

**Satellite Meeting**  
**"Conservation and preservation of library material in a cultural-heritage oriented context"**

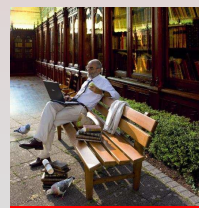
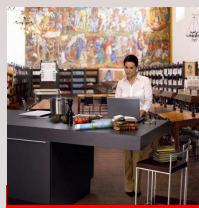
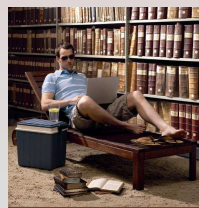
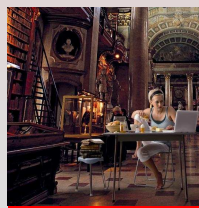
**31 August - 1 September 2009**  
**Rome, Italy**

**Organized by IFLA Core Activity on Preservation and Conservation**  
**and IFLA Preservation and Conservation Section**

Thanks to the support of:



# Book Scanning Solutions: Features and Benefits with a Special Focus on Scanning Quality

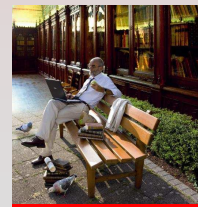
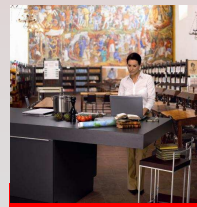
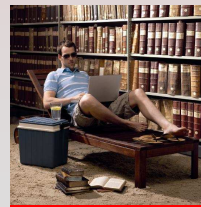
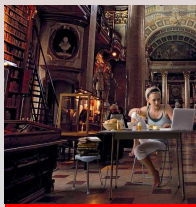


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## Mass digitization goals

- Easy worldwide access to information;
- Preservation of original documents;

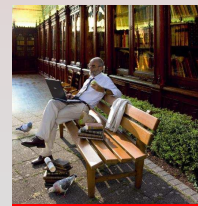
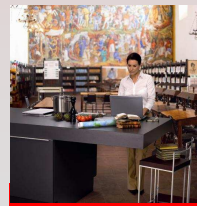
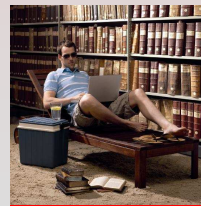
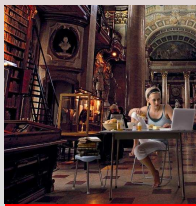


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## Mass digitization requirements

- Highest quality digital master to avoid future rescanning;
- Digital copy for web research  
Easy handling,  
Small file size,  
Reading quality.

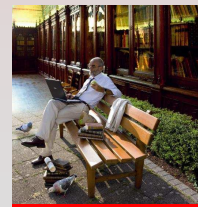
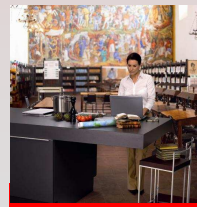
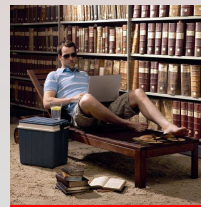
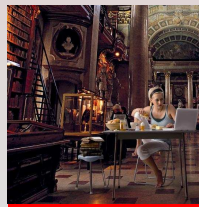


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**In the beginning of a scanning project, quality requirements must be defined.**

**Here the question comes up, how can quality be measured?**



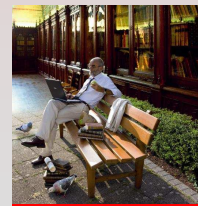
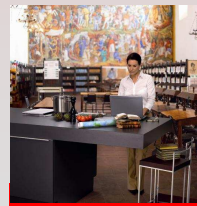
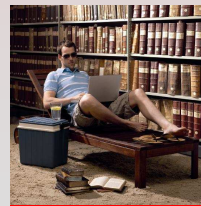
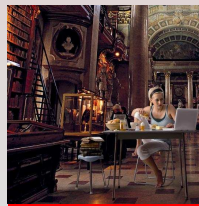
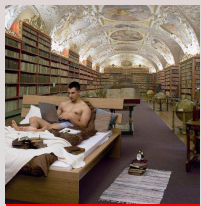
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**In the beginning of a scanning project, quality requirements must be defined.  
Here the question comes up, how can quality be measured?**

## **Technical Scanner Quality factors**

- Resolution
- Geometric Accuracy & Distorsion
- Noise
- Dynamic Range
- Linearisation & Colour accuracy
- Homogeneity ( light fall off)



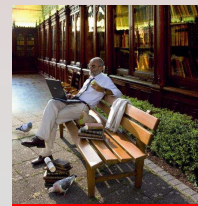
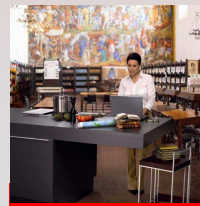
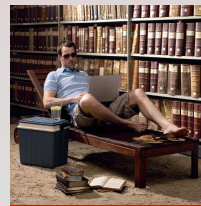
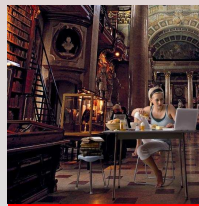
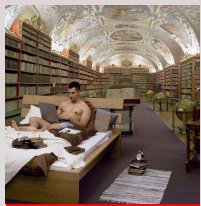
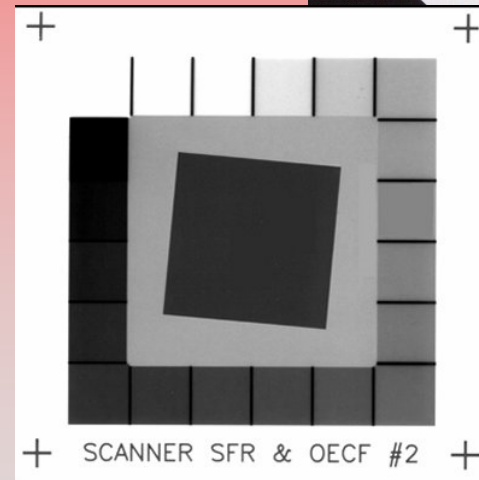
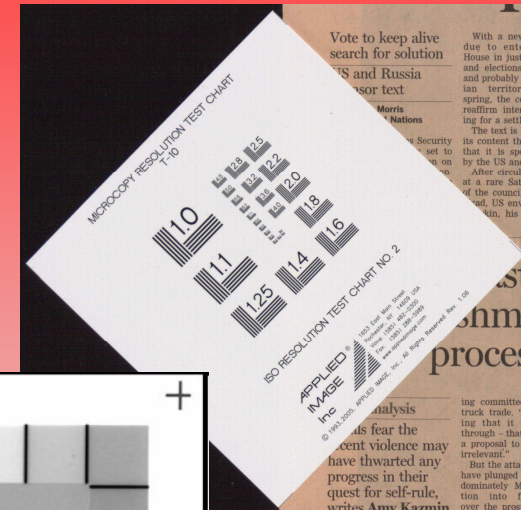
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# Measurable scanning criteria:

- **Image resolution**

Can be measured optically in  
and by software.

Line pairs test target and  
“Slanted Edge” test target.



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- **Image resolution OS14000**

*300 dpi:*

10% MTF – 5 lp/mm up to A0

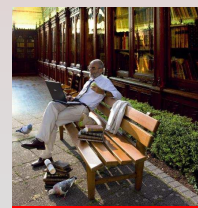
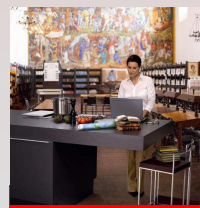
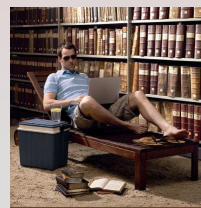
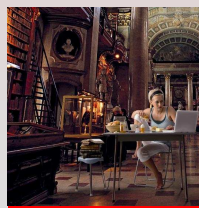
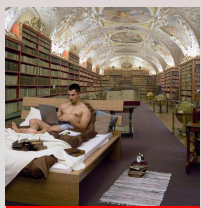
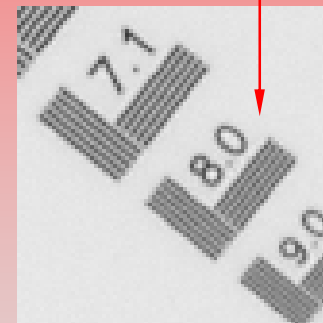
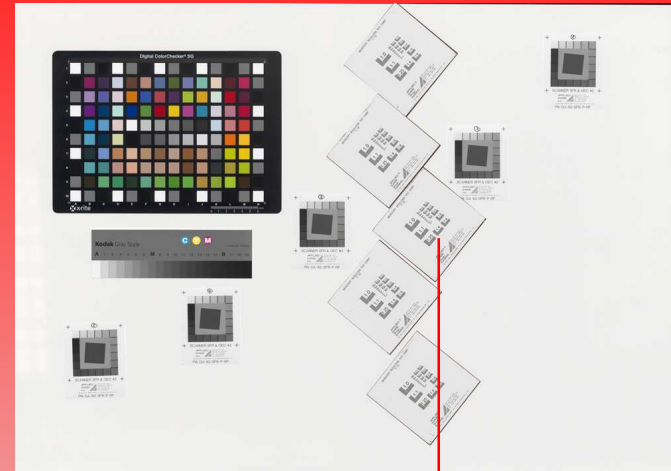
*600 dpi:*

10% MTF – 7,9 lp/mm up to A1

- **Image resolution Digital Camera**

*300 dpi:*

10% MTF – 5 lp/mm max. A3

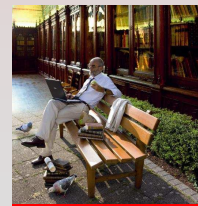
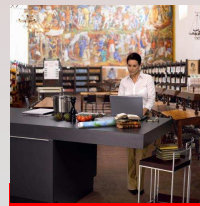
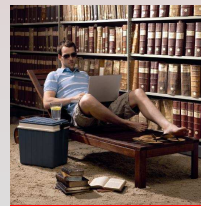
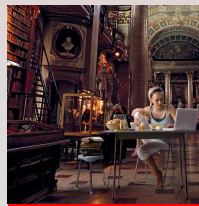
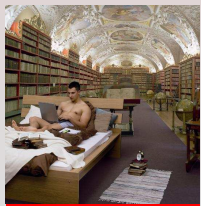
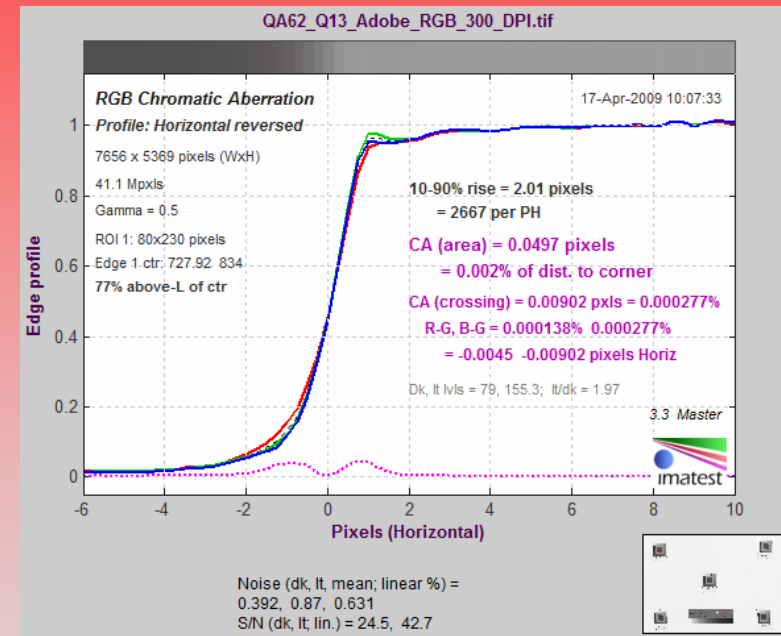


