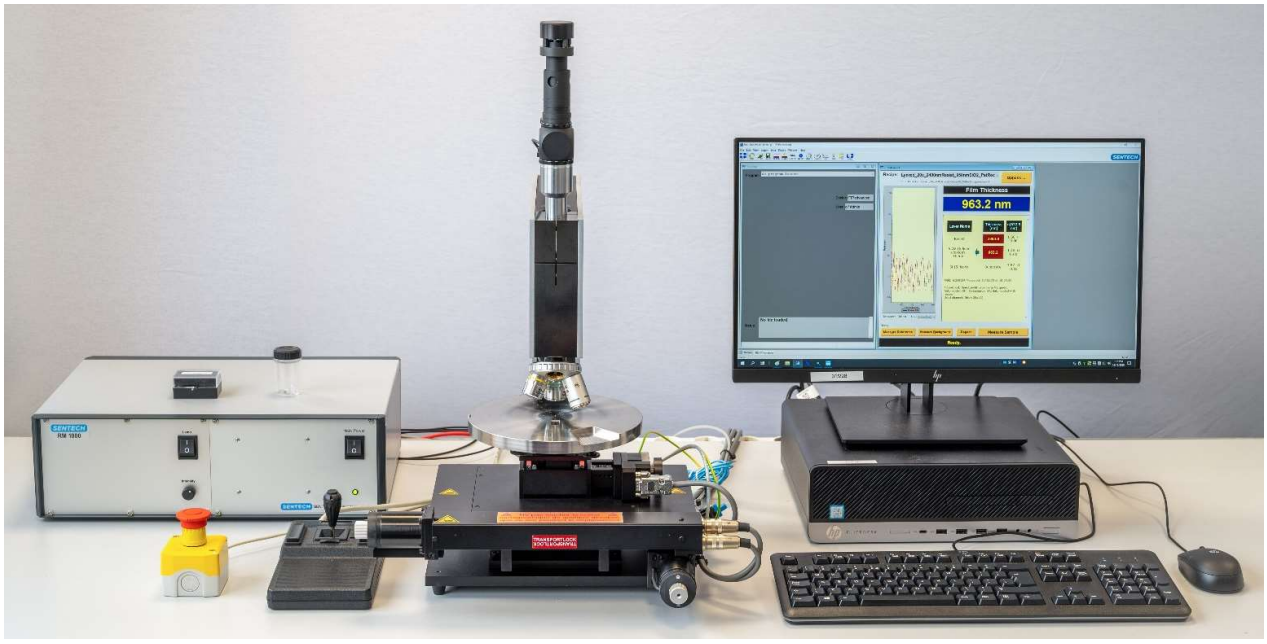
RM 1000 QC
Spectroscopic Reflectometer



- **Table top quality control for random sampling**
- Quality control on patterned wafers with manual wafer handling
- Contactless, optical reflection measurement at normal incidence for the characterization of thin films and bulk materials
- Measurement in test patterns between 145µm and 30µm (optional) with spectral range from 400 – 1000 nm (optional 400 nm – 1650 nm)
- Powerful, unmatched analysis software package **SpectraRay/4** for recipe and advanced engineering modes
- XY mapping up to 200 mm with high lateral resolution and pattern recognition
- Pattern recognition software (based on HALCON)
- Optional SECS/GEM interface

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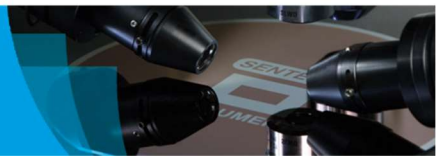

1. General description

The Spectroscopic tabletop reflectometer **RM 1000 QC** is an optical reflection measurement instrument for quality control of thin films and bulk material on patterned substrates. The **RM 1000 QC** is best suited for random sampling and statistical process control (SPC) of patterned wafers.

The **VIS/NIR Reflectometer RM 1000 QC** provides reflectivity spectra at normal incidence which are analyzed by the **SpectraRay/4** software according to the sample parameters like film thickness, absorption, composition, energy gap, color, spectral bandwidth and more. The software includes pattern recognition, recipe-oriented operation as well as an advanced engineering mode for advanced modelling tasks.

A major application is the fast and easy thickness measurement of transparent and semitransparent films on transparent and absorbing substrates in manufacturing. It covers a film thickness range from 20 nm to 50 microns and can be applied to a high variety of material systems due to the large and extensible material library.

