chip (Cont.)

`Chip sucessfully learned`

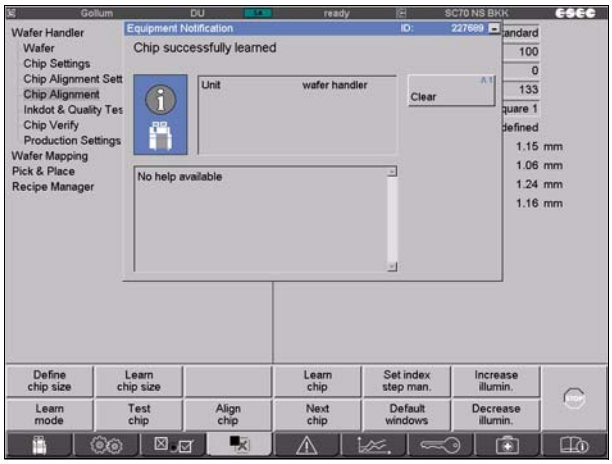
If the chip was not successfully learned:

i 23 1. choose an other template position.

i 26 2. optimize the illumination setting.

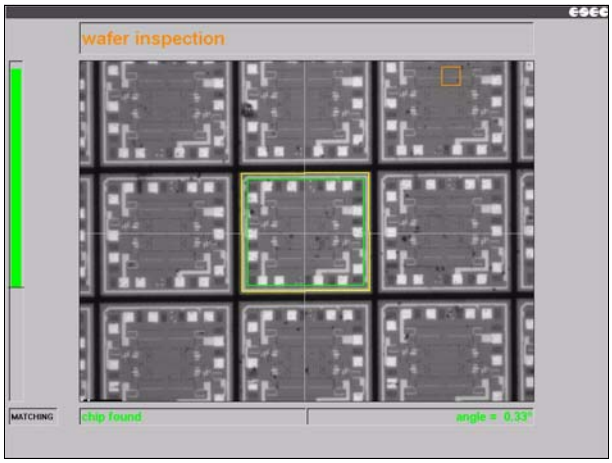
3. start again with section Learn chip.

Repeat this procedure until the chip is learned successfully.

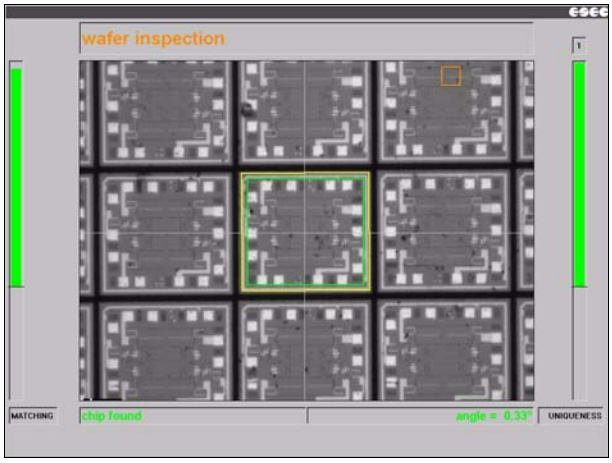


Align chip

Check that the matching bar on the inspection monitor is high on the green level.



Test chip to perform uniqueness test.



Note: Continue with section *Inkdot, Quality Tests & Broken Wafer* on page *8-57*.

© 2009 Esec Ltd.

8.19.2 Chip Alignment Street

i 16 **Note:** For more information about this subject refer to the info sheet.

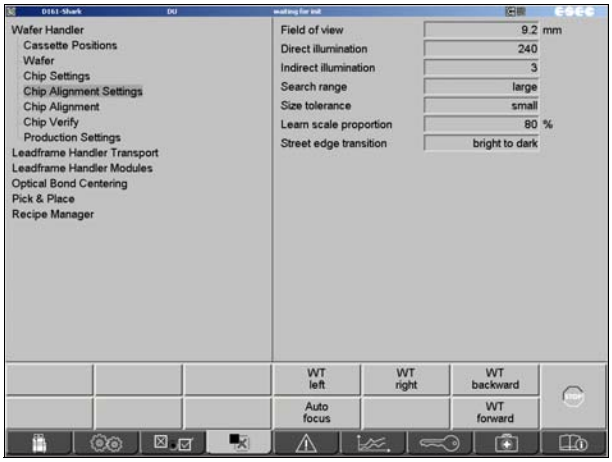
Preparation

Wafer Handler
Chip Settings

Set the parameter **Alignment Method** to **street**.

Parameter Settings

Wafer Handler
Chip Alignment Settings



Set the parameter **Direct illumination** to a value that a chip is visible.

i 17 Adjust the parameter **Field of view**.

If manual pick vision is installed:

- adjust the focus manually.

If motorized pick vision is installed:

- ***Auto focus*** or adjust the focus manually by using the cursor keys ***left*** and ***right***.
- After manual adjustment click ***Define zoom/foc.*** to define the correct settings.

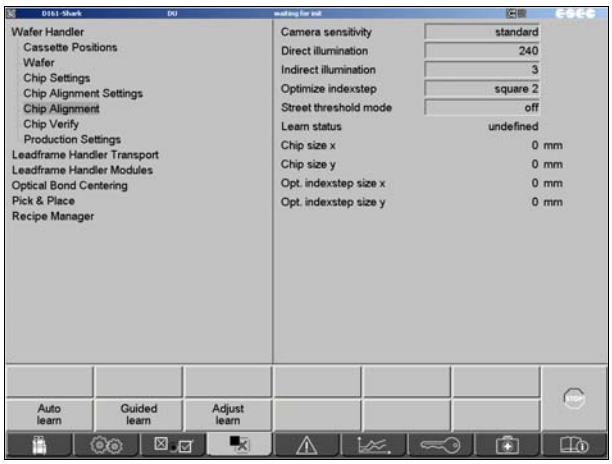
i 17 Set the following parameters according to the chip size etc.:

- **Search range**
- **Size tolerance**
- **Learn scale proportion**
- **Street edge transition**

© 2009 Esec Ltd.

i 29 **Learn Chip Size**

Wafer Handler
Chip Alignment



i 26 Adjust the parameter **Direct illumination** and **indirect illumination** so that there is a good contrast between the chip surface and the saw cut.

If necessary adjust the parameter **Camera sensitivity**.

i 25 Set the parameter **Optimize indexstep** correctly.

i 28

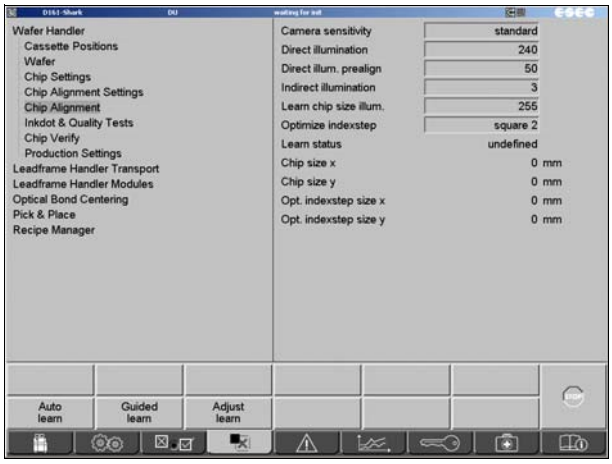
i 24 Set the parameter **Street threshold mode** to **on** if necessary.

i 36 Switch to color mode by pressing **Ctrl F7**.

i 24 With the help of the colors, adjust the parameter **Street threshold** so that there is a clear dark-bright contrast between the chip surface and the wafer foil.

The wafer handler provides three different modes to learn the chip:

- Auto learn
- Guided learn
- Adjust learn



Note: Teaching the chip details can be performed automatically with the provided function. Due to the fact that each product requires its dedicated setup and therefore a series of judgements must be made to meet the user's requirements, it is normally recommended to perform the teaching manually.

Select the desired learn mode by clicking the respective soft key.

Learn mode will bring you back to the selection screen as shown in the screenshot above.

- ***Auto learn*** provides a fully automatic function to learn the chip.
- ***Guided learn*** guides the operator through the different calibration steps. The key ***Continue*** always brings the operator to the next step.
- ***Adjust learn*** is ideal to try and adjust. It is fully manual and not guided.

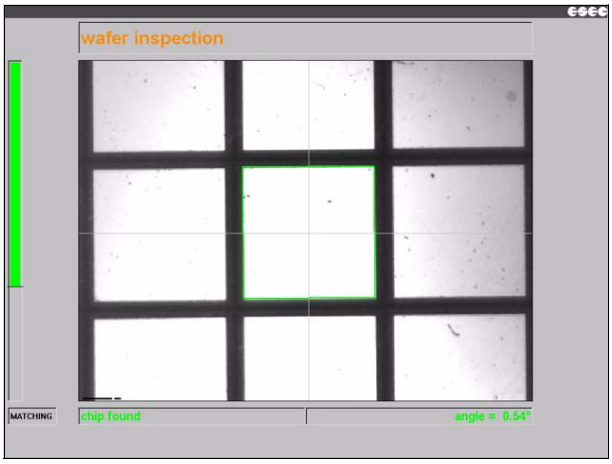
© 2009 Esec Ltd.

Learn Chip Size (Cont.)

The following step-by-step description is based on the learn mode ***Adjust learn***.

Adjust learn

Set the green chip window around the chip and adjust it correctly.



Note: The chip window must be smaller than the chip itself.

Learn chip size

Check that the actual **Learn status** shows **size learned**.

If ok, continue with section *Learn Chip* on page *8-52*.

If not ok, optimize the parameters **Direct illumination** and **Indirect illumination** or readjust the parameter **Street threshold** and if necessary set the chip window once again.

Learn chip size

Repeat this procedure until the chip size is learned successfully.

i 30

Learn Chip

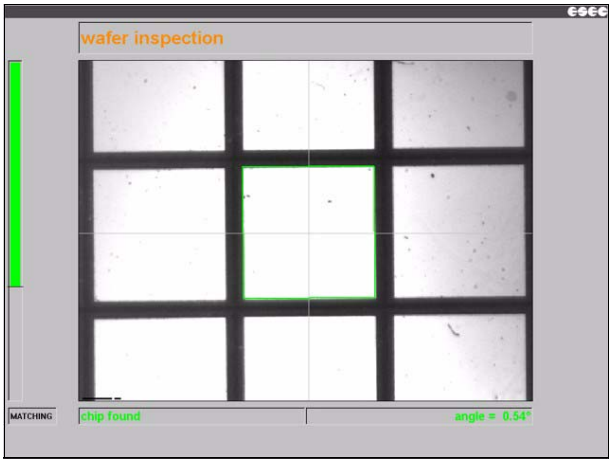
Learn chip

`Chip successfully learned`

If the chip was not learned successfully:

1. optimize the illumination settings.
2. try again to learn the chip.

Repeat the procedure until the chip is learned successfully.



Align chip

Make sure that the matching bar on the inspection monitor is high on the green level.

Note: Continue with section *Inkdot, Quality Tests & Broken Wafer* on page *8-57*.

© 2009 Esec Ltd.

8.19.3 Chip Alignment Two Point

i 14 **Note:** For more information about this subject refer to the info sheet.

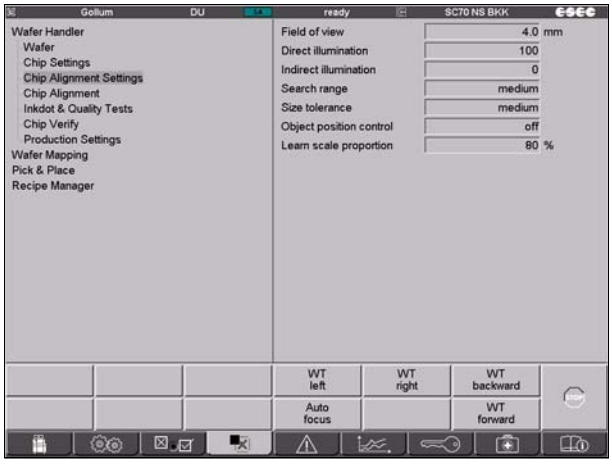
Preparation

Wafer Handler
Chip Settings

Set the parameter **Alignment Method** to **two point**.

Parameter Settings

Wafer Handler
Chip Alignment Settings



Set the parameter **Direct illumination** to a value that a chip is visible.

i 17 Adjust the parameter **Field of view**.

If manual pick vision is installed:

- adjust the focus manually.

If motorized pick vision is installed:

- ***Auto focus*** or adjust the focus manually by using the cursor keys ***left*** and ***right***.
- After manual adjustment click ***Define zoom/foc.*** to define the correct settings.

i 17 Set the following parameters according to the chip size, chip structure etc.:

- **Alignment filter**
- **Search range**
- **Size tolerance**

Set the parameter **Learn scale proportion**.

© 2009 Esec Ltd.

i 29 **Learn Chip Size**

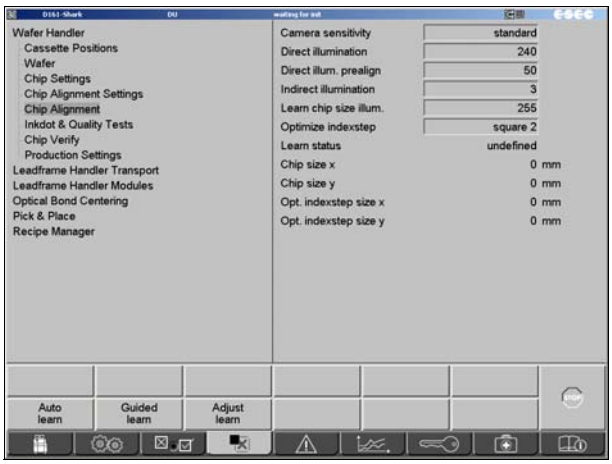
Wafer Handler
Chip Alignment

i 26 Adjust the parameter **Direct illumination** and **indirect illumination** that the structure of the chip has as many gray values as possible.

i 26 If necessary adjust the parameter **Camera sensitivity**.

i 25 Set the parameter **Optimize indexstep** correctly.

i 29 Set the parameter **Learn chip size illum.** that there is a good contrast between the chip surface and the saw cut.



Note: The value of the parameter **Learn chip size illum.** must be lager than the value of the parameter **Direct illumination.**

The wafer handler provides three different modes to learn the chip:

- Auto learn
- Guided learn
- Adjust learn

Note: Teaching the chip details can be performed automatically with the provided function. Due to the fact that each product requires its dedicated setup and therefore a series of judgements must be made to meet the user's requirements, it is normally recommended to perform the teaching manually.

Select the desired learn mode by clicking the respective soft key.

Learn mode will bring you back to the selection screen as shown in the screenshot above.

- ***Auto learn*** provides a fully automatic function to learn the chip.
- ***Guided learn*** guides the operator through the different calibration steps. The key ***Continue*** always brings the operator to the next step.
- ***Adjust learn*** is ideal to try and adjust. It is fully manual and not guided.

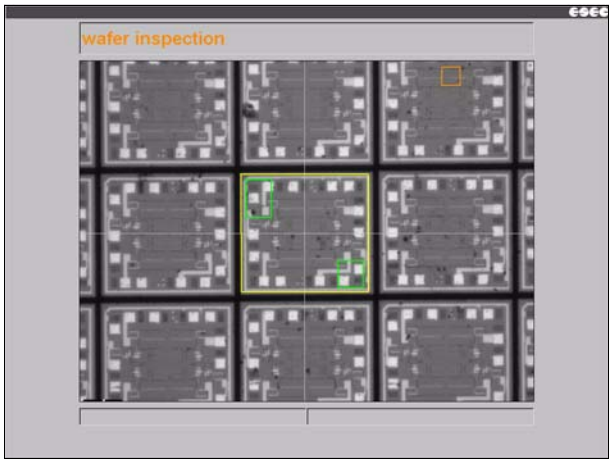
© 2009 Esec Ltd.

Learn Chip Size (Cont.)

The following step-by-step description is based on the learn mode ***Adjust learn***.

Adjust learn

Set the yellow chip window around the chip and adjust it correctly using the mouse.



Note: The chip window must be smaller than the chip itself.

Learn chip size

Check that the actual **Learn status** shows **size learned**.

If ok, continue with section *Learn Chip* on page *8-55*.

If not ok, optimize the parameter **Learn chip size illum.** and if necessary set the chip window once again.

Learn chip size

Repeat this procedure until the chip size is learned successfully.

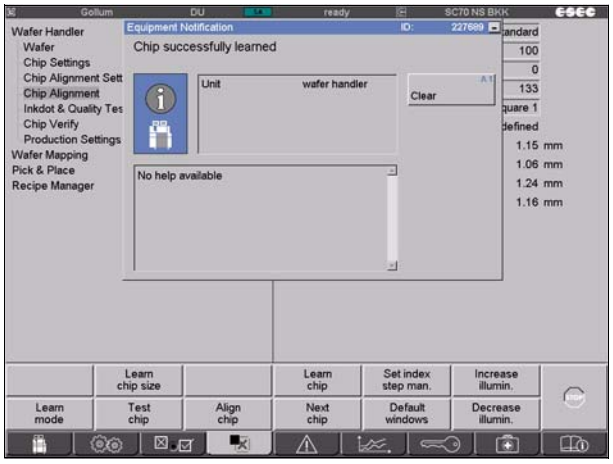
Learn Chip

i 30 Set each of the two green template windows over an unique part of the chip structure.

Make sure that the uniqueness bars on the inspection monitor are on the yellow level!

Learn chip

`Chip sucessfully learned`



If the chip was not successfully learned:

i 23 1. choose other template positions.

i 26 2. optimize the illumination setting.

3. start again with section Learn chip.

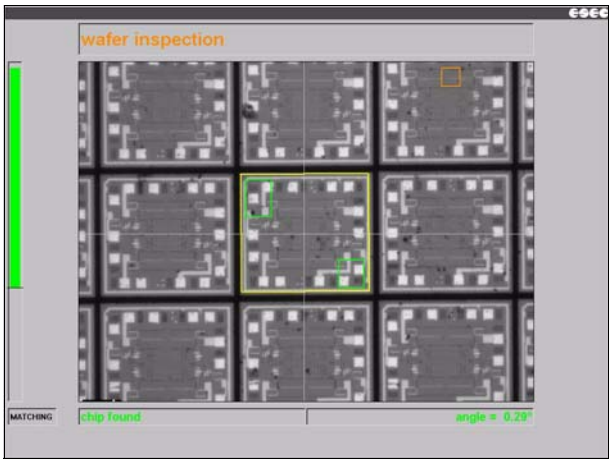
© 2009 Esec Ltd.

Learn Chip (Cont.)

Test chip to perform uniqueness test.

Align chip

Check that the matching bar on the inspection monitor is high on the green level.



Note: Continue with section *Inkdot, Quality Tests & Broken Wafer* on page *8-57*.

© 2009 Esec Ltd.

8.20 Inkdot, Quality Tests & Broken Wafer

Note: In the menus shown on the following pages, all tests are activated. For showing how the menus look like if only one test is activated, refer to the Info Sheets.
All screenshots shown are taken with manual limits.

8.20.1 Neighbor Check

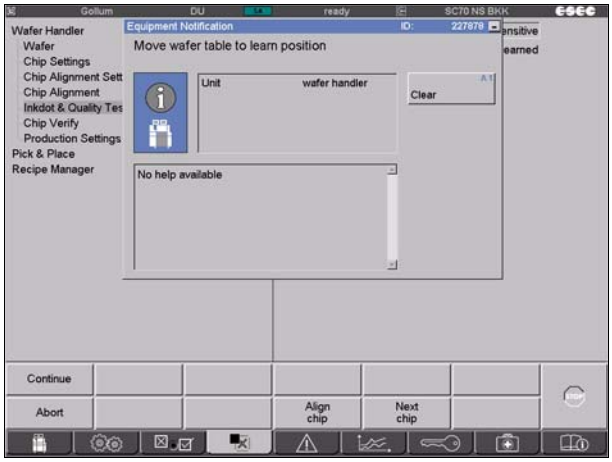
Check Neighbor

Wafer Handler
Inkdot & Quality Tests

click ***Neighbor check***

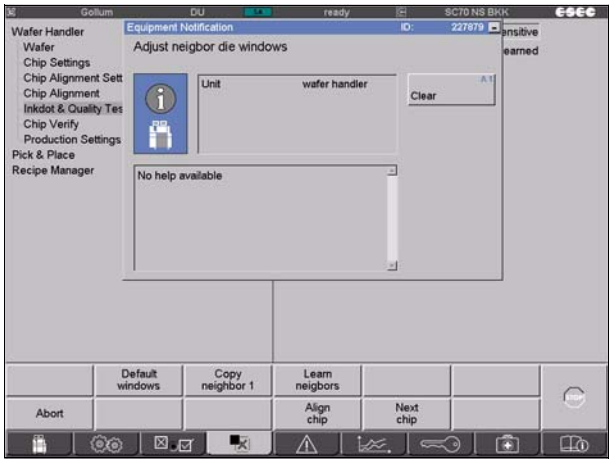
Use the cursor keys to move the wafer table to the learn position.

click ***Continue***



click ***Default windows***

click ***Complete***



© 2009 Esec Ltd.

8.20.2 Inkdot Test „on“

Note: For more information about this test refer to the info sheet.

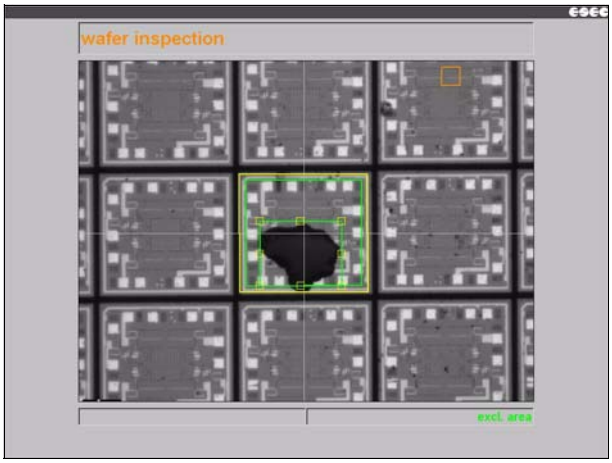
Learn Inkdot

Wafer Handler
Chip Settings

Set the parameter **Inkdot mode** to **on**.

Set the parameter **Exclusion area** to **on**.

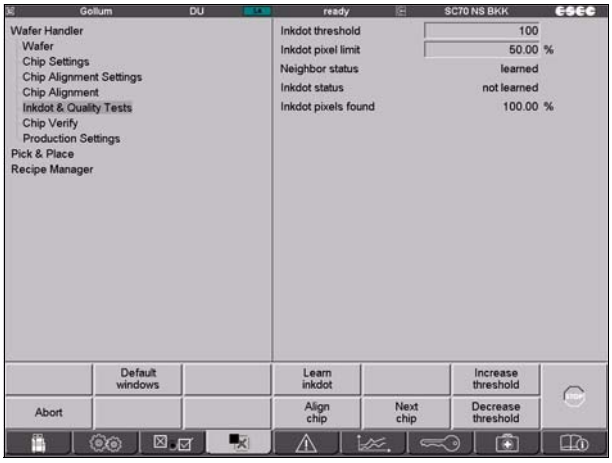
Note: The exclusion is the area where the template area is searched. During teaching the exclusion area (green) must include the inkdot completely.



Wafer Handler
Inkdot & Quality Tests

Use the cursor keys to position a inked chip below the pick vision camera.

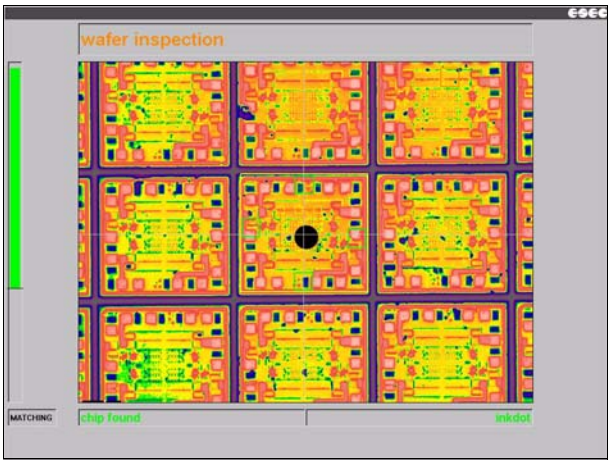
Inkdot check



© 2009 Esec Ltd.

Learn Inkdot

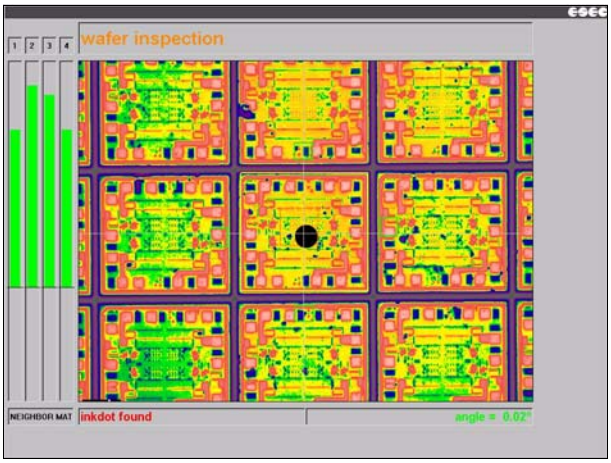
i 36 Place the orange inkdot window around the inkdot and adjust its size (the inspection monitor switches automatically to color mode).



click ***Learn inkdot***

`Inkdot pixel limit and threshold changed`

Check the result.



Note: The inkdot must appear black while the chip surface, within the orange window, must not contain black pixels.

If necessary adjust the threshold manually.

Example: picture beside with threshold 10.

Set the parameters **Inkdot pixel limit** to the correct values.

Check the Settings

click ***Align chip***

Check that the inkdot is detected and the message `inkdot found` is displayed on the inspection monitor.

Position a chip without inkdot below the pick vision camera.

click ***Align chip***

Check that the chip is recognized as good chip and the message chip `found` is displayed on the inspection monitor.

click ***Complete***

© 2009 Esec Ltd.

8.20.3 Inkdot Test „pattern“

i 22 **Note:** For more information about this test refer to the info sheet.

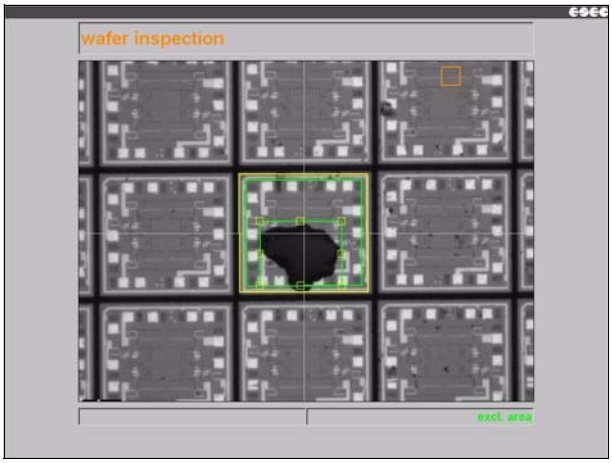
Learn Inkdot

Wafer Handler
Chip settings

Set the parameter **Inkdot mode** to **pattern**.

Set the parameter **Exclusion area** to **on**.

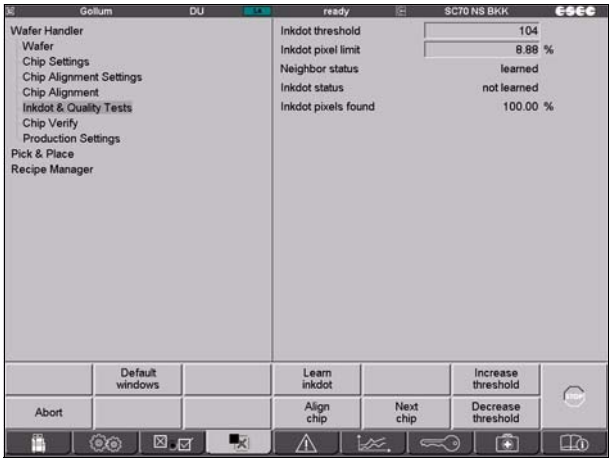
Note: The exclusion is the area where the template area is searched. During teaching the exclusion area (green) must include the inkdot completely.



Wafer Handler
Inkdot & Quality Tests

Position a chip without inkdot below the pick vision camera.

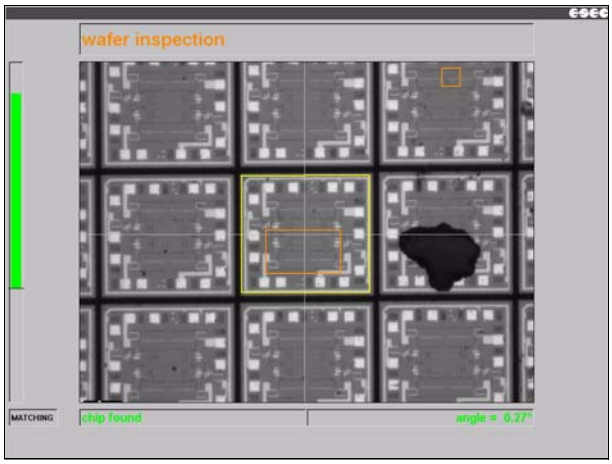
click ***Inkdot check***



© 2009 Esec Ltd.

Learn Inkdot

Place the orange inkdot window over the correct position and adjust its size.



click ***Learn inkdot***

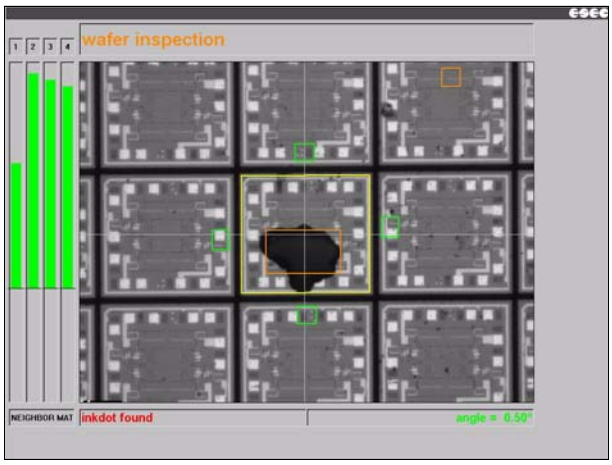
✓ Check that the actual **Inkdot status** shows **pattern learned**.

Set the parameter **Inkdot pixel limit** to the correct value.

Check the Settings

click ***Align chip***

✓ Check that the chip is recognized as good and the message `chip found` is displayed on the inspection monitor.



Use the cursor key to position an inked chip below the pick vision camera.

click ***Align chip***

✓ Check that the inkdot is detected and the message `inkdot found` is displayed on the inspection monitor.

If not ok, change the parameter **Inkdot pixel limit**.

click ***Complete***

© 2009 Esec Ltd.

8.20.4 Corner Test „on“ / „pattern“

Preparation

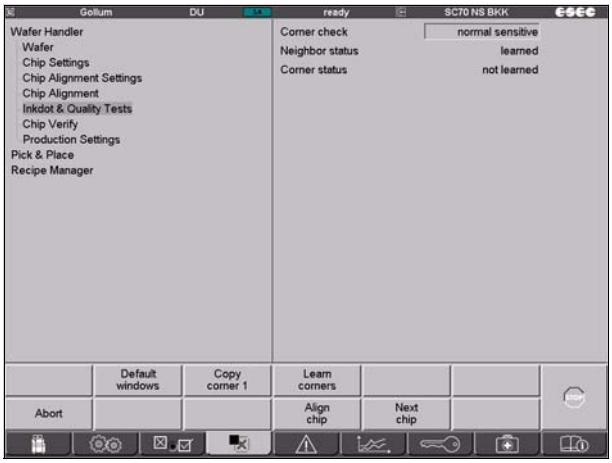
Wafer Handler
Chip Settings

i 18 Set parameter **Corner mode** either to **on** or to **pattern** as required.

i 19

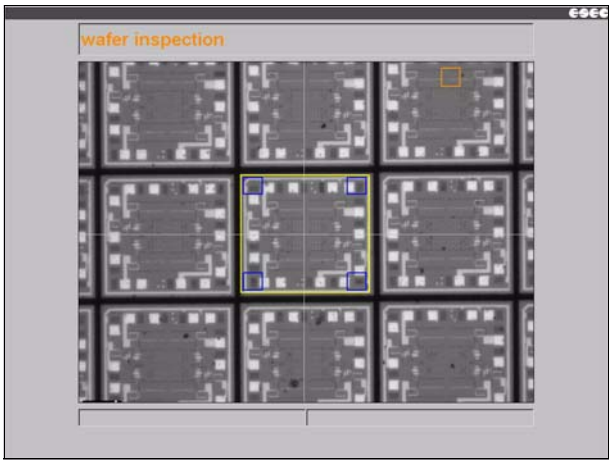
Wafer Handler
Inkdot & Quality Tests

click ***Corner check***



Copy Corner

Note: Make sure a good chip is aligned for this set up!



click ***Default windows*** (only if the parameter **Corner mode** is set to **on**)

Adjust the size and position of the first blue corner window on the upper left chip corner as required.

click ***Copy corner 1***

The three other blue corner windows are placed over the other chip corners according to the first corner window.

© 2009 Esec Ltd.

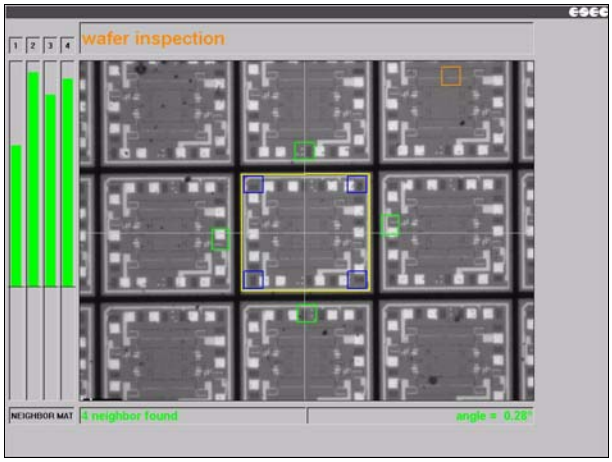
Learn Corner

Learn corners

If the parameter **Corner check** is set to **manual**, set the following limits to the correct values:

- **Upper brightness limit**
- **Lower brightness limit**
- **Corner quality limit** (only if the parameter **Corner mode** is set to **pattern**)

Complete



Check Corner in Pattern Mode

Align chip

Observe the alignment data (corner and surface) displayed on the inspection screen.

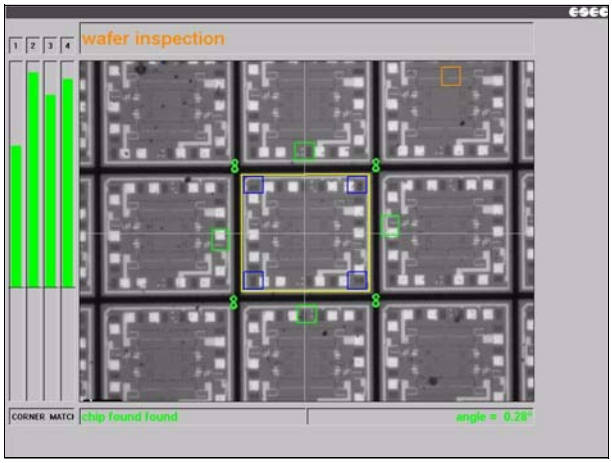
Check that the deviation of the aligned chip to the learned chip is minimal.

Use the cursor keys to move to a bad chip.

Align chip

Check that the chip is recognized as bad and the message `missing corner` is displayed on the inspection monitor.

If not ok, set the parameter **Corner check** to the correct setting.



© 2009 Esec Ltd.

8.20.5 Surface Test

Note: Fore more information about this test refer to the info sheet.

Wafer Handler
Chip Settings

Set parameter **Chip surface test** to **on**.

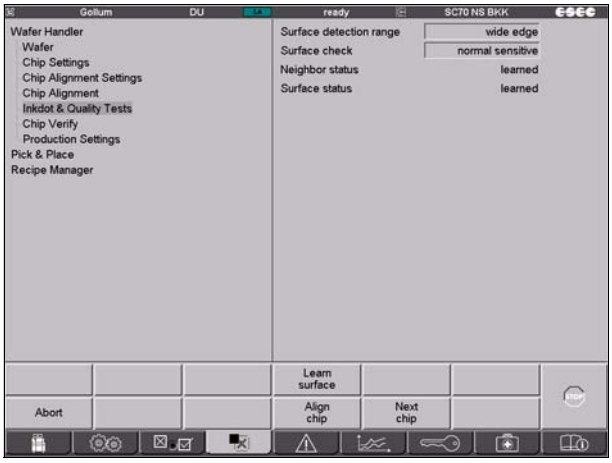
Wafer Handler
Inkdot & Quality Tests

Learn Surface

Surface check

Note: Make sure a good chip is aligned for this set up!

Using the surface test increases the cycle time for chip alignment, for small dies this might influence the UPH.



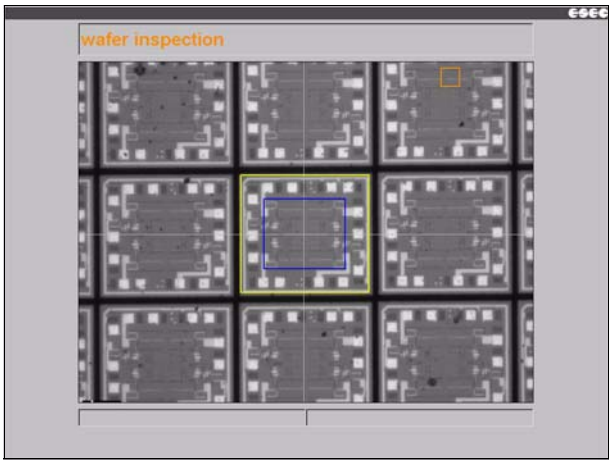
Set the parameter **Surface detection range** corresponding to the area to be tested.

Set the parameter **Surface check** as required.

If **Surface check** is set to **manual**, set the following two parameters to the correct value:

- **Surface brightness limit**
- **Surface edge offset**

Learn surface



© 2009 Esec Ltd.

Check Surface

click ***Align chip***

Observe the alignment data (surface) displayed on the inspection screen.

Check that the deviation of the aligned chip to the learned chip is minimal.

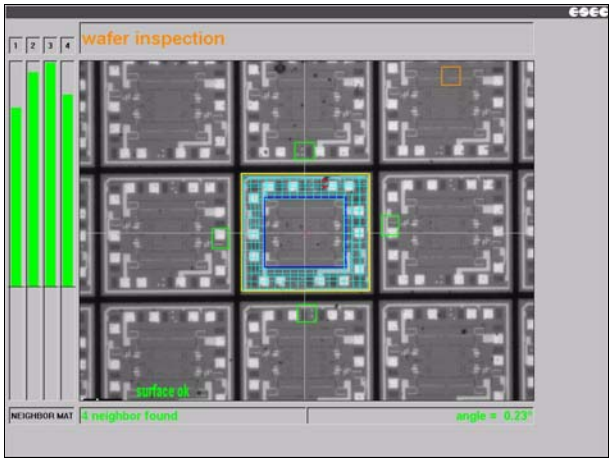
click ***Complete***

Use the cursor keys to move to a bad chip.

click ***Align chip***

Check that the chip is recognized as bad and the message `surface error` is displayed on the inspection monitor.

If not ok, set the parameter **Surface check** to an other sensitivity.



8.20.6 Broken Wafer

Note: Fore more information about this mode refer to the info sheet.

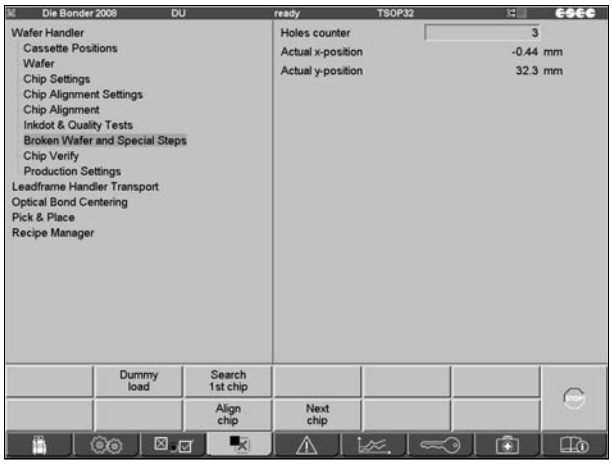
Parameter Setting

Wafer Handler
Chip Settings

Set parameter **Broken wafer check** to **on**.

Wafer Handler
Broken Wafer and Special Steps

Set the parameter **Holes counter** as required.



© 2009 Esec Ltd.

8.20.7 Alter X, Y Step Mode

Note: Fore more information about this mode refer to the info sheet.
In the following procedure the set up of Alter X step is described. The set up of Alter Y step is identical and therefore not described.

Preparations

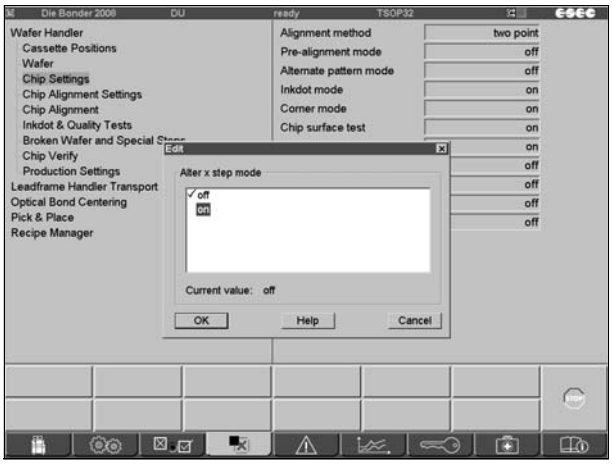
Take a wafer containing test chips and count the number of normal chips between two reference chips.

Assist
Wafer

Load wafer to load a wafer.

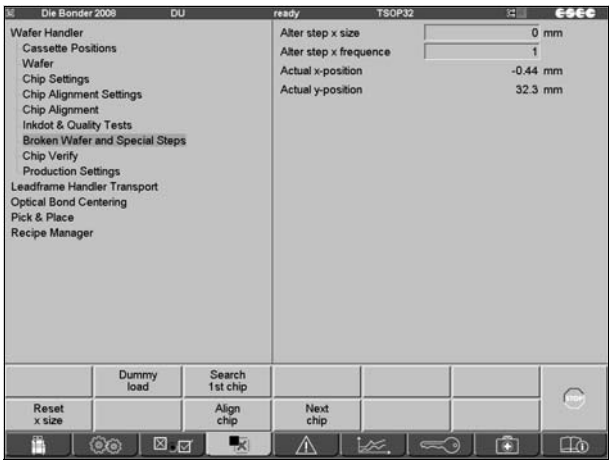
Wafer Handler
Chip Settings

If the changed step size is in X, set the parameter **Alter x step mode** to **on**.



Wafer Handler
Broken Wafer and Special Steps

Set the parameter **Alter step x frequency** according to the number of chips counted above.



© 2009 Esec Ltd.

Teaching the Steps

Use the cursor keys to move to the first good chip on the right of the first (left-hand) reference chip.

Align chip

Reset x size

Use the cursor keys to move to the left-hand line of the chip window with the left-hand edge of the first reference chip.

Set x size

The value moved will be displayed at the parameter **Alter step x size**.

Steps in Y

If the altered step size is in Y, set the parameter **Alter y step mode** to **on**.

Proceed as above using the soft keys ***Reset y size*** and ***Set y size***.

They appear when clicking ***Toggle alter***.

Teach the top reference chip (the one nearest the rear of the machine) first and align the top line of the chip window with the top edge of the chip.

Note: When the special steps mode is used, the 1st chip parameter must be set above the centre of a good chip in the first row. This is because, in order to recognize reference chips quickly, the Die Bonder first steps to the right, then to the left. All good chips are picked off the wafer.

© 2009 Esec Ltd.

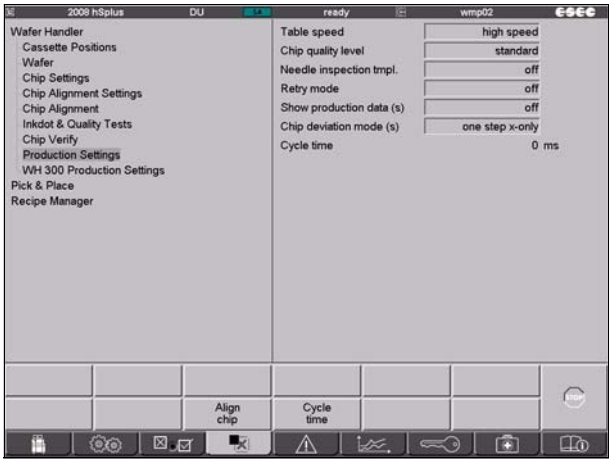
8.21 Production Settings

Note: Fore more information about this subject refer to the info sheet.

8.21.1 Without Local Mapping

Parameter Settings and Check

Wafer Handler
Production Settings



Set the parameter **Table speed** according to your quality requirements.

Set the parameter **Chip quality level** to your quality requirements.

Set the following parameters to **on** or **off** according to your requirements:

- **Needle inspection templ.**
- **Retry mode**
- **Brightness correction**
- **Micro step alignment**
- **Show production data**

Align chip

Cycle time

Check the time displayed in actual value **Cycle time**.

© 2009 Esec Ltd.

8.21.2 With Local Mapping

Note: Fore more information about this subject refer to the info sheet.

Wafer Handler
Chip Settings

Set the parameter **Inkdot mode** to **on**.

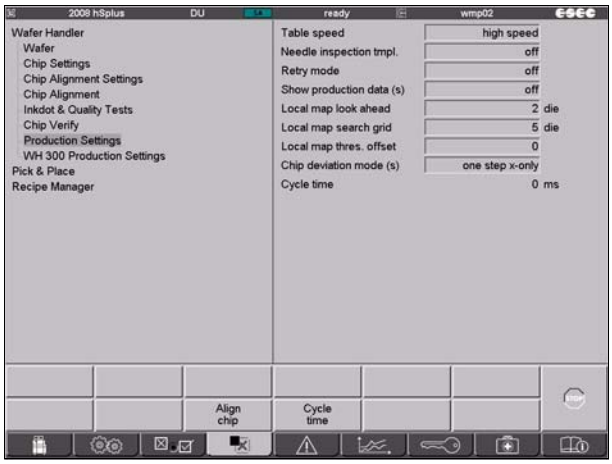
Set the parameter **Local mapping** to **on**.

Parameter Settings

Wafer Handler
Production Settings

Set the following parameters according to your requirements and the material:

- **Local map look ahead**
- **Local map search grid**
- **Local map thres. offset**

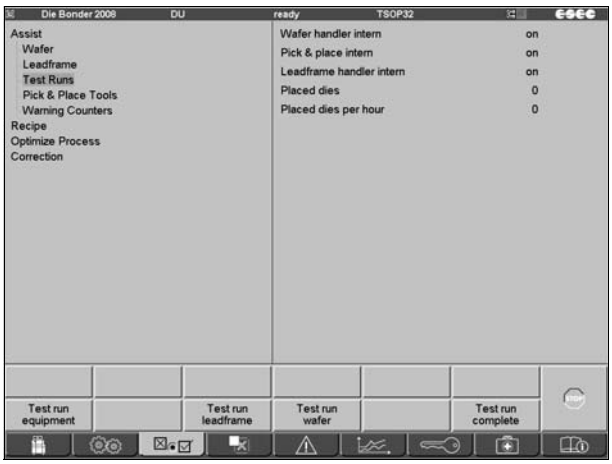


© 2009 Esec Ltd.

8.22 Test Run Wafer

Successful Test

This procedure can be used to check the chosen wafer handler setup in production condition without picking and processing the dice.



Assist
Test Runs

click ***Test run wafer***

The system performs a dummy pickup of all good chips and skips all the bad ones.

Perform one or several test runs as required.

Unsuccessful Test

If the results are not good:

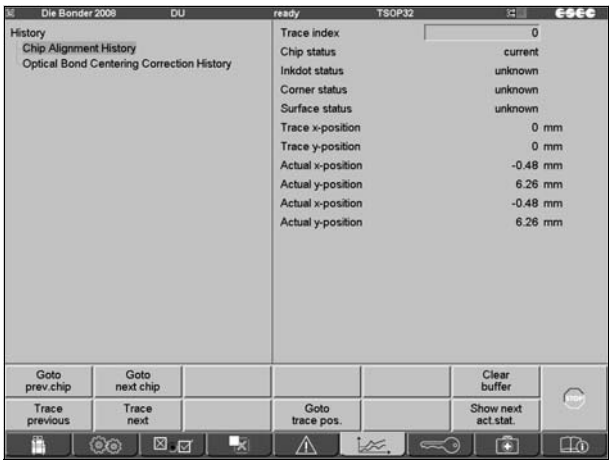
Wafer Handler
Chip Alignment

Click on the appropriate learn soft key for the individual function(s) which cause the problem, e.g. ***Adjust learn***, ***Learn chip size***, ***Search template*** etc.

The system will automatically relearn that function only.

Note: After using an individual function the soft key ***Learn chip*** must be used.
When the results are good perform the test detailed above.

If the result of an individual automatic teaching routine is still not good:



History
Chip Alignment History

The parameter **Chip status** gives the current status and the soft keys ***Goto prev. chip*** and ***Goto next chip*** provide the means of tracing the entire teach procedure. Identify the problem area and re-define parameters using the information provided in the appropriate part of *section 8.19* on page *8-45*.

© 2009 Esec Ltd.

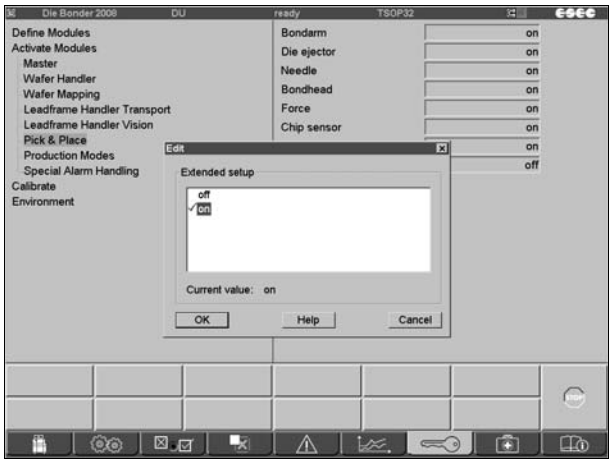
8.23 Pick & Place Teaching

8.23.1 Die Ejector Height Offset Setting

Setting the Extended Pickup Process

Activate Modules
Pick & Place

Set the parameter **Extended setup** to **on**.



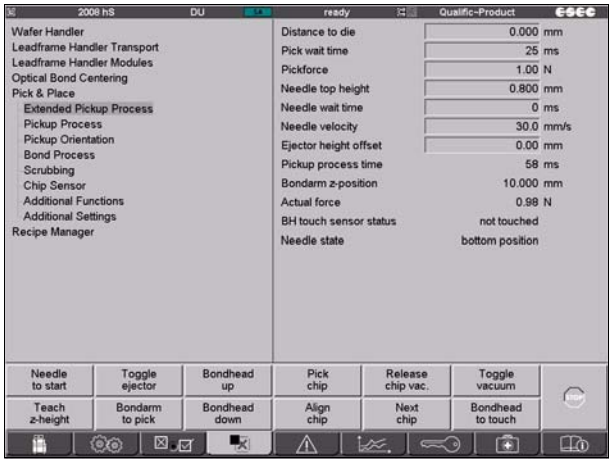
Setting the Die Ejector Height

Pick & Place
Extended Pickup Process

Set the parameter **Ejector height offset** as required.

click ***Toggle ejector*** to move the ejector up and down.

Observe the chips on the inspection monitor. The die ejector should just touch the rear side of the wafer foil.



© 2009 Esec Ltd.

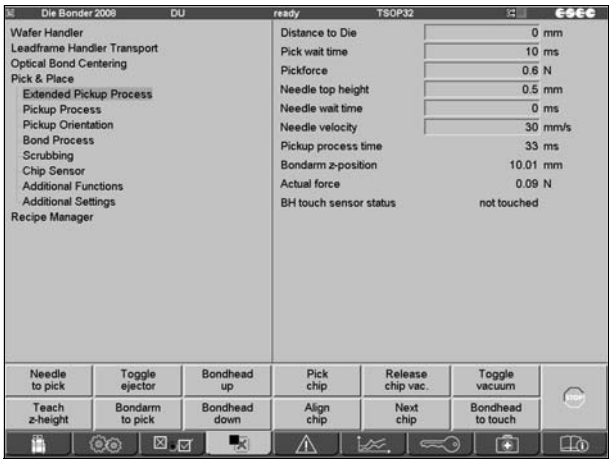
8.23.2 Chip Pickup Teaching

Pick & Place
Extended Pickup Process

Set the following parameters as required:

i 10

- **Distance to die**
- **Pickforce**
- **Needle top height**
- **Needle velocity**



Note: All of the above parameters are seldom changed.
For this reason hide the menu again after you have finished the teaching of the chip pickup.

Teaching the Bondhead Height at Pick Position

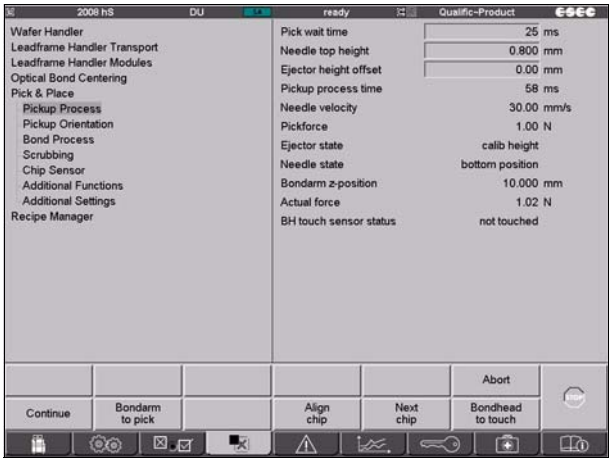
Assist
Wafer

click ***Load wafer*** to load a wafer into the wafer table.

Pick & Place
Pickup Process

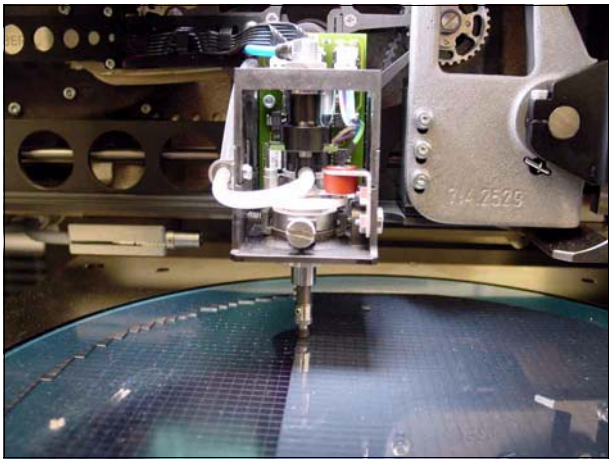
click ***Teach z-height***

Make sure a chip is aligned.



click ***Continue***

The bondhead moves to the pick up position, then down to touch the surface of the wafer with the help of the integrated touch-down sensor.



© 2009 Esec Ltd.

Teaching the Bondhead Height at Pick Position (Cont.)

The bondhead moves to the touch position again, the needle now detects the foil height. It uses the touch-down sensor signal of the bondhead to find its correct height.

The bondhead moves to the park position.

`Teach z needle pick height completed`.

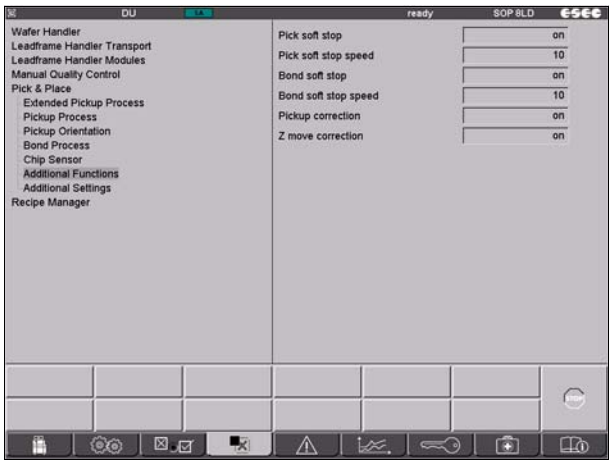
Note: If the pickforce is changed, the Z-height has to be re-learned due to different tool deflections with different pickforces.

Verifying Additional Functions and Settings

Pick & Place
Additional Functions

Set the parameters.

Note: Selecting “Additional Functions” for editing detailed settings.

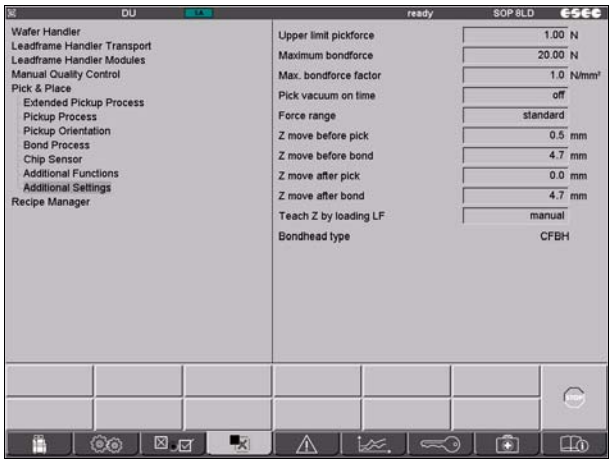


Pick & Place
Additional Settings

Set the parameter **Process speed** to a value depending on the process and on the products (chip, solder, leadframe).

Set parameter **Upper limit pickforce** if required.

Note: In most cases the pick force should be limited to 1 N. If it is necessary to use a higher pick force, the parameter **Upper limit pickforce** can be increased up to 5 N.



