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Edition 1.0 2015-12

TECHNICAL SPECIFICATION

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Professional video storage products – Tape-less camera recorder using MXF file format – Encoding guidelines – Part 1: MXF Operational Patterns

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CONTENTS

FOREWORD 4
INTRODUCTION 6
1 Scope 7
2 Normative references 7
3 Terms, definitions,abbreviations and conventions 7
3.1 Terms and definitions 7
3.2 Abbreviations 7
3.3 Conventions 8
4 Overview of the MXF file format 8
4.1 General 8
4.2 File structure 9
4.2.1 Overview 9
4.2.2 File Header 9
4.2.3 File Body 9
4.2.4 File Footer 9
4.3 Partitions 9
4.3.1 Overview 9
4.3.2 Header Partition 10
4.3.3 Body Partition 10
4.3.4 Footer Partition 10
4.3.5 Partition rules summary 10
4.3.6 Partition status 11
4.4 Key-Length-Value (KLV) coding 11
4.4.1 KLV encoding structure 11
4.4.2 KLV Fill Item 11
4.5 Header Metadata 12
4.5.1 Overview 12
4.5.2 Structural Metadata 12
4.5.3 Descriptive Metadata 12
4.5.4 Structure of Header Metadata 12
4.6 Operational Pattern 13
4.6.1 Operation Pattern outline 13
4.6.2 Generalized Operational Pattern 14
4.6.3 Specialized Operational Pattern 15
4.7 Index Table 15
5 Encoding guideline for professional tape-less camera recorder 15
5.1 General 15
5.2 Operational Pattern 16
5.2.1 General 16
5.2.2 Operation of OP-1a 16
5.2.3 Operation of OP-Atom 17
Bibliography 20

Figure 1 – Overview of MXF file structure 9
Figure 2 – Required order of file components in each Partition kind 10

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IEC TS 62871-1:2015
https://standards.iteh.ai/catalog/standards/sist/6b20ffdc-cb38-4e81-9b04-aad5ed71bbff/iec-ts-62871-1-2015

Figure 3 – Key-length-value encoding 11
Figure 4 – Header Metadata structure 13
Figure 5 – Generalized Operational Pattern 14
Figure 6 – Basic structure of Material Package and File Package in OP-Atom 15
Figure 7 – Typical example of Index Table placement for OP-1a 17
Figure 8 – Example-1 to locate the entire Index Table in the Body Partition 17
Figure 9 – Example-2 to locate the entire Index Table in the Header Partition 17
Figure 10 – Basic Structure of OP-Atom 18

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IEC TS 62871-1:2015
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PROFESSIONAL VIDEO STORAGE PRODUCTS – TAPE-LESS CAMERA RECORDER USING MXF FILE FORMAT – ENCODING GUIDELINES –

Part 1: MXF Operational Patterns

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- the subject is still under technical development or where, for any other reason, there is the future but no immediate possibility of an agreement on an International Standard.

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

IEC TS 62871-1, 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
100/2373/DTS	100/2446/RVC

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

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

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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.

Future parts will be proposed to specify implementation guidelines appropriate for specific codecs.

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

Part 1: MXF Operational Patterns

1 Scope

This part of IEC 62871, which is a Technical Specification, gives guidelines for MXF Operational Patterns for professional tape-less camera recorders and also outlines the general parts of the MXF file format.

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, in whole or in part, are normatively referenced in this document and are indispensable for its application. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

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

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SMPTE ST 378:2004, *For Television – Material Exchange Format (MXF) – Operational Pattern 1a (Single Item, Single Package)*

SMPTