Content

Preamble:

A contemporary and relevant strategy for the preservation and development of our digital film heritage requires a hybrid approach. It entails both, the preservation of the original analogue film element, which, as museum object in its own right, is a sustainable carrier of "dense" information; as well as the digitisation of such original film elements, thus ensuring that otherwise inaccessible content can be made accessible to a broad public. A modern approach not least requires the development of a strategy for the long-term preservation of digitally produced film materials.

To achieve this, we need:

- a clear institutional commitment to a 'digital archive'
- adequate resources, including trained personnel, and suitable work spaces
- clearly documented collections policies
- national and international co-operation

Ad 1. Why do we need a preservation strategy for our digital film heritage?

The Austrian Film Museum has kept films and material in other media relating to film (paper documents, stills, posters, equipment) in its collection for decades. We have preserved films originally produced on a celluloid base and in a variety of gauges and forms, adhering to international standards and best practice, most importantly to the guidelines of FIAF (Fédération Internationale des Archives du Film).[1]

The preservation of analogue film materials includes

- Conservation (passive preservation) – conservation treatments and adequate storage of physical carriers in a controlled environment.
- Printing and duplication (active preservation) – transferring sound and picture information onto modern 35mm and 16mm film stock using photo chemical techniques. For Austria, this includes the solution proposed for all feature films funded by the Austrian Film Institute, which recommends the creation of separation masters on black and white negative stock for colour film.

Digitally Produced Films

The drastic reduction in the use of physical film materials in film production and film distribution, and the shift to an almost exclusive use of digital files in production, post-

[1] Refer to section 6 (pp. 12-13) for a list of relevant standards.

production, distribution and exploitation of films, has led to an urgent demand for film heritage organisations to invest in the capability and competencies required to ensure digitally produced and distributed film materials (born-digital films) are preserved for posterity in a media appropriate form.

Broadening Access

In addition to the preservation of born-digital film materials there is also a need to digitise analogue films to guarantee continued engagement (research, identification, cataloguing, access) with these materials. Various factors can limit access to film materials: fragility and uniqueness of the physical materials as well as the fact that digitisation is a process requiring considerable resources. Special equipment and a designated infrastructure that is linked to a specific location, such as a specialist laboratory, are other factors.

Digitisation as Conservation Method

It can be assumed that for the majority of films in our collection, the method of using a film scanner for digitisation and creating high quality digital records (file-based) which are then kept in current and future open source formats, presents a practicable form of duplication (active preservation).[2]

Our current state of knowledge and current technology suggest that using active preservation in conjunction with advanced conservation is the best way to guarantee long-term preservation of analogue film materials originating on film stock. For content captured solely on magnetic tape (analogue and digital video and audio data carriers) or optical disc data storage formats such as Mini-Disc, or DVD/ Blu-Ray, however, digitisation is the only practicable path towards long-term preservation as the original carriers are more susceptible to physical damage or format obsolescence.

Obsolescence as a Risk:

The digital data resulting from the digitisation of analogue film materials (turned-digital films) also require long-term preservation. While film materials stored according to best conservation principles will in general survive for many decades, the longevity of digital film data is significantly shorter. Regardless of whether files are born digital or turned digital, life expectation of digital data is estimated to be no longer than three decades for the following reasons:

[2] This does not explicitly exclude analogue duplication (preservation of nitrate and acetate originals on modern safety film stock). To preserve the complete holdings using analogue techniques, however, would be too expensive and laborious. Accordingly, this preservation method cannot be fully justified for some types of films such as amateur films and other "ephemeral films." For more details see the Film Museum's Collection Policy (forthcoming Summer 2019).

Carrier Obsolescence: Electromagnetic carriers, half solid-state drives and optical carriers (hard drives, solid state drives tapes, CDs, DVDs, etc.) are subject to mechanical wear and tear and aging. Another issue is the fact that underlying technology required for reading the content of such carriers (file systems, transmission protocols, wrapper and container) tends to be proprietary and therefore is owned by a specific manufacturer. This usually means that such technology is subject to short production cycles and not available in the long term.