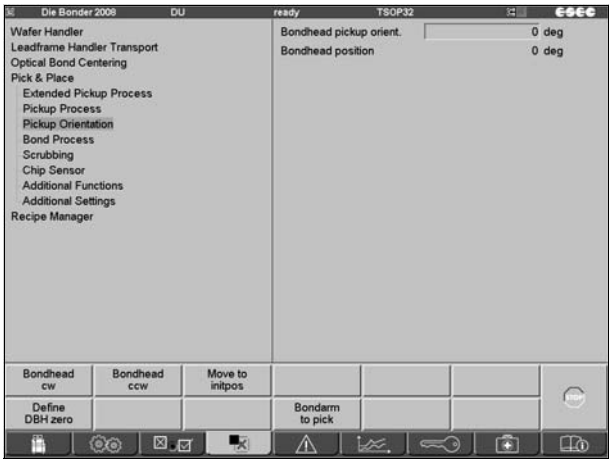
Set parameter **Pick vacuum on time** to **off**.

Set the following parameters as required:

- **Maximum CFBH Bondforce**
- **Teach Z by loading LF**

© 2009 Esec Ltd.

Teaching the Theta Rotation



Note: Only when rectangular or square tools are in use.

Make sure a wafer is loaded and a chip is aligned.

Pick & Place
Pickup Orientation

Bondarm to pick

The bondarm moves to the pick position.

Use the cursor keys ***up*** and ***down*** until the bond tool is just not touching the wafer anymore.

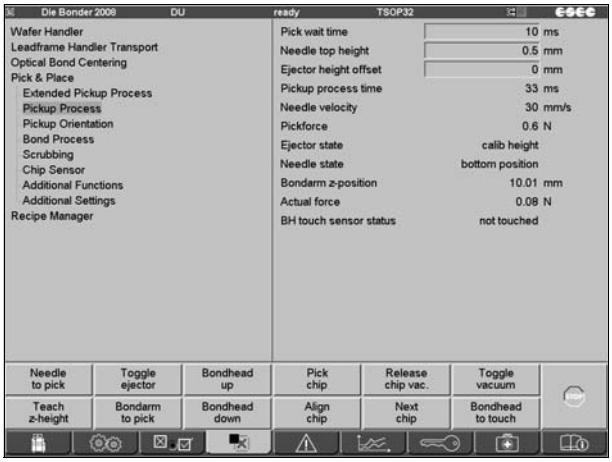
Bondhead cw (clockwise)

or

Bondhead ccw (counter-clockwise) to align the pickup tool as accurately as possible to the chip.

Define DBH zero

Setting the Pickup Process



Make sure a wafer is loaded.

Pick & Place
Pickup Process

Enter the following parameters as required:

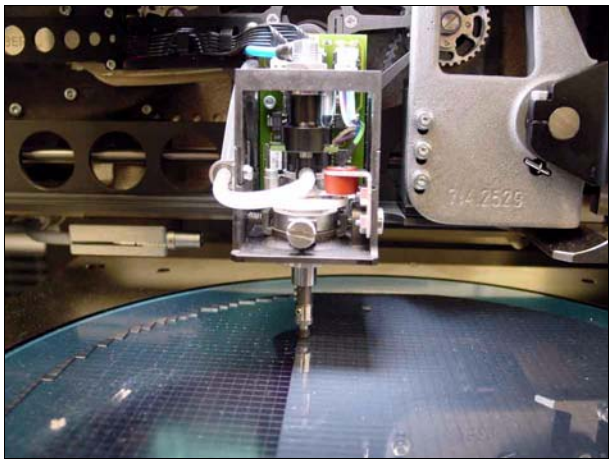
i 10

- **Pick wait time**
- **Needle top height**

Note: The parameters to be entered depend on various factors as e.g. chip size, Needle tip radius, foil type and -age, pickup tool etc.

© 2009 Esec Ltd.

Setting the Pickup Process (Cont.)



Align chip

Next chip

Pick chip

Check whether a chip was picked and sticks on the pickup tool.

If the pickup is not successful:

Adjust the parameters above and check the correct needle centering with the microscope. Check the parameters in the menu **Extended Pickup Process** as well.

If the pickup is successful:

Place your hand below the bondhead to catch the chip.

Release chip vac.

or

Bondhead to touch to place the chip back on the foil.

Release chip vac.

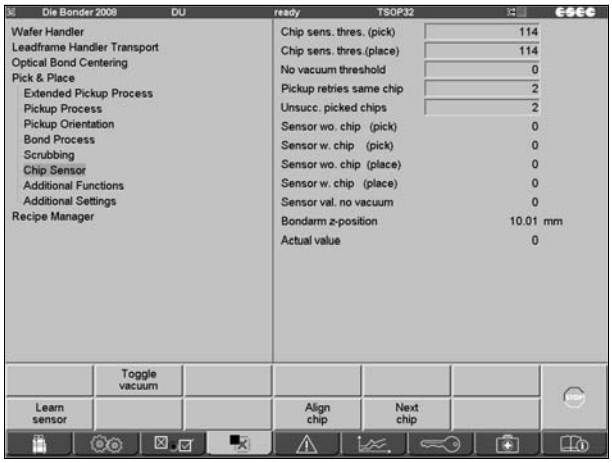
Bondarm to park

Check on the inspection monitor whether the chip is still aligned (rotation has been corrected).

Repeat this test procedure with a number of chips from various points around the wafer to make sure that the process is reliable.

8.23.3 Chip Sensor Teaching

Teaching the Vacuum Chip Sensor



Make sure a wafer is loaded and a pickup tool is fitted.

Pick & Place
Chip Sensor

Learn sensor

Align chip

Continue

The bondarm moves to the pick position and checks the vacuum.

© 2009 Esec Ltd.

8.23.4 Bondhead Height at Bond Position Teaching

Preparations

Pick & Place
Bond Process

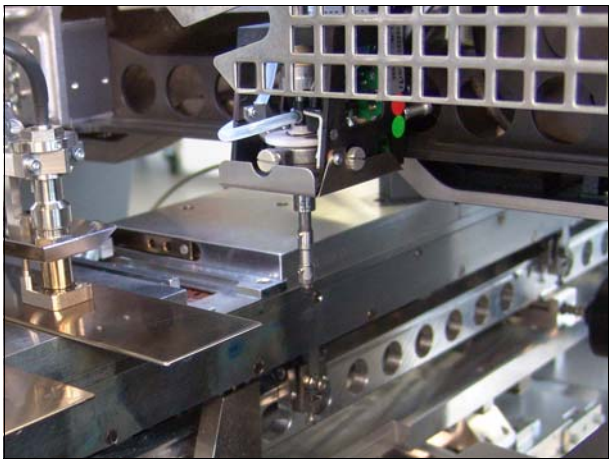
Put a stack of leadframes into the first stack magazine.

Make sure the orientation of the leadframe is correct.

Load leadframe

A leadframe is placed on the indexer and moved until the first pad is positioned at bond position.

Set the parameter **Bondforce** according to the process specification.



Note: If the bondforce has been changed, the Z-height has to be re-taught.

Teaching the Z-Height

Make sure a wafer is loaded.

Align chip

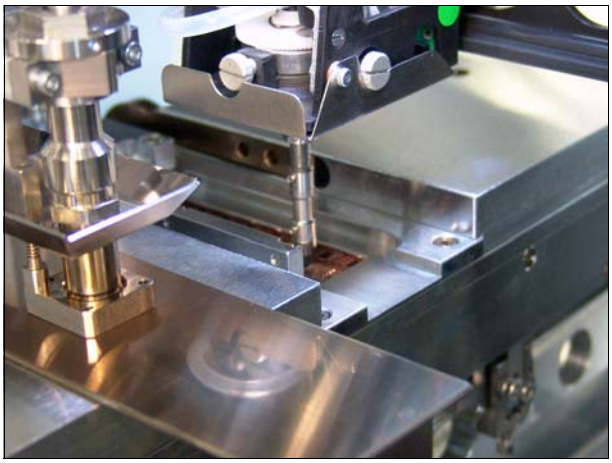
Pick chip

The bondhead picks a chip and stops at park position.

Teach z at bond

Continue

The bondhead moves down to the bond position to learn the z-height.



The bondhead moves then to the park position.

Place your hand under the bondhead.

Release chip vac. to remove the die from the bondhead.

Unload leadframe

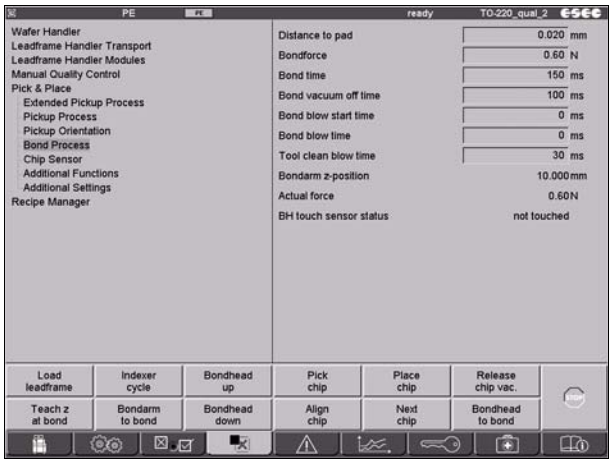
© 2009 Esec Ltd.

8.23.5 Bond Parameters Setting

Setting the Parameters

Make sure a wafer is loaded.

Pick & Place
Bond Process



Set the parameters as required. Use the help key to obtain information on individual ranges and settings.

- **Distance to pad**
- **Bondforce**
- **Bond time**

The Total bond time is defined as:

Total bond time (ms) = **Pre scrub time** + **Scrub time** + **Post scrub time**.

Therefore, if the **Scrub time** is zero (**Scrub frequency** and **Scrub amplitude** set to zero) the **Total bond time** is defined by **Pre scrub time** plus **Post scrub time** only.

Set the parameters as required.

- **Bond vacuum off time**
- **Bond blow start time**
- **Bond blow time**
- **Tool clean blow time**

8.23.6 Process Mode & Bond Parameter Adjustment

Note: Changes made in these menus do not update the recipe. However, if required the recipe can be updated.

General Optimization

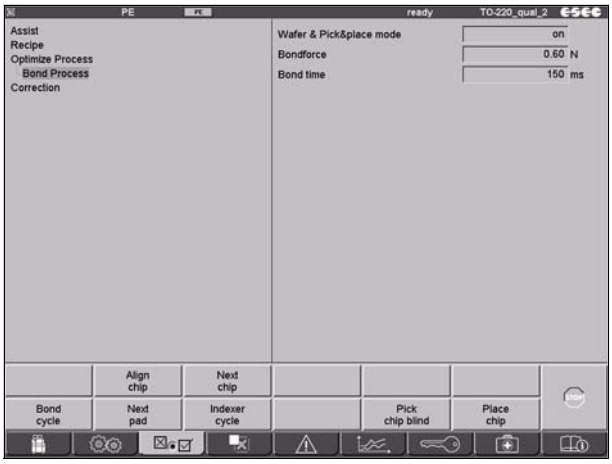
Optimize Process

In this menu the most important teaching parameters are listed on one screen for easier optimization.

© 2009 Esec Ltd.

Optimizing the Bond Process

Optimize Process
Bond Process



Set the parameter **Wafer and pick & place mode** to **on** or **off**.

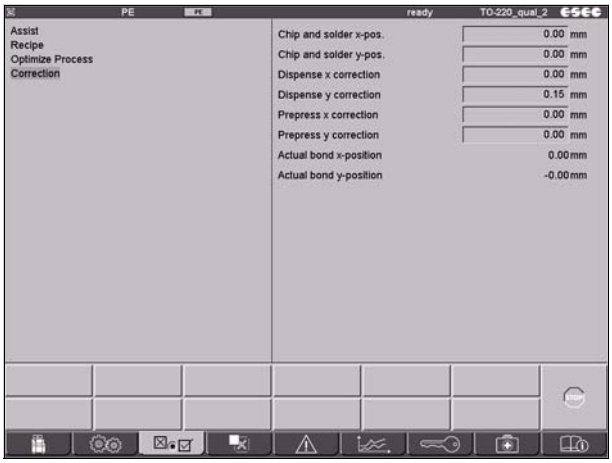
This feature can be used to prevent chips being wasted while machine optimization adjustments are made.

If the parameter **Wafer mode and pick & place mode** is set to **off** the wafer handler and the pick & place unit is switched off, but the indexer is switched on yet. This is useful for defining the dispense path.

Adjust the parameters **Pre scrub** and **Post scrub time** in the **Teach - Pick & Place - Bond Process** if required.

Adjusting the Chip and Solder Positions

Correction



Perform the corrections via the dialogue boxes.

© 2009 Esec Ltd.

8.23.7 PQCTV (Option)

Overview

Run 1 chip

Make sure that the chip is bonded at the correct position.

Manual Quality Control

Set the following parameters to the required mode:

- **Pad window**
  If **Pad window** is switched **on**, an orange window appears on the inspection monitor.
- **Chip window**
  If **Chip window** is switched **on**, a green window appears on the inspection monitor.

When clicking on one line of the windows, yellow drag and drop handles appear.

Adjust the windows according to the pad and/or chip size.

Define settings after completion of the window(s) adjustments.

Remove leadframe or continue production.

© 2009 Esec Ltd.

© 2009 Esec Ltd.

9 Recipe / Statistics

CAUTION

For better visibility of subjacent functions covers have been removed before taking pictures. In standard operating mode all covers have to be in place at any time (see Safety Chapter).

9.1 Recipe Handling

What is a Recipe

On the Die Bonder 2009 SSI a lot of software parameters guarantee an accurate and fast production. Many of these parameters are material and process related and can be saved in a recipe. The recipe is therefore a set of parameters which is firmly related to a particular type of die, leadframe and solder. All these parameters are defined and taught to the machine during the procedures described in chapter *8*, *Machine Setup*.

A recipe consists of the following recipe modules:

- Leadframe Handler
- Wafer Handler
- Pick & Place

A recipe can be

- saved on the hard disk or any network drive
- saved on a hard memory (e.g. USB-stick, CD, floppy disk)
- modified to match to new material
- reloaded to the machine
- copied from one Die Bonder to another
- deleted

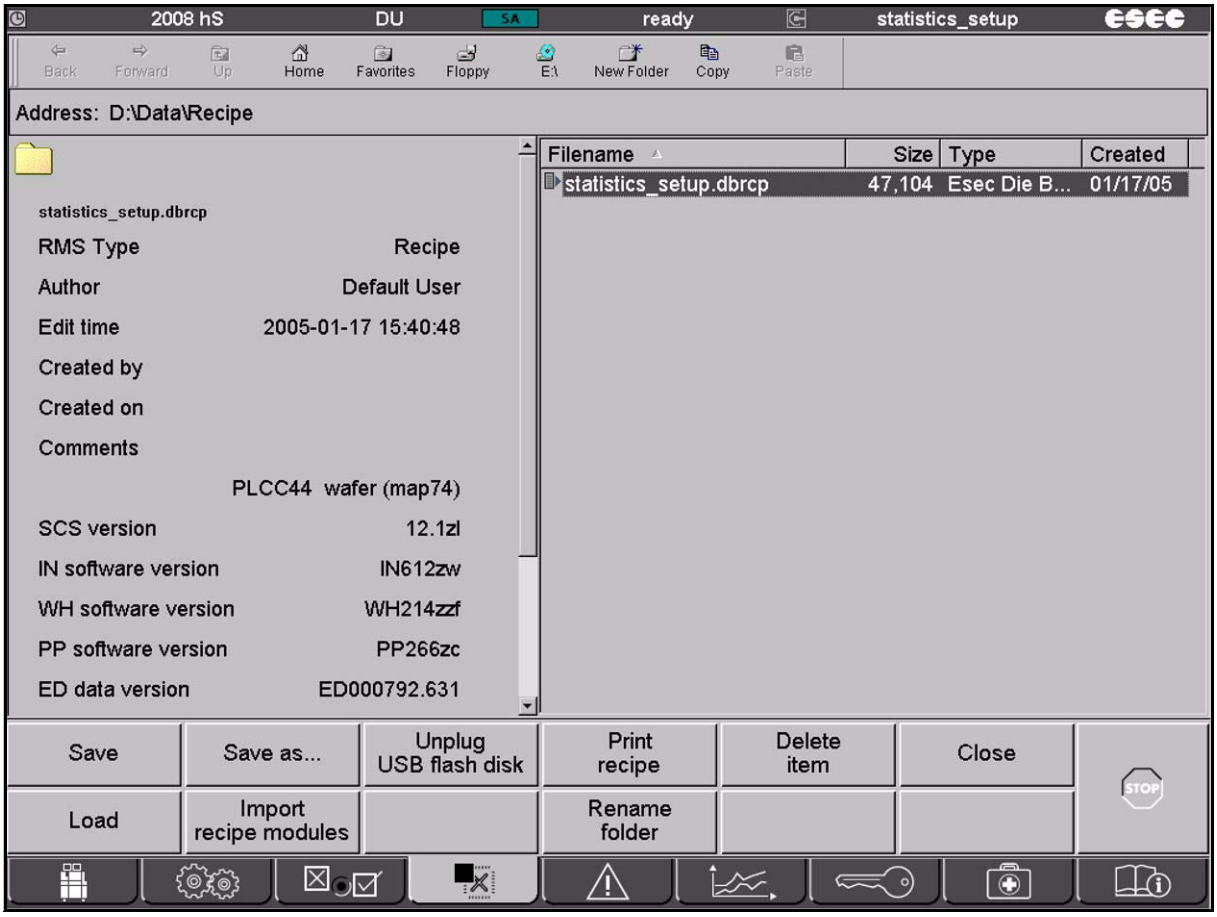
It takes time to teach the Die Bonder 2009 SSI and to produce a recipe. A good recipe also promotes reliable and repeatable operating quality. Therefore a recipe is a valuable item.

Although the hard disk is extremely reliable, it is strongly recommended to copy a recipe onto a hard memory (e.g. USB-stick, CD, floppy disk) as a backup.

© 2009 Esec Ltd.

/ (May 29, 2009)

9.2 Recipe Manager



All recipe handling tasks are centralized in the **Recipe Manager** menu. On the right hand side of the information screen the recipe files can be selected while on the left hand side the details of the recipe are shown.

Recipe Manager

to enter the **Recipe manger**.

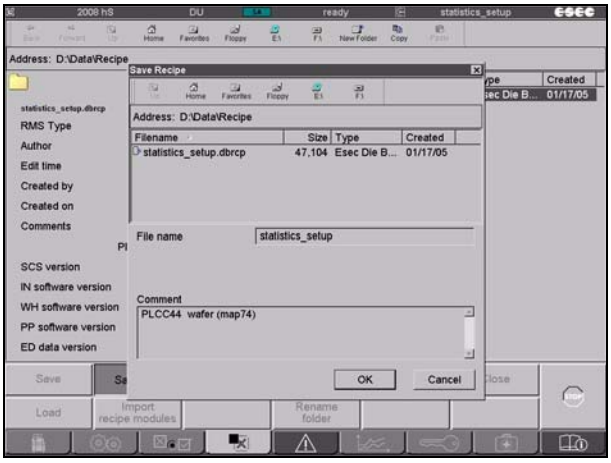
Close

the leave the **Recipe manager**.

© 2009 Esec Ltd.

9.2.1 Create Recipe

The current machine set-up can be memorized in a recipe file doing the following steps:



Recipe Manager

click ***Save as***

Select the recipe file path.

Enter the recipe file name.

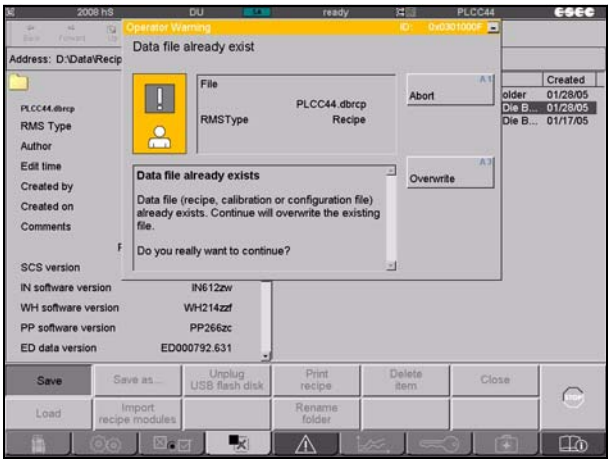
Add comments, if required.

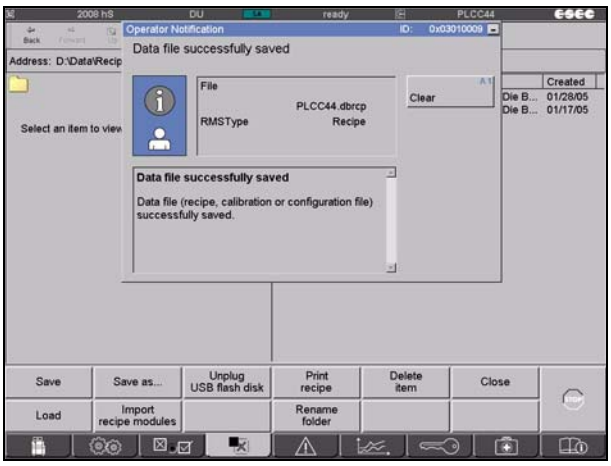
click ***OK***

A new recipe file has been created now.

9.2.2 Save Recipe

At any time it is possible to save changes, made to the currently loaded recipe file.





Recipe Manager

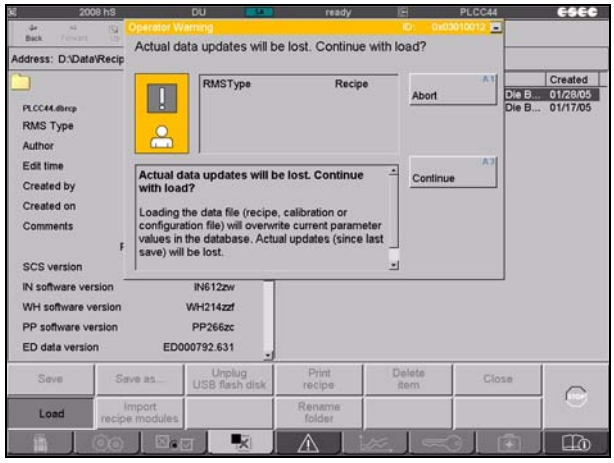
click ***Save***

click ***Overwrite*** to overwrite the existing recipe file.

© 2009 Esec Ltd.

9.2.3 Load Recipe

At any time it is possible to load a recipe file.



Note: All changes you made after the last "Save" command will be lost.

Recipe Manager

Select required recipe file out of the list. Details of the selected recipe file are shown on the left.

Load

Continue to continue with loading.

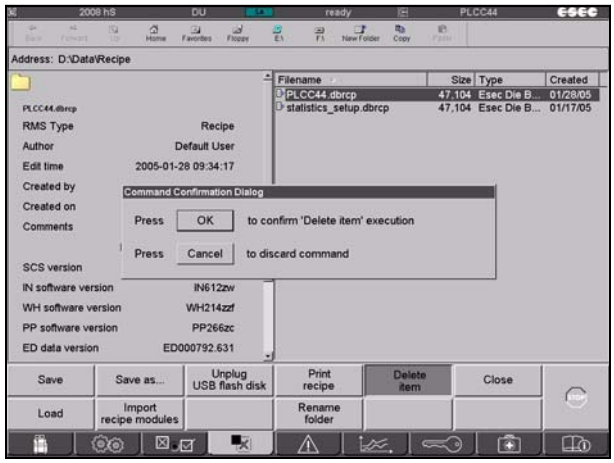
9.2.4 Delete Recipe

Recipe Manager

Select the recipe files to delete out of the list. For multi selection of files, the “windows rules“ can be used.

Delete item

OK to delete the recipe file.



9.2.5 Copy Recipe

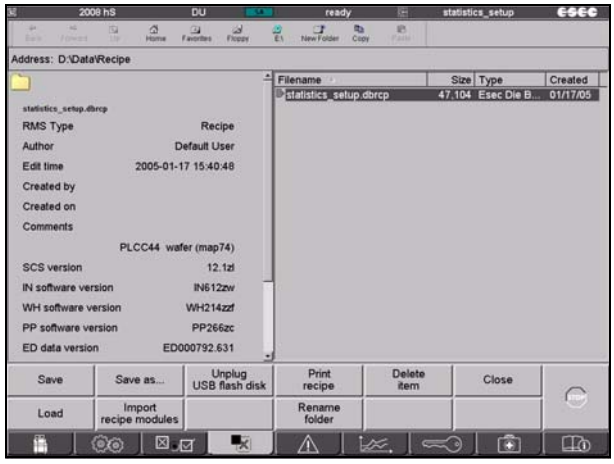
Recipe Manager

Select the required recipe files. For multi selection of recipe files, the “windows rules” can be used.

Copy in the upper tool bar.

Select the destination path.

Paste in the upper tool bar



© 2009 Esec Ltd.

9.2.6 Import Recipe Modules

This function allows to load parts of an existing recipe file into the current recipe file which is active on the machine. E.g. a recipe file exist for a particular product on leadframe type A. For test purpose, the same product should be bonded to leadframe type B.

Note: Loading a recipe module will overwrite all parameters of this module.

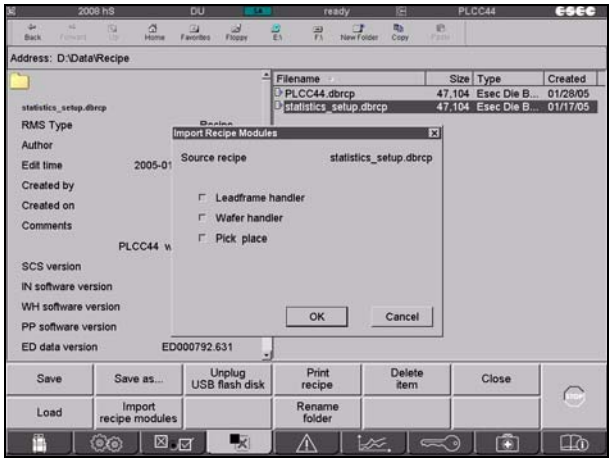
Recipe Manager

Select the required recipe file to load recipe modules from.

Import recipe modules

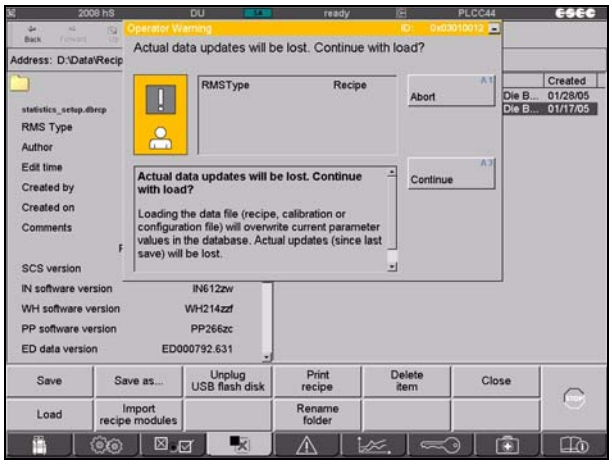
Select the recipe module(s) to load.

OK to load the recipe modules.



An operation notification requests for confirmation of the recipe modules loading.

Continue to import the selected recipe modules.



9.2.7 Create / Rename Folder

At any time it is possible to create a new recipe folder.

Recipe Manager

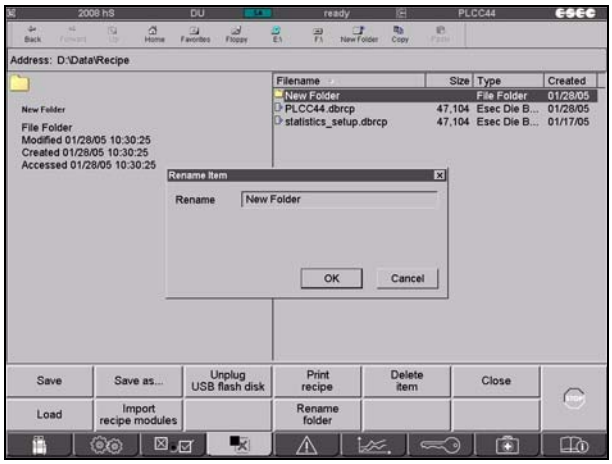
New Folder in the upper tool bar

Select the new folder.

Rename

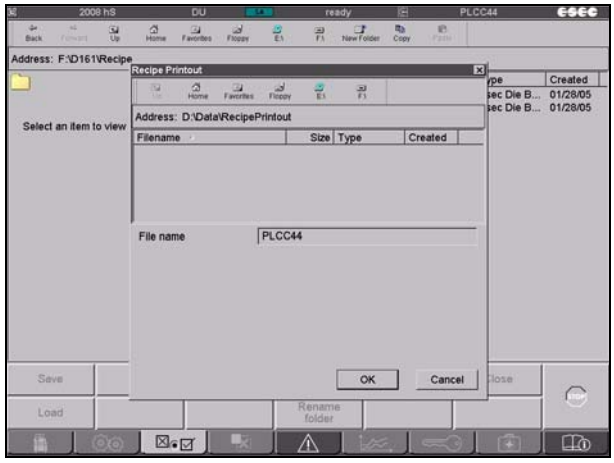
Enter the new folder name.

OK



© 2009 Esec Ltd.

9.2.8 Print Recipe



This function allows to create a text file (.txt) of an existing recipe file. If required, the text file can be printed out.

Recipe Manager

Select the required recipe file.

Print recipe

Select the destination path of the text file folder.

Enter the text file name. The file is automatically extended by “txt“.

OK to create the text file of the selected recipe file.

9.2.9 Unplug USB Flash Disk

In case an USB flash disk is used, it should be “ejected” before unplugged.

Unplug USB flash disk

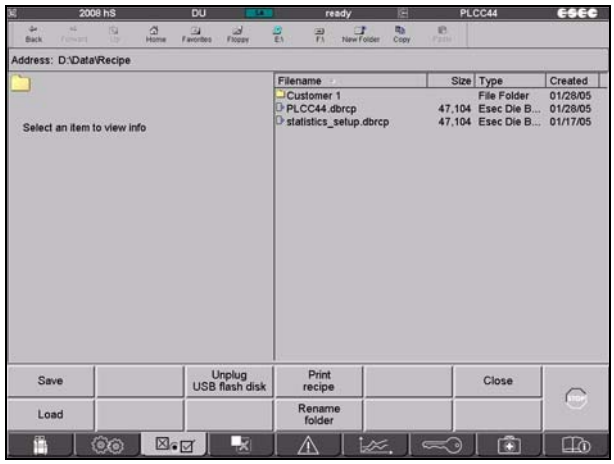
Select the appropriate hardware you want to eject.

Stop

Unplug the USB flash disk.

Close

9.2.10 Access Rights to Recipes



A user who is member of the user group "operator" only gets access to the recipe files in the **Setup - Recipe** menu. He is authorized to load an existing recipe file and to save a recipe file but not authorized to create a new recipe file.

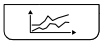
A user who is member of the user group "Process Engineer" gets access to the **Teach - Recipe Manager** and has full control to create, modify and delete any recipe file.

© 2009 Esec Ltd.

9.3 Statistics

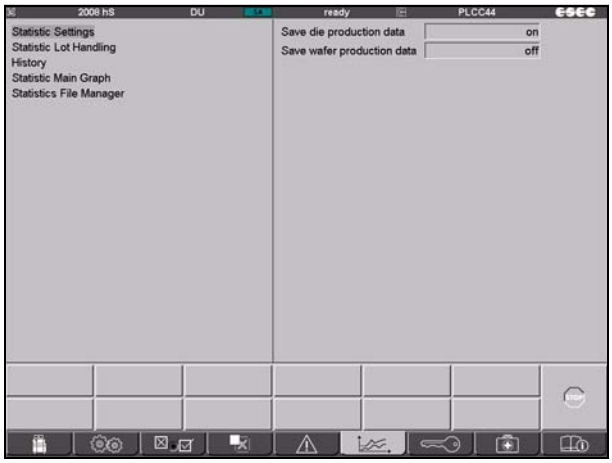
The integrated quality controlling (IQC) of the Die Bonder 2009 SSI produces accurate statistics throughout the machine‘s life. This section describes how the statistics features are defined and what data they provide.

9.3.1 Statistic Settings



Statistic Settings

Activate the following statistic features as required.



Save die production data

If this parameter is set to **on**, the following data are saved for each bonded die.

- Database index of corresponding wafer
- Database index of corresponding strip cell
- Die type, i.e. number for multi-die application
- Die rotation
- Die quality
- Die column index in the wafer/wafer map
- Die row index in the wafer/wafer map
- Wafer map binary code
- Inkdot mode

Safe wafer production data

If this parameter is set to **on**, the following data are saved for each used wafer.

- Database index of corresponding wafer cassette
- Database index of corresponding material identification
- Slot number at the moment of wafer load
- Slot number at the moment of wafer unload
- Wafer bar code
- Wafer flat notch location

© 2009 Esec Ltd.

Post bond QC statistic

If this parameter is set to **on**, the post bond quality control data will be collected in the statistics.

Pre bond QC statistic

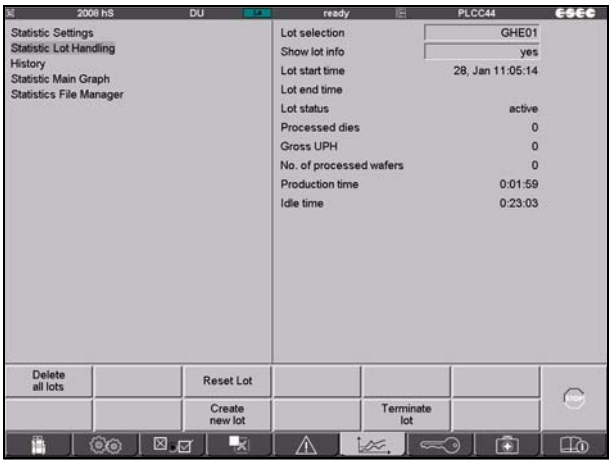
If this parameter is set to **on**, the pre bond quality control data will be collected in the statistics.

Last bonded die tracking

If this parameter is set to **on**, the position (pad number, row and column within the matrix) of the last bonded die is displayed when the machine stops.

9.3.2 Statistic Lot Handling

The **Statistic Lot Handling** menu provides information and soft keys for handling the lots.



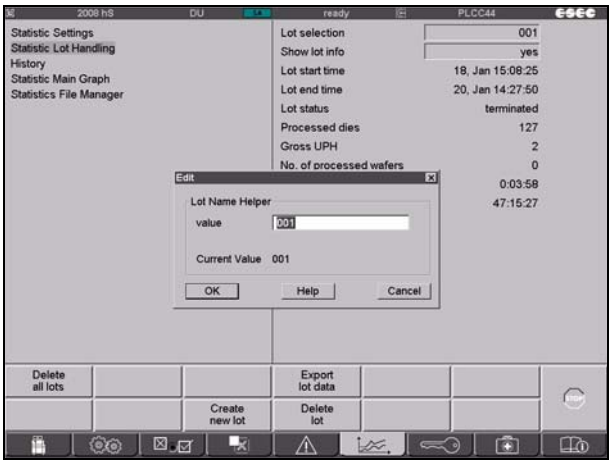
Create New Lot

Statistic Lot Handling

click ***Create new lot***

Enter the name of the new lot.

click ***OK*** to create a new lot.



© 2009 Esec Ltd.

Delete all Lots

Statistic Lot Handling

Delete all lots to delete all lot data.

All lots of the current folder are deleted.

Reset Lot

Statistic Lot Handling

Reset Lot to delete the data of the current active lot.

Data of the current lot is deleted.

Restart Lot

Statistic Lot Handling

Restart lot to restart a terminated lot.

If another lot is active, it will be terminated.

The data of the restarted lot will be deleted.

Terminate Lot

Statistic Lot Handling

Terminate lot to finish the current lot.

The **Lot end time** is displayed on the screen.

The **Lot status** is set to **terminated**.

Export Lot

Statistic Lot Handling

To create a text file of the selected lot:

Export lot data

Select the destination path for the export file.

Enter the name of the export file.

OK to export the lot data.

Note: The lot must be terminated before it can be exported.

© 2009 Esec Ltd.

Delete Lot

Statistic Lot Handling

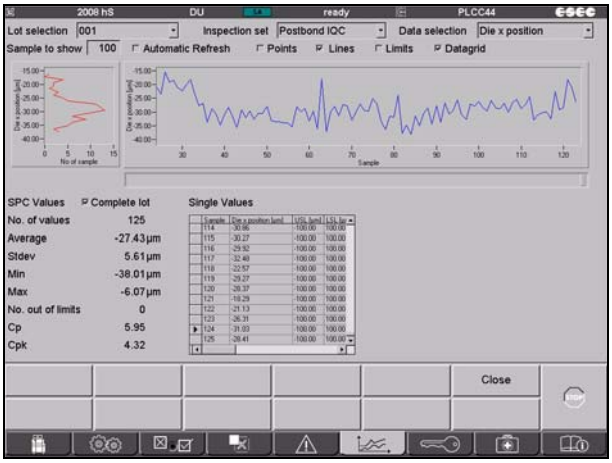
Select the lot.

Delete lot to delete the selected lot.

Note: The lot must be terminated before.

9.3.3 Statistic Main Graph

The **Statistic Main Graph** shows graphs of the IQC data of the selected lot.



Statistic Main Graph

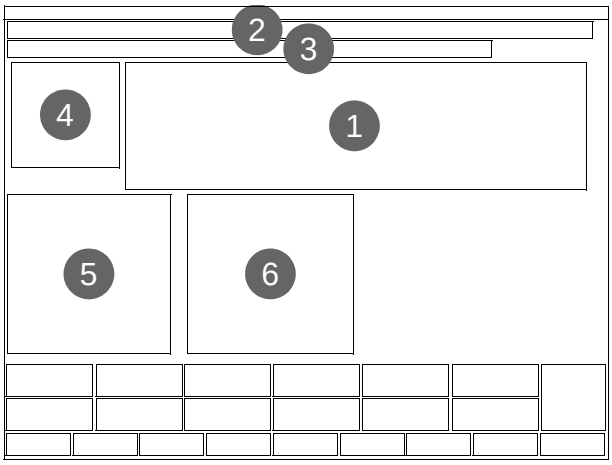
to enter the **Statistic Main Graph**.

Close

the leave the **Statistic Main Graph**.

Note: It is also possible to view the **Statistic Main Graph** of the current lot by clicking the ***Statistics display*** soft key in the **Produce** menu. Click the ***Produce screen*** soft key to leave it again.

The **Statistic Main Graph** menu can be divided into six fields.



© 2009 Esec Ltd.

1 **Statistic Main Graph**

This field provides a graph of the selected IQC data.

2 **Lot selection**

Drop down list of all lots

Inspection set

Selection of the vision (IQC) system

Data selection

Selection of the lot data, which is displayed in the Statistic Main Graph

3 **Sample to show**

Number of die data which are displayed in the Statistic Main Graph

Automatic Refresh

If this box is checked, the Statistic Main Graph is refreshed each time when a new statistic data is added.

Points

If this box is checked, the statistic data is shown in form of a point for each die.

Lines

If this box is checked, the statistic data is shown with a continuous line.

Limits

If this box is checked, the upper and lower limit is shown in the graph.

Datagrid

If this box is checked, the statistic data are listed in the list **Single Value** below.

4 View of the Gaussian distribution of the data shown in the Statistic Main Graph.

© 2009 Esec Ltd.

5 SPC values

This field provides the summary of the statistic data.

Complete lot

If this box is checked, the statistic data is calculated from the data of the complete lot.

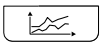
If this box is not checked, the statistic data is calculated from the data range selected in the field **Sample to show**.

6 Single Values

This field lists the raw data of the selected lot.

9.3.4 Statistic File Manager

The **Statistic File Manager** menu is used to manage (copy, delete,...) the lot export files. Similar to section *Statistic Lot Handling* on page *9-8*.

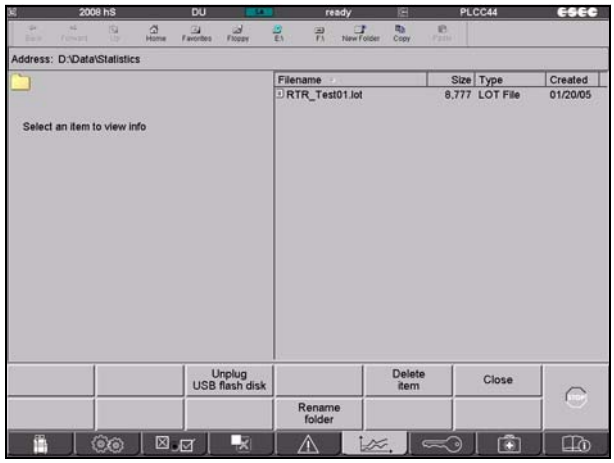


Statistic File Manager

to enter the **Statistic File Manager**.

Close

the leave the **Statistic File Manager**.



© 2009 Esec Ltd.

10 Software Handling

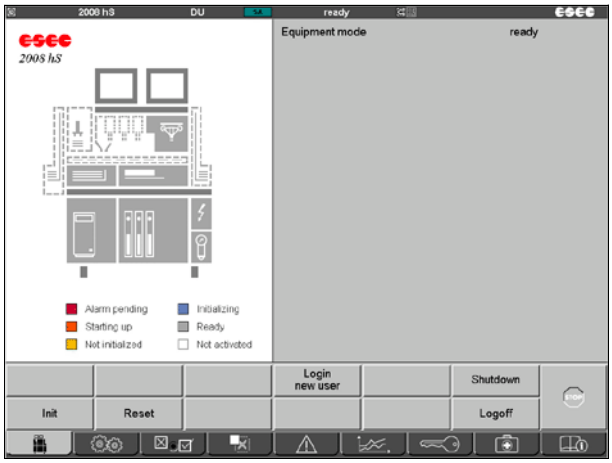
CAUTION

For better visibility of subjacent functions covers have been removed before taking pictures. In standard operating mode all covers have to be in place at any time (see Safety Chapter).

10.1 Restore MS Windows 2000 Software

Restore MS Windows 2000

It is recommended to backup all production data before starting the restore procedure.



Overview

Insert the MS Windows 2000 Restore CD #1 into the DVD/CD-drive.

click ***Shutdown***

click ***OK***

The operating system is now shutting down. Wait until the monitors appear black (no signal).

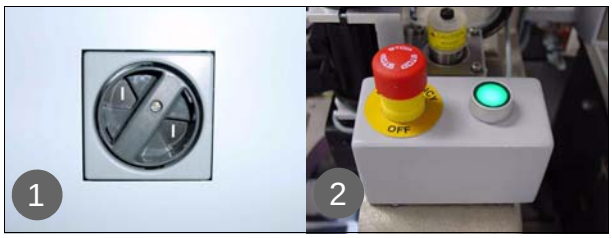
Turn off the main switch to off „**0**“.

Note: The accumulator of the UPS (option) will not be charged as long as the main switch is turned off.

Wait a few seconds and turn the main power switch to on “**I**” (1).

Press the green release button (2).

The PC starts up.

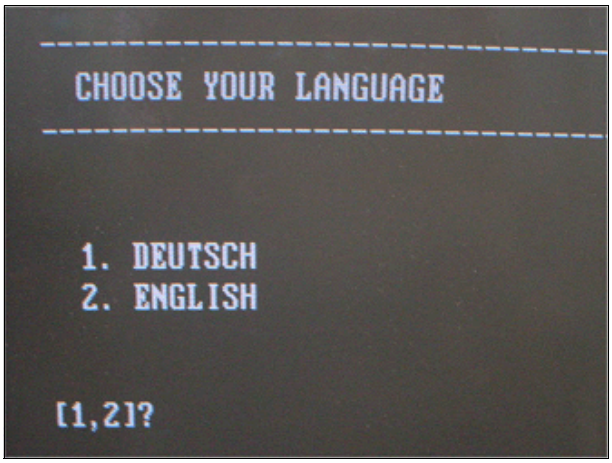


© 2009 Esec Ltd.

Restore MS Windows 2000 (Cont.)

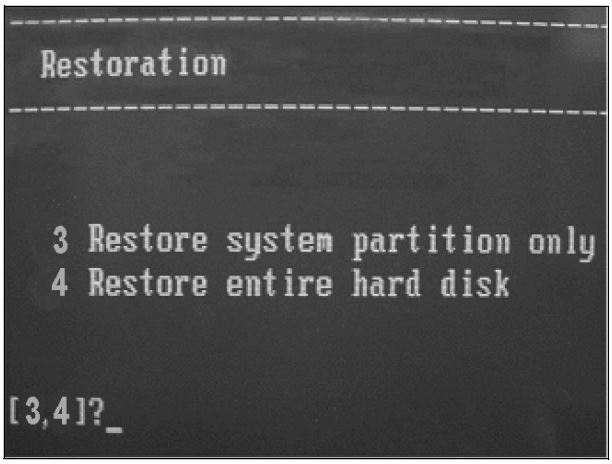
Select the language when asked.

Note: Do not press ENTER, just enter in the number of the desired language.



Select the desired restoration. Usually **Restore system partition only** (#**3**) is sufficient.

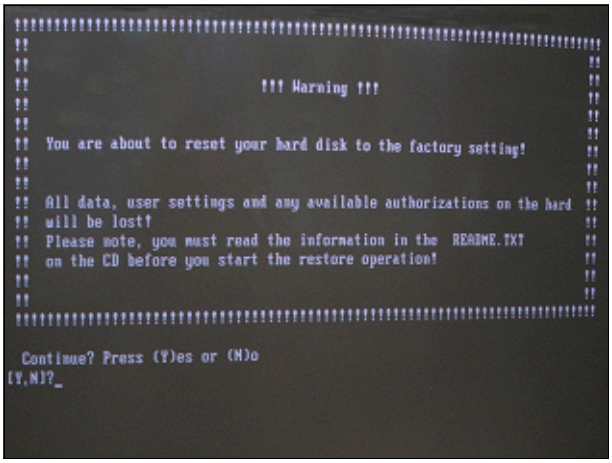
Note: Press ENTER to confirm the selection.



Carefully read the warning message!

Select only **Yes** if the selection is correct.

Note: **No** will abort the installation and you may start from the beginning again.



© 2009 Esec Ltd.

Restore MS Windows 2000 (Cont.)

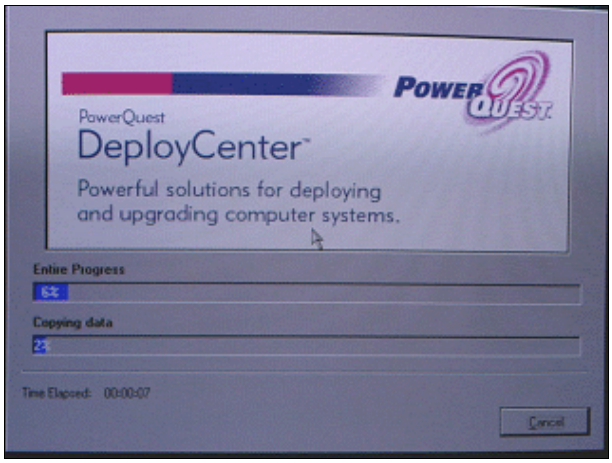
Power Quest starts to restore the MS Windows 2000 system.

Insert MS Windows Restore CD #2 into the DVD/CD-drive after system request.

Wait a view seconds until the DVD/CD-drive is ready (LED of DVD/CD-drive is dark)

click ***OK***

Power Quest will continue restoring.



MS Windows starts up automatically after successful reinstallation.

The Windows 2000 Set Up Wizard pops up.

click ***Next***

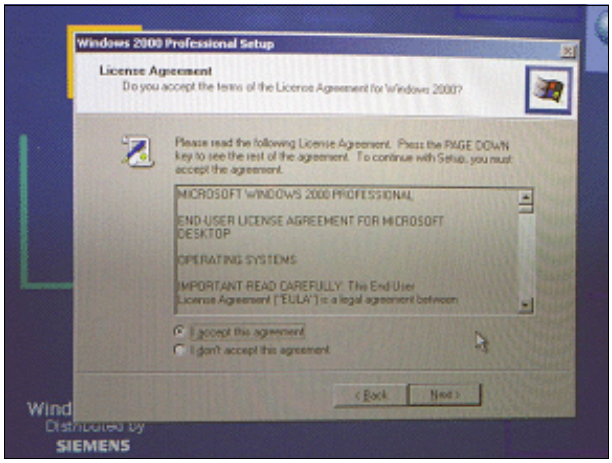
Check “I accept this agreement”

click ***Next***

click ***Next*** in the menu “Regional settings”

click ***Next*** in the menu “Computer name and administrator password”

The computer name is generated randomly. If the Die Bonder 2009 SSI is connected to a network, it is advisable to change the computer name for easy recognition.



Note: Do not change the Administrator password!

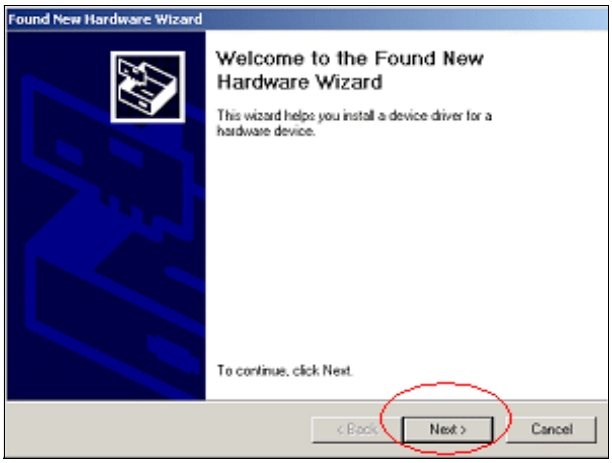
The PC will reboot automatically. Please wait until the system has rebooted completely.

click ***Next***

© 2009 Esec Ltd.

Restore MS Windows 2000 (Cont.)

The “Found New Hardware Wizard“ pops up after reboot.



click ***Next***

click ***Next***

Uncheck the boxes “Floppy Disk“ and “CD-ROM“.

click ***Next***

click ***Finish***

Repeat above steps until all new hardware has been found.

Windows is installing its components.

Windows is shutting down and restarting automatically.

Remove the Restore CD out of the DVD/CD-drive.

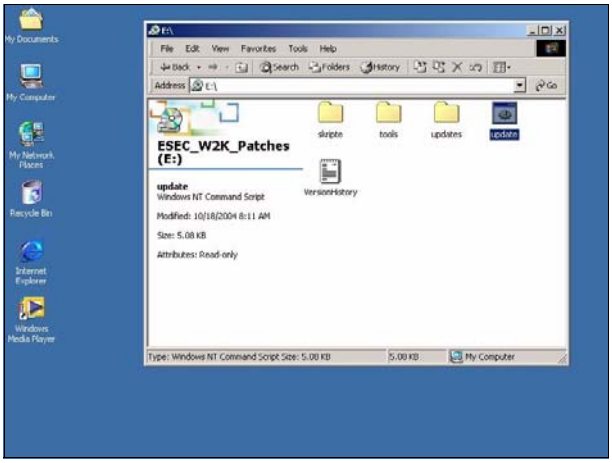
The system is now ready to install further software like Nero Burning Software, Info Page, SCS etc.

10.2 Installation of Windows Patches

Insert the Patch CD into the DVD/CD-drive.

Open the (E:) drive in the folder “My Computer“.

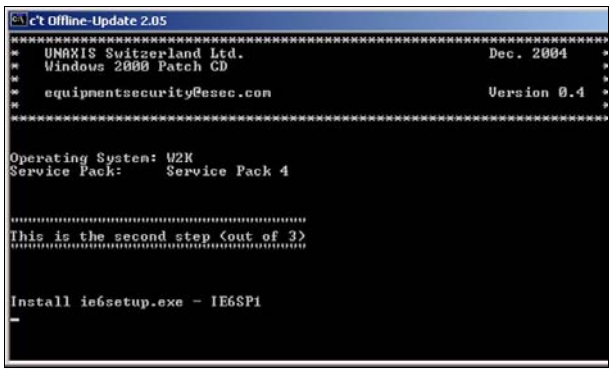
click Execute (double click) the “update“.



© 2009 Esec Ltd.

The Service Pack 4 will be installed.

Note: This step will only be executed if the Service Pack 4 is not yet installed.



Note: This step takes several minutes displaying the screen showing to the right.

Windows will restart automatically when the installation is finished.

click Execute (double click) the “update“ a second time (same as above).

The Internet Explorer 6 Service Pack 1 will be installed.

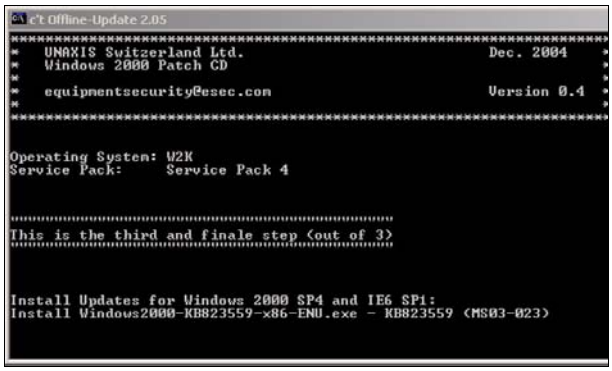
Note: This step will only be executed if the Internet Explorer 6 Service Pack 1 is not yet installed.

Windows will restart automatically when the installation is finished.

During the automatic restart, a Windows Update will run.

click Execute (double click) the “update“ a third time (same as above).

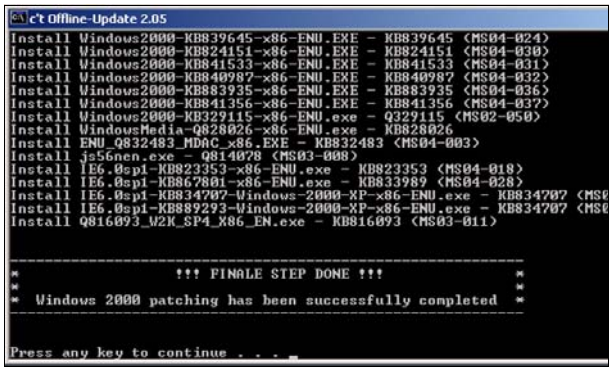
All patches not included in Service Pack 4 will be installed.



When the Windows Patch installation is finished,

any key to finish the installation.

Note: The computer will be restarted automatically.



© 2009 Esec Ltd.

10.3 Installation of Nero Burning Software

Insert the Nero Burning CD into the DVD/CD-drive.

The Installer starts automatically.

click ***Nero Express***

Note: Probably there may be different buttons on your entry screen (depends on the software version).

Accept the End-User Agreement and follow the online instructions.

The Serial Number is noted on the envelope of Nero Burning CD.

click ***Exit***

No reboot is necessary at this time. Restart the computer later.

click ***OK***

10.4 Installation of the Info-Page

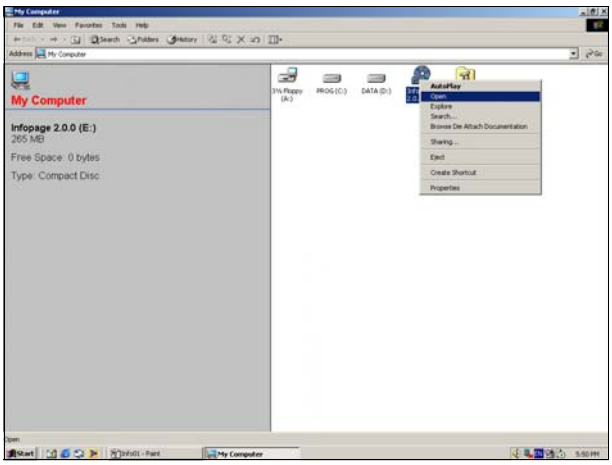
Info Page

Insert the Info Page CD into the DVD/CD-drive.

click ***My Computer***

F5

Click right mouse button on drive (E:) and select ***open***.

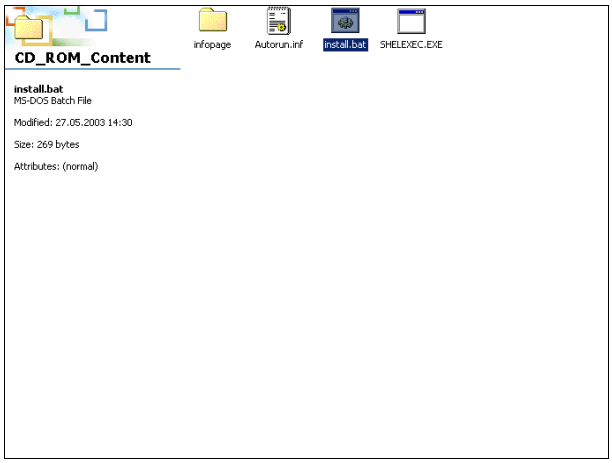


© 2009 Esec Ltd.

Info Page (Cont.)

install (double click)

After installation has been done (black DOS windows closed), please close all other windows.



10.5 Installation of SCS Software

Note: SCS = **S**mart **C**ontrol **S**ystem = Control software of the Die Bonder 2009 SSI

When the Die Bonder 2009 SSI is delivered, the software is already installed. Because of continuous product improvement it might be necessary to install new software. There are two cases possible:

- New Installation (First Time Installation)
- Update Installation

Every issued software version is identified by the version number (i.e. SCS 12.0.1) which is written on the CD label.

10.5.1 New Installation (First Time Installation)

NOTICE

On completion of the installation of the new software, the complete calibration procedure as detailed in chapter 6, Calibration has to be carried out.

During this procedure recipes and other system data might be deleted from the hard disk, make sure that back up copies are available.

i 39 **Note:** The PC hard disk has to have two partitions assigned to the letters **(C:)** and **(D:)**.

© 2009 Esec Ltd.

