Video spectral comparator Regula 4307

The device is intended for advanced authenticity verification of passports, ID cards, travel documents, passport stamps, banknotes, driving licences, vehicle registration certificates and other vehicle related documents, signatures and handwritten records, paintings, revenue stamps and other security documents.

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The device is made as a single unit for desktop use. It is used with a PC (model Regula 4307MC.XXXX is supplied with Built-in PC) and fully controlled through "Regula Forensic Studio" software interface (supplied with a unit). The video spectral comparator enables to capture, process and store digital images of examined objects. All models are equipped with a hyperspectral imaging module, modules for reading MRZ, RFID chips, hidden image (IPI), 1D and 2D barcodes. Regula 4307 is supplied with a Spectral luminescent magnifier Regula 4147, information reference systems "Passport", "Autodocs", "Currency" (Brief versions).

Regula 4307 has a set of light sources of visible, infrared, ultraviolet spectral ranges and imaging filters used for carrying out forensic examinations.

The comparator can optionally be equipped with a high resolution spectrometer, a light source for anti-Stokes luminescence, an XY translation stage, a built-in PC.

**Features**

- Magnification up to 200x (for 30 inch monitor)
- Connection interface — USB 3.0
- Protective shields against harmful UV radiation
- Big size/thick documents examination option
- Possibility to use with additional equipment (magnetic ink visualizer Regula 4197, spectral luminescent magnifier Regula 4177 and information reference systems on travel documents and banknotes)

**Functionality**

- **Examinations under high magnification on different levels:**
  - protection of the document basis
    - paper opacity, watermarks, security fibers, planchettes, security threads, foil stamping, pole feature, all types of windows, transparent varnish coating, shadow images, etc.
  - printing methods
    - *intaglio*: texts, guilloche frames, rosettes and vignettes, microprinting, latent images and moire patterns, signs for the visually impaired, blind embossing, colour shifting ink, including OVI with embossing and latent images, etc.
    - *letterpress*: serial numbers, texts, barcodes, etc.
    - offset printing including Orlov and rainbow printing: texts, microprinting, moire patterns, background and anti-copy patterns, etc.
    - screen printing: security features with optically variable effects, etc.
    - see-through register
    - perforation
  - physicochemical protection
    - anti-Stokes luminescence
    - UV luminescence with different wavelength
    - IR luminescence
    - security features with magnetic properties, etc.
  - complex security features
    - holographic images, OVD
    - retroreflective protection
    - security features with IR-metameric ink
    - special polymer coating of security laminates
    - metallized coating
    - laser engraving

- **Additional examination of:**
  - fragments of document images depending on the degree of absorption or reflection of IR light
  - document alterations such as erasure, etching etc.
  - traces of signature forgery
  - extraneous lines (do not originally belong to the examined object) that are performed with IR opaque inks

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- blurred, crossed out entries, texts and images
- document mechanical defects such as cuts, tears, folds, etc.
- Comparison of two images in different combinations (two saved images, saved image against live video, saved images against etalon image from information reference systems, etc.)
- Automatic reading of:
  - Textual information from machine readable zone of ICAO compliant documents (ID-1, ID-2, ID-3)
  - 1D and 2D barcodes
  - Information from RFID chips in eDocuments (DG1 to DG15, BAC, EAC, AA, PA, TA, PACE) and verification of those chips

Application

- Border control and immigration services
- Customs authorities
- Law-enforcement agencies
- Forensic laboratories
- Financial institutions
- Other agencies and organizations authorized to check documents
- Document examiners