Format Obsolescence: Digital film data often is captured and stored in proprietary formats (codecs, wrappers or containers) or are unstructured implementations of open source formats without sufficient documentation or standards. As a result, files often are only partially readable or become unreadable within a short space of time, and important information on colour space, aspect ratio, and so forth, is lost as a result.

Data Corruption: Repeated copying and transmission of data without adequate quality control (for instance checksum or fixity) often leads to the loss or corruption of data, which may remain undetected for years.

Ad 2. Which Collections are Covered by a Preservation Strategy for Our Digital Film Heritage?

- Current film productions relating to the collecting priorities of the Austrian Film Museum which are not covered by the proposed program of creating separation masters for federally funded productions. For the Austrian Film Museum, these are mainly artist films and experimental films funded by The Austrian Federal Chancellery, as well as digital productions by artists whose earlier, analogue works, have already been deposited with the Museum.
- Digitised historical film materials (turned-digital).
- Data from digital film restorations.
- Digitised materials relating to the collection of amateur films of the Austrian Film Museum. In conjunction with the conservation of the analogue materials, digitisation is the most important preservation method for small gauges – 8mm, Super8, 9.5mm up to 16mm due to the uniqueness and fragility of the source material and the fact that it cannot be projected easily from film.
- Digitised materials and digitally produced materials resulting from the Museum's research and outreach activities. This includes compilations, digital materials used for projection and exhibitions, recordings (sound and/or picture) of Museum events, interviews, and research outcomes (digital data, metadata and interactive application, from "Digital Humanities" projects since 2007.

Ad 3. Foundations and Principles for the Long-Term Preservation of Digital Film Materials

File-based digital film technology hasn't been on the market long enough to offer reliable information on sustainability. Due to the lack of empirical data, a long-term preservation strategy therefore is based on best practice, which is continually shared, tried, evaluated and improved amongst the community of international archives.[3]

Related models and methods are not only relevant for the "how," meaning the type of carrier used for preservation, but also for the "what," meaning which data formats are used for storing digital film materials. The most important premise in both areas is to stay clear of proprietary systems, and to move towards open source architectures. This strategy will protect an archive and its collections from the arbitrary nature and constraints of the market.

3.1 The OAIS Model of Reference

All relevant international organisations – FIAF, IASA[4] and FIAT/ IFTA[5] recommend the Open Archive Information System (OAIS) model as the most suitable model for long-term preservation of digital materials. OIAS is an ISO Standard (ISO 16363) which sets the framework a digital archive needs to operate in to guarantee long-term access to big volumes of data. The OISA model for reference can therefore be used as a checklist which enables structural checks of an archiving system with regards to sustainability and robustness. An archive can thus be formally classified as "trustworthy."

An Archive Needs to Fulfil the Following Function According to OAIS

- Data needs to be ingested, archived, and actively managed
- Processes and procedures for data management (including metadata) must be clearly documented and implemented, for instance by using a relational database or a digital asset management system (DAMS).
- Strategy for long-term preservation (preservation planning) is defined, documented and implemented. This particularly applies to the areas of format migration (migration planning), to developing a strategic approach for the selection of software applications, and to setting data and metadata standards.

[3] Leading film archives acknowledge that current best practice will not be the basis for carrying digital films into the next millennium. We assume that current standards and practices will apply for the next 20 years. During this period, they are the most secure and sustainable methods to achieve long term preservation. It is plausible that technological innovation over the coming decades will fundamentally change the methods of digital preservation.
[4] International Association of Sound and Audiovisual Archives: www.iasa-web.org
[5] Fédération Internationale des Archives de Télévision / The International Federation of Television Archives http://fiatifta.org

- Access to data and access to information about the data needs to be available to the user (archive professional) without having to refer to any source materials.

The OAIS Model Defines the Following Obligatory Responsibilities:

- Acquisitions must be actively managed and documented in great detail from the point of entry.
- The archive must be able to control management of the materials (for instance, no copy-protection or encryption).
- The archive must have clearly documented collecting policies and data collection strategies: for what purpose and for which type of usage is the data stored?
- All occurrences of data processing and data transformation need to be clearly documented in order to be retraceable.
- Plans and procedures need to be in place to ensure lossless transmission of data, and to ensure that users of the archive can easily access data in adequate and unaltered form.

