

AUTOMATIC BOOK SCANNER

SCANROBOT®
turn the Page



**AUTOMATIC BOOK SCANNER
FOR MAXIMUM PRODUCTIVITY**

TREVENTUS
MECHATRONICS

SYSTEM OVERVIEW

ScanRobot® 2.0 MDS



High quality - Automatic Book Scanner

- Fast - up to 2,500 pages per hour
- Distortion free & gentle scanning (prism technology)
- Unique 60° V-shape book cradle
- Single scan technology (for covers, folded maps, loose pages, ...)
- Self standing unit on wheels for easy relocating
- Ergonomic design
- ISO compliant image quality (optionally available)



Unique hardware features



Wooden 60° V-shape book cradle

- * Adjustable between 60° and 100°
- * Minimum load/unload time
- * Suitable for valuable old & new books
- * Applicable for hard & soft covers

Patented capturing technology

- * Unique 60° prism
- * One central capturing unit
- * Equal and constant focus
- * No mechanical shutter

Only one mechanical moving part

- * Robust and simple design
- * Built for 24h shift operation
- * Low maintenance
- * Very long life cycle

ADVANTAGES

ScanRobot® 2.0 MDS



Page turning technology



- Most gentle & touch free page turning by air flow
- Automatic (up to 2,500 pph)
- Process monitoring & double sheet control
- Semi-automatic / weightless mode
- No clamps
- No fingers
- No glass plates

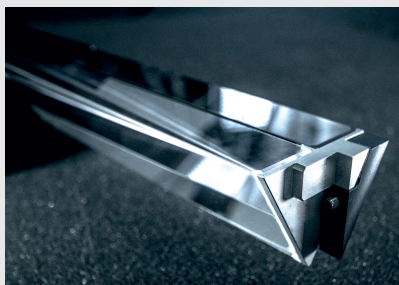
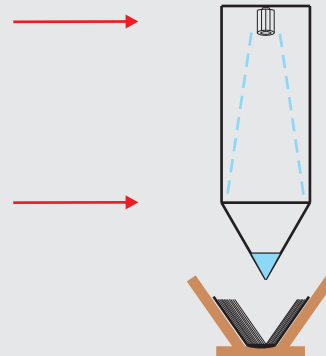
Patented capturing system

Closed capturing unit (optical 400 dpi)

- * Independent from ambient light
- * Minimum calibration (static white balance)
- * Constant distance between object and focal plane

Inside LED illumination

- * Perfect homogenous page illumination
- * High color reproduction index value (CRI)
- * No radiation of heat, infrared or UV light
- * Long life cycle LED technology



High quality 60° prism technology

- * Distortion free scanning
- * Smallest book opening angle - unique 60° V-shape

The ScanRobot® can scan every page with the exact, constant and maximum resolution independent of the book size, thickness and the paper quality.

UNIVERSAL, GENTLE & ROBUST

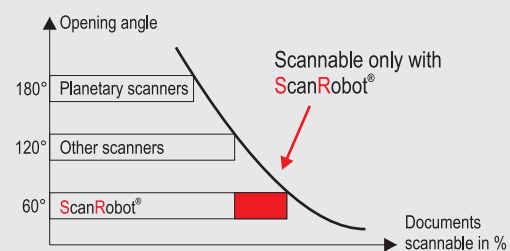
ScanRobot® 2.0 MDS

Universal - suitable for any bound material



Gentle - suitable for historic books (from the 14th century on)

- Book opening angle 60°
- No overstretching of the book binding
- Pressure free scanning
- Touch free page turning by air flow
- LED illumination without any radiation of heat, infrared or UV



Developed for Mass-Digitization

- Robust - Designed for 24/7 shift operation
- Reliable - Only one active moving part
- High quality industrial components (low downtime)
- Very long system life cycle
- Worldwide customer proven