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# Measurable scanning criteria:

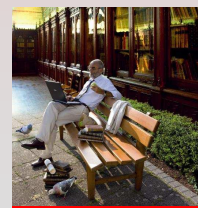
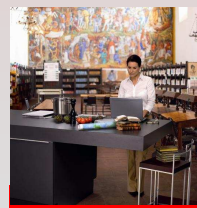
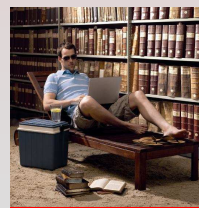
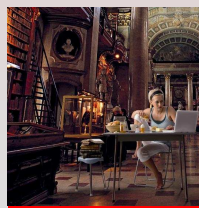
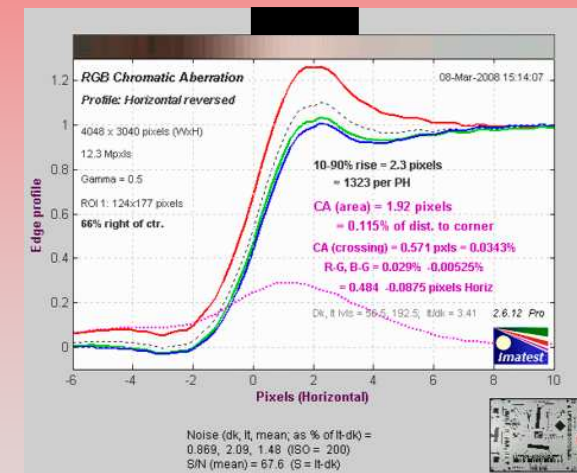
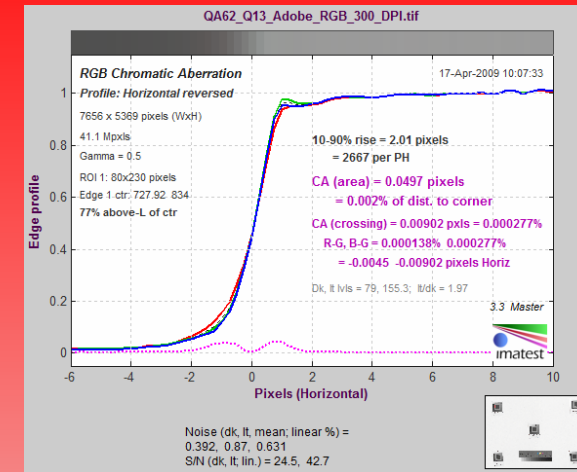
- Image resolution;
  - Linearisation & Colour accuracy
- for colour scans, the channel deviation of the different colour channels can be measured by software.



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- **Channel deviation OS14000**  
better than 0,2 Pixel

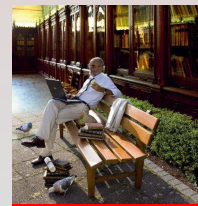
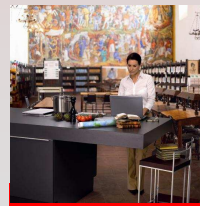
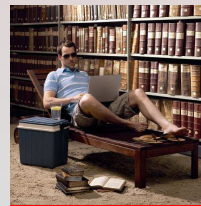
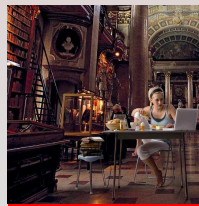
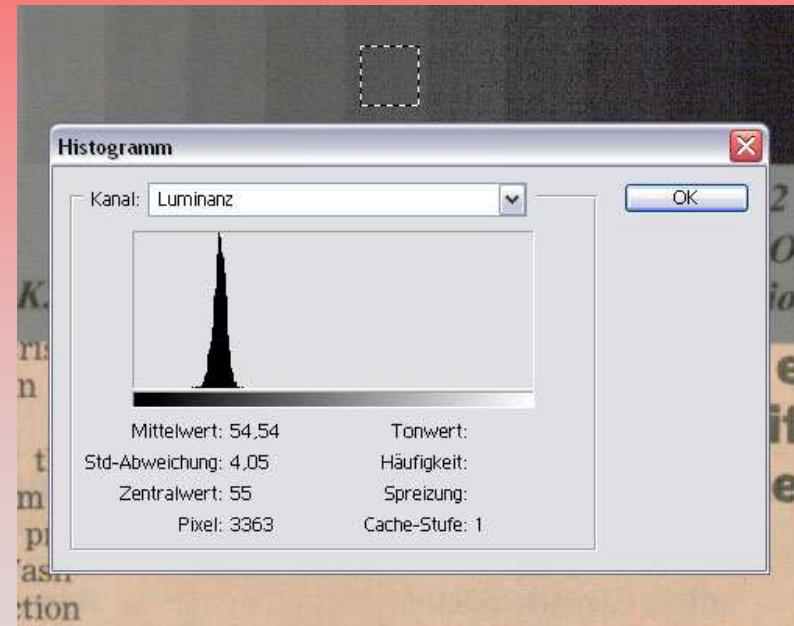
- **Digital Camera**  
> 1,5 Pixel



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## Measurable scanning criteria:

- Image resolution;
  - Colour channel coverage;
  - Image noise
- Noise can be measured by software, the value is the deviation from a middle value.

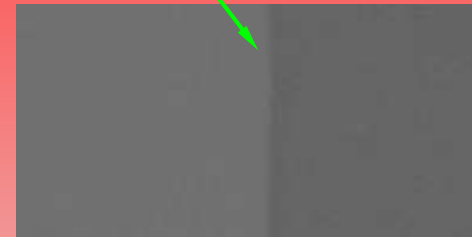


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- **Noise OS14000**  
1.2

- **Other Scanner**  
15

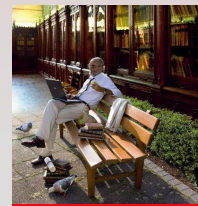
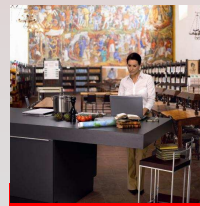
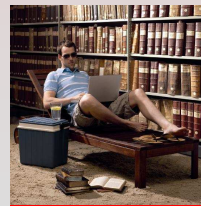
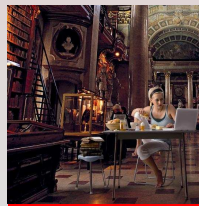
- **Digital Camera**  
approximately equivalent  
results than OS14000



Detail OS14000 (low noise)



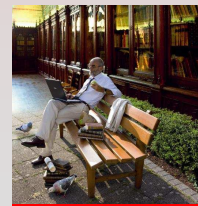
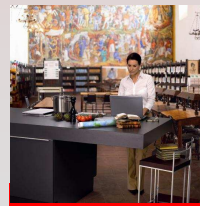
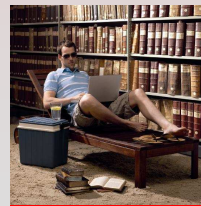
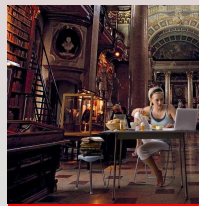
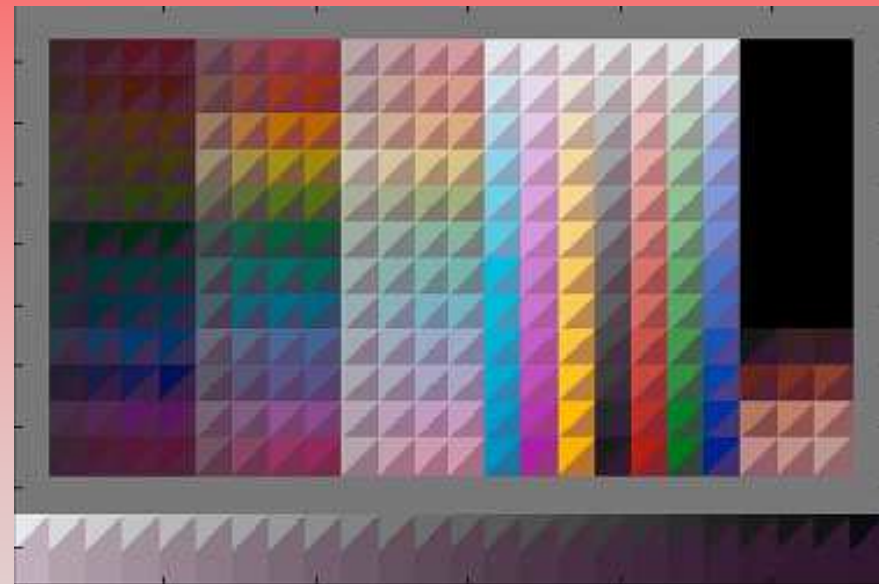
Detail other scanner  
(excessive noise)



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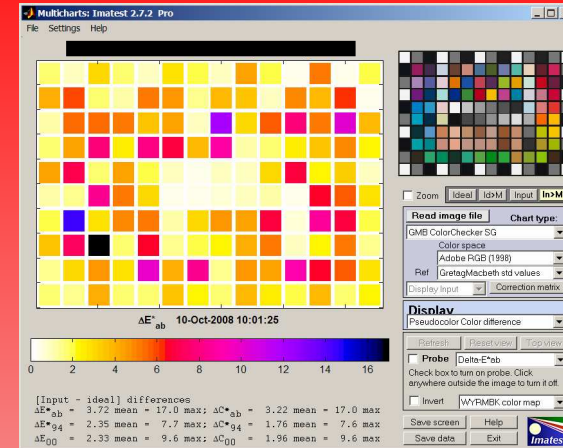
## Measurable scanning criteria:

- **Image resolution;**
- **Colour channel coverage;**
- **Image noise;**
- **True colour reproduction**  
The deviation from the correct value can „easily“ be measured and is called  $\Delta E$ .  
The smaller  $\Delta E$ , the better.