The OAIS model isn't a media-specific model: it is applied in the context of space travel as much as for the management of personal files. There are comprehensive best practice documents available for the audio visual media sector – published by IASA[6] and, specifically for film, by FIAF[7]. **Unstructured collecting or storing of data alone, as well as saving digital data in proprietary formats without a strategy for migration and without systematic metadata management in do not constitute 'archiving'.**

3.2 Methodology

International organisations including FIAF, FIAT/ IFTA, IASA, support the following current practice implemented in leading film heritage organisations:[8]

Material Selection and Ingest:

- Applying the principles set out in the collecting policy of an organisation, the best quality materials and the most complete materials are selected.[9]

[6] ISASA publications TC-03 and TC-04; TC-06 on digital video is in preparation.
[7] "Basic Principles of Digital Preservation" (2016): www.fiafnet.org/pages/E-Resources/Technical-Commission-Resources.html
[8] Amongst others: Library of Congress (USA), Eye Filmmuseum (NL), BFI National Archives (UK), National Film and Sound Archive (AUS).
[9] The Austrian Film Museum excludes "raw data" of a film project (unedited pre-print materials including off-cuts). Preserving such materials would require the preservation of related editing software including the relevant operating system and hardware, not to mention project data and periphery of special applications (special effects, colour correction, audio mix). If only one of these elements is missing, archiving the rest is meaningless. It is therefore vital to determine which elements are essential for preserving the complete film – in order to discard anything that isn't essential. For more details see the Film Museum's Collection Policy (forthcoming Summer 2019).

- In the case of digitally produced and distributed feature films, DCDM[10] files are considered the most suitable source materials for long-term preservation as preservation masters are created from uncompressed files. Viewing copies for distribution can then be created from such uncompressed master files in different formats as required.
- Digital Cinema Packages (DCP) alone are not considered a suitable format for long-term preservation. They are only useful as examples of viewing materials used for cinema exhibition. We can't assume that DCPs produced over the last decade will run on future projection equipment.
- This means that archiving DCPs is only useful as "digital viewing copy" or access copy. It is essential that DCPs are not encrypted.[11]
- Other common formats used in production are based on proprietary data formats, wrappers and codecs.[12] For long-term preservation, such formats are best to be avoided. Wherever possible, uncompressed single-frame files (such as currently DPX or TIFF) in open source containers should be acquired or created during ingest by file conversion.[13]
- According to international standards, audio files should be preserved in WAV format.
- For subtitles and captioning, XML is currently considered as the most flexible solution.
- Quarantine – measures to prevent the introduction into the system of viruses, malicious codes or similar – is advisable for data from external sources.
- Carrying out fixity checks and checksums at the point of acquisition as well as prior to and following ingest into the system is mandatory.[14]
- Visual inspection of picture and sound should be carried out to detect any faults.
- Metadata needs to be captured manually or through automated processes. In the case of born-digital materials, embedded, technical metadata needs to be ingested. In the case of turned-digital materials such as scans of films, technical metadata needs to be captured from the scan.

[10] According to DCI specifications and SMPTE 428-x, a DCDM file needs to be created directly from uncompressed files, NOT in a reversed step from DCPs.
[11] Encryption must be avoided categorically. Keys that unlock files are usually produced by external providers who may go out of business over time. Another risk factor is the potential for future obsolescence of encryption software, inherent in any type of software.
[12] Apple ProRes currently is a widely used format for video projection and has reached the status of a de-facto standard due to its popularity. As illustrated in the above, there are inherent risks of using proprietary software, and Apple's history of discontinuing products, is not reassuring in this respect. Should the manufacturer decide to stop support for ProRes, all related files will be lost to posterity.
[13] TIFF and DPX files, which have become the norm, unfortunately are only partially open source formats. Some manufacturers of film scanners are currently promoting the open source format OpenEXR as output format. The Austrian Film Museum is pro-actively engaged in talks with ARRI, a leading manufacturer of film scanners, around this development.
[14] Checksums are digital fingerprints, specific to a data package, which make it possible to detect even the smallest change. The MD5 process has worked well.