Installing the SCS Software

Have the following CD ready:
“Die Attach Software Installation SCS“

Insert the installation CD into the DVD/CD-drive.

click ***New installation***

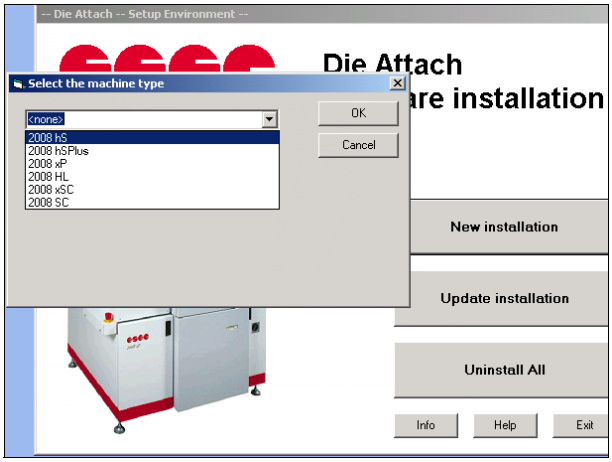
Select the appropriate machine type.

click ***OK***

Retain all default settings unchanged.

click ***Enter*** or ***Next*** if required.

The third part of the SCS software will be installed.



Time Zone Setting

click ***Time Zone***

Select the time zone.

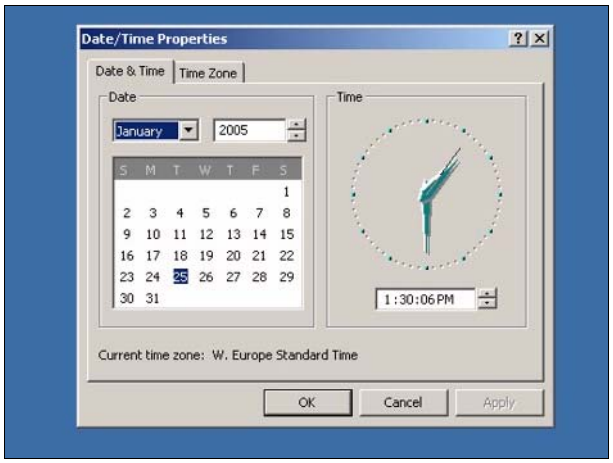
© 2009 Esec Ltd.

Time Zone Setting (Cont.)

click ***Date & Time***

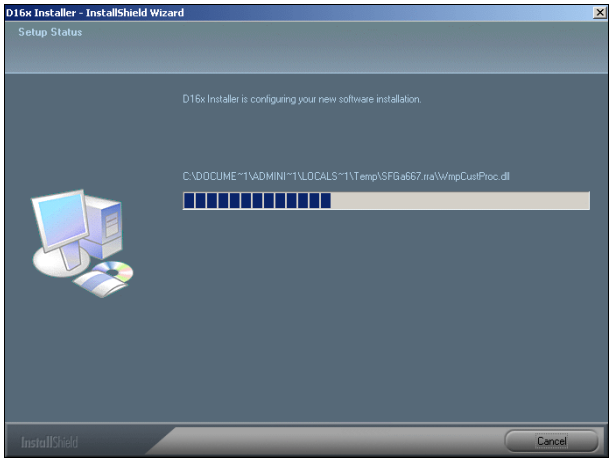
Set time and date.

click ***OK***



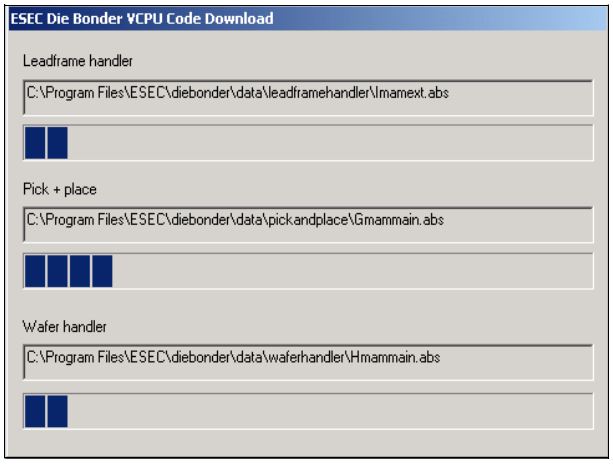
Installing the SCS Software (Cont.)

DACS Installation starts automatically.



VCPU Code Download

Note: This takes a while, please be patient! In between the various installation tasks, no installer menus are visible for a while. This gives the impression that the installation has been finished! Please wait for the next installer menu.

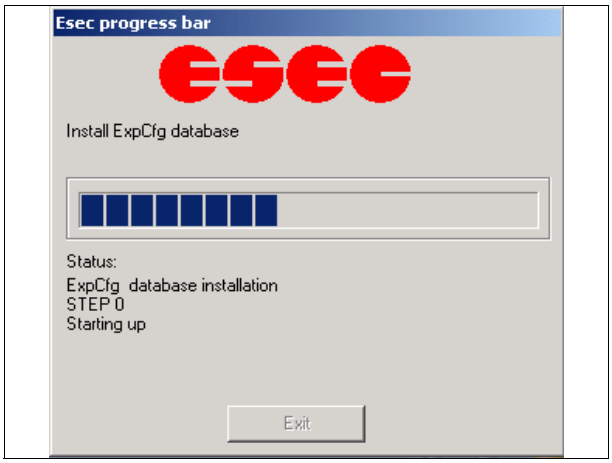


© 2009 Esec Ltd.

Installing the SCS Software (Cont.)

Installation of Databases

Note: This takes a while, please be patient! In between the various installation tasks, no installer menus are visible for a while. This gives the impression installation has been finished! Please wait for the next installer menu.



The SCS installation is now completed.

click ***Yes***

Remove the SCS Software CD from the DVD/CD-drive.

10.6 Installation of Options Software

10.6.1 Uninterruptable Power Supply (UPS)

In case an uninterruptable power supply (UPS) is installed, follow the software installation procedures explained in the UPS Retrofit Kit Instruction 1000-4616 chapter “software installation”.

The retrofit kit instruction can also be found on the Info Page (option manuals).

© 2009 Esec Ltd.

10.7 Software Updates

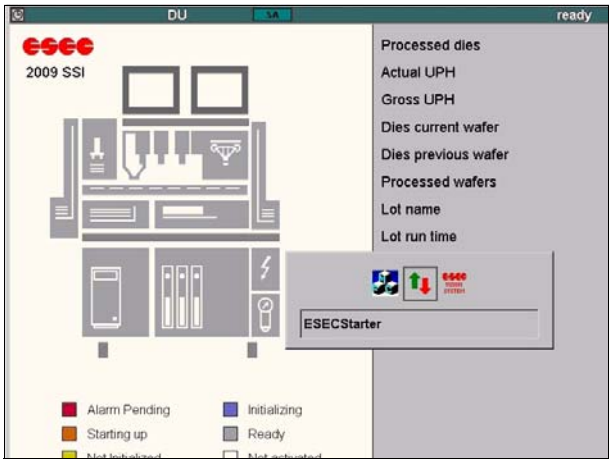
10.7.1 Updating SCS Software

Note: If the first two version numbers of the installed software and the update software are the same (for instance: SCS 12.0.5 and SCS 12.0.8) a simple update can be done. No recalibration is necessary.

© 2009 Esec Ltd.

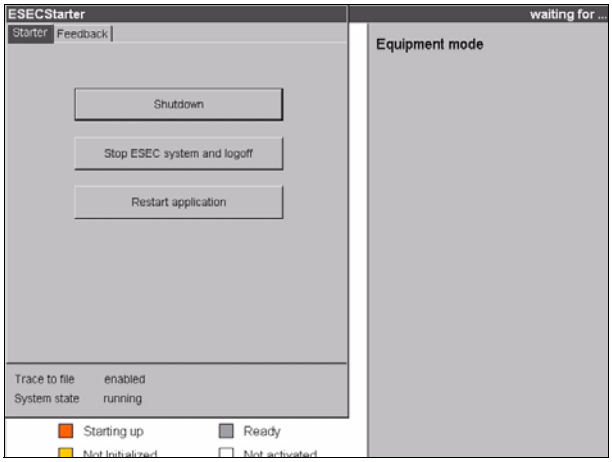
Updating the Software

Alt + Tab to display the ESEC starter.



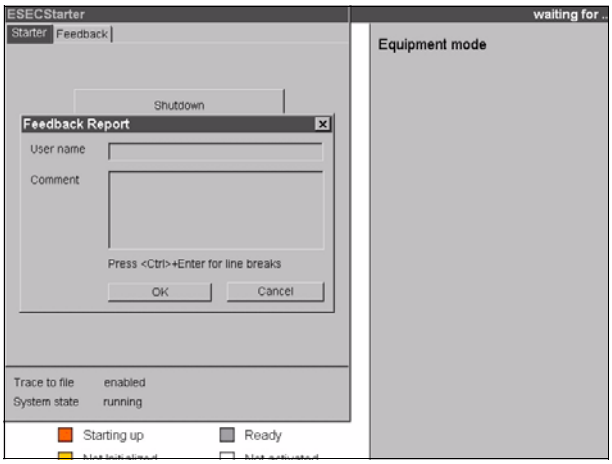
In the ESEC starter click the ***Starter*** tab.

Stop ESEC system and logoff



OK in the feedback report window.

The system will now terminate the SCS application.



© 2009 Esec Ltd.

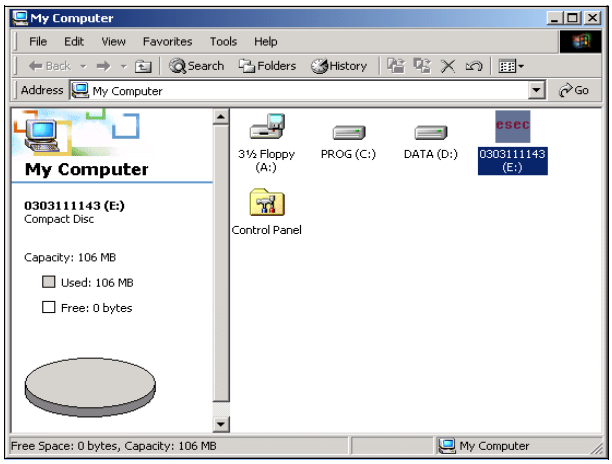
Updating the Software (Cont.)

At the Windows 2000 login prompt enter the password “Administrator” to get to the Windows 2000 desktop.

Insert the **Die Attach Software Installation SCS** CD into the DVD/CD-drive.

Select the DVD/CD-drive.

Execute (double click) DAsetup.exe.



click

Update installation

Follow the online prompts to update the whole software.

Note: Make sure that the VME rack is powered up (i.e. the emergency switch is released).
If the emergency switch is pressed, the installation procedure cannot download the software code to the VCPUs.

© 2009 Esec Ltd.

Updating the Software (Cont.)

After the successful software update, restart the system as prompted.

Note: In case of an Uninterruptable power supply (UPS) is installed, check if the power option software settings are correct. Please refer to the Retrofit Kit Instructions P/N 1000-6416, chapter “software installation”.

© 2009 Esec Ltd.

11 Material Safety Data Sheets MSDS

© 2009 Esec Ltd.

/ (May 29, 2009)

11.1 MSDS KODAK LENS CLEANER

MATERIAL SAFETY DATA SHEET

200000855/F/USA

Approval Date:	10/16/1996
Print Date:	08/28/1999

11.1.1 A: Chemical Product and Company Identification

Product Name: KODAK Lens Cleaner

Catalog Number(s):	146 3728 - 16 ounce(s) 176 7136 - 1 1/4 ounce(s) 198 4988
Manufacturer/Supplier:	EASTMAN KODAK COMPANY, Rochester, New York 14650
For Emergency Health, Safety & Environmental Information, call:	716-722-5151
For other information, call:	(800) 242-2424.
To request an MSDS, call:	(800) 242-2424, extension 25
Synonym(s):	KAN 471122; PCD 5672; F-0092.100, PTN 1C8000, PTN 1386TL

ESEC Part No. 240.0111.1

© 2009 Esec Ltd.

11.1.2 B: Composition/Information on Ingredients

Weight % - Component - (CAS Registry No.)

> 99	Water (007732-18-5)
< 1	Ammonium carbonate (010361-29-2)
< 1	Nonionic surfactant (009002-93-1)
< 1	Cationic surfactant (000121-54-0)

11.1.3 C: Hazards Identification

LOW HAZARD FOR RECOMMENDED HANDLING

HMIS Hazard Ratings:

Health - 0, Flammability - 0, Reactivity - 0, Personal Protection - A

/ (May 29, 2009)

NFPA Hazard Ratings:

Health - 0, Flammability - 0, Reactivity (Stability) - 0

Note: HMIS and NFPA hazard indexes involve data review and interpretation that may vary among companies. They are intended only for rapid, general identification of the magnitude of the potential hazards. The personal protection index is only intended for general guidance on personal protection equipment (PPE) that is suitable for the potential hazards of the material. PPE (e.g., respirators) may not be needed if engineering controls (e.g., local ventilation) are adequate. An asterisk (*), in the HMIS health field, designates potential chronic or target organ hazards. To adequately address safe handling, ALL information in this MSDS must be considered.

11.1.4 D: First-Aid Measures

Inhalation:	If symptomatic, move to fresh air. Get medical attention if symptoms persist.
Eyes:	Any material that contacts the eye should be washed out immediately with water. Get medical attention if symptoms occur.
Skin:	Wash with soap and water. Get medical attention if symptoms occur.
Ingestion:	Drink 1-2 glasses of water. Seek medical attention. Never give anything by mouth to an unconscious person.

© 2009 Esec Ltd.

11.1.5 E: Fire Fighting Measures

Extinguishing Media:	Use appropriate agent for adjacent fire.
Special Fire-Fighting Procedures:	None (noncombustible)
Hazardous Combustion Products:	None (noncombustible)
Unusual Fire and Explosion Hazards:	None

11.1.6 F: Accidental Release Measures

Flush to sewer with large amounts of water. Otherwise, absorb spill with vermiculite or other inert material, then place in a container for chemical waste. Clean surface thoroughly to remove residual contamination.

/ (May 29, 2009)

11.1.7 G: Handling and Storage

Personal Precautionary Measures:	No special precautionary measures should be needed under anticipated conditions of use.
Prevention of Fire and Explosion:	No special precautionary measures should be needed under anticipated conditions of use.
Storage:	Keep container closed.

11.1.8 H: Exposure Controls/Personal Protection

Exposure Limits:	Not established
Ventilation:	None should be needed.
Respiratory Protection:	None should be needed.
Eye Protection:	None should be needed.
Skin Protection:	None should be needed.
Recommended Decontamination Facilities:	Eye bath, safety shower, washing facilities

11.1.9 I: Physical and Chemical Properties

Physical Form:	Liquid
Color:	Colorless
Odor:	Sweet
Specific Gravity (water = 1):	1.00
Vapor Pressure at 20×C (68×F):	24 mbar (18 mm Hg)
Vapor Density (Air = 1):	0.6
Evaporation Rate (n-butyl acetate = 1):	0.4
Volatile Fraction by Weight:	>99%
Boiling Point:	>100°C (>212°F)
Solubility in Water:	Complete
pH:	8.6
Flash Point:	None, noncombustible liquid

© 2009 Esec Ltd.

11.1.10 J: Stability and Reactivity

Stability:	Stable
Incompatibility:	None with common materials and contaminants with which the material may reasonably come into contact.
Hazardous Polymerization:	Will not occur.

11.1.11 K: Toxicological Information

Effects of Exposure:

Inhalation:	Low hazard for recommended handling.
Eyes:	No specific hazard known. May cause transient irritation.
Skin:	Low hazard for recommended handling.
Ingestion:	Expected to be a low ingestion hazard.

11.1.12 L: Ecological Information

Introduction

This environmental effects summary is written to assist in addressing emergencies created by an accidental spill which might occur during the shipment of this material, and, in general, it is not meant to address discharges to sanitary sewers or publicly owned treatment works.

Summary

Data for the major components of this material have been used to estimate the environmental impact of this material. However, this material itself, has not been tested for environmental effects.

It is expected to have the following properties: a low biochemical oxygen demand and little potential to cause oxygen depletion in aqueous systems, a low potential to affect aquatic organisms, a low potential to affect secondary waste treatment microbial metabolism, a low potential to bioconcentrate. When diluted with a large amount of water, this material released directly or indirectly into the environment is not expected to have a significant impact.

11.1.13 M: Disposal Considerations

Discharge, treatment, or disposal may be subject to national, state, or local laws. Flush to sewer with large amounts of water.

11.1.14 N: Transport Information

For transportation information regarding this product call the Kodak Worldwide Transportation Hazmat Hot Line: (716) 722-2400 between 8 a.m. and 5 p.m.

(Eastern Standard Time), Monday through Friday.

© 2009 Esec Ltd.

/ (May 29, 2009)

11.1.15 O: Regulatory Information

- Material(s) known to the State of California to cause cancer: None
- Material(s) known to the State of California to cause adverse reproductive effects: None

Carcinogenicity Classification (components present at 0.1% or more):

- American Conference of Governmental Industrial Hygienists (ACGIH): None
- International Agency for Research on Cancer (IARC): None
- National Toxicology Program (NTP): None
- Occupational Safety and Health Administration (OSHA): None
- Chemical(s) subject to the reporting requirements of Section 313 or Title

III of the Superfund Amendments and Reauthorization Act (SARA) of 1986 and 40 CFR Part 372: None

11.1.16 P: Other Information

US/Canadian Label Statements:

LOW HAZARD FOR RECOMMENDED HANDLING

Keep out of reach of children.

For additional information, see Material Safety Data Sheet (MSDS) for this material.

The information contained herein is furnished without warranty of any kind. Users should consider these data only as a supplement to other information gathered by them and must make independent determinations of suitability and completeness of information from all sources to assure proper use and disposal of these materials and the safety and health of employees and customers and the protection of the environment.

R-1, S-1, F-0, C-0

© 2009 Esec Ltd.

11.2 MSDS METALON HT-1.5

ILO/WHIMS MATERIAL SAFETY DATA SHEET No. 0041

Emergency No: (613) 996-6666

Approval Date: 06/13/1994

Revision Date: 02/01/2006

11.2.1 A1: Company Identification, A2: Chemical Product

Metalon Products (a division of Professional Products of Canada Inc.)

2150Winston Park Drive Unit #18

Oakville, Ontario L6H 5V1

Tel: (905) 829 4826, Fax: (905) 829 4828

Product name: METALON HT-1.5 (high-tech EP grease)

Chemical formula: Complex lubricant

Product family: Anti-wear friction fighter

Material/Use: Grease / Lubrication

T.D.G. Classification: Not regulated

ESEC Part No. 240.0011.1

© 2009 Esec Ltd.

11.2.2 B: Composition / Information on Ingredients, C: Hazards Identification

hazardous ingredients	%	T.L.V.	C.A.S. Nº	LD/50 route, species	LC/50 route, species
Over-based Calcium Sulfonate	70–90	not applicable	none applicable	not available	not available
Chloro Alkanes	5–30	not available	61788-76-9	7 mg/kg rat oral	not applicable

11.2.3 D: First-Aid Measures

Skin Contact: Wash affected area, remove contaminated clothing. If irritation persists, consult a doctor

Eye Contact: Flush eyes with large quantities of water for at least 15 minutes. Get medical attention

Inhalation: Remove victim to fresh air. If victim is not breathing, begin artificial respiration immediately. Get immediate medical attention.

Ingestion: Dilute with large quantities of water. Do not induce vomiting. Get immediate medical attend.

/ (May 29, 2009)

11.2.4 E: Fire-Fighting Measures

Flammability:	Not applicable
If yes, under which conditions:	Not applicable
Means of extinction:	Water fog, carbon dioxide, dry chemical, foam
Special procedures:	Keep storage containers cool in fire vicinity. Fire fighters should wear self-contained breathing apparatus and protective clothing.
Flash point ºC (ºF):	> 235 °C (>455ºF), closed cup method
Auto ignition temperature:	Not established
Explosion limit upper/lower:	Not applicable
Hazardous combustion products:	Oxides of carbon
Sensitivity to static discharge:	No
Sensitivity to impact:	No, not under normal handling conditions

11.2.5 F: Accidental Release Measures

Leak/spill...small spills:	Stop flow, contain material, collect in proper containers, remove all sources of ignition, provide adequate ventilation.

11.2.6 G: Handling and Storage

Handling procedures and equipment:	Handle an open container with care. Handle away from all sources of ignition. Avoid smoking. Keep containers closed.
Storage needs:	Keep away from heat and flame. Keep from freezing. Store at room temperature in well ventilated area.

© 2009 Esec Ltd.

11.2.7 Exposure Controls / Personal Protection

Protective Equipment

Gloves/type	Wear *NEOPRENE* gloves if direct contact is likely.
Respiratory/type	Wearing of *niosh* mask approved for organic vapors (or *scba*), if appropriate.
Eye/type	Splash-proof safety goggles.
Footwear/type	Safety boots per local requirements.
Clothing/type	Wear adequate protective clothes.
Other/type	Emergency shower and eye wash station should be in close proximity to work area.
Engineering Controls:	Local exhaust at points of emission.

11.2.8 I: Physical and Chemical Properties

Physical State:	Paste
Odor/appearance:	Pleasant/rich glossy blue
Odor Threshold:	Not available
Vapor Density (Air = 1):	Not available
Vapor Pressure:	< 5 mm Hg
Volatile:	% by volume: 0.0 % by weight: 0.0
Evaporation Rate:	Not available
Freezing Point:	Not available
Spec. Gravity:	1.0 kg/dm³
Ph Value:	Not applicable
Boiling Point:	Not available
Solubility in H2o 20ºC	Insoluble
Coeff. Water/oil dist.	Not applicable

© 2009 Esec Ltd.

/ (May 29, 2009)

11.2.9 J: Stability and Reactivity

Chemical Stability

Yes	Product is stable, hazardous polymerization will not occur.
No/which conditions	None

Compatibility with other Substances

Yes	
No/which conditions	Strong oxidizers and reducing agents.
Reactivity/what conditions:	Excessive heat, strong oxidizers, acids and strong bases.

Hazardous products of decomposition:Oxides of carbon

11.2.10 K: Toxicological Information

Route of Entry

Skin contact	Possible irritation
Skin absorption	Low order of toxicity
Eye contact	Irritation
Inhalation	Vapors may cause respiratory tract irritation, nausea, headache and dizziness.
Ingestion	May cause nausea, vomiting, diarrhoea, central nervous system depression.

Effects of..

chron.exposure	Conjunctivitis, Tracheitis, Dermatitis, Narcosis,
acute exposure	No evidence of adverse effects.
LD/50 of material, species + route	See sections (B) and (C).
LC/50 of material, species + route	See sections (B) and (C).
Exposure limit of material	See sections (B) and (C).
Irritation cause by material	See effects of acute exposure, see route of entry.
Sensitizing capability of material	In susceptible individuals.
Carcinogenicity of material	None known
Reproductive effects:	None known
Mutagenicity:	None known
Teratogenicity:	None known
Synergistic materials:	None known

© 2009 Esec Ltd.

/ (May 29, 2009)

11.2.11 L: Ecological Information

Leak/spill:

Small spills	See instructions section (F).
Large spills	Prevent run-off into drains, sewers and waterways. Wear protective equipment to protect against hazards and dispose as per approved local waste disposal method.

11.2.12 M: Disposal Considerations

Waste disposal/method and equipment	In accordance with municipal, provincial and federal regulations.

11.2.13 N: Transport Information

T.D.G. classification:	Not regulated.

11.2.14 O: Regulatory Information

This product has been classified in accordance with the hazard criteria of the C.P.R. and the M.S.D.S contains all the information required by the C.P.R.

11.2.15 P: Other Information

Note: This information and data are based on tests, reports and research we believe to be accurate and reliable. It is provided herein without warranty, guarantee or liability on our part, and are therefore provided to customers for their own investigation, verification and consideration.
All Metalon products are proprietary formulations designed and manufactured by and for Metalon products to its specifications. Further use of the copyrighted information provided herein shall be used "as is". Any omission, substitution, deletion or alteration whatsoever is strictly prohibited.

© 2009 Esec Ltd.

11.3 MSDS MICROLUBE GL261

MATERIAL SAFETY DATA SHEET

According to 1907/2006/EXC, Article 31

11.3.1 A1: Company Identification, A2: Chemical Product

Trade name:	MICROLUBE GL 261
Article number:	020195
Application of the substance / the preparation:	Grease
Manufacturer/Supplier:	KLÜBER LUBRICATION MÜNCHEN KG Geisenhausenerstrasse 7 D-81379 München Tel.: 0049 (0) 897876-0 Fax: 0049 (0) 897876-333
Further information obtainable from:	Material Compliance Management
Information in case of emergency:	0011 49 89 7876 700 (24 hrs)
ESEC Part No.	102296452

© 2009 Esec Ltd.

11.3.2 B: Composition / Information on Ingredients

Chemical characterization:	mineral oil, special lithium soap, UV indicator
Dangerous components:	CAS: 68411-46-1 EINECS: 270-128-1 Dioctyldiphenylamine , R 52/53, ≤2.5%
Additional information:	For the wording of the listed risk phrases refer to section *11.3.16* on page *11-16*.

11.3.3 C: Hazards Identification

Hazard description:	not applicable
Information concerning particular hazards for human and environment:	The product does not have to be labelled due to the calculation procedure of the "General Classification guideline for preparations of the EU" in the latest valid version.
Classification system:	The classification is according to the latest editions of the EU-lists, and extended by company and literature data.

/ (May 29, 2009)

11.3.4 D: First-aid Measures

After inhalation:	Supply fresh air; consult doctor in case of complaints.
After skin contact:	Wash off with soap and plenty of water.
After eye contact:	Rinse opened eye for several minutes under running water. If symptoms persist, consult a doctor.
After swallowing:	If symptoms persist consult doctor.

11.3.5 E: Fire-fighting Measures

Suitable extinguishing agents:	• Water haze • foam • fire-extinguishing powder • carbon dioxide
For safety reasons unsuitable extinguishing agents:	Water with full jet
Special hazards caused by the substance, its products of combustion or resulting gases:	Carbon monoxide (CO), hydrocarbons
Protective equipment:	Do not inhale explosion gases or combustion gases. Standard procedure for chemical fires.
Additional information:	Cool endangered receptacles with water spray. Dispose of fire debris and contaminated fire fighting water in accordance with official regulations.

11.3.6 F: Accidental Release Measures

Person-related safety precautions:	Not required.
Measures for environmental protection:	Do not allow to enter sewers / surface or ground water.
Measures for cleaning/collecting:	Pick up mechanically. Dispose of the material collected according to regulations.
Additional information:	No dangerous substances are released.

© 2009 Esec Ltd.

11.3.7 G: Handling and Storage

Handling:

Information for safe handling:	No special measures required.
Information about fire - and explosion protection:	No special measures required.

Storage:

Requirements to be met by storerooms and receptacles:	Store in cool, dry conditions in well sealed receptacles.
Information about storage in one common storage facility:	Store away from foodstuffs. Store away from oxidizing agents.
Further information about storage conditions:	None.

11.3.8 H: Exposure Controls / Personal Protection

Additional information about design of technical facilities:	No further data; see section *11.3.7* on page *11-14*.
Ingredients with limit values that require monitoring at the workplace:	The product does not contain any relevant quantities of materials with critical values that have to be monitored at the workplace.
Additional information:	The lists valid during the making were used as basis.

Personal Protective Equipment:

General protective and hygienic measures:	Immediately remove all soiled and contaminated clothing Avoid close or long term contact with the skin. Be sure to clean skin thoroughly after work and before breaks.
Respiratory protection:	Not required.

11.3.9 I: Physical and Chemical Properties

General Information:

Form:	Pasty
Colour:	Yellow-brown
Odour:	Product specific

© 2009 Esec Ltd.

Change in Condition:

Drip point:	> 220°C (DIN ISO 2176)
Flash point:	Not applicable
Danger of explosion:	Product does not present an explosion hazard.
Density at 20°C:	~ 0.89 g/cm³
Solubility in / Miscibility with water:	Insoluble

11.3.10 J: Stability and Reactivity

Thermal decomposition / conditions to be avoided:	No decomposition if used and stored according to specifications.
Materials to be avoided:	Oxidizing agents
Dangerous reactions	No dangerous reactions known.
Dangerous decomposition products:	None under normal use

© 2009 Esec Ltd.

11.3.11 K: Toxicological Information

Additional toxicological information:	Prolonged skin contact may cause skin irritation and/or dermatitis.

11.3.12 L: Ecological Information

Ecotoxical Effects:

Behaviour in sewage processing plants:	The product can be mechanically separated.
General notes:	Do not allow product to reach ground water, water course or sewage system.

11.3.13 M: Disposal Considerations

Product:

Waste disposal key:	For this product no waste disposal key according the European Waste Catalogue (EWC) can be determined, as only the purpose of application defined by the user enables an allocation. The waste code number has to be determined in accordance with the local waste disposer.

/ (May 29, 2009)

Uncleaned Packaging:

Recommendation:	Empty contaminated packagings thoroughly. They may be recycled after thorough and proper cleaning.

11.3.14 N: Transport Information

Land transport ADR/RID (cross-border):	ADR/RID class: -
Maritime transport IMDG:	IMDG Class: -
Air transport ICAO-TI and IATA-DGR:	ICAO/IATA Class: -
Transport/Additional information:	Not classified as dangerous according to the above specifications.

11.3.15 O: Regulatory Information

Labelling according to EU guidelines:	The product is not subject to classification according to the calculation methods of the "General Classification Guideline for Preparations of the EU" as issued in the latest valid version.
Special labelling of certain preparations:	Safety data sheet available for professional user on request.

© 2009 Esec Ltd.

11.3.16 P: Other Information

This information is based on our present knowledge. However, this shall not constitute a guarantee for any specific product features and shall not establish a legally valid contractual relationship.

Relevant R-phrases	52/53 Harmful to aquatic organisms, may cause long-term adverse effects in the aquatic environment.
Department issuing MSDS:	Material Compliance Management
Contact:	+49(0)897876-1564

/ (May 29, 2009)

11.4 MSDS MOLYKOTE (R) PG 602

MATERIAL SAFETY DATA SHEET

Conformable to EC directive 91/155 EEC

11.4.1 A1: Company Identification, A2: Chemical Product

Dow Corning Europe

62, Rue General De Gaulle

1310 La Hulpe

Brussels, Belgium

Service Phone:	Dow Corning Northern Europe++44 1676 528 000
Emergency phone:	Dow Corning (Barry, GB 24h)++44 1446 732 350
	Dow Corning (Brussels, B)++32 2 6552111
Health & Safety Information:	Health, Environment and Reg. Affairs++32 2 6552523
	Department, Dow Corning, Brussels, B.++32 2 6552304
Product name:	MOLYKOTE (R) PG 602
ESEC Part No.	240.0029.1

© 2009 Esec Ltd.

11.4.2 B: Composition / Information on Ingredients

Chemical characterization: Organic grease (Preparation)

Hazardous ingredients (According to Commission Directive 88/379/EEC (Article 3 [6a])

CAS-No.	Components	%(w/w) Symbols & Health Risk Phrases
Mixture	Mineral Oils	>75

11.4.3 C: Hazards Identification

Not hazardous.

11.4.4 D: First Aid Measures

Skin:	Wipe off and wash with soap and water.
Eyes:	Flush with water
Inhalation:	Remove to fresh air
Ingestion:	Treat symptomatically
Other first aid information:	Not applicable

/ (May 29, 2009)

11.4.5 E: Fire-Fighting Measures

Suitable extinguishing media:	Carbon dioxide, foam, dry powder or fine water spray
Unsuitable extinguishing media:	None known
Unusual fire fighting hazards:	When burned, toxic vapours are evolved
Special fire fighting procedures:	Self-contained respirator and protective clothing should be worn. Determine the need to evacuate or isolate the area according to your local emergency plan
Combustion products:	Carbon dioxide and traces of incompletely burned carbon products Metal products Formaldehyde. Silica Chlorine products Fluorine products.

11.4.6 F: Accidental Release Measures

Personal precautions:	Avoid eye contact Avoid prolonged or repeated skin contact.
Environmental precautions:	None established, do not allow large quantities to enter drains.
Methods for cleaning/taking up:	Scrape up and place in a container fitted with a lid.
Additional information:	None.

© 2009 Esec Ltd.

11.4.7 G: Handling and Storage

Handling:

Handling precautions:	General ventilation is recommended Avoid eye contact Avoid prolonged or repeated skin contact.

Storage

Unsuitable packaging materials:	None known
Incompatible materials:	None known
Further information on storage conditions:	None known

/ (May 29, 2009)

11.4.8 H: Exposure Controls/Personal Protection

Exposure controls: Refer to section 7

Exposure controls for hazardous components

CAS-No.	Components	Exposure limits (according to Health and Safety executive document EH40)
Mixture	Mineral Oils	5.00 mg/m^3 (OES,8hr TWA)

Personal protective equipment:

Respiratory protection:	Respiratory protection should be worn if the product is used in large quantities, confined spaces or in other circumstances where the OEL may be approached or exceeded.
Hand protection:	Rubber or plastic gloves should be worn, where repeated or prolonged contact can occur.
Eye protection:	Safety glasses should be worn.
Skin:	Additional protective equipment is not normally required
Other protection measures:	None known
General protection and hygiene:	Exercise good industrial hygiene practice. Wash after handling, especially before eating, drinking or smoking.

© 2009 Esec Ltd.

11.4.9 I: Physical and Chemical Properties

Appearance

Form:	Grease
Colour:	White
Odour:	Slight

Safety data

Safety related information (This information is not intended for use in preparing product specifications. Contact Dow Corning before writing specifications):

pH:	Not determined
Boiling point/boiling range:	Not determined
Melting point/melting range:	Not determined
Flashpoint:	Not applicable
Flammability (solid, gas):	Not determined
Auto flammability:	Not determined
Explosive properties:	Not determined
Oxidizing properties:	Not determined

Vapour pressure:	Not determined
Specific gravity:	0.96
Solubility in water:	Not determined
Solubility in fat:	Not determined
log n-octanol/water partition coefficient:	Not determined

Other data:

Vapour density (air = 1):	Not determined
Evaporation rate (ethyl ether = 1):	Not determined
Viscosity:	Not determined
% Volatiles:	Not determined

11.4.10 J: Stability and Reactivity

Stability:	Stable
Conditions to avoid:	None known
Materials to avoid:	Can react with strong oxidizing agents.
Hazardous decomposition products:	If this product is heated to > 150×C trace quantities of formaldehyde may be released, and adequate ventilation is required.
Additional information:	None

© 2009 Esec Ltd.

11.4.11 K: Toxicological Information

Possible health effects:

Skin:	Can irritate on prolonged or repeated contact.
Eyes:	May cause temporary discomfort.
Inhalation:	No adverse effects are normally expected.
Oral:	No adverse effects are normally expected.

This information is based either on test data, extrapolation from tests on similar materials, review of component data, or a combination of these sources.

Other health hazard information:

Product may emit formaldehyde vapours at temperatures above 150×C in the presence of air. Formaldehyde vapour is harmful by inhalation and irritating to eyes and respiratory system at breathing concentrations less than one part per million (1 ppm).

Occupational exposure measurement and control within established limits is necessary for applications where formaldehyde may be formed to ensure worker health and safety.

/ (May 29, 2009)

Detailed information concerning current formaldehyde exposure limits can be found in UK HSE EH40 Occupational Exposure Limits.

11.4.12 L: Ecological Information

Environmental fate and distribution:

Air:	Not applicable
Water:	No specific information is available
Terrestrial environment:	No specific information is available

Ecotoxicity:

Toxicity to bacteria and effect on effluent treatment: No test data or other information is available on the effect on bacteria.

Toxicity to aquatic organisms: Not determined

Fish LC50 (96hr):	Not determined
Daphnia EC50 (48hr):	Not determined
Algal IC50 (72hr):	Not determined

Toxicity to terrestrial organisms: No specific information is available

Bioconcentration:	No specific information is available

Persistence and degradation:

BOD:	No specific information is available
COD:	No specific information is available
Degradation:	No specific information is available

11.4.13 M: Advice on Disposal

Product Disposal:	Can be incinerated or land-filled in accordance with local regulations. Landfilling of large quantities may not be appropriate, check with Dow Corning first.
Dispose of contaminated packaging and recommended cleaning:	Packaging should be disposed of in accordance with regional and/or national regulations.

11.4.14 N: Transport Information

Road & rail transport (ADR/RID):Not subject to ADR.

Sea transport (IMO):	Not subject to IMDG code.
Air transport (ICAO):	Not subject to ICAO regulations.

© 2009 Esec Ltd.

11.4.15 O: Regulatory Information

EEC Supply classification & labelling (According to 93/18/EEC as adapted for the 3rd time to technical progress commission directive 88/379/EEC).

Contains:	NOT APPLICABLE
S24/25:	Avoid contact with skin and eyes.
S41:	In case of fire and/or explosion do not breathe fumes.

National legislation:

For product information in other EC languages, including appropriate national legislation, please contact the sales office at the above address.

Other regulations:

German waste number:	Not determined
German water class:	Not applicable
German Vbf:	Not applicable
Ozone depleting chemicals:	No ozone depleting chemicals are present or used in manufacture.
EINECS/ELINCS:	All ingredients listed or exempt
TSCA:	Not determined
MITI:	All ingredients listed or exempt
DSL:	Not determined
AICS:	Not determined

© 2009 Esec Ltd.

11.4.16 P: Other Information

This product safety data sheet was prepared in compliance with Commission Directive 93/112/EC, 67/548/EEC and 88/379/EEC as well as their relevant amendments, on the approximation of laws, regulations and administrative provisions relative to the classification, packaging and labelling of dangerous substances and preparations.

It is the responsibility of persons in receipt of this Product Safety Data Sheet to ensure that the information contained herein is properly read and understood by all people who may use, handle, dispose or in any way come in contact with the product. If the recipient subsequently produces a formulation containing the Dow Corning product, it is the recipient's sole responsibility to ensure the transfer of all relevant information from the Dow Corning Product Safety Data Sheet to their own Product Safety Data Sheet in compliance with Commission Directive 88/379/EEC.

All information and instructions provided in this Safety Data Sheet (SDS) are based on the current state scientific and technical knowledge at the date indicated on the present SDS. Dow Corning shall not be held responsible for any defect in the product covered by this SDS should the existence of such defect not be detectable considering the current state of scientific and technical knowledge.

Please note: for customers sourcing Dow Corning products in regions other than the European Union, the Safety Data Sheet will reflect the requirements of existing

local legislation. This may result in a different format and presentation of hazard classification information.

/ (May 29, 2009)

11.5 MSDS NEVER SEEZ

MATERIAL SAFETY DATA SHEET

NSN: 803000N036842

11.5.1 A1: Company Identification, A2: Chemical Product

Bostik Inc

Boston Street

Middletown 01949, MA

U.S.A.

Service Phone:	508-777-0100
Emergency phone:	508-777-0100
MSDS prepared:	08 SEP93
Safety Data Review Date:	04 APR95
MSDS Serial Number:	BXQBT
Product name:	NEVER SEEZ REGULAR GRADE, 057940
ESEC Part No:	240.0012.1

11.5.2 B: Composition / Information on Ingredients

Chemical characterization: Grease

Ingredients:

CAS-No.	NIOSH-No.	Components	%	OSHA PEL	ACGIH TLV
7782-42-5	MD9659600	Graphite (synthetic)	21.5	15 MPPCF; Z-3	2 MG/M3 RDUST
7440-50-8	GL5325000	Copper (copper powder) (SARA 313) (CERCLA)	15	0.1 MG/M3 FUME; 1 DUST	0.2 MG/M3 FUME
1314-13-2	ZH4810000	Zinc Oxide (SARA 313) (CERCLA)	2.3	15 MG/M3 TDUST	10 MG/M3 TDUST
7429-90-5	BD0330000	Aluminum (Aluminum Flake) (SARA 313)	2.7	15 MG/M3 DUST	10 MG/M3 DUST

© 2009 Esec Ltd.

/ (May 29, 2009)

11.5.3 C: Hazards Identification

LD50-LC50 mixture:	None specified by manufacturer
Route of entry - inhalation:	YES
Route of entry - skin:	YES
Route of entry - ingestion:	NO
Health haz acute and chronic:	Irritation, dry throat, mucuous membrane irritation, weakness, coughing, nausea, fever. Chronic: long term overexposure to the hazardous materials in this product have been eyes, kidneys, liver, respiratory system, skin, lung.
Carcinogenicity - NTP:	NO
Carcinogenicity - IARC:	NO
Carcinogenicity - OSHA:	NO
Explanation Carcinogenicity:	Not relevant.
Signs/Symptoms of overexp:	See health hazards
Med cond aggravated by exp:	Asthma, respiratory diseases.

11.5.4 D: First Aid Measures

Skin:	Flush with copious amounts of water. Call MD (FP N).
Eyes:	Immediately flush eyes with plenty of water for at least 15 minutes. Call MD.
Inhalation:	Remove to fresh air. If not breathing give artificial respiration, preferably mouth to mouth. If breathing is difficult, give oxygen. Call MD.
Ingestion:	Call MD immediately (FP N).
Other first aid information:	Not applicable

11.5.5 E: Fire-Fighting Measures

Suitable extinguishing media:	Water spray, foam, dry chemical, carbon dioxide
Unsuitable extinguishing media:	None known
Unusual fire fighting hazards:	None known to manufacturer
Special fire fighting procedures:	Use NIOSH/MSHA approved SCBA and full protective equipment (FP N).
Combustion products:	

© 2009 Esec Ltd.

/ (May 29, 2009)

11.5.6 F: Accidental Release Measures

Personal precautions:	Use with adequate ventilation. Avoid prolonged or repeated breathing of vapors. Avoid skin contact.
Environmental precautions:	None specified by manufacturer.
Methods for cleaning/taking up:	If liquid, soak up with absorbent material such as sand, earth sweeping compound or some other absorbent material. Package absorbent material or solid product in steel drums which are in good condition. Thoroughly clean area where spill occurred.
Neutralizing agent:	None specified by manufacturer.
Additional information:	None.

11.5.7 G: Handling and Storage

Handling:

Handling precautions:	Use with adequate ventilation, avoid prolonged or repeated breathing of vapors. Avoid skin contact.

Storage

Unsuitable packaging materials:	None known
Incompatible materials:	None known
Further information on storage conditions:	Store in cool location (60-80F) away from sunlight and any source of heat. Keep container tightly closed when not being used.

11.5.8 H: Exposure Controls/Personal Protection

Personal protective equipment:

Respiratory protection:	Use NIOSH/MSHA approved respirator appropriate for exposure of concern (FP N). Ventilation not normally required.
Hand protection:	Cloth gloves.
Eye protection:	ANSI approved chemical workers goggles (FP N).
Skin:	Additional protective equipment is not normally required
Other protective equipment:	Safety shower and eye bath.
General protection and hygiene:	None specified by manufacturer.

© 2009 Esec Ltd.

11.5.9 I: Physical and Chemical Properties

Appearance

Form:	Grease
Colour:	Silvery Gray
Odour:	Greaselike

Safety data

pH:	Not determined
Boiling point/boiling range:	875 F, 468 C
Melting point/melting range:	Not determined
Flashpoint:	482 F, 250 C (method OC)
Flammability (solid, gas):	Not determined
Auto flammability:	Not determined
Explosive properties:	Not determined
Oxidizing properties:	Not determined
Vapour pressure:	Not determined
Specific gravity:	1.36
Solubility in water:	0.0 %
Solubility in fat:	Not determined

Other data:

Vapour density (air = 1):	Not determined
Evaporation rate (ethyl ether = 1):	Not determined
Viscosity:	Not determined
% Volatiles by Volume:	0.0

11.5.10 J: Stability and Reactivity

Stability:	Stable
Conditions to avoid:	None specified by manufacturer
Materials to avoid:	Strong mineral acids, magnesium
Hazardous decomposition products:	Unknown due to complex nature of this material. Fumes from complete/incomplete combust of this matl may incl. carbon (SUPDAT).
Hazardous poly occur:	No

© 2009 Esec Ltd.

/ (May 29, 2009)

11.5.11 K: Toxicological Information

Possible health effects:

Skin:	No specific information is available
Eyes:	No specific information is available
Inhalation:	No specific information is available
Oral:	No specific information is available

11.5.12 L: Ecological Information

Environmental fate and distribution:

Air:	No specific information is available
Water:	No specific information is available
Terrestrial environment:	No specific information is available

Ecotoxicity:

Toxicity to bacteria and effect on effluent treatment: No test data or other information is available on the effect on bacteria.

Toxicity to aquatic organisms: No specific information is available

Fish LC50 (96hr):	No specific information is available
Daphnia EC50 (48hr):	No specific information is available
Algal IC50 (72hr):	No specific information is available

Toxicity to terrestrial organisms: No specific information is available

Bioconcentration:	No specific information is available

Persistence and degradation:

BOD:	No specific information is available
COD:	No specific information is available
Degradation:	No specific information is available

11.5.13 M: Advice on Disposal

Waste Disposal Method:	Disp of I/A/W Fed, state and local rules. Be aware that state and local reqs may differ widely depending on location and may in many cases be different from Fed. regs. When intending to dispose of matl, user is advised that prod would not be (SUPDAT)

© 2009 Esec Ltd.

11.5.14 N: Transport Information

Road & rail transport (ADR/RID):No specific information is available.

Sea transport (IMO): No specific information is available.

Air transport (ICAO): No specific information is available.

11.5.15 O: Regulatory Information

Label required: YES

Label Date: 04APR95

Label status: G

Other regulations: No specific information is available.

11.5.16 P: Other Information

No specific information is available.

© 2009 Esec Ltd.

11.6 MSDS Loctite 221 (R) Threadlocker

Material Data Safety Sheet No. 173033, Version V001.4

Revision Date: 02.10.2007

11.6.1 A1: Company Identification, A2: Chemical Product

Henkel & Cie AG

Adhesives Technologies

Salinenstrasse 61

4133 Pratteln

Switzerland

Phone: +41 (61) 825 7000

Fax-no.: +41 (61) 825 73 33

E-mail address of person responsible for Safety Data Sheet:

ua-productsafety.uk@uk.henkel.com

24 Hours Emergency Information:

+44(0)8701906777

ESEC Part No. 102257233

© 2009 Esec Ltd.

11.6.2 B: Composition / Information on Ingredients

General Chemical Description:

Methacrylate resin based threadlocker

Declaration of Ingredients According to EC/1907/2006:

Hazardous components CAS-No.	EINECS ELINCS	Content	Classification
Cumene hydroperoxide	201-254-7	> 1 ≤ 3%	O - Oxidizing; R7
80-15-9			T - Toxic; R23
			Xn - Harmful; R21/22, R48/20/22
			C - Corrosive; R34
			N - Dangerous for the environment; R51, R53
Cumene	202-704-5	> 0,1 ≤ 1%	R10
98-82-8			Xn - Harmful; R65
			Xi - Irritant; R37
			N - Dangerous for the environment; R51, R53
N,N-dimethyl-o-toluidine	210-199-8	> 0,1 ≤ 1%	T - Toxic; R23/24/25
609-72-3			R33
			R52, R53

For full text of the R-Phrases indicated by codes see section *11.6.16* on page *11-36*.

Substances without classification may have community workplace exposure limits available.

11.6.3 C: Hazards Identification

R20 Harmful by inhalation.

R36/37 Irritating to eyes and respiratory system.

R52/53 Harmful to aquatic organisms, may cause long-term adverse effects in the aquatic environment.

11.6.4 D: First Aid Measures

Inhalation:

Move to fresh air. If symptoms persist, seek medical advice.

Skin Contact:

Rinse with running water and soap. Seek medical advice.

© 2009 Esec Ltd.

Eye Contact:

Rinse immediately with plenty of running water (for 10 minutes). Seek medical attention if necessary.

Ingestion:

Rinse out mouth, drink 1-2 glasses of water, do not induce vomiting. Seek medical advice.

11.6.5 E: Fire Fighting Measures

Combustion Behaviour:

Non flammable product (flash point is greater than 100°C (CC))

Suitable Extinguishing Media:

Foam, extinguishing powder, carbon dioxide

Hazardous Combustion Products:

Trace amounts of toxic and/or irritating fumes may released and the use of breathing apparatus is recommended.

© 2009 Esec Ltd.

11.6.6 F: Accidental Release Measures

Personal Precautions:

Avoid skin and eye contact. Ensure adequate ventilation.

Environmental Precautions:

Do not let product enter drains.

Clean-up Methods:

For small spills wipe up with paper towel and place in container for disposal.

For large spills absorb onto inert absorbent material and place in sealed container for disposal.

11.6.7 G: Handling and Storage

/ (May 29, 2009)

Handling:

Use only in well-ventilated areas. Prolonged or repeated skin contact should be avoided to minimise any risk of sensitisation.

Storage:

Store in original containers at 8-21°C (46.4-69.8°F) and do not return residual materials to containers as contamination may reduce the shelf life of the bulk product.

11.6.8 H: Exposure Controls / Personal Protection

Components with Specific Control Parameters for Workplace:

Valid for Great Britain. Basis: UK EH40 WELs

Ingredient	ppm	mg/m^3	Type	Category	Remarks
CUMENE 98-82-8	20	100	Time Weighted Average (TWA)		EU-2000/39/EC
	50	250	Short Term Exposure Limit (STEL)		EU-2000/39/EC
			Skin designation	Can be absorbed through the skin.	EU-2000/39/EC
	25	125	Time Weighted Average (TWA)		EH40 WEL
	50	250	Short Term Exposure Limit (STEL)		EH40 WEL
			Skin designation	Can be absorbed through the skin.	EH40 WEL

Respiratory Protection:

Use only in well-ventilated areas.

Hand Protection:

The use of chemical resistant gloves such as Nitrile are recommended.

Please note that in practice the working life of chemical resistant gloves may be considerably reduced as a result of many influencing factors (e.g. temperature). Suitable risk assessment should be carried out by the end user. If signs of wear and tear are noticed then the gloves should be replaced.

Eye Protection:

Wear protective glasses.

Body Protection:

Wear suitable protective clothing.

General Protection and Hygiene Measures:

Good industrial hygiene practices should be observed.

© 2009 Esec Ltd.

11.6.9 I: Physical and Chemical Properties

General Charactersistics

Appearance	liquid, purple
Odor:	characteristic

Phys./Chem. Properties

pH-value	3,00 - 6,00
Boiling point	> 150,0 °C (> 302 °F)
Flash point	> 100 °C (> 212 °F)
Vapor pressure (25 °C (77 °F))	< 0,13 mbar
Density	1,0800 g/cm3
Solubility (qualitative) (Solvent: Water)	not miscible
Solubility (qualitative) (Solvent: Acetone)	miscible

© 2009 Esec Ltd.

11.6.10 J: Stability and Reactivity

Conditions to Avoid:

Stable under normal conditions of storage and use.

No decomposition if stored and applied as directed.

Materials to Avoid:

Peroxides.

Reaction with strong bases

Reaction with strong acids.

Reaction with strong oxidants.

/ (May 29, 2009)

11.6.11 K: Toxicological Information

Oral Toxicity:

May cause irritation to the digestive tract.

This material is considered to have low toxicity if swallowed.

Inhalative Toxicity:

Harmful by inhalation.

Irritating to respiratory system

Skin Irritation:

This product is considered to have low dermal toxicity.

Prolonged or repeated contact may cause skin irritation.

Eye Irritation:

Irritating to eyes.

11.6.12 L: Ecological Information

Ecotoxicity:

Harmful to aquatic organisms.

May cause long-term adverse effects in the aquatic environment.

Mobility:

Cured adhesives are immobile.

Bioaccumulative potential:

Does not bioaccumulate.

General ecological information:

Harmful to aquatic organisms.

May cause long-term adverse effects in the aquatic environment.

Do not empty into drains / surface water / ground water.

11.6.13 M: Disposal Considerations

Product Disposal:

Dispose of in accordance with local and national regulations.

Contribution of this product to waste is very insignificant in comparison to article in which it is used.

Waste code (EWC):

08 04 09 waste adhesives and sealants containing organic solvents and other dangerous substances.

© 2009 Esec Ltd.

Disposal of Uncleaned Packaging:

After use, tubes, cartons and bottles containing residual product should be disposed of as chemically contaminated waste in an authorised legal land fill site or incinerated.

11.6.14 N: Transportation Information

General Information:

Not hazardous according to RID, ADR, ADNR, IMDG, IATA-DGR.

11.6.15 O: Regulatory Information

Indication of Danger:

Xn - Harmful

Contains

Cumene hydroperoxide

Risk Phrases:

- R20 Harmful by inhalation.
- R36/37 Irritating to eyes and respiratory system.
- R52/53 Harmful to aquatic organisms, may cause long-term adverse effects in the aquatic environment.

Safety Phrases:

- S23 Do not breathe vapour.
- S25 Avoid contact with eyes.
- S26 In case of contact with eyes, rinse immediately with plenty of water and seek medical advice.
- S51 Use only in well-ventilated areas.
- S61 Avoid release to the environment. Refer to special instructions/Safety data sheets.

© 2009 Esec Ltd.

/ (May 29, 2009)

11.6.16 P: Other Information

The labelling of the product is indicated in section *11.6.15* on page *11-35*. The full text of the R-phrases indicted by codes in this safety data sheet are as follows:

- R10 Flammable.
- R21/22 Harmful in contact with skin and if swallowed.
- R23 Toxic by inhalation.
- R23/24/25 Toxic by inhalation, in contact with skin and if swallowed.
- R33 Danger of cumulative effects.
- R34 Causes burns.
- R37 Irritating to respiratory system.
- R48/20/22 Harmful: danger of serious damage to health by prolonged exposure through inhalation and if swallowed.
- R51 Toxic to aquatic organisms.
- R52 Harmful to aquatic organisms.
- R53 May cause long-term adverse effects in the aquatic environment.
- R65 Harmful: may cause lung damage if swallowed.
- R7 May cause fire.

Further Information:

This information is based on our current level of knowledge and relates to the product in the state in which it is delivered. It is intended to describe our products from the point of view of safety requirements and is not intended to guarantee any particular properties.

This safety data sheet was prepared in accordance with Council Directive 67/548/EEC and it's subsequent amendments, and Commission Directive 1999/45/EC.

© 2009 Esec Ltd.

/ (May 29, 2009)

11.7 MSDS Loctite 243 (R) Threadlocker

MATERIAL SAFETY DATA SHEET

11.7.1 A1: Company Identification, A2: Chemical Product

Loctite Corporation

Rocky Hill, Connecticut 06067

Emergency Phone: (860) 571-5100

Product Name:	Loctite(R) Threadlocker 243 Medium Strength
Item No.:	24077
Product Type:	Anaerobic
ESEC Part No.	240.0224.1

11.7.2 B: Composition / Information on Ingredients

Ingredients	**CAS No.**	**%**
Polyglycol dimethacrylate	25852-47-5	60-65
Polyglycol dioctanoate	18268-70-7	20-25
Poly(vinyl acetate)	9003-20-7	5-10
Poly(ethylene)	9002-88-4	3-5
CUMENE HYDROPEROXIDE[a]	80-15-9	1-3
Castor oil derivative	51796-19-1	1-3
Modified silicon dioxide	68611-44-9	1-3
SACCHARIN	81-07-2	1-3
1-Acetyl-2-phenylhydrazine	114-83-0	0.1-1
MALEIC ACID	110-16-7	0.1-1

a) This component is listed as a SARA Section 313 Toxic Chemical.

Ingredients which have Exposure Limits

Exposure Limits (TWA) Ingredients	ACGIH (TLV)	OSHA (PEL)	OTHER
CUMENE HYDROPEROXIDE	None	None	1ppm(6mg/m3) Skin(WEEL)
Modified silicon dioxide	10mg/m3 (Inhal) 3mg/m3 (Resp)	20 mppcf	6 mg/m3
Exposure Limits (STEL) Ingredients	ACGIH (TLV)	OSHA (PEL)	

© 2009 Esec Ltd.

/ (May 29, 2009)

11.7.3 C: Hazards Identification

Toxicity:	Mild eye irritant. Estimated oral LD50 more than 5000 mg/kg Estimated dermal LD50 more than 2000 mg/kg
Primary Routes of Entry:	None known
Signs and Symptoms of Exposure:	May cause dermatitis on prolonged contact in sensitive individuals

Existing Conditions

Aggravated by Exposure: None known

Ingredients	**Literature Referenced Target Organ and Other Health Effects**	**Carcinogen**		
		NTP	**IARC**	**OSHA**
Polyglycol dimethacrylate	ALG IRR	NO	NO	NO
Polyglycol dioctanoate	IRR	NO	NO	NO
Poly(vinyl acetate)	NTO	NO	N/A	NO
Poly(ethylene)	NTO	NO	N/A	NO
CUMENE HYDROPEROXIDE	ALG CNS COR IRR MUT	NO	NO	NO
Castor oil derivative	No Data	NO	NO	NO
Modified silicon dioxide	NTO	NO	NO	NO
SACCHARIN	NTO	NO	N/A	NO
1-Acetyl-2-phenylhydrazine	ALG BLO KID MUT SOM	NO	NO	NO
MALEIC ACID	IRR KID	NO	NO	NO

Abbreviations

N/A:	Not Applicable	ALG:	Allergen
BLO:	Blood	CNS:	Central nervous system
COR:	Corrosive	IRR:	Irritant
KID:	Kidney	MUT:	Mutagen
NTO:	No Target Organs	SOM:	Evidence of some carcinogenicity

© 2009 Esec Ltd.

11.7.4 D: First Aid Measures

Ingestion:	Do not induce vomiting. Keep individual calm. Obtain medical attention.
Inhalation:	Does not apply
Skin Contact:	Wash with soap and water.
Eye Contact:	Flush at least 15 minutes with water. Obtain medical attention.

11.7.5 E: Fire Fighting Measures

Flash Point:	More than 200°F	Method:Tag Closed Cup
Recommended Extinguishing Agents:	Carbon dioxide, foam, dry chemical	
Special Fire Fighting Procedures:	Not available	
Hazardous Products formed by Fire or Thermal Decomp:	Irritating organic vapors	
Unusual Fire or Explosion Hazards:	None	
Explosive Limits: (% by volume in air) Lower	Not available	
(% by volume in air) Upper	Not available	

11.7.6 F: Accidental Release Measures

Steps to be taken in case of spill or leak:	Soak up in an inert absorbent. Store in a partly filled, closed container until disposal.

11.7.7 G: Handling and Storage

Safe Storage:	Store below 100°F

(Contact Loctite Customer Service 1-800-243-4874 for shelf life information)

Handling:	Avoid prolonged skin contact. Keep away from eyes.

