Metamorfoze Preservation Microfilming Guidelines

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Introduction

These *Metamorfoze Preservation Microfilming Guidelines* are the guidelines applied by Metamorfoze, the Dutch national programme for the preservation of the paper heritage. They are to be regarded as representing a standard for '*preservation microfilming'*, which means that the microfilm serves to preserve the content of the original for posterity. Metamorfoze started in 1997. The programme is financed by the Dutch Ministry of Education, Culture and Science, and co-ordinated by the Koninklijke Bibliotheek, the National Library of the Netherlands. The programme focuses on the preservation of documents, books, newspapers and periodicals from the period 1840-1950 that are endangered by paper acidification.
The method chosen is to preserve the information by capturing the content of the documents on microfilm. In addition, the original documents are securely packaged and stored and withdrawn from use.

At the start of the programme, in 1997, microfilming quality standards were developed to ensure optimum quality of the microfilms produced as part of the programme. These standards were in keeping with the international standards for *preservation microfilming* in place at the time.
During the past nine years of practice with the Metamorfoze programme, the standards have been repeatedly adjusted in detail and some sections have been elaborated.
In this new version of the Guidelines, these adjustments and recent new insights have been incorporated.
The following points are new in the Metamorfoze Preservation Microfilming Guidelines February 2006, Version III:

- In principle all originals must be filmed at low contrast.
- The gamma value of low contrast microfilms should be between 1.0 and 1.8. In the guidelines of February 2005 the gamma value had to be between 1.3 and 2.0.
- Mackie lines may only occur to a very limited extent (see also 2.6 Density)
- High contrast-filming is only permitted for books, and after permission has been obtained from the Metamorfoze Office.
- The density for high contrast-filming is 1.00 to 1.30 in all cases.
- The maximum reduction ratio for both low-contrast and high-contrast filming has been increased from respectively 18 and 21 to a maximum of 22. The desired resolution (Quality Index) has been modified as a consequence of this.
- As of yet, only scanning from the microfilm in the grey value is permitted.
- Only the Agfa Structurix Thiotest is used for determining the residual value of thiosulphate in the master negative. If necessary the quality manager microfilming can supplement this tests by asking the microfilm company concerned to perform a methylene blue test.

This revised version of the Metamorfoze Preservation Microfilming Guidelines is effective from 1 March 2006 and is available from the Metamorfoze website:
http://www.metamorfoze.nl.

Chapter 2 of these guidelines replaces the section in the *Metamorfoze Handbook* (2000) that deals specifically with the technical aspects of microfilming (Appendices 11-13). Chapter 1 is an elaborated version of some sections from the *Handbook*.

Since 2001, digitization projects have also been carried out under the umbrella of the Metamorfoze programme. These projects are conducted according to the so-called *hybrid* method. This means that for every item a microfilm is produced for the purpose of preservation, as well as a scan from the microfilm to provide access to users. Both techniques are thus used in combination, whereby the microfilm serves as a surrogate for digitization. For these digitization projects, Metamorfoze complies with the guidelines of the national digitization programme Memory of the Netherlands (*Guidelines and Procedures for the execution of projects for Memory of the Netherlands. Version 4.0*. The Hague 2003 / www.geheugenvannederland.nl)

The objective of these *Metamorfoze Preservation Microfilming Guidelines* is to ensure the quality of the Metamorfoze programme as such, as well as the quality of the individual microfilms. This applies to three generations of microforms:

- A master film
- A duplicate film
- A service copy (microfilm, microfiche or scan)

The following aspects have to be taken into account:
This refers to substitute filming. Although the original is not destroyed, it is unusable or will be in the near future. Therefore, the microfilm serves to replace the original.
All information in the original must also be present in the service copy.
The duplicate films must be suitable as surrogates for digitization.
The service copies must be easily legible on microfilm reading equipment or on a PC.
The service copies must be reproducible.

If you have any questions or comments about these *Metamorfoze Preservation Microfilming Guidelines*, please contact Hans van Dormolen, Metamorfoze microfilming quality manager, tel. +31(0)70 3140129, e-mail hans.vandormolen@kb.nl, or Dennis Schouten, Metamorfoze project manager, tel. +31(0)70 3140373, e-mail dennis.schouten@kb.nl.

1 Microfilming: content and procedures

1.1 Prefilming procedures

Before the original documents are delivered for microfilming, they must be checked by the client for completeness, order and quality.

Completeness

A bound original must be browsed through to see if all the pages are present. Loose-leaf originals must be checked leaf by leaf.

Order

The originals must be delivered in the correct order. Bound materials are filmed in physical order, unless indicated differently by the client. In the case of loose-leaf materials the client decides the order in which they have to be filmed. The client bears responsibility for the correct order and numbering.

Quality

Where the original is of low quality, the client inserts an A4 sheets containing symbols that give information about the quality of the original, for instance: incorrect numbering or dating, original badly legible, damaged text, bound in the wrong order etc. These sheets indicate where the microfilmer must insert small symbol cards with the same symbols. These small symbol cards must be included in the filming, positioned bottom right against the edge of the original. When a specific irregularity occurs throughout the document, for instance text lost in the inner margin, it is sufficient to indicate this once, at the start of the film (for an overview of these symbol cards: see 1.4 Symbol cards).

In addition, there are four *target sheets* that the client needs to fill in and which have to be incorporated in the *leader* of the film (see 1.5: Target sheets).