Saving Records

- Hard drives and solid state drives are suitable for data transmission, but do not fulfil the requirements for long-term preservation.
- Optical media are designed with the end user in mind, or for transmitting date with low density. It is advisable not to use optical media in an archival context, or, if absolutely necessary, to migrate without delay.
- Cloud storage is only attractive for access or data transmission; the underlying proprietary and closed business models are problematic for long-term preservation, as they contravene OAIS and in some cases applicable legislation.[15]
- Other technologies such as glass masters or holograms are laborious (one film file needs to be saved across dozens if not hundreds of glass plates) and are also based on proprietary technology.
- RAID drives or NAS drives facilitate quick access to data ("Online" and "Nearline" systems) but are not ideal for long-term preservation due to the considerations outlined under Section 1 in the above.
- For these reasons, data is captured in the data format LTFS[16] on LTO tapes for long-term preservation.
- It is possible to zip folders or single image sequences in TAR format before saving onto tape – this is an additional step in the process which has become obsolete with the emergence of other data formats and is no longer recommended (please refer to "Management" and "Access" below.
- Best practice with regards to disaster planning and security is to keep two tape copies with identical content[17] in two separate locations, in case of flooding or similar occurrences. The "3-2-1" rule: three independent copies saved on two different types of carriers, stored in at least two different locations.
- Digital archives have to be protected from unauthorised access and manipulation in the same way, if not even more, than analogue archives (controlled access, quarantine, physical safeguards, firewalls, separate networks).

[15] There are specific issues around the storage of and access to data from the cultural heritage sector, particularly if a country's national heritage assets are stored on servers owned by third parties, such as Apple, Google, Amazon, Facebook, etc., and are located outside the jurisdiction of the EU. It is advisable

[16] LTO (Linear Tape Open) is a tape-based storage system on ½ inch magnetic tape developed in co-operation by IBM, Hewlett Packard and Seagate. The technical standards are open which means related drives and magnetic tapes can be manufactured by other companies. Standards for the next generation are released every 2-3 years, memory of a single tape is usually doubled in the process. The latest generation of LTO tapes, LTO-8 can save up to 12 TB per tape. LTFS, short for "Linear Tape File System," is an open format licensed by the LTO-consortium, and therefore the most suitable data format.

[17] The second tape ideally shouldn't be copied from the first tape, but a copy made independently from the source material. Some archives use the alternative approach of storing the data on one LTO tape, and on another tape in a different format, such as the IBM Tap Drive. The thinking behind this is to minimise the risk of flaws in the architecture of new LTO-system data. As this approach requires an entirely separate parallel infrastructure, it is very expensive. The risk of losing data as a result of potential errors in the construction of the LTO system data can be managed by not upgrading each time a new version comes on the marked. By skipping a generation, the assumption is that any faults will have been picked up and rectified by the time the next generation of tape is released. This process also reduces the cost of data storage significantly as a new generation of tapes generally leads to a reduction in price for the previous release. So far, LTO tapes have been consistently reliable with no errors in their underlying architecture having been reported since their inception.

Management and Access

- Data should be saved in lossless and open source formats (codecs, wrappers).
- Uncompressed files can be saved in formats using lossless compression as the original can be restored retrospectively.[18] Using open source formats is vital, however.
- The creation of a file using FFV1 as video codec, LPCM (linear un-compressed) as audio codec in a Matroska (.mkv)-container using FFmpeg is generally considered best practice for lossless compression of AV materials, as codec and wrapper are open source and therefore have the capability to manage a great variety of audiovisual objects.
- WAV files (PCM in a RIFF-Container) with minimum resolution of 44.1 kHz 16 bit linear are the standard format for separate audio tracks. The storage of multi-channel audio files should ideally follow one consistent specification.
- Carriers should be checked as well as played frequently to ensure they are functioning correctly. This especially applies to hard drives but is also an important aspect of data lifecycle management.
- As LTO is compatible up to two generations downwards, the established best practice is to skip one generation when data is migrated from one LTO version to another.
- Producing and comparing checksums ensures the integrity of data is preserved in the process of every single migration.
- Metadata migration is essential.
- Up to a certain volume of data it is possible to carry out many of the required steps manually. Automating processes is desireable, however, for collections which continually grow (scale to handle).
- Data Management and Metadata Management must follow standards and data models that can be easily followed. Lossless migration and the ability to exchange data across different systems are essential. It is therefore advisable to apply up-to-date standards as formulated and recommended by international organisations.[19]
- Usage of opens source software is generally worthwhile to ensure sustainable access to collections data for the Austrian Film Museum and other authorised organisations.