© 2009 Esec Ltd.

11.7.8 H: Exposure Controls / Personal Protection

Eyes:	Safety glasses or goggles.
Skin:	Rubber or plastic gloves.
Ventilation:	Does not apply.
Respiratory:	Not available.
	See section *11.7.2* on page *11-37* for Exposure Limits.

11.7.9 I: Physical and Chemical Properties

Appearance:	Blue liquid
Odor:	Mild
Boiling Point:	More than 300°F
pH:	Does not apply
Solubility in Water:	Slight
Specific Gravity:	1.08 at 68°F
Volatile Organic Compound	
(EPA Method 24)	Not available
Vapor Pressure:	Less than 0.1mm at 80°F
Vapor Density:	Not available
Evaporation Rate (Ether = 1)	Not available

11.7.10 J: Stability and Reactivity

Stability:	Stable
Hazardous Polymerization:	Will not occur
Incompatibility:	None
Conditions to Avoid:	Not available
Hazardous Decomposition Products (non-thermal):	None

11.7.11 K: Toxicological Information

See section *11.7.3* on page *11-38*.

© 2009 Esec Ltd.

11.7.12 L: Ecological Information

No data available.

11.7.13 M: Disposal Considerations

Recommended methods of disposal:	Incinerate following EPA and local regulations.
EPA Hazardous Waste Number:	NH - Not a RCRA Hazardous Waste Material.

11.7.14 N: Transportation Information

DOT (49 CFR 172)

Domestic Ground Transport

Proper Shipping Name:	Unrestricted
Hazard Class or Division:	Unrestricted
Identification Number:	None
Marine Pollutant:	None
IATA Proper Shipping Name:	Unrestricted
Class or Division:	Unrestricted
UN or ID Number:	None

11.7.15 O: Regulatory Information

CA Proposition 65:	This product contains Saccharin. No prop65 hazard warning is necessary if this product is used as reasonably anticipated.

11.7.16 P: Other Information

Estimated NFPA(R) Code:

Health Hazard:	1
Fire Hazard:	1
Reactivity Hazard:	1
Specific Hazard:	Does not apply.

Estimated HMIS(R) Code:

© 2009 Esec Ltd.

Health Hazard:	1
Flammability Hazard:	1
Reactivity Hazards:	1
Personal Protection:	See section *11.7.8* on page *11-40*.

HMIS is a registered trademark of the National Paint and Coatings Assn.

Prepared By:	Stephen Repetto	
Title:	Research Chemist, Environmental Health & Safety	
Company:	Loctite Corp., 1001 Tr Br Cr, Rocky Hill CT 06067	
(24hr.) Phone:	(860) 571-5100	
Revision Date:	October 13, 2000	Revision: 0005

© 2009 Esec Ltd.

11.8 MSDS: Multemp PS2

MATERIAL SAFETY DATA SHEET

MSDS No. 07-490
Product name: Multemp PS2, VS No. 2
Prepared: 2003/03/10

11.8.1 A: Chemical Product and Company Identification

Product name:	Multemp PS2, Multemp VS No. 2
Product code:	07490
Company name:	Kyodo Yushi Co Ltd. Dentsu Kosan Dai-3 Bldg. 2-16-7, Ginza, Chuo-Ku, Tokyo, Japan 104
Emergency telephone no.	03 - 3543 - 5813
ESEC Part No.	102254866

11.8.2 B: Composition / Information on Ingredients

Chemical family:	Lubricating grease
Formula:	not applicable
Components:	Base oil (synthetic ester oil) 75 - 85% Thickener (lithium soap) 15 - 25% Additives (containing barium compound)<5%

11.8.3 C: Hazardous Identification

Class name of hazardous chemicals for SDS in Japan: Not applicable

Physical and chemical hazards:	Combustible
Adverse human health effects:	Prolonged and repeated contact may cause skin irritations.
Environmental effects:	No data available.
NFPA hazard rating:	Health: 1 Fire: 1 Reactivity: 0

© 2009 Esec Ltd.

11.8.4 D: First-aid Measures

Eyes:	Immediately flush with water for at least 15 minutes. Get medical attention if eye irritation persists.
Skin:	Remove excess with cloth or paper and wash area thoroughly with soap and water.
Ingestion:	Consult a physician. Do not induce vomiting.
Inhalation:	Keep the victim warm and quiet. Remove the victim from the contamination immediately to fresh air.
Note to physicians:	Supportive care. Treatment based on judgement of the physician in response to reactions of the patient.

11.8.5 E: Fire Fighting Measures

Flash point:	200 °C (Method: Seta Flash Method)
Flammable limits:	LFL: N/A, UFL: N/A
Auto ignition temperature:	No data available
Hazardous decomposition products:	Thermal decomposition and combustion may produce carbon monoxide and/or carbon dioxide.
Extinguishing media:	• Dry chemical • Wafer fog • CO_2 • Foam • Sand / earth
Fire fighting instructions:	Dens smoke. Fire fighters wear an approved self-contained breathing apparatus. Do not use water except fog.

11.8.6 F: Accidental Release Measures

Procedure for clean-up:	Transfer bulk of mixture into another container. Absorb residue with an inert material such as earth, sand or vermiculite. Sweep up and dispose solid waste in accordance with local, state and federal regulations.
Waste disposal:	Dispose of in accordance with all applicable federal, state and local regulations.

© 2009 Esec Ltd.

/ (May 29, 2009)

11.8.7 G: Handling and Storage

Handling:	Contact with eye may cause irritation. Use protective glasses or other devices to avoid contact with eyes. Contact with skin may cause irritation. Use protective gloves to avoid skin contact.
	Do not swallow (Eating product causes diarrhea and vomiting).
	Wear gloves to avoid injury on hands when opening the container.
	Keep out of reach of children.
Storage:	Keep container closed until ready for use. Storage away from fire source or sunlight and in cool dry area.

11.8.8 H: Exposure Controls / Personal Protection

Control parameters:	None
Engineering measures:	None

Personal Protective Equipment:

Respiratory protection:	Good general ventilation should be sufficient for most conditions.
Eye protection:	Chemical safety goggles and, if handled hot, full face shield.
Hand and body protection:	Protective gloves, rubber or plastic, oil resistant
Other protective equipment:	None

11.8.9 I: Physical and Chemical Properties

Appearance:	Peach white paste
Odor:	Slight odor
Vapor pressure:	N/A
Vapor density:	N/A
Specific gravity:	0.94
Solubility in water:	Negligible
Evaporation rate:	Slower (n-Buthyl Acetate=1)
PH:	N/A
Freezing point:	N/A
Boiling point:	N/A
Melting point:	188°C

© 2009 Esec Ltd.

11.8.10 J: Stability and Reactivity

Stability (conditions to avoid):	Product is stable under normal conditions. Avoid overheating.
Incompatibility (specific materials to avoid):	Strong oxidizers such as hydrogen peroxide, bromine and chromic acid.
Hazardous decomposition products:	Oxide of nitrogen, lithium, barium, sulfur
hazardous polymerization:	None
Reactivity with water:	None

11.8.11 K: Toxicological Information

Corrosive and irritant properties:	No data available
Allergenic and sensitizing effects:	No data available
Acute toxicity:	No data available
Sub-chronic toxicity:	No data available
Chronic toxicity:	Prolonged and repeated skin contact may cause irritation.
Carcinogenic effect:	Not listed IARC, NTP, ACGIH
Mutagenic effects:	No data available
Effects on the reproductive system:	No data available
Teratogenic effects:	No data available

11.8.12 L: Ecological Information

Biodegradability:	No data available
Bioaccumulation:	No data available
Fish toxicity:	No data available

11.8.13 M: Disposal Consideration

Waste disposal method:	Incinerate in accordance with applicable regulation. Attention: Do not use pressure to empty this container. When empty, container may have vapor or product residue. Do not cut, puncture or weld on or near the drum.

© 2009 Esec Ltd.

11.8.14 N: Transport Information

DOT:	Not applicable
UN No.	Not applicable
Fire service law (Japan)	Not applicable

11.8.15 O: Regulatory Information

Regulatory information with regard to this product in your country or your region should be examined by your own responsibility.

US TSCA (Toxic Substances Control Act):
All components of this product are listed on the TSCA Inventory of Chemical Substances.

US OSHA (Occupational Safety and Health Act):
This product is not hazardous according to the OSHA Hazard Communication Standard, 29 CFR 1910.1200.

US CERCLA (comprehensive Environmental Release, Compensation & Liability Act):
This product contains no CERCLA Hazardous Substances.

US SARA (Superfund Amendment & Reauthorization Act) Title III:
This product contains no Extremely Hazardous Substances.
SARA Hazard Categories (311/312): None
SARA Toxic Release Inventor (TRI) (313): Barium compounds (0.3 - 0.7%)

© 2009 Esec Ltd.

11.8.16 P: Other Information

Information contact:	Kyodo Yushi Co Ltd. Technical Headquarters 1-4-1 Tsujido Kandai Fujisawa City, Kanagawa Pref. Japan Tel. 0466 - 33 - 3111
Reference:	CMA Interim Guideline for the Preparation of MSDS Chapter 7: MSDS Examples ACGIH Threshold Limit Values for Chemical Substances in the Work Environment (1998-1999).
Original date:	2001 / 9 / 28
Revision date:	2003 / 3 / 10

This MSDS is an addition and complementory document beside the technical data sheet. The information is based upon our knowledge about the product at the date of edition. Since we cannot anticipate or control the different conditions under which these information or our product may be used, we make no guarantee that recommendations will be adequate for all individuals and situations.

/ (May 29, 2009)

© 2009 Esec Ltd.

/ (May 29, 2009)

12 InfoSheets

CAUTION

For better visibility of subjacent functions covers have been removed before taking pictures. In standard operating mode all covers have to be in place at any time (see Safety Chapter).

Information Sheets Description

Since the step by step procedures for calibration, set up etc. are described as short as possible they provide no additional information i.e. about the reason of an adjustment. At work steps where background information can be provided, it can be found on an information sheet in this chapter.

The numbered information pictogram which is placed next to the text is referring to the appropriate information sheet.

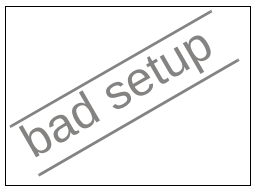
Example:

i 8 Define the correct adapter type.

This system enables the experienced user to proceed quickly through the procedures. The unexperienced user which sometimes need more information to correctly carry out a procedure can get this information out of the information sheets.

In addition, the information sheets can be used for selfstudies or as handouts during a training.

Some information sheets show pictures of examples with bad settings. To avoid misunderstandings, these pictures are marked with a stamp **bad setup** as shown beside.



© 2009 Esec Ltd.

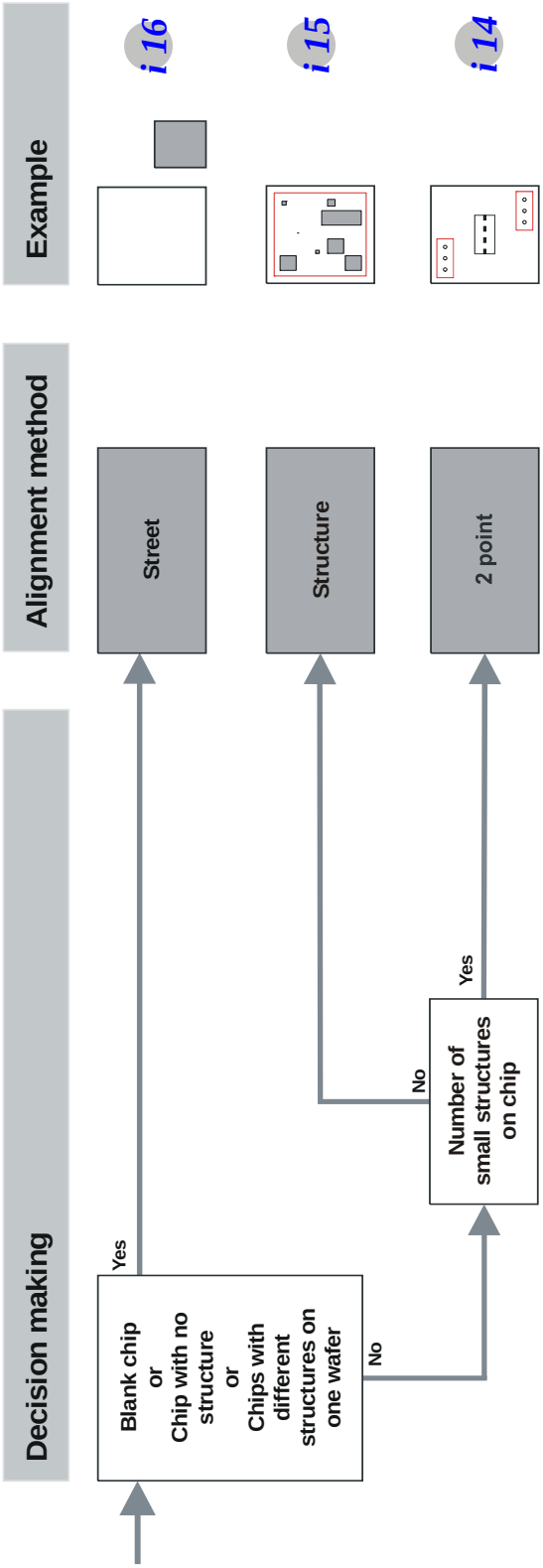
i 1 Overview Wafer Tests and Process Modes

Alignment method	Defines how the chips are aligned.	i 2
Inkdot test	Checks the chips for inkdots.	i 4 i 21 i 22
Corner test	Checks the chip corners for damages.	i 5 i 18 i 19
Surface test	Checks the surface for damages.	i 5 i 20
Chip quality level	Defines the quality level of the templates required.	i 34
Blank test	Will not pick blank chips (street alignment).	i 34
Process direction	Defines in which direction the wafer is processed.	i 13
Broken wafer	Will skip rows when missing chips are found.	i 31
Border mode	Will skip bad chips at the wafer border.	i 32
Local mapping	Will skip inked chips during production.	i 35
Retry mode	Will align a chip a second time when the first alignment fails.	i 34
Brightness correction	Will adjust illumination after each chip.	i 34
Alternate pattern	Will try to align the chip with an alternate pattern when the first alignment fails.	i 27
Microstep alignment	Will align each chip for a second time.	i 34
Wafer handler speed up	Defines how to speed up the wafer handler.	i 34
Special step	Can process wafers with two different chip sizes on it.	i 37

© 2009 Esec Ltd.

i 2 Selection of an Alignment Method

The following chart can help you to choose the right alignment method for most of the cases.

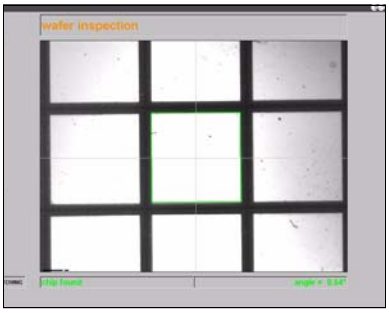


Note: Due to the increased cycle time for the alignment when using pre alignment, it is recommended to use pre alignment only if necessary.

© 2009 Esec Ltd.

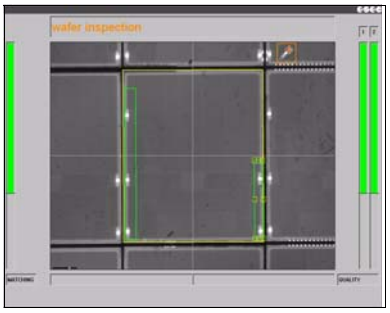
Examples of Alignment Method Selection

The following examples show how the alignment method can be selected with the help of the decision making chart.



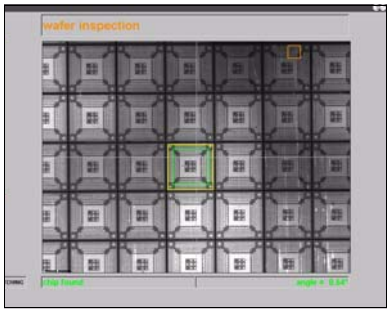
Blank chip? Yes

→ **Street alignment**



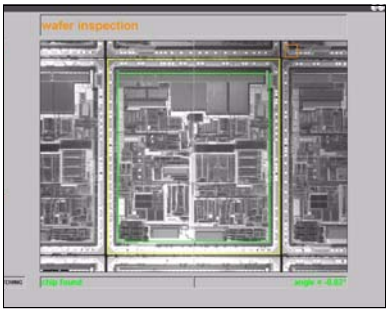
Blank chip? No
Small Die? No
Bold Unique Structure? No

→ **Two point alignment**



Blank chip? No
Small Die? Yes
Pattern Check? Yes

→ **Structure alignment**

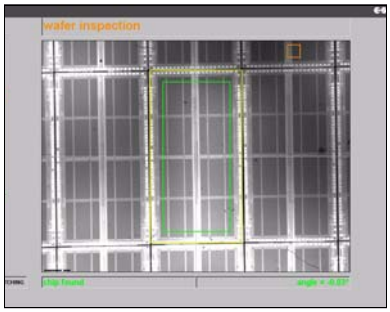


Blank chip? No
Small Die? No
Bold Unique structure? Yes
2nd bold structure? Yes

→ **Structure alignment**

Blank chip? No
Small Die? No
Bold Unique structure? Yes
2nd bold structure? No
Small structures? No
Pattern check? Yes

→ **Structure alignment**



Blank chip? No
Small Die? No
Bold Unique structure? Yes
2nd bold structure? No
Small structures? Yes

→ **Structure alignment**

© 2009 Esec Ltd.

i 3 Tips and Tricks Chip Teaching

What to do when:

`Chip not found` **message appears during learn chip procedure**

- adjust illumination and street threshold
  or
- decrease learn scale proportion
  or
- increase field of view (FOV)

Can not find unique template with mixed alignment mode

- set object position control to off and use chip edge within the template
  or
- use street alignment method instead and activate inkdot pattern mode for pattern check

Chip not found during chip verify or production

- use white LED illumination
  or
- optimize illumination or change templates
  or
- increase size tolerance
  or
- increase search range

Pattern mismatch in production or low match during chip verify because of passivation differences on wafer.

- optimize illumination or change templates
  or
- set brightness correction to on
  or
- activate and teach additional chip alignment
  or
- set chip quality level to medium or low

Learn index step failed

- set index step manually, see section *i 28* on page *12-55*

Illumination disturbance

- Always make sure the service lamp on the machine is off during setup and production.

Note: Any wrong influence to the chip illumination may disturb the chip alignment.

© 2009 Esec Ltd.

i 4 Selection of an Inkdot Test

Two types of inkdot tests are available:

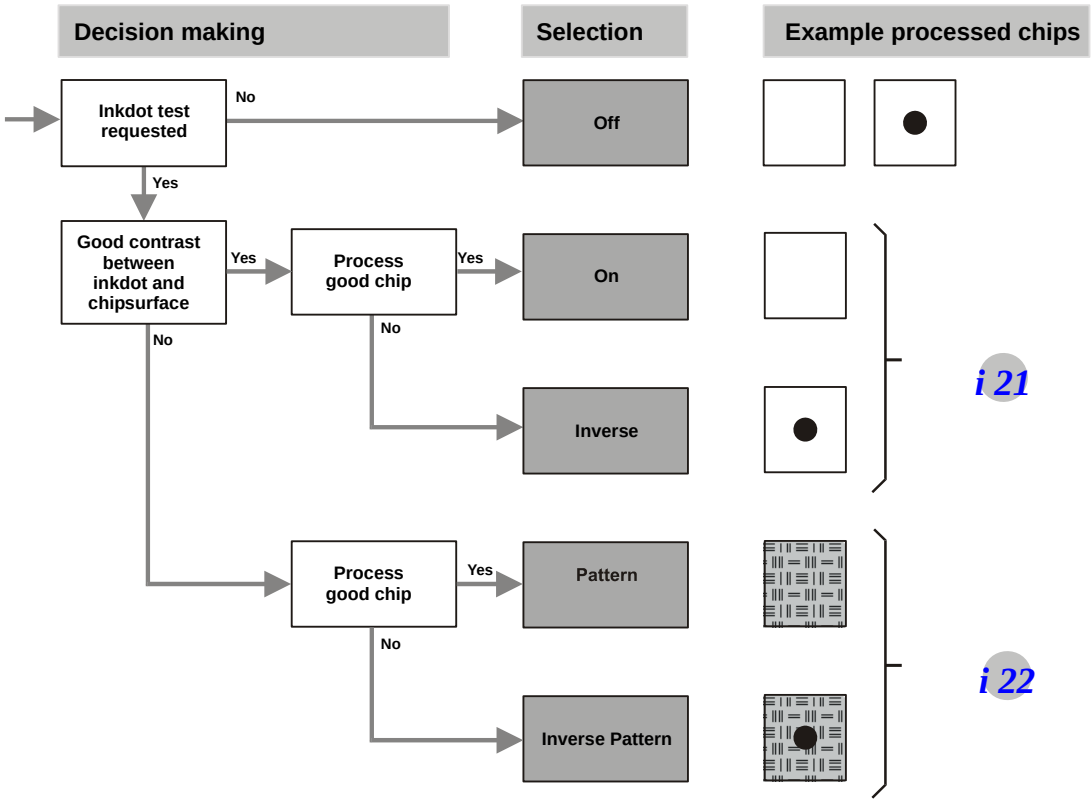
i 21 The standard inkdot test recognizes dark pixels on the chip surface. When a set limit of dark pixels is exceeded an inkdot is detected.

i 22 The pattern inkdot test compares within a test window the taught pattern with the pattern of each chip.

If the pattern does not match a defined quality limit an inkdot is detected. This test is used when the contrast between the chip surface and the inkdot is bad.

Both tests also can be set to an inverse mode. In this case inked chips will be processed and good chips will not be processed (i.e. for setup).

The following chart can help to choose the correct inkdot test.



© 2009 Esec Ltd.

i 5 Selection of a Corner Test or Surface Test

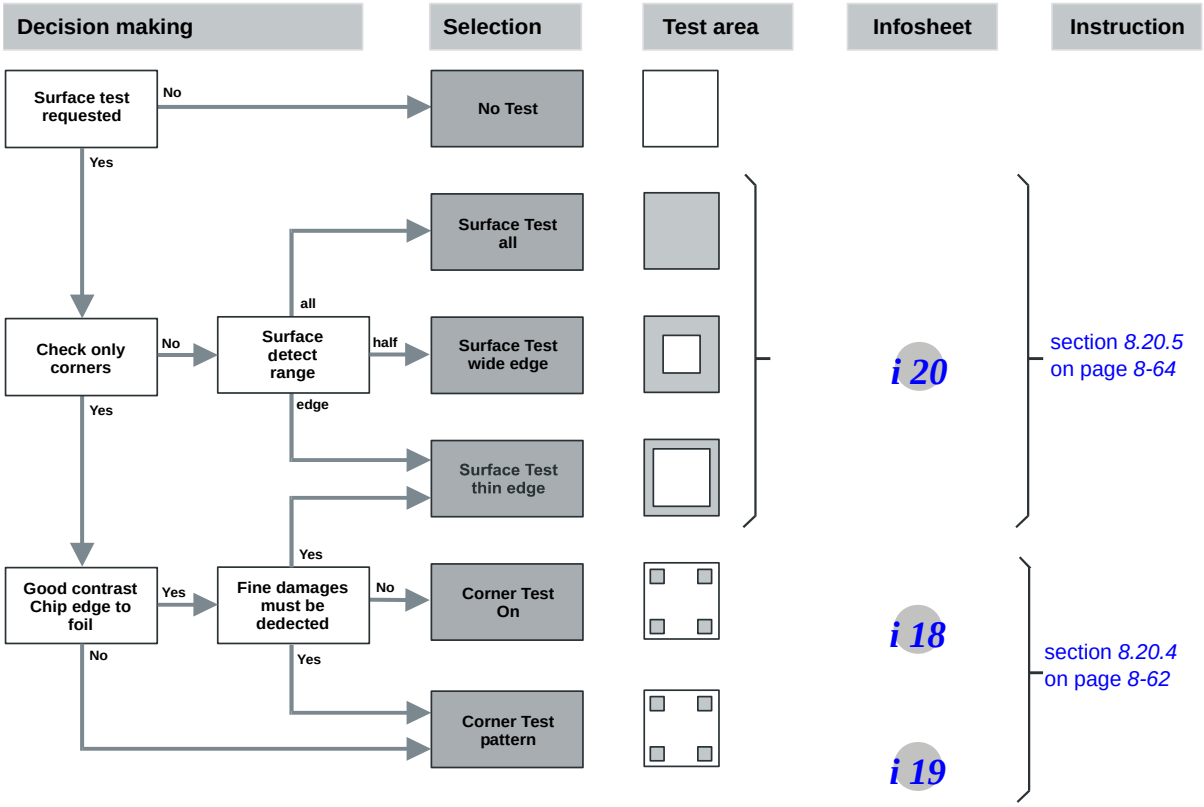
Two types of corner tests are available.

i 18 The standard corner test compares within the four corner windows the average grey values of the taught chip with the chip to be processed. If the grey values are not within a set tolerance, a missing corner is detected.

i 19 The pattern corner test also checks the quality of the corner windows before it compares their grey values. If the quality or the grey values are not within a set tolerance a missing corner is detected.
This test is used when the contrast between the chip edges and the foil is low and therefore missing corners can not be detected with the grey values only. However this test might decrease the UPH.

i 20 With the surface test the edge range or even the whole chip surface is tested. The test range is divided into many test boxes and the average grey value of all the test boxes is checked. In certain cases the corner test can be replaced by the surface test as small corner damages will cause a higher deviation in a test box than in a corner test window and therefore can be easier detected. However the surface test might decrease the UPH.

The following chart can help to choose the right surface or corner test:



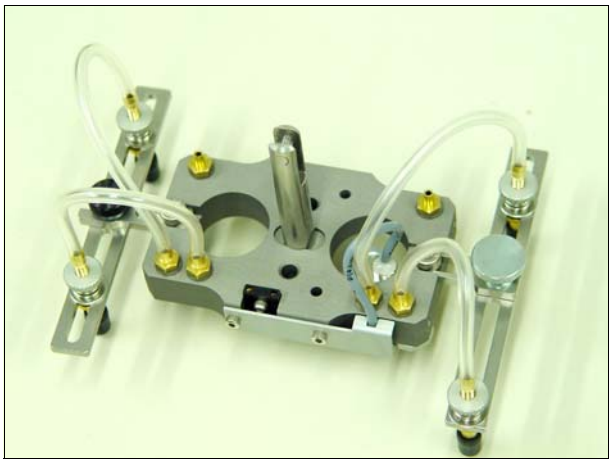
© 2009 Esec Ltd.

i 6 Gripper

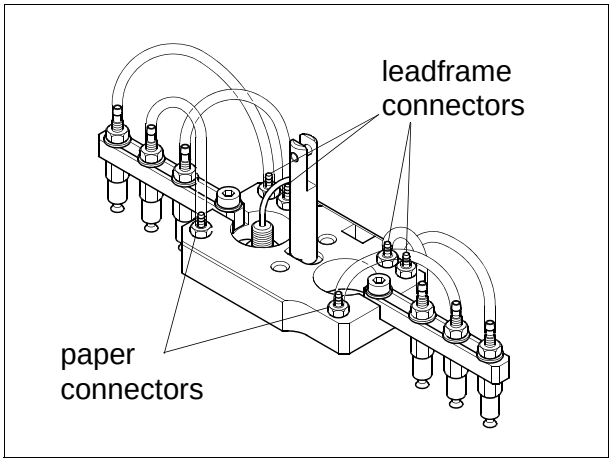
Gripper Types

Make sure the gripper is of the correct type. Three types of grippers are available:

The vacuum type which picks up leadframes uses suction cups to lift up leadframes.

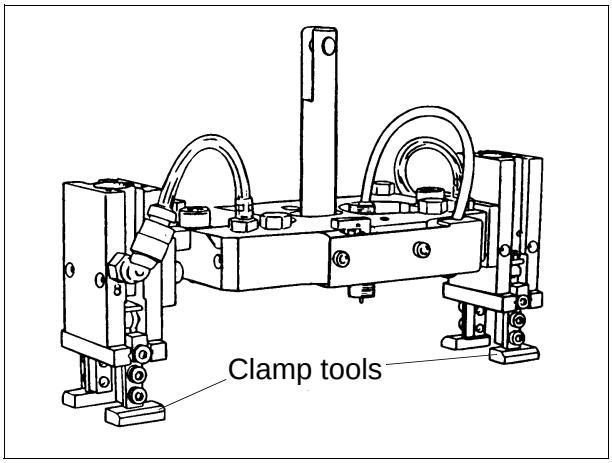


The second vacuum type provides a similar function but a different design.



The pneumatic type picks up leadframes using pneumatically operated clamps.

The clamp tools must be the correct type for the leadframe to be used.

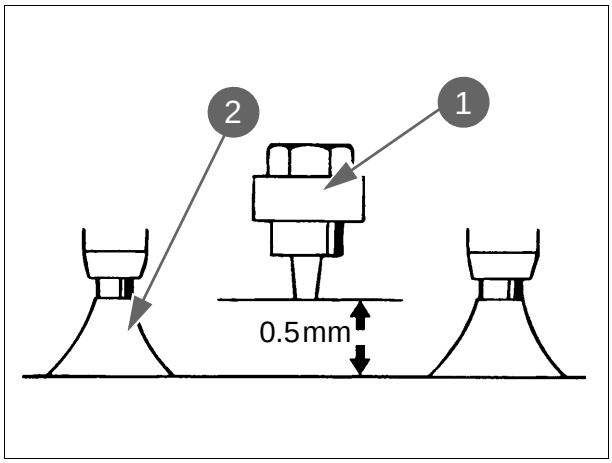


The gripper has to be assembled with the parts of the gripper kit and must be set up and adjusted to suit the leadframe to be used. Fit the correct clamp tools and/or adjust the position of the suction cups as required.

© 2009 Esec Ltd.

Inspection Sensor

The inspection sensor (1) of the gripper must be adjusted so that it just touches the lead-frame surface when the suction cups (2) are compressed by 0.5 mm.



© 2009 Esec Ltd.

i 7 Needle and Needle Holder

Needle and Needle Holder

There are two types of die ejector needle holders available; a universal chuck or ‚unichuck‘ with separate needles, and a fixed needle assembly.

With the unichuck, several needles can be inserted in the desired configuration.

With the fixed needle assembly, only one needle is available and this cannot be changed.

The needle size and the working configuration depend on the size of the processed chip. The following table will assist in making the appropriate selection.

Chip size in mm	Needle tip radius (µm)	Configuration and holder type
Less than 0.5	18	1 needle, Small Die Kit
0.5 - 3.5	30	1 needle, fixed needle assembly or unichuck
3.5 - 14	30	several needles, unichuck
12 - 20	100	several needles, unichuck
17 - 25	flat	several needles, unichuck

Chip size means the length of the shortest side of the chip (1 mm = 40 mil).

A single needle will not eject large chips smoothly. In this case, several needles are used, gripped in a unichuck. The positions in which the needles are set should be according to the shape of the chip.

Access to the needle(s) is obtained by turning and pulling the pepper pot vertically upwards off the die ejector.

The pepper pot must be selected according to the needle tip radius. There are four different pepper pots available, each for a specific needle size.

© 2009 Esec Ltd.

i 8 Mini Adapters for Vision Modules

On the different vision modules the zoom range on the camera lens is limited and can not cover all chip sizes.

Therefore mini adapters are provided. Before making any adjustments to any vision system, make sure that the correct mini adapter is fitted.

The type of mini adapter that can be fitted, depends on the type of the vision system of the Die Bonder 2009 SSI.

Five types of mini adapter are available according to the tables below.

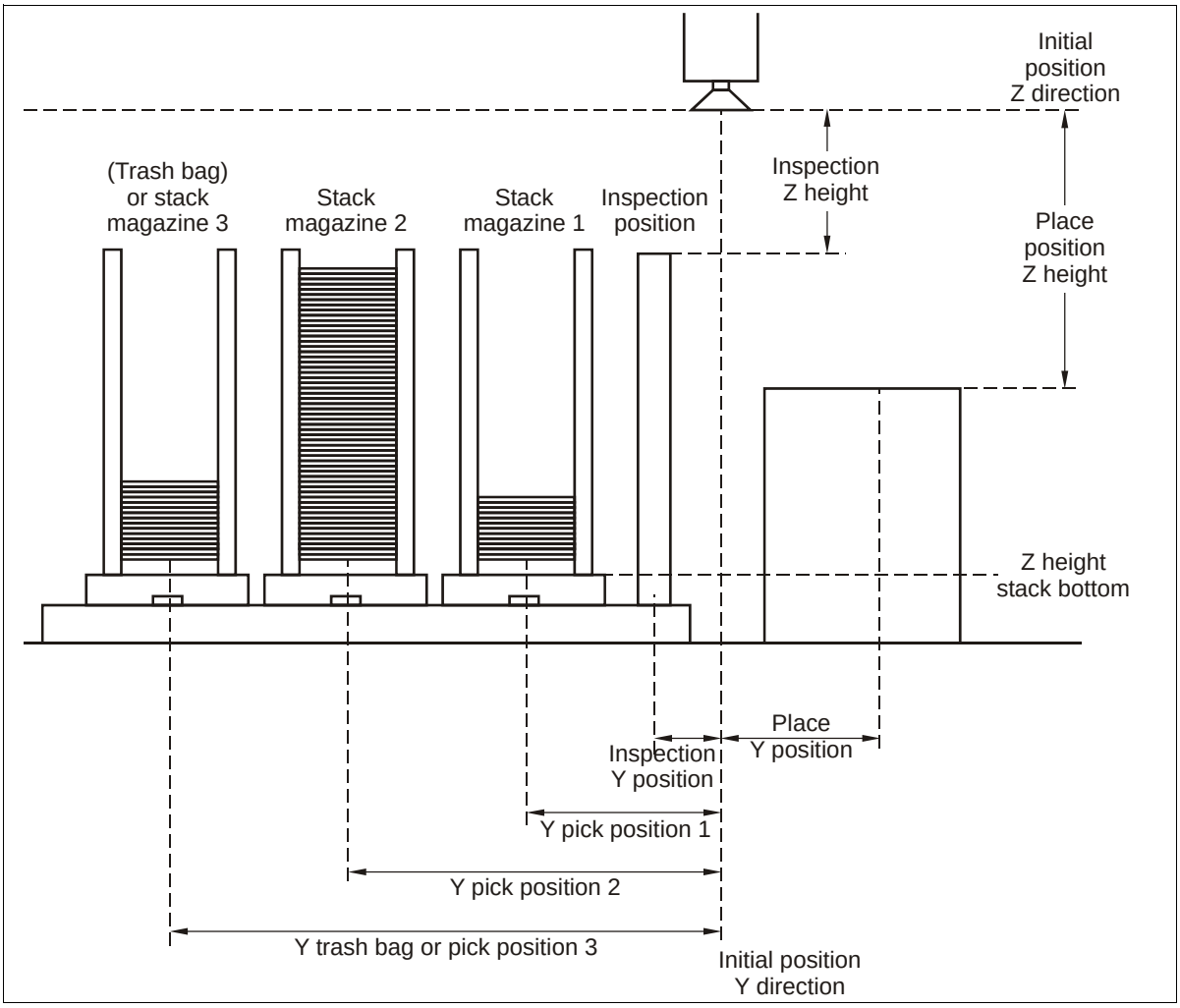
Part.No.	Magnification	Chip Size	Field of View (FOV)
1001-2954	0.5x	1.0 ... 25mm	X = 6.2 ... 33.4mm Y = 4.5... 26.0mm
120.0288.1	0.67x	0,8 ... 15mm	X = 4.5... 26.8mm Y = 3.3 ... 20.0mm
120.0286.1	1.0x	0.5 ... 10mm	X = 3.1... 17.8mm Y = 2.3 ... 13.3mm
120.0289.1	1.33x	0.2 ... 8mm	X = 2.2 ... 13.4mm Y = 1.3 ... 10.1mm
120.0509.1	2.0x	<0.5mm	X = 1.5 ... 9.0mm Y = 1.2 ... 6.8mm

Note: Whenever possible use a mini adapter with the lowest magnification as possible due to better optical performance.

© 2009 Esec Ltd.

i 9 Teaching TOS Parameters

The illustration below shows all parameters which can be adjusted during teaching of the TOS.



© 2009 Esec Ltd.

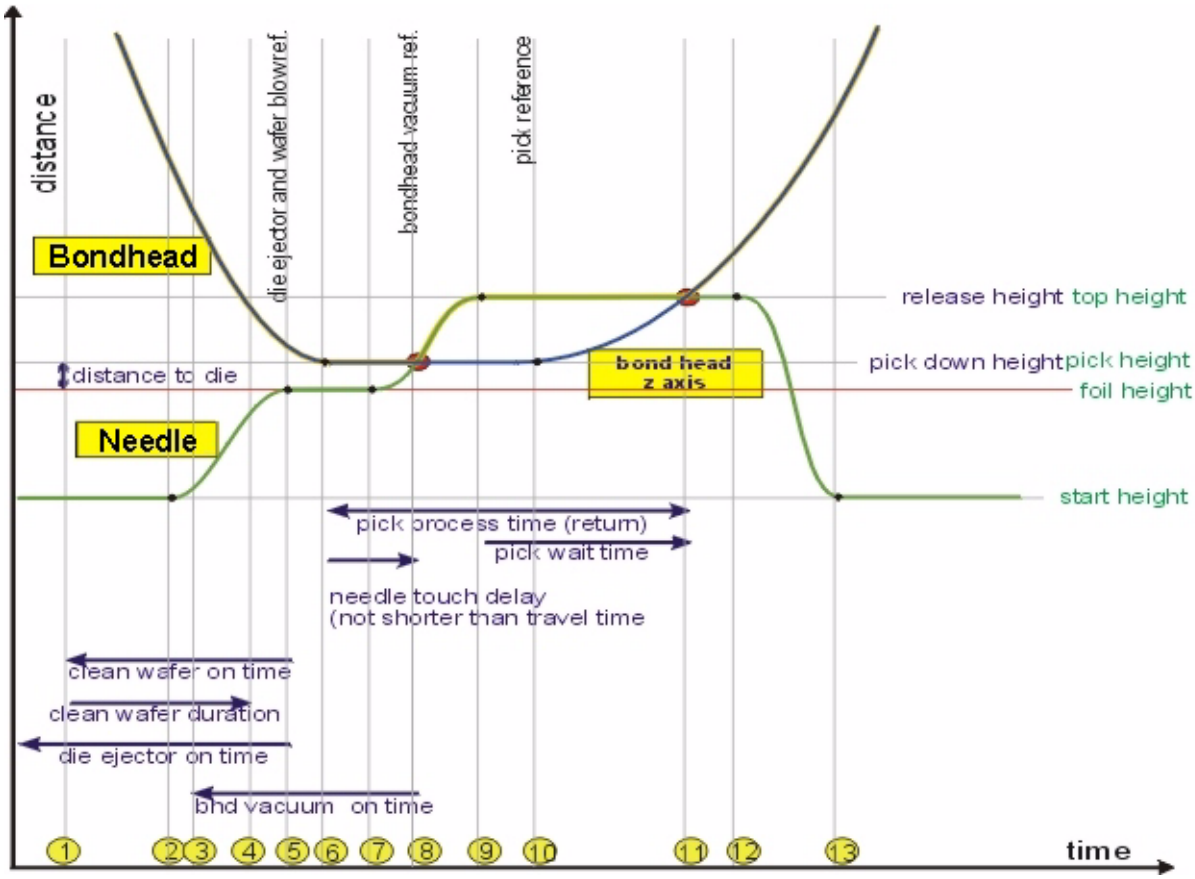
i 10 Pickup Process

The Pick & Place of the Die Bonder 2009 SSI consists of three main units besides the fast and accurate bondarm.

- The bondhead features a position independent force behavior (with a pressure controlled pneumatic cylinder to keep the force constant). The bondhead is used to hold the chip with vacuum and to transport it from the pick point (chip on wafer foil) to the bond point (substrate). The force to hold the chip is applied by means of vacuum.
- The touchdown sensor allows to measure the touch position of the pickup tool with the chip very accurate. It further allows to learn the height of the needle at foil height during a defined teach procedure.
- The Die ejector holds the wafer foil during process tight to the pepper pot with vacuum. The needle is very well centered to the pepper pot center hole and can be moved very accurate in z direction. It separates the die from the foil (transfer from chip on foil to pickup tool of bondhead).

Constant Force Two Step Pick Process

The two step pickup is the standard pick process.



© 2009 Esec Ltd.

How Does it Work? - Step by Step

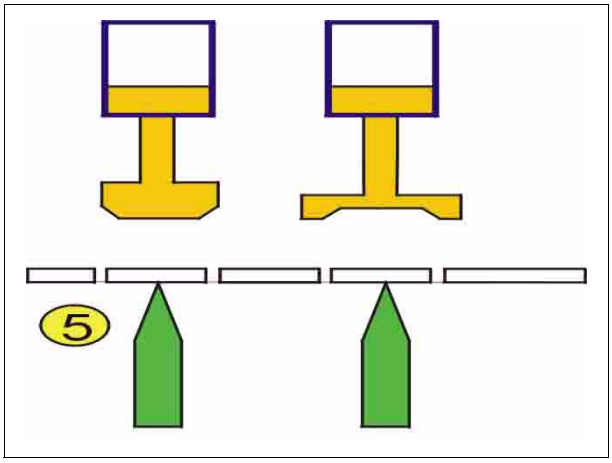
Needle: At start position.

0 Die ejector: Vacuum on.

1 The bondhead moves from travel height towards the pick height.

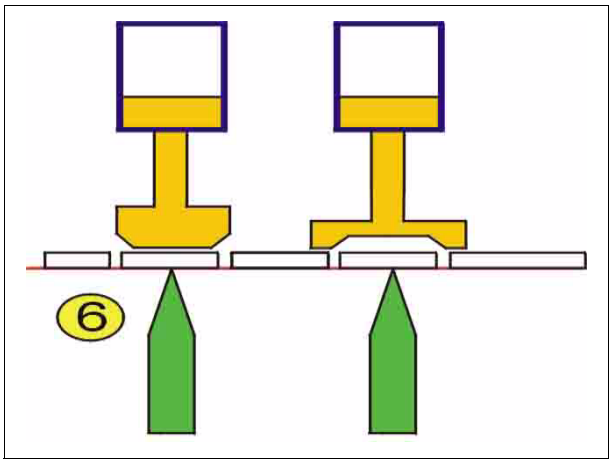
2 The needle starts to move towards the foil height.

5 The needle reaches the foil height (lower edge of foil) and waits for bondhead arrival.



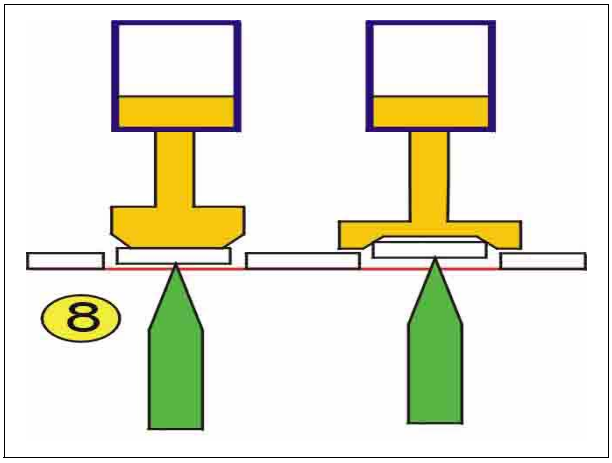
6 The bondhead arrives at the pick height and remains there.

Note: Set distance to Die slightly larger than (20-30 microns) to avoid impact of tool on chip.



7 The needle moves towards the tool tip.

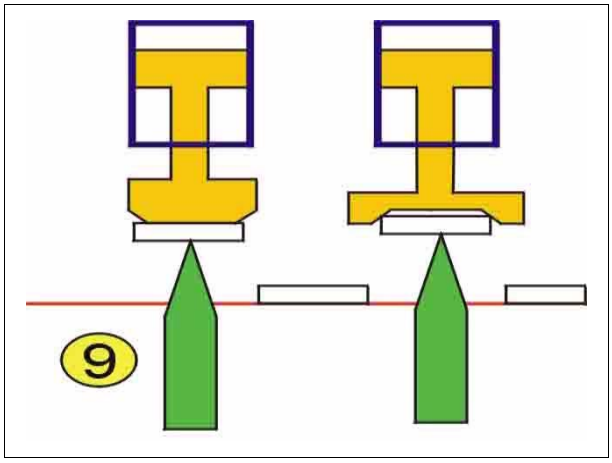
8 At this point, the chip touches the tool. The bondhead is still at the same height as before. Due to the continuing motion of the needle, the tool tip of the bondhead is deflected and the pressure applied in the bondhead cylinder builds a constant reaction force. The chip is clamped between needle and pickup tool firmly.



© 2009 Esec Ltd.

9 The needle reaches the top height.
The tool tip is deflected by the motion of the chip (needle).
The force remains constant due to the fact that the pressure in the bondhead cylinder is kept at a constant pressure level at any time.

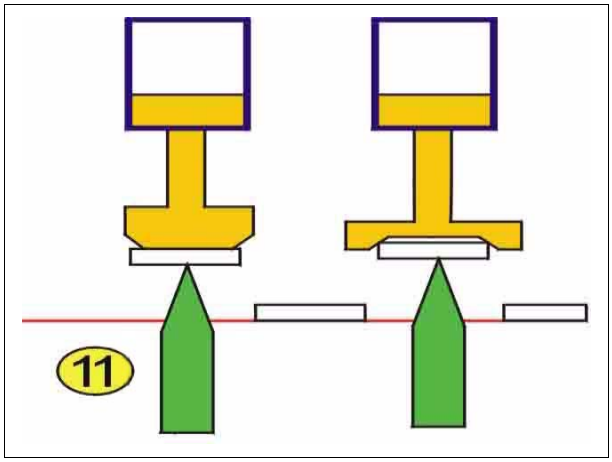
10 The bondhead starts to move towards travel height. The force is still applied by constant pressure. The tool remains in its position during the motion of the bondhead, because the cylinder is still deflected due to the prior needle motion.



11 The bondhead continuous its z movement. At this point the pneumatic cylinder is not deflected anymore and the force between needle and chip will decrease rapidly to zero. The chip is lifted off from the needle.

12 The bondhead moves towards the travel height.
The needle is allowed to move to initial position and enables wafer table movement to align the next die.

13 The needle arrives at the initial position.

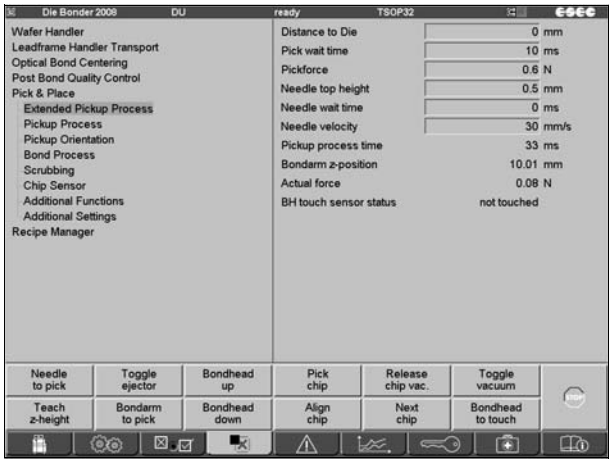


Parameter Settings

Pick up parameters can be set in the menu:

Pick & Place
Extended Pickup Process

Find some standard values of the most important pickup parameters in the table below.



© 2009 Esec Ltd.

		Flat Face Pickup Tool			
Chip Size	**(mm)**	**1.0...<4.0**	**4.0...<8.0**	**8.0...<15.0**	**>15.**
Pickforce	(N)	0.6...1N	0.6...1.0	0.6...1.0	0.6...1.0
Pick wait time	(ms)	0...60	40...100	100...200	150...300
Needle top height	(mm)	0.3...0.7	0.5...0.9	0.8...1.20	1.0...1.5
Needle velocity	(mm/s)	30...60	30...60	30...60	30...60
Distance to Die	(mm)	0.02	0	0	0

Parameter Description

The parameter **Upper limit pickforce** in the menu **Teach - Pick & Place - Additional Settings** defines the upper limit to which the parameter **Pickforce** can be adjusted.

Note: If the value of **Upper limit pickforce** is too high the chip might be damaged during production.

Tips and Tricks

Pick & Place Setup (only if using OBC or QCTV)

Precondition:

The parameter **Process speed** in the menu **Teach - Pick & Place - Additional Settings** is set to **high speed**.

Note: If the Pick & Place encounters a lot of recoveries at the bond position, the number of the recoveries can be eliminated by increasing the parameter **Pick wait time** in the menu **Teach - Pick & Place - Pickup Process**. This will increasing the UPH significantly.

© 2009 Esec Ltd.

i 11 Bond Process

General Description

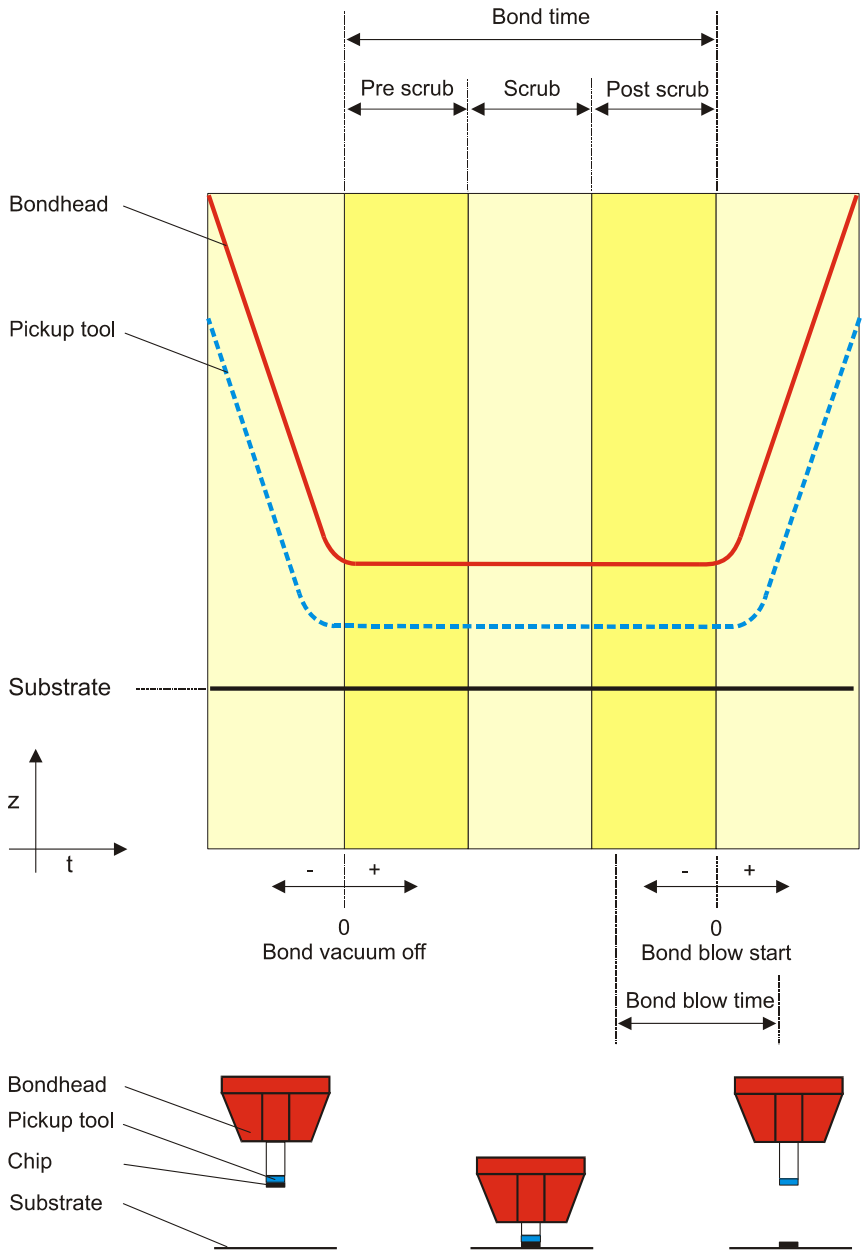
During the bond process the bondhead drops at the bond position and places the chip on the leadframe.

To release a chip from the pickup tool the bond vacuum is switched off.

The chip is bonded on the leadframe pad with a defined bond force. The bond force is defined during teaching.

After the chip has been placed, the bondhead moves upwards while air is blown through the pickup tool to ensure the chip is separated from the pickup tool.

Finally, the bondhead returns to the pick position to pick up the next chip.

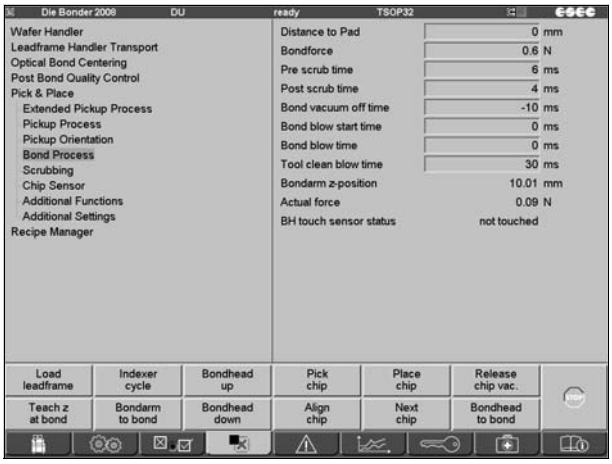


© 2009 Esec Ltd.

Bond Process Parameters

Pick & Place
Bond Process

This menu displays all user definable parameters concerning the bond process.



Distance to Pad

To build-up a force, the piston of the pressure controller must be lifted up in the cylinder. So the force affects the die, otherwise it would affect the cylinder. This parameter adjusts the overtravel at bond position. Use negative values to lower the z-axis.

Note, with positive values, the bondhead stops above the pad.

Bond vacuum off time

At the beginning of the bond process the bond vacuum is switched off. This bond vacuum off start time can be set by the user.

The bond vacuum off time reference (bond vacuum time = 0) is the very moment at which the bond force is built up to its preset value. When a negative value is set, the bond vacuum is switched off earlier, vice versa for positive values.

Bond blow start time / Bond blow time

The bond blow is used to separate the chip from the pickup tool by a gas jet after the chip has been placed on the leadframe. The start time and the duration of the bond blow is user defined.

The **Bond blow start time** reference (bond blow start time = 0) is the very moment when the bond force is released. A negative value for the bond blow start time switches on the bond blow gas jet while the bond force is still being applied.

With the parameter **Bond blow time** the duration of the bond blow can be defined.

© 2009 Esec Ltd.

i 12 Vision Calibration Procedures

Introduction

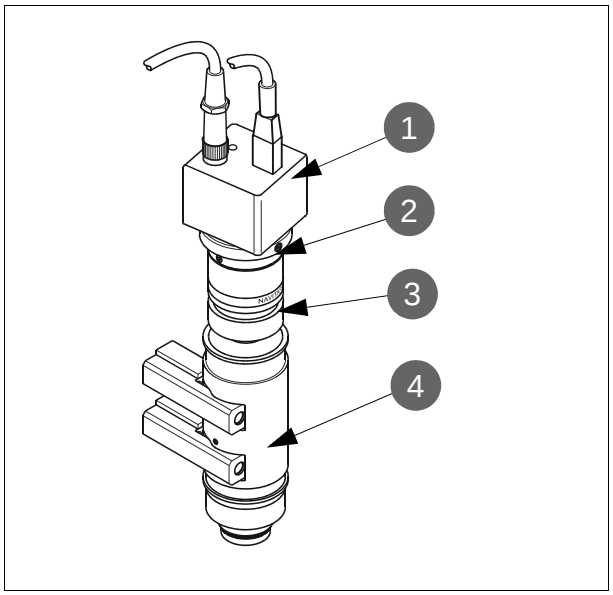
On the Die Bonder 2009 SSI five vision modules can be installed:

- BVI: Bond Vision
- PVI: Pick Vision
- PQCTV: Programmable Quality Control TV

Note: As the different vision modules have partly similar functions, not all of them are installed on the same machine.

The four main parts of the vision modules are:

1. Digital Camera
2. Camera Adapter
3. Mini Adapter
4. Motorized Zoom and Focus



Because the components of the vision modules are identical, their calibration procedure is very similar and is roughly described on the next pages.

The calibration procedure contains the following work steps:

- Adjusting the Focus at Minimum and Maximum Field of View (FOV)
- Coarse Adjustment of Camera Rotation
- Camera Alignment
- Adjustment of Module Rotation
- Module Centering
- Final Calibration

© 2009 Esec Ltd.

/ (May 29, 2009)

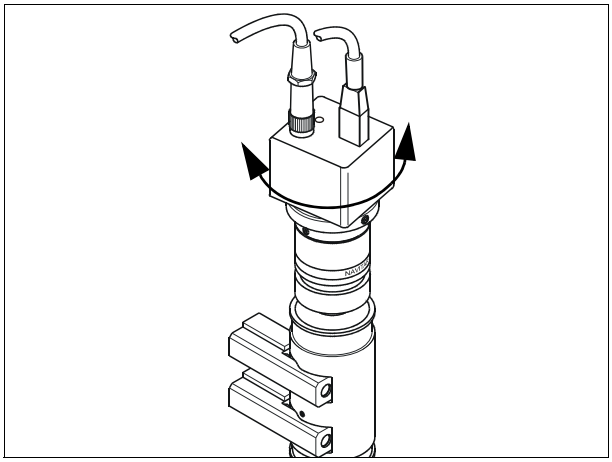
Calibration Work Steps

Adjusting the Focus at Minimum and Maximum Field of View (FOV)

The intention of this procedure is to have a good focus over the whole range of FOV. The focus at minimum FOV is adjusted automatically. The focus at maximum FOV must be adjusted manually.

Coarse Adjustment of Camera Rotation

As a preparation for the following adjustments the rotation of the camera and the optics must be roughly adjusted.