1.2 Filming mode

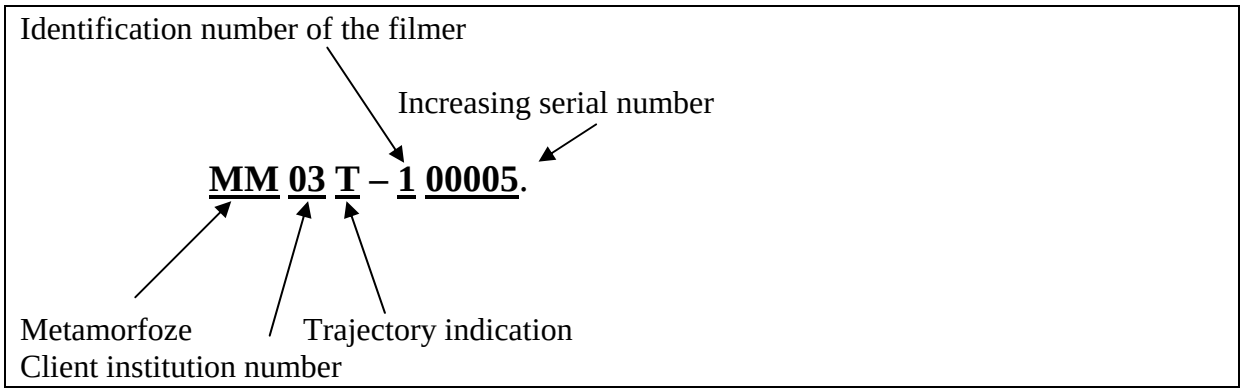
The filming mode is *comic mode/IIB*. Positioning: left-right in the middle of the frame, top-bottom at the bottom of the frame, parallel to the longitudinal axis of the microfilm.
For the purpose of automated digitization of the microfilms at a later date, when desired, the films are always made with a black background. When necessary, a small sheet is distinguished from a larger sheet by putting a black sheet underneath. Damaged sheets are made visible in the same manner.
The space between two microfilm images must not be less than 3 mm in the case of 35 mm-films and 16 mm-films. This enables automatic frame positioning during digitization.

1.3 Film numbering

A Metamorfoze microfilm number is unique and is always constructed in the same manner. It consists of:
A letter code, indicating that the film was made in the context of Metamorfoze.
The identification number of the client institution (Metamorfoze derives the institution's number from OCLC|Pica's national shared cataloguing system).
A letter code indicating as part of which trajectory of the Metamorfoze programme the microfilming took place (for instance: collections, books, newspapers or periodicals).
The identification number of the filming vendor.
A microfilm serial number consisting of five digits.

This is what a Metamorfoze microfilm number looks like: MM03T-100005.

This microfilm number is constructed as follows:



MM = Metamorfoze

03 = Client institution identification number, in this case Koninklijke Bibliotheek. Libraries participating in the OCLC|Pica national shared cataloguing system have an institutional ID consisting of up to 4 digits. This number is used as identification code. To institutions not participating in the national shared cataloguing system, an institutional ID is assigned in consultation with the Metamorfoze Office.

T = Trajectory indication, in this case the Periodicals trajectory.
Metamorfoze has six different trajectories, each with its own letter code:
L = Literary Collections
C = Cultural-historical Collections
I = Collections of International Value
B = Books
K = Newspapers
T = Periodicals

1 = Identification Number of the filmer, here Karmac in Lelystad.
At the moment there are four Dutch microfilming vendors able to comply with the Metamorfoze quality requirements:
0 = MicroFormat, Lisse
1 = Karmac, Lelystad
2 = GMS, Alblasserdam
3 = Strata Preservation, The Hague

00005 = Increasing serial number of the microfilm. In this case the fifth film in the series. This serial number always consists of five digits. Consecutive numbers are assigned as long as the client, trajectory and microfilming vendor stay the same. When, for instance, the same vendor is awarded a new commission in the same trajectory, consecutive numbers are assigned.
Example:
Collection A of library 03 was filmed in trajectory C by company 0. Film numbers MM 03C-00001-00012.
Collection B of the same library is filmed two years later, also in trajectory C, by the same company:
Film numbers MM 03C-00013-00020.
This requires the attentiveness of both the client and the filmer.

When either client, trajectory or filmer is different, the numbering is not consecutive.

Master negative, duplicate film and service copy are assigned identical Metamorfoze microfilm numbers.
To the service copies the client institution may assign its own shelfmark in addition to the microfilm number, which may be freely constructed (microform shelfmark).
On the label of the film container the various generations are indicated as follows:

- Master negative

Silver positive or Duplicate negative
Service copy
The label of the service copy contains the shelfmark assigned by the client institution in addition to the microfilm number.
Service copies can be silver positives as well as diazo films. On the labels these are distinguished by adding a Z (silver) or a D (Diazo) to the microfilm number (see also: 1.13 Labelling).

1.4 Symbol cards

Symbol cards contain pictograms and short texts giving technical and bibliographical information about the originals and about the microfilms.
There are two types of symbol cards:

- **Large** (A4)

The large symbol cards are used at the beginning and at the end of a film.

- **Small**

Small symbol give additional information about the original and are filmed together with the original.

Please note that the small symbol cards come in two sizes: 3.3 x 4.5 cm and 2.2 x 2.9 cm. For originals larger than A4, the 3.3 cm x 4.5 cm card is used, while the 2.2 cm x 2.9 cm card is used for originals smaller than or equalling A4. The small symbol cards give additional information about the original and are filmed positioned bottom right against the edge of the original document. This is done on the instruction of the client. When during the course of the filming irregularities are noted, for instance badly legible sections, cut out sections or other damage to the text that has been overlooked by the client during preparation, these must also be indicated in the filming. Of course, this is possible only when the irregularities are noted by the operator.

The following large symbol cards are used:
Start of film
End of film
Continued on next reel
Continued from previous reel
The images in the original publication are in colour

Sub: Start of film
This symbol card indicates the start of the film.

Sub: End of film

This symbol card indicates the end of the film.

Sub: Continued on next reel
This symbol card indicates that the next section of the original is to be found on the next reel.

Sub: Continued from previous reel
This symbol card indicates that the film starts with the next section of the original, following on the section on the previous reel.

The microfilm rolls preferably contain complete items, continuing until the reel is full, whereby the film shall not extend closer than 6 mm from the outer edge of the reel. Newspapers, books and periodicals are filmed per complete publication. Manuscript materials are filmed as arranged beforehand by the client.
When it is not possible to finish an item on one roll, according to the method described above, then the symbol card *Continued on next reel* must be used to end the film. The next film then starts with the symbol card *Continued from previous reel*.

Sub: The images in the original publication are in colour
When the original contains mainly colour images, the symbol card for colour images is incorporated in the *leader,* with the following text: *The images in the original publication are in colour*. In this case, the use of small symbol cards in the film itself is not necessary.