The principle of the **RM 1000 QC** reflectivity measurement is based on the measurement of the reflected intensity which is normalized to an intensity taken at a reference sample. The reference sample is part of the delivery. For high reflecting coatings as Al mirrors a specific second reference is optionally available.

The **RM1000 QC** is intended for the semi automated measurement of patterned wafers. It targets quality control for single wafers. **Pattern recognition** assists in the measurement inside patterned layers. An overview objective with low magnification is used for finding reference markers.
The **RM 1000 QC** is configured for the size of the test pattern.

The **VIS/NIR Reflectometer RM 1000 QC** comprises the tabletop microscope unit with sample stage and optical setup for the illumination of a relatively small spot of the sample and detection of the reflected light. Further it comprises a sample alignment arrangement consisting of an auto-collimating telescope and an automated height alignment for repeatable measurements. The electronics box contains an embedded microcontroller and the spectrometer. The electronics box can be interfaced to any state-of-the-art PC running under Windows 10 via an Ethernet LAN connection.

The **Reflectometer RM 1000 QC** is equipped with a computer controlled XY – mapping stage to scan the sample properties laterally. The mapping software allows to define any kind of measurement pattern, to display the results in 2D and 3D plots and to perform statistics over the sample.

The user software is easy to handle and presents the measurement result in a clear way. It supports the thickness measurement of single layers as well as the analysis of layer stacks. The software offers ready and user defined applications.

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2 Technical specifications

2.1 Hardware

Spectral range	400 nm – 1000 nm
	Optional: 400 nm – 1650 nm
Light source	stabilized Halogen Tungsten lamp
Video camera	yes, included in auto-align system
Illumination	fiber attached source
Detection	Fiber attached spectrometer
Objectives	1x overview objective
	1x measurement objective
	Measurement area can be configured (see below)
Configurations for test patterns	Test pattern: 90µm x 90µm or 145µm x 145µm (Standard) 30µm x 30µm or 60µm x 60µm (optional: RM OE) Only one size can be ordered. The definition includes a margin of 5 µm (spot to field edge).
Automatic objective changer	2 objective positions, software controlled
Sample stage	200 mm diameter
	wafer thickness 8 mm maximum
	alignment pins for 4, 6 and 8 inch wafers
Spectrometer	high resolution spectrometer:
	1.5 nm FWHM optical resolution
Reference sample	Si reference included (for R 0% … 60%)
	Al based reference optional available (for R 50% … 100%)
Controller	Wide range (85...264VAC) power supply Rated frequency: 50-60 Hz, Rated power: 300 VA
Weight:	Device: 26 kg; Electronics: 8 kg
PC	State of the art PC running Win 10 operating system

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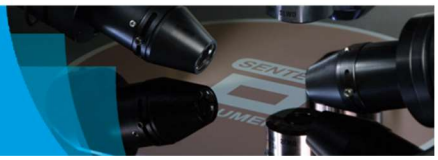

2.2 Software

Measurement and Analysis	SpectraRay/4
	- Recipe oriented FTPadv Expert mode
	- Advance engineering with SE-advanced
Pattern Recognition	HALCON (industrial standard software)
Data storage	Optional SECS/GEM interface

2.3. Specifications

Thickness range	20 nm … 50.000 nm[1]
Measurement time	typical 300 ms
Thickness accuracy	better than 1 nm (typ. for 400 nm SiO_2 on Si reference)
Thickness precision	0.3 nm (1 ☐☐ typ. for 400 nm SiO2 on Si reference sample)
Measurement field	The required minimum measurement field defines the optics included. Select a square sizing from 145 µm down to 35 µm.
Video area	Overview objective: 4.2 mm x 3.15 mm
	Measurement objective:
	- 90 µm and 145 µm configuration: 0.94 mm x 0.70 mm
	- 35 µm to 60 µm configurations: 0.38 mm x 0.28 mm
Particle generation	Less than 50 added particles > 0.2 µm

[1] For SiO_2 layers. The thickness range depends on the layer stack.

