TECHNICAL SPECIFICATION

colour inside

Professional video storage products – Tape-less camera recorder using MXF file format – Encoding guidelines –
Part 2: Mapping MPEG-2 and AVC Streams into MXF

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Part 2: Mapping MPEG-2 and AVC Streams into MXF

FOREWORD

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Technical specifications are subject to review within three years of publication to decide whether they can be transformed into International Standards.

IEC TS 62871-2, which is a technical specification, has been prepared by technical area 6: Storage media, storage data structure, storage systems and equipment, of IEC technical committee 100: Audio, video and multimedia systems and equipment.

The text of this technical specification is based on the following documents:

Enquiry draft	Report on voting
100/3152/DTS	100/3218/RVDTS

Full information on the voting for the approval of this technical specification can be found in the report on voting indicated in the above table.

This document has been drafted in accordance with the ISO/IEC Directives, Part 2.

A list of all parts in the IEC 62871 series, published under the general title *Professional video storage products – Tape-less camera recorder using MXF file format – Encoding guidelines*, can be found on the IEC website.

The committee has decided that the contents of this document will remain unchanged until the stability date indicated on the IEC website under "http://webstore.iec.ch" in the data related to the specific document. At this date, the document will be

- reconfirmed,
- withdrawn,
- replaced by a revised edition, or
- amended.

A bilingual version of this publication may be issued at a later date.

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INTRODUCTION

The professional camera recorder has evolved from a traditional tape-based system into a file-based system, taking advantage of recent advances in information technology. Instead of using conventional magnetic tape as the recording medium, video and audio streams can now be stored as files that can be read directly by a personal computer (PC).

Several file format specifications exist, and most broadcasters are using the Material eXchange Format (MXF), which has been standardized by the Society of Motion Picture and Television Engineers (SMPTE). As reported in IEC TR 62712:2011, the MXF file format has been adopted for various types of professional tape-less camera recorders. MXF is being used by many broadcast stations around the world. Since the MXF file format provides a multiplicity of functions and options in order to satisfy the needs of various applications in a range of situations, it is important to address interoperability issues between equipment. Therefore, it is essential for interoperability that there is an appropriate Technical Specification that specifies guidelines for MXF implementations and operational usage.

The IEC 62871 series gives encoding guidelines for professional tape-less camera recorders using the MXF file format to ensure interoperability.

The IEC 62871 series currently consists of:

– IEC 62871-1, which gives guidelines for MXF operational patterns for professional tape-less camera recorders and also outlines the general parts of the MXF file format.
– IEC 62871-2, which gives guidelines for mapping MPEG-2 and AVC Streams into MXF files which are used for professional tape-less camera recorders.

PROFESSIONAL VIDEO STORAGE PRODUCTS – TAPE-LESS CAMERA RECORDER USING MXF FILE FORMAT – ENCODING GUIDELINES –

Part 2: Mapping MPEG-2 and AVC Streams into MXF

1 Scope

This part of IEC 62871, which is a technical specification, specifies implementation guidelines for mapping MPEG-2 video and AVC streams into MXF file format for professional tape-less camera recorders.

The guidelines are applicable to the creation of an MXF file in professional tape-less camera recorders. They are also applicable for content management software and to equipment that supports MXF files generated by professional tape-less camera recorders.

2 Normative references

The following documents are referred to in the text in such a way that some or all of their content constitutes requirements of this document. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

ISO/IEC 13818-2:2013, *Information technology – Generic coding of moving pictures and associated audio information – Part 2: Video*

ISO/IEC 14496-10:2014, *Information technology – Coding of audio-visual objects – Part 10: Advanced Video Coding*

SMPTE ST 377-1:2011, *Material Exchange Format (MXF) – File Format Specification*

SMPTE ST 381-2:2018, *Material Exchange Format (MXF) – Mapping MPEG Streams into the MXF Constrained Generic Container*

SMPTE ST 381-3:2017, *Material Exchange Format (MXF) – Mapping AVC Streams into the MXF Constrained Generic Container*

3 Terms and definitions

For the purposes of this document, the terms, definitions and abbreviated terms given in ISO/IEC 13818-2, ISO/IEC 14496-10, SMPTE ST 377-1, SMPTE ST 381-2 and SMPTE ST 381-3 apply.

ISO and IEC maintain terminological databases for use in standardization at the following addresses:

- IEC Electropedia: available at http://www.electropedia.org/
- ISO Online browsing platform: available at http://www.iso.org/obp

4   Mapping of MPEG-2 video and AVC streams into MXF

4.1   Video codec

The MXF file body, which contains video, sound and data is specified with various types of video codec. As reported in IEC TR 62712, two types of video codec, MPEG-2 defined in ISO/IEC 13818-2 and MPEG-4 AVC/H.264 defined in ISO/IEC 144960-10, are widely used in professional tape-less camera recorders.

ISO/IEC 13812-2, the MPEG-2 video specification, enables the compression of picture-based video. In this specification, for progressive video, a picture is identical to a frame, while for interlaced video a picture can refer to a frame or to the top field or the bottom field of the frame depending on the context.

ISO/IEC 14496-10, the MPEG-4 AVC/H.264 specification, enables more efficient compression than MPEG-2 video compression generally.

In this guideline, the term "picture" is used as a collective term for a frame or a field, as defined in ISO/IEC 14496-10.

In both specifications, progressive video is encoded frame-based, and interlaced video is encoded field-based. A sequence of macroblocks is defined as a "slice". A picture can be divided into multiple slices, or a picture can be constituted by one slice. Further, the slice can be divided into multiple blocks.

4.2   Video codec mapping

The wrapping specification of an MPEG-2 video stream is specified in SMPTE ST 381-2, while for an AVC stream it is specified in SMPTE ST 381-3. A sequence of pictures is KLV-coded as defined in SMPTE ST 336. The MPEG-2 video and AVC streams are KLV-wrapped using the MPEG Picture Element Key defined in SMPTE ST 381-2. One type of KLV wrapping, defined as "frame wrapping", is specified for the MPEG body structure and is described in this subclause.

As described in SMPTE ST 379-2, frame wrapping has one or more content packages in the essence container. An example of frame wrapping of MPEG-2 video using MXF Operational Pattern 1a (OP-1a) is shown in Figure 1. Each Content Package has the duration of one MPEG video access unit (AU). Specifying the duration through an MPEG video AU determines where the MPEG headers will be found. Through these MPEG headers, the picture type can be determined as shown in Annex C of SMPTE ST 381-2:2018.

The frame wrapping method is intended to enable retrieval of individual AUs and the corresponding field/frame within them by MXF applications which process at the KLV level. This can be particularly useful for applications that support frame-based access in order to edit or play back randomly.