The following small symbol cards are used:
Appendix to publication
End of appendix to publication
Duplicate exposure
Original badly legible
Incorrect numbering or dating
Missing editions
Missing pages
Damaged text or bound incorrectly
Image is in colour

1.5 Target sheets

The target sheets and the large symbol cards together make up the microfilm's *leader*.
They precede the actual film. The leader contains all the relevant technical and bibliographic metadata.

Metamorfoze utilizes two types of target sheets: custom-produced target sheets with variable text or images, whereby the text is determined by the client and the filming agent, and target sheets with standard text or images.

There are two types of custom target sheets with variable text or images:
1. Target sheets produced by the client
2. Target sheets produced by the filming agent, in consultation with the client

Sub 1: Target sheets produced by the client:
- **Master negative storage number**
  (see also: 1.3 Film numbering)

- **Copyright statement**
  Standard text, to be adapted for each institution.

Microform shelfmark
Information about the service copy. To be determined by the client.

Bibliographic record
This target sheet contains content information about the filmed document: the bibliographic record. Additional data are entered by the filming agent (see below).

List of irregularities
This target sheet must always be filmed, also when there are no irregularities. When no irregularities are mentioned, the user will know that the original contains none.

Sub 2: Target sheets produced by the filming agent, in consultation with the client:

- **Master negative storage number**
  The master negatives are assigned a unique Metamorfoze microfilm number (see also: 1.3 Film numbering).
- **Microfilmed (year)**
  This target sheet contains the year the film was made. When a collection has been filmed over a period of several years, the year must be adjusted for every year of filming.

Bibliographic record
In addition to the bibliographical record of the original, produced by the client, this target sheet contains:
Bibliographic information about the filmed document
Master negative storage number
Film format: 16 or 35 mm
Frame positioning
Master negative reduction ratio
Microfilmed (year)
Filming vendor

- **Reel contents**
  For newspapers and periodicals, this target sheets contains the period covered by the filmed publication. For books this target sheet does not need to be included. For manuscript materials the client has to indicate whether this target sheet must be used and which information it should contain.

The target sheets with standard text or images also come in two kinds:
1. Target sheets containing an explanation of a small symbol card.
2. Technical target sheets.

Sub 1: Target sheets explaining a small symbol card

Explanation of duplicate exposures
This target sheet must always be included (see also: 1.9 Duplicate exposures).

Explanation of colour images
This target sheet must be incorporated in the leader when the original contains a number of colour images. For every colour image a small symbol card, *Colour image*, must be inserted in the film (see also: 1.4 Symbol cards).

Sub 2: Technical target sheets

These target sheets provide information on, for instance, illumination, resolution and gamma value of the film.

Illumination target

This is a white sheet, at least the size of the entire frame, used to evaluate the illumination.

Resolution test chart

This is a sheet containing 5 resolution test charts (ISO Resolution Test chart No. 2), the *Kodak Gray Scale*, a ruler and information about the reduction ratio.

In every corner of the frame (5 cm from the corner) one resolution test chart is placed, and one is positioned in the centre of the sheet. The ruler is placed above the chart in the centre, with the information about the applied reduction ratio above the ruler. The *Kodak Gray Scale* Q-13 is placed underneath the centre chart.

Scan target

This is a target sheet with the AIIM scanner test chart #2. This is used for evaluating the scans.

Chapter 1.7 (Filming sequence chart) provides an overview of the symbol cards and target sheets and their proper use.

1.6 Film composition

1	Blank leader of at least 50 cm (without exposures). This blank leader serves as protection for the film.
2	Leader. A film leader consists of symbol cards and target sheets.*
3	Blank space (forward one image without making an exposure). This blank space in the film will be used to insert a splice when the leader with symbol cards and target sheets is added after the original document has been filmed.
4	Technical target sheets (illumination sheet, resolution test charts and scan target). Between the technical target sheets and the original document no splices are allowed.
5	The original document
6	Symbol card(s)
7	Blank trailer of at least 50 cm (without exposures). This trailer serves to protect the film.

* Leader: when filming books several books can be put onto one film, depending on the length of the originals. Each book must be preceded by a complete leader.

1.7 Filming sequence chart

Below a filming sequence chart is given, showing the sequence of the exposures. This chart contains the following items:

1. Symbol cards and target sheets
2. Exposure number
3. Use
4. Size
5. Type

Sub 1: Symbol cards and target sheets

This column lists the symbol cards, target sheets and technical targets in the order in which they must be filmed.

Sub 2: Exposure number

This column contains the number of the exposure. The range of the cell containing the number indicates whether a symbol card or target sheet is to be filmed individually or together with the next one, in one exposure.
Exposures 1 to 8 are symbol cards and target sheets. *Exposures 9 to 11* are technical target sheets. Between the individual technical target sheets and between the technical target sheets and the exposures of the original no splices are allowed.
Between exposures 8 and 9 a *blank space* is inserted (forward one image). This blank space clearly marks the separation between the symbol cards and the content target sheets on the one hand, and the technical target sheets on the other hand. When the leader needs to be added after filming, the blank space must be used to insert the ultrasonic splice.

Sub 3: Use
This column indicates the use of symbol cards and target sheets per microfilm:

Mandatory
These symbol cards and target sheets must always be included.

- **Optional**
  The use of these symbol cards and target sheets depends on the nature of the collection and the requirements of the client.

Ad. 4: Size
This column indicates how large the image needs to be on the film:

Frame filling
The entire surface area of the film is to be used for the image.

Eye-legible
A number of symbol cards and target sheets contain vital information. This information must be legible with the naked eye, without the use of a magnifying glass or a microfilm reader. When viewing the film on microfilm reading equipment they should be clearly visible.

Sub 5: Type
This column indicates the type of the symbol card or the target sheet:

Standard
This type of symbol cards and target sheets never change. They contain information that is always the same, with one exception. The target sheet *Microfilmed* contains the year in which the film was produced. When a collection is filmed over a period of several years, this date needs to be adjusted for every year.

