WAFER PROCESS EVALUATION SEM

S-7840

HITACHI

INTRODUCTION

The semiconductor industry has been moving toward higher circuit integration and density, as well as higher production yield. With this trend in mind, we have developed a new wafer process evaluation SEM, Model S-7840. In addition to the basic user-friendly design, the S-7840 has integrated many convenient and useful functions as described in this brochure. We trust that the S-7840 will provide the industry with a new field of view for imaging, defect review and microanalysis, as well as CD-measurement.

FEATURES

1. High resolution imaging and high angle tilt of wafer samples

A new high performance objective lens, combined with a newly designed stable Schottky emission electron source, allows for high imaging resolution of up to 4 nm and a high wafer tilt angle of up to 60 degrees. Its double-detector system, consisting of a through-the-lens E x B filter system and a standard detector below the lens, collects almost all signals generated from the sample at all tilting conditions. The S-7840 is equipped with a precise and stability-enhanced multi-axis sample stage. This enables a panoramic viewing of wafers at optimum tilt angles and orientations, thereby allowing minimum working distances for the best quality images. User-friendly access to all stage parameters is provided through a new intuitive "Panoramic Stage Controller" window.

New GUI window:
"Panoramic Stage Controller"

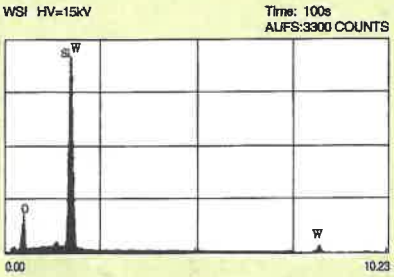
2. Defect review

The S-7840 can be directly linked with all major defect inspection and/or data management systems via networking. New software functions offer improved precision for particle and defect locations, and its clearly structured and intuitive Graphical User Interface allows a fast and convenient review and classification of defects and particles. Images may be saved on the internal hard disc of the S-7840 and can be uploaded together with the classification data through the network. Automatic Defect Review and Defect Classification is available as an option.

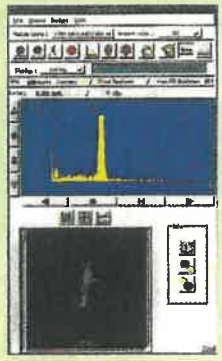
3. Microanalysis using EDX*1 spectroscopy (Option).

Elemental microanalysis of interesting particles can be precisely performed by EDX spectroscopy on the S-7840. The high take-off angle of 45 degrees, the maximum beam energy of 15 keV and the high probe current available from the Schottky emission electron source offer ultimate analysis capability for light as well as heavy elements. Convenient operation of the EDX system is possible from the standard SEM operating console.*2

*1 EDX: Energy Dispersive X-ray Spectroscopy

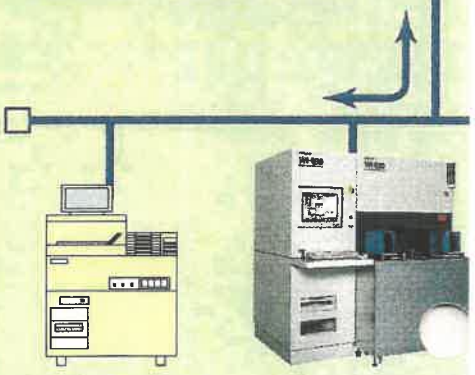


Tungsten has been identified by an Lα line at 15 kV operation.



*2 EDX system operation on the SEM operation window. This is available for Noran EDX systems (Option).