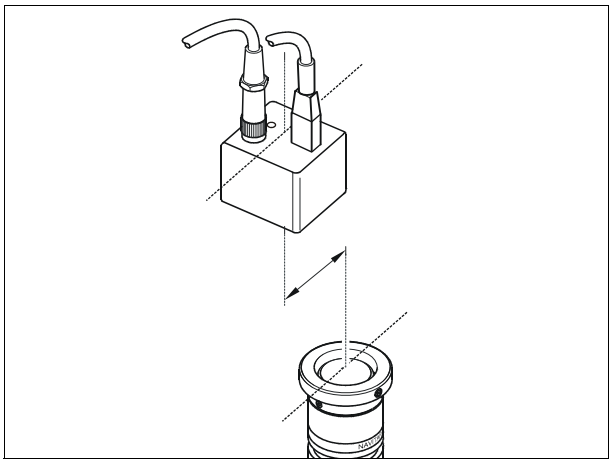


Camera Alignment

The optical axis of the camera and the optical components must be aligned.

As a help for the adjustment the system displays a red crosshair on the inspection monitor.

With the mechanical adjustment the camera is shifted in the Y- and X-axis.



Adjustment of Module Rotation

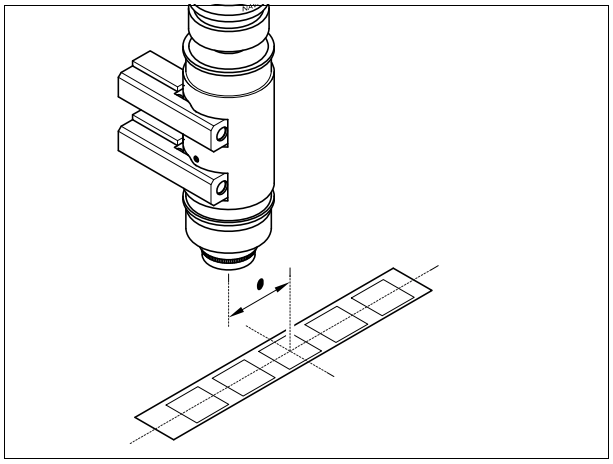
The rotation of the camera and the optical components must now be adjusted.

The reference for this adjustment is the calibration strip on the indexer or the calibration pot on the die ejector (depending on the vision module).

© 2009 Esec Ltd.

Module Centering

Now the vision module must be aligned to the center of the calibration strip or the calibration pot (depending on the vision module).



Final Calibration

During the final calibration the residual error of the adjustments is being calculated and corrected.

In addition the magnification of the FOV is calibrated.

© 2009 Esec Ltd.

i 13 Wafer

General Information

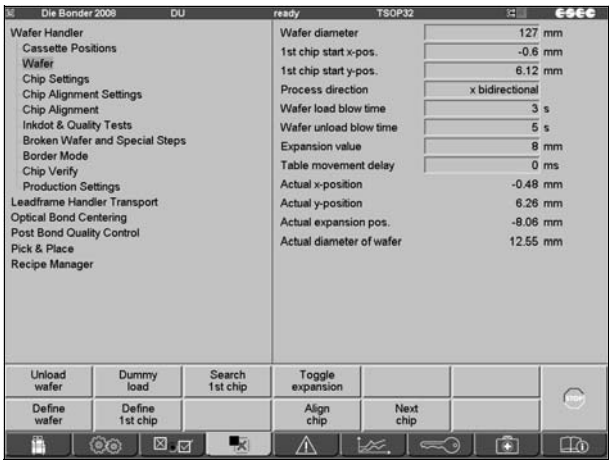
The menu **Teach - Wafer Handler** is used to define wafer properties like wafer diameter, first chip position and parameters for the expansion unit.

Parameter

Wafer diameter

This parameter defines the area within the pick vision module looks for good chips.

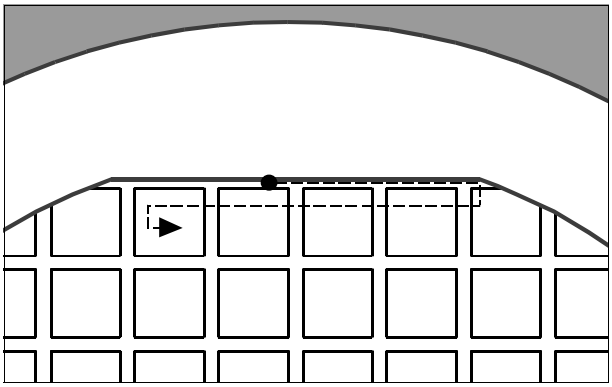
This value may be defined during the set up (see section *Wafer Properties Teaching* on page *8-43*) or manually by entering the appropriate value.



1st chip start x-pos. / 1st chip start y-pos.

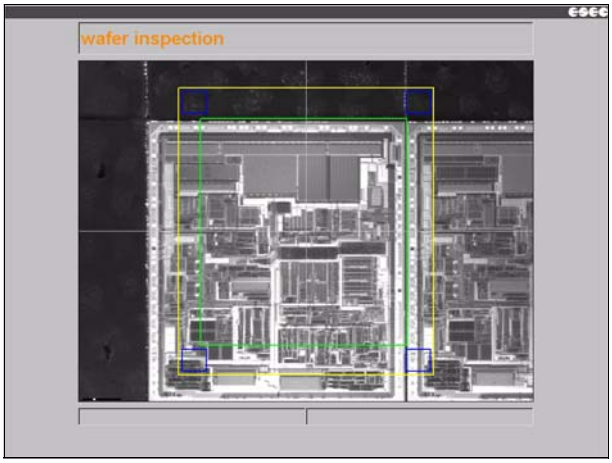
This parameters defines the starting point of the search procedure to find the first chip to be processed.

The search procedure searches in a snaky line from outside to the center of the wafer until the first chip is found.



This starting point must therefore be a bit outside the first chip.

This position may be defined during the set up (see section *Defining First Chip* on page *8-44*) or manually by entering the appropriate value.



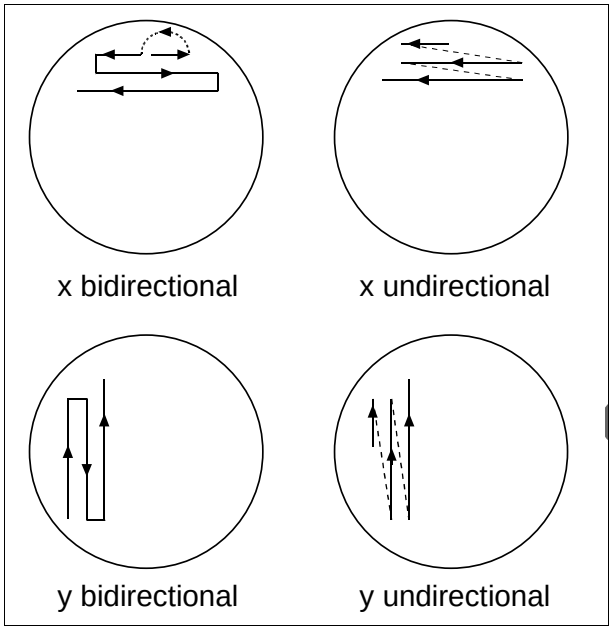
© 2009 Esec Ltd.

/ (May 29, 2009)

Process direction

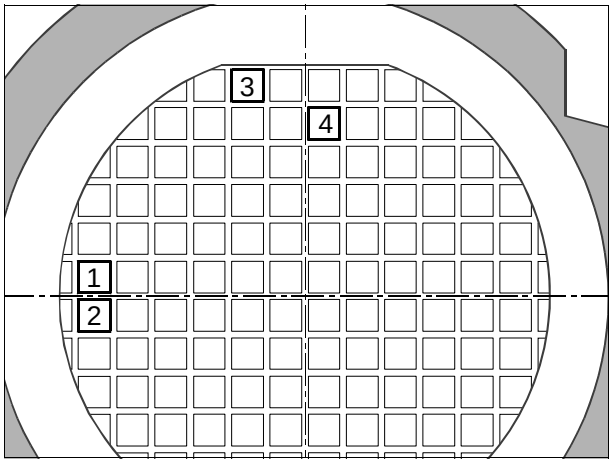
This parameter defines the direction in which the wafer is processed. Four different process directions can be set:

- **x bidirectional**: the chips are picked in two directions and from top to bottom (or from bottom to top).
- **x unidirectional**: the chips are picked in one direction and from top to bottom (or from bottom to top).
- **y bidirectional**: the chips are picked in two directions and from left to right (or from right to left).
- **y unidirectional**: the chips are picked in one direction and from left to right (or from right to left)



Note: The sequence of how the chips are being picked up from the wafer is also depending from the position of the first chip!

The combination of the first chip's position and the process direction is defining the workflow of the pick up sequence. See the following four examples:



First chip position 1

- Process direction: **x bi- or unidirectional** All chips below the first chip will be picked up.
- Process direction: **y bi- or unidirectional** All chips will be picked up.

First chip position 2

- Process direction: **x bi- or unidirectional** / All chips above the first chip will be picked up.
- Process direction: **y bi- or unidirectional**:/ All chips will be picked up.

First chip position 3

- Process direction: **x bi- or unidirectional /** All chips will be picked up.
- Process direction: **y bi- or unidirectional**:/ All chips to the right of the first chip will be picked up.

First chip position 4

- Process direction: **x bi- or unidirectional /** All chips below the first chip will be picked up.
- Process direction **y bi- or unidirectional /** All chips to the left of the first chip will be picked up.

© 2009 Esec Ltd.

Wafer load blow time

This parameter defines the time period during which the hot air blower is turned on during loading of the wafer.

The wafer foil should be warmed up during the load procedure to improve the expanding procedure.

Wafer unload blow time

This parameter defines the time period during which the hot air blower is turned on during unloading of the wafer.

The wafer foil must be warmed up before and during the unload procedure. This will support the shrinking procedure of the wafer foil and allows an unproblematic unload procedure.

Expansion value

This parameter defines the moving distance of the expansion unit when expanding a wafer.

This value is defined relative to the init position of the expansion unit.

Table movement delay

After a chip has been picked up, the wafer table waits this time period before it moves to the next chip.

© 2009 Esec Ltd.

i 14 Alignment Method Two Point

How Does it Work

The system searches the two previously learned structures on the chip surface and aligns the chip accordingly.

Parameters

i 17 See info sheet for parameter adjustment.

Tips and Tricks

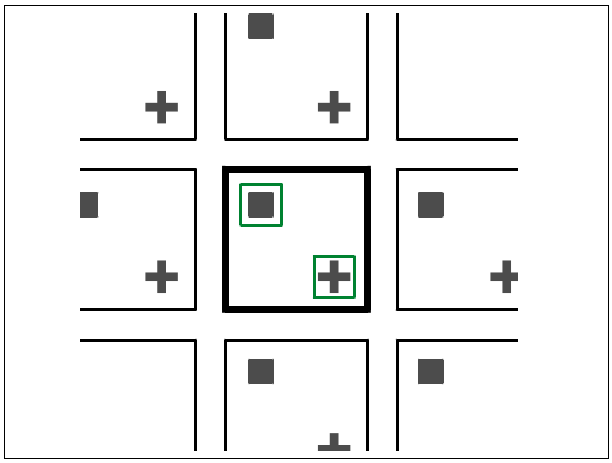
How to Choose the Two References Correctly

The first reference is tested over the whole chip surface while the second is tested in a smaller area (for more information about these areas refer to the info sheet *Set Index Step Manually* on page *12-55*). This different test field sizes must be considered when choosing patterns for the first or second template.

The chosen references must be unique within the respective test field.

In the example to the right a wafer is partly shown with simplified pattern on the chip surface.

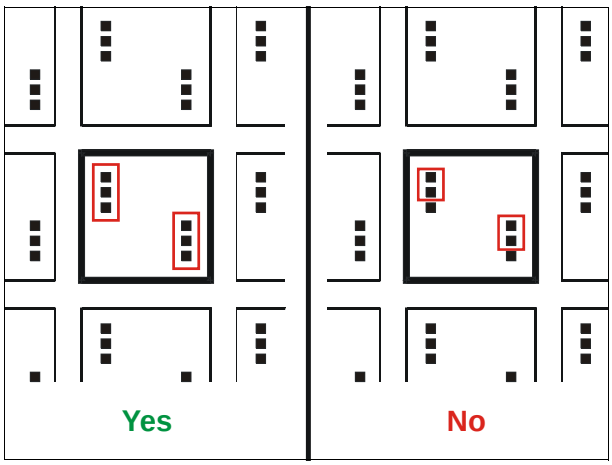
Both patterns are unique over the whole chip surface, therefore both can be used as template 1.



In this example a single square is not unique. Therefore it can not be taken as template 1.

In this case it is necessary to choose the all three squares as template 1.

Only two squares cannot be used as template 1 because they are not unique.



© 2009 Esec Ltd.

i 15 Alignment Method Structure

General Information

This is the alignment method which is the preferred setting for the DB 2009 SSI. The chip is aligned using two previously learned structures.

How Does it Work

The system searches one previously learned structures on the chip surface and aligns the chip accordingly.

Parameters

i 17 See info sheet for parameter adjustment.

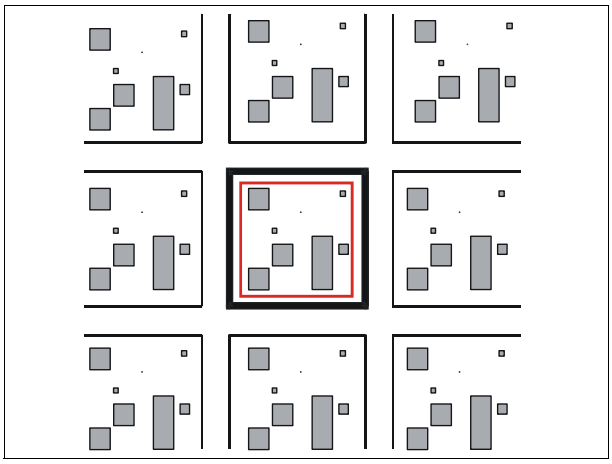
Tips and Tricks

How to Choose the Reference Correctly

The chosen references must be unique within the respective test field.

In this example single squares are not unique.

In this case it is necessary to choose the whole pattern as template.



© 2009 Esec Ltd.

i 16 Alignment Method Street

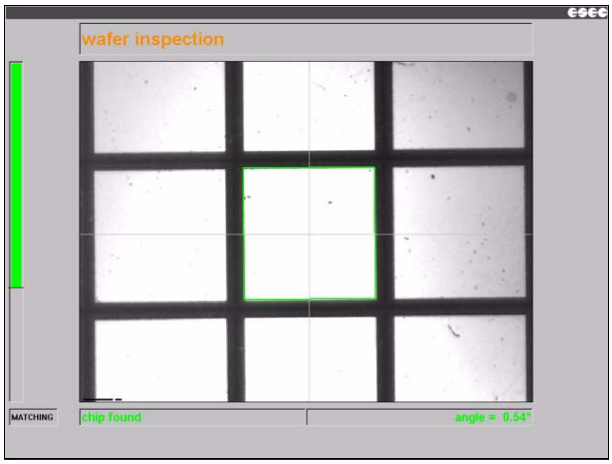
General Information

This alignment mode is used either

- for blank chips
- for test wafers containing chips with different structures
- for wafers containing very small chips with different structures or with big variations in the structures

How Does it Work?

The system searches for the four chip edges and corrects the chip position according to the result.



Parameters

i 17 See info sheet for parameter adjustment.

© 2009 Esec Ltd.

i 17 Chip Alignment Settings

General Information

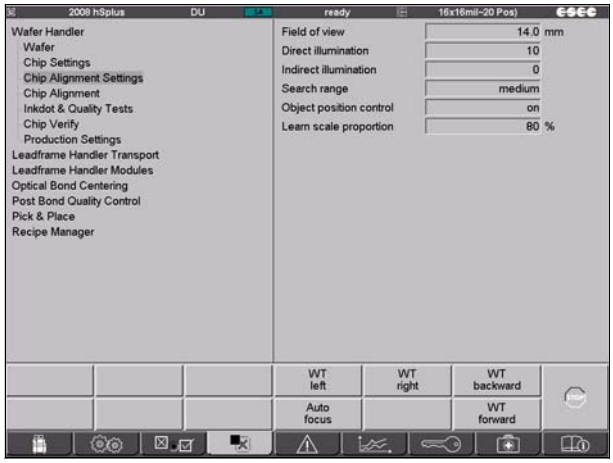
The parameter settings for the modes of chip alignment can be done in the menu:

Wafer Handler
Chip Alignment Settings

This menu looks slightly different for each alignment mode.

The following tables provides an overview about the different parameters which are available. As an example the menu **Chip Alignment Settings** for **Alignment method Two point** is shown.

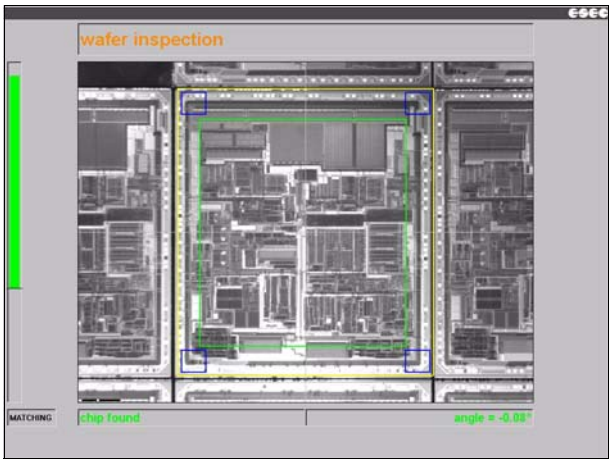
Alignment Method: / Available Parameters:	Two point	Street	Structure
Field of view	x	x	x
Direct illumination	x	x	x
Indirect illumination	x	x	x
Search range	x	x	x
Size tolerance	x	x	x
Object position control	x	x	x
Learn scale proportion	x	x	x
Street edge transition		x	



Parameters

Field of view (FOV)

Defines the area of the wafer which is visible on the inspection monitor. To be adjusted by entering the appropriate value in parameter **Field of view**. It can also be changed by using the cursor keys on the production keyboard. After the **Field of view** is adjusted in this way, the soft key ***Define zoom/foc.*** must be pressed. As a general rule for big chips approximately 1/4 of the chip to the right side (and left side) should be visible on the screen.



Note: For **Local mapping** another adjustment of **Field of view** is required. See section *i 35* on page *12-69*.

© 2009 Esec Ltd.

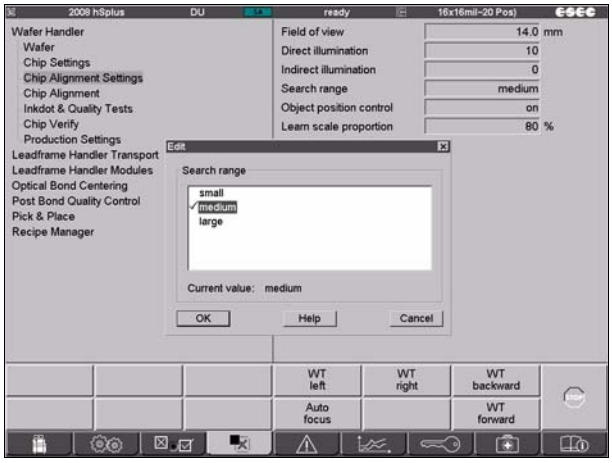
Direct illumination

Defines the amount of direct light to illuminate the chip in work position for adjustment of **Field of view** and camera focus.

It's possible to learn the illumination automatically by using the soft key ***Auto Learn illumin.*** in the menu **Chip Alignment**.

Search range

Defines the size of the area in which the chip edge respectively the template 1 is searched for the chip alignment.

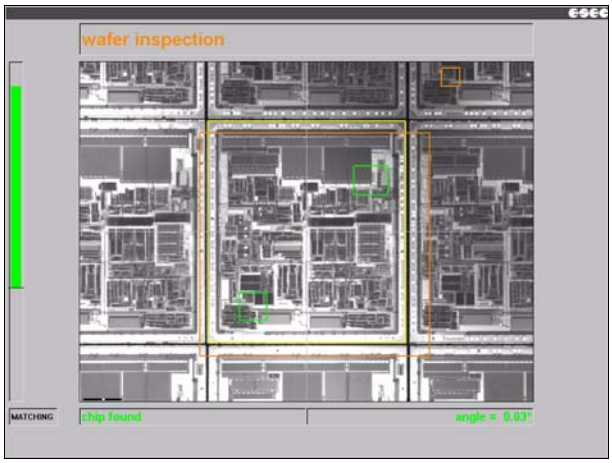


Three settings are possible:

- **small**
- **medium**
- **large**

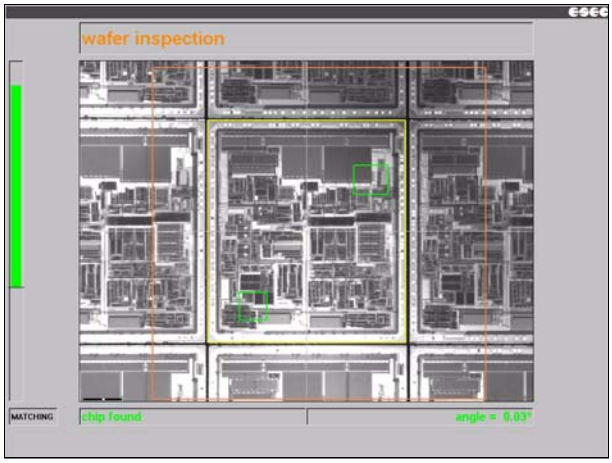
Whenever a chip is found successfully, the size of the area is reduced step by step to make the search procedure even faster. If once a chip could not be found the area will be expanded to its original size.

If set to **small** the search range is originally set to 20% of the chip size in each direction and will be reduced minimally to 15% of the chip size.



If set to **medium**, the search range starts with 40% of the chip size in each direction and will be reduced to 15% of the chip size.

If set to **large**, the search range starts with 60% of the chip size in each direction and will be reduced to 15% of the chip size.



© 2009 Esec Ltd.

Size Tolerance

During the alignment procedure after the chip has been found, also the chip size is checked. The tolerance of this check can be set with the parameter **Size tolerance**.

Three different tolerances can be chosen:

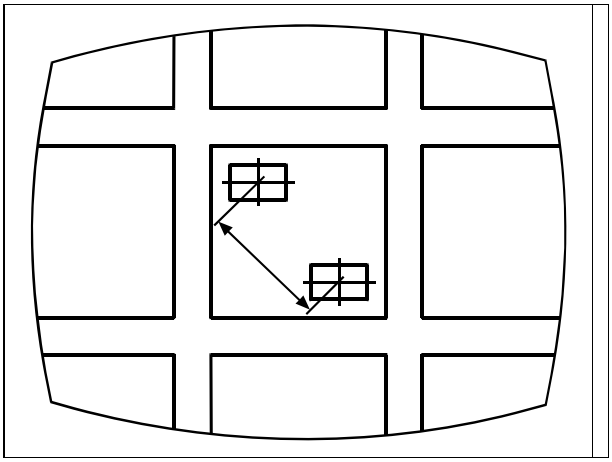
- **small** => tolerance of 2 pixels
- **medium** => tolerance of 3 pixel
- **large** => tolerance of 5 pixel

This check is done with two different procedures, depending on the alignment method.

For **Alignment method Two point**, the distance between the centers of the two templates is measured and compared with the distance of the learned chip.

If this difference is outside the tolerance, the chip will not be picked.

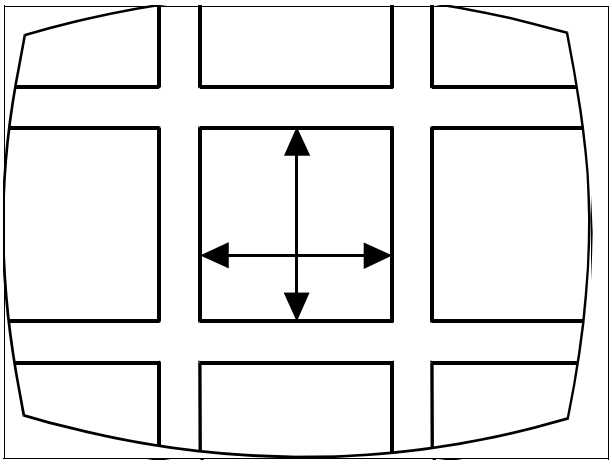
If alignment method Two point is used, the **Size tolerance** should be set to **small** or **medium**.



For **alignment method Street**, the distance between the right and the left chip edge as well as the distance between the upper and the lower chip edge is measured and compared with the learned distance.

If this difference is outside the tolerance, the chip will not be picked.

If alignment method Street is used, the **Size tolerance** should be set to **medium** or **large**, depending on the quality of the saw cut.

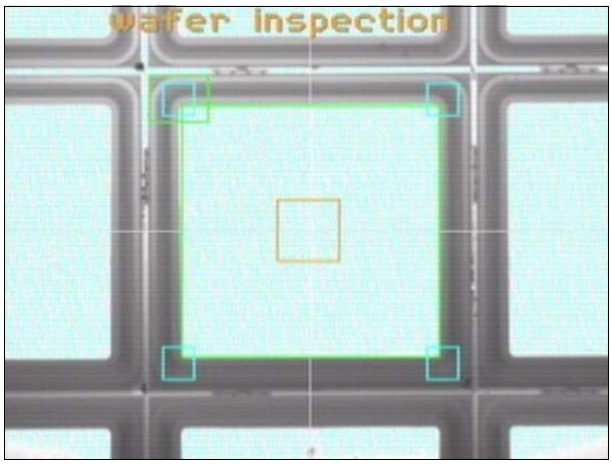


© 2009 Esec Ltd.

Object position control

If this parameter is set to **off** the template windows or corner windows might be placed outside the chip window which is not possible in normal case.

This feature might be helpful for power chip recognition.

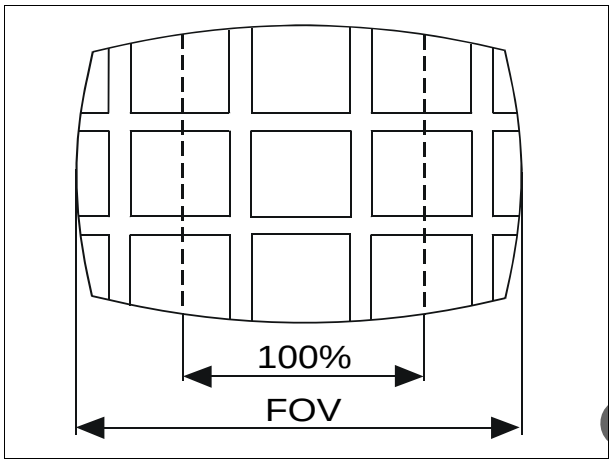


Learn scale proportion

Defines the moving distance when learning the magnification of the vision module. The value is defined in percent of half of the FOV, i.e. if FOV is 10 mm and **Learn scale proportion** is 100% the moving distance will be 5 mm.

If not the whole FOV is illuminated equally, it is sometimes necessary to set the parameter **Learn scale proportion** to **50%** or less.

As a default value it can be set to **70%**.



Street edge transition

Determines the brightness/darkness transition between the chip surface and the saw cut (wafer foil) when learning and searching the saw cuts.

Two different settings are possible:

- **bright to dark**
  The system considers the chip as bright and the saw cut as black. This is the default setting and mostly used.
- **dark to bright**
  The system considers the chip as dark and the saw cut as bright. This mode can be used if the chip surface is darker than the saw cut.

© 2009 Esec Ltd.

i 18 Corner Test 'on'

General Information

The corner test checks if the aligned chip does not have any mechanical damages at the corners.

Two different **Corner modes** are available:

- **on**
- **pattern**

For a description of **Corner mode pattern** refer to section *i 19* on page *12-35*.

To activate the **Corner mode on**:

Wafer Handler
Chip Settings

Set the parameter **Corner mode** to **on**.

How Does it Work?

The system is checking the average grey value (or brightness) within the four corner windows.

If the grey value is not within the defined tolerance, the test has failed.

The result of the test is displayed on the left side of the inspection monitor with one corner match bar for each corner.

- For good test results, the corner match bars show a green bar in the positive level.

  The message `chip found` is displayed.

- In case the average grey value of a corner is outside the tolerance, the corner match bar shows a green bar in the negative level.

  The message `missing corner(s)` is displayed.

A chip with missing or broken corners will not be picked up.

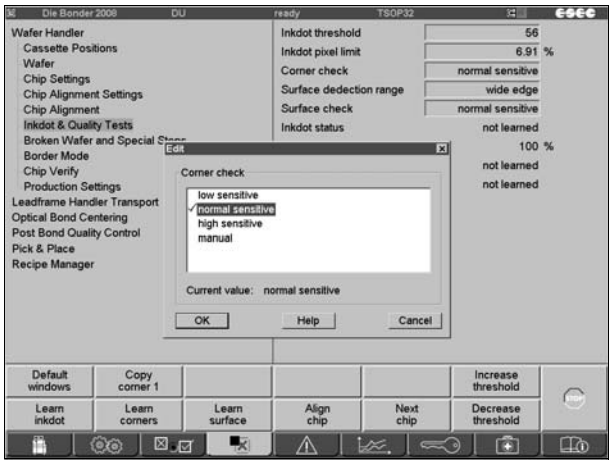
© 2009 Esec Ltd.

Parameters

Corner Check

The sensitivity (or tolerance) of the corner test can be set in the following menu:

Wafer Handler
Inkdot & Quality Tests



The parameter **Corner check** can be set to four different values:

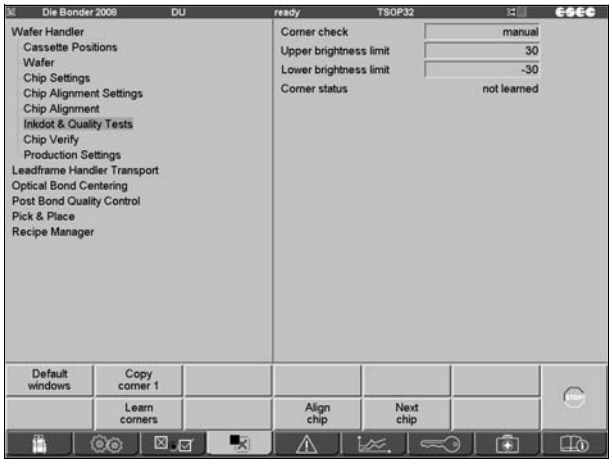
- **low sensitive**
  allowed tolerance: +/- 50 grey values
- **normal sensitive**
  allowed tolerance: +/- 30 grey values
- **high sensitive**
  allowed tolerance: +/- 20 grey values
- **manual**
  The tolerance can be set manually (see description below)

Manual Settings

If the parameter **Corner check** is set to **manual**, the sensitivity of the corner test must be adjusted manually.

For this, two additional parameters appear in the menu **Inkdot & Quality Tests**:

The limits of the tolerance must be entered in parameters **Upper brightness limit** and **Lower brightness limit**.



To simplify the setting the systems displays the deviation of the detected values to the learned grey values.

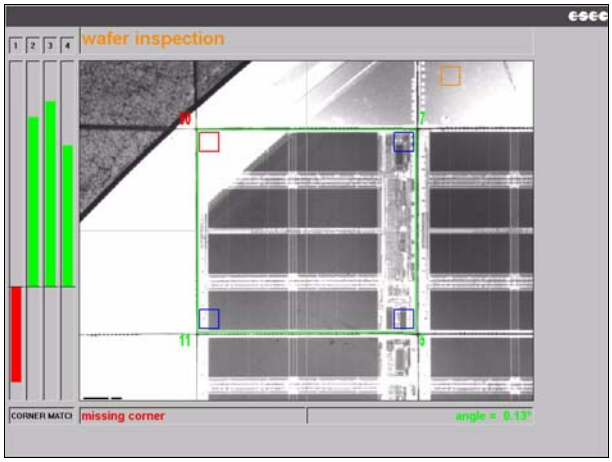
For this a damaged chip must be aligned.

For each corner window the deviation is displayed in a small box beside the chip corner.

If the value is out of limits, the deviation is displayed in red, else in green.

In addition the corner match bar shows the result as well.

This values might be a help for a correct adjustment of the limits.



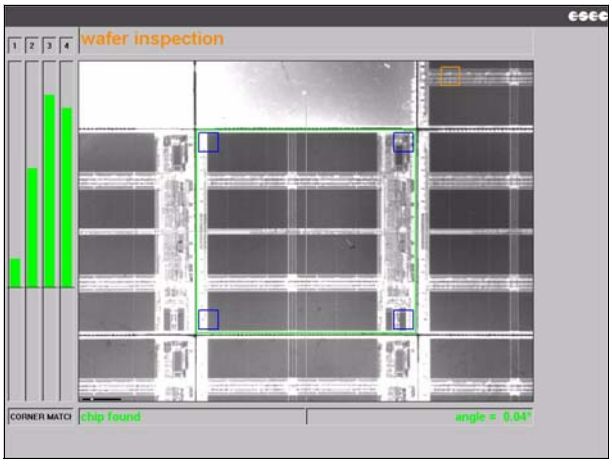
© 2009 Esec Ltd.

/ (May 29, 2009)

Standard Settings

If the parameter **Corner check** is set to one of the given tolerances (**low, normal** or **high sensitive**), only the corner match bars show the quality of the corners and no numeric deviation is displayed.

In this example, corner 1 is hardly accepted, the corresponding corner bar is therefore very small.



© 2009 Esec Ltd.

i 19 Corner Test 'pattern'

General Information

The corner test checks if the aligned chip does not have any damages at the corners.

Two different **Corner modes** are available:

- **on**
- **pattern**

For a description of **Corner mode on** refer to section *i 18* on page *12-32*.

Note: The **Corner mode pattern** is slower than the **Corner mode on** and might lower the UPH.

To activate the **Corner mode pattern**:

Wafer Handler
Chip Settings

Set the parameter **Corner mode** to **pattern**.

How Does it Work?

If the **Corner mode** is set to **pattern**, an additional quality test is executed.

Prior to the average grey value of the corner, the quality of the pattern within the corner windows is checked.

A quality level can be defined by setting the parameter **Corner quality limit**.

Note: The settings of the parameter **Corner check** are identical to the settings in **Corner mode on**.

Corner quality limit

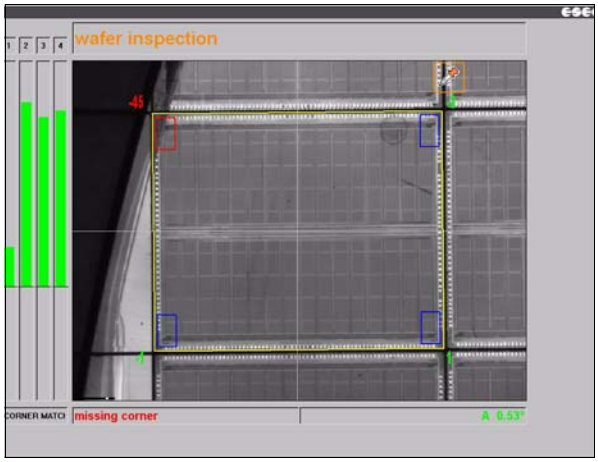
Defines how many percent of the corner template should match with the learned template.

If the parameter is set to 80% the check is very sensitive, if it is set to 40% the check is low sensitive.

In the two following examples the same chip is tested twice with different settings of brightness and quality limits.

© 2009 Esec Ltd.

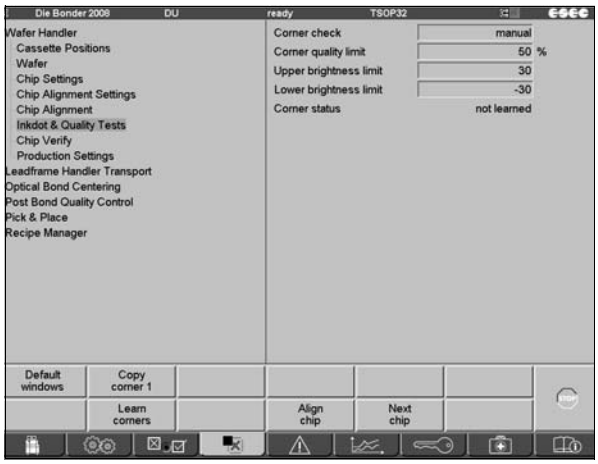
Corner Quality: Example 1



Settings:

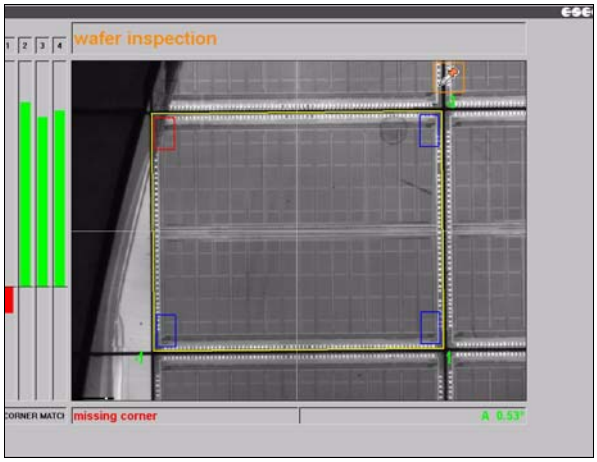
- **Corner quality limit: 50%**
- **Upper brightness limit: 30**
- **Lower brightness limit: -30**

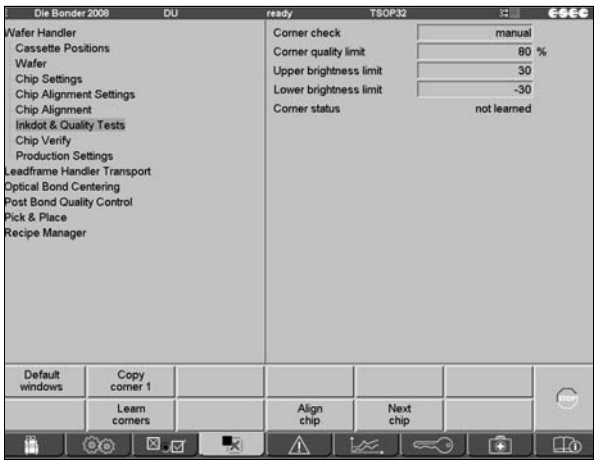
Because the corner quality was within the specified limits, the corner match bar show good results. The test of the corners grey value detected a deviation of -45 which is out of limit. Therefore the message `missing corner(s)` is displayed and the chip would not be picked.



© 2009 Esec Ltd.

Corner Quality: Example 2





Settings:

- **Corner quality limit: 80%**
- **Upper brightness limit: 30**
- **Lower brightness limit: -30**

The same chip this time failed at the corner quality test, because the higher value of the **Corner quality limit** requires a higher quality for the inspected pattern.

The corner match bar shows a bad result for the specific corner. The test of the corners grey value is not executed and therefore the grey value is not displayed. Therefore the message `missing corner(s)` is displayed and the chip would not be picked.

© 2009 Esec Ltd.

i 20 Surface Test

General Information

This test is used to test parts of the chip surface or even the whole surface.

How Does it Work?

The selected part of the chip surface is divided into several boxes. The average grey value of each box is checked by the system. If not all grey values are within the defined tolerance, the test has failed.

The result of the test is displayed in a message box on the lower left corner of the inspection monitor.

- For good test results, the message `surface ok` is displayed in green.
- In case the average grey value of a test box is outside the tolerance, the respective box will be marked with a red circle. The message `surface error` is displayed red.

A chip with surface error will not be picked up.

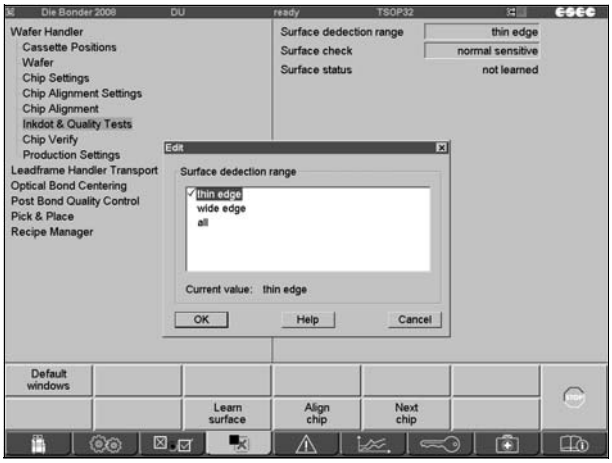
Parameter Settings

Surface detection range

Defines the area in which the chip surface is inspected.

Three settings are possible:

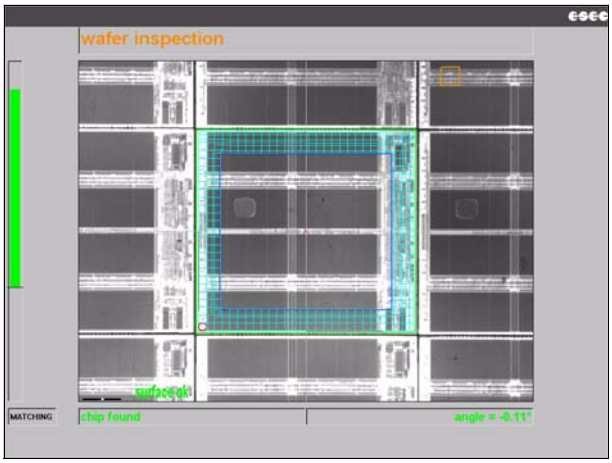
- **thin edge**
- **wide edge**
- **all**



If set to **thin edge** only a small area along the chip edge will be inspected.

This area with its inspection boxes are displayed in yellow or blue.

In certain cases this test could also be used instead of the corner test. Small corner damages will cause a higher deviation of the grey value, because the inspection boxes are smaller than the corner windows.

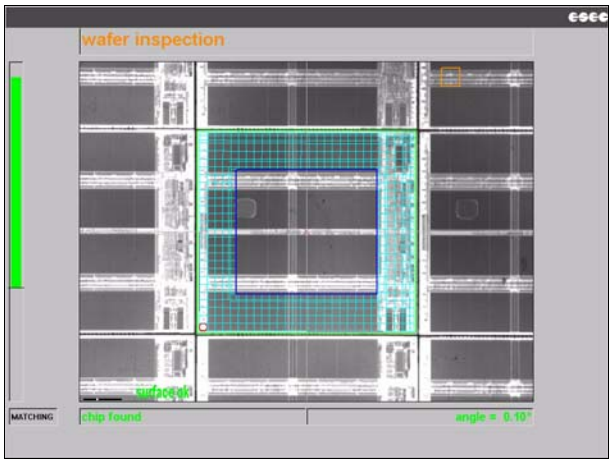


© 2009 Esec Ltd.

Surface detection range (Cont.)

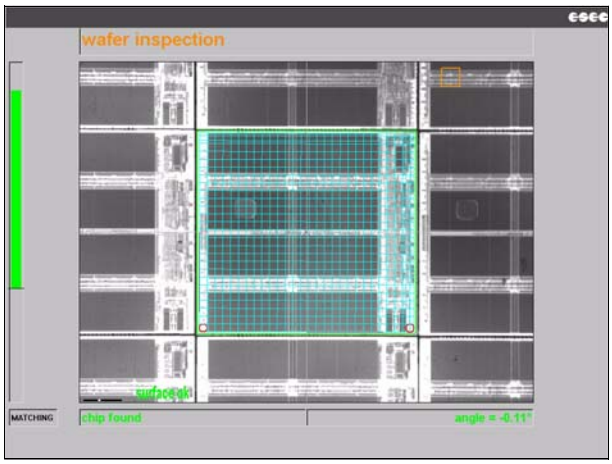
If set to **wide edge**, approximately the outer half of the chip surface will be inspected.

This area with its inspection boxes are displayed in yellow or blue.



If set to **all**, the whole chip surface will be inspected.

Note: This setting may decrease the UPH!

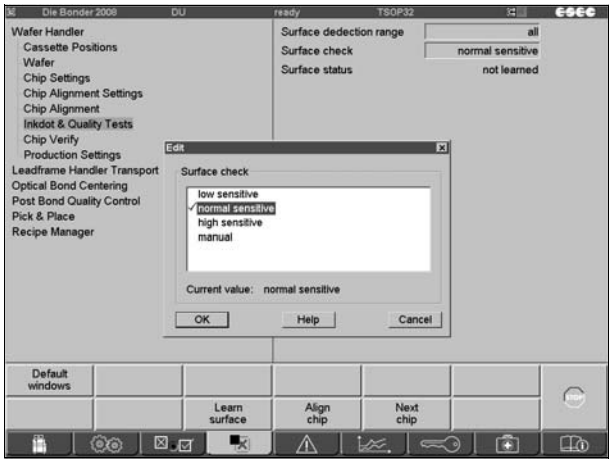


Surface check

Defines the sensitivity of the surface test.

Four different settings are possible:

- **low sensitive**
  allowed tolerance: +/- 50 grey values
- **normal sensitive**
  allowed tolerance: +/- 30 grey values
- **high sensitive**
  allowed tolerance: +/- 20 grey values
- **manual**
  The tolerance can be set manually (see description below)



© 2009 Esec Ltd.

Manual Setting

If the parameter **Surface check** is set to **manual**, the sensitivity of this surface test must be adjusted manually. Additionally a **Surface edge offset** must be set. For this, two additional parameters appear in the menu **Inkdot & Quality Tests**.

Surface brightness limit

If the manual setting is chosen, the sensitivity of the surface test must be defined with the parameter **Surface brightness limit**.

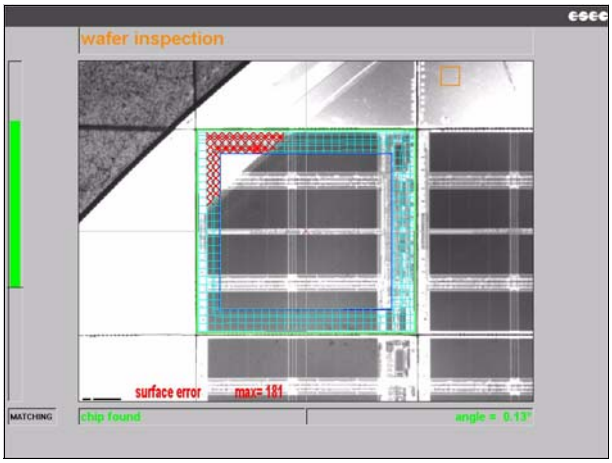
To simplify the setting, the system displays the value of the maximum deviation out of all detected values to the learned grey values.

For this a chip must be aligned.

The maximum grey level deviation is displayed in an additional message box on the lower left of the inspection monitor.

If the value is out of limit, the deviation is displayed in red, else in green.

When good and bad chips are aligned, this values might be a help for a correct adjustment of the limit.



Surface edge offset

Provides the possibility to set the test window smaller than the chip window.

Three settings are available:

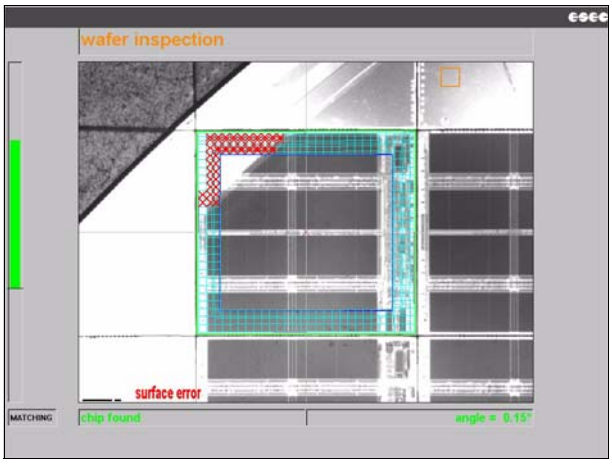
- **small**: set an offset of 3 pixels
- **medium**: set an offset of 5 pixels
- **large**: set an offset of 9 pixels

This offset reduces the test window on all chip edges.

Standard Settings

If the parameter **Surface check** is set to one of the given tolerances (**low, normal** or **high sensitive**), no numeric deviation is displayed.

In this example the boxes in the upper left area failed the surface check and are marked with red circles or crosses.



© 2009 Esec Ltd.

i 21 Inkdot Test 'on' / 'inverse'

General Information

This test checks the chip for an inkdot. Depending on the result, the chip will be picked or not.

Two different modes can be chosen:

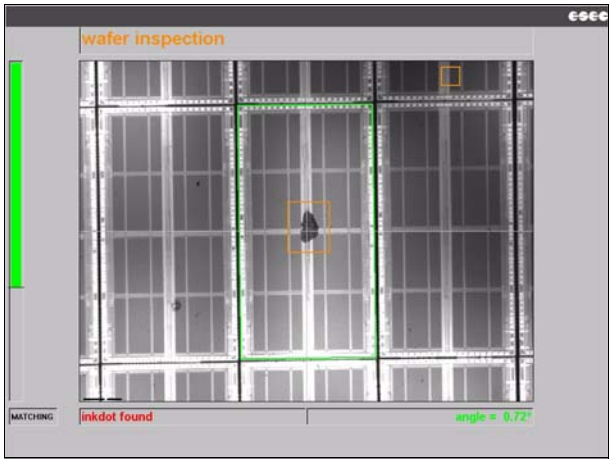
- **on**
- **inverse**

Inkdot Test 'on'

How Does it Work?

The black pixels within a defined inkdot window are counted. If the number of detected black pixels is above a defined limit, the chip is identified as inked and will therefore not be picked.

Note: The setup must be made on a inked chip and can be done in color mode.



An inkdot window is placed over the inkdot. The window should not be too big, but should cover variations of the inkdot position.

If an inkdot was found the message `inkdot found` is displayed on the inspection monitor.

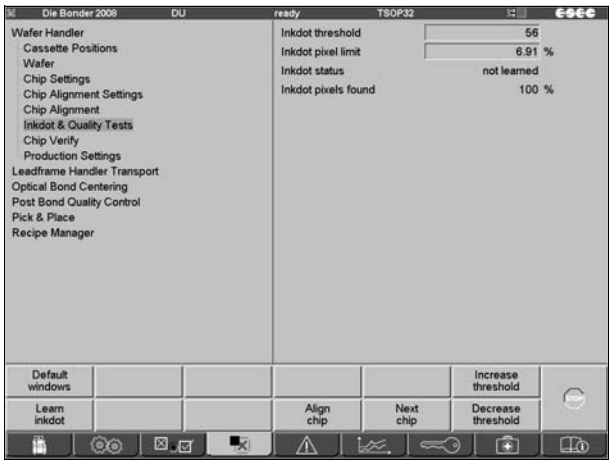
The actual value **Inkdot pixels found** shows the area of the detected black pixels relative to the inkdot window area.

Parameters

Inkdot threshold
Defines the value between the dark and the white pixels. This value must be set that the inkdot appears black while the chip surface does contain as few as possible black pixels.

If the soft key ***Learn inkdot*** is clicked during setup, the system sets the threshold automatically.

If the result is not good, the **Inkdot threshold** must be set manually or the illumination setup must be improved.



Note: If the illumination setup is optimized, the setup of the chip must be repeated.

© 2009 Esec Ltd.

Parameters (Cont.)

Inkdot pixel limit

Defines the limit of black pixels within the inkdot window, above which the chip is identified as inked. The limit should be set to a value which is in the middle of the value **Inkdot pixels found** on a good chip and the value **Inkdot pixels found** on an inked chip.

For example, if the value **Inkdot pixel found** on a good chip is **10%** and the value found on an inked chips **50%**, the **Inkdot pixel limit** should be set to **30%**.

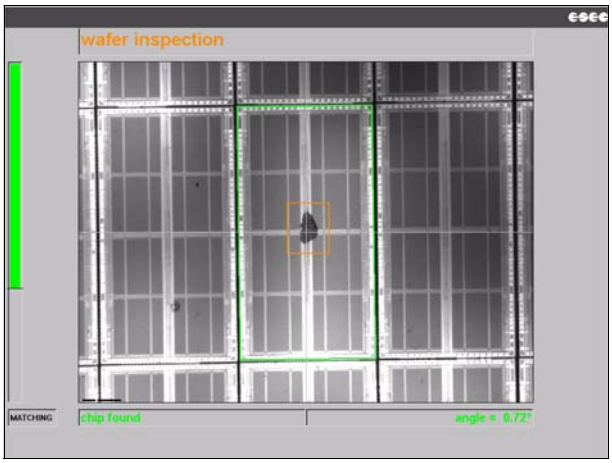
Inkdot Test 'inverse'

How Does it Work?

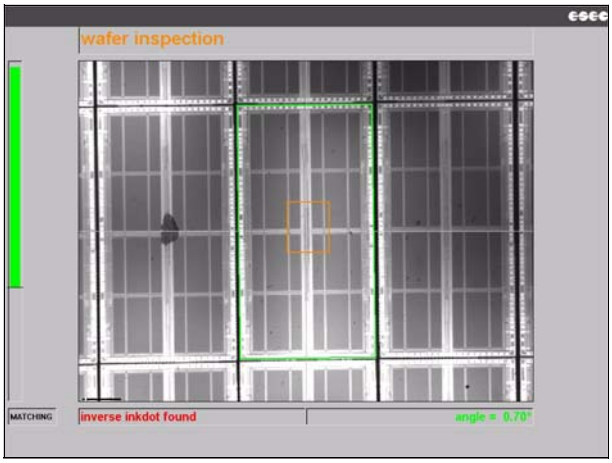
The **Inkdot test inverse** works in the same way as described above, but the inked chips will be picked and the others will be left on the wafer.

This mode is used mainly for setup devices and during set up of the machine.

If an inkdot is detected the message `chip found` is displayed.



If a chip without inkdot is tested the message `inverse inkdot found` is displayed on the inspection monitor.



© 2009 Esec Ltd.

i 22 Inkdot Test 'pattern' / 'inverse pattern'

General Information

This test checks the chip for a pattern. Depending on the result, the chip will be picked or not.

Two different modes can be chosen:

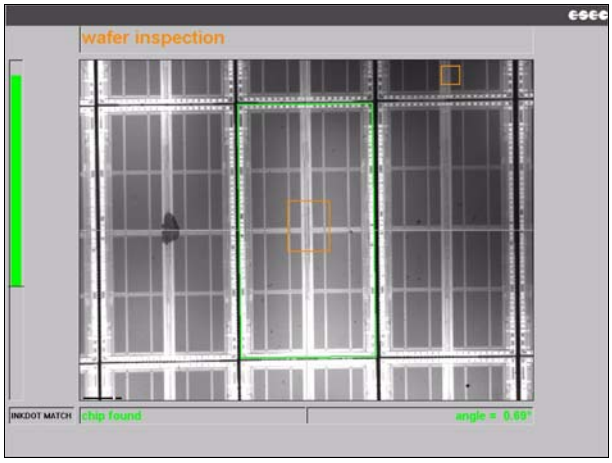
- **pattern**
- **inverse pattern**

How Does it Work?

If set to **pattern** the inkdot test checks for a pattern within the inkdot window.

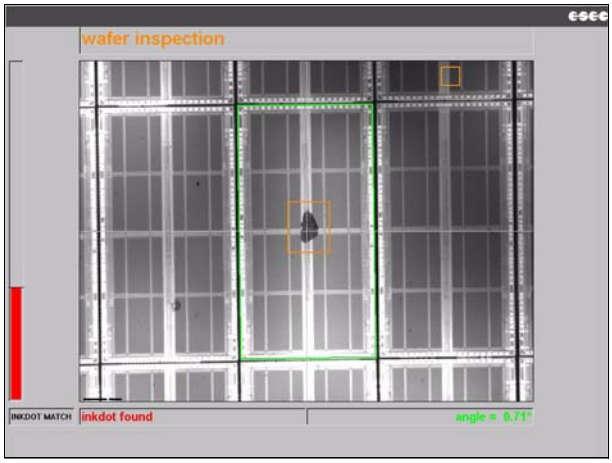
The detected pattern has to match the learned pattern within certain limits.

The green inkdot match bar at the left side of the inspection monitor shows how much the found pattern matches the learned one.



If an applied inkdot is covering the learned pattern, the pattern can not be found any-more. This is indicated by the red inkdot match bar in the negative sector.

In addition, the message `inkdot found` is displayed on the inspection monitor.



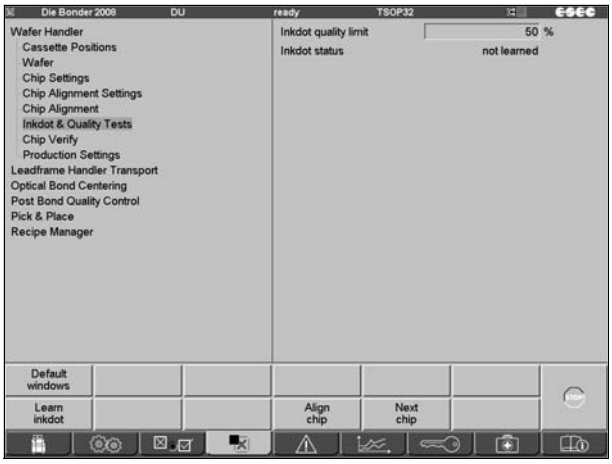
Note: The setup must be made on a good chip!

© 2009 Esec Ltd.

Parameter

Inkdot quality limit

Defines how many percent of the found pattern on the chip must match the learned pattern.



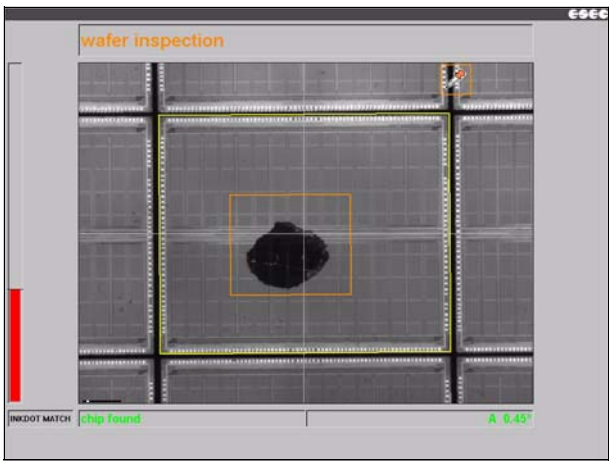
Inkdot Test 'Inverse Pattern'

How Does it Work?