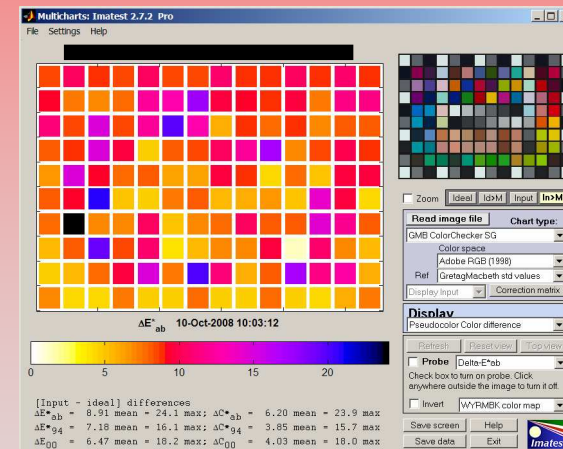
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- **Color accuracy OS14000**  
~ 3.6 - 4.5  $\Delta E$

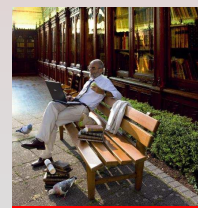
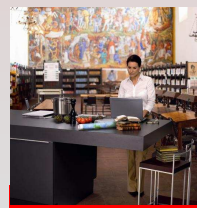
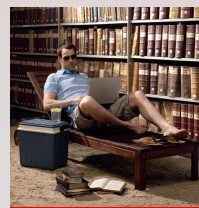
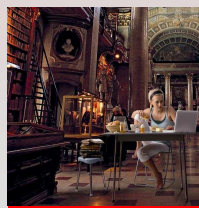


**OS14000**  
(the brighter the color the better the color accuracy)

- **Other Scanner**  
~ 8,9  $\Delta E$



**Other Scanner**



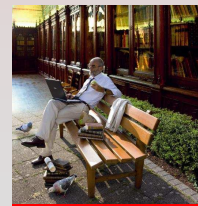
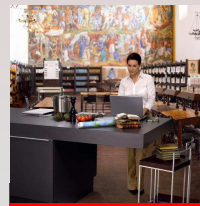
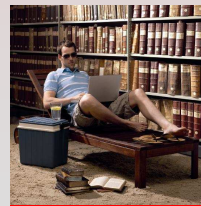
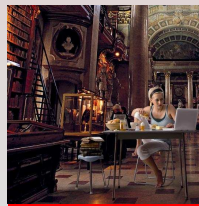
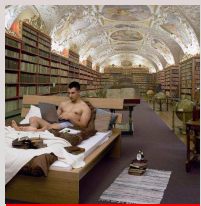
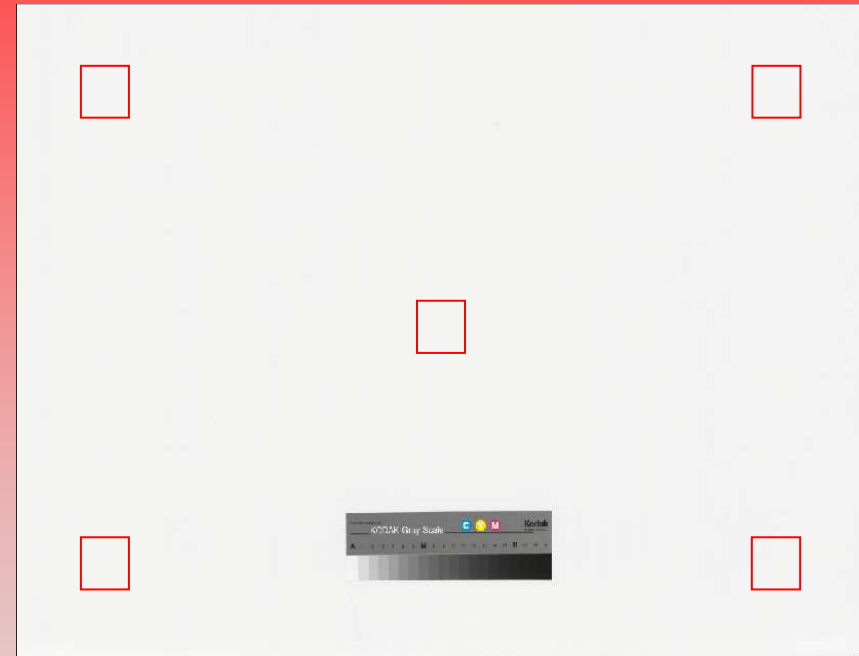
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## Measurable scanning criteria:

- Image resolution;
- Colour channel coverage;
- Image noise;
- True colour reproduction;
- Uniform lighting

Uniform lighting can be measured with software on bright background.

OS14000: light fall off < 5 Px  
Digital Camera: > 8

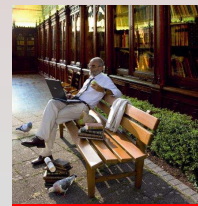
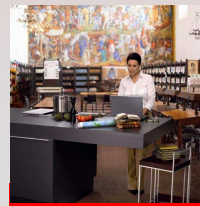
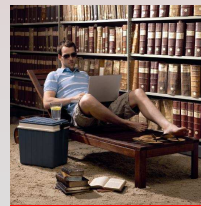
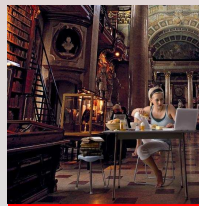
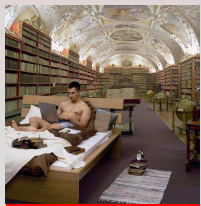
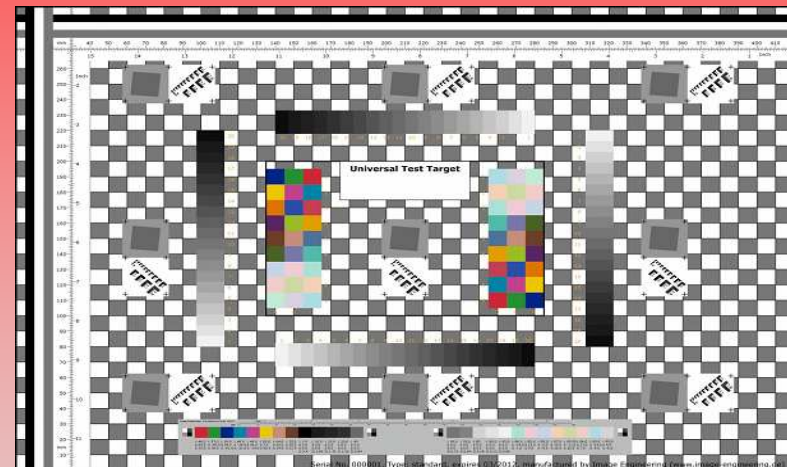


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# Zeuschel QS Kit

## Universal Test Target

containing all targets needed to perform the quality checks.  
The UTT was developed with Royal Dutch Library, Image Engineering and the Professional Association of Information Processing (FMI e.V.)



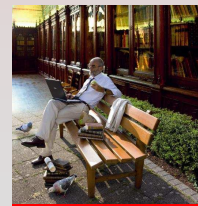
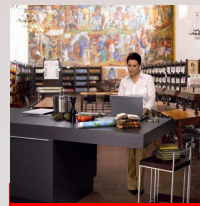
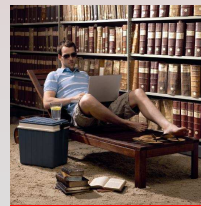
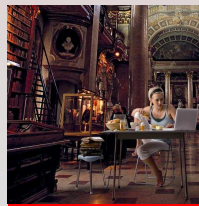
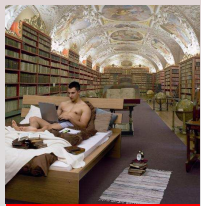
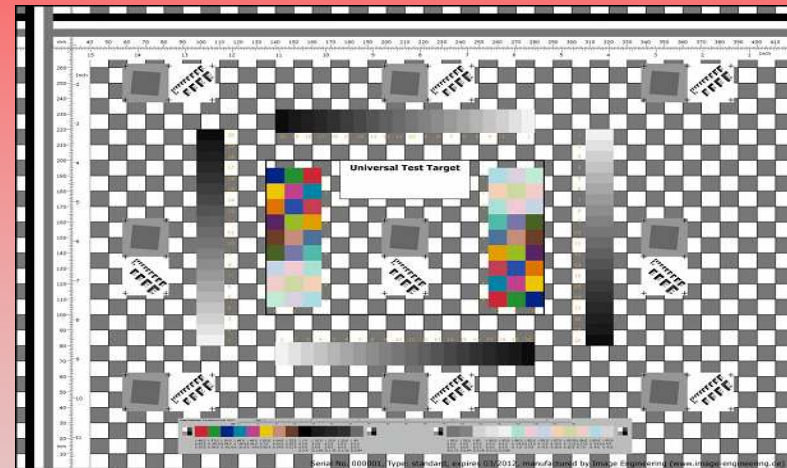
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# Zeutschel QS Kit

The Zeutschel QS kit contains

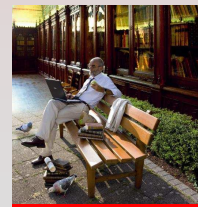
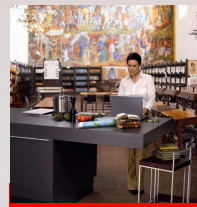
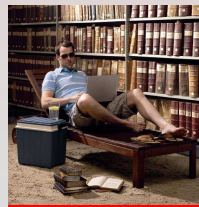
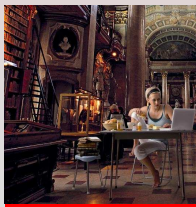
- test target UTT
- software to analyze all quality criteria automatically
- Two versions:
  - stand alone;
  - integrated into Omniscan software when using Zeutschel scanners



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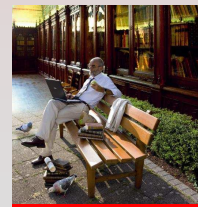
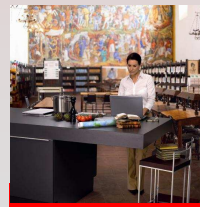
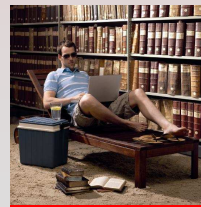
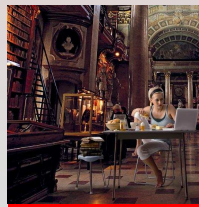
Once quality issues are defined, there are numerous possibilities to do the actual scanning:



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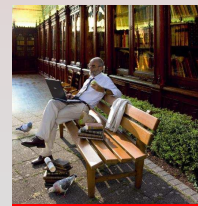
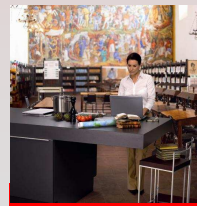
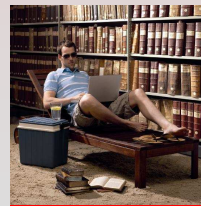
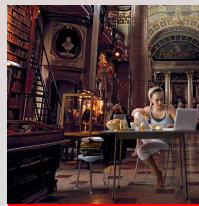
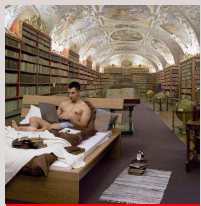
Specialized flatbed scanners are a starting point for this business, offering a cheap but rather tedious way of scanning.



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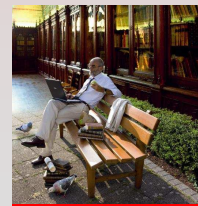
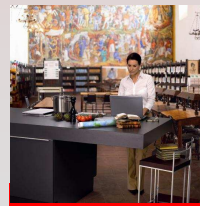
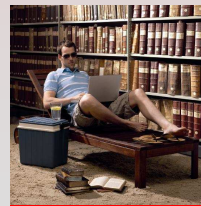
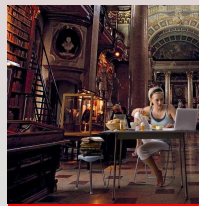
Most times, you will only be able to scan one page of a rather small document at a time.



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Other equipment will use digital cameras, which are also quite affordable.