SCAN QUALITY - 1/3

ScanRobot® 2.0 MDS

ScanRobot® - unique 60° scanning

1406 HEAT TRANSFER FUNDAMENTALS

Table 43.16 Radiation Function $F_{r,s}$

1407

faces that allow no radiation to pass through are referred to as opaque, that is, $\tau_s = 0$, and all of the incident energy will be either reflected or absorbed. For such a surface,

and

Light rays reflected from a surface can be reflected in such a manner that the incident and reflected rays are symmetric with respect to the surface normal at the point of incidence. This type of radiation is referred to as specular. The radiation is referred to as diffuse if the intensity of the reflected radiation is uniform over all angles of reflection and is independent of the incident direction, and the surface is called a diffuse surface if the radiation properties are independent of the direction. If they are independent of the wavelength, the surface is called a gray surface, and a diffuse-gray surface absorbs a fixed fraction of incident radiation from any direction and at any wavelength, and $\alpha_s = \epsilon_s = \rho_s = 1$.

Kirchhoff's Law of Radiation

The directional characteristics can be specified by the addition of a 's' to the value. For example the spectral emissivity for radiation in a particular direction would be denoted by $\epsilon_{s,\lambda}$. For radiation in a particular direction, the spectral emissivity is equal to the directional spectral absorptivity for the surface irradiated by a black body at the same temperature. The most general form of this expression states that $\epsilon_{s,\lambda} = \alpha_{s,\lambda}$. If the incident radiation is independent of angle or if the surface is diffuse, then $\alpha_s = \epsilon_s$ for the hemispherical properties. This relationship can have various conditions imposed, depending on whether the spectral, total, directional, or hemispherical quantities are being considered.

Emissivity of Metallic Surfaces

The properties of pure smooth metallic surfaces are often characterized by low emissivity and absorptivity values and high values of reflectivity. The spectral emissivity of metals tends to increase with decreasing wavelength and exhibits a peak near the visible region. At wavelengths $\lambda > 2 \mu\text{m}$, the spectral emissivity decreases with increasing temperature. However, this trend reverses at shorter wavelengths ($\lambda < 1.25 \mu\text{m}$). Surface roughness has a pronounced effect on both the hemispherical and directional emissivities, and large optical roughnesses, defined as the mean square roughness of the surface divided by the wavelength, will increase the hemispherical emissivity. For cases where the optical roughness is small, the directional properties will approach the values obtained for smooth surfaces. The presence of inclusions, such as oxides or other nonmetallic contaminants, will change the properties significantly and increase the emissivity of an otherwise pure metallic body. A summary of the normal total emissivities for metals is given in Table 43.17. It should be noted that the hemispherical emissivity for metals is typically (0.5-0.9) higher than the values typically encountered for nonmetallic materials.

Emissivity of Nonmetallic Materials

Large values of total hemispherical emissivity and absorptivity are typical for nonmetallic surfaces at moderate temperatures and, as shown in Table 43.18, which lists the normal total emissivity of some nonmetals, the temperature dependence is small.

Absorptivity for Solar Incident Radiation

The spectral distribution of solar radiation can be approximated by black-body radiation at a temperature of approximately 5800 K (10,000°F) and yields an average solar irradiation at the outer limits of the atmosphere of approximately 1353 W/m² (329 Btu/(ft²·hr)). This solar irradiation is called the solar constant and is greater than the solar irradiation received at the surface of the earth, due to the radiation scattering by air molecules, water vapor, and dust, and the absorption by O₂, H₂O, and CO₂ in the atmosphere. The absorptivity of a substance depends not only on the surface properties but also on the spectral characteristics of the incident radiation. Since solar radiation is concentrated at a shorter wavelength, due to the high source temperature, the absorptivity for opaque materials, when exposed to solar radiation, may be quite different from that for low-temperature radiation, where the radiation is concentrated in the longer-wavelength range. A comparison of absorptivities for a number of different materials is given in Table 43.19 for both solar and low-temperature radiation.

