eDR7280 Product Introduction



The eDR7280 is a new generation wafer defect review and classification system from KLA-Tencor that meets high resolution defect review requirements of advanced semiconductor production and development facilities for at the 1X nm node and beyond.

The eDR7280 incorporates an electromagnetic immersion lens and proprietary stage technology to deliver superior imaging quality on all semiconductor manufacturing process layers both now and in the future. With its industry leading resolution and multi-channel capability, the eDR7280 is the ideal system for imaging and classifying physical defects, material and topographic variations, voltage contrast variations, high aspect ratio structures and photo resist defects. World-class productivity and lowest cost of ownership are delivered on the eDR7280 with robust automated defect location, automated bare wafer review, automated EDX elemental analysis for sub-100 nm defects, and exceptional system stability and reliability. Fully automated defect classification (RT-ADC™) and

dramatically accelerated manual classification with power assisted defect classification plus (ePAC+™) are enhanced with the Inline Defect Organizer (iDO ™) to equip the eDR7280 with flexible classification technologies to reduce the time to meaningful Pareto. The eDR7280 couples closely with KLA-Tencor's world-leading defect inspector families via RICO™ to enable dramatic improvements to the inspector recipe setup time and quality. The eDR7280 will be the first design-aware production SEM with RICO DA™ (Design-Aware) capability for leading-edge 29xx XP inspectors. Software version 9.1 delivers additional system functionality and capability. In summary, the fab's overall yield management system is improved with the eDR7280 by reducing the time to intelligent SPC decisions.

System Options and Configurations

System Options

- ❑ Auto Bare Wafer Review

Enables automated defect review of unpatterned and bare wafers inspected by unpatterned wafer inspectors. SEM spiral search is included with the ABW option

- ❑ Auto Bare Wafer Review Throughput

Enhanced Defect Per Hour and Wafer Per Hour Throughput enabled by Laser Optical Microscope and Large Area EDX detector

- ❑ Auto Elemental Analysis (Auto-EDX)

Enables automated elemental analysis via Energy dispersive X-ray spectroscopy on small defects in review.

- ❑ Power Assisted Classification Plus (ePAC+)

Provides a quick and easy way to double manual classification speed with minimal setup required. It is designed to run in parallel with automatic defect localization (ADL).

- ❑ Inline Defect Organizer (iDO)

Intuitive user interface for efficient inline classification setup with both Rule-Base and feature based nodes.

- ❑ RICO – Bright field, Dark field

Allows on-SEM sensitivity tuning of recipes for KLA-Tencor's 23xx & 28xx and higher series bright-field inspectors and Puma 9xxx series dark field inspectors. Wafers need to be on the SEM in order to for this option to function. Optimized recipes are directly available on the inspector.

- ❑ RICO Design Aware – Bright field (28xx and higher XP)

This option allows on-SEM optimization of recipes for KLA-Tencor's 28xx and higher XP series bright-field inspectors with fully interactive design information. Wafers need to be on the SEM in order to for this option to function. Optimized recipes are directly available on the inspector.

- ❑ PWQ RICO

Streamlines SEM review activities for Process Window Qualification (PWQ) applications. Includes automated reporting capability for efficient process window determination.

- ❑ Critical Point Inspection (CPI)

Critical Point Inspection (CPI) is a feature that automatically drives to pre-defined locations and capture images per pre-defined parameters in a recipe by user.

- ❑ Reticle Defect Review (RDR)

Reticle Defect Review (RDR) is a feature that connects with KLA-Tencor Reticle Inspection System and transforms reticle defect coordinates into wafer based coordinates for reviewing reticle defects on wafer.

- ❑ SATServer

Allows the user to run ePAC+ and/or iDO setup off-line on a stand-alone workstation. Contact KLA-Tencor's WIN Division for details.

- ❑ Data on Demand II

Enables KT BF inspector patch images to be retrieved directly from inspector lot results when using a KLARF as an input (as in FA scenario); the BF patches are available on SEM and in ePAC+ for defect classification.

- ❑ NFS Send

Enables updates to be made to YMS system using the NFS protocol through iLink framework.

- ❑ Light Tower

Four colors: Red, Amber, Blue and Green.

- ❑ Factory Automation

This is a series of options that comply with SEMI factory automation standards commonly required by major fabs. This includes GEM/SECS with RS-232 or HSMS; E4, E37.1, E30, E84, E87, E39, E90; E40, E94, E116 as well as carrier ID readers.