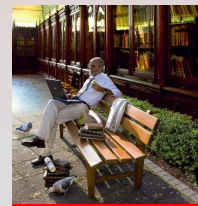
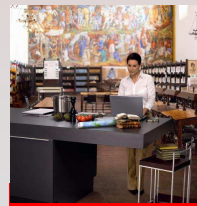
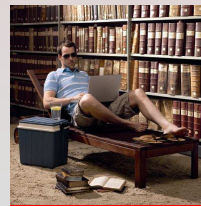
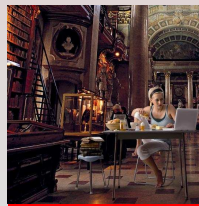
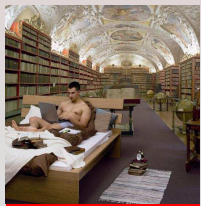


**Z** ZEUSCHEL

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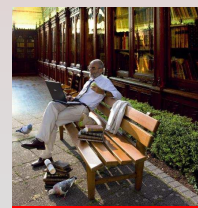
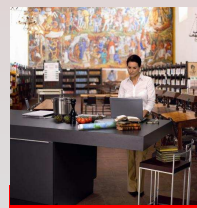
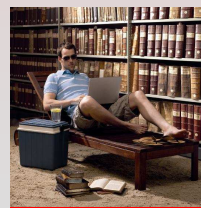
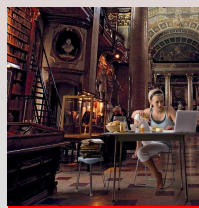
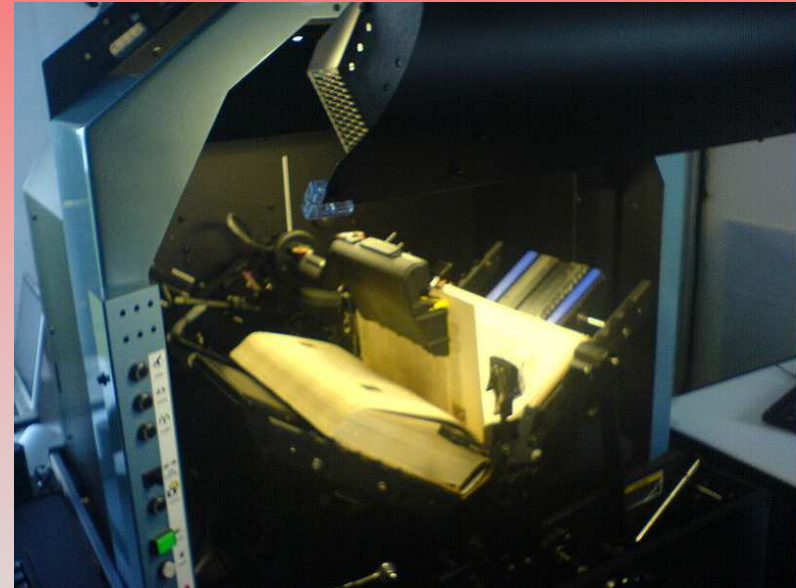
Digital cameras will need a – homemade? – base to be fixed to, and either 2 cameras are used, or each side must be recorded separately, or the sides must be split in postprocessing.



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Scan robots are available who promise to scan documents quickly and highly automated.

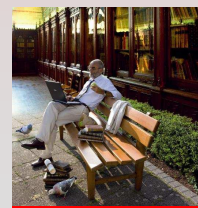
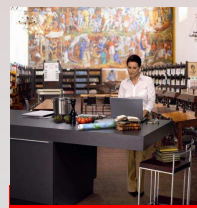
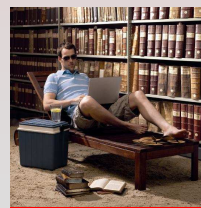
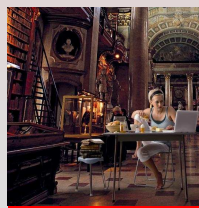
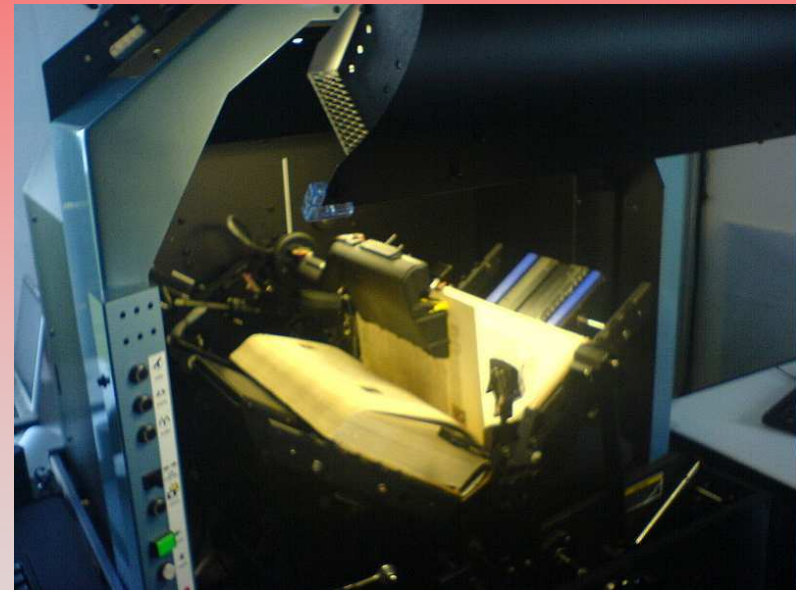


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Scan robots can handle bound documents in stable quality from approx. A5 size to A3 size.

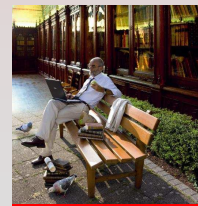
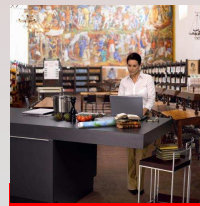
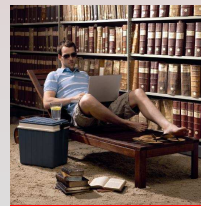
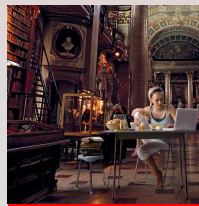
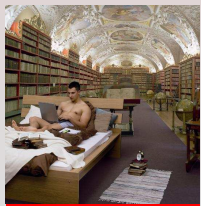
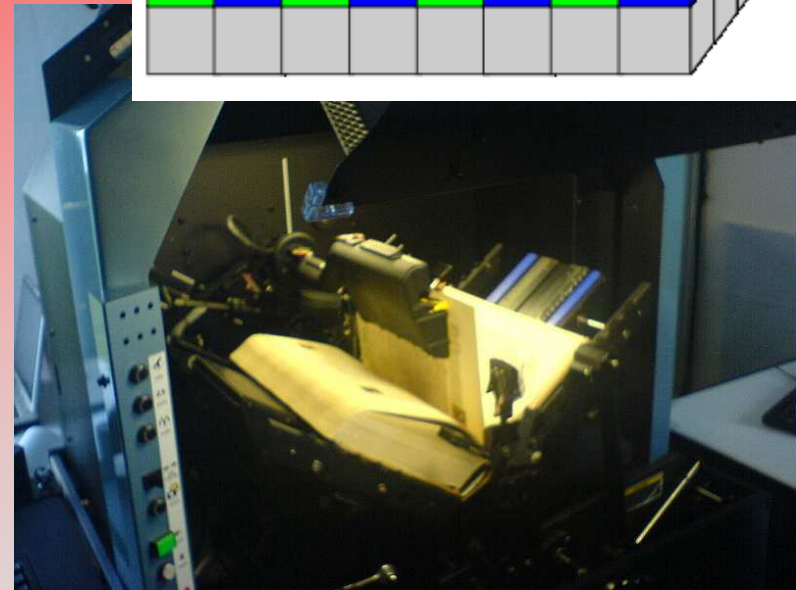
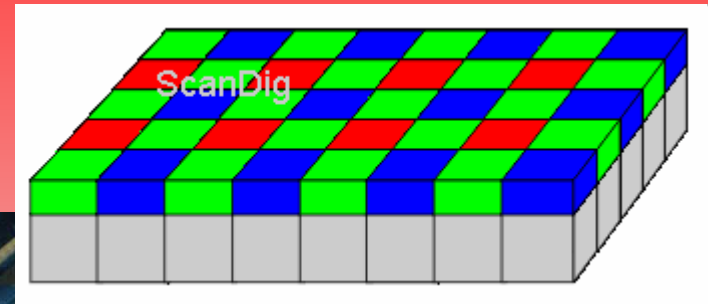
(depending on documents in the library, some 30 - 60% of the total archive can be handled)



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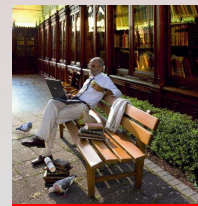
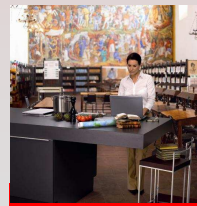
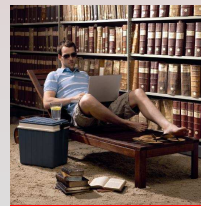
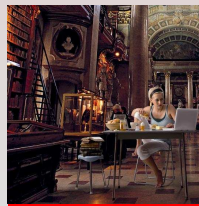
A good part of scan robots are equipped with digital cameras which use CCD chips for scanning, using 50 % green sensors and 25 % each for red and blue. Different optical resolution per colour channel – lower image quality especially in resolution and colour accuracy (risk of Moirée).



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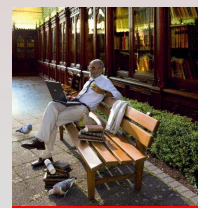
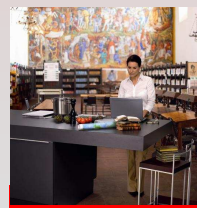
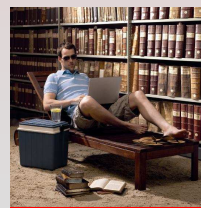
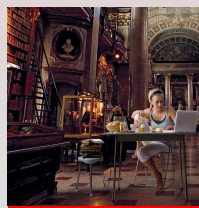
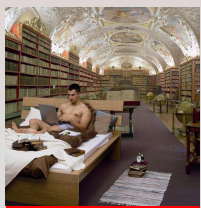
Also overhead scanners with CCD line scanners in various sizes will be an option for the job.



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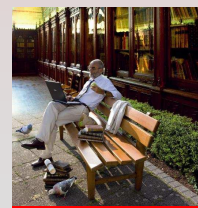
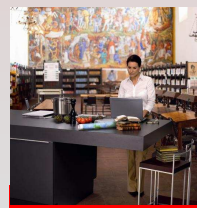
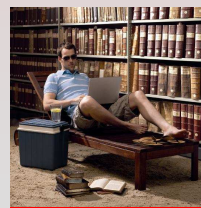
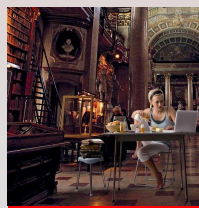
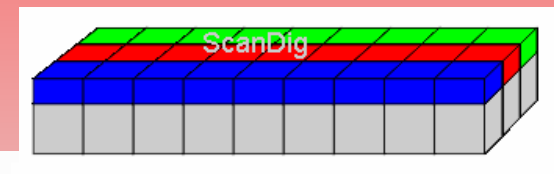
They can handle flat or bound documents, from stamp size to maximum format size.  
Also loose pages inside a book or fold out pages can be handled without problems.