43.4.3 Configuration Factor

The magnitude of the radiant energy exchanged between any two given surfaces is a function of the emissivity, absorptivity, and transmissivity. In addition, the energy exchange is a strong function of

- No distortions
- No curvature
- No waves
- Exact page margin scan
- Perfect illumination



Compared to Planetary scanners (with 180° opening angle)

1406 HEAT TRANSFER FUNDAMENTALS

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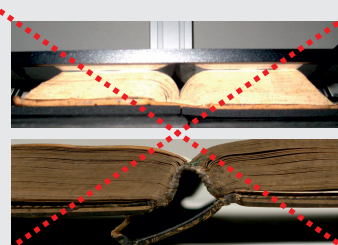
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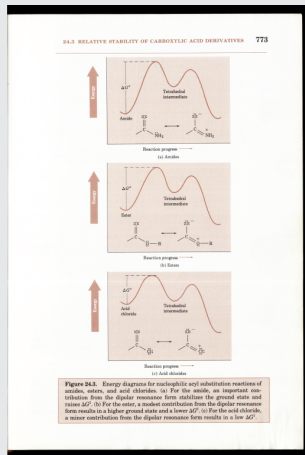
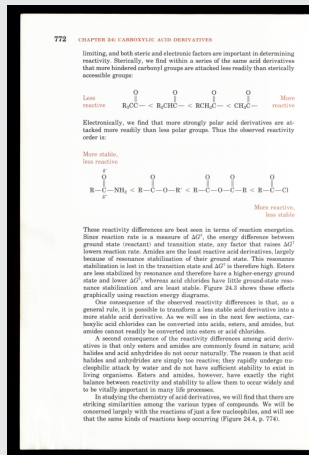
- Distortions
- Curves
- No exact page margin
- Inhomogeneous illumination



SCAN QUALITY - 2/3

ScanRobot® 2.0 MDS

ScanRobot® - prism technology

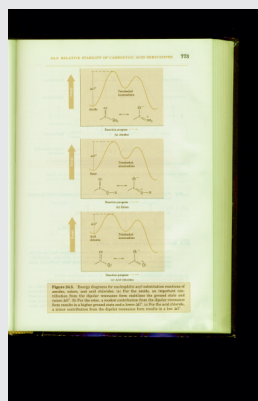
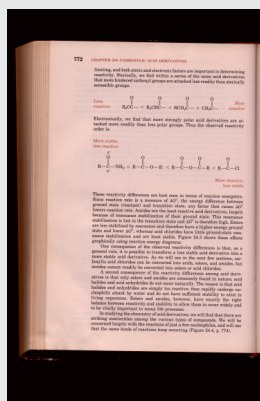


- Exact size & resolution
- Exact colour
- Exact focus & sharpness
- Exact white point

Advantage
No corrections needed!

1 capturing unit = 1 scan result

Compared to Systems with camera devices



- Varying sizes
- Varying resolutions
- Varying colours
- Varying white point

Upcoming challenges

- Resolution correction
- Colour correction
- Focus & sharpness correction

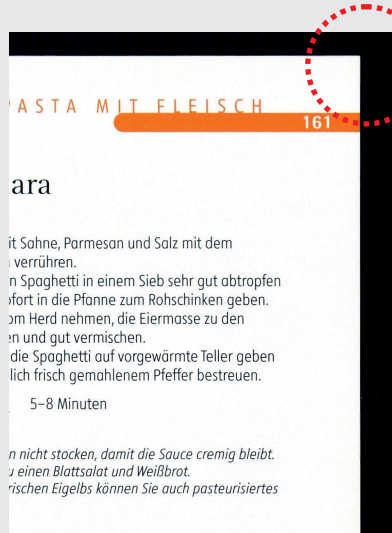
2 cameras* = 2 different scan results

* Effects are amplified for demonstration reasons

SCAN QUALITY - 3/3

ScanRobot® 2.0 MDS

ScanRobot® - prism technology



- Single page image
- Easy page edge detection
- Easy cropping

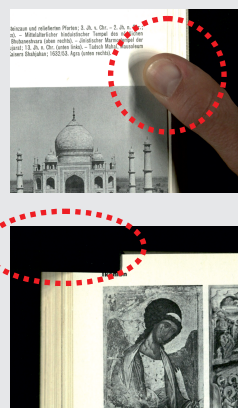
- Artefact free
- No clamps / fingers
- Perfect scan of the page

