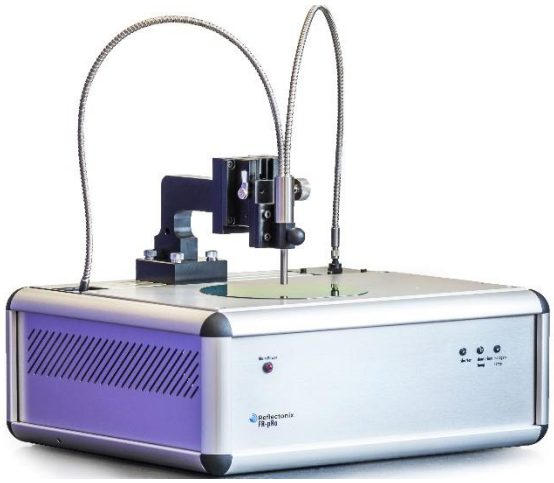
**FR-pRo:** the modular & expandable platform for non-destructive characterization of coatings in the **1nm-3mm** thickness range.
FR-pRo tools are tailored to meet any user need for a wide range of diverse applications, such as: Film thickness, Refractive Index, Color, Transmittance, Reflectance, Film Characterization under temperature or ambient controlled environment or in liquid environment and many more …



**Applications**

- **Univ. & Research labs**
- **Semiconductors**
- **Polymer & Resist characterization**
- **Concentration measurements of chemicals**
- **Dielectric characterizations**
- **Biomedical**
- **Hardcoats,**
- **Anodization**
- **Optical Coating**
- **non-metal Films**
- **And many more…**

**FR-pRo** tool is assembled by user selected modules. The Core Unit accommodates the light source, the spectrometer (for any spectral regime in the 190nm-2500nm range) and the control & communication electronics. The tool comes with a set of reference samples (Si reference, $SiO_2$/Si, $Si_3/N_4/SiO_2$/Si). Then, there is a wide range of Accessories, such as:

- **Film Thickness kit** for reflectance measurements,
- **FR-Mic** for measurements at very small areas,
- **Manual & Motorized stages**,
- **Film/Cuvette Holder** for Absorbance / Transmittance and chemical concentration measurements,
- **Thermal** or **Liquid kits** for measurements under controlled Temperature or in Liquid environment,
- **Integration Spheres** for diffuse & total reflectance

**By the combination of different modules, the final set-up meets any end-user needs**

# Specifications

| Model | UV/VIS | UV/NIR-HR | D UV/NIR | VIS/NIR | D VIS/NIR | NIR | NIR-N1 | NIR-N2 | NIR-N3 | NIR-N4 |
|---|---|---|---|---|---|---|---|---|---|---|
| WL Range -nm | 200 – 850 | 190-1100 | 200 – 1700 | 380 –1020 | 380 – 1700 | 900 – | 850-1050 | 900 - 1050 | 1280-1350 | 1520-1580 |
| Pixels | 3648 | 2048 | 3648 & 512 | 3648 | 3648 & 512 | 512 | 3648 | 3648 | 512 | 512 |
| Min Thick -$SiO_2$ | 1nm | 1nm | 1nm | 12nm | 12nm | 50nm | 1um | 4µm | 12um | 20um |
| Max Thick $SiO_2$ | 80µm | 100µm | 250µm | 120µm | 250µm | 250µm | 500µm | 1.0mm | 2mm | 3mm |
| Max Thick -Si | | | | | | | 300µm*** | 450µm*** | 1mm*** | 1.3mm*** |
| n&k -Min Thick | 50nm | 50nm | 50nm | 100nm | 100nm | 500nm | | - | - | - |
| Thick. Accuracy | 1nm / 0.2% | 1nm / 0.2% | 1nm / 0.2% | 2nm / 0.2% | 2nm / 0.2% | 3nm / | 50nm / | 50nm / | 50nm / | 50nm / 0.2% |
| Thick. | 0.05nm | | | 0.05nm | 0.05nm | 0.1nm | 0.1nm | 5nm | 5nm | 5nm |
| Thick. stability | 0.05nm | | | 0.05nm | 0.05nm | 0.15nm | 0.15nm | 5nm | 5nm | 5nm |
| API support | YES | | | YES | YES | YES | YES | YES | - | - |
| Light Source | Internal Deuterium (2000h) & Halogen | | | Halogen (internal), 3000h (MTBF) | | | | | SLED (150Kh) | |
| Integration | 5msec (min) | | | 5msec (min) | | | | | 20msec (min) | |
| Size/Weight | FR-pRo: 39x32x17cm (LxWxH) 10Kg, FR-pRo D: 45x32x19cm (LxWxH) 13Kg | | | | | | | | | |
| Power | 110V/230V, 50-60Hz | | | | | | | | | |
| Spot size | Diameter of ~350-400µm (smaller spot size options are available upon request) | | | | | | | | | |
| Material | > 850 different materials | | | | | | | | | |
| SW | FR-Monitor v4.0 (free of charge updates) Full S/W details are listed at the related catalog's page | | | | | | | | | |

# Accessories

| | |
|---|---|
| Film/Cuvette kit | Transmission measurements of films or liquids in standard cuvettes |
| Transmittance stage | Stage upgrade to support transmittance measurements |
| Lens Module | -Measurements on coatings where a small spot-size is required |
| Contact probe | Thickness & optical measurements of coatings in the field. Ideal for curved surfaces |
| Microscope | Microscope-based reflectance / transmittance and thickness measurements with high lateral resolution |
| Scanner (motorized) | Polar (R-Θ) or Cartesian (X-Y) automated stage with wafer chuck. Reflectance& transmittance |
| Integration sphere | For the characterization of specular and diffuse reflectance of coatings and surfaces |
| Manual X-Y stage | Manual X-Y stage for measurements over an area of 100mm x 100mm or 200mm x 200mm |
| Thermal Module | Computer controlled Hot plate embedded in the FR-tool (Room temperature - 200°C, 0.1°C accuracy) |

* Specifications are subject to change without any notice; ** Thickness range depends on the spectral range and refers to a single layer with refractive index ~1.5 on Si substrate ** Measurements compared with a calibrated spectroscopic ellipsometer and XRD, Average of standard deviation of mean value over 15 days. Sample: 1µm $SiO_2$ on Si, Standard deviation of 100 thickness measurements. Sample: 1µm $SiO_2$ on Si, 2*Standard-Deviation of daily average over 15 days. Sample: 1µmicron $SiO_2$ on Si.