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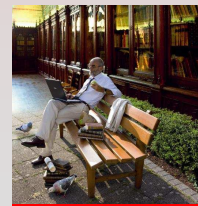
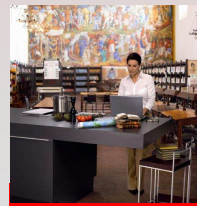
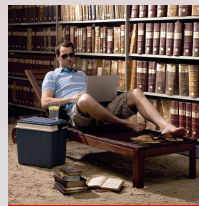
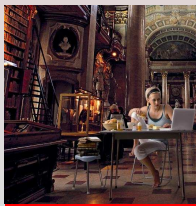
Most overhead scanning systems use CCD line sensors for scanning, using full coverage for each colour channel (RGB).



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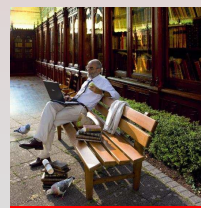
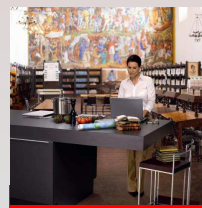
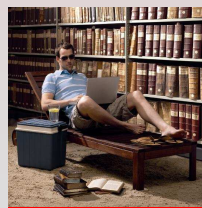
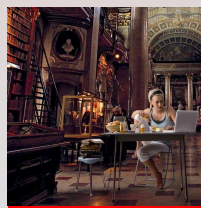
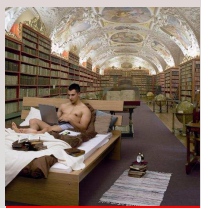
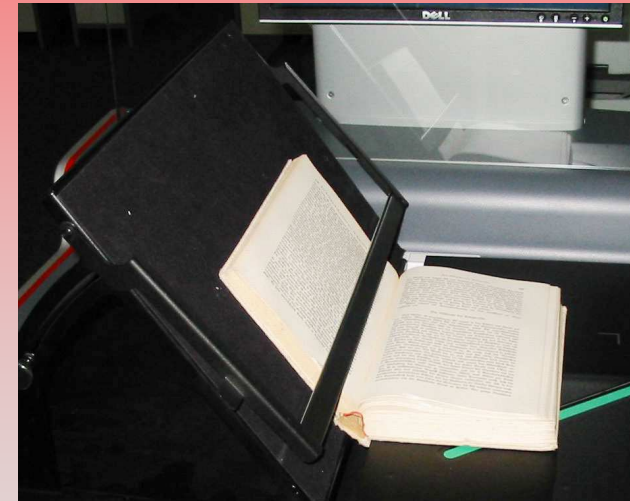
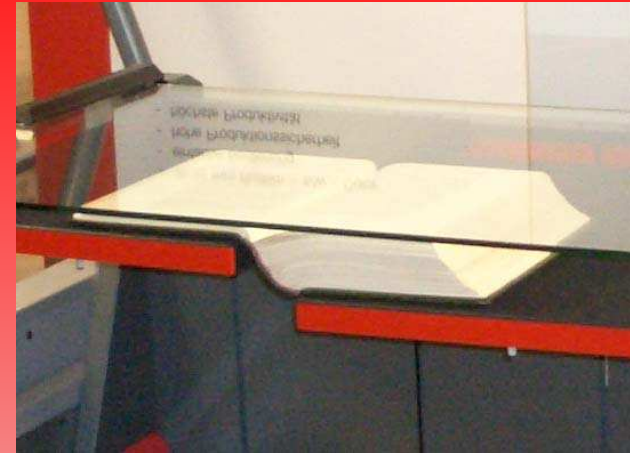


The Zeutschel OS 14000 series was designed to fulfil today's requirements in image quality, such as NARA standard and Metamorfoze.

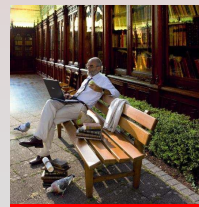
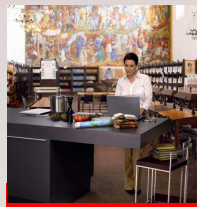
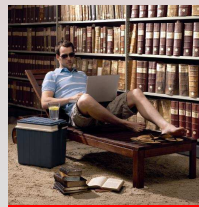
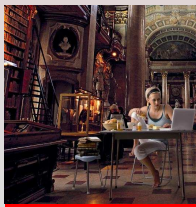


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Mechanically balancing book plates of the book cradles will help to handle books carefully, for fragile book which cannot fully be opened, Zeutschel also offers special supports.



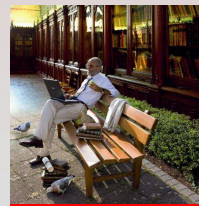
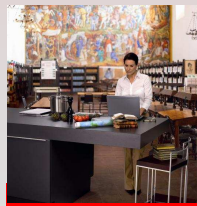
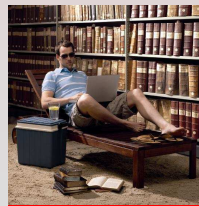
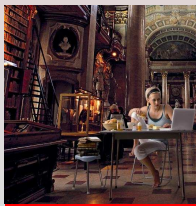
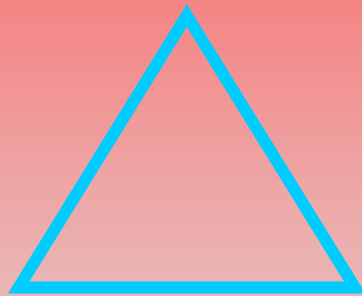
**Whatever equipment will  
be used, it should  
answer to three criteria:**



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Whatever equipment will be used, it should answer to three criteria:

Cost per page

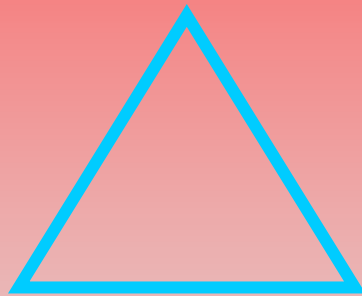


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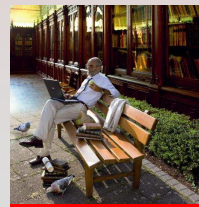
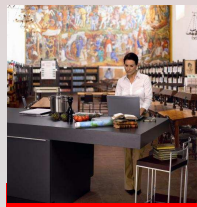
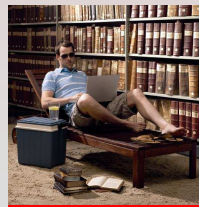
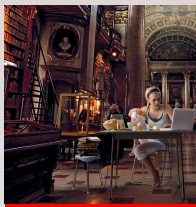


Whatever equipment will be used, it should answer to three criteria:

Cost per page



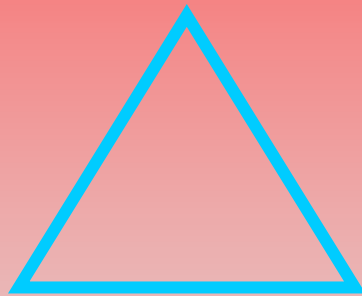
Output image quality



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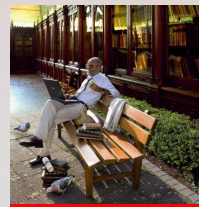
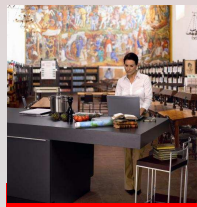
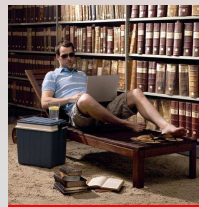
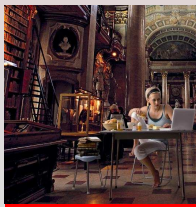
Whatever equipment will be used, it should answer to three criteria:

Cost per page

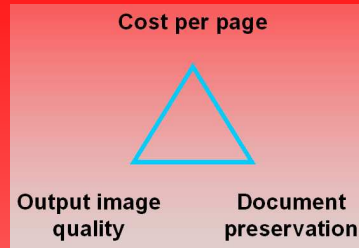


Output image quality

Document preservation

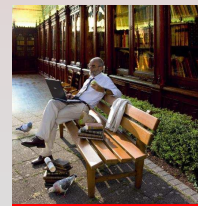
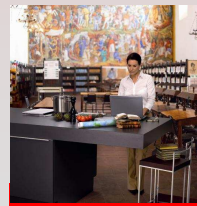
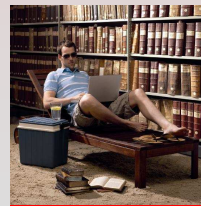
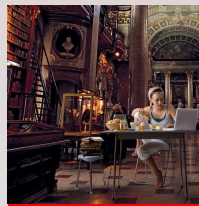
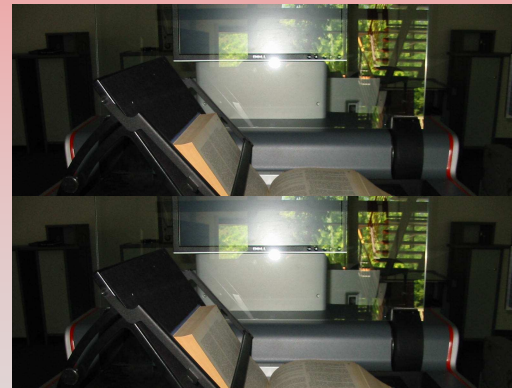


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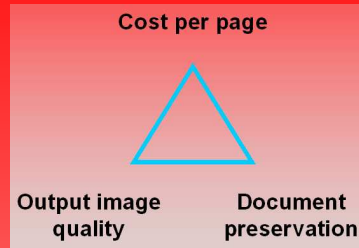


# Document preservation

Working with delicate documents will require specialized treatment during the scanning process.

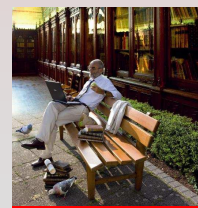
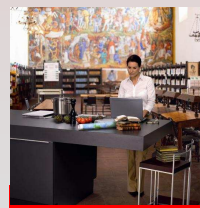
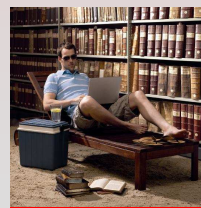
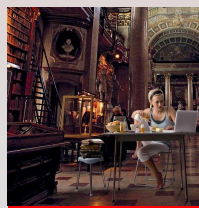


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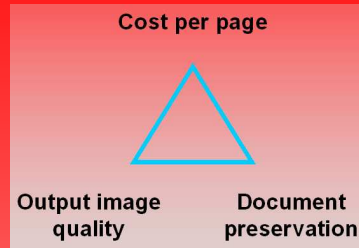


# Document preservation

The preservation needs may be considered less important for documents which can be replaced easily.