Compared to Other scanners

Disturbing book block



Image artefacts



- Page edge detecting challenge
- Cropping & deskewing challenge

- Artefacts like clamps or fingers
- Clamp/finger removing challenge

ScanGate® RT - CAPTURING SOFTWARE

Real-Time image processing for ScanRobot® 2.0 MDS

Advantages



AUTOMATION IN REAL-TIME

- Capturing & image processing in real-time
- Automated creation of best practice outputs for
- Archiving, Presentation and Reprint
- Live view of processed images
- Efficient job management

Specifications

Professional real-time image capturing & processing

The ScanGate® RT software enables real-time image processing during the scanning process. Ready-to-use output is created in one single and automated step without loss of speed.

Pre-defined output options

Best practice outputs for Archiving, Presentation and Reprint are included (details see next page).

Live view of scanned & processed images

The fast live view of the scanned & processed images with the pre-defined output options allows real-time quality control.

Efficient job management

The profile administration allows to store settings as basis for new jobs. This ensures e.g. fast book changeovers and to process repetitive jobs (similar books) highly efficiently.

Powerful recognition & evaluation functions

Automatic border & page color recognition, text base line detection, border evaluation (e.g. page size, margins etc.)

Real-time image processing tools

Deskewing, cropping, rotation, extrapolation, ICC profile rendering, background homogenization / normalization, achromatism reducing, binarization (dynamic threshold), brightness / contrast adaption, unsharp masking, image scaling

High quality color management - According to ICC profile standards.

Dublin Core metadata interface - For the creation of fixed metadata xml-files based on the Dublin Core standard.

Multi language user interface - Software available in over 15 languages.

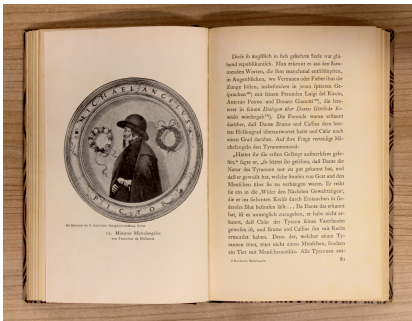
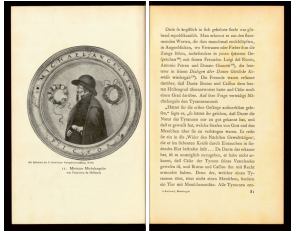
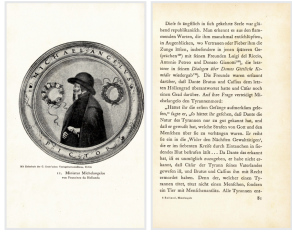
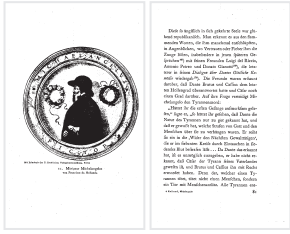
External interface - Intuitive interface for the included flatbed scanner (e.g. for scanning of folded maps, covers, etc.).

Flexible storage in multiple file formats - JPEG, JPG2000*, TIFF, TIFF G4, PNG, GIF, BMP, PDF*, PDF/a*

* Formats may be generated within a separate process.