System Configurations

- ❑ Wafer Handler configuration:

  For 300mm wafers: Dual FOUP

- ❑ Seismic Restraint

eDR7280 System Specifications

Base E-Beam Review & Classification Functionality[1]

1.1.1 Base E-Beam Review & Classification functionality	
Resolution	1.2 nm (Tin spheres on Carbon) @ 600 eV
Landing Energy Values	200 eV - 14700 eV in predefined steps
Beam Current Range	50pA - 3000pA, MaxBC
SEM Field of View Range	0.25µm - 64µm in predefined steps
Pixel Density	Variable, from 256x256 to 1536x1536 pixels
Automatic Focus, SEM Review	Yes
Contrast & Brightness for SEM	Automatic or Manual
Optical Microscope, Fields of View	100 µm, 2000 µm
Opt. Microscope, Illumination modes	Brightfield, Darkfield
Automatic Contrast & Brightness for OM	Yes
Data Transfer Mechanism	DVD-RW, Network

System Performance[1] (CTD tests summarized in §5)

1.1.2 Imaging Performance (Tin / Carbon)		
SEM Image Resolution		≤ 1.2 nm @ 600eV, 50 pA
1.1.3 ADL Performance on KT Defect Standard Wafer (DSW)		
ADL Sensitivity (DSW)		≥ 20 nm (20 nm is min size on DSW)
ADL Redetection Success Rate (DSW)		≥ 95% (array and random detection)
ADL Repeatability (DSW)		≥ 95% (array and random detection)
Wafer Alignment Success Rate (DSW)		100%
Stage Position Accuracy		3σ ≤ 125 nm (stage cal pass criteria)
1.1.4 SEM Throughput (DSW)		
Random Mode	Defect per Hour	≥ 4750 dph @ 95% cap & sharp rate
	Wafer per Hour, pipeline	≥ 33 WPH (50 def/wfr, 3wfr/lot)
DDL Mode	Defect per Hour	≥ 20,000 dph @ 95% cap & sharp rate
	Wafer per Hour, pipeline	≥ 46 WPH (50 def/wfr, 3wrf/lot)
Array Mode	Defect per Hour	≥ 12000 dph @ 95% cap & sharp rate
1.1.5 System Stability		
Wafer Transfer reliability		No failures in 500 cycles; both load ports
1.1.6 System Cleanliness[2]		
Front-side Particles / Wafer Pass (PWP)		≤ 0.5 at ≥ 45nm (mean + 2σ); 2 mm edge exclusion

Back-side Particles / Wafer Pass (PWP)	≤ 2000 at ≥ 160nm; 2mm edge exclusion
Typical Metallic (not a spec, not tested per system)	≤1×10^{10} Atoms/cm^2 Cu,Ni,Co,Zn,Ti,Cr,Fe,Mn ≤ 5×10^{10} Atoms/cm^2: K, Na, Ca, Li ≤ 5×10^{11} Atoms/cm^2: Al

Options & Configurations

1.1.7 Factory Automation	
E30 (GEM-SECS)	Optional
E37 (HSMS)	Optional
E87/E39	Optional
E90	Optional
E40/94	Optional
E10	Optional
E58	Optional
E84	Optional
E116	Optional
Wafer ID Reader	Optional
Cassette Reader	Optional: types available Omron, Hermos, AdvanTag, Keyence
1.1.8 Light-Tower	
Light Tower	1 light tower: Red, Amber, Blue, Green, White, Buzzer
1.1.9 RICO II (KT Standard Patterned Wafer)	
RICO II™ – 23xx, 28xx and higher, 9xxx	Functions to optimize recipes on SEM: BBP 23xx, 28xx and higher (≥ 10.3) LS 9xxx (≥ 9.3)
RICO II™ PWQ, BBP & LS	Functions to streamline PWQ review PPT generation ≥10.4 BBP, ≥ 9.3 LS
RICO II DA™ – 28xx and higher XP	Functions to optimize recipes on SEM with Design Information from XP server
1.1.10 Auto Bare Wafer (PSL on bare silicon wafer)	
Min defect size sensitivity (Spiral search)	≥ 20 nm
Optical Sensitivity	≥ 22 nm in engineering mode (with laser OM option) ≥ 29 nm in production mode (with laser OM option) ≥ 40 nm (without laser OM option)
DPH Throughput with LASER	≥ 1500 DPH @ 95% cap & sharp rate
DPH Throughput with SEMSS	≥ 1100 DPH @ 95% cap & sharp rate
Recipe Repeatability (no SEMSS)	≥ 95% ABW Capture rate (all repeats)

1.1.11 EDX Use Case (EDX test wafer)	
EDX electron beam landing energy	5700 eV – 14700 eV in predefined steps
Peak Resolution (FWHM) on C, Si	C: Kα 56 eV ; Si Kα 80 eV
EDX Material Defect Size Sensitivity	Identify >100 nm defects in <2 sec of: Al_2O_3, W, Ni, Si_3N_4, SiO_2, Fe_2O_3
DPH Throughput (18 defects)	≥ 500 DPH standard
WPH Throughput (18 defects)	≥ 19 WPH standard
1.1.12 CPI	
CPI DDL @ 0.5um FOV	≥ 3400 DPH
1.1.13 IDO (KT Standard Patterned Wafer)	
iDO Acc / Purity (3 classes)	≥ 80% mean across classes
iDO Classification Repeatability	≥ 95%
SATServer	Available for offline ePAC+ & iDO
1.1.14 Data-on-demand II (DOD II)	
BF and DF Data on Demand II	Functions to incorporate inspector patch images into Manual Review & ePAC+ from KLARF input for s/w ≥ 10.4 (BF) and ≥ 9.3 (DF)
1.1.15 NFS Data Send	
NFS protocol through iLink framework	Available
1.1.16 RDR	
RDR – RAPID Reticle Inspectors	Functions to directly review reticle defects on the wafer.