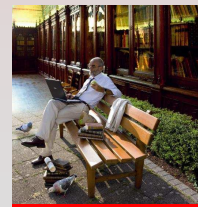
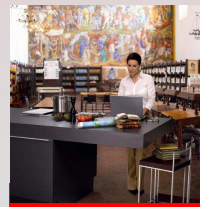
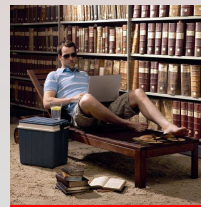
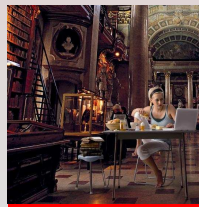


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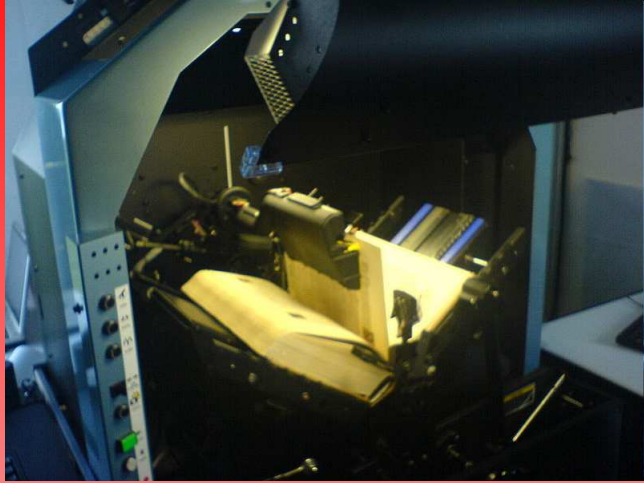


## Cost per page

**Cost per page** is considered by the price of the hardware, the throughput of the equipment, the post processing cost, and the manpower needed through the whole process.



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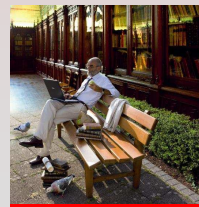
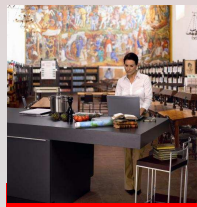
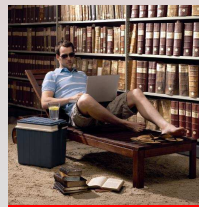
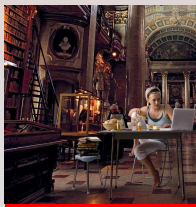


## Cost per page

**A scan robot** is rather high priced. It will scan, under optimal circumstances, approx. 1'200 pages per hour – if document sizes are the same and no set up time is required.

Typically, a real production performance is approx. 600 – 700 pp/h.

To achieve this capacity, one operator must be present at all times.



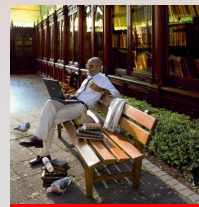
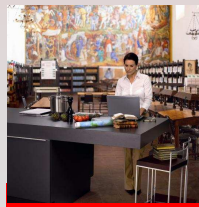
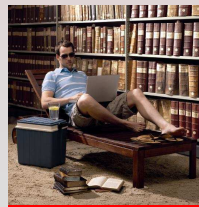
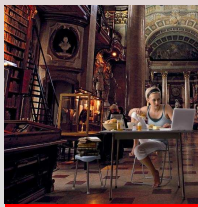
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## Cost per page

Latest generation **overhead scanners** are reasonably priced. They also can scan approx. 600 - 700 pages per hour – and with the appropriate software, no special adjustment for documents is needed.

One operator must be present at all times – in addition, he needs to turn the pages.



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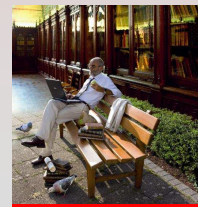
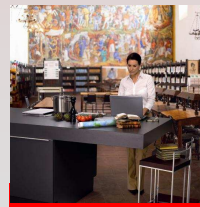
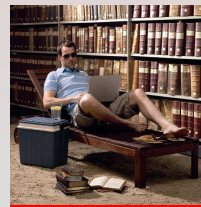
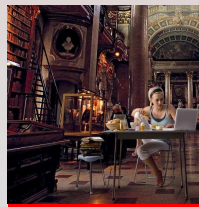


## Cost per page

**Digital Cameras** are lower cost, however, the performance is dependent of the set up.

One operator-photographer must be present at all times.

Digital cameras don't offer workflow solutions.



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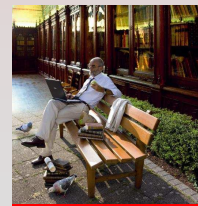
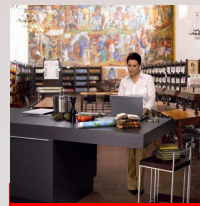
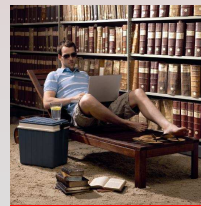
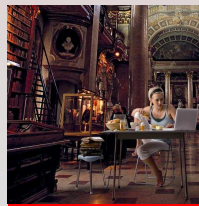
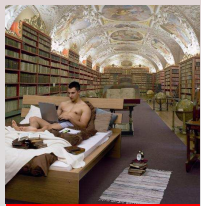




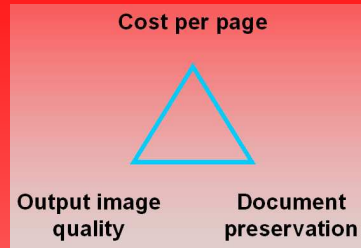
## Cost per page

**Flatbed scanners** are inexpensive. The performance can be quite high; mostly, two sides of a book must be scanned in two scans, or the sides must be split in post processing. This method has high handling costs and there is a higher risk of damaging the document during scan.

One operator must be present at all times.

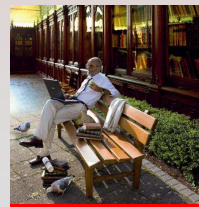
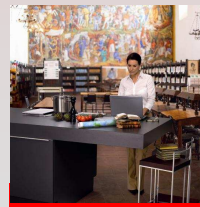
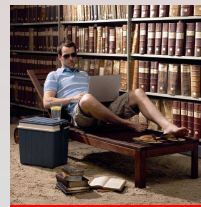
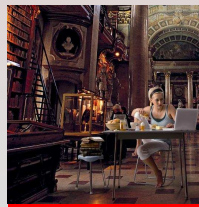
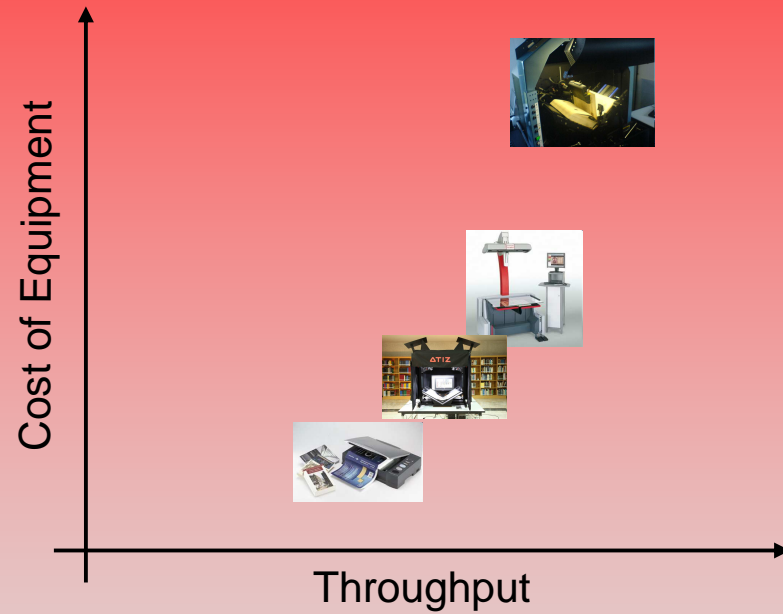


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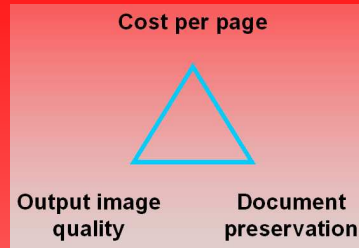


# Cost per page

Scan cost per page only

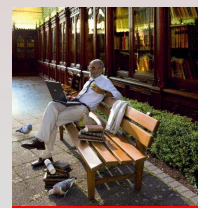
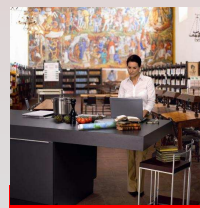
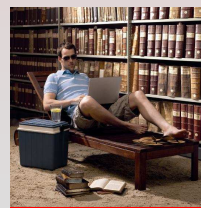
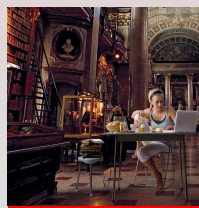
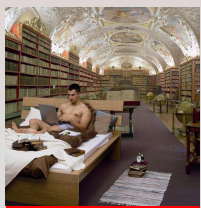
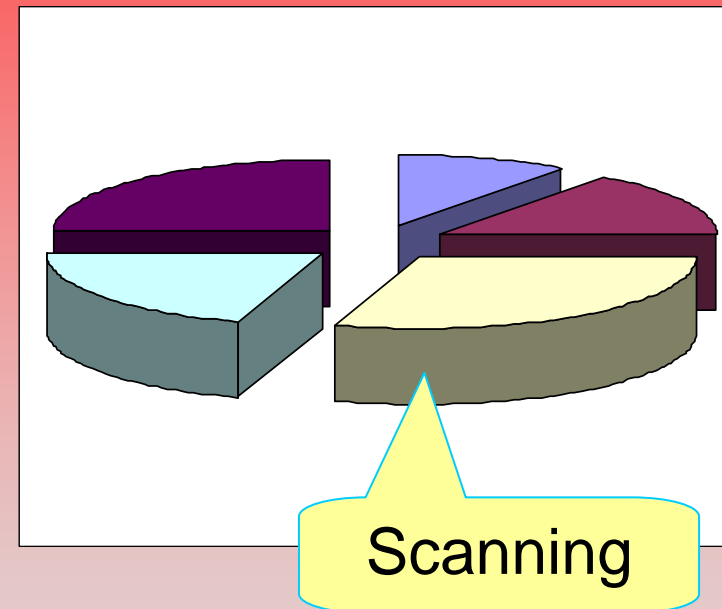


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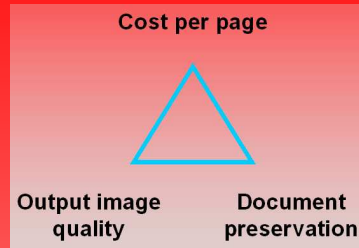


## Cost per page

However the cost of the scanning – including equipment – in general will only be about 30 % of the cost of an overall digitalizing project.

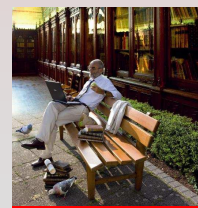
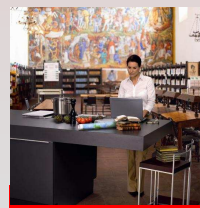
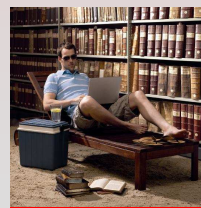
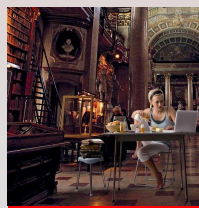
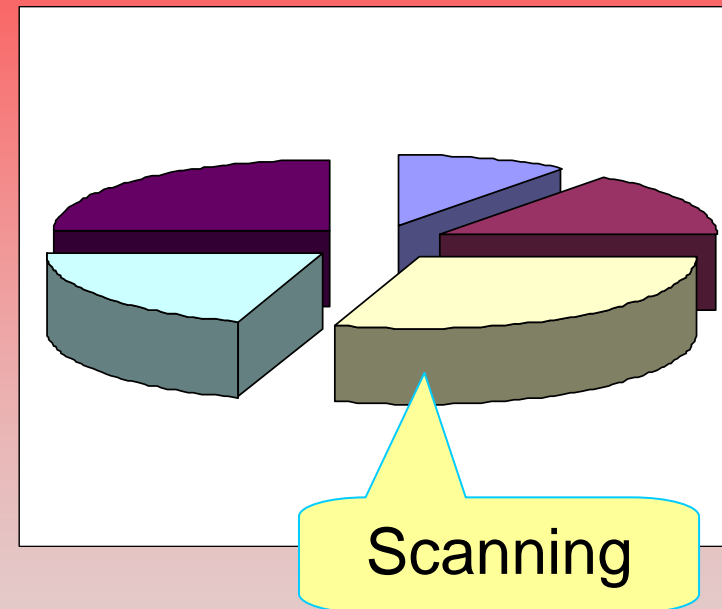


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# Cost per page

A lot of time is consumed by post processing of images – checking pages and rescanning missing pages, adding metadata, correcting and binarizing/ converting images.