REAL-TIME OUTPUT OPTIONS

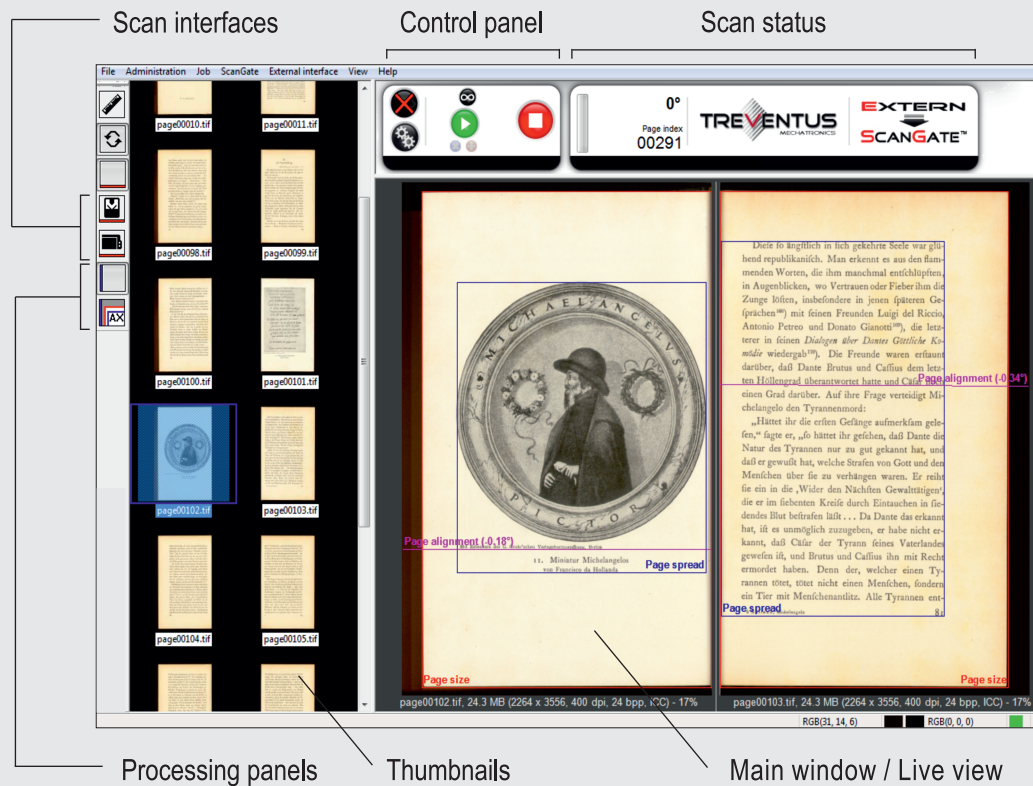
ScanRobot® 2.0 MDS (with ScanGate® RT)

Original			
Option	ARCHIVING	PRESENTATION	REPRINT
Output			
Goal	As close to the original as possible (facsimile)	Good looking images for presentation	Optimal quality for printer
Use cases	<ul style="list-style-type: none"> Digital heritage Digital master files 	<ul style="list-style-type: none"> Digital library Web (downloadable content) 	<ul style="list-style-type: none"> Print on demand Reprint of books
Guidelines (applied real-time functions)	<ul style="list-style-type: none"> No image processing allowed (except rotation by multiples of 90° and cropping) Uncompressed file storage (except lossless compression) 	<ul style="list-style-type: none"> Good contrast & readability Background homogenization Deskewed & cropped (only page should be visible but no outside margins) Rather small file size for easy access and handling (e.g. via internet) 	<ul style="list-style-type: none"> White background with black text Binarized Despeckled Deskewed & cropped (no borders visible)
Specifications			
Resolution	300 / 400 DPI	300 / 400 DPI	300 / 400 DPI
Color depth	24 bit (color with ICC profile)	24 bit or 8 bit (color or grayscale)	1 bit (black and white)
Output format	TIFF	JPEG (optional: PDF)	TIFF (optional: PDF)
Compression	None	JPEG (lossy)	CCITT4 (lossless)
File size (one page)	Large 300 DPI, A4: ca. 26 MB 400 DPI, A4: ca. 46 MB	Small 300 DPI, A4: ca. 1,5 MB 400 DPI, A4: ca. 2,5 MB	Very small 300 DPI, A4: ca. 0,2 MB 400 DPI, A4: ca. 0,5 MB

ScanGate® RT - CAPTURING SOFTWARE

User interface & Software add-ons

Graphical user interface (GUI available in over 15 languages)



Software add-ons* for ScanGate® RT (optionally available)

OCR Enterprise solution™ - UNLIMITED

Text recognition software for automated processing of OCR-jobs for over 130 languages.