S-7840

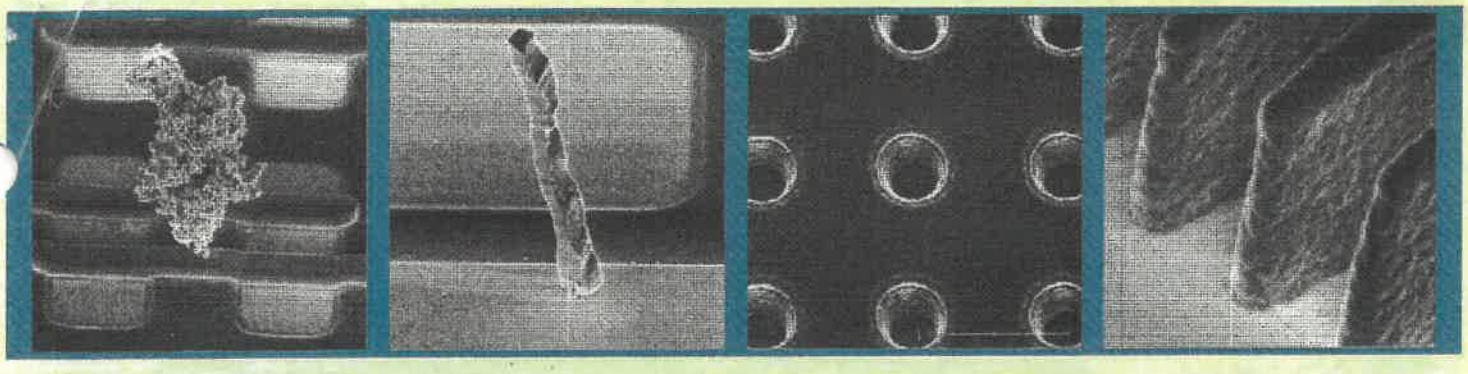


Particle Monitor System

Defect Inspection System

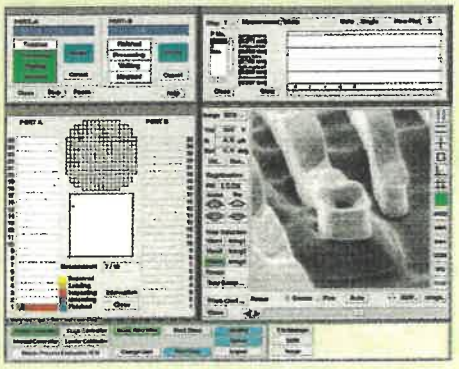
4. High precision CD-measurement

The precisely controlled electron beam system including the Schottky emission electron source of the S-7840 gives the ability of high precision and fully automated (programmed) CD measurements. The S-7840 uses the same pattern recognition and measurement algorithms as the Hitachi S-8000 and S-9000 series that are worldwide standards for Critical Dimension Metrology. These include hole measurements using polar coordinates width and width roughness measurements and various optional functions. This makes the S-7840 the most ideal tool for engineering and process evaluation work.



5. User-friendly design

Normal SEM operations are performed by the mouse through the intuitive Graphical User Interface which is basically identical to that of the popular S-8000 and S-9000 CD-SEM series. Manual navigation by using a trackball is also available, and the built-in optical microscope facilitates field search.