Custom
The custom target sheets come in two types:

Produced by the client
The content of this type of target sheet depends on the collection and the reel number of the film. For each new collection, the client provides all the required information for these target sheets prior to filming.

Produced by the filming agent, in consultation with the client
Depending on the nature of the collection, the client decides on the use and contents of the target sheet *Reel contents*.

Table: Filming sequence and target application chart. Exposures 1 to 8 and blank space.

Symbol cards **Target sheets**	**Exposure number**	**Use**	**Size**	**Type**
Start of film	1	Mandatory	Eye-legible	Standard
Continued from previous reel		Optional	Eye-legible	Standard
Master negative storage number	2	Mandatory	Eye-legible	Custom: produced by client
Microfilmed	3	Mandatory	Frame filling	Standard
Copyright		Mandatory	Frame filling	Custom: produced by client
Shelfmark microform	4	Mandatory	Eye-legible	Custom: produced by client
Bibliographic record		Mandatory	Frame filling	Custom: produced by client, additions by filming agent
Shelfmark and/or title	5	Mandatory	Eye-legible	Custom: produced by client
Reel contents	6	Optional	Eye-legible	Custom: produced by filming agent, in consultation with client
List of irregularities	7	Mandatory	Frame filling	Custom: produced by client
Explanation Duplicate exposures		Mandatory	Frame filling	Standard
Explanation Colour images	8	Optional	Frame filling	Standard
All images are colour images	8	Optional	Frame filling	Standard
Blank space				

Table, continued: Exposure 9 to last exposure.

Symbol cards Target sheets	Exposure number	Use	Size	Type
Illumination target	9	Mandatory	Larger than frame	Standard
Resolution test chart	10	Mandatory	Frame filling	Standard
Scan target	11	Mandatory	Frame filling	Standard
Original	12 and cont.		Frame filling	
Continued on next reel	Last exposure	Optional	Eye-legible	Standard
End of film Please rewind		Mandatory	Eye-legible	Standard

1.8 Completeness and order

The filming must be comprehensive. Everything must be filmed, for instance in the case of manuscript materials also the blank sheets and blank reverse sides. Bound materials (books and periodicals) are filmed in physical order, including the cover, endpapers and supplements, unless indicated differently by the client.
Non-bound materials must be filmed in the order determined by the client. The responsibility for the correct order and numbering lies with the client.
For bound material precautions should be taken to ensure that the letters do not disappear in the gutter or are illegible due to shadow (See also: 2.10).

1.9 Duplicate exposures

To ensure that an exposure has the correct density, various illuminations may be needed for one exposure, for instance when there are irregularities in the original such as stains or variations in the colour of the paper. In these cases duplicate exposures are made, whereby the illumination is adjusted for each part of the text. With the second exposure a small symbol card *Duplicate exposure* must be filmed.
When there are differences between the two pages in one opening, two exposures are made: first one for the left page and then one for the right page. An *opening* consists of two pages facing one another. In other words: the left and right page in the case of bound materials or newspapers. Together with the second exposure the symbol card *Duplicate image* must be filmed.
It sometimes happens that the operator does not know for sure whether a certain exposure has been made. In these cases the exposure has to be made again, which may result in a duplicate exposure without a *Duplicate image* symbol card (see also: 1.1 Prefilming procedures and 1.4 Symbol cards).

1.10 Corrections

Corrections, when required, are spliced into the master negative at the appropriate places with an ultrasonic splice (see also: 2.9 Splices).

1.11 Quality control

The filming agent checks on completeness in compliance with the method previously agreed on by the filming agent and the client.
The filming agent first conducts a technical inspection of the master negatives. This is followed by a technical inspection by the microfilming quality manager from the Metamorfoze Office (see also: 2.11 Technical Control).
The client checks the service copies for completeness and also checks if all the information visible in the original is present in the service copy.
During the filming of the originals every effort should be taken to ensure that the letters do not disappear in the gutter or are illegible due to shadow (see also : 2.10 Other defects).

1.12 Packaging

The *master negatives* and *duplicate film*s are stored in lignin and acid free cardboard containers. The film reel must be secured with an acid and lignin free paper wrapper tied with a string.

The *35 mm and 16 mm service copies* can be stored in the same containers in which the unexposed microfilms were delivered, but only when these are poly-propylene containers of the kind produced by Agfa. These containers are user friendly, durable and easy to close.

Microfiches and *scans* are to be delivered according to the specifications of the client.

1.13 Labelling

After packaging the films, the containers must be labelled. For the master negatives and the duplicate films other guidelines apply than for the service copies.

1. Master negative and duplicate film

The containers of the master negatives and duplicate films are labelled with two different labels:

one label on the flap of the container
one label on the left side of the container

Label on the flap of the container

This label must contain the following information, always in the same order:

1. Client name
   (font: Arial, 12 point)
2. Title and/or author of the collection
   (font: Arial, 14 point, capitals, bold)
3. Shelfmark original
   (font: Arial, 12 point)
4. Metamorfoze microfilm number
   (font Arial, 14 point)
5. Date original: from.. to ..
   (font: Arial, 12 point)
6. Film generation (master negative, silver positive, duplicate negative) + microfilmed (year)
   (font: Arial, 12 point)

Examples:

Koninklijke Bibliotheek
HET CENTRUM C 74
MM03K - 100157
02-06-1924 - 31-10-1924
Master negative 2001

Koninklijke Bibliotheek
HET CENTRUM C 74
MM03K - 100157
02-06-1924 - 31-10-1924
Silver positive 2001

Koninklijke Bibliotheek
HET CENTRUM C 74
MM03K - 100157
02-06-1924 - 31-10-1924
Duplicate negative

- **Label on the left side of the container**

This label contains the following information, always in the same order:

1. Metamorfoze microfilm number
   (font: Arial, 22 point, bold)

Film generation: master negative, silver positive or duplicate negative
(font *master negative* and *silver positive*: Arial, 22 point, bold)
(font *duplicate negative*: Arial, 20 point, bold).