RT-Batch workflows for Automated Batch Processing™

Individual solutions for automated (overnight) batch processing of a customized set of functions.

Advanced image processing tools package

E.g. color replacing, blurring, tiff tag changing, etc.

* For details see next pages.

ScanGate® RT - SOFTWARE ADD-ONS

OCR Enterprise solution™ - UNLIMITED
(optionally available)

Automated text recognition



OCRSOLUTIONS™

Functions / Features

OCR Enterprise solution™ - UNLIMITED

OCR page contingent

Unlimited (no page limitation)

•

Customization options / Flexibility

Pre-configured OCR workflows

(workflows are fixed / hard-coded; OCR languages can be set)

•

Performance

Batch processing of multiple OCR-jobs

•

Output formats (by default / standard)

PDF (PDF/a, multi- and single pages)

•

TXT (multi- and single page)

•

XML (hOCR, single pages only)

•

OCR languages

Over 130 available languages

•

(excerpt: Afrikaans, Azerbaijani, Bengali, Bulgarian, Catalan, Czech, Cyrillic, Danish, German, Greek, English, Esperanto, Estonian, Persian, Finnish, French, Hebrew, Croatian, Hungarian, Italian, Georgian, Latin, Latvian, Lithuanian, Nepali, Norwegian, Polish, Portuguese, Romanian, Russian, Slovak, Slovenian, Spanish, Swedish, Thai, Tibetan, Turkish, Ukrainian, etc.)

Gothic font (Fraktur) / Korean / Chinese / Arabic / Vietnamese

•

ScanGate® RT - SOFTWARE ADD-ONS

RT-Batch workflows for Automated Batch Processing™ (optionally available)

Advantages & Benefits

The customized RT-Batch workflows enable automated batch processing* in scan-free periods (e.g. overnight, weekends, longer scanning breaks etc.). Within this a customized set of system functions like creating another output format, copying files to e.g. another storage place, executing of additional image processing functions etc. will be processed fully automated (e.g. overnight).

Automatic execution of several tasks in the batch-processing

Tasks can be combined (according to the individual customer request) to a batch, which is executed sequentially and automatically until the last task.

#	Task
01	SCANNING - RT Output: Archiving (master tiffs, color, 400 dpi)
02	PAGE ORDER - Rename pages
03	IMAGE TREATMENT - Crop pages (smaller than page size)
04	IMAGE TREATMENT - Unsharp masking
05	FORMATS - Create Jpegs (greyscale, 300 dpi)
06	FORMATS - Create multipage PDF (bitonal, 600 dpi)
07	OUTPUT - Copy Jpegs to destination
08	OUTPUT - Upload PDF via FTP
09	ARCHIVE - Clean job and compress master tiffs (LZW)
10	ARCHIVE - Create backup copy of the job
11	CLEANUP - Delete job after 10 days

- ➔ Scanning of the images in the format "RT Output: Archiving"
- ➔ Rename all pages systematically
- ➔ Execute time consuming image treatment functions
- ➔ Create different output formats
- ➔ Copy the created output safely to its destination
- ➔ Reduce data size to a minimum for a backup copy
- ➔ Empty the disk space after a certain period

Queuing of several jobs for the batch-processing

During the day the jobs* are pushed to the batch-processing queue, which is executed e.g. overnight.