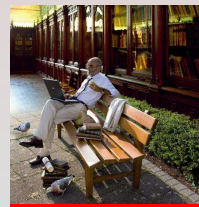
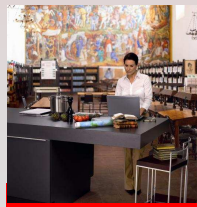
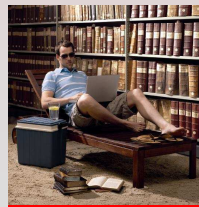
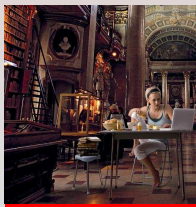
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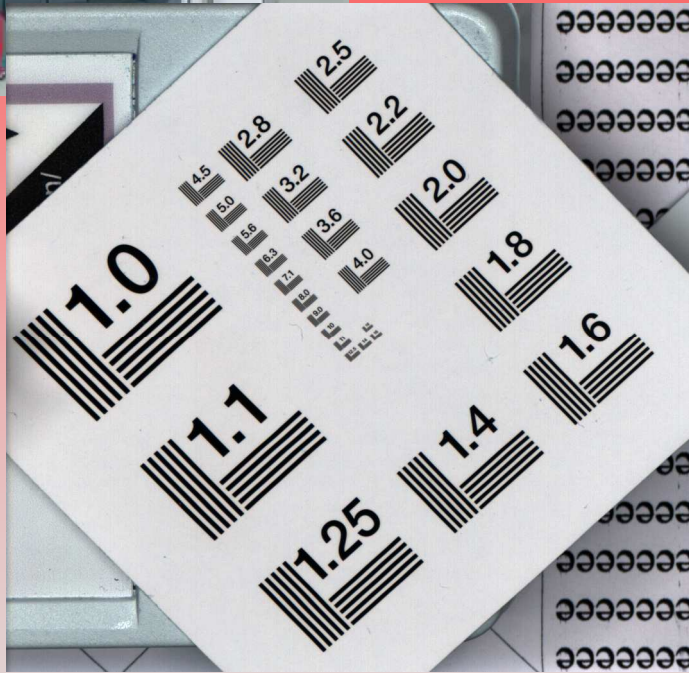
## Zeutschel scan solutions

Zeutschel overhead scanners like the **OS 14000 A1** allow for:

- **Fast scanning**  
up to 10 scans = 20 pp/min;



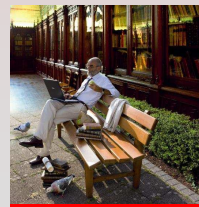
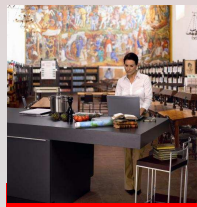
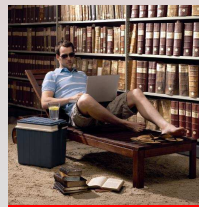
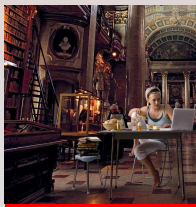
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## Zeutschel scan solutions

Zeutschel overhead scanners like the **OS 14000 A1** allow for:

- **Fast scanning;**
- **Highest image quality**  
8,0 line pairs/mm image resolution;



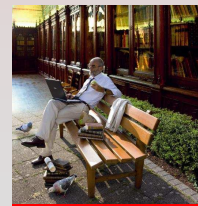
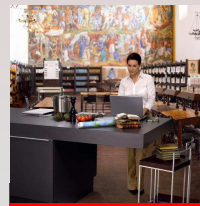
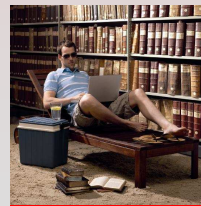
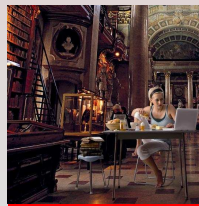
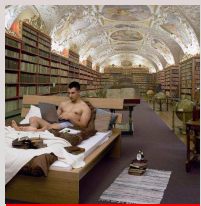
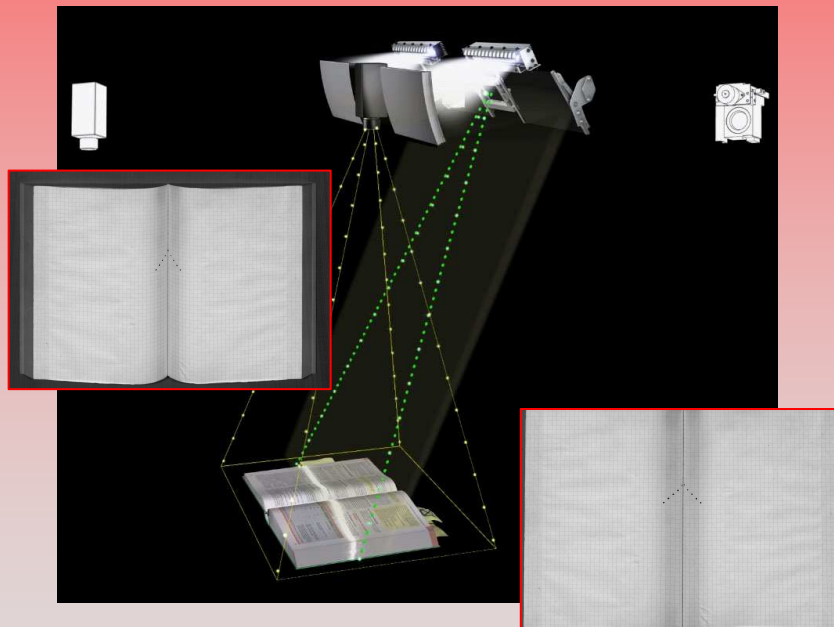
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## Zeutschel scan solutions

Zeutschel overhead scanners like the **OS 14000 A1** allow for:

- **Fast scanning;**
- **Highest image quality;**
- **PerfectBook** book curve correction and thumb removal;



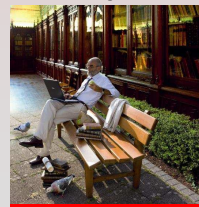
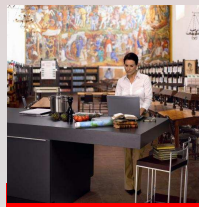
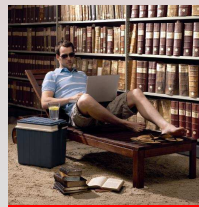
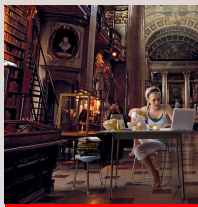
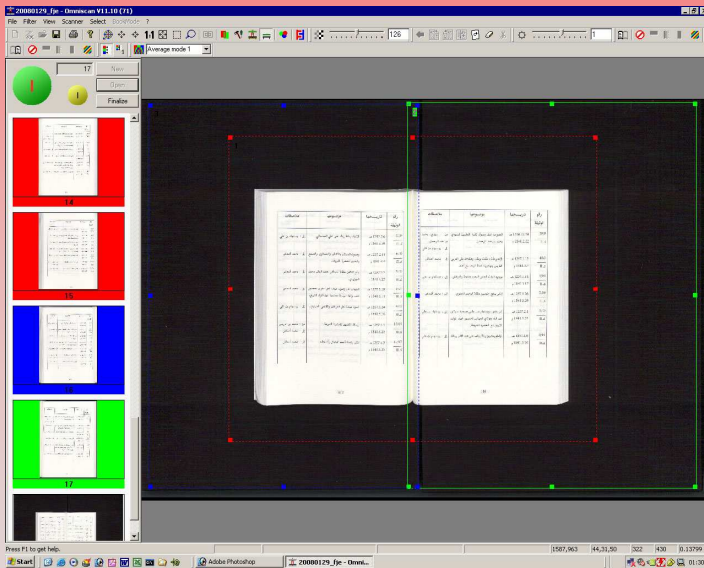
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## Zeutschel scan solutions

Zeutschel overhead scanners like the **OS 14000 A1** allow for:

- **Fast scanning;**
- **Highest image quality;**
- **PerfectBook;**
- **OS 12 software** allowing
  - capture of metadata;
  - multiple images out of one scan (digital master and web-copies);
  - true multi thread function;
  - image processing on the fly;
  - quality control on the fly;



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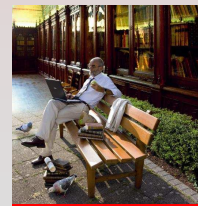
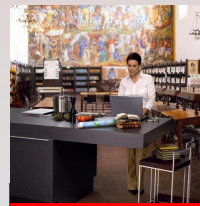
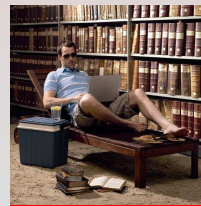
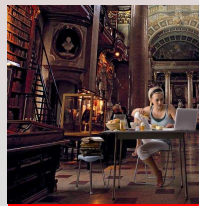
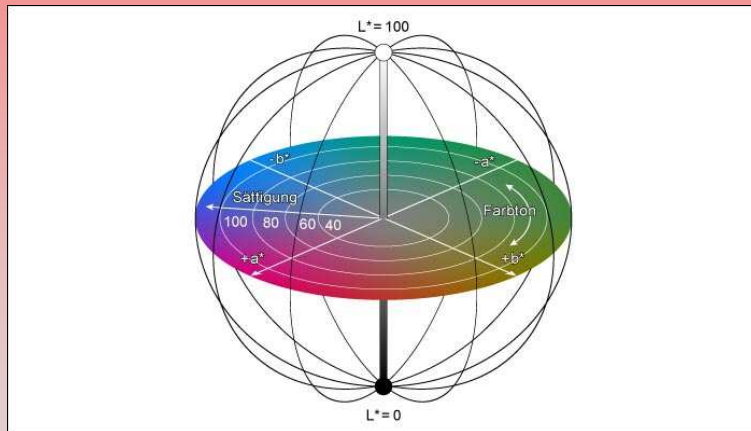




## Zeutschel scan solutions

Zeutschel overhead scanners like the **OS 14000 A1** allow for:

- **Fast scanning;**
- **Highest image quality;**
- **PerfectBook;**
- **OS 12 software;**
- **True colour reproduction** with scanner-individual colour profile and white reference for every scan;