Example:

MM03K - 100157
MASTER NEGATIVE

MM03K – 100157
SILVER POSITIVE

MM03K – 100157
DUPLICATE NEGATIVE

2. Service copies

The labelling of service copies, microfiches and scans must be done according to the client's specifications. Below, KB's specifications for service copies are given. For the service copies only one label is used. This label is affixed to the flap of the container. The label contains the following information, always in the same order:

Client name
(font Arial, 12 point)
Title or author collection

(font Arial 14 point, capitals, bold)
Microform shelfmark (optional)
(font Arial, 12 point)
Date original: from .. to… (optional)
(font Arial, 12 point, bold)
Service copy, Metamorfoze microfilm number and a letter indicating the type of film of the service copy.

- Z for a 35 mm silver halide polyester-based film.
- D for a 35 mm diazo film.

(font Arial, 10 point).

Examples:

Koninklijke Bibliotheek
HET CENTRUM
NBM Mfm MMK 0024
02-06-1924 - 31-10-1924
Service copy MM03K – 100157 Z

Koninklijke Bibliotheek
HET CENTRUM
NBM Mfm MMK 0024

02-06-1924 - 31-10-1924
Service copy MM03K – 100157 D

1.14 Reporting

For every film reel, the filming agent submits an electronic record to the client and the Metamorfoze microfilming quality manager. This record must contain the following bibliographic and technical information:

Bibliographic:
Metamorfoze film number
Name filming vendor
Microfilmed (year)
Number of exposures
Title(s) of the original document(s)*
Shelfmark(s) of the original document(s)*
From… to… information *
Client name

* Depending on the original document.

Technical:
Reduction ratio
Number of splices
Type of film and size

High contrast or low contrast
Date technical inspection Metamorfoze, in the form: month plus year
Number of the methylene-blue test, if carried out

1.15 Storage of the master negatives

After filming, the master negatives are put in long-term purpose-built cold storage. The recommended climate requirements applied by Metamorfoze for long-term storage of polyester-based master negatives are:

Air temperature	4 to 10 degrees Celsius
Relative humidity	25 to 40 %

Temperature and humidity must be constant. Fluctuations must be avoided. (For more information, please refer to the Bibliography: *Aanbevelingen voor de koelte-opslag van microfilms / fiches met polyesterdrager*, Koninklijke Bibliotheek/Nationaal Archief, Den Haag).

2 Microfilming: technical aspects

2.1 Camera type

A planetary camera is used for filming. Bound materials are filmed with the help of a book cradle.

2.2 Film type and generation

In the case of *preservation microfilming*, first, second and third generation microfilms are distinguished.

1. **First generation**
   This microfilm, the *master negative*, is used to make the exposures. The film is preserved in long-term storage. The master negative is a 16/35 mm non-perforated, panchromatic silver halide polyester-based film with anti-halation layer, roll length 30.5 metres (100 ft), film thickness ‘PET 13’, of negative polarity.
2. **Second generation**
   This is a *duplicate copy* made from the master negative. All service copies are made from this film. Depending on the film's polarity, it is called a *silver positive* or *duplicate negative*. The duplicate copy is a 16/35 mm non-perforated silver halide polyester-based film, film thickness ‘Pet 10’, of negative or positive polarity. Since 2005 only a second generation film with negative polarity still needs to be made. For this second generation film the Direct Duplicating Intermediate Microfilm 2470 of Kodak is used. Using a base plus fog of 0.14 to 0.18 guarantees a gamma value of 1 to 1.1 in the linear area of the S-curve. The D-max in this second generation microfilm must be slightly lower than the D-max in the master negative.
3. **Third generation**
   This is the *service copy*. Metamorfoze utilizes three types of service copies:

Service copy film

The service copy film is a 16/35 mm non-perforated silver halide polyester-based film, film thickness ‘PET 10’ of positive polarity. A 16/35 mm diazo film of positive polarity, ‘PET 10’, may also be used. For low contrast filming the use of diazo film is advised against, because diazo film has a high gamma value (steep character) and can therefore not render enough gray scale values (see also 2.3 High contrast and low contrast filming).

Microfiche

Metamorfoze uses two types of microfiche: polyester-based silver halide microfiche, of positive polarity, 'PET 17', and the diazo microfiche of positive polarity, 'PET 17'.
Numbers of images:

From 16 mm film: (books smaller than A4): 7x7 images
From 35 mm film: (books larger than A4): 5x6 images, or 4x5 images (on demand).
Please note: for 4x5 images the reduction ratio from 35 mm film to microfiche is 1.5.
For 5x6 images the reduction ratio is 1.9.

For low contrast filming the use of microfiches as service copies is strongly advised against. Many details are lost during the creation of a microfiche. This loss is caused by the reduction and by the high gamma value of the microfiches (see also: 2.3 High contrast and low contrast filming).

- *Digital service copies.*
  - A second generation microfilm must be used for scanning.

- Low and high contrast films must be scanned in gray scale, at 200 or 300 dpi (depending on the scan quality that is achieved). The files must be stored as JPG 6 or higher. In Photoshop, JPG 6 is an average quality (50%).
- For negative film, Direct Duplicating Intermediate Microfilm 2470 by Kodak shall be used. The 2470 must have a base plus fog with a density of 0.14 to 0.18. The maximum density of the 2470 must be slightly lower than the maximum density of the master negative.
- By default, the scans are assigned a standard file name related to the Metamorfoze microfilm number. The composition is as follows: first the Metamorfoze microfilm number and then a serial number that consists of four figures. For example, MM03T-100345-0001.
- The client institution may in consultation with the company assign other file names. However the costs for this are not subsidised by Metamorfoze and must therefore be quoted and billed separately.
- The scans are delivered to the client via FTP or mobile harddisk. The costs for delivery on CD or DVD are not subsidised by Metamorfoze. Nevertheless, in the latter case we do recommend leading brand quality.
- The digital service copies must not be more expensive than analogue copies.
- The digital service copies shall, just like the analogue copies, be available to the users of the client institution. Metamorfoze does not provide funding for the development of an access interface.
- Postprocessing activities, such as deduplicating, splitting, removing skew, sharpening and cropping, shall be conducted only after consultation with the client. Postprocessing costs will not be subsidised by Metamorfoze, and must therefore be quoted and billed separately.
- The filming agent carrying out the digitization shall keep back-ups of the scans at least until after the scans have been accepted by the client.