The digital preservation of film is a complex task that requires high-level curatorial and technical knowledge - it is not primarily an “IT-issue.” On the contrary, to carry out digital preservation of film successfully requires trained personnel that is embedded in a team of curators and conservators, and clear collections policy documents. It is possible to address specific technical needs with external IT consultants or developers who are hired on a temporary basis, or through training a suitable member of the team in these areas. Finding a hybrid solution, which allows a trained team member to solve small issues while more

[18] This process is also recommended, at least in some cases, where no uncompressed master materials are available: converting files from proprietary formats (such as Apple ProRes) to open source formats, ensures that files can be accessed and films can be viewed over the next few decades.

[19] In this context, the Metadata Standard EN15907 developed by the FIAF Cataloguing and Access to Collections Commission, is particularly relevant http://filmstandards.org/fsc/index.php/Main_Page

complex tasks are handed to an external specialist, is considered best practice (not only in film archives).

The Film Museum also pursues the strategy of supporting innovation and the development of sustainable preservation standards and workflows by collaborating with a community of developers. The Museum actively collaborates with other archives and continuously participates in discussions on the long-term preservation of digital films, and supports cross organisational initiatives such as RAWCooked,[20] and business models based on sponsored development.

Ad 4. Digitisation of Analogue Film and Video Collections

As outlined under Section 1 in the above, digitisation in conjunction with the best possible conservation of the physical assets, the film originals, is the most practicable approach to ensuring access to collection items. Our digital strategy differentiates between the so-called 'mass' or 'bulk digitisation' and 'digitisation on demand'.

4.1 Bulk (or Mass) Digitisation

'Bulk digitisation' refers to the approach of digitising an archive's entire holdings, or large part thereof, over a defined period of time. The advantage of bulk digitisation is twofold: analogue collections which are relatively heterogeneous in terms of formats, are transferred into standardised digital formats, and an archive's complete holdings can be made accessible. High cost and high impact on resources are the main disadvantages of this approach.[21]

While even small organisations usually can manage the digitisation of selected, single items using a mix of in-house and external specialist resources, bulk digitisation requires out-sourcing most of the work to external commercial companies. It also requires additional funding, either for part of the work, or for the duration of the project. Technical inspections of external companies should be carried out to ensure they meet technical standards and minimum requirements as outlined in the above, and to establish strict quality control.

Bulk digitisation is not relevant for the Film Museum collection as:

- the primary focus for bulk digitisation is on access and outreach; our film collection largely consists of viewing prints of in-copyright films preserved elsewhere, as opposed to original negatives or other original elements;

[20] https://mediaarea.net/RAWcooked

[21] Analogue film materials are primarily kept for long-term preservation (passive preservation) and ideally should only be retrieved for scanning at the highest possible quality once. Increasingly improving quality of scans and standards for access, however, will most likely mean that current standards and scans will not fulfil future expectations and requirements, and renewed scanning will be necessary. On the other hand, funds for mass digitisation usually are only available once, for specially funded projects, as opposed to being an ongoing financial commitment.

- it is safe to assume that most films in the collection are preserved and digitally managed in another organisation;
- the Museum does not own sufficient IP rights in the material to justify the expense of mass digitisation;
- some of the films in the collection (for instance avant-garde and experimental films, which represent a vital focus of the museum's collection) are designed to be presented in their original analogue formats.

4.2 Digitisation on Demand

The Austrian Film Museum has adopted the approach to digitise on demand.