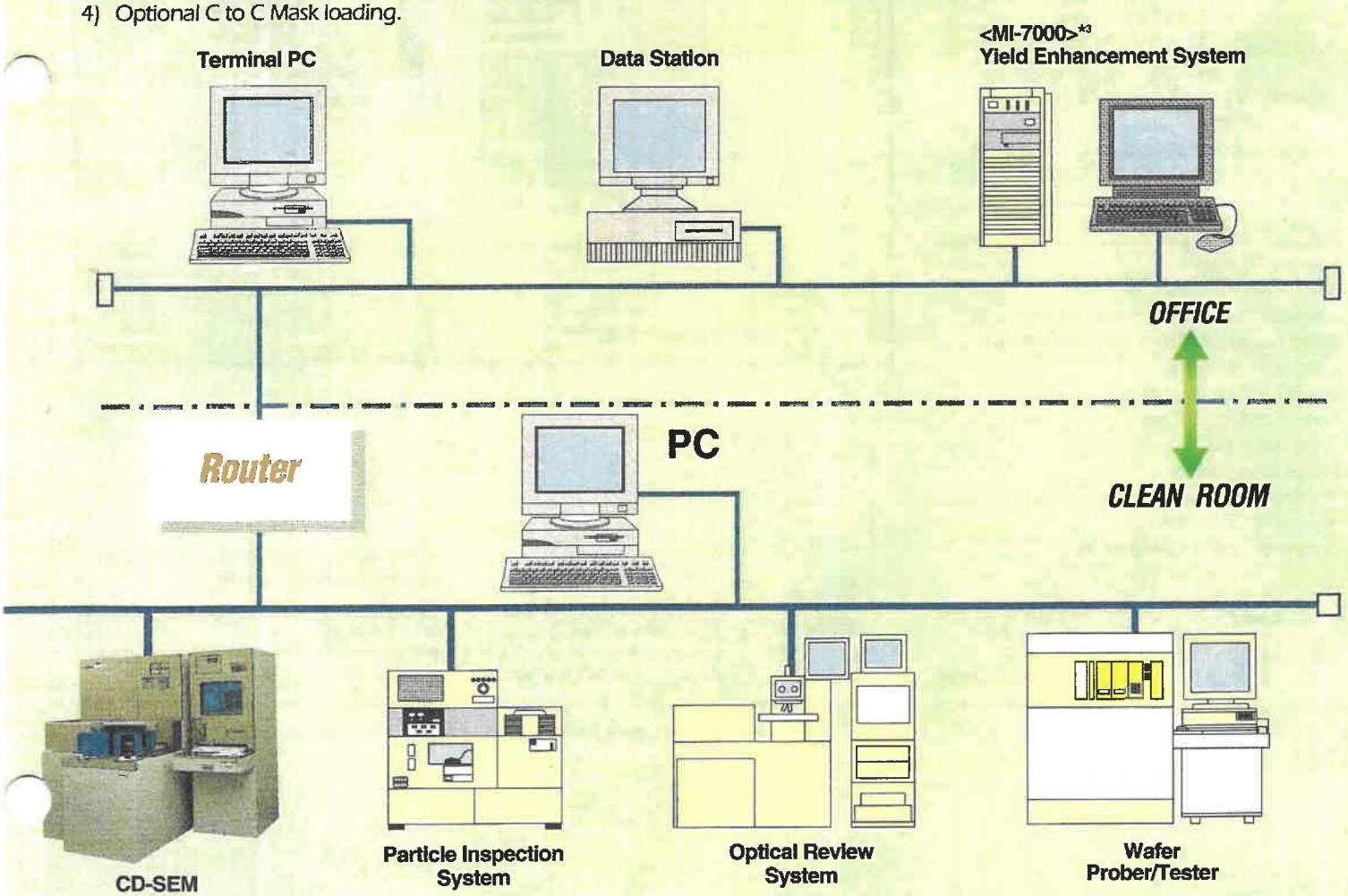


Graphical User Interface

6. Expansive system design

From chip cross sections to wafers and masks, the S-7840 is compatible with various sample requirements. It also allows interfacing with various systems through networking.

1) The S-7840 images and measurement data files can be transferred to outside PCs through the network. (Option: Terminal PC)
2) By using Data Stations, it is possible to a) create recipes off-line, b) manage files remotely, c) monitor the instrument real-time, d) transfer images and measurement data for central management automatically. (Option: Data Station)
3) The S-7840 can be interfaced with various data management systems for a total data management. (ex. Hitachi MI-7000 Yield Enhancement System)
4) Optional C to C Mask loading.



*3: MI-7000 (AS-5000) is Hitachi's Yield Enhancement System Product. Other venders' yield management system linkages are also available.

SPECIFICATIONS

Secondary electron image resolution:
4 nm (Tilt angle=0, Vacc.=1kV)
Magnification: ×100 ~ 200,000
Accelerating voltage: 0.7 ~ 15 kV
Optical microscope: ×110 (magnification)
Measurement repeatability: 5 nm (3 sigma)
or less than 1% (whichever is larger)
Wafer size: 200 mm dia. or 150 mm dia.
Sample stage: 5-axis CPU control
X,Y: 0 ~ 200 mm
Tilt: 0 ~ 60°
Rotation: 0 ~ 360°
Stage positioning accuracy: ±5 µm
Wafer exchange:
Cassette to cassette autoloader system
Computer:
Engineering Work Station (20 inch CRT)
External memory: 3.5 inch FD, 3.5 inch MO
Networking with wafer inspection systems:
(Option)
Elemental microanalysis: Energy dispersive
X-ray spectrometer (Option)

Dimensions & weight

Column: 126 (W) × 160 (D) × 190 (H) cm
2,000 kg
SEM control unit: 60 (W) × 129 (D) × 186 (H) cm
340 kg
Power supply: 54 (W) × 87 (D) × 180 (H) cm
380 kg
HV Unit: 40 (W) × 76 (D) × 78 (H) cm
80 kg
Rotary pump: 36 (W) × 65 (D) × 52 (H) cm
57 kg × 2 sets (Option)