2.3 High contrast and low contrast filming

Two different techniques are used for filming library materials, each with its own preferred film type and development method. The choice of technique depends on the original material.

High contrast filming

Normally, this method is only used for materials that contain no or very few grey tones and therefore show a high contrast between characters and substrate (also called background), for instance books. For high-contrast filming special permission should be obtained from the Metamorfoze Office.

Low contrast filming

This method is normally used for materials that contain many grey tones (continuous tone) and therefore show low contrast between characters and background, for instance manuscript materials and periodicals. When one collection contains a combination of manuscripts and printed materials, the choice for high or low contrast filming should be based on the manuscript materials. In these cases, Metamorfoze advises low contrast filming, because high contrast filming of manuscript materials will result in more information loss than low contrast filming of printed materials.

Modern newspapers contain many colour photographs. For the production of newspapers, various tints of white are sued as well. The paper of old newspapers can be strongly discoloured. The black letters in old newspapers can also be discoloured to dark grey and/or light grey. To gain the best result and to overcome the aforementioned problems, newspapers will only be filmed with low contrast from February 2006 onwards.

2.4 *Kodak Gray Scale*

The difference between high contrast and low contrast filming can be made clearly visible by using a *Kodak Gray Scale Q-13*, which must be included with the resolution test charts at the start of the film.
The *Kodak Gray Scale Q-13* consists of a gray scale of 20 patches, going from white (patch A with an appearance density of about 0.05) to black (patch no. 19 with an appearance density of about 1.95). The difference in appearance density between the individual patches is 0.10.
A visual check of the *Kodak Gray Scale* exposure on a microfilm negative will show that not all 20 patches are separately visible. The number of discernable patches will depend on the type of film used, in combination with the applied development method. In other words, the number of discernable patches will depend on the gamma value or the contrast factor of the film. The gamma value indicates in a simple manner the relationship between the contrast range of the original and that of the negative. Apart from the gamma value, the number of discernable patches will depend largely on the density of patch A on the microfilm negative. Patch A renders the maximum density. For a correct assessment of the gray scale, the density of patch A is of essential importance. Not only maximum density but also minimum density is of vital importance. Minimum density must always be 0.00. The patch for which this value is measured depends on the gamma value of the film and the density of patch A. The densitometer must be set to zero on the film before taking any density readings. (see also 2.6 Density).

Assessment and calculation in the case of high contrast filming
For a correct assessment of the gray scale, patch A must have a density of about 1.50. For a correct calculation of the gamma value it is important to assume minimum and maximum densities for the area for which the gamma value has to be calculated. In the case of high contrast filming, the gamma value must be determined from a density of c. 1.50 (patch A) to a density of c. 0.80. These films should have a gamma value between 2.5 and 3.5. The difference in density between the consecutive patches of the Kodak Gray Scale must be no more than 0.35. In other words, the steps should not be bigger than 0.35. The number of visually discernable patches following patch A will be at least seven for these films.
To calculate the gamma value, the densities of the steps between 1.50 and 0.80 are simply added up. Next, they are divided by the sum of the densities of the same steps of the original Kodak Gray Scale. For example:

Kodak Gray Scale Q-13	Patch density	Step density
A	1.53	
1	1.19	0.34

2	0.85	0.34
3	0.59	0.26
4	0.38	0.21
5	0.19	0.19
6	0.12	0.07
7	0.07	0.05
8	0.04	0.03
9	0.02	0.02
10	0.00	0.02

There are two steps between the densities 1.53 and 0.85. These steps both have a density of 0.34. The sum of the two steps is 0.68.
The sum of the two steps in the original Kodak Gray Scale is 0.20.
The gamma value is therefore 0.68:0.20 = 3.4.

Assessment and calculation in the case of low contrast filming
For a correct assessment of the gray scale, patch A must have a density of about 1.40. To calculate the gamma value correctly, it is important to assume a maximum and minimum density for the area for which the gamma value has to be determined. In the case of low contrast filming the gamma value must be calculated from a density of c. 1.40 (patch A) to c. 0.80. These films must have a gamma value of between 1 and 1.8. The difference in density between consecutive patches of the Kodak Gray Scale must not exceed 0.18. This means the steps must not be larger than 0.18. The number of visually discernable patches following patch A will be at least twelve for these films.
To calculate the gamma value, the densities (without the 0) of the steps between 1.40 and 0.80 are simply added up. Next, they are divided by the sum of the densities (without the 0) of the same steps of the original Kodak Gray Scale. For example:

Kodak Gray Scale Q-13	Patch density	Step density
A	1.44	
1	1.28	0.16
2	1.11	0.17
3	1.00	0.11
4	0.86	0.14
5	0.70	0.16
6	0.60	0.10

7	0.46	0.14
8	0.36	0.10
9	0.25	0.11
10	0.15	0.10
11	0.10	0.05
12	0.06	0.04
13	0.03	0.03
14	0.02	0.01
15	0.01	0.01
16	0.00	0.01

There are four steps between the densities 1.44 and 0.86. The sum of these steps is 0.58.
The sum of the four steps in the original Kodak Gray Scale is 0.40.
The gamma value is therefore 0.58:0.40 = 1.45.

The gamma value required for low contrast filming is 1 – 1.8.

2.5 Resolution

The resolution is determined with the help of the *ISO Resolution Test chart No. 2* and a microscope. The magnification power of the microscope must be at least 60. With the resolution test chart and the microscope, the *Quality Index* can be calculated.
The *Quality Index* is a value that indicates the minimum resolution required for the film to be easily legible and reproducible. The *Quality Index* relates the resolving power of the film to the size of the characters in the original document. The *Quality Index* can be calculated by multiplying the smallest target on the resolution test chart discernable by microscope with the height in mm of the smallest lower case ‘e’ in the original document. The outcome, which is thus related to the size of the characters in the original document, determines the quality of the master negative and the following generations. For Metamorfoze, we assume the size of the smallest character for all types of materials to be 1 mm. This applies to printed and manuscript materials, newspapers and periodicals, but also to children's books printed in large fonts. A visible target 10 on the resolution test chart, multiplied by 1, results in a *Quality Index* of 10.