#	Job name	Pages	Task	Workflow name	Priority	Progress
1	Job_05	250	PAGE ORDER - Rename pages	BatchProcessingWorkflow_01	very high	<div><div></div></div>
2	Job_01	100	FORMATS - Create Jpegs (greyscale, 300 dpi)	BatchProcessingWorkflow_01		<div><div></div></div>
3	Job_03	150	ARCHIVE - Clean job and compress master tiffs (LZW)	BatchProcessingWorkflow_03		<div><div></div></div>
4	Job_04	400	OUTPUT - Copy Jpegs to destination	BatchProcessingWorkflow_01		<div><div></div></div>
5	Job_02	200	CLEANUP - Delete job after 10 days	BatchProcessingWorkflow_02	-1	<div><div></div></div>

* Jobs can have different tasks, processing stages, priorities, batch-processing-workflows etc.

ScanGate® RT - SOFTWARE ADD-ONS

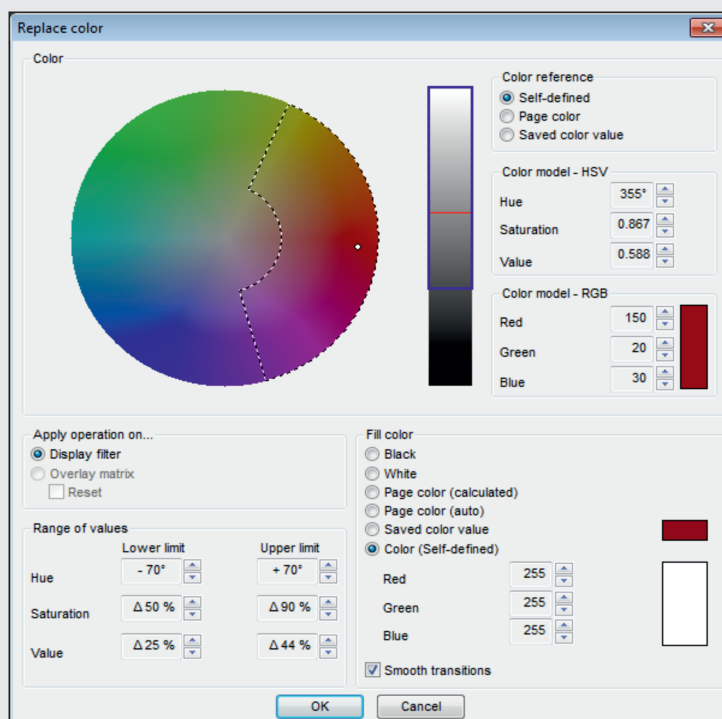
Advanced image processing tools
(optionally available)

Included advanced features

- Color depth conversion, color replacing, background removing
- Moiré effect removing, blurring, black margin coloring
- Image file resolution setting, Tiff tag changing, watermark / ruler / trim mark adding
- Split line detection, page splitting / combination / zip merge & unzip merge
- Grouping of pages (group naming), page renaming

Example: Color replacing

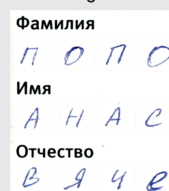
This function enables you to replace a color by another one.



Original



Red rectangles removed



Blue pen removed



SPECIFICATIONS & SCOPE OF DELIVERY

ScanRobot® 2.0 MDS

Technical specifications

- **Speed** up to 2,500 pages/hour* (automatic mode)
- **Page turning** automatic with process monitoring (incl. double sheet control), semi-automatic / weightless mode and single scan technology
- **Opening angle** (book cradle) 60 degrees (steplessly adjustable between 60 and 100 degrees)
- **Illumination** user- and book-friendly LED illumination (without any exposure to heat, IR or UV)
- **Resolution** 400 dpi (optical)
with constant resolution independent of the page format
- **Colour depth** 36-bit
- **Image types** colour, greyscale, b&w
- **Image quality** compliant to ISO19264-1 Level-C (optionally available**)
- **Page format** (scanning area) minimum (2 times - automatic mode): 5 x 5 cm (1.97 x 1.97 in)
maximum (2 times - automatic mode): 32 x 32 cm (12.6 x 12.6 in)
single scan area: 30 x 43.2 cm (11.8 x 17 in)
- **Book size** (maximum) 35.5 x 34.0 cm (13.98 x 13.39 in)
- **Book thickness** up to 15 cm (5.91 in)
- **Paper thickness** no restrictions
(recommended spectrum: 40 g/m² to 260 g/m²)
- **Paper quality** all pages, also acid damaged and wavy pages
- **Covers** all covers (soft and rigid)
- **Book age** 14th century up to now
- **Storage formats** jpg, jpg2000, tiff, tiff G4, png, gif, bmp, pdf
- **Dimensions** l/w/h (without monitor): 0,78 x 0,78 x 1,90 m (30.7 x 30.7 x 74.8 in)
- **Weight** 260 kg (573 lbs)