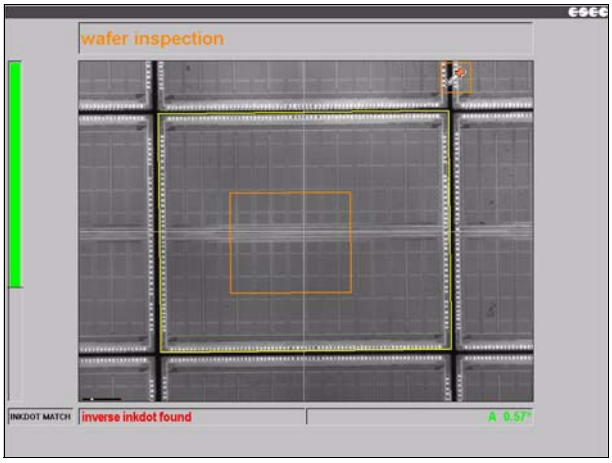
The **Inkdot test inverse pattern** works in the same way as the **Inkdot test pattern**, but the inked chips will be picked and the others will be left on the wafer.

This mode is used mainly for setup devices and during set up of the machine.

If a pattern was not found, the red inkdot match bar is in the negative sector and the message `chip found` is displayed on the inspection monitor.



If a chip without inkdot is tested, the inkdot match bar is in the green positive sector and the message `inverse inkdot found` is displayed on the inspection monitor.



© 2009 Esec Ltd.

i 23 Quality

General Information

After setting a reference window and clicking the soft key ***Learn chip***, the system checks the quality of the selected patterns and indicates the result with the quality bar at the right side of the inspection monitor.

How Does it Work?

The system inspects the patterns in the reference window and checks if there are good transitions from dark to bright pixels.

Examples

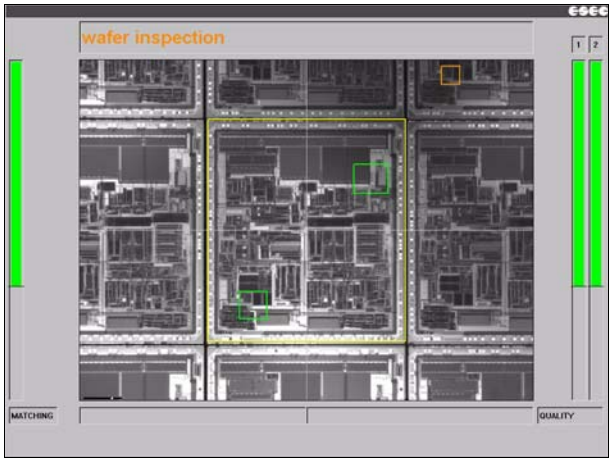
Good Uniqueness and Good Quality

After placing the template windows the system checks the uniqueness of the templates.

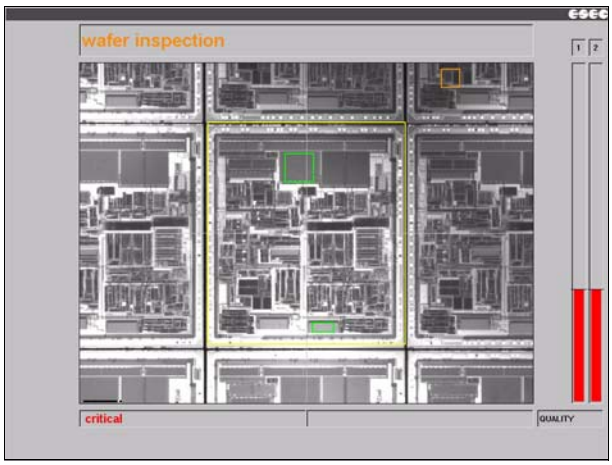
After clicking the soft key ***Learn chip*** the system checks the quality of the templates.

This example has good transitions between dark and bright pixels.

Therefore the quality bars of both templates are green in the positive sector.



The quality bars of both templates are red in the negative sector.



© 2009 Esec Ltd.

i 24 Street Threshold

General Information

With a correct setting of the parameter **Street threshold** the system is able to distinguish between the chip itself and the background (wafer street (saw cut), foil) and therefore to find and learn the chip.

It can be chosen, if the **Street threshold** should be set automatically by the system or manually by the user.

Note: The parameters **Street threshold mode** and **Street threshold** are available in the menu **Chip Alignment** for the **Alignment methods Street**, and **Mixed** as well for **Alignment method Two point** the **Pre-alignment** is set to **Street**.

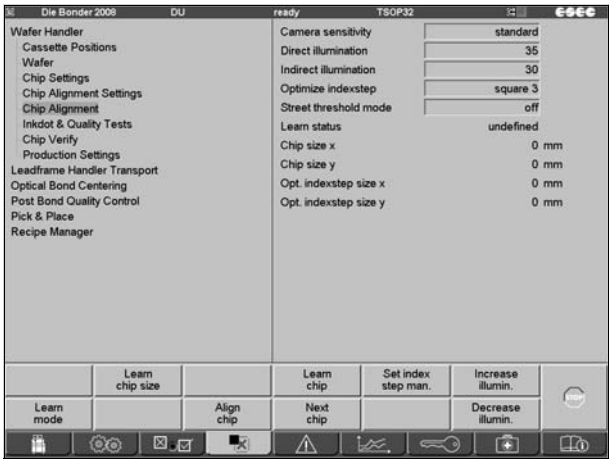
Threshold mode

Street threshold mode off

When the parameter **Street threshold mode** is set to **off**, the system will define the **Street threshold** automatically.

The parameter **Street threshold** does not appear in menu **Chip Alignment** in this case.

Note: This setting is suitable for 80% to 90% of the applications.



Street threshold mode on

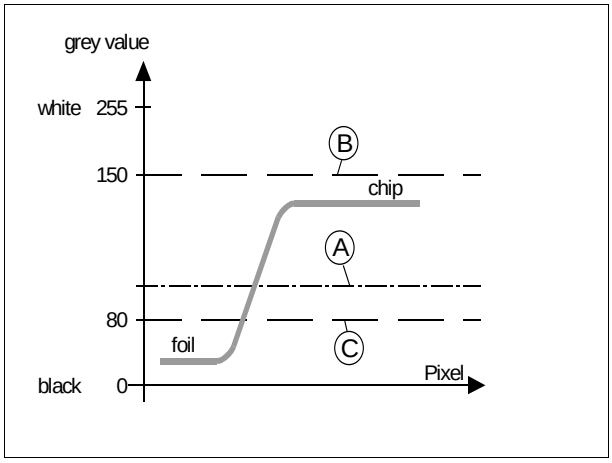
If the **Street threshold mode** is set to **on**, the threshold must be defined by the operator.

In this case the parameter **Street threshold** appears in the menu and can be adjusted by the operator.

© 2009 Esec Ltd.

Threshold Adjustment

The diagram to the right shows a possible grey value profile of a chip edge. The transition from the wafer foil to the chip can be easily seen.



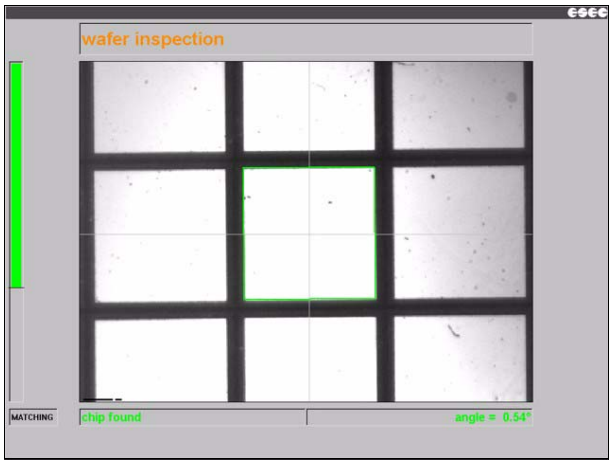
Three different threshold values are shown:

A: **Street threshold mode** is set to **off**. The system sets the **Street threshold** between the grey value of the chip and foil.

B: **Street threshold mode** is set to **on** and the **Street threshold** is adjusted by the operator to a value of 150. The system is not able to detect and learn the chip.

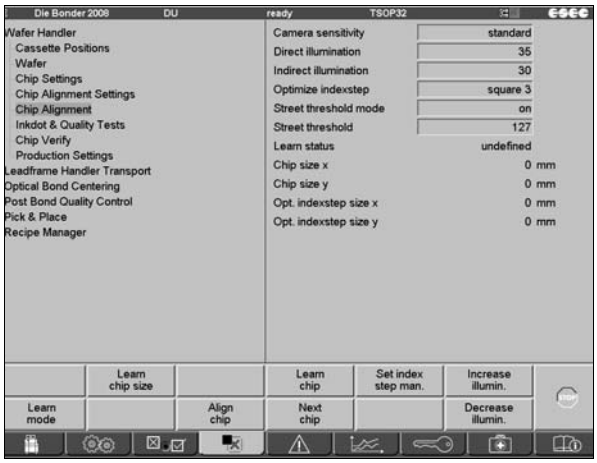
C: **Street threshold mode** is set to **on** and the **Street threshold** is set to 80 by the operator. The chip can be learned by the system in this case.

Correct Threshold



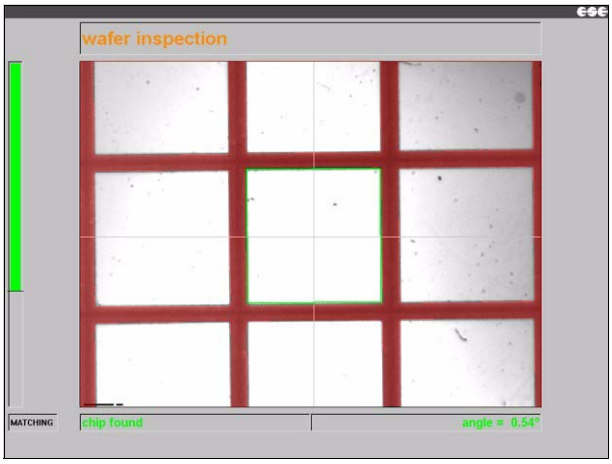
With a correctly set **Street threshold** the wafer streets appear i.e. in violet and are recognized as dark by the system.

The system is able to learn the chip, which is indicated by the message `chip found` on the inspection monitor.



© 2009 Esec Ltd.

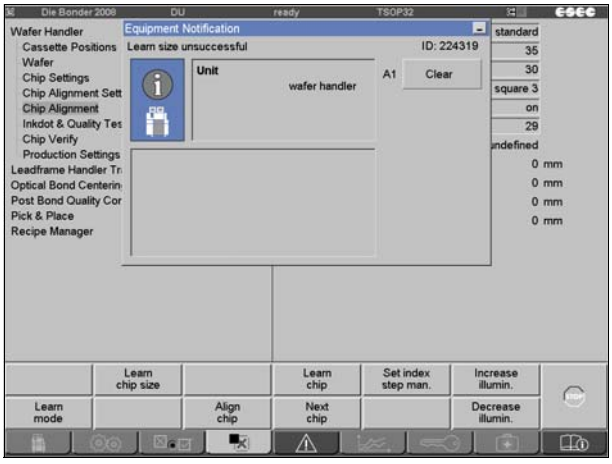
Threshold too Low



In this example the **Street threshold** is set to 20. If the image is viewed in color mode, the wafer streets appear in red and are therefore too bright for the system.

In this case the **Street threshold** is too low, the system will not recognize the wafer streets and is therefore not able to learn the chip size.

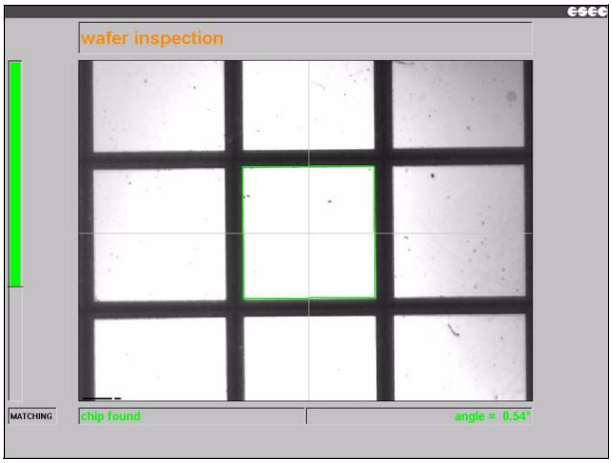
This is indicated by the hint `Learn size unsuccessful`, which is displayed on the master monitor.



Threshold Automatically Set

The same chip as above is shown here with identical illumination settings.

Unlike above, the **Street threshold** was defined by the system, because the **Street threshold mode** is set to **off**. The system could set the threshold in a way that the chip was found without problems, even with a very good matching.



© 2009 Esec Ltd.

i 25 Optimize Index Step

General Information

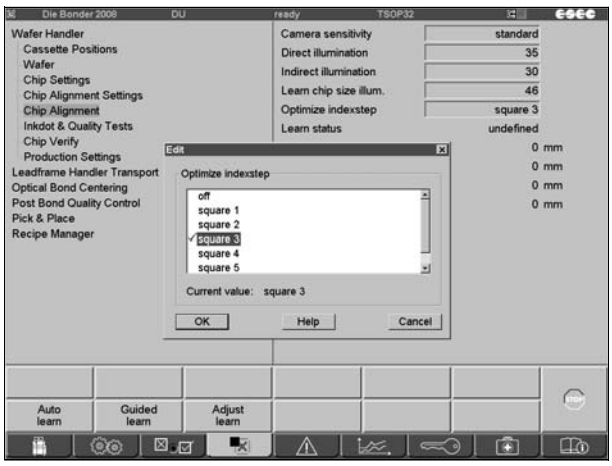
The function **Optimize index step** is used to learn the step from chip to chip in x- and y- direction over one or more chips. This function is especially important for wafer mapping where the position of the next chip is calculated by using the data of the index step.

Note: When working with partly processed wafers, it might not be possible to use this function, because there is no sufficient number of chips on the wafer.

How Does it Work?

When the function **Optimize index step** is activated, an optimization algorithm is used for learning the index step.

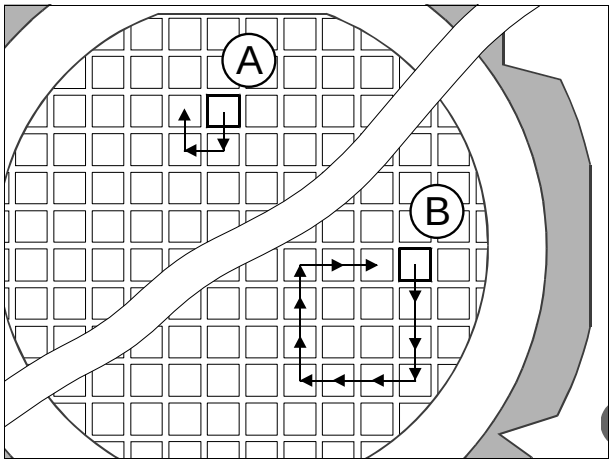
To activate this function the parameter **Optimize index step** must be set to either **square 1**, **square 2**, ..., **square 6**.



The wafer handler moves the wafer table around in a square pattern beginning at the learned chip.

Depending on the setting of the parameter **Optimize index step** the wafer table movement will comprise one to six chips (in each direction).

Example (A) shows the movement if it is set to **square 1**, while example (B) shows the range of the movement if it is set to **square 3**.



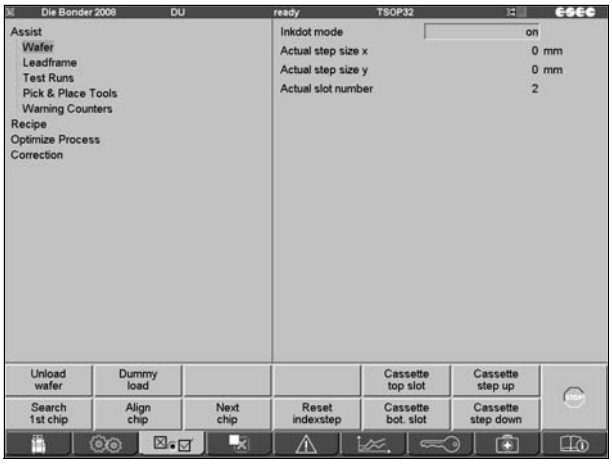
© 2009 Esec Ltd.

Checking the Index Step

The learned index step is displayed in parameter **Opt. index step size x** and **Opt. index step size y** in the menu **Teach - Wafer Handler - Chip Alignment**.

The actual index step is displayed in parameter **Actual step size x** and **Actual step size y** in the menu **Setup - Assist - Wafer**.

Note: The learned and the actual index step may be different.



© 2009 Esec Ltd.

i 26 Illumination Setting

General Information

The illumination is of great importance during teaching and production. The subject of the illumination is to illuminate the wafer so that as much as possible grey value differences (contrast) are visible for the vision system.

Note: Generally it is better to have too little than too much light. The system is able to see grey levels even with a poor illumination and even if the human eye is not able to see differences anymore.

Parameters

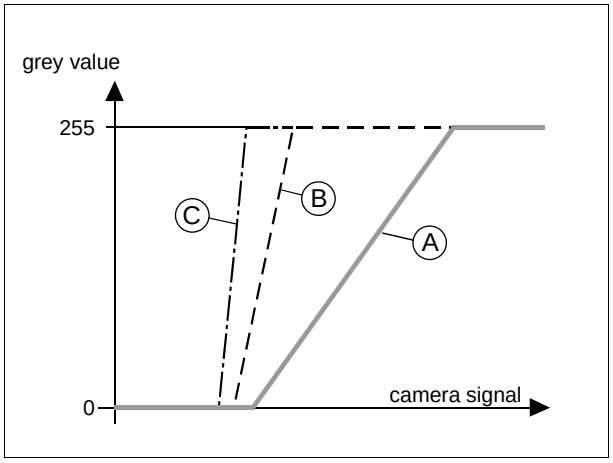
Direct illumination / Indirect illumination

The pick vision has a direct and an indirect illumination module which can be separately adjusted by the parameters **Direct illumination** and **Indirect illumination**.

In most of the cases the direct illumination is sufficient. But sometimes details on the chip (i.e. inkdot) are not visible with the direct illumination. In this cases it is necessary to use the indirect illumination additionally.

Camera Sensitivity

The grey values of the vision must be determined out of the camera signal. The sensitivity describes between which signal levels grey values are recognized. Below the lower gain limit everything is recognized as black and above the upper gain limit everything is recognized as white.



Three predefined sensitivities can be selected with the parameter **Camera sensitivity**:

A: **standard** lower/upper gain limit = 90/220
B: **medium** lower/upper gain limit = 85/110
C: **high** lower/upper gain limit = 72/88

If set to **manual**, the sensitivity can be adjusted with the parameters **Upper camera gain limit** and **Lower camera gain limit**.

The maximal sensitivity is 65/66.

Note: Whenever possible the setting **standard** should be used. However, if the illumination is not sufficient, especially with very small field of view (FOV), change the **Camera sensitivity** to **medium** or even **high**.

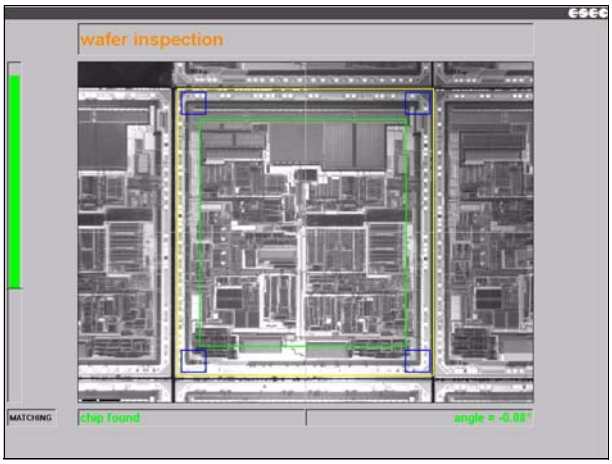
© 2009 Esec Ltd.

Examples of Illumination Settings

Good Illumination

This chip is illuminated in an optimal way.

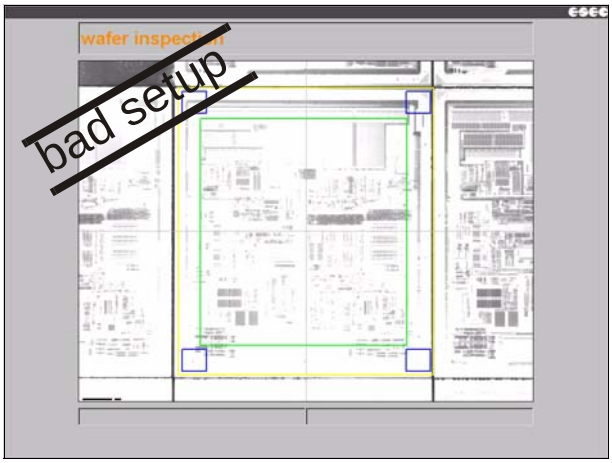
The structures are visible clearly in different grey values.



Too Much Light

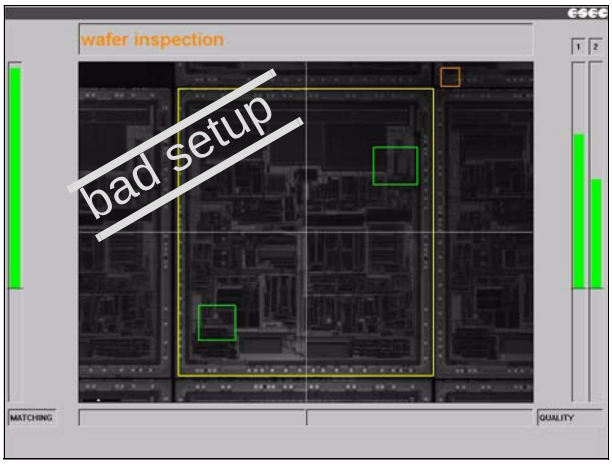
With this illumination setting, the chip appears too bright.

Some of the structures disappear and are only visible as bright areas with no differences in grey value.



Less Light

This illumination setting is quite low, but good enough for the system to distinguish between the different grey values.



© 2009 Esec Ltd.

Less Light (Cont.)

This illumination setting is even lower, but still the system is able to recognize the patterns.

Also the uniqueness is acceptable.

Note: The two examples above are shown only to illustrate the ability of the pick vision to work with critical illumination settings. Still, the set up should not be made like this. The illumination set up must be made according to example *Good Illumination* on page *12-52*!

© 2009 Esec Ltd.

i 27 Alternate Pattern Mode

General Information

If this mode is activated an alternate pattern can be learned. This is helpful when the chip patterns vary from wafer to wafer or even within the wafer because of passivation differences.

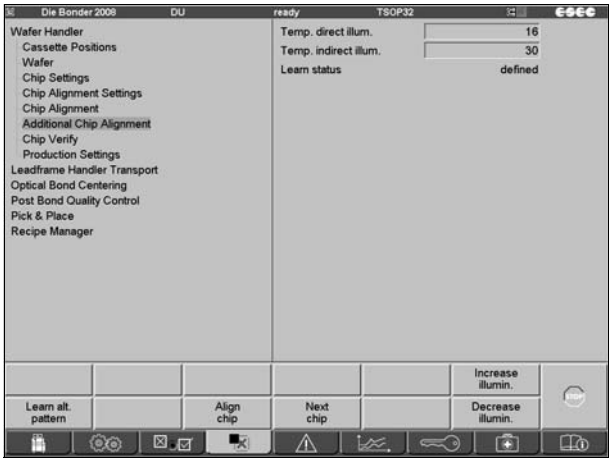
Note: This mode is only available for **Alignment method One point** and **Two point**.

How Does it Work?

The illumination settings and the template positions can not be changed.

Only an other structure within the existing template is learned.

If the system is not able to align the chip using the normal template, it will try to find the alternate pattern for alignment.



Tips and Tricks

How to Teach it

The chip must be taught already. Then move the wafer table to a chip with a different surface brightness.

Adjust the parameters **Temp. direct illum.** and **Temp. indirect illum.** until the chip can be aligned with a high value at the matching bars. This is to make sure that the chip will be aligned exactly the same with the alternate pattern as with the standard pattern.

After pressing the soft key ***Learn alt. pattern*** the alternate pattern will be taught using the original illumination settings.

Note: The parameters **Temp direct Illum.** and **Temp indirect illum.** are only used during the setup.
After an alternate pattern is taught no different illumination is required as the alternate pattern is used to align chips which can not be aligned with the standard settings.

© 2009 Esec Ltd.

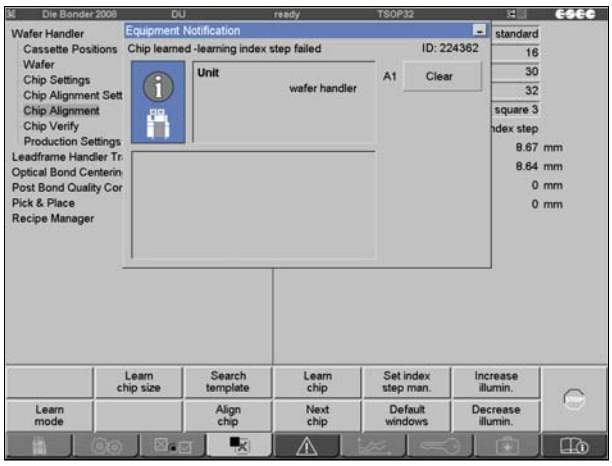
i 28 Set Index Step Manually

General Information

Normally, the system learns the index step automatically after the chip has been learned (see info sheet *Learn Chip* on page *12-59*).

But sometimes this is not possible. For instance if the next chip has different structures than the learned chip (i.e. at wafers with test chip) or if there are no chips in the neighborhood.

In this case the hint `Chip learned -learning index step failed` will be displayed.

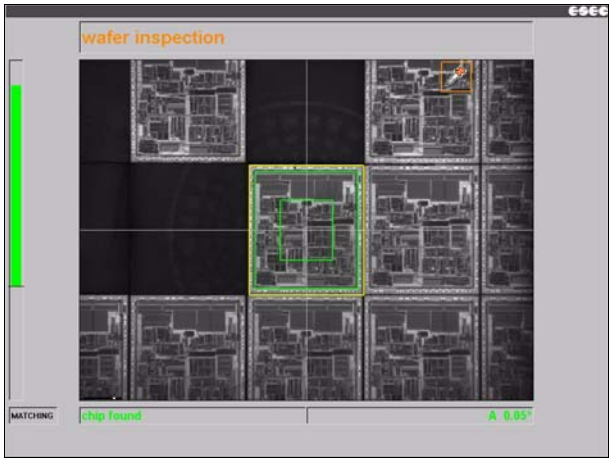


Set Up Procedure

Using the cursor keys, move the wafer to a position with a chip, which has at least one neighbor chip at its corners.

click ***Set index step man.***

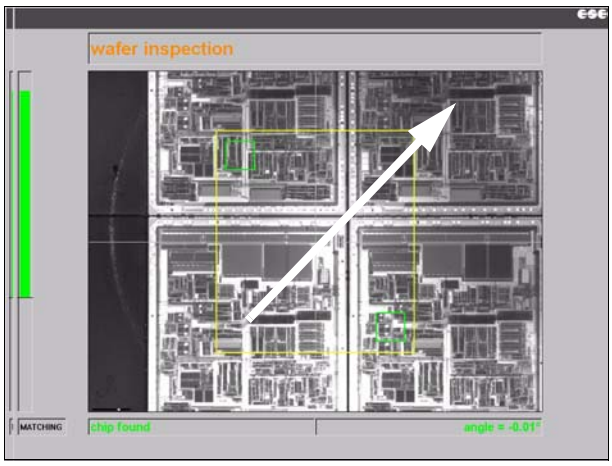
The parameters **Opt. index step size x** and **Opt. indexstep size y** will change to value **0** (zero).



Using the cursor keys, move the wafer to a position with a chip, which has at least one neighbor chip at its corners.

click ***Set index step man.***

The parameters **Opt. index step size x** and **Opt. index step size y** will change to value **0** (zero).

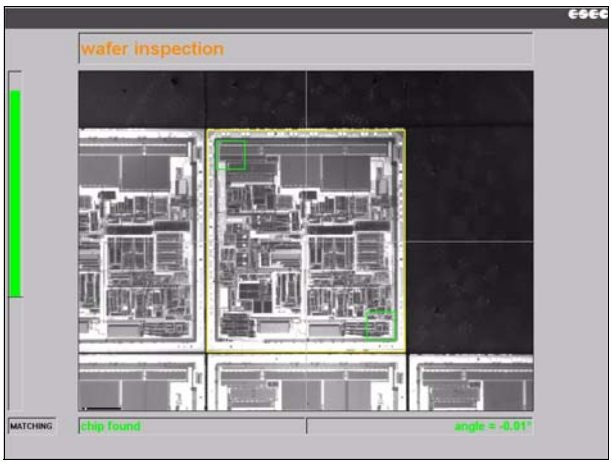


© 2009 Esec Ltd.

When the chip window is approximately over the chip:

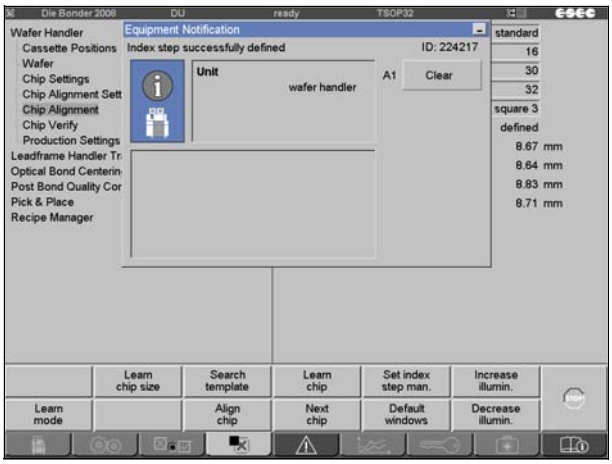
Align chip to align the chip accurately.

Define index step



`Index step successfully defined`

The parameters **Opt. index step size x** and **Opt. index step size y** will show the learned values.



© 2009 Esec Ltd.

i 29 Learn Chip Size

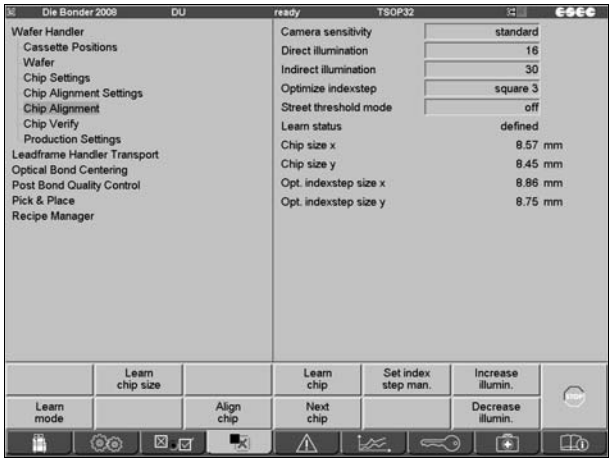
General Information

This function is used to define the chip size and the center of the chip. In the chip alignment process the center of the chip is aligned to the pickup position respectively to the center of the pick up tool. If the chip size is not learned, the chip will probably not be picked at its center.

How Does it Work?

To learn the chip size, place the chip window around the chip and adjust it correctly. The chip window must be a little smaller than the chip itself.

When the soft key ***Learn chip size*** is pressed, the system searches the four chip edges and the size is learned. The learned chip size can be seen in the parameters **Chip size x** and **Chip size y**.



Learn Chip Size with Street Alignment Methods

If the **Alignment method Street**, **Mixed** or **Two point** with **Pre-alignment Street** is activated, the chip window will be displayed in green on the inspection monitor.

Before learning the chip size, check and adjust the **Street threshold** if necessary (see info sheet *Street Threshold* on page *12-46*)

Note: For all Street Alignment methods the chip size is taught in the learn chip procedure (see info sheet *Learn Chip* on page *12-59*). But it‘s strongly recommended to teach the size before learning the chip to ensure and check the teaching is done correctly.

Learn Chip Size with Structure Alignment Method

If the **Alignment method Structure** is activated, the chip window will be displayed in yellow on the inspection monitor.

With an optimal illumination set up for the templates, the chip edges are often not clearly visible for the system.

That’s why a special illumination can be set with the parameter **Learn chip size illum.** This illumination is only used for set up (i.e. teaching the chip size) and is never used during the production. To check the parameter **Learn chip size illum.** click ***Learn chip size***.

© 2009 Esec Ltd.

Learn Chip Size with Point Alignment Methods

If the **Alignment method One point** or **Two point** with no or with **Pre-alignment One point** is activated, the chip window will be displayed in yellow on the inspection monitor.

With an optimal illumination set up for the templates, the chip edges are often not clearly visible for the system.

That's why a special illumination can be set with the parameter **Learn chip size illum.** This illumination is only used for set up (i.e. teaching the chip size) and is never used during the production. To check the parameter **Learn chip size illum.** click ***Learn chip size***.

Note: For all **Point Alignment methods** the chip size is not taught during the learn chip procedure.
Always learn the chip size before learning a chip to ensure the chip will be picked at its center.
The chip size also defines the test field of template 1. If not taught the search field might be unsuitable for production.

© 2009 Esec Ltd.

i 30 Learn Chip

General Information

When the soft key ***Learn chip*** is pressed a defined short work routine is started:

- the chip size will be learned if a **Street Alignment method** is used.
- the chip structures within the templates will be learned (not with **Alignment method Street**).
- the magnification will be learned.
- the index step will be learned.

Sequence of Work Routine

Learn Chip Size

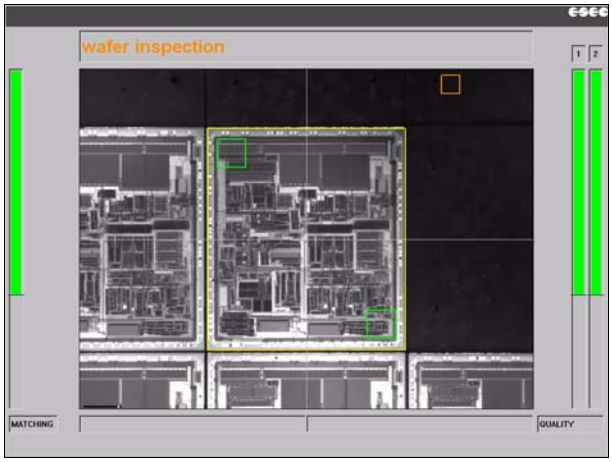
i 29 The learn chip size function is only executed for the **Alignment methods Street**, **Mixed** and **Two point** with **Pre-alignment Street**.

Learn Structure

i 23 After the learn structure function is started, the quality of the patterns is checked.

The result of this test is shown with the quality bar at the right side of the inspection monitor.

If the quality is o.k., the structures of the template windows will be learned.

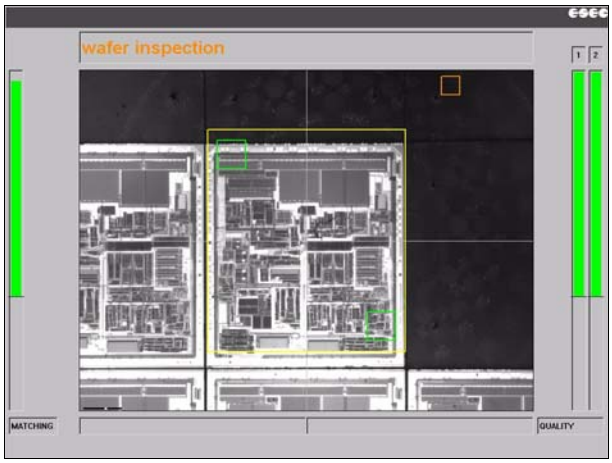


Learn Magnification

Then the learning of the magnification is started.

Depending on what was learned first during the learn chip routine, the reference for learning the magnification will be:

- the chip street
  (in **Alignment methods Street**)
- the prealign-template
- or the template one.



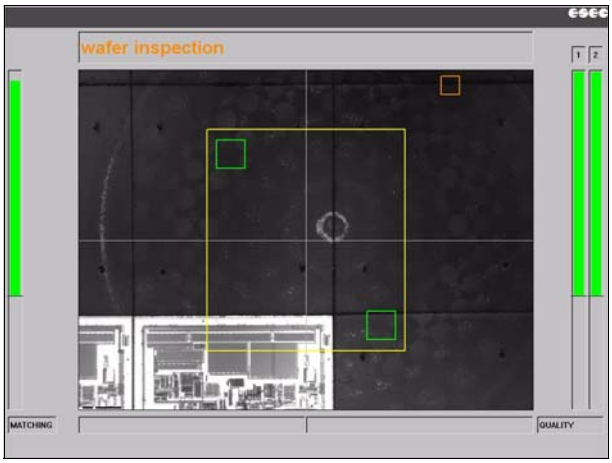
© 2009 Esec Ltd.

Learn Magnification (Cont.)

First the reference is moved towards an edge of the Field of View (FOV).

Next the reference is aligned on the nearest axis (x-axis or y-axis).

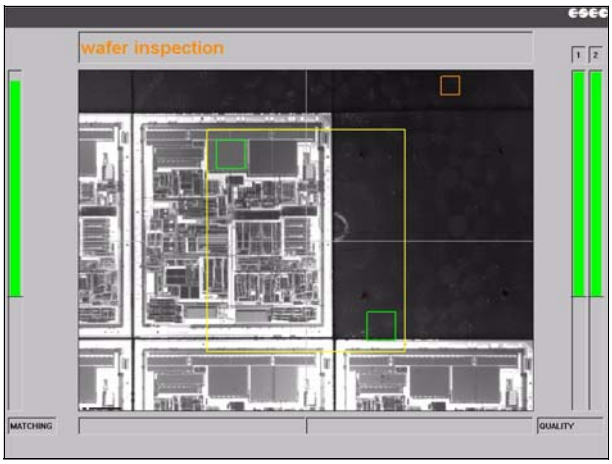
In the example the reference is the template one and is aligned on the y-axis.



i 17

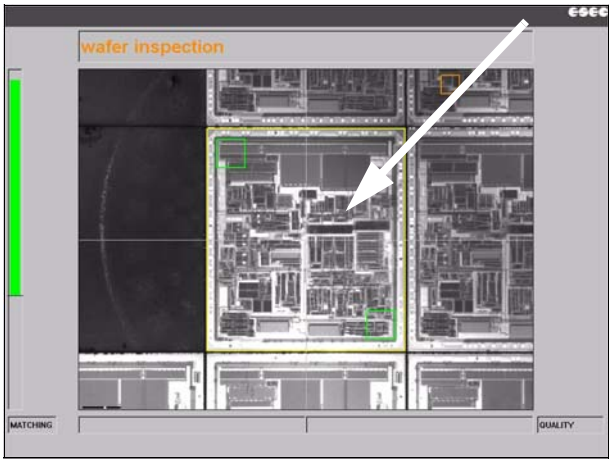
Then the reference is moved over the distance of the **Learn scale proportion** and the magnification is learned.

Finally the chip is aligned to the center of the FOV.



Learn Index Step

The system will now align the chip to the lower left corner and will learn the index step.



Then the first chip is aligned again.

i 25

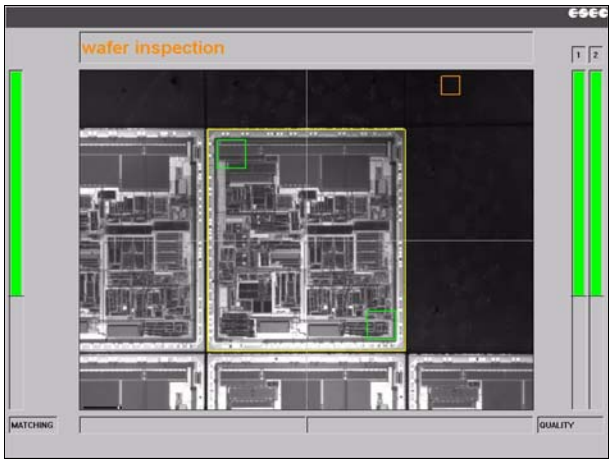
If the function optimize index step is activated, it is processed at this point.

© 2009 Esec Ltd.

Learn Index Step (Cont.)

Then the first chip is aligned again.

i 25 If the function optimize index step is activated, it is processed at this point.



© 2009 Esec Ltd.

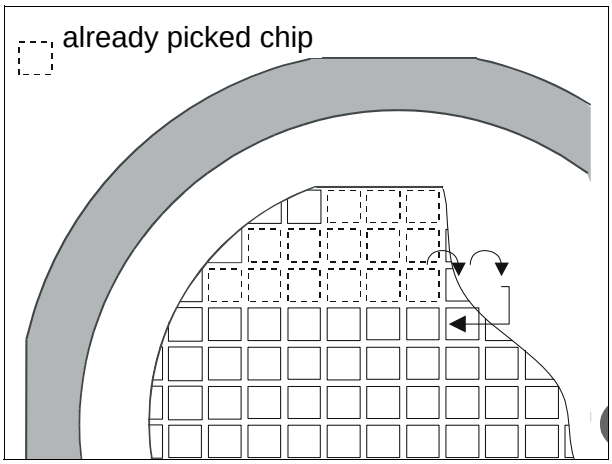
i 31 Broken Wafer

General Information

The **Broken wafer check** mode is used for wafers with missing chips.

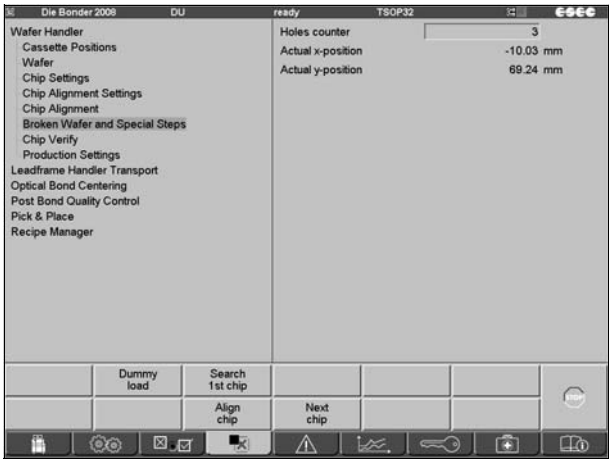
How Does it Work?

If the system finds a defined number of missing chips (or holes) in succession, it will move to the next row to carry on the production.



Parameter

By setting the parameter **Holes counter** it can be defined after how many missing chips the system will jump to the next row.



© 2009 Esec Ltd.

i 32 Border Mode

General Information

The **Border mode** is used for wafers with a lot of inked, blanked or reference chips at the border. It is mainly used for small chips below 0.5 x 0.5 mm.

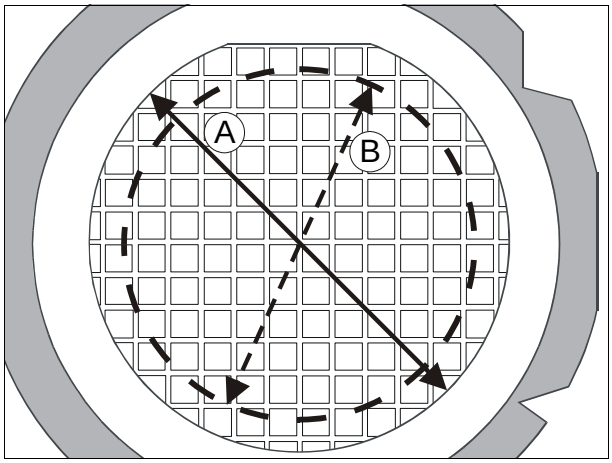
i 13 **Note:** For the **Border mode** the process direction must be set to **x- bidirectional** or **y- bidirectional**.

How Does it Work?

A **Border size** (B) has to be defined which is smaller then the **Wafer diameter** (A).

Outside this border, the chips are checked for a set criteria. If a defined number of chips fail a set criteria (i.e. inked chips or blank chips) in succession, the left chips of the row will be skipped.

Note: If the criteria are set correctly, this mode will increase the UPH!



Examples

The following examples describe how the **Border mode** works.

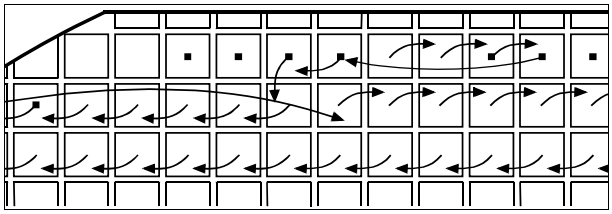
- The **Chip count** is set to **2 die**.
- The test criteria is inked die.

Example One

The first row at the top of the wafer is outside of the border and hence the **Border mode** is active. After two inked dies are found, the rest of the row is skipped.

The production continues in the first row into the opposite direction.

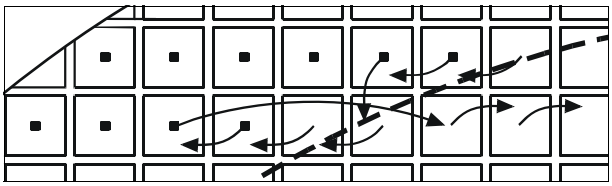
The **Border mode** is still active.



© 2009 Esec Ltd.

Example Two

The system has reached an area with inked dies outside the border. After two inked dies the row is skipped and the production continues with the chip below in the same direction.

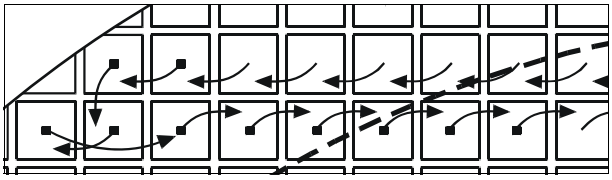


Now the system will change the direction either when the wafer diameter is reached or the border criteria is fulfilled again, as in this example after two inked dies. The system jumps now to the die beside the first aligned chip of the same row and continues production in the opposite direction but in the same row.

Example Three

In this example after the direction change the system is still outside the border.

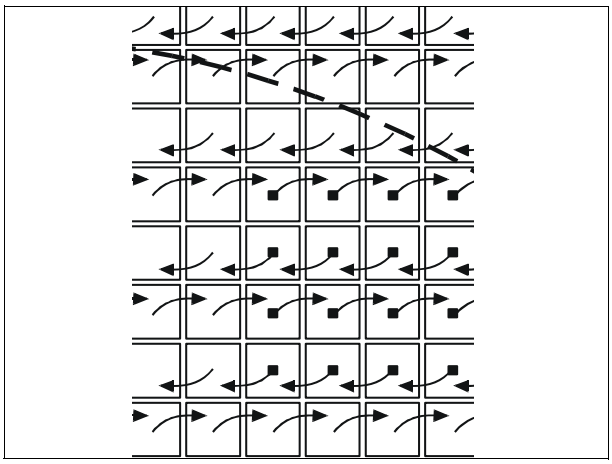
Now the criteria (two inked chips) is fulfilled. But as the **Border mode** is not active after a direction change until the system moves into the second half of the wafer, the inked die do not cause a row skip.



Example Four

Here the system is inside the border size.

The inked dies have no effect as the border test is not active.



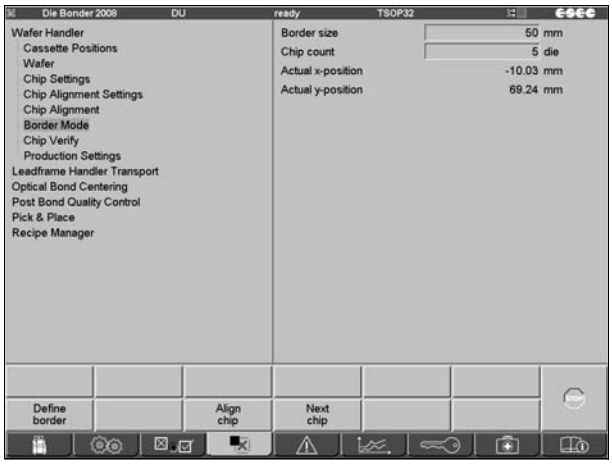
© 2009 Esec Ltd.

Parameters

Border size

Defines the border size diameter.

If the system works outside of the border size diameter, the border mode is active.



Border inkdot check

If set to **on**, each inked chip will increase the chip counter.

This parameter is only available if the **Inkdot mode** is activated.

Border chip check

This parameter can have three settings:

- **Off**: No border chips increase the chip counter.
- **Blank Chip**: Blank chips increase the chip counter.
  This setting is only available for street alignment and when the **Blank test** is activated.
- **Border mismatch**: The chip counter will be increased by a pattern mismatch.
  This setting is only available for point alignment methods.

Note: If the chip counter reaches the value set by the parameter **Chip count**, a row skip will be done.
Each good chip found will reset the chip counter.

Chip Count

Defines the number of chips which must fulfill the border test criteria in succession to cause a row or direction change.

© 2009 Esec Ltd.

i 33 Chip Verify

General Information

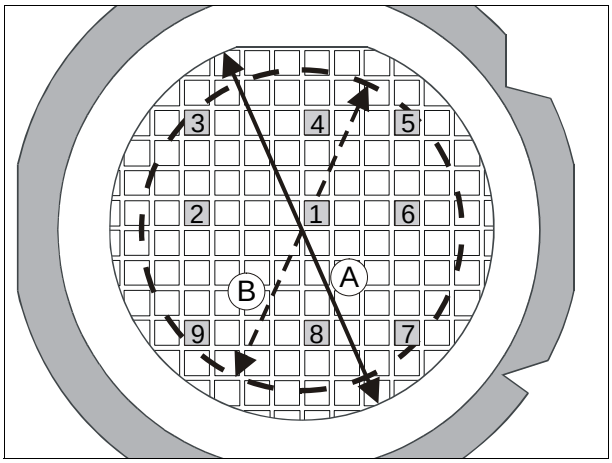
This function is used to check the setup of the chip alignment and of the activated tests.

How Does it Work?

Within a defined area the system will align nine chips and will test the quality of the templates and the test settings.

This nine positions can be aligned again and the results of this checks can be seen in the actual values of the menu **Chip Verify**.

A: Wafer diameter
B: Verify diameter
1-9: Positions of the verified chips



Parameter

Verify diameter

Defines the area in which the nine chips are chosen. This parameter is defined in percentage of the wafer diameter.

Verify searchgrid

Defines after how many chips the next chip is aligned.

Verify chip

Indicates the chip to which the displayed results belong.

Found value

Shows the quality of the respective chip.
The chips should be found with **best mach** or **good match**. If **low match** or even **not found** is displayed, the set up must be optimized (i.e. illumination or template position).

Inkdot result

Shows the result of the **Inkdot test** (if activated).
The results **inkdot found**, **inverse inkdot** and **no inkdot** are possible.

Corner result

Shows the result of the **Corner test** (if activated).
The results **corner ok** and **missing corner** are possible.

Surface result

Shows the result of the **Surface test** (if activated).
The results **surface ok** and **error detected** are possible.

© 2009 Esec Ltd.

i 34 Production Settings

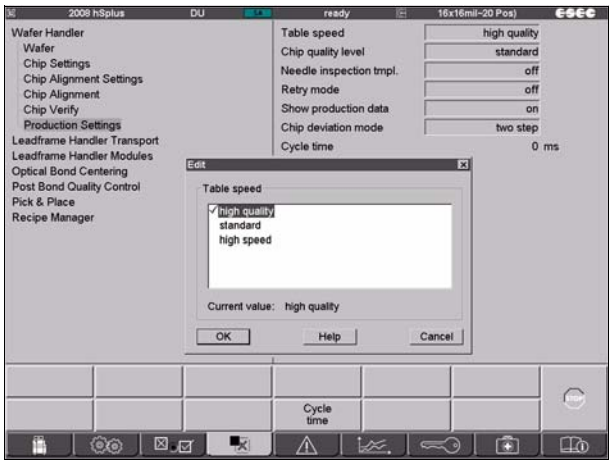
This menu is used to define the production.

Parameters

Table speed

Defines the speed of the wafer table. The following settings are possible:

- **high quality**: for BGA-, CPS- and other high end products
- **standard**: for standard products
- **high speed**: for SOIC- and PLCC-products where highest UPH is needed.



Chip quality level

Defines the tolerance of the chip alignment. The following settings are possible:

- **standard**: this setting should be used for most of the products
- **medium** and **low**: These settings should be used for wafers with big variation in structure within the same lot. A lower quality will be accepted than with setting **standard**.

Note: The **Chip quality level** parameter is not available with **Alignment method Street**.

Blank test

If this test is set to **on**, the system will check the chips and skip them when they are blank.

Note: This test is only available with **Alignment method Street**.

Retry mode

If this mode is set to **on**, the system will search for a chip a second time, if a chip could not be aligned at the first attempt. The wafer is then moved a defined distance in x- and y- direction. Then the chip is searched again at this position. If the search procedure is still not successful the system will move to the next chip.

© 2009 Esec Ltd.

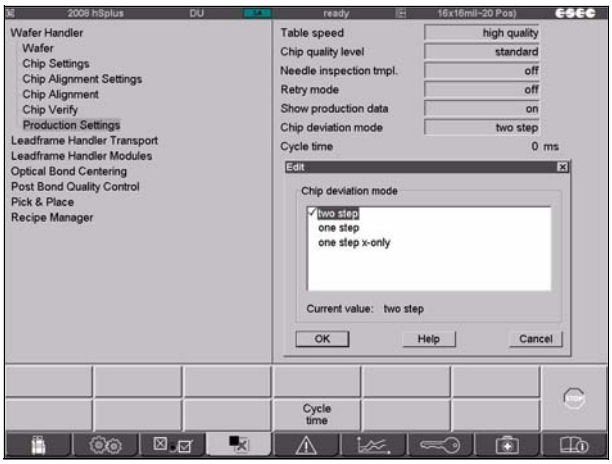
Show production data

if this parameter is set to **on**, the angle of the found chip will be displayed on the inspection monitor.

Chip Deviation Mode

This parameter influences the speed of the wafer table. The following settings are possible:

- **two step**: for best quality but standard speed
- **two step**: for medium quality and medium speed
- **two step**: for standard quality but highest speed. Only x-deviations are corrected.



Local map parameters

i 35 Parameters used for productions with local mapping are described in info sheet *Local Mapping* on page *12-69*.

Cycle time

This actual value shows the time which was needed by the system to align and test the chip.

This time is depending on:

- the number and kind of activated tests
- the size of the different windows (i.e. inkdot window, corner window or selection of the surface test)
- other parameters as the search range

© 2009 Esec Ltd.

i 35 Local Mapping

General Information

If this mode is activated, the chips in the neighborhood of an aligned chip will be checked if they are inked or not.

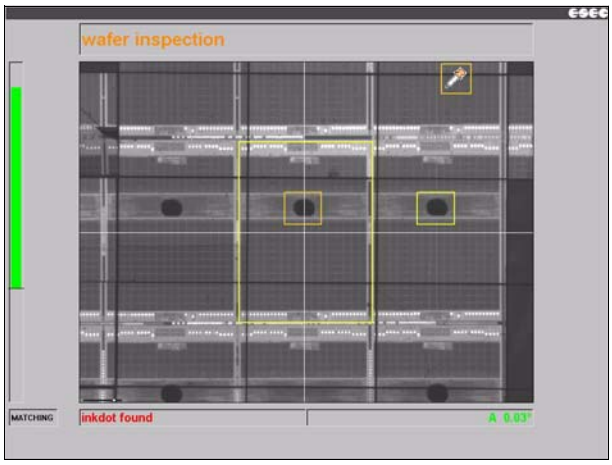
When processing wafers with bad yield (a lot of inked chips) this mode will increase the UPH.

How Does it Work?

The system recognizes the inked chips in advance without aligning them.

These chips will be skipped and the system will only align chips without inkdot.

The number of mapped chips is depending on the **Field of view** and the parameter settings (see below).



How to Set the Field of View for Local Mapping

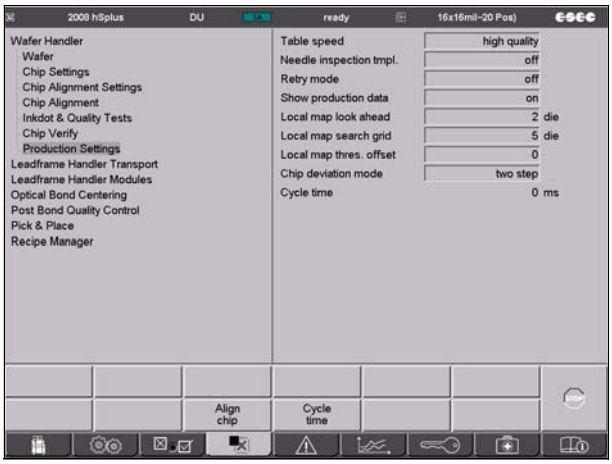
The system only can check those chips for inkdots which are clearly within the **Field of view**. Therefore the **Field of view** must be bigger than for standard production. For instance: for mapping 3 chips, 3 chips to the left and 3 chips to the right of the aligned chip must be visible on the inspection monitor.

© 2009 Esec Ltd.

Parameters

The parameter setting for local mapping must be made in the menu **Production Settings**.

Note: The parameters of menu **Production Settings** not used for local mapping are described in info sheet *Production Settings* on page *12-67*!



Local map look ahead

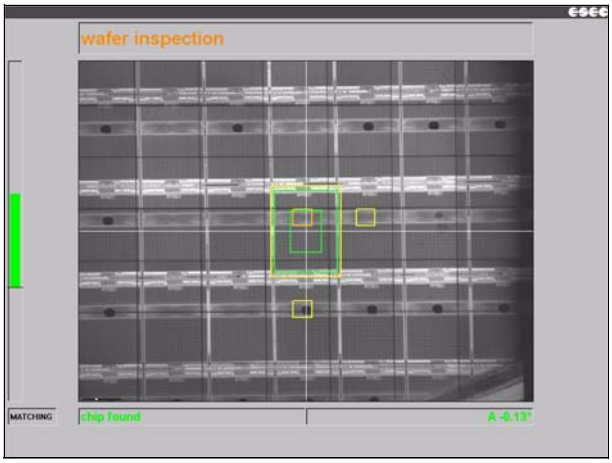
Defines how many chips should be checked for inkdots in advance.