The *Quality index* is divided in three groups:
QI 8 = high quality (e.g. everything is very easily legible)
QI 5 = average quality (e.g. everything is fairly easily legible)
QI 3.6 = low quality (e.g. everything is legible with some effort)

For assessment of the *Quality Index,* the reduction ratio must be taken into account as well. The higher the reduction ratio, the more difficult it is to achieve the desired Quality Index.

For high contrast filming another *Quality Index* applies than for low contrast filming:

- **For high contrast filming**

For a reduction ratio of 8 to 18, Metamorfoze requires that the master negative has a *Quality Index* of at least 10.
For a reduction ratio of 19 to 21, Metamorfoze requires that the master negative has a Quality Index of at least 9.
For a reduction ratio of 22, Metamorfoze requires that the master negative has a Quality Index of at least 8.

For low contrast filming
For a reduction ratio of 8 to 18 , Metamorfoze requires that the master negative has a *Quality Index* of at least 8.
For a reduction ratio of 19 to 21, Metamorfoze requires that the master negative (first generation) has a Quality Index of at least 7.1.
For a reduction ratio of 22, Metamorfoze requires that the master negative (first generation) has a Quality Index of at least 6.3.

2.6 Density

The density is measured with a projection densitometer (type HE 610), calibrated by Metamorfoze, with which the open spaces between the lines on the background can be measured. The density is measured after setting the densitometer to zero on the medium, that is without the so-called base plus fog (= Dmax-Dmin). The base plus fog of the master negative should not exceed 0.05.

The density must be checked at least 8 times over the entire roll. To limit loss of information on the duplicate film and on the service copy, the density of the master negative must be constant as far as possible. Fluctuations in density of up to 0.30 are the limit of what is acceptable. When irregularities occur in the original, for instance stains or variations in paper colour, this may result in various illuminations being necessary per exposure to ensure it having the correct density. In these cases, the image is exposed more than once, whereby the illumination is adjusted for each section of the text. In each case a small symbol card *Duplicate image* must be inserted (see also 1.4: Symbol cards).
In the case of two pages in one opening, the exposure is made twice, first for the left page and then for the right page. In these cases, the small symbol card *Duplicate image* must also be included in the exposure.

The technical targets (illumination target, resolution test chart and scan target) must have a density between 1.10 and 1.40.

High contrast
The density of the originals must be between 1.00 and 1.30
All symbol cards, target sheets and technical target sheets (= Patch A of the Kodak Gray Scale, illumination target, resolution test exposure and scan target at the start of the film and possibly further in the film) must have a density of between 1.10 and 1.50.

Low contrast
The density of the originals must be between 1.00 and 1.20.
All symbol cards, target sheets and technical target sheets (= Patch A of the Kodak Gray Scale, illumination target, resolution test exposure and scan target at the start of the film and possibly further in the film) must have a density of between 1.10 and 1.40.

The low contrast film development is to a certain extent underdevelopment. During underdevelopment development errors can occur. One such development fault is a so-called Mackie line. This is an increase in the density of the left-hand or right-hand side of the original. Whether a Mackie line occurs on the left-hand or right-hand side depends on the direction the film is fed through the development machine. The Mackie lines can possibly arise on the side of the image which first enters the film developer. A standard for measuring a Mackie line is to determine the density of an exposure of a white sheet of paper with a tint of 0.00. The density must be measured in the middle and at the edges. An increase in the density from 0.05 to a maximum of 0.07 is accepted.

2.7 Illumination
To ensure appropriate illumination, the difference in density between centre and corners, and between the corners themselves must not exceed 0.10.

2.8 Reduction ratio
The reduction ratio must be determined for every original document in such a way that it fills as much of the frame as possible. For bound materials, the reduction ratio for every original item is determined by the external dimensions of the opened volume. For non-bound materials it is determined by the external dimensions of an opened double sheet. Within one film roll the reduction ratio must not be changed. Whether to film on 16 mm or 35 mm film must be decided on the basis of character size and/or the size of the original. When larger sizes occur occasionally within one collection (for instance fold-out maps) these pages are included as overlapping sections. When larger sizes occur regularly, they must be filmed together on a separate roll with the reduction ratio appropriate to this type of large originals.

High contrast
If the external dimensions of the original are smaller than or the same as A4, then filming may be done on 16 mm film, as long as in the original there are no lower case letters smaller than (or equal to) 1 mm. The maximum reduction ratio is 22 (see also point 2.5 Resolution).

Low contrast
Manuscript materials and other originals suitable for low contrast filming must be filmed exclusively on 35 mm.
The use of microfiches as service copies is advised against in the case of low contrast filming. The reason is that in the reduction from 35 mm to microfiche too many details are lost.
The maximum reduction ratio is 22 (see also point 2.5 Resolution).

If larger sizes occasionally occur in a collection (e.g. fold-out maps) such a sheet is recorded in overlapping parts. If larger sizes are present in a collection on a structural basis these are jointly filmed on a separate roll that is preferable for the size of the originals concerned.

High contrast
Fold-out maps up to A1 in size can be filmed in a single exposure on 35 mm film with a reduction ratio of 22. Foldable maps larger than A1 must be filmed in an overlapping manner. The length/width ratio of the original is decisive for the choice between filming in cine mode/IA of comic mode/IB. Filming should be as effective (i.e. logical) as possible. The frame should be filled as much as possible with a minimum number of overlapping exposures.

Low contrast
Foldable maps up to A1 in size can be filmed in a single exposure on 35 mm film with a reduction ratio of 22. Foldable maps larger than A1 must be filmed in an overlapping manner. In this case the length/width ratio of the original is once again decisive for the choice between filming in cine mode/IA of comic mode/IB. Filming should be as effective (i.e. logical) as possible. The frame should be filled as much as possible with a minimum number of overlapping exposures.