There is an ongoing dialogue across the Museum's directorate, collections' managers and curators, which informs curatorial decisions on whether a single film, or selected collections are digitised or restored digitally. Such decisions are not based on personal preferences but are led by demand and the availability of financial resources.[22]

'Demand' arises if one, or more of the following criteria are met:

- If the analogue source-material for a transfer is damaged or deteriorated to such an extent that a photo-chemical transfer is impossible.
- If the make-up of the source materials isn't suitable for an analogue transfer.[23]
- If the main purpose for the digitisation of film materials is access and outreach, including online publication.
- If an external request for access needs to be facilitated (for instance commercial use, an external research project or presentation).

Digitisation on demand usually relates to single films but can on occasion also lead to 'batch digitisation' of a larger body of films. Examples for the batch digitisation of specific collections are cases where digital content is required for research projects (such as the projects "Ephemeral Films", EFG1914", or the publication of the "Kino Pravda" newsreels[24]), or the systematic digitisation of amateur films originating on small gauges including 9.5mm, 8mm and Super-8mm.

4.3 Guidelines for Digitisation

Regardless of the technical requirements in terms of film formats, or the intended usage external partners envisage, certain general digitisation and quality standards (in accordance with archival sustainability) have to be met at all times.

[22] This means the scope of a digitisation project is variable, depending on funds: if there are additional funds available, more material can be digitised, if more material needs to be digitised, for instance if there is an urgent preservation need, additional funds need to be found.
[23] For instance, as described under section 2, unique materials on magnetic tape or optical data carriers need to be digitised for preservation reasons.
[24] See http://efilms.ushmm.org/ and https://filmmuseum.at/sammlungen/film_online

Each digitisation should meet the following criteria:

- Carried out by qualified personnel under supervision of a conservator, and using equipment that is regularly inspected and serviced.
- Original source material must not be damaged, and, except for essential repair work, must not be adapted or altered in any way at any stage of the digitisation process.
- Any changes must be written down, recorded and made accessible on the information management systems of the Austrian Film Museum.
- Technical metadata relating to the scan must be archived and transferred or recorded onto the data management system of the Film Museum.
- Regardless of the required end format, the original scan must be carried out frame-by-frame with full, un-compressed image content at highest resolution and bit depth.[25] We are following the guidelines of the FIAF Technical Commission published in 2018.[26]
- The original scan must be archived, regardless which other files and formats will be created from it. 2K resolution with 2048x1080 pixels and 10 bit (log) picture depth is the acceptable minimum resolution for archiving uncompressed single frames in an open source format.[27] For sound, the acceptable minimum requirement for archiving are WAV files with 48 kHz 16 bit.
- Any intermediate files or mezzanine files created from the original scan for access, or files created for restorations, should also be saved in high resolution (single frame sequences or FFV1 files).
- All modifications of raw scan data must be recorded in writing and made accessible in the Museum's information management system.

Ad 5. Metadata Capture and Metadata Management

As stated in Sections 1-4 above, it is essential to record information on digital collections items and to preserve them for the long-term, and to integrate them as seamlessly as possible with information on other collections and information systems.

A relational database and following on from that, a digital asset management system (DAMS), are essential components to automate the preservation and the management of digital data to a large extent. **The act of filing unstructured information about data doesn't constitute metadata management and cannot be regarded as adequate archiving. An adequate database should have the following functionality:**

[25] This means that interpolation of films with a frame rate less than 24fps should only be carried out when creating access files. For the master file, single frames need to be captured.
[26] "The Digital Statement. Recommendations for digitization, restoration, digital preservation and access," https://www.fiafnet.org/pages/E-Resources/Digital-Statement.html
[27] This minimum requirement applies to small gauge films (including 16mm) and for the digitisation of 35mm film for access purposes. For the restoration of 35mm source material, film materials should be scanned at 4K resolution if possible to better allow for image processing. For 35mm negative scanning 4K is recommended to capture the visual information of the source as much as possible.

- The capability to integrate technical metadata, filmographic metadata with information on the provenance of the material and descriptions of its contents and context.
- Digital objects must be integrated relationally on a data level with analogue source materials: to manage materials solely on data carrier level (LTO tape) is impermissible.[28]
- The FIAF cataloguing standard should be applied.[29]
- The integration of referential databases via linked (open) data resources is desirable and should be prepared with scalability in mind.
- The creation and the management of access copies (via Web player and/or automated process to restore files from offline or nearline servers) is desirable but depends on the system's ability for scalability.