The two following examples show the situation with the same **Field of view** but with different settings of **Local map look ahead**. The **Process direction** is from left to right.

The example shows the effect if the parameter **Local map look ahead** is set to **1**:

The chip to the right and below will be checked.

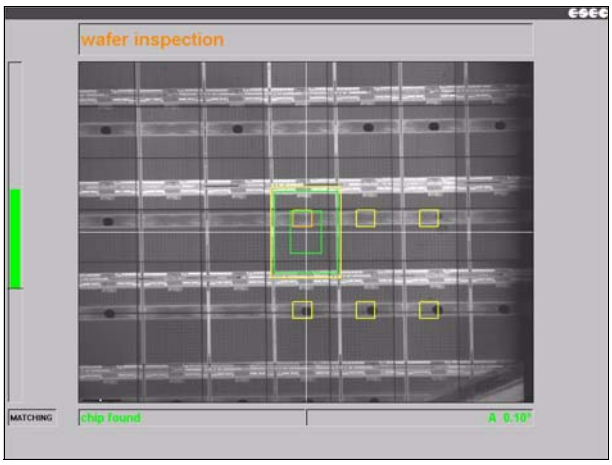
The inkdot window is displayed in yellow on the chips to be checked.



This example shows the effect if the parameter **Local map look ahead** is set to **3**:

The two chips to the right and three chips below will be tested.

Note: If the field of view would be bigger, three chips to the right would be tested!



© 2009 Esec Ltd.

Local map search grid

Defines how many inked chips can be skipped at maximum in one step.

Local map thres. offset

This parameter is used to optimize the threshold setting for the local map inkdots. The illumination is not always evenly over the whole field of view. Therefore it might be necessary to adjust the threshold to recognize inkdots at the edge of the field of view correctly.
If set to **0**, the threshold is the same as for the inkdot of the aligned chip.

© 2009 Esec Ltd.

/ (May 29, 2009)

i 36 Threshold and Color Mode

General Information

All images taken by the Die Bonder 2009 SSI vision systems are grey scale images with 256 levels of grey values. Depending on its brightness, each pixel of an image has a grey value between 0 and 255.

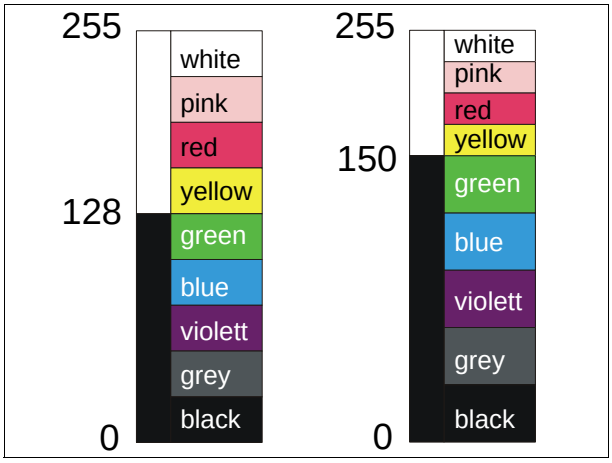
Anyway, for tests like **Inkdot mode** and **Rejected pad sensor mode** the vision system only needs the information wether a pixel is bright or dark (below or above the threshold).

Color Mode

As a help for setting the threshold correctly, the color mode can be activated. In this mode the 256 levels of grey are grouped to 9 colors, which are called pseudo colors. The colors black, grey, violet, blue and green are used for grey values below the threshold and the colors yellow, red, pink and white are used for values above the threshold.

If the threshold is set to 128, each pseudo color comprises around 30 grey values.

If the threshold is set to a higher value (i.e. 150), the colors of bright and dark pixels remain the same, but they comprise more (or less) grey values.

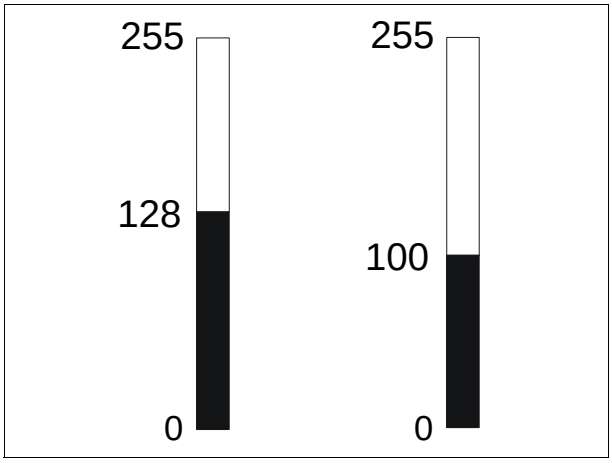


Threshold

The user defined threshold separates between the dark and the bright pixels.

Standard setting of threshold is 128. Pixels with a brightness value up to 128 are considered as dark, pixels with a value above 128 are considered as bright.

If the threshold is set manually to 100, pixels with a brightness value up to 100 are considered as dark, pixels with a value above 100 are considered as bright.



© 2009 Esec Ltd.

Activating and Deactivating the Color Mode

To activate the color mode:

Press and hold the ***CTRL*** key (to change the soft key functions)

Color image

Release the ***CTRL*** key.

To return to the monochrome mode:

Press and hold the ***CTRL*** key.

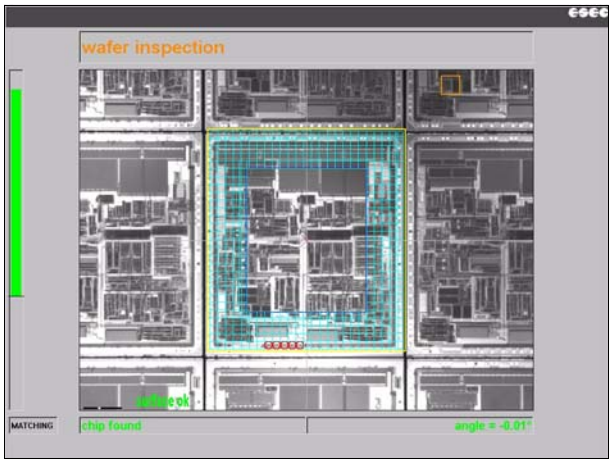
Monochrome image

Release the ***CTRL*** key.

Example

The image to the right shows the inspection monitor in color mode.

The chip structures are displayed in pseudo colors. In this way it can be seen which areas are detected as bright or dark pixels.



Note: Never use the color mode during set up of references, because the system uses the 256 grey values and not the nine pseudo colors.

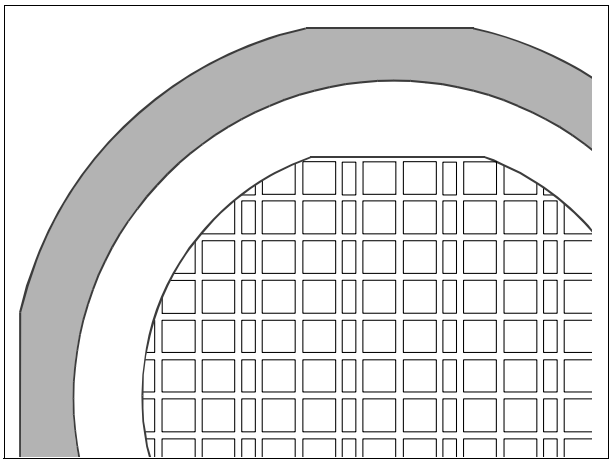
© 2009 Esec Ltd.

i 37 Special / Alternate Step

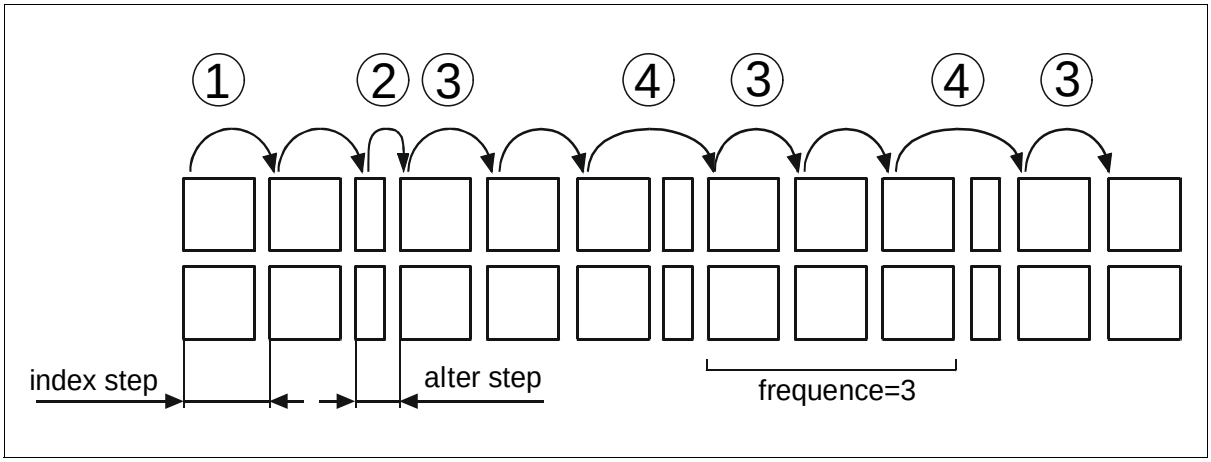
General Information

This mode is used to process wafers with rows or columns of dies with different sizes.

The picture to the right shows a wafer which must be processes with the **Alter x step mode**.



How Does it Work?



1. After the first chip is picked, the wafer table moves to the next chip using the normal index step. As long as the next chip can be aligned, it will be picked and the next index-step is done as usual.

2. When no chip is found for the first time, it is assumed that this is a reference chip and the table moves the distance of the alter step. If the chip can then not be aligned immediately, the next chip is searched using small correction steps. Now the system remembers the position of the reference chip.

3. As long as the next chip is not a reference chip, production continues as usual.

4. When the next chip is a reference chip, the table moves the normal index step and the alter step together. So the reference chip will be over jumped and the next production chip is aligned directly.

© 2009 Esec Ltd.

How Does it Work? (Cont.)

Note: The alter x/y step mode works in process direction only!
E.g. for the **Alter x step mode** the process direction must be in x! For the **Alter y step mode** the process direction must be in y! Therefore the **Alter x step mode** and the **Alter y step mode** can not be used together.

Parameters

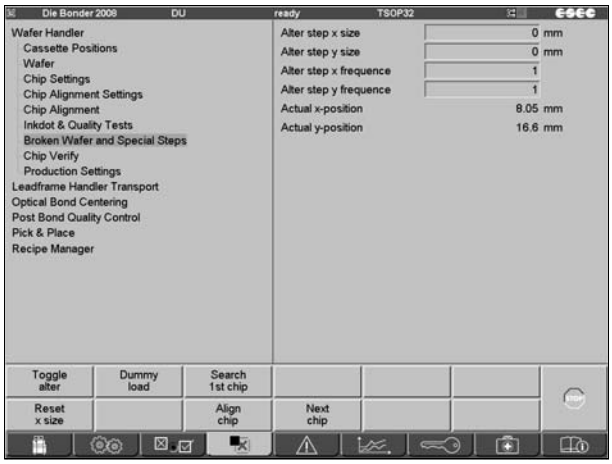
After step x/y-size

Defines the length of the step from a reference chip to a production chip.

This parameter can be set with the help of the soft keys ***Reset x/y*** and ***Set x/y size*** or manually by entering the appropriate value.

Alter step x/y frequency

Defines how many chips of normal size are between two reference chips.

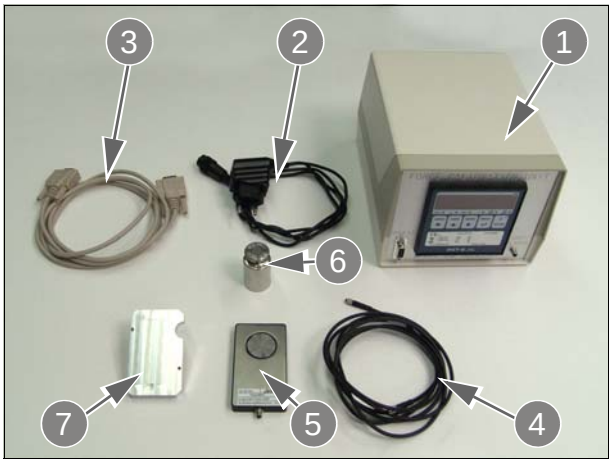


© 2009 Esec Ltd.

i 38 Force Calibration Unit

Parts of Force Calibration Unit

1. Control Unit
2. Power Connection
3. RS 232 Cable
4. Cell Connection
5. Load Cell
6. Calibration Weight 200 g = 1.962 N
7. Die Ejector Adaptor Plate



Operating Panel of the Control Unit

Press the **Zero** button (1) to resets the displayed force value to zero.

Make sure there is no force applied to the load cell during the reset.

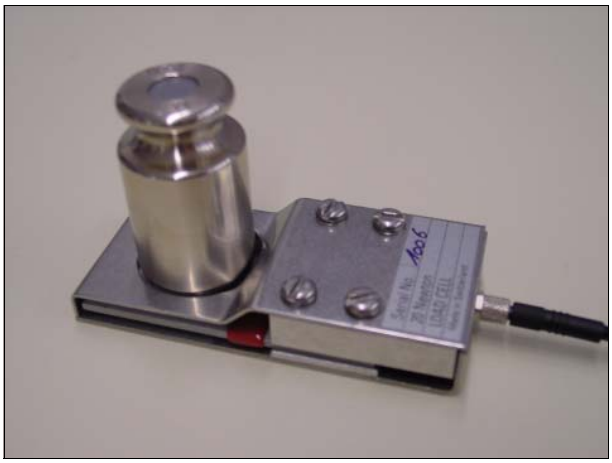
Controlling the Force Measurement

The measurement of the force calibration unit itself can be controlled with the delivered calibration weight.

Place the calibration weight to the center of the load cell.

The displayed value must be 1.962 N with a tolerance of +/- 0.02 N

If the displayed value is out of this range, the complete force calibration unit must be sent to the manufacturer for recalibration.



© 2009 Esec Ltd.

Technical Data

Range	0 - 20 N
Resolution	2 mN
Overall Unit Error	<20 mN
Display	5 digits
Power Supply	100 - 240 VAC / 50 - 60 Hz

© 2009 Esec Ltd.

/ (May 29, 2009)

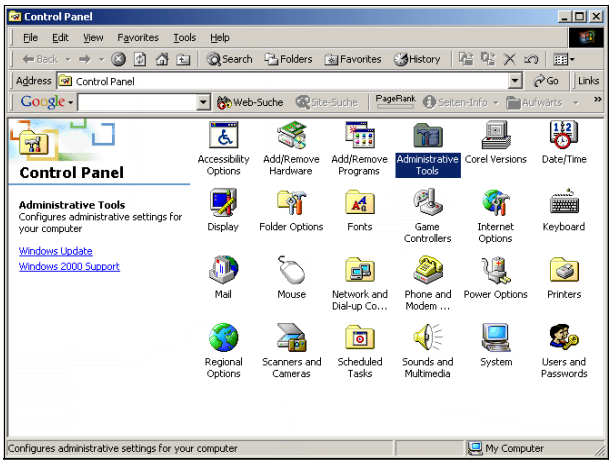
i 39 System Verification before Installation of the SCS Software

For installation of the SCS software, the PC hard disk has to have two partitions assigned to the letters (C:) and (D:). Otherwise the installation of SCS software would fail. Though the partitions on the hard disk are correct, the drives can be assigned to the wrong letter or a drive letter can be missing.

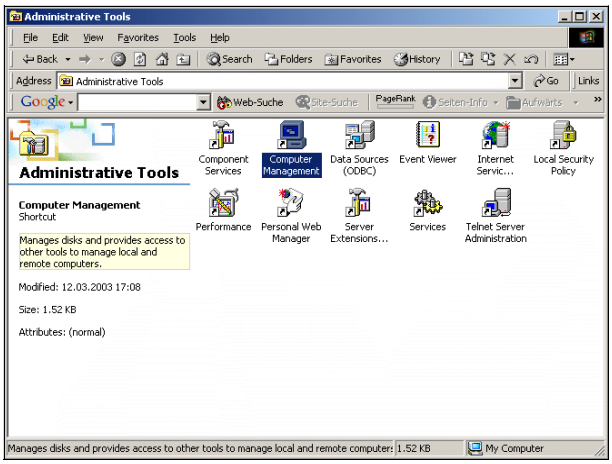
Follow the next steps to make the correct assignments or to make sure the PC has the correct configuration.

System Verification

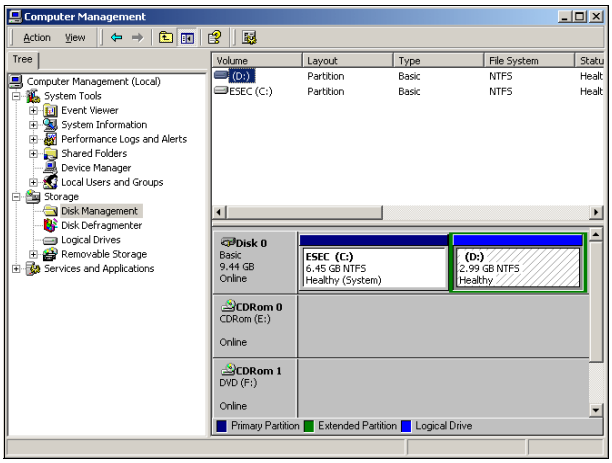
Start - Settings - Control Panel



click ***Administrative Tools***



click ***Computer Management***



click ***Disk Management***

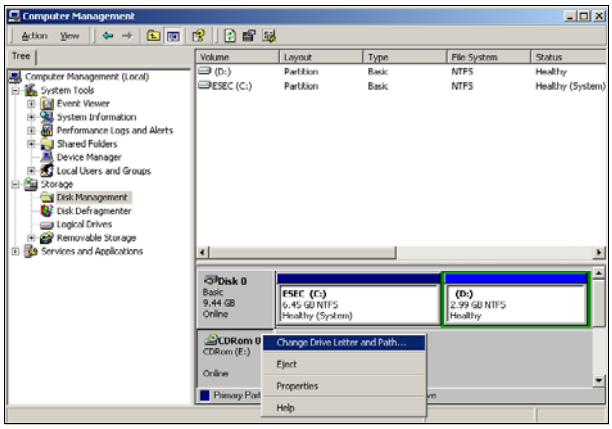
- ☑ Check that primary partition on **Disk 0** is defined as **(C:)**.
- ☑ Check that second partition on **Disk 0** is defined as **(D:)**.
- ☑ Check that **DVD/CDRom 0** is defined as **(E:)**.

In case, all checks above are ok, then close all control windows and continue with SCS software installation.

© 2009 Esec Ltd.

System Verification (Cont.)

In case the checks are not ok, then continue with following steps:



click

Click right mouse button on **CDRom 0** and on the two disk partitions subsequently and define the following drive letters:

- Primary partition on **Disk 0** is defined as **(C:)**
- Secondary partition on **Disk 0** is defined as **(D:)**
- **DVD/CDRom 0** is defined as **(E:)**

Confirm the appropriate changes.

Close all control windows and continue with SCS software installation.

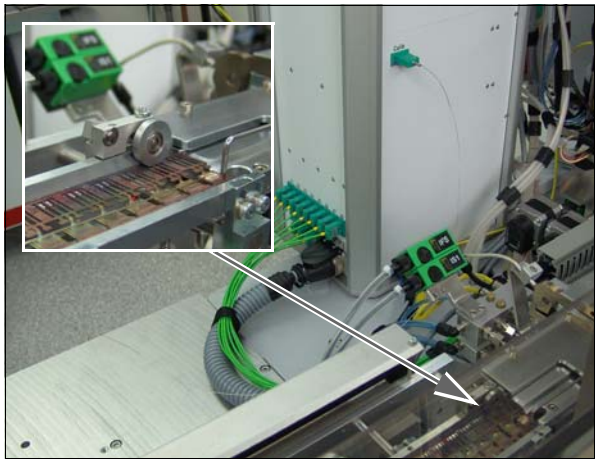
© 2009 Esec Ltd.

i 40 Calibrating the Indexer Heating Elements

This procedure automatically calculates the difference between the leadframe temperature required (as set during the teach procedure, refer to section *Soft Solder Indexer* on page *8-18*) and the actual temperature attained.

The leadframe is stepped trough the indexer. During this movement the machine records the temperature at each index position along the whole length of the indexer and calculates the temperature correction factors required for each heater zone.

The correction factor produced during this procedure is automatically applied during production.



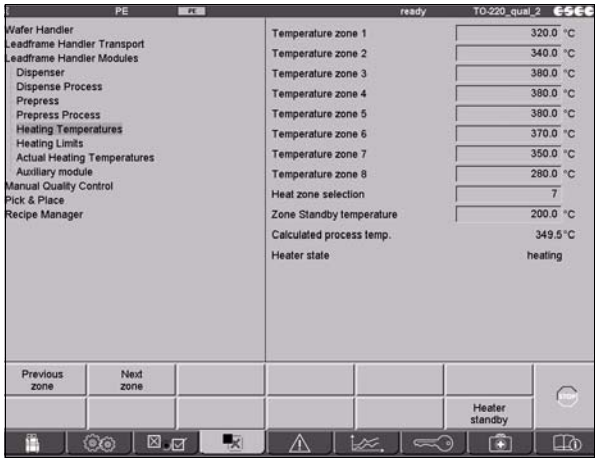
The parameter **Pad pos. on indexer** allows the temperature measured at each index position to be selected and checked.

Position 0 is the bond position, -1 is one indexer step before bond, and 1 is one step after bond etc.

The position can be selected using the ***Previous pad*** and ***Next pad*** soft keys or by entering the number required in the parameter.

Clicking the ***Optimize temp.*** soft key automatically applies the correction factor calculated to the temperatures set.

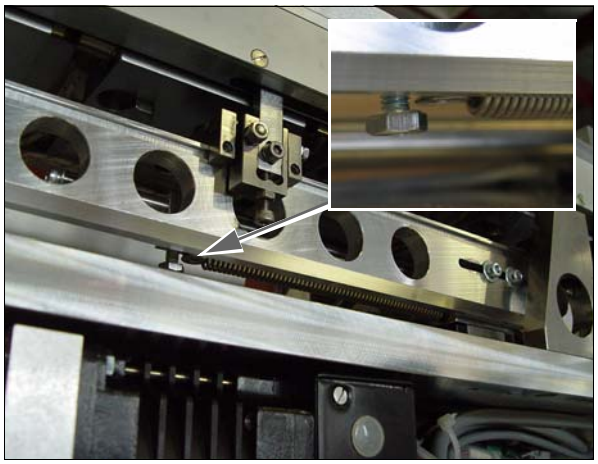
The required temperatures, as displayed in the teach menus, do not change, but the heater settings are automatically adjusted.



© 2009 Esec Ltd.

i 41 Indexer Driver Mechanism Spring Tension

The drive mechanism spring is fitted as a precaution in case a leadframe jams inside the indexer during production. If a jam occurs and the transport fingers cannot move a leadframe, the spring becomes extended, thus reducing the pressure on the jammed leadframe.



In most cases the centering pin will not be able to enter the centering hole of the leadframe. This will prevent the centering unit from lowering itself, therefore it will not cover the sensor located behind the centering unit. If this sensor is not covered, the machine will stop automatically.

However, if there is too much tension on the spring, it is possible that the drive mechanism will shear off the locating pin on the transport fingers. In this case it is necessary to adjust the driver mechanism spring tension.

The spring tension should be set high enough to allow the drive mechanism to draw leadframes along the indexer, but not so high that damage will occur in the event of a jam. Typically the spring force is set to 4Kg (40N).

On the walking beam, behind the spring holder fastening screw, is a punch mark. The position of this mark is calculated for each machine by ESEC. Setting the spring holder to this position will give the exact spring force needed for a specific type of leadframe.

© 2009 Esec Ltd.

/ (May 29, 2009)

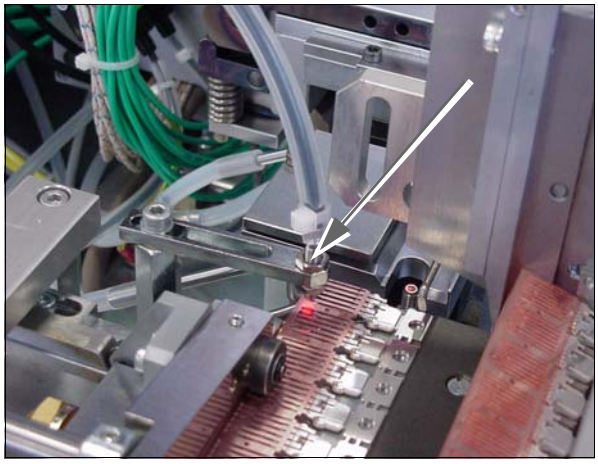
i 42 Indexer Sensors

Input Frame Sensor

The input frame sensor checks the leadframe position after a leadframe load cycle. For correct operation, the sensor has to be covered during the whole of the operation of transporting the leadframe and after a correct load leadframe cycle.

The operating distance between the sensor and leadframe is between 1 and 3 mm.

When the sensor is covered, both of the LEDs in the fibre optic box are On.

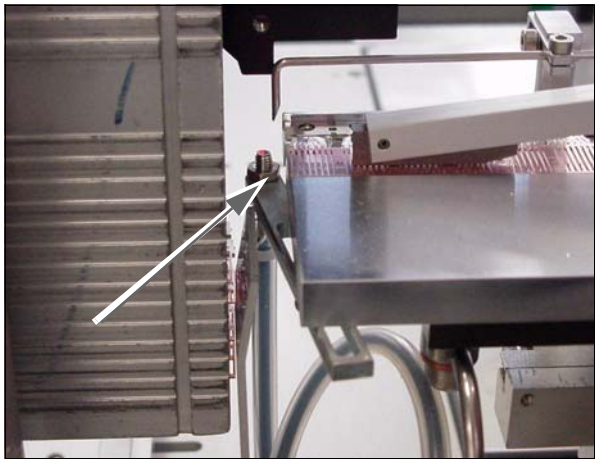


When the sensor is not covered, both of the LEDs in the fibre optic box are Off.

Output Frame Sensor

Gap = 1
The output frame sensor checks for the end of a leadframe. If the sensor is not covered, the output handler (magazine handler or buffered handler) will step down to the next magazine slot.

Gap = 0
Zero gap occurs only when using a buffered handler as the output handler. An additional sensor (the magazine step sensor) located at the end of the output magazine, detects the end of a leadframe and will cause the magazine to step down if it is covered.



The operating distance between the sensor and leadframe is between 1 and 3 mm.

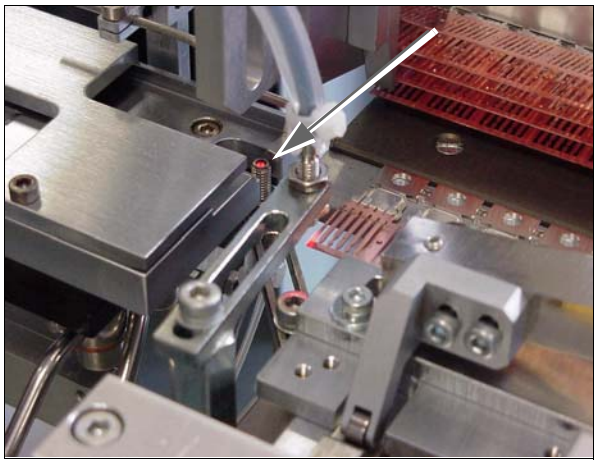
When the sensor is covered, both of the LEDs in the fibre optic box are On.

When the sensor is not covered, both of the LEDs in the fibre optic box are Off.

© 2009 Esec Ltd.

/ (May 29, 2009)

Index Sensor



The index sensor checks that after each lead-frame cycle, the leadframe has been transported.

During the leadframe cycle the sensor will change from uncovered to covered then back to covered.

The operating distance between the sensor and leadframe is between 1 and 3 mm.

When the sensor is covered, both of the LEDs in the fibre optic box are On.

When the sensor is not covered, both of the LEDs in the fibre optic box are Off.

Leadframe handler transport
Leadframe indexer

Make sure the parameter **sensor function** is set to **dynamic signal**.

Downholder Sensor

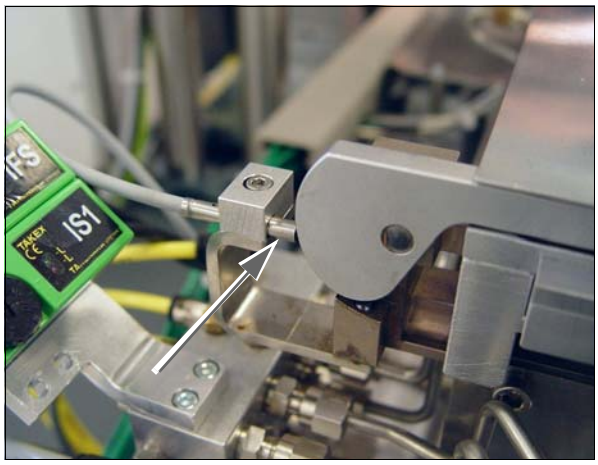
The downholder sensors check whether the leadframe downholders are in there up or down position.

If no downholder are fitted to the indexer the downholder sensors only check whether the indexer cover is open or closed.

© 2009 Esec Ltd.

Furnace Cover Sensor

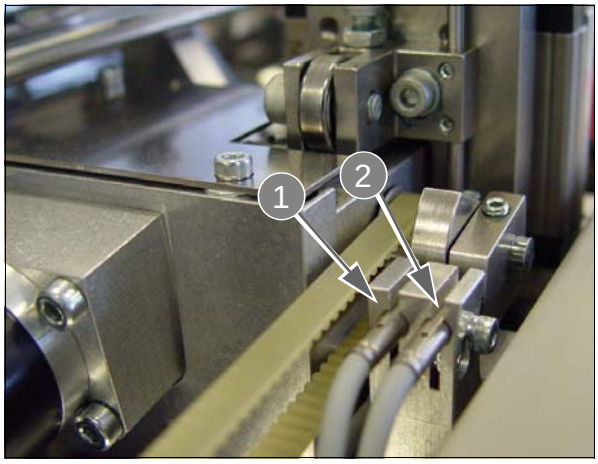
During production the furnace cover should be closed. The furnace cover sensors check whether the furnace cover is opened. There is a sensor for both furnace covers.



Cycle End Sensor / X-Move Synchronization Sensor

The cycle end sensor (1) detects the position of the finger carrier and indicates the end of a indexer cycle.

During each indexer cycle, the indexer fingers move in X to step the leadframes forward. Various process steps are synchronized to the end of the finger X-movement. The X-movement end sensor (2) detects the end of the indexer finger movement in X.



© 2009 Esec Ltd.

i 43 Buffered Handler Adjustment

Magazine Size Adjustments

The magazine must be able to slide up and down between the guide rails without jamming.

The magazine support pins should be positioned at about the centre of the magazine and the magazine slots must align with the indexer in Y. It may be necessary to reposition the buffered handler lift in order to achieve these adjustments.

Position Adjustment

If the buffered handler position has to be adjusted to suit a different magazine, a number of points must be considered and adjustments made as necessary.

Ejected leadframes must be pushed fully into the magazine and the magazine support pins should be positioned at about the centre of the magazine.

These adjustments are made by re-positioning the whole elevator unit, the indexer base plate contains a number of fixing holes to allow for this.

Adjusting the Output Platform

After moving the elevator to a different hole position, it is necessary to readjust the position of the magazine output platform so that it remains correctly aligned.

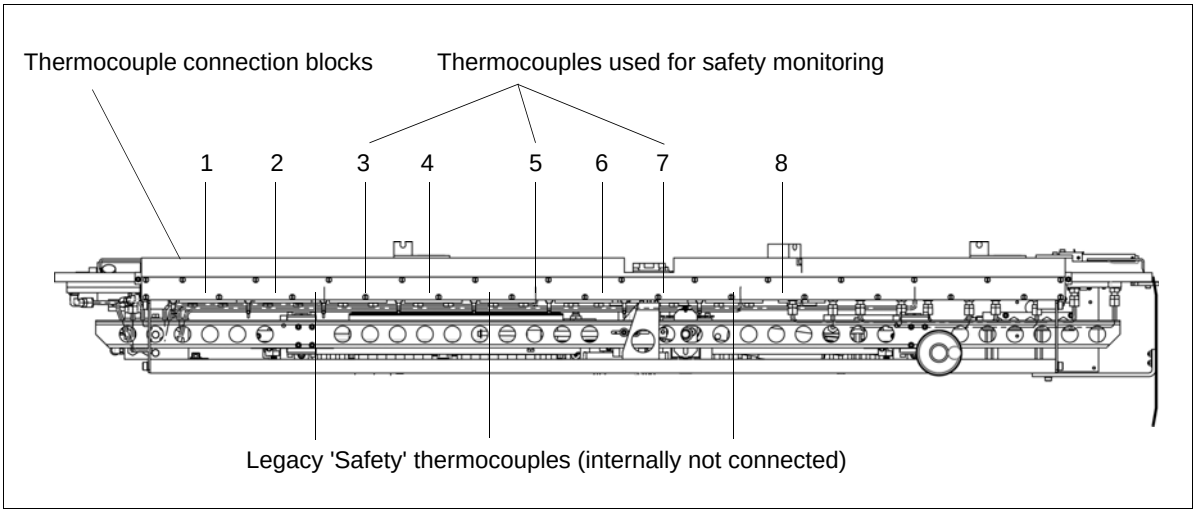
Magazine Step Sensor Adjustment

The magazine step sensor is an additional sensor, located at the end of the output magazine, which detects the end of a leadframe and allows the magazine to step down. The presence of this sensor allows the indexer to operate with 0 gap.

© 2009 Esec Ltd.

i 44 Indexer Heaters

The temperature of the furnace is measured by a total of 11, NiCr-Ni type (K type), thermocouples.



Temperature Zones

There are eight zone thermocouples, the temperature of which are set by the user. Four temperatures can be set at each of the eight heater zones; the normal operating temperature, the standby (energy saving) temperature, plus offset upper and lower heat control limits.

The machine contains an over-temperature protection system. This measures the temperature of the indexer furnace using 3 thermocouples which are connected to an additional independent heater controller.

Operating Temperatures

Two temperatures, normal and energy saving (stand-by) can be set for each zone.

These temperatures may be set anywhere between 0 and 480° Celsius.

The actual temperature of the indexer is measured at each zone. The temperature displayed on the menu is the average of all the cartridges in the particular zone selected, i.e., two in zone 3, six in zone 6.

Over Temperature

This hardware alarm is activated if the temperature measured at any of the three safety zones exceeds 530°C. If this happens the supply voltage to all the heaters is switched off and the machine stops (displaying a temperature alarm). The safety thermocouple operated shows an open circuit. The machine can only be restarted (rebooted) after the fault condition has been cleared.

Low Temperature

This hardware alarm is activated if the temperature measured at any of the three safety zones drops below 200°C. If this happens the machine stops and the gas safety switch is turned off.

© 2009 Esec Ltd.

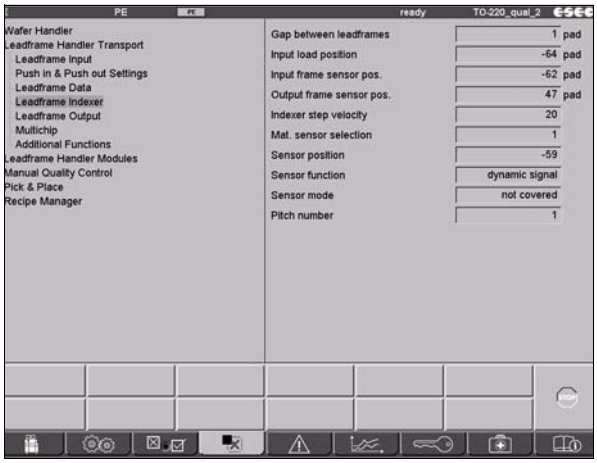
i 45 Leadframe Teaching

Each soft solder indexer is built and optimized to handle one particular type of leadframe. Change-overs (to handle different types of leadframes on the same machine) are uncommon and would require extensive hardware changes to the indexer.

Variations within the same type of leadframes are easily possible and are taught to the machine by setting various parameters.

Leadframe Handler Transport
Leadframe Indexer

Set the parameters to adapt the machine to the leadframes to be processed.

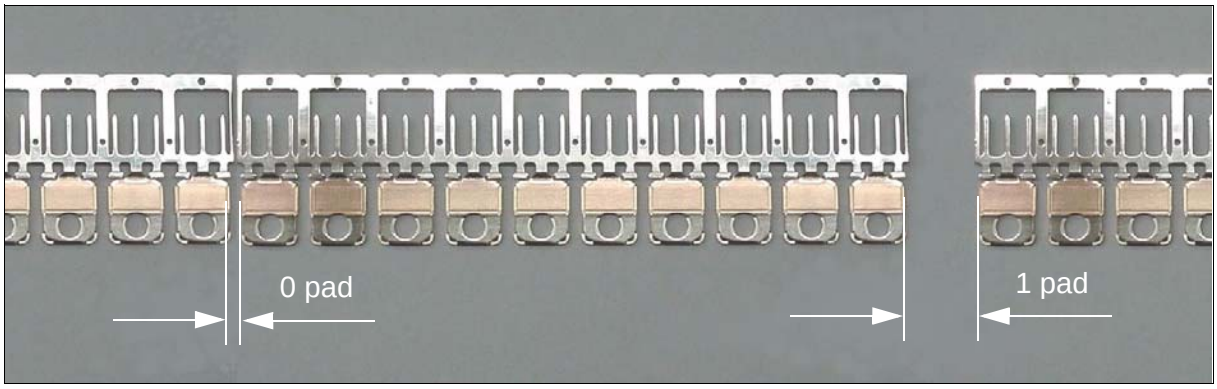


Gap between Leadframes

Select the gap between two leadframes on the indexer.

If the parameter is set to **0 pad** (Gap=0) the distance between the last pad of the previous leadframe and the first pad of the next leadframe is the same as between two pads within a leadframe (leadframe pitch). This setting is only possible with a clearance of approx 0.3mm between two leadframes.

If the parameter is set to **1 pad** (Gap=1) the input handler places the next leadframe onto the indexer with a gap of one pad to the previous leadframe.



Number of Pads on Leadframe

Enter the number of pads on the leadframe.

Leadframe Pitch

Enter the leadframe pitch in mm. The pitch is the step the indexer must perform to move the leadframe forward one pad.

© 2009 Esec Ltd.

Input Load Position

Define the load position of the leadframe. The load position is set relative to the bond position (number of pads). The bond position is the origin (position 0), therefore the input load position is always a negative figure.

For the TOS option, the position is referenced to the last position of the previous leadframe (normally set to the input frame position).

Input Frame Sensor Position

Define the frame sensor position relative to the bond position (negative figure)

Output Frame Sensor Position

Define the frame sensor position relative to the bond position (positive figure).

Indexer Step Velocity

The index step velocity defines the speed with which the leadframe is forwarded one pitch. The higher the step velocity the shorter the time until the next pad is ready to be bonded.

Measured step times for the soft solder indexer drive:

Step velocity	2007 SSIplus	2009 SSI
12	480ms	560ms
14	420ms	460ms
16	380ms	400ms
18	340ms	360ms
20	310ms	310ms
22	290ms	290ms
24	270ms	270ms
26	240ms	240ms
28	not allowed	not allowed
30		

Material Sensor Selection

Select the sensor fitted to the machine (i.e. pad reject sensor).

(Material) Sensor Position

Define the sensor position relative to the bond position (negative figure).

(Material) Sensor Function

Switch the selected sensor on or off as required.

(Material) Sensor Mode

Define the sensor state that will cause an interaction.

© 2009 Esec Ltd.

i 46 Leadframe Identification

What is Leadframe Identification Used for?

The leadframe identification is used to check whether the correct type of leadframe has been loaded onto the push-in. Its hardware is located at the push-in of the top stack loader.

How Does Leadframe Identification Work?

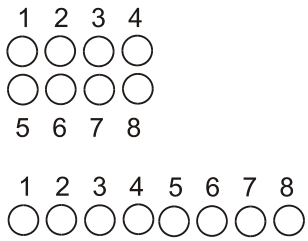
The leadframes carry a pattern of up to eight holes in one or two rows. The pattern is detected by the Die Bonder by means of photoelectric barriers and is then compared with the pattern taught to the machine.

If the pattern on the leadframe is identical with the pattern taught to the machine, the leadframe is pushed onto the indexer. If not, the machine stops and displays an error message.

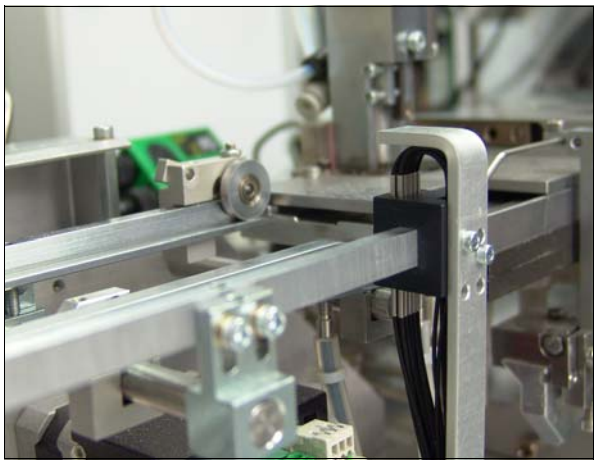
Teaching Leadframe Identification

The holes of the pattern and their corresponding sensors on the machine are numbered from one to eight. To teach the leadframe identification, it is essential to know which photoelectric barrier is connected to which sensor and is displayed at which position on the screen.

Position of the sensors on the push-in for the one-row and two-row layout:



Sensor number 8 is always located at the front right of the bracket.



© 2009 Esec Ltd.

i 47 Teaching the Wire Dispenser

Dispenser Position

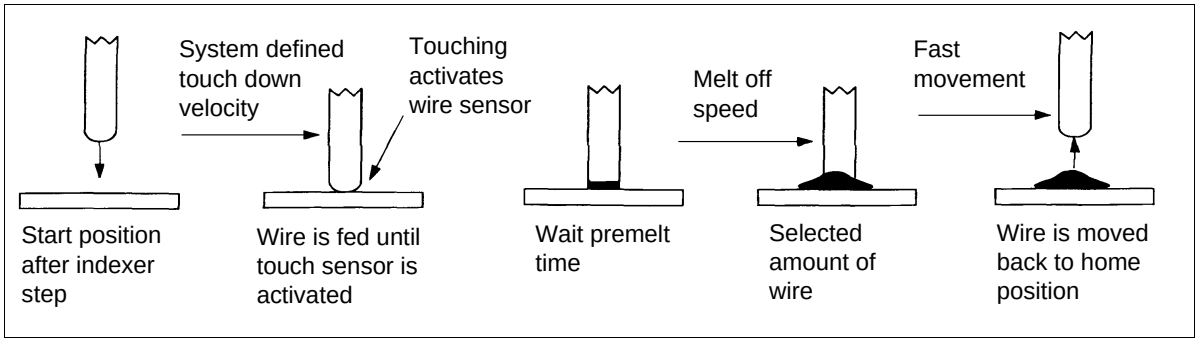
The bond position itself is defined as zero. Index steps to the left (input) side of the bond position are minus values, steps to the right (output) side of the bond position are positive values.

The dispenser position will therefore always be set to a minus quantity, for example "-7".

Touch Mode

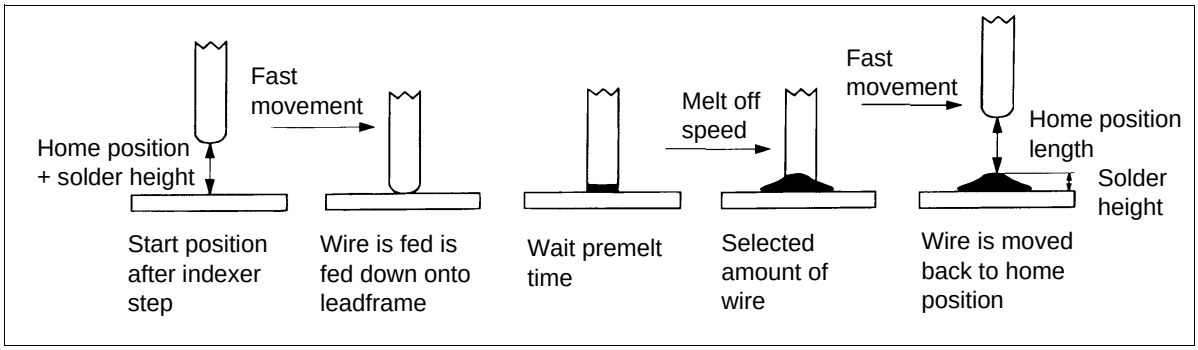
The touch mode uses the touch down sensor to define the wire height above the leadframe at each new wire dispenser cycle.

The complete front assembly of the wire dispenser is electrically isolated from the rest of the machine. A small DC potential is applied to the preform wire at the sensor contact leaf springs. The sensor registers when this potential is shorted to ground (by touching a leadframe). In this case the wire sensor displays "covered" on the monitor screen and the LED on the wire dispenser module is turned ON.



Distance Mode

In the distance mode the touch down sensor is disabled. The sensor is only active for the first wire dispenser cycle (to find the correct height). After that, the wire moves a set distance at a set time as detailed below:



Note: After the melt off cycle, in touch mode and distance mode, the system checks whether a touch signal has been detected. It is also possible to completely disable the touch sensor by setting the parameter **touch sensor** to **off**. The system will then perform a blind dispensing.

© 2009 Esec Ltd.

i 48 Optimizing Atmosphere and Gas Consumption

This information helps to the setup a controlled atmosphere in the indexer furnace concerning quality and overall gas consumption.

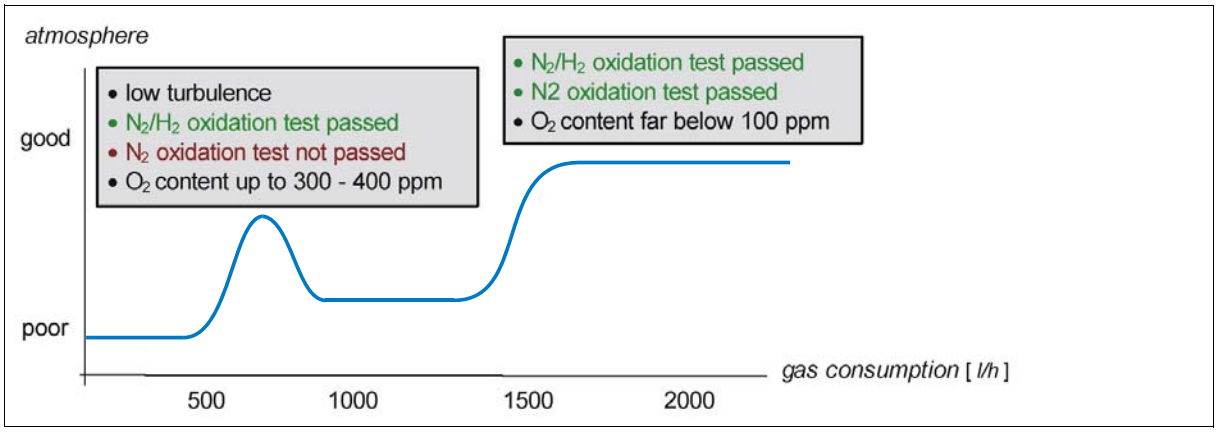
The Indexer Furnace

The DB 2009 SSI furnace resembles a channel with several smaller (i.e. for transportation fingers and dispenser) and some larger openings (i.e. at the bond position). Because the furnace is not a closed system, establishing an O_2-free atmosphere must be achieved by driving and keeping out the oxygen by a continuous forming gas flow. An O_2-free atmosphere (no oxidation on leadframes) is necessary for the soft solder process.

The Atmosphere Inside the Furnace

The atmosphere depends on the amount of gas used as well as on the gas flow behavior inside the indexer. A minimum volume of gas is required in order drive out and keep out the oxygen and, depending on the total amount of gas used, a more or less homogeneous gas flow will result.

A homogeneous flow creates an atmosphere where no oxidation occurs (under N_2/H_2) due to the presence of H_2, where no oxygen is entrapped in “pockets” due to low turbulence and where there is no negative effect on the die tilt because of the absence of gas jets.



The Gas Supply of a DB 2009 SSI Indexer

The standard gas supply for a DB 2009 SSI consists of 3 gas inlets, each equipped with a flow meter:

- *Insert 1*: Gas from the bottom in the area of the first cover.
- *Insert 2*: Gas from the bottom in the area around the bond position.
- *Insert 3*: Gas from the bottom in the cooling area.

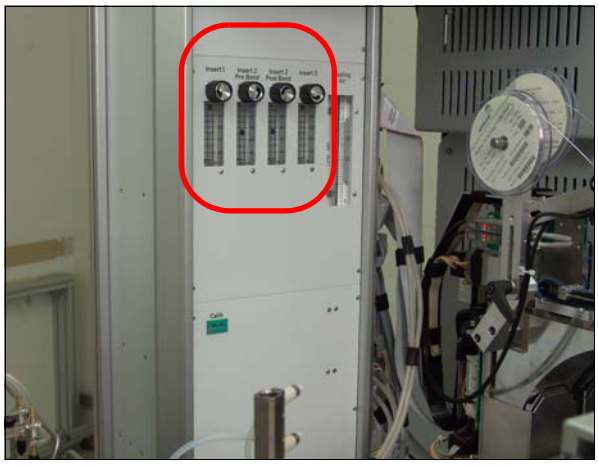
The separation into three flow meters is useful for reducing the overall gas consumption: *Insert 1* covers the heating zone, *Insert 2* the bond area. These are the areas which are most important for the process and where, especially on bare copper, the atmosphere can have an influence on the die attach quality. *Insert 3* is located in the cooling area and can therefore be chosen as low as possible (oxidation test).

Establishing an Optimized Atmosphere Inside the Furnace

The atmosphere in the furnace can be optimized for either low overall oxygen content or low gas consumption:

© 2009 Esec Ltd.

Setting Up an Atmosphere With a Low Overall O_2 Content



Adjust the main forming gas pressure at the machine to 2 bars.

Adjust the *Insert 1* to approx. 350 l/h.

Adjust the *Insert 2* to approx. 350 l/h

Adjust the *Insert 3* to approx. 350 l/h

This values are the read-off from the flow meters, which are calibrated for 1 bar. The actual gas consumption is therefore approx. 1480 l/h:

$$\text{actual gas consumption} = \text{read-off} \times \sqrt{\text{main pressure}}$$

Perform an oxidation test with N_2, bare Cu.

Note: Some leadframes, esp. with a larger pitch (<25 mm), might require a special adjustment of the gas flow in *Insert 2* to 0-100 l/h in order to maintain low turbulences.

Setting Up an Atmosphere With a Low Overall Gas Consumption

Adjust main forming gas pressure at the machine to 2 bar.

Adjust the *Insert 1* to approx. 150 - 200 l/h

Adjust the *Insert 2* to approx. 150 - 200 l/h

Adjust the *Insert 3* to approx.150 - 200 l/h

The actual gas consumption lies between 640 ... 850 l/h.

Perform an oxidation test with N_2/H_2, bare Cu.

Note: If the dispenser or PPM must be lifted from the furnace, the amount of gas must be increased first to avoid oxidation of the leadframes.

Summary

A good atmosphere inside the furnace can be established using only the *Insert* flow meters. For a standard setup this will result in a total gas consumption of approx. 1500 l/h.

There is also the possibility to reduce the overall gas consumption even more following the setup described in *Setting Up an Atmosphere With a Low Overall O2 Content*. By using the oxidation test with forming gas the actual required gas settings can be found. This gas setting results in a low but homogeneous flow within the furnace which is sufficient for production mode.

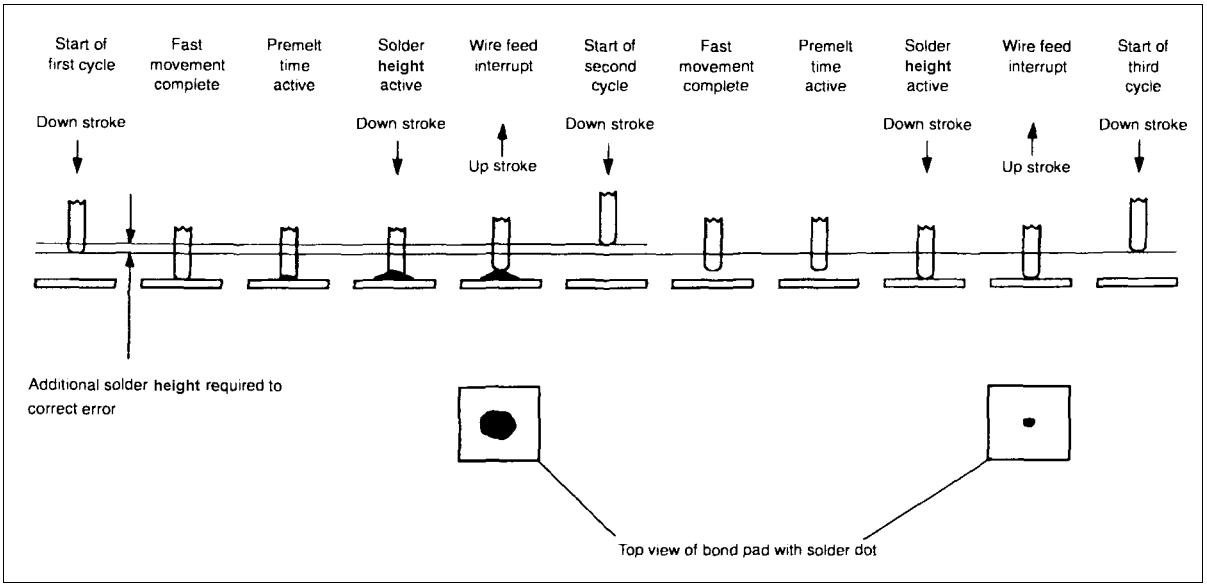
© 2009 Esec Ltd.

i 49 Dispensing Errors

Solder Height Parameter too Small

Working in the distance mode with a **solder height** parameter that is too small can lead to irregular solder deposit.

Repeated occurrences of a large solder dot on the first bond pad followed by a small dot on the second pad is a typical sign of this problem.



To solve the problem, increase the **solder height** parameter or use the touch mode.

Wire Dispenser Error

If the 'touch sensor always covered' message is displayed at the start of the first cycle, the cause is usually that the preform wire is too close to (or is already touching) the leadframe.

To recover from this error, pull the wire back a little more than the amount set in the **home position** parameter, check that the LED on the wire dispenser is off. Restart the machine.

Increasing the value of the **home position** parameter may also help to prevent this error.

Dispenser No Material

Regardless of whether touch or distance mode is used, before a dispenser cycle, the wire must be on or a 'no wire detected' message will appear.

The probable cause is that the preform wire has all been used and therefore cannot be fed by the drive and idler wheels; because of this no contact is made between the preform wire and the bond pad.

To recover from this error, mount a new reel of preform; follow the setup procedure described in section *Programmable Dual Wire Dispenser* on page *8-23*.

© 2009 Esec Ltd.

Solder Wire Jam

If necessary, set the main machine On/Off switch to *"I"* (On), make sure that all pneumatic supplies are turned off.

WARNING

The dispensing tip and nozzle area will be hot, coming into contact with them may result in serious burns. Wear protective gloves.

NOTICE

Do not attempt to clear or clean the nozzle using any tool or item which could damage the inner surface of the wire guide.

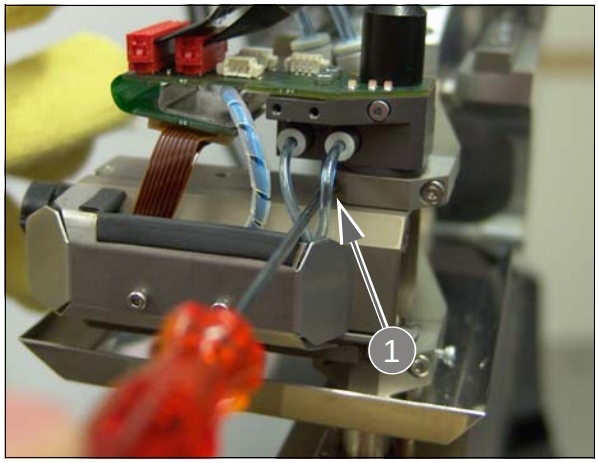
Never attempt to disassemble the nozzle assembly.

To Recover from a Wire Jam

Move the PDWD to the service position.

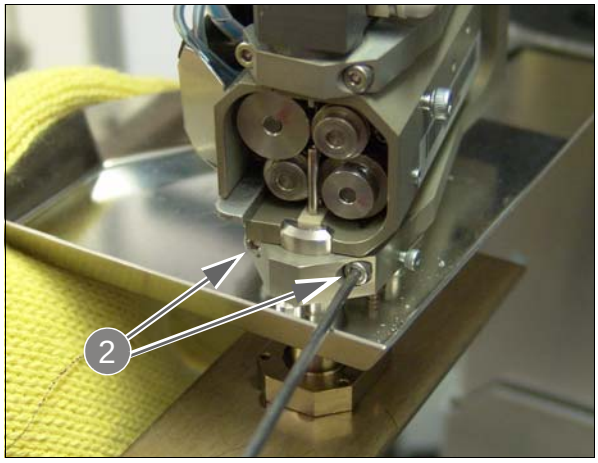
Loosen the fixing screw (1).

Swing the PDWD 90° clockwise.



Loosen the two wire guide fixing screws (2).

Pull the wire guide to the front.