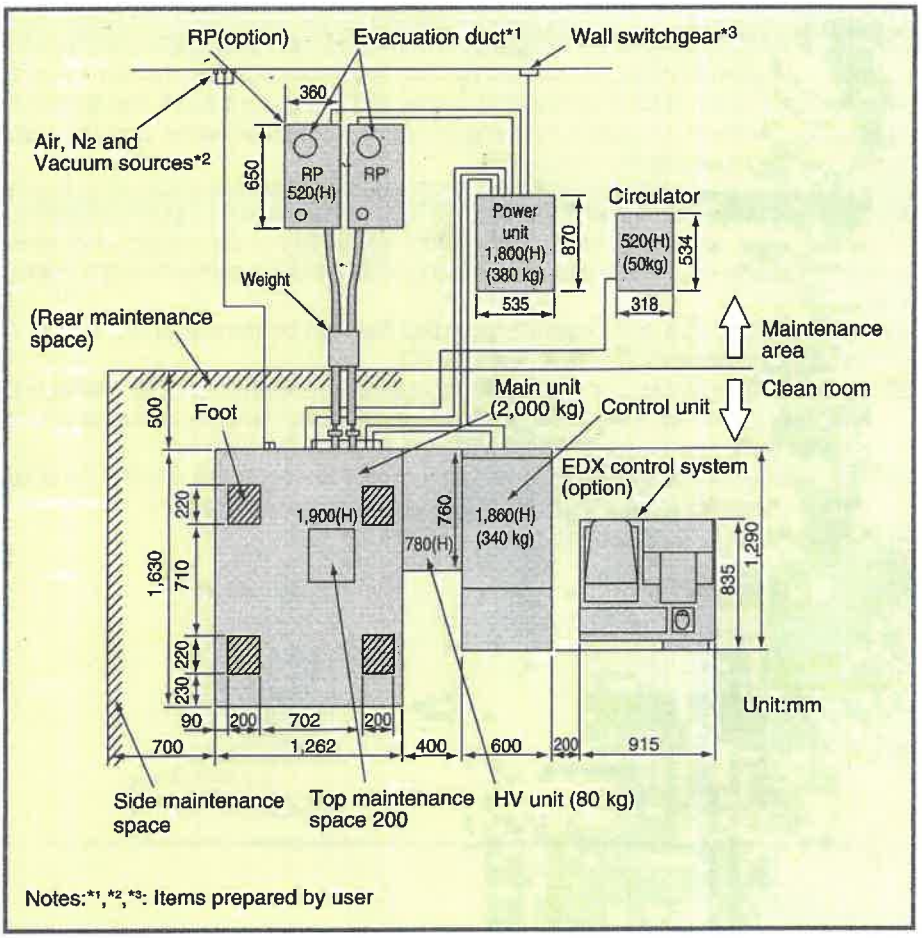
Optional accessories

Photo.CRT unit
SECS communication interface
Interface for wafer inspection systems
Wafer holders 200 mm dia., 150 mm dia.
Cross-section holders
(95, 90, 75, 60, 0, degrees),
Custom holder is available.
C to C Mask loader,
Image filing system
Terminal PC, Data Processing Software,
Automatic Defect Review,
Automatic Defect Classification

Installation

Room temperature: 20 ~ 25°C (Δt =2°C or smaller)
Power: Single phase AC 100, 115, 200, 220, 240 V ±10%, 7 kVA (50/60 Hz)
Gas/air source: Dry N_2/dry air (for vent): 400 ~ 880 kPa
Air (for pneumatic valve control): 600 ~ 880 kPa
Vacuum (for operation of C to C): 13 ~ 40 kPa

Installation layout



CERTIFIED ISO 9001

Reliable products and systems of proven quality for high customer satisfaction.

ISO 14001 CERTIFIED

Hitachi Instrument Div. is promoting environmental consciousness throughout its manufacturing operations.

NOTICE: For proper operation, follow the instruction manual when using the instrument.

Specifications in this catalog are subject to change with or without notice,
as Hitachi continues to develop the latest technologies and products for our customers.

HITACHI

For further information, please contact your nearest sales representative.

Printed in Japan (H) **EX-E857** 0399

Cost of other facilities (incl. waste treatment)	Same as SEM5

SPECIFICATIONS

Secondary electron image resolution:
4 nm (Tilt angle=0, Vacc = 1kV)
Magnification: ×100 ~ 200,000
Accelerating voltage: 0.7 ~ 15 kV
Optical microscope: ×110 (magnification)
Measurement repeatability: 5 nm (3 sigma)
or less than 1% (whichever is larger)
Wafer size: 200 mm dia. or 150 mm dia.
Sample stage: 5-axis CPU control
X,Y: 0 ~ 200 mm
Tilt: 0 ~ 60°
Rotation: 0 ~ 360°
Stage positioning accuracy: ±5 µm
Wafer exchange:
Cassette to cassette autoloader system
Computer:
Engineering Work Station (20 inch CRT)
External memory: 3.5 inch FD, 3.5 inch MO
Networking with wafer inspection systems
(Option)
Elemental microanalysis: Energy dispersive
X-ray spectrometer (Option)