The same principles outlined in the above also apply for this type of database: the underlying architecture must be open source and not proprietary, to ensure a seamless and effective exchange of information and sustainability.

5.1 Access

Digitisation of archive film brings us nearer to the goal of contributing to making Austria's film heritage broadly accessible for:

- Research and outreach
- Study and scholarship
- Creative and artistic re-use
- exhibitions outside a cinematheque context

As set out in our collections policy, The Austrian Film Museum is committed to the principle of open access to our collections. This particularly applies to our digital collection. The Film Museum endeavours to grant access to the collection for any legitimate research request, except in cases where limitations such as conservation issues, copyright restrictions or ethical considerations, all of which are internationally accepted legitimate reasons for restrictions, apply. [30]

Access to our digital film holdings is primarily achieved

- Through externally-funded research projects and co-operations,
- On the Film Museum's website and
- On selected social media platforms.

Since 2018, digital film data is usually available free-of-charge for non-commercial usage (fair dealing), and, apart from a few exceptions the material is available in watermarked, high resolution HD formats. The Film Museum is therefore meeting the need to make

[28] This doesn't mean that each single frame file (DPX or TIFF) is linked separately. Linking data is carried out at the FFV1 or other TAR-file level.
[29] Refer to Section 6 for EN-Standard 15907
[30] Refer to ethical codes and guidelines by FIAF and ICOM, Section 6.

authorised, well-researched and curated archive film accessible for research and teaching. Depending on the nature of a project, The Film Museum usually makes its own research data and research outcomes available to the general public for free usage including editing, copying and disseminating materials by applying open licences and the principle of Open Access.

To guarantee transparency and to increase visibility and usage of our collection, we aim to make all digital collection materials searchable online by 2022.

5.2 Co-operation and Knowledge Sharing

Standardised digitisation, cataloguing and the management of metadata, enabling and advancing the integration of institutional collections in joint search engines or platforms. The Film Museum has been part of the Europeana aggregation platform "European Film Gateway" since 2012 (http://www.europeanafilmgateway.eu).

We are committed to the principle of co-operation and of seamless exchange of materials [with our partners]. We aim to enable aggregation of our data through integration of international agreed metadata models in our own data management.

Ad 6. Relevant Standards and Best Practice Guidelines

Österreichische Mediathek – Das digitale System (The digital system): https://mediathek.at/digitalisierung/das-digitale-system-der-mediathek/

GLAM Peak Australia – Digital Access to Collections: http://www.digitalcollections.org.au

ICOM (International Council of Museums) Code of Ethics (2017): http://icom-oesterreich.at/publikationen/icon-code-ethics-0

FIAF Code of Ethics (1997): https://www.fiafnet.org/pages/Community/Code-of-Ethics.html

FIAF Technical Commission resources: https://www.fiafnet.org/pages/E-Resources/Technical-Commission-Resources.html

- The Digital Statement. Recommendations for digitization, restoration, digital preservation and access (2018)
- Digital Preservation Principles (2017)
- Recommendation on the deposit and acquisition of D-cinema elements for the long-term preservation and access (2010)
- Choosing a Film Scanner (2016)

FIAF Moving Image Cataloguing Manual (2016): https://www.fiafnet.org/pages/E-Resources/Cataloguing-Documentation-Commission-Resources.html

IASA Special and Technical Publications: https://www.iasa-web.org/iasa-special-and-technical-publications

- IASA-TC 03 The Safeguarding of the Audio Heritage: Ethics Principles and Preservation Strategy (2017, 4th Edition)
- IASA-TC 04 Guidelines on the Production and Preservation of Digital Audio Object (2009)
- IASA-TC 05 (2014) Handling and Storage of Audio and Video Carriers; Ethical Principles for Sound and Audiovisual Archives (2010).

Open Frameworks & Standards, FFV1 and Matroska in Film Archive:

- RAWCooked Initiative: https://mediaarea.net/RAWcooked
- Using FFV1 for preservation: http://www.av-rd.com/knowhow/video/risk_assessment.html

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Autors: Michael Loebenstein, Kevin Lutz, Janneke van Dalen.
English translation: Corinna Reicher.

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