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## Functionality

<table>
<thead>
<tr>
<th>Light sources</th>
<th>incident</th>
<th>transmitted</th>
<th>oblique</th>
<th>coaxial polarized</th>
<th>OVD</th>
<th>back light</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>ultraviolet 365 nm</td>
<td>white</td>
<td>6×white</td>
<td>white LED</td>
<td>horizontal: 31 LEDs</td>
<td>white LEDs</td>
</tr>
<tr>
<td></td>
<td>ultraviolet 313 nm</td>
<td>infrared</td>
<td>6×infrared</td>
<td></td>
<td>vertical: 9 LEDs</td>
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<tr>
<td></td>
<td>ultraviolet 254 nm</td>
<td>ultraviolet 365 nm</td>
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<tr>
<td></td>
<td>ultraviolet 400 nm*</td>
<td>spot white</td>
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<tr>
<td></td>
<td>400 nm*</td>
<td>spot infrared</td>
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<tr>
<td></td>
<td>450 nm*</td>
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<td>470 nm*</td>
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<td>505 nm*</td>
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<td>530 nm*</td>
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<td>590 nm*</td>
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<td>620 nm*</td>
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<td></td>
<td>640 nm*</td>
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<td>infrared 700 nm</td>
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<td>infrared 780 nm</td>
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<td>infrared 860 nm</td>
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<td>infrared 940 nm</td>
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<td></td>
<td>white</td>
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</tbody>
</table>

* – separate LEDs, can be used in combinations (255 combinations)

convertable infrared 800-1100 nm for Anti-Stokes (optional)

All light sources are LEDs except ultraviolet 313, 254 nm

Camera filters:

- IR High pass 580 nm
- IR High pass 600 nm
- IR High pass 630 nm
- IR High pass 650 nm
- IR High pass 670 nm

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- IR High pass 685 nm
- IR High pass 700 nm
- IR High pass 715 nm
- IR High pass 730 nm
- IR High pass 780 nm
- IR High pass 850 nm
- Visible pass 370-700 nm
- UV cut off 450-1100 nm
- Polarization

Filters:

- Visible pass 390-410 nm
- Visible pass 440-460 nm
- Visible pass 460-480 nm
- Visible pass 495-515 nm
- Visible pass 520-540 nm
- Visible pass 580-600 nm
- Visible pass 605-635 nm
- Visible pass 625-655 nm
- Neutral

Video camera* — 5 Mpx, CMOS digital camera

Spectral response — 350-1100 nm

Frame size, pixels:

- 2592×1944 (Full Frame)
- 2592×1460 (16:9; Extra Full HD)

* – optional installation of a 14 Mpx CMOS camera is available (frame size: 4416×3312 pixels)

Magnification:

- optical — 30x
- digital — 2x (optionally up to 8x)
- for a 32 inch (81 cm) monitor* — 1.7x to 840x

Fields of view:

- 205×154 mm (Full Frame)
- 240×190 mm (with X-Y Translation stage)

* – all magnifications are approximate

Maximal document size (length×width), mm — 530×400

Output signal / Interface — USB 3.0

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Spectral luminescent magnifier Regula 4147

Light sources:

- incident white
- 2 high-intensity infrared 980 nm: spot and flood

Field of view, mm — 11,1×8,1

Sensor:

- type — CMOS
- megapixels — 3,1:
  - resolution, ppi — 4700
  - frame size, pixels — 2048×1536
- dynamic range, dB — 61

Camera filters — IR high-pass with threshold, nm — 660

Connection interface — USB 2.0

Dimensions (length×width×height), mm, not more than — 94×62×52

Weight, kg, not more than — 0,2

Power supply voltage, V — 5

Power consumption, W, not more than — 12,5

Incident white

High-intensity infrared 980 nm: spot

High-intensity infrared 980 nm: flood

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<table>
<thead>
<tr>
<th>Hardware modules</th>
<th>Model</th>
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<td></td>
<td>4307.1XXX</td>
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<tr>
<td>Hyperspectral imaging module</td>
<td>+</td>
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<tr>
<td>High resolution spectrometer</td>
<td></td>
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<tr>
<td>Light source for anti-Stokes luminescence</td>
<td></td>
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<tr>
<td>XY translation stage</td>
<td></td>
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<tr>
<td>Built-in PC</td>
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</tbody>
</table>