* The speed can vary depending on paper quality, book size and the general book condition.

** The upgrade package for the ISO-C compliant image quality is optionally available.

Scope of delivery

- 1 pc Automatic book scanner ScanRobot® 2.0 (400 dpi optical)
- 1 pc Single-scan book scanner (flatbed A3)
- 1 pc Control Computer System (high-end PC-workstation)
- 1 pc EIZO 24" widescreen monitor (colour calibrated)
- 1 pc Integrated holder for monitor, keyboard and mouse
- 1 pc Capturing software with real-time processing - ScanGate® RT
- 1 pc ISO Target book (only included within the optional ISO-C upgrade package)

Add-ons (optionally available): OCR Enterprise solution™ - UNLIMITED (text recognition)
RT-Batch workflows for Automated Batch Processing™
Advanced image processing tools package

SCANROBOT® 2.0 MDS

MASS DIGITIZATION SYSTEM

World Wide References



National University, AUSTRALIA
 University of Queensland, AUSTRALIA
 Federal Office of Metrology and Surveying, AUSTRIA
 National Library, AUSTRIA
 University of Graz Library, AUSTRIA
 University Library of Liege, BELGIUM
 Brazilian Institute of Agronomic Research, BRAZIL
 University of Prince Edward Island, CANADA
 National Archive, COLOMBIA
 National Library, CZECH REPUBLIC
 University of Jyväskylä, FINLAND
 Bavarian State Library, GERMANY
 State Library of Berlin, GERMANY
 University Library Regensburg, GERMANY
 NUEPA National University, INDIA
 Trinity College Library, IRELAND
 Meteo Operation Center, JAPAN
 Nazarbaev University, KAZAKHSTAN
 National Library, KUWAIT
 National Library, LATVIA
 University, LUXEMBOURG
 Universidad Autonoma Metropolitana, MEXICO
 National Library, MONGOLIA
 GMS Service Provider, NETHERLANDS
 National Library, NORWAY
 National Library, POLAND
 Siberian Federal University, RUSSIA
 Moscow State University, RUSSIA
 National Library, RUSSIA

King Fahd Private Library, SAUDIA ARABIA
 National Library, SLOVAKIA
 Universidad Complutense de Madrid, SPAIN
 National Library, SWEDEN
 Stockholm University Library, SWEDEN
 Umeå University Library, SWEDEN
 ETH Library of Zürich, SWITZERLAND
 Ankara Social University, TURKEY
 National Library, TURKEY
 Ukrainian Institute of Industrial Property, UKRAINE
 The Getty Research Institute, UNITED STATES
 Utah State University, UNITED STATES
 Vietnam National University, VIETNAM

... and many more ...

"The ScanRobot® can scan almost any types of book, binding or paper (e.g. Leather-covered wooden bindings, flexible bindings, cardboard bindings, thick, thin or rigid paper)."

The Bavarian State Library, GERMANY

"Treventus Mechatronics GmbH submitted a tender that offers some very clear advantages. [...] The evaluation group's assessment is that no other supplier can match the tender from Treventus Mechatronics GmbH."

Specialists evaluation committee, SWEDEN

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Digitization Center Regensburg, GERMANY

Excerpt (alphabetical order by countries)

REFERENCES (excerpt)



Awards of Treventus

Winner of the European ICT Grand Prize

Innovation prize of the Theodor Kery foundation

1st place in Genius Innovation Award

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