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3 Ordering information of VIS Reflectometer RM 1000

Spectroscopic Tabletop Reflectometer **RM 1000 QC** including:

- microscope stand with illumination and detection optics
- adjustable sample stage with 8” sample platform
- autofocus sample alignment with auto-collimating telescope
- optical fiber between spectrometer in controller box,
- SpectraRay/4 software including pattern recognition software
- tool with reference sample and background measurement position
- SE K400 standard wafer, nominal 400 nm SiO_2 on silicon
- PC

3.1. Options

RM1000 NIR	Extended spectral range: 400 nm … 1650 nm
RM1000 EO	Reduced spot size optics. Allows to measure inside squares less 90 µm size. This option is available before factory shipment.
SEN GEM SE	Software interface for SECS/GEM (see separate product description)
SE K100	SENTECH thin film standard wafer, nominal 100 nm SiO2 on silicon
SE K400	SENTECH thin film standard wafer, nominal 400 nm SiO2 on silicon
SE N80	SENTECH thin film standard wafer, nominal 80 nm Si3N4 on silicon

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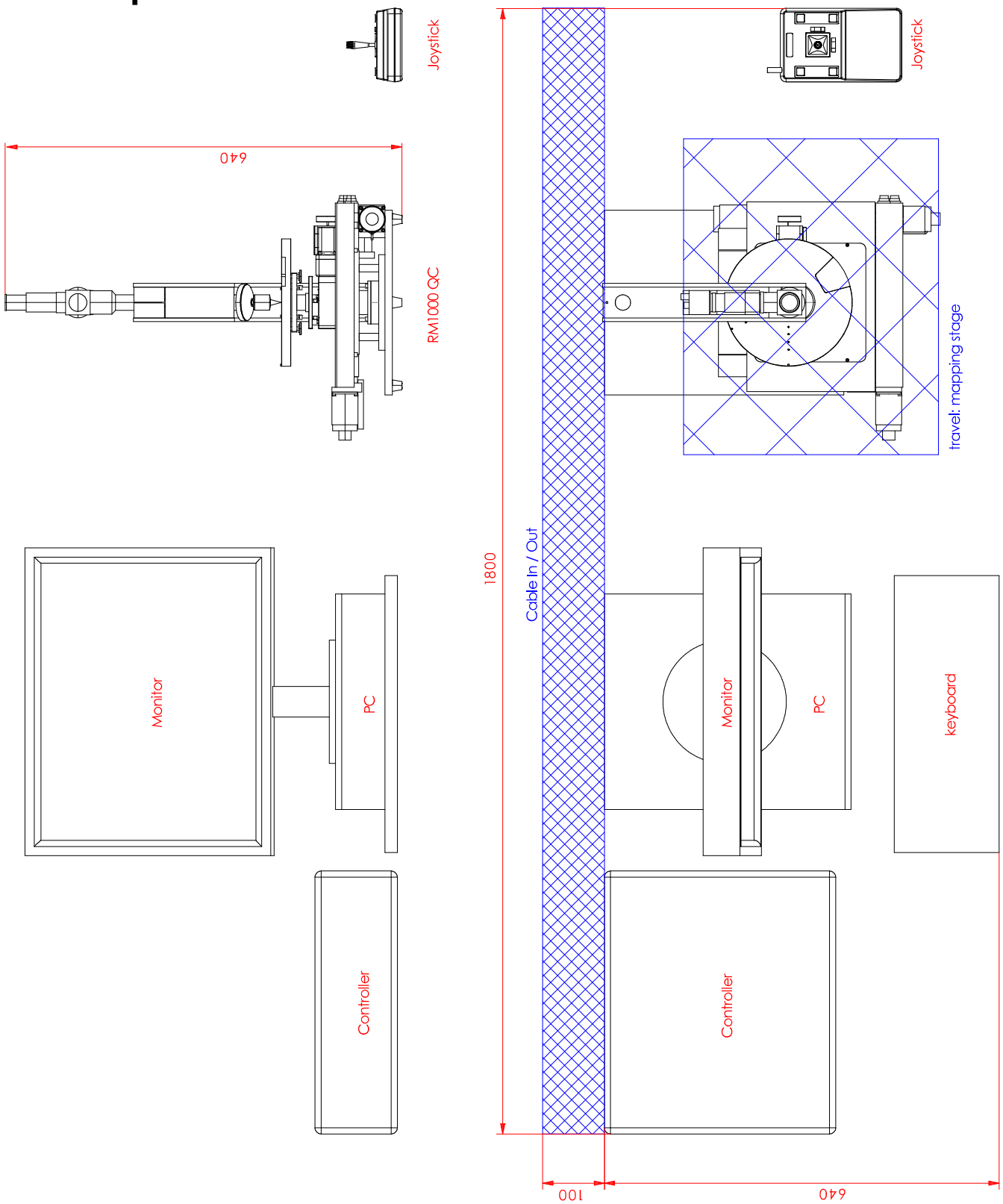
4. Floor plan



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