2.9 Splices
In the master negative splices should be avoided as far as possible. When splices are absolutely necessary, they must be ultrasonic splices. A master negative should never contain more than six splices, with at least 15 cm between two splices. Between the exposures of the illumination target, the resolution test charts, the scan target and the start of the filmed original no splices are allowed. Splices are not allowed to cut through an exposure. The splice must also be inserted as far as possible removed from an exposure, to avoid loss of sharpness when duplicating the film. Duplicate films and service copies should not contain splices.

2.10 Other defects
No shadow whatsoever, caused during the filming, may be visible on the microfilm.
Shadow in the gutter should be prevented as much as possible. The shadow in the binding should in any case not fall on the letters located in the start of the gutter. If it is the case that due to tight binding or the thickness of the binding the letters disappear in the gutter or are located in its shadow, the Metamorfoze Office advises breaking the spine. If this is not possible or has no effect then the Metamorfoze Office advises deconstructing the binding and filming the pages separately. The breaking of the spine or the deconstruction of the binding may only take place with the written consent of the owner of the originals. Where the spine is broken, the binding is deconstructed or in cases of doubt, the microfilm company should always contact the Metamorfoze Office beforehand. Inspecting the film for missing letters in the margin is a standard part of inspecting the film.
The originals should be positioned straight in relation to the longitudinal axis of the film. In some cases it is very hard, and sometimes even impossible to film bound materials without skew. In these cases skew up to 3 degrees is acceptable.
All microfilm generations should be free of scratches and stains.
All microfilm generations should be free of dust, finger prints and other defects. Therefore, the appropriate type of gloves should be worn at all times when handling microfilms.

2.11 Technical inspection

The master negatives are twice checked on technical aspects:

First inspection

The first check is conducted by the filming agent. This involves checking all the master negatives.

Second inspection

The second inspection is conducted by the Metamorfoze quality manager. The second inspection also takes place on the premises of the microfilming vendor, ensuring that technical defects can be discussed on the spot with the production manager or other people responsible. This offers the additional opportunity to discuss new technical insights. The second check is a sample survey of 1 out of every 5 master negatives of every collection filmed.

During this inspection a test to check the residual value of thiosulphate is also performed. This test is called the Agfa Structurix Thio-test and is performed on a randomly-selected film from each batch of films to be checked.

When it is suspected that a technical flaw occurs in more than one master negative within one batch, more master negatives are checked (that is: more than 1 out of 5). When a technical flaw is discovered in a master negative, or in an entire batch, that master negative or batch will be rejected.

When a film or batch has been rejected, it has to be filmed all over again. The new films or batches must then again be inspected twice (once by the filming vendor and once by the Metamorfoze quality manager).

If the Agfa Structurix Thio-test performed reveals that the residual value of thiosulphate in the film is too high then there are three options:

The film or the entire batch of films must be rinsed again.

A methylene-blue test must be performed. This is dependent on the time span between the original film development and the performance of the Structurix Thio-test.

The film or the entire consignment of films must be taken again.

The Metamorfoze quality manager submits a written report on every inspection of a batch of films. The microfilming vendor will receive a copy of this report immediately after the inspection has taken place. Once every three months, the clients also receive a copy of all inspection reports. The quality manager archives the original reports.

Technical inspections involve checking the following aspects:

Gamma value
Density
Quality Index
Illumination
Skew
Number of splices
Scratches and stains
Dust, fingerprints and other possible defects
Residual value thiosulphate

In addition to the technical inspection of the first generation of microfilms, occasionally inspections will be performed of second and third generation films.

2.12 Archival preservation

The master negatives and duplicate films must satisfy the perishability requirements for long-term storage (LE 500) according to ISO 18901:2002(E). A residual value for thiosulpahte of 1.4µg/cm² is permitted. The residual value for thiosulphate in these silver films is determined using a Agfa Structurix Thio-Test (see also 2.11 Technical Inspection).

Bibliography

The Koninklijke Bibliotheek has a tradition of many years regarding research and practice in the area of *preservation microfilming*. The *Metamorfoze Preservation Microfilming Guidelines* are based on these experiences. In addition, the various international ANSI and ISO standards and various publications by the Research Libraries Group have been consulted. This section contains a concise list of consulted resources.

- *ISO 18901 First edition 2002-02-15, Imaging materials-Processed silver- gelatin type black-and-white films-Specifications for stability. Reference number ISO 18901:2002(E). Geneve 2002.*
- *ISO 6199 First edition 1991-07-15, Micrographics – Microfilming of documents on 16 and 35 mm silver-gelatin type microfilm – Operation procedures, Annex C, Quality Index. Reference number ISO 6199:1991 (E)*. Geneve 1991.
- *ISO 9878 First edition 1990-04-15 Micrographics - Graphical symbols for use in microfilming. Reference number ISO 9878: 1990 (E).* Geneve 1990
- *ISO 3334 Second edition 1989-11-15, Micrographics – ISO resolution test chart No. 2 – Description and use. Reference number ISO 3334: 1989 (E).* Geneve 1989.
- *ANSI /ISO 3334 – 1991, ANSI / AIIM MS51-1991, Micrographics – ISO Resolution Test Chart No. 2 – Description and use. Association for Information and Image Management.* Maryland 1991.
- *ANSI / AIIM MS26 – 1990 35 mm Planetary Cameras (top-light) – Procedures for Determining Illumination Uniformity of Microfilming Engineering Drawings. Association for Information and Image Management.* Maryland 1990.
- *RLG Guidelines for Microfilming to Support Digitization, Supplement to RLG Microfilming Publications January 2003*. The Research Libraries Group, Inc. Mountain View 2003. www.rlg.org/preserv/microsuppl.pdf
- *RLG Archives Microfilming Manuel,* Editor Nancy E. Elkinton, The Research Libraries Group, Inc. Mountain View 1994.
- *RLG Preservation Microfilming Handbook*, Ed. Nancy E. Elkington, The Research Libraries Group, Inc. Mountain View 1992.
- *Aanbevelingen voor de koelte-opslag van microfilms / fiches met polyesterdrager*, Koninklijke Bibliotheek / Nationaal Archief, Den Haag, 2004.