**Hyperspectral imaging module – 400–940 nm with a step of 1 nm**

**High resolution spectrometer** (microspectrophotometer) for measurement of absorbtion, reflectance, transmission, and fluorescent features

- Wavelength range: 350–1000 nm
- Optical resolution: ~0.3-10.0 nm
- Signal-to-noise ratio: 250:1 (at full signal)
- Dynamic range: 8.5 x 10^7 (system); 1300:1 for a single acquisition
- Integration time: 1 ms to 65 seconds

**Light source for anti-Stokes luminescence**

- Power, J — 160
- Wavelength range, nm — 800–1100
**XY translation stage** for high-performance positioning along multiple axes and image stitching

Maximum displacement along the X-axis, not less than, mm — 50±2

Maximum displacement along the Y-axis, not less than, mm — 50±2

**Built-in PC**

CPU — Intel® Core™ i7 or better

RAM, Gb, min — 8

SSD, Gb, min — 120

Active cooling system with a heat sink and fan

**ID and passport processing module**

ICAO MRZ reading for ID-1, ID-2, ID-3 documents

RFID reader (ISO 14443) (built-in)

1D, 2D and QR codes processing

**Position locked panels**

All side panels can be locked in the position to accommodate larger items.

Built in sensors will prevent unintended exposure from high intensity UV and IR light if any of side panels is not properly closed.

**Additional hardware specifications**

Water resistant cover

Quartz Glass Holding Plate (length×width×height), mm — 200×200×5

Device overall dimensions (length×width×height), mm — 580×495×450

Weight, kg — 36 (netto)

Lifting Handles — two suitable handles for easy move and setup

Power supply, V; Hz — 110-240; 50-60

Power consumption, W — 200

**Software modules**

Device operation — Regula Forensic Studio software

Software updates — Lifetime free update

Multilingual interface

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Software functionality

Automatic and manual focus, iris, white balance
Multi focus
Integration rate to increase sensitivity to faint images
Polarisafe feature — Polarised visible LEDs for viewing birefringent security features plus a linearly polarised LED crossed with the polarising filter
IR Luminescence light — 255 combinations
IR luminescence vizualization
Letterscreen++
Pulsed 365 nm UV LEDs for differentiating fluorescent and phosphorescent security ink
Super Resolution Imaging
Visualization of 3M™ Confirm™ laminate
Visualization of Invisible Personal Information (IPI - Hidden image)
Visualization of Optically Variable Inks (OVI)
Both vertical and horizontal scanning of Diffractive Optically-Variable Devices/Holograms
Integration with Regula Information Reference Systems

Additional software functionality

Image stitching (with X-Y Translation stage)
Saved document format — .BMP, .JPG, .TGA, .TIFF
Ability to save with the image the types of lighting, filters used, shooting date, etc.
Accumulation of images (camera integration time) — up to 50 frames (up to 180 sec)
Video recording
USB port 2.0 on the front panel for external devices
Image post processing

Recommended PC and monitor requirements (minimum)

Intel Core i7 processor or equivalent
HDD, Gb, min — 520 (1TB recommended)
32-inch 4K UHD Flat Panel Monitor
RAM, Gb, min — 8
Graphics card with a minimum of 1GB Ram
Operation System - Windows 7 or above

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Optional equipment

1. Visualizer of magnetic properties Regula 4197

Functionality

- Examination of magnetic security features in banknotes and travel documents in the mode of live video
- Visualization of magnetically hard and magnetically soft materials
- Possibility to distinguish magnetic inks by residual magnetization
- Carrying out non-destructive examination of objects with “hard” magnetic properties
- Reading latent magnetic strokes and codes
- Examination of damaged documents: reading blurred and crossed out texts printed with magnetic ink
- Possibility to take magnetic ink intensity measurements in tesla (T)

Field of view, mm — 14×18

Spatial resolution of the optical input system, mkm:

- frame size 1024×1280 pixel — 14
- frame size 512×640 pixel — 28

Connection interface — USB

OS — Microsoft Windows XP (SP3), Windows Vista, Windows 7, Windows 8, Windows 10

Dimensions (length×width×height), mm — 59×113×50

Weight, kg — 0,49

Power supply voltage from a USB port, V — 5

Power consumption, W, max — 2,5

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2. Thermostage Regula 4168

Functionality

- Examination of images and elements of banknotes and travel documents containing thermochromic ink at different temperatures.
- Examination of a composite security feature Feel®-ID developed by Giesecke & Devrient company. Feel®-ID is based on optically variable and thermochromic effect.

Temperature range, °C — +30...+80 with a step of 1 °C

Heated area (length×width), mm — 78×48

Dimensions (length×width×height), mm — 170×78×16

Weight, kg — 0,25

Power supply voltage: powered by the USB port of the video comparator, V — 5

Power consumption, W, max — 15

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3. Trinocular Stereo Microscope Regula 5003

**Functionality**

- Examination of security features in banknotes and travel documents in the mode of live video
- The microscope is based on the Greenough optical system which allows obtaining stereo images of examination objects
- Smooth magnification adjustment
- Coarse and fine focus adjustment
- Additional optical path for the digital video camera
- Document clamps

A ring-shaped LED illuminator (white light) with variable intensity control

**Colour camera:**

- type — CMOS
- effective pixels — 5 MP
- frame size, pixels — 2592×1944 (Full Frame)
- connection interface — USB 3.0

**Magnification:**

- optical — 0,8x to 14x
- objective magnification with 10x eyepieces — 8x to 140x
- objective magnification with 30x eyepieces — 24x to 420x
- for a 30 inch (75 cm) monitor* — 26x to 1330x

* – all magnifications are approximate

**Diopter adjustment, dptr — ±6**

**Interpupillary distance, mm — 52...76**

**Dimensions (length×width×height), mm — 285×285×450**

**Weight, kg, not more than — 5**

**Power consumption, W, not more than — 15**

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4. Tilting stage Regula 4165

Tilt angle, max — ±30

Working area (length×width), mm — (180×110) ±1

Dimensions (length×width×height), mm, max — 230×112×42

Power supply voltage via a USB port, V — 5

Device weight, kg, max — 0,5

Rated current, A, max — 1

5. Polarizer Regula 4169

6. 3D viewer Regula 4162

Light sources:

- white (30 light sources)
- infrared, nm — 860±20 (60 light sources)

Dimensions (length×width×height), mm, max — 160×140×40

Device weight, kg, max — 0,5

Power supply voltage via a USB port, V — 5

Rated current, A, max — 0,5

7. Calibration Kit

Calibrated White reference material. NIST traceable. For spectrometer reflectance reference.

UV 365 nm, 312 nm, 254 nm and Anti-stokes tester

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Document examination in different operating modes

UV 365 – 1,3x magnification
UV 313 – 1,3x magnification
UV 254 – 1,3x magnification
UV 400 – 1,3x magnification

Visible light range – reflected light – 1x magnification
Visible light range – reflected light – 4x magnification
Visible light range – reflected light – 10x magnification
Visible light range – reflected light – 29x magnification

Incident royal blue 450 nm – 3,39x magnification
Incident blue 470 nm – 4,29x magnification
IR top 870 nm – 1,49x magnification
IR top 950 – 1,49x magnification

Incident cyan 505 nm – 1,6x magnification
Bottom white – 1,2x magnification
Bottom IR 870 – 1,2x magnification
Bottom UV 365 nm – 2,2x magnification

Oblique white light – 7,49x magnification
Oblique white light – 7,49x magnification
Oblique IR light 870 – 9x magnification
Oblique IR light 870 – 9x magnification

Coaxial polarized white – 1,3x magnification
Coaxial polarized white – 1,3x magnification
Hologram

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