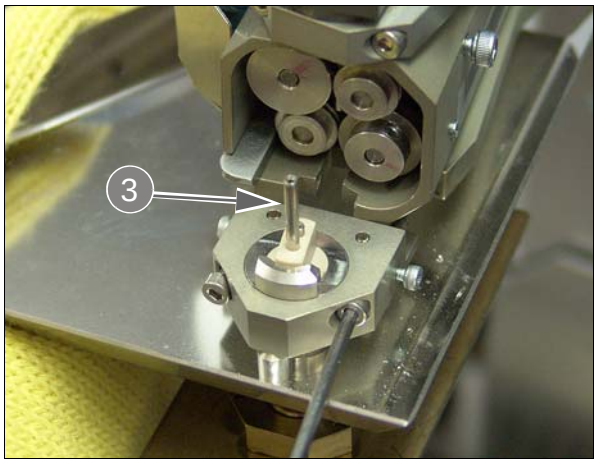


© 2009 Esec Ltd.

To Recover from a Wire Jam (Cont.)

Clean the wire guide (3) with a spring steel wire.

Reassemble the PDWD.



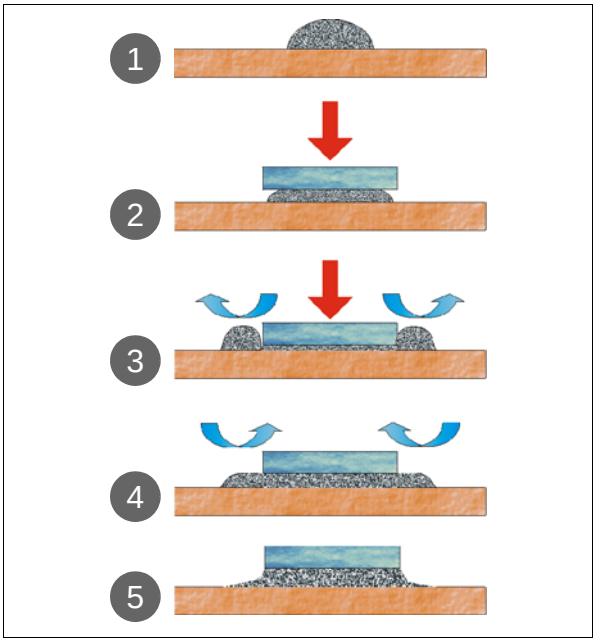
© 2009 Esec Ltd.

i 50 Influencing the Die Tilt

Soft Solder Process

The soft solder process is based on the interactions of liquid solder with the leadframe surface and the die back in absence of oxygen.

1. Dispensing liquid solder on leadframe.
2. Spreading (“flow”) of the liquid solder on leadframe surface as well as wetting of the die back initiated by the pressure applied by the bondhead.
3. Due to the very low viscosity of the liquid solder the solder flow is not under control after the bondhead has reached its lowest position.
4. Solder starts to flow back underneath the die after the bondhead has been moving away (no correlation between resulting die tilt and tilt of bondhead).
5. This process is controlled by material properties.



The standard soft solder die attach process is totally controlled by the movement of the liquid solder (wetting, flow back), which is determined by the interactions of the liquid solder with the leadframe surface and the die backside metallization (material controlled process). The bondhead parameters have very limited effect on the die attach quality.

The major parameters of the soft solder process are:	
– the solder alloy (Pb-based, Sn-based, doting, impurity) – the leadframe (bare Cu, Ni, Ag, Pd, surface quality) – the die back (Ag, Au, structure)	Material controlled
– the temperature (stability) – the atmosphere in the furnace (oxygen free)	Machine controlled

© 2009 Esec Ltd.

/ (May 29, 2009)

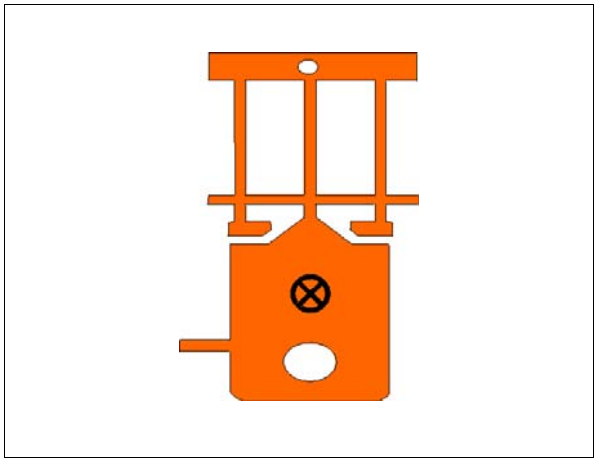
Wire Dispensing Process

The wire dispensing is mainly controlled by the interaction between the solder wire preform and the surface of the hot leadframe.

- the wire is transported down to the leadframe
- the hot leadframe starts to melt the wire
- the required amount of solder is dispensed
- the wire is pulled back

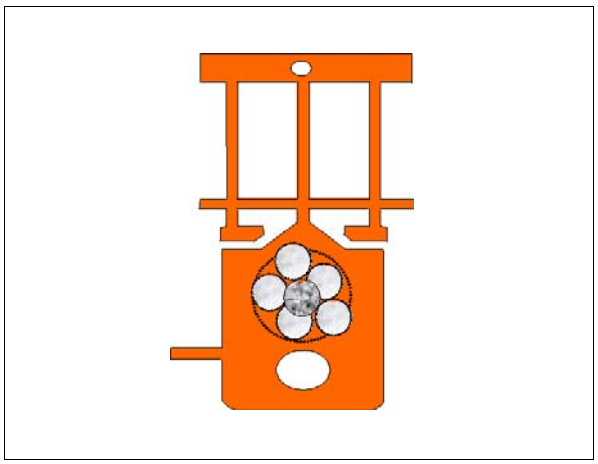
The cross marks the target position of solder according to position of the wire dispenser (imprint, bond diagram).

The circle marks the possible deviation in position caused by the width of the nozzle.



The large circle marks the center of possible solder dot positions. This deviation is caused by differences in the wetting properties of the leadframe surface.

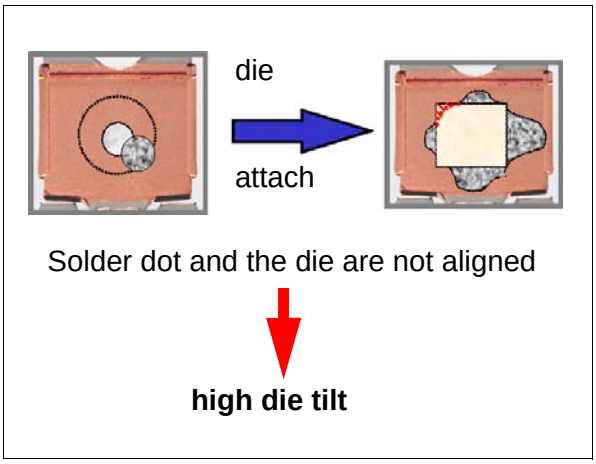
A minor influence through the wire dispenser parameter settings is possible.



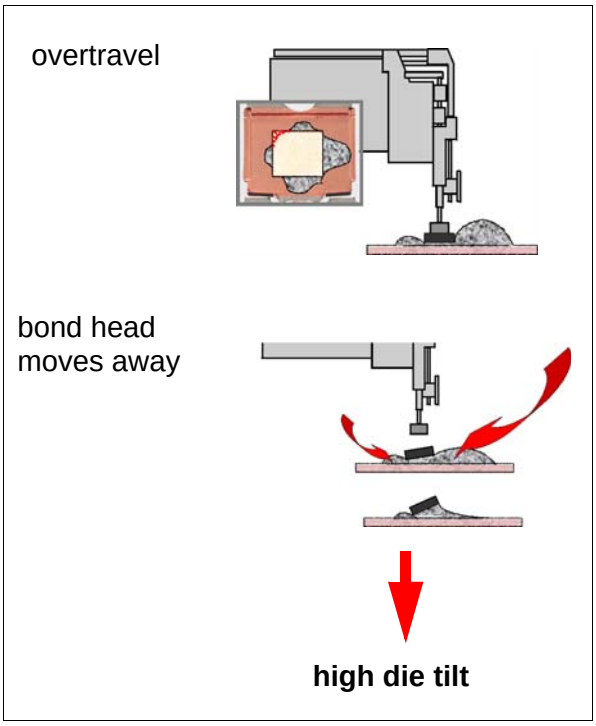
© 2009 Esec Ltd.

Possible Reasons for High Die Tilt

- **un**symmetrical solder out flow
- **un**symmetrical solder back flow
- different amount of solder beneath each corner
- incomplete solder coverage solder dot and die are aligned



- the solder is squeezed out from beneath the die during the die attach (overtravel, bond force)
- remaining gap approx. 5 µm
- unsymmetrical solder “pockets” on each side of the die
- unsymmetrical solder back flow underneath each side of the die



Summary:

The following (material controlled) parameters lead to a high die tilt.

- unsymmetrical pockets on leadframe
- local differences in the wetting properties of the leadframe surface
- deviation in the solder dot positions
- misalignment of solder dot and die
- unsymmetrical solder out flow
- unsymmetrical solder back flow

© 2009 Esec Ltd.

Gaining Control over a Material Controlled Process - The Basic Idea

mechanical control of the local differences in the wetting properties of the leadframe surface

↓

mechanical control of the solder position

↓

no misalignment of solder and die

↓

symmetrical solder out flow

↓

symmetrical solder back flow

↓

low die tilt

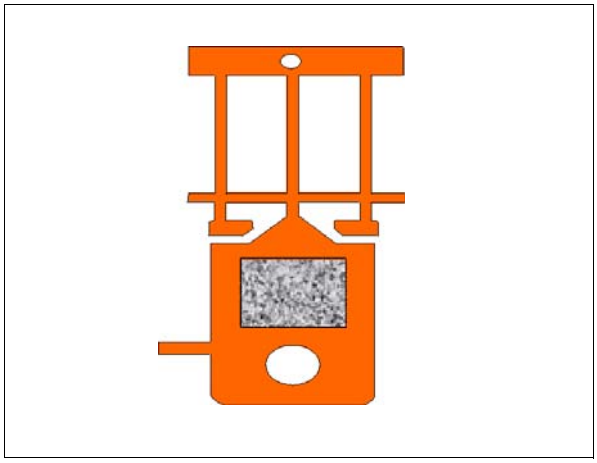
By dispensing a *solder pattern* rather than a solder dot the process is brought under control.

Pattern Dispensing

Mechanical control of the local differences in the wetting properties of the leadframe surface can be achieved by dispensing a solder pattern.

By dispensing a pattern, the solder is forced to wet the whole pattern area and overcomes the local differences of the wetting properties of the leadframe surface.

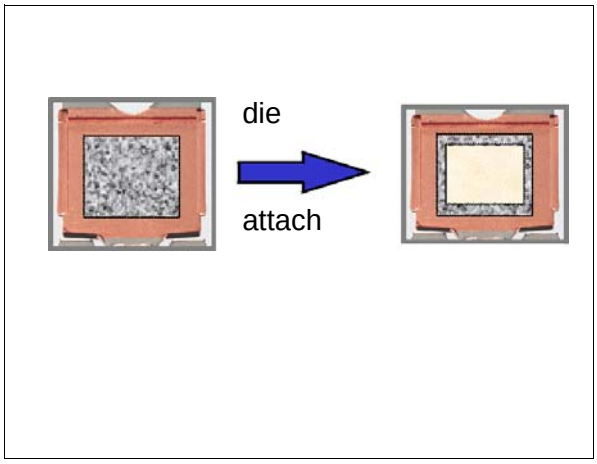
The position of the pattern is independent of the local differences in the wetting behavior of the leadframe surface.



By dispensing a pattern, solder and die are always aligned (mechanical control). This results in:

- symmetrical solder out flow
- symmetrical solder back flow
- same amount of solder beneath each corner of the die

and therefore to low die tilt.



© 2009 Esec Ltd.

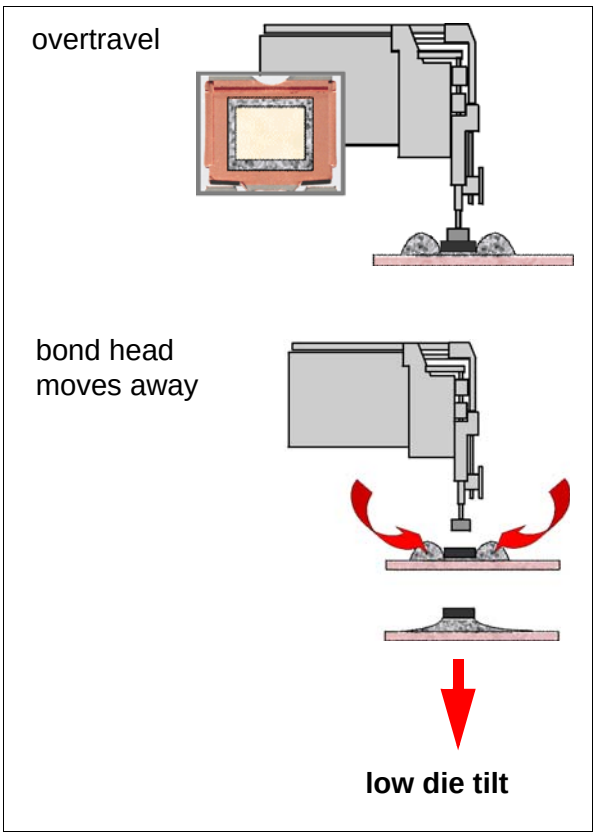
By setting an overtravel during die attach:

- the solder is squeezed out from beneath the die during the die attach.
- the remaining gap between the die and the leadframe is approx. 5 µm.
- the solder “pockets” on each side of the die are symmetrical.
- the solder back flow underneath each side of the die is symmetrical.

This behaviour leads to a low die tilt.

Additional benefits of a solder pattern are:

- complete solder coverage
- better control of fillet formation
- better control of solder bleed out (pattern size, leadframe plating)
- better control of bondline thickness

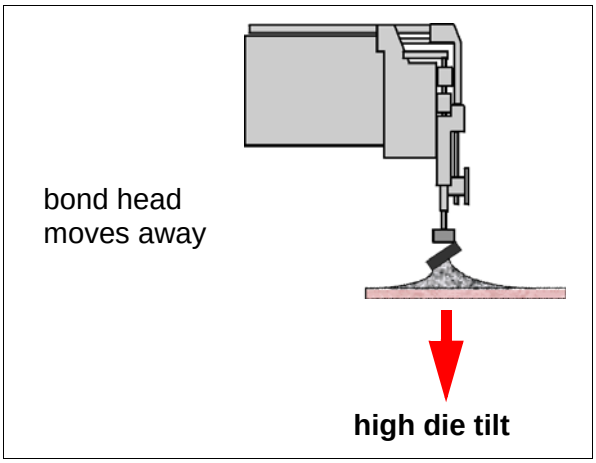


Minor Influence Parameters on the Die Tilt

Timing of bond vacuum:

If the bond vacuum is released too late, the bond head tears away the die. The die drops back onto the solder dot or pattern. The die is out of control.

This situation is difficult to detect with solder patterns.

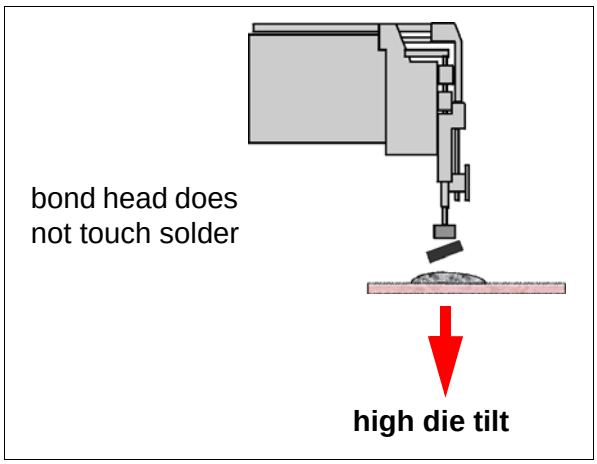


© 2009 Esec Ltd.

Insufficient overtravel:

Insufficient overtravel leads to an uncontrolled drop back of the die onto the solder dot or pattern.

This situation is difficult to detect with solder patterns.

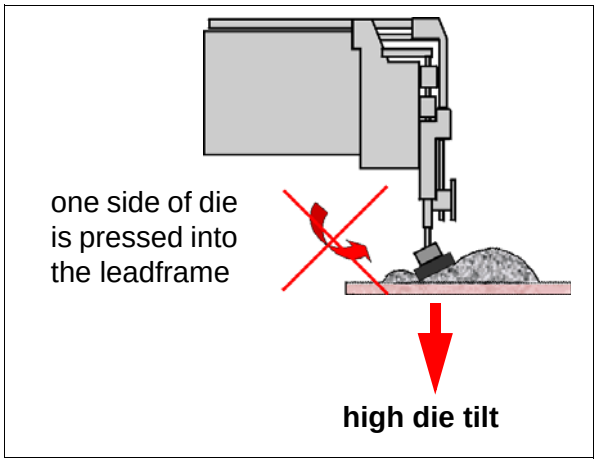


Severe misalignment of the bondhead:

- solder is distributed unsymmetrical
- no solder back flow from one side

Bondhead misalignment is especially critical with solder dots.

Note: For standard machine setup: no influence of bondhead tilt is detectable.



© 2009 Esec Ltd.

Summary

The soft solder die attach process is controlled by the wetting, spreading & back flow behavior of the liquid solder. For a standard die attach process (WD) this behavior depends mainly on the surface properties of the leadframe and the die. No control of process by m/c.

Introduction of a mechanical process control through pattern technologies in order to be more independent of the material properties.

NOTICE

Even with the pattern dispensing technology, the die tilt, bondline thickness and voids are still material dependent.

Good results can only be achieved with good materials (leadframe, solder and die).

/ (May 29, 2009)

i 51 Tool Design Considerations

When designing tools the tool dimensions and the tool materials must be taken into consideration.

This information sheet also informs about tool designs to reduce the amount of tools and about tool designs for special applications such as multi dice applications.

Important Dimensions

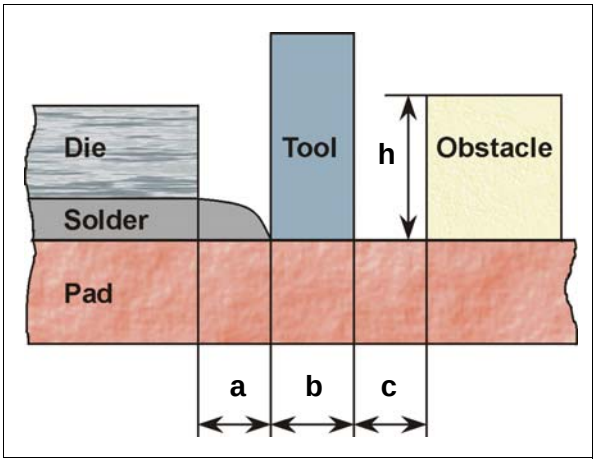
The important dimension which have to be considered are:

a) Distance from die edge to tool wall (solder rim)

b) Tool wall width

c) Distance from tool to next obstacle

h) Height of obstacle

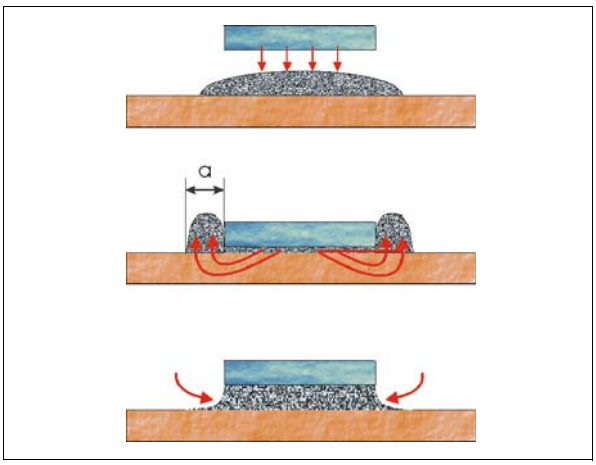


Distance from Edge to Tool Wall

Basic principle

- During die attach, the solder is squeezed out due to overtravel
- Remaining gap approx. 5 µm
- Solder flows into “pockets” on each side of the die, the solder is buffered in the solder rim (a)
- Symmetrical solder back flow underneath each side of the die

Almost the whole amount of solder must be buffered in the solder rim during die attach.



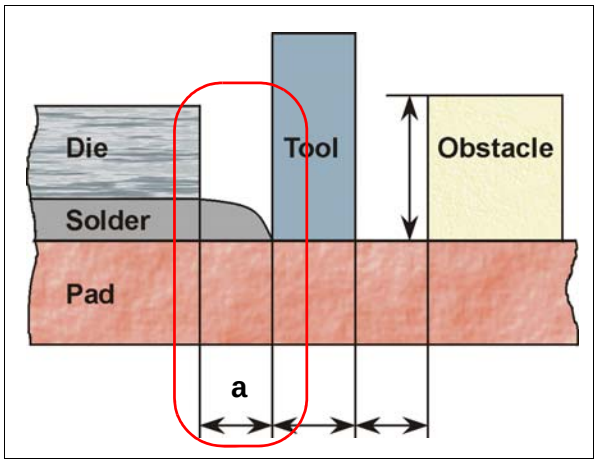
© 2009 Esec Ltd.

Distance from Edge to Tool Wall (Cont.)

Depending on:

- Die area: An increasing die size leads to an increased distance a.
- Bondline thickness: An increasing BLT leads to an increased distance a.
- Wetting angle: An increasing Θ leads to a decreased distance a.

The minimum distance (a) for a standard applications is 0.25 mm.

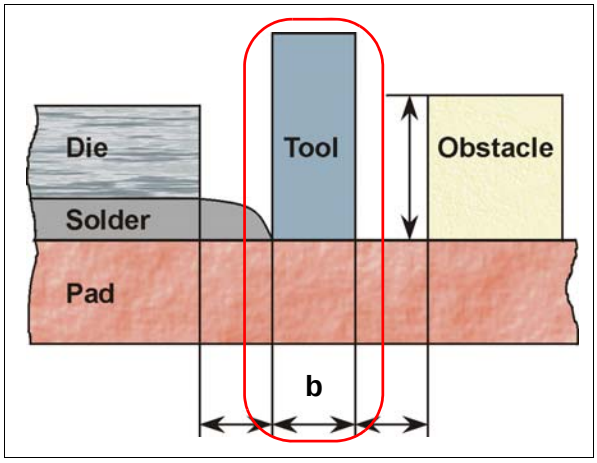


Tool Wall Width

The tool wall width is given by the mechanical strength of the tool material.

Caused by the mechanical impact during dispensing, the tool wall must have a minimum width to resist the applied force without damage.

The minimum tool wall width (b) for standard applications is 0.15 mm.



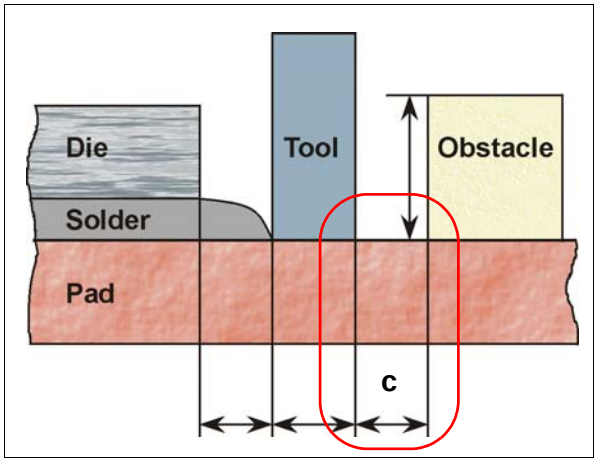
Distance between Tool and next Obstacle

Possible obstacles are:

- Additional dice
- Leads
- Grooves

To tolerate a certain x/y placement inaccuracy (leadframe, indexer), a minimum clearance between the tool wall and the next obstacle must be provided.

The minimum distance (c) for standard applications is 0.2 mm.

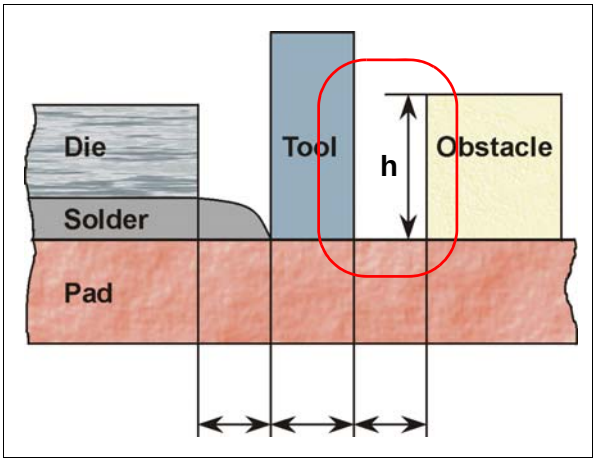


© 2009 Esec Ltd.

Height of Obstacle

The maximum height of an obstacle is given by the tool and dispenser dimensions.

The allowed maximum height (h) of an obstacle for standard applications is1.8mm.



Summary Tool Dimensions

For standard applications the following minimum distances must be provided:

a = 0.25mm

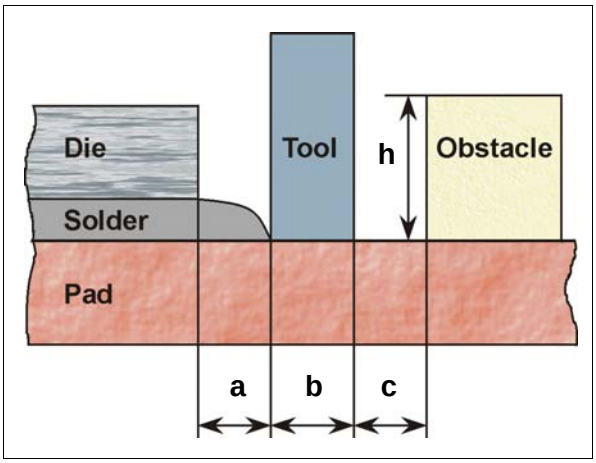
b = 0.15mm

c = 0.20mm

A total of 0.6mm on each side of the die must be provided.

This results in a standard minimal size of the bond window of:

Die size + 1.2mm



Tool Materials

The selection of the tool material is according to the requirements of abrasion resistance and inertness.

- Pb-rich alloys (e.g. PbSn2Ag2.5) require tools made of stainless steel.
- Sn-rich alloys (e.g. J - alloy) require tools made of titanium.

Reducing the Amount of Tools

The largest die defines the tool size according to the standard design rules. Smaller dice with a similar aspect ratio can be bonded using the same tool as long as the increase in the bondline thickness is within the specifications. A smaller die results in a higher bondline thickness.

If the solder rim (a) becomes very large (several millimeters), the risk for high die tilt is increased.

The higher the acceptable deviation from the target bondline thickness, the lower the amount of required tools.

© 2009 Esec Ltd.

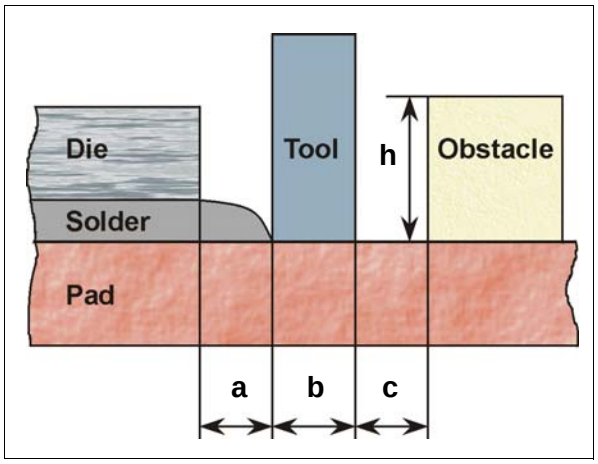
Special Applications

The minimum dimensions (tool width, offset from obstacle) might be further reduced, but this will result in a more critical process.

a < 0.25mm: Possible, but not recommended, especially if solder bleed out control is necessary.

b < 0.15mm: Not possible.

c < 0.2mm: Possible (0.15mm), but not recommended, because the tool becomes too critical to align. Instead of decreasing c, it is recommended to decrease a, if possible.



Tool Designs for Multi Dice Application

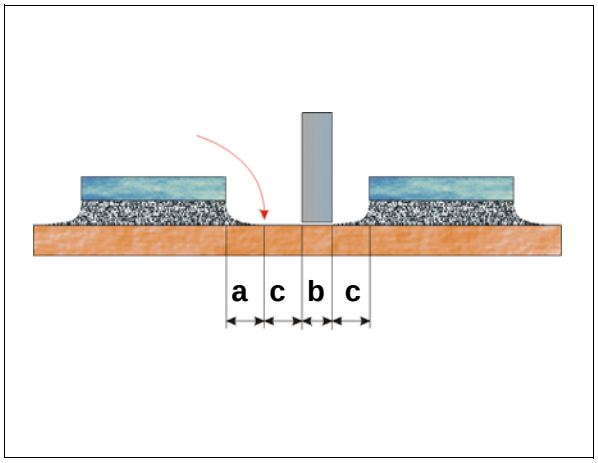
The minimum distance between two dice for standard tool dimensions equals:

a+c+b+c

0.25mm + 0.2mm + 0.15mm + 0.25mm

0.85mm

The distance between the two dice can be reduced by reducing a and c, but this will lead to a more critical process.



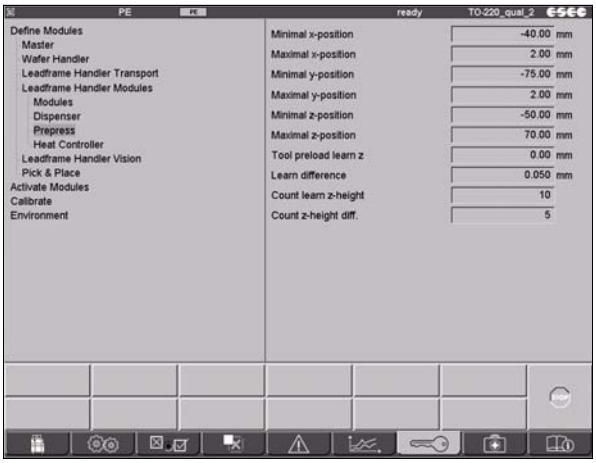
© 2009 Esec Ltd.

i 52 Z-Axis Parameters

In the menu

Define Modules
Leadframe Handler Modules
Prepress

the behavior of the MPPM Z-axis can be defined by setting four parameters.



Parameter	Value	Description	Comment
Tool preload learn z	0.2 mm	Defines the additional Z-axis travel after the tool has touched the leadframe (overtravel) while learning the Z-height. This is to preload the tool spring.	default / recommended setting
Learn difference	0.010mm	When learning the Z-height, several samples are taken. Within these samples a certain number of samples (defined by the **Count z-height diff.** parameter) must not exceed a predefined deviation. The **Learn difference** parameter defines the maximum allowed deviation within the number of consecutive samples to successfully learn the Z-height.	default / recommended setting
Count learn z-height	10	Defines the total number of samples taken for learning the leadframe Z-height. Should be increased for small tools.	default / recommended setting
Count z-height diff.	5	Defines the number of consecutive samples that must be within the limit defined by the **Learn difference** parameter to successfully learn the Z-height.	default / recommended setting

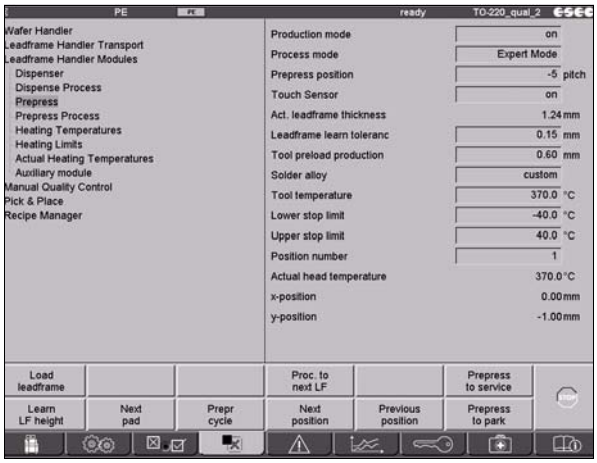
© 2009 Esec Ltd.

i 53 General Prepress Parameters

In the menu

Leadframe Handler Modules
Prepress

the general prepress parameters can be set.



Parameter	Value	Description	Comment
Prepress position	- [pitch]	MPPM process position relative to the bond position (negative sign).	Machine dependent
Production mode	on/off	Defines whether the MPPM is active during production.	Process dependent
Leadframe thickness	[mm]	Target leadframe thickness according to the construction drawing or manual measurement.	Machine dependent
Leadframe tolerance	0.10 mm	Acceptable difference between the target leadframe thickness and the actual thickness after teaching the Z-height. Exceeding the tolerance results in an error message.	Default / recommended setting
Tool preload production	0.3 mm	Defines the additional Z-axis travel after the tool has touched the leadframe (overtravel).	Default / recommended setting
Tool temperature	[°C]	Depending on the solder alloy and the furnace temperature (and therefore depending on the leadframe temperature). A tool temperature slightly above the melting point of the solder helps spreading of the solder inside the MPPM tool and minimizes sticking of the solder to the tool.	Machine dependent

© 2009 Esec Ltd.

Parameter	Value	Description	Comment
Lower stop limit	-15°C	Lower limit for the tool temperature range, relative to the tool temperature. Exceeding the limit results in an alarm message.	Default / recommended setting
Upper stop limit	+15°C	Upper limit for the tool temperature range, relative to the tool temperature. Exceeding the limit results in an alarm message.	Default / recommended setting
Temp. limit check	on	Activates / deactivates the temperature check.	Default / recommended setting
Standby temperature	200°C	When the machine is not currently producing, the tool temperature is reduced to the stand-by temperature.	Default / recommended setting
Act. leadframe thickness	[mm]	Measured leadframe thickness after teaching the Z-height.	Taught parameter
Actual head temperature	[°C]	Measured tool temperature.	Online measurement

© 2009 Esec Ltd.

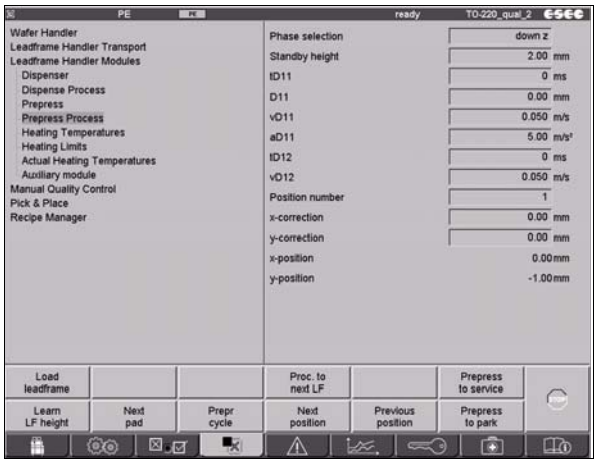
i 54 Prepress Process Parameters

In the menu

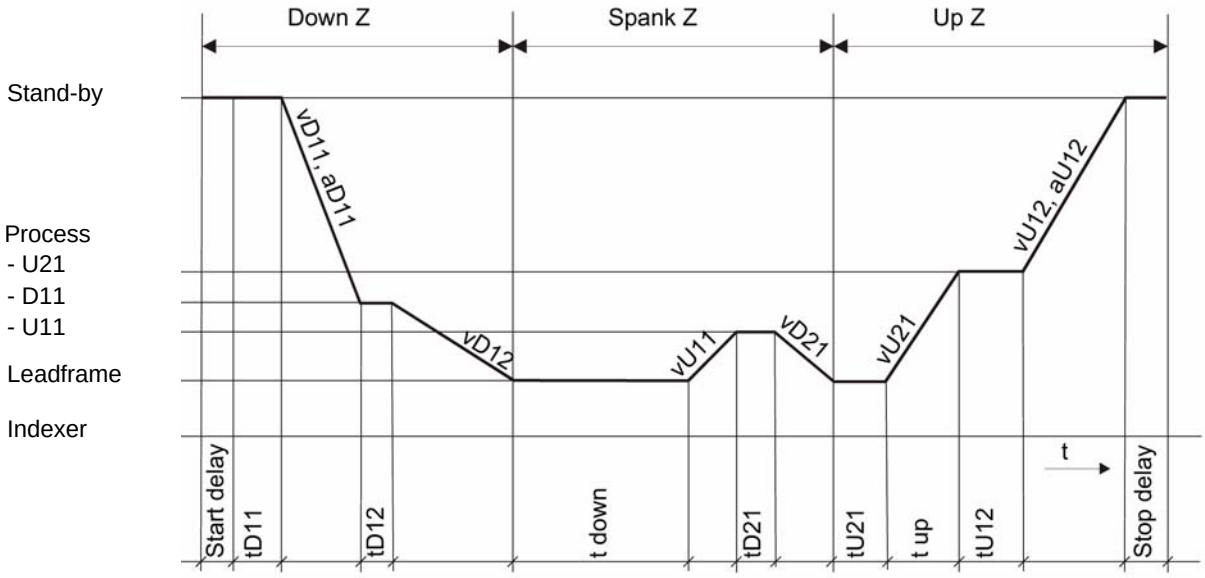
Leadframe Handler Modules
Prepress Process

the timing of the prepress process can be defined.

The prepress process is divided into the three phases down Z, spank Z and up Z. Select the appropriate phase first, then define the parameters for this phase.



MPPM Timing Diagram



Down-Z-Parameters

Parameter	Value	Description	Comment
Standby position	2.50 mm	Defines the Z-position of the MPPM tool relative to the leadframe when not in use.	default / recommended setting
tD11	0 ms	Defines the dwell time on the stand-by position before descending to the process height D11.	default / recommended setting

© 2009 Esec Ltd.

Parameter	Value	Description	Comment
D11	0.00 mm	Defines the process height in the down Z phase relative to the leadframe.	do not change
vD11	0.05 m/s	Defines the down speed of the MPPM tool to the position D11.	default / recommended setting
aD11	5 m/s^2	Defines the acceleration to achieve the down speed vD11.	default / recommended setting
tD12	0 ms	Defines the dwell time on the process height D11 before descending to the leadframe.	default / recommended setting
vD12	0.05 m/s	Defines the down speed of the MPPM tool to the position D12. The higher the down speed, the easier the solder is distributed, but the higher is the risk for solder splashes. Higher speeds increase the tool wear-off (tool lifetime under standard conditions: >10 mio cycles).	default / recommended setting
Start delay	0 ms	Defines the delay before starting the prepress cycle.	default / recommended setting
Stop delay	0 ms	Defines the delay after completing the prepress cycle (phase up z).	default / recommended setting

© 2009 Esec Ltd.

Spank-Z-Parameters

Parameter	Value	Description	Comment
t down	20 ms	Defines the effective prepress time. A minimum prepress time of approx. 20 ms is required for the spreading of the solder within the cavity tool. Excess prepress time has no influence on the prepress result.	default / recommended setting
U11	0 mm	Defines the process height in the spank Z phase. If **U11** is set to **0 mm**, no additional prepress step is performed. If **U11** is set to **0.2 mm**, an additional prepress step with a height of 0.2 mm is performed.	default / recommended setting
vU11	0.05 m/s	Defines the up speed while performing an additional prepress step as defined with the parameter **U11**.	default / recommended setting
tD21	0 ms	Delay after the additional prepress step.	default / recommended setting
vD21	0.01 m/s	Defines the down speed from the additional prepress step back to leadframe height.	default / recommended setting
Start delay	0 ms	Defines the delay before starting the prepress cycle (phase down Z).	default / recommended setting
Stop delay	0 ms	Defines the delay after completing the prepress cycle (phase up Z).	default / recommended setting

© 2009 Esec Ltd.

Up-Z-Parameters

Parameter	Value	Description	Comment
tU21	0 ms	Defines the dwell time on the leadframe height before ascending to the process height U21.	do not change
U21	0.0 mm	Defines the process height in the up Z phase.	default / recommended setting
vU21	0.1 m/s	Defines the up speed to the process height U21. It has no influence on the process, but can reduce the uph, if set too low.	default / recommended setting
tU12	0 s	Defines the dwell time on the process height U21 before ascending to the stand-by position.	default / recommended setting
vU12	0.05 m/s	Defines the up speed to the stand-by position.	default / recommended setting
aU12	5 m/s^2	Defines the acceleration to achieve the up speed vU12.	default / recommended setting
t up		Value calculated by the system.	

Note: After setting up the prepress process perform several prepress cycles by clicking the ***Prep cycle*** soft key to check for correct operation.

Manual cycling of the MPPM can also be used to align the MPPM tool perpendicular to the leadframe.

© 2009 Esec Ltd.

Index

A
Additional chip alignment *12-54*
Adjust
  Bondhead
    X-direction *6-5*
    Y-direction *6-6*
  Camera alignment *12-20*
  Camera rotation *12-20*
  Chip and epoxy position *8-78*
  Date time format *4-29*
  Die ejector
    In x-direction *6-7*
    In y-direction *6-8*
  Frame sensor (TOS) *7-18*
  Gripper suction cup (TOS) *7-15*
  Inspection station rider *7-17*
  Interleaf papers *7-16*
  Language *4-29*
  Output magazine handler *7-37*
  Push-in (MH-IN) *8-14*
  Stack configuration *7-17*
  Stack magazine *7-16*
  Top stack loader *7-14*
  Units of measure *4-29*
Alarms *4-16*
Alignment
  Method *12-3*
  Method street *12-27*
  Method two point *12-25*
Alter step
  x frequency *12-75*
  x-size *12-75*
Alter step mode *8-66*
Alternate pattern
  Mode *12-54*
Alternate step *12-74*
Area check units *4-29*
Atmosphere
  Optimizing the *12-91*

B
Blank test *12-67*
Bond position
  Defining *6-10*
  Teaching the bondhead height at *8-76*
Bond process
  Description *12-17*
  Parameters *12-18*
Bond vision
  Adjustment *6-30*
  Calibration *6-29*
Bondarm calibration
  Y-Z-movement *6-11*
Bondforce
  Defining *6-11*
Bondhead
  X-direction adjustment *6-6*
  Y-direction adjustment *6-6*
Border mode *12-63*
Border size *12-65*
Brightness correction *8-68*
Brightness limit *12-40*
Broken wafer *8-65*, *12-62*
Buffered handler
  Adjustment *12-85*
  Calibrating the input handler *6-55*
  Calibrating the output handler *6-57*
  Danger zones *1-10*
  Description *3-6*
  Mechanical preparation *7-34*
  Teaching the output handler *8-31*
BVI
  Calibration *6-29*

© 2009 Esec Ltd.

/ (May 29, 2009)

C
Calibrate
Bond vision *6-29*
Bondarm in y-direction *6-9*
Cassette lift (WHG) *6-26*
Die ejector height (WHG) *6-59*
Gripper (WHG) *6-26*
Input magazine handler *6-48*
Output magazine handler *6-52*
Pick vision *6-15*
Wafer table frame diameter (SWL),(AWL),(WHG) *6-23*
Wafer table load position (SWL),(AWL),(WHG) *6-24*
Wafer table origin (SWL,)(AWL),(WHG) *6-21*
Calibration
Description *3-21*
Overview *6-2*
Camera
Alignment *12-20*
Rotation *12-20*
Sensitivity *12-51*
Cassette lift
Calibration (WHG) *6-26*
Parameters *8-40*
Cavity tool
Mounting *7-32*
Changing
Display formats *4-29*
Check
Parameters *5-14*
Check corner *8-63*
Check surface *8-65*
Chip alignment *12-54*
Chip alignment setting *12-28*
Chip deviation mode *12-68*
Chip quality level *12-67*
Chip sensor teaching *8-75*
Chip size *12-57*
Chip teaching *12-5*
Chip verify *12-66*
Color definitions *4-13*
Color mode
Activating and deactivating *12-73*
Info sheet *12-72*
Control screens *4-19*
Corner
Check sensitivity setting *12-33*
Copy *8-62*
Quality limit *12-35*
Result *12-66*
Test on *12-32*
Test pattern *12-35*
Test selection *12-7*
Cycle time *12-68*

D
Date time format *4-29*
Define
Bond position *6-10*
Bondforce *6-11*
First chip *8-44*
Wafer table expansion ring position (SWL),(AWL),(WHG) *6-25*
Die ejector
X-direction alignment *6-7*
Y-direction alignment *6-8*
Die tilt *12-96*
Direct illumination *12-29*, *12-51*
Danger zones *1-17*
Display formats changing *4-29*
Dual input handler
Calibration *6-56*
Description *3-25*
Teaching *8-16*
Dual power leadframe loader
Calibration *6-56*
Description *3-26*
Teaching *8-16*
Dual wire dispenser
Danger zones *1-9*
Dispensing errors *12-93*
Mechanical preparation *7-29*
Teaching *8-23*
DVD/CD-ROM drive *4-11*

E
Electrical power supply
Description *3-14*
Emergency Stop *5-4*
Release *5-4*
Equipment Description *2-1*
Expansion unit
Replacement (SWL), (AWL),(WHG) *7-38*
Expansion value *12-24*

F
Failures *4-16*
Field of view *12-28*
Fine tuning *8-40*
First chip definition *8-44*
First chip start x-/y- position *12-22*
Fitting production tools *5-13*
Floppy disk *4-11*
Force calibration unit *12-76*

© 2009 Esec Ltd.

Found value *12-66*
Frame sensor
  Adjusting the *7-18*

G
Gas consumption
  Optimizing the *12-91*
Gas supply feature
  Description *3-30*
Gas supply label *1-17*
General prepress parameters
  Info sheet *12-107*, *12-109*
Graphical User Interface *4-13*
Grey value *12-72*
Gripper *12-8*
  Inspection sensor *12-9*
  Inspection sensor adjustment (TOS) *7-15*
  Suction cup adjustment (TOS) *7-15*
  Types *12-8*
GUI *4-13*

H
Heat control system
  Description *3-16*
Heater
  Teaching the heating limits *8-18*
Height reference selection *6-60*
Help functions *4-29*
Holes counter *12-62*

I
Icons *4-13*
Illumination settings
  Examples of *12-52*
Index step *12-49*
  Checking the *12-50*
  Settings manually *12-55*
Indexer
  Adjusting the jam sensor spring force *7-27*
  Adjusting the sensors *7-28*
  Adjusting the transport finger height *7-20*
  Adjusting the transport finger position *7-23*
  Adjusting the Y-guides *7-21*
  Calibration *12-80*
  Description *3-5*
  Driver mechanism spring tension (info sheet) *12-81*
  Heater calibration *6-34*
  Heaters *12-86*
  Leadframe teaching *8-19*
  Mechanical preparation *7-20*
  Sensors *12-82*
  Setting the pitch length *7-21*
  Teaching *8-18*
  Teaching the heating limits *8-18*
  XY position calibration *6-38*
Indirect illumination *12-51*
Info sheets
  General prepress parameters *12-107*, *12-109*
  Process parameters *12-109*
  Z-axis parameters *12-106*
Info-Page installation *10-6*
Information sheets description *12-1*
Inkdot
  Pixel limit *12-42*
  Quality limit *12-44*
  Result *12-66*
  Test on / inverse *12-41*
  Test pattern / inverse pattern *12-43*
  Test selection *12-6*
  Threshold *12-41*
Inkdot test *12-6*
Input magazine handler
  Adjusting MH-pushin *8-14*
  Danger zones *1-7*, *1-9*
  Defining magazine side thickness *8-14*
  Defining slot positions *8-13*
Inspection station rider
  Adjusting the position *7-17*
Interleaf papers
  Setting the gripper for *7-16*

K
Keyboard *4-10*
Keyboard placement *4-9*
Keypad segments *4-8*
Kodak lens cleaner (MSDS) *11-2*

© 2009 Esec Ltd.

L
Lamp indicator post *4-11*
Language *4-29*
Leadframe
  Place position teaching *8-11*
  Teaching *8-19*, *12-87*
  Thickness measuring *8-10*
Leadframe handler
  Calibration *6-29*
Leadframe identification
  Description *3-27*
  Teaching *8-17*
Learn
  Chip *5-15*
  Corner *8-63*
  Inkdot (inkdot test on) *8-58*
  Inkdot (inkdot test pattern) *8-60*
  Scale proportion *12-31*
  Surface *8-64*
Learn chip
  Description *12-59*
  Street *8-52*
  Structure *8-48*
  Two point *8-55*
Learn chip size
  Description *12-57*
  Street *8-51*
  Structure *8-47*
  Two point *8-54*
Load
  Blow time *12-24*
  Material *5-14*
  Recipe *5-13*
Local map
  Look ahead *12-70*
  Parameters *12-68*
  Search grid *12-71*
  Thres.offset *12-71*
Local mapping *8-69*, *12-69*
Loctite 221 (R) threadlocker (MSDS) *11-23*, *11-29*
Loctite 243 (R) threadlocker (MSDS) *11-37*
Logoff for service purposes *5-6*
Lower brightness limit *12-33*

M
Machine identification *2-4*
Machine operation *2-4*
Machine preparation *6-3*
Magazine handler
  Description *3-24*
Mapping local *12-69*
Material safety data sheets (MSDS) *11-1*
Mechanical preparations *5-14*
Menu
  Alarm *4-23*
  Debug *4-27*
  Info Page *4-28*
  Overview *4-19*
  Produce *4-20*
  Setup *4-21*
  Statistics *4-25*
  System *4-26*
  Teach *4-22*
Metalon HT-1.5 (MSDS) *11-7*
MH-IN
  Adjusting the push-in *8-14*
  Calibration *6-48*
MH-OUT
  Adjustment *7-37*
  Calibration *6-52*
Mini adapter replacement *7-46*
Mini adapters for vision modules *12-11*
Molykote (R) PG 602 (MSDS) *11-17*
Monitors *4-7*
Motorized centering sensors
  Danger zones *1-13*, *1-16*
Motorized pre press module
  Description *3-27*
Mounting a cavity tool *7-32*
Mouse *4-10*
Multichip leadframe
  Teaching *8-20*

N
Name plate *2-4*
Needle *12-10*
  Replacement small Die *7-44*
  Size *12-10*
Needle holder *12-10*
Neighbor check *8-57*
Nero Burning ROM SW installation *10-6*
Notifications *4-14*

O
Object position control *12-31*
Optimize Index Step *12-49*
Options
  Description *3-23*
Options Software installation *10-10*
Output magazine handler
  Adjustment *7-37*
  Danger zones *1-10*

© 2009 Esec Ltd.

P
P&P
Bondhead
Y-direction adjustment *6-5*, *6-6*
Calibration tools *6-4*
Danger zones *1-12*
Pickup tool and shank replacement *7-38*
Paper separation
Setting up the *8-9*
Parameter setting
Process *8-26*, *8-27*
Z-axis *8-26*
Password
Change *4-5*
Lost *4-5*
PDWD Calibration *6-41*
Pick position
Defining *6-9*, *6-10*
Pick vision
Adjustment *6-15*
Calibration *6-15*
Pick wait time *8-74*
Pickup
Process description *12-13*
Process parameter setting *8-74*
Pickup tool
Considerations for design *12-102*
Pickup tool replacement *7-38*
Pneumatic unit
Description *3-17*
Power failure with UPS *5-11*
Power leadframe loader
Description *3-3*
Power leadframe loader PLL
Adjusting the buffer *7-3*
Adjusting the gripper *7-4*, *8-2*
Adjusting the Y position *7-7*, *8-5*
Calibrating the gripper axis *6-44*
Loading the buffer *7-7*
Vacuum sensor settings *6-45*
Power marker unit 2
Activating the *7-19*
Adjusting its position in X and Z *8-28*
Changing the stamps *7-19*
Description *3-27*
Parameter settings *8-28*
Power racks
Danger zones *1-13*
Powering up the machine *5-1*
PPPM Calibration *6-43*
PQCTV Calibration *6-40*
Preparations, mechanical *5-14*
Preparing the machine *5-13*
Process description *2-3*
Process direction *12-23*
Process parameters *8-26*, *8-27*
Info sheet *12-109*
Production
Overview *5-12*
Settings *12-67*
Start *5-16*
Starting the *5-13*
Production keyboard *4-8*
Production settings *8-68*
Pseudo colors *12-72*
Push-in *3-5*
Mechanical preparation *7-13*
PVI
Adjustment *6-15*
Calibration *6-15*

Q
Quality *12-45*

R
Recipe
Description *9-1*
Handling *9-1*
Load *5-13*
Manager *9-2*
Regular shut down *5-3*
Rejected pad sensor
Description *3-28*
Release Emergency Stop *5-4*
Restart menu *5-6*, *5-7*
Restore MS Windows 2000 *10-1*
Retry mode *12-67*

S
Screen zoning *4-17*
SCS software installation *10-7*
Search range *12-29*
Selection of a corner test *12-7*
Selection of an inkdot test *12-6*
Selection of the alignment method *12-3*
Set index step manually *12-55*
Setup
Fine tuning *8-40*
Shank replacement *7-38*
Show production data *12-68*

© 2009 Esec Ltd.

Shutting down the machine *5-3*
Emergency Stop *5-4*
Regular *5-3*
Un-ordered Stops *5-5*
Unusual conditions / Logoff for service purposes *5-6*
Size tolerance chip alignment *12-30*
Software
First time installation *10-7*
Installation of Info-Page *10-6*
Installation of Nero Burning Rom *10-6*
Installation of SCS software *10-7*
New installation *10-7*
Options installation *10-10*
Restore of MS Windows 2000 *10-1*
Specific warning *1-26*
System verification before installation of the SCS software *12-78*
Updating SCS software *10-11*
Windows patches installation *10-4*
Special step *12-74*
Stack magazines
Adjusting and positioning the *7-16*
Stack power
Calibration *6-47*
Danger zones *1-6*
Description *3-4*
Mechanical preparation *7-8*
Start position *12-22*
Starting the production *5-13*
Statistics *9-7*
Settings *9-7*
Street alignment method *12-27*
Street edge transition *12-31*
Street threshold *12-46*
Structure alignment method *12-26*
Surface
Brightness limit *12-40*
Check *12-39*
Detection range *12-38*
Edge offset *12-40*
Error *12-40*
Result *12-66*
Test *12-7*, *12-38*
System
Hardware description *3-19*
System verification *12-78*

T

Table
Movement delay *12-24*
Speed *12-67*
Table speed *12-67*
Teach
Alter step mode *8-66*
Bond parameters *8-77*
Bondhead height at bond position *8-76*
Bondhead height at pick position *8-72*
Bright correction *8-68*
Broken wafer *8-65*
Chip *12-5*
Chip (street) *8-52*
Chip (structure) *8-48*
Chip (two point) *8-55*
Chip quality *8-68*
Chip sensor *8-75*
Chip size (street) *8-51*
Chip size (structure) *8-47*
Chip size (two point) *8-54*
Corner *8-63*
Die ejector height *8-71*
Distance to die *8-72*
Extended pickup process *8-71*
Inkdot (inkdot test on) *8-58*
Inkdot (inkdot test pattern) *8-60*
Leadframe inspection position *8-8*
Leadframe pickup position (TOS) *8-6*
Leadframe place position *8-11*
Local mapping *8-69*
Needle inspection *8-68*
Needle top height *8-72*
Needle velocity *8-72*
Neighbor check *8-57*
Paper separation (TOS) *8-9*
Pick wait time *8-74*
Pickforce *8-72*
Quality control manually *8-79*
Retry mode *8-68*
Show production data *8-68*
Step alignment *8-68*
Surface *8-64*
Table speed *8-68*
Theta rotation *8-74*
TOS parameters *12-12*
Trash bag position *8-8*
Wafer cassette (WHG) *8-37*
Wafer diameter *8-43*
Wafer overview *8-35*
Wafer properties *8-43*
Teaching
Tips and tricks *12-5*
Test run
Leadframe *5-15*
Production *5-16*
Test run wafer *8-70*
Text translation *4-29*

© 2009 Esec Ltd.

Theta rotation
Teaching the *8-74*
Threshold and color mode *12-72*
Threshold mode *12-46*
Tips and tricks chip teaching *12-5*
Top stack loader
Adjustment *7-14*
Calibration *6-47*
Danger zones *1-7*, *1-9*
Description *3-23*
Parameters *12-12*
TOS
Adjustment *7-14*
Inspection position teaching *8-8*
Leadframe thickness measuring *8-10*
Parameters *12-12*
Pickup position teaching *8-6*
Translation of text *4-29*
Trash bag position
Teaching the *8-8*
Two point alignment method *12-25*

U

Units of measure *4-29*
Unload blow time *12-24*
Un-ordered stops *5-5*
Update
SCS software *10-11*
Upper brightness limit *12-33*
UPS *4-12*
Error recovery *5-2*
Power failure *5-11*
User
Assign new user *4-4*, *4-5*
Change password *4-5*
Delete existing user *4-4*
User group
Assign new user group(s) to user *4-5*
Change ESEC system user *4-6*
Predefined (default) user groups *4-3*
Remove user group(s) from user *4-6*
User management
Assign new / delete / change ESEC system users *4-4*
Change MS Windows user to administrator *4-2*
Introduction *4-1*
Log-in *4-6*
MS Windows User *4-2*
Predefined (default) ESEC system users *4-3*
Predefined (default) user groups *4-3*

V

Verify chip *12-66*
Verify diameter *12-66*
Verify searchgrid *12-66*
Vision
Calibration *12-19*
Description *3-12*
Systems *3-12*

W

Wafer
Broken *12-62*
Diameter *12-22*, *12-66*
Diameter definition *8-43*
Load blow time *12-24*
Properties *12-22*
Properties teaching *8-43*
Start position *12-22*
Test run *8-70*
Tests and process modes *12-2*
Unload blow time *12-24*
Wafer cassette holder
Adjustment (WHG) *7-41*
Wafer mapping
Description *3-28*
Wafer table frame diameter calibration *6-23*
Wafer table origin calibration *6-21*
Warnings *4-15*
Windows 2000 Restoration *10-1*
Windows patches *10-4*
Wire dispenser
Danger zones *1-9*
Description *3-7*
Dispensing errors *12-93*
Mechanical preparation *7-29*
Teaching *8-23*, *12-90*

X

XY-shuttle
Description *3-6*
Teaching *8-20*

Z

Z-axis parameters *8-26*
Info sheet *12-106*

© 2009 Esec Ltd.

/ (May 29, 2009)

© 2009 Esec Ltd.

/ (May 29, 2009)