Dimensions & weight

Column: 126 (W) × 160 (D) × 190 (H) cm
2,000 kg
SEM control unit: 60 (W) × 129 (D) × 186 (H) cm
340 kg
Power supply: 54 (W) × 87 (D) × 180 (H) cm
380 kg
HV Unit: 40 (W) × 76 (D) × 78 (H) cm
80 kg
Rotary pump: 36 (W) × 65 (D) × 52 (H) cm
57 kg × 2 sets (Option)

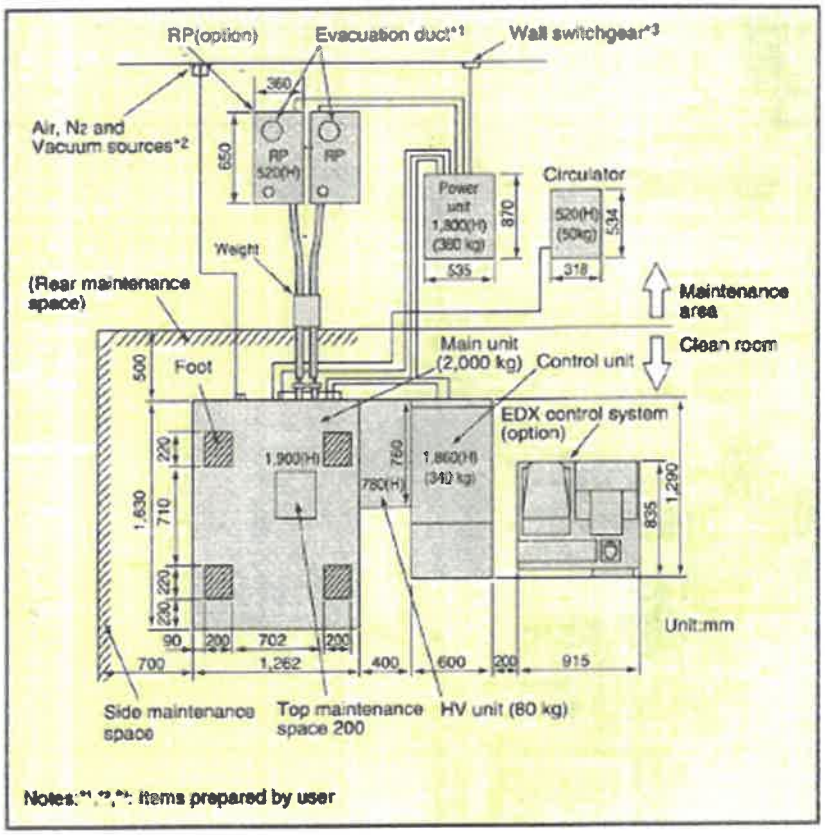
Optional accessories

Photo CRT unit
SECS communication interface
Interface for wafer inspection systems
Wafer holders 200 mm dia., 150 mm dia.
Cross-section holders
(95, 90, 75, 60, 0, degrees)
Custom holder is available
C to C Mask loader,
Image filing system
Terminal PC, Data Processing Software
Automatic Defect Review,
Automatic Defect Classification

Installation

Room temperature: 20 ~ 25°C (Δt =2°C or smaller)
Power: Single phase AC 100, 115, 200, 220, 240 V ±10%, 7 kVA (50/60 Hz)
Gas/air source: Dry N_2/dry air (for vent): 400 ~ 880 kPa
Air (for pneumatic valve control): 600 ~ 880 kPa
Vacuum (for operation of C to C): 13 ~ 40 kPa

Installation layout



NOTICE For proper operation, follow the instruction

Revision History

Revision	Change Originator	Description of Revision and Reason	Change Analyst	Effective Date
J	JV	General revision. Added specific check wrt cost of electrical energy. Removed checkpoint wrt LIS and added Fabguard & Acquaint instead	S. De Bruycker	20-Sep-2016
K	JVM	2-yearly review. No content changes.	S. De Bruycker	27-Sep-2018
L	JVM	2-yearly review. No major changes. Added 'Altair as defect measurement method.	S. De Bruycker	01-Feb-2021
M	JVM	Added a chapter 6 concerning ergonomic aspects	S. De Bruycker	28-May-2021