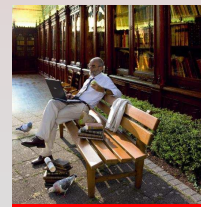
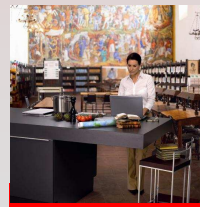
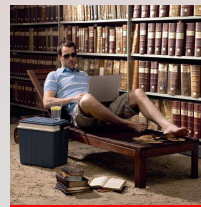
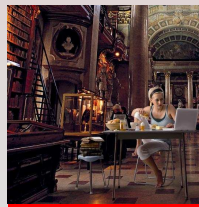
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## Zeutschel scan solutions



Zeutschel overhead scanners like the **OS 14000 A1** allow for:

- **Fast scanning;**
- **Highest image quality;**
- **PerfectBook;**
- **OS 12 software;**
- **True colour reproduction;**
- **Manual pageturning** on special book tables with book opening 180° - 30° only, with or without glass plate, for highest demands in document preservation;



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### OS 14000 TT

- Color scanning of originals > A2 (635 mm x 460 mm) at highest quality
- Scan speed for full format  
3,5 sec @ 300 ppi  
4,0 sec @ 400 ppi  
6,0 sec @ 600 ppi
- Optical resolution: 600 ppi
- Contrast resolution: 8,0 line pairs/mm

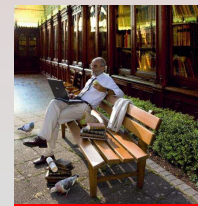
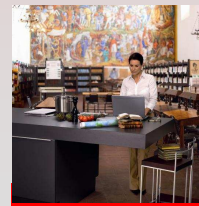
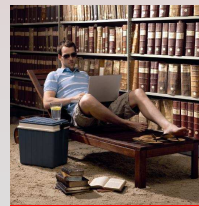
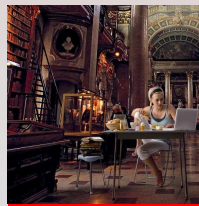
### OS 14000 A1

- Color scanning of originals > A1 (880 mm x 640 mm) at highest quality
- Scan speed for full format  
6,5 sec @ 300 ppi  
8,2 sec @ 400 ppi  
12,3 sec @ 600 ppi
- Optical resolution: 600 ppi
- Contrast resolution: 8,0 line pairs/mm



### OS 14000 A0

- Color scanning of originals > A0 (1240 mm x 870 mm) at highest quality
- Scan speed for full format  
6,5 sec @ 200 ppi  
8,4 sec @ 400 ppi  
16,8 sec @ 400 ppi
- Optical resolution: 400 ppi
- Contrast resolution: 6,3 line pairs/mm

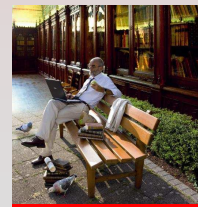
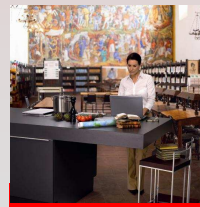
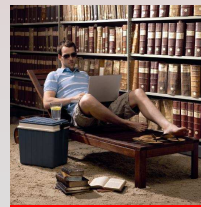
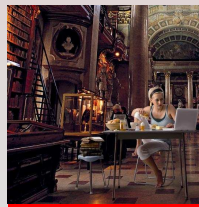


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# Zeutschel scan solutions

## Zeutschel V-Scan

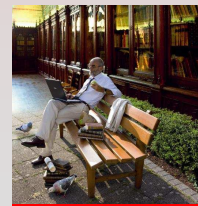
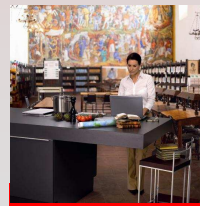
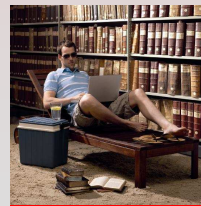
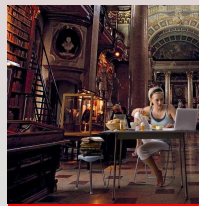
fast and simple book scanning  
without glass plate,  
book opening  $< 90^\circ$



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# Zeutschel scan solutions

**Zeutschel  $\Delta$ -Scan**  
to scan fragile books which can  
be opened less than 30°.

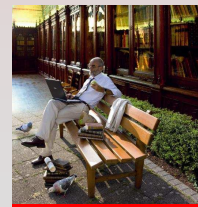
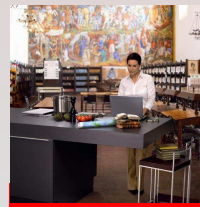
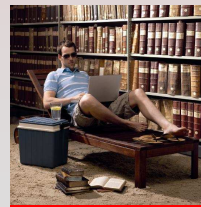
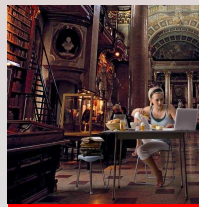


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## **Zeutschel scan solutions**

**More scans ready to use  
without loss of scan speed;  
without expensive  
postprocess;  
less rescan costs.**

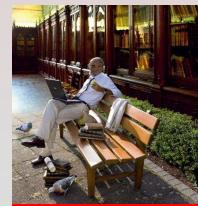
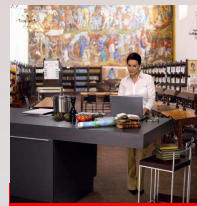
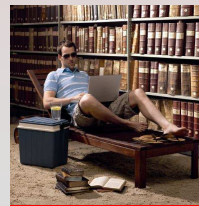
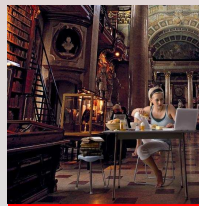
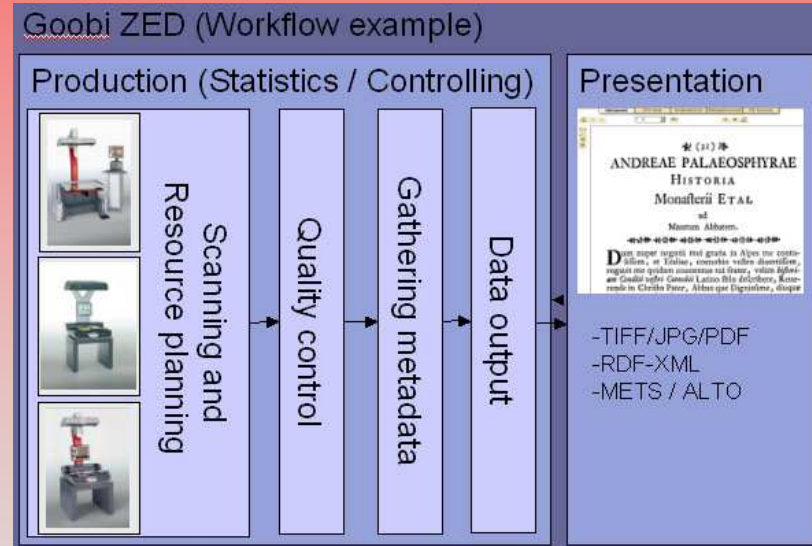


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## Further Zeutschel support for mass digitization projects

**Goobi ZED workflow tool** to organize and control mass digitization projects from document selection to conversion (including quality control), research and web presentation.



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 Al-Kuwait - Altdorf - Amarillo - Amman - Amsterdam -  
 Andorra - Andover - Ankara - Annapolis - Antwerpen -  
 Aragon - Ardoie - Ashville - Asti - Athens - Atlanta -  
 Augsburg - Ausschwitz - Avila - Babenhausen - Bad Vilbel  
 - Bad-Arolsen - Bakersfield - Baltimore - Bandar Seri Begawan - Bangalore - Bangkok - Barcelona -  
 Bari - Basel - Bayreuth - Beijing - Beirut - Belfort - Bensen - Bergen - Berkeley - Berkshire - Berlin  
 - Bern - Bicester - Bielefeld - Bilbao - Birmingham - Blacksburg - Bogota - Bologna - Bolzano -  
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 Bromley - Brookvale - Brugge - Brühl - Brussels - Bückeberg - Budapest - Bukarest - Burgos -  
 Bussy - Caceres - Cadiz - Caen - Cagliari - Cairo - Calcutta - Cambridge - Camden - Canberra -  
 Caracas - Carquefou - Casablanca - Caudebec en Caux - Ceske Budejovice - Cham - Champagne -  
 Chambery - Changwon - Charlottesville - Chemnitz - Cheoung - Chiang Mai - Chicago - Chonan -  
 Clermont-Ferrand - Coimbra - Collado Villaiba - College Park - Colmar - Columbia - Compton -  
 Copenhagen - Cordoba - Cortegaca - Craisheim - Cremona - Crowthome - Cuenca - Dallas -  
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 Klagenfurt - Klmpfjäll - Koblenz - Kolbotn - Kolkata - Köln - Konstanz - Kontich - Kornwestheim -  
 Kossenblatt - Krakau - Krakow - Kuala Lumpur - Kyritz - La Rochelle - Lagos - Lahore - Le Lamentin  
 - Le Mans - Leon - Le Puy-en-veay - Leesburg - Leipzig - Lelystad - Lens - Leuven - Lexington -  
 Liege - Lille - Lima - Linz - Lisboa - Lisse - Ljubljana - Lodi - London - Los Alamos (New Mexico) -  
 Los Angeles - Lucca - Ludwigsburg - Lugo - Luik - Luxembourg - Luzern - Lynchburg - Lyon - Lyss -  
 Macao - Madison - Madrid - Märstetten - Malaga - Manila - Marbach - Maringá - Marmontier -  
 Maryland - Maseru - Mashad - Melbourne - Memphis - Merignac - Metz - Mexico City - Michigan -  
 Milano - Mo I Rana - Monaco - Montgomeryville - Montpellier - Moscow - Mulhouse - Mumbai -  
 München - Münster - Murray Hill - Murrieta - Muscat - Nairobi - Nancy - Nantes - Napoli - New  
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 Sutton - Sydney - Taipei - Tallin - Tamil Nadu - Tampa - Tehran - Tel Aviv - Tennessee - Tetuan -  
 Thessaloniki - Tianjin - Tirana - Tokyo - Toledo - Torino - Tordheim - Toronto - Trebotov - Trento -  
 Trenton - Trieste - Tripolis - Troisdorf - Tübingen - Tucson - Tunis - Uppsala - Urdorf - Utah - Vaduz -  
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 Villepinte - Vilvoorde - Vizcaya - Volos - Walnut - Waltersdorf - Warsaw - Washington - Weimar -  
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# Zeuschel GmbH

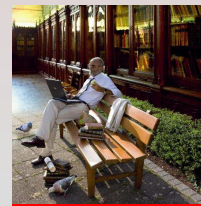
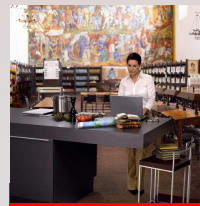
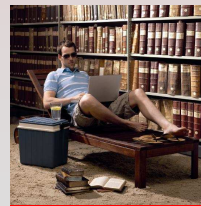
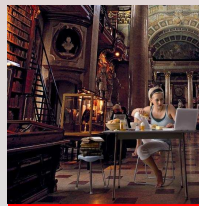
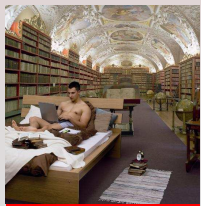
We guarantee

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www.zeuschel.com info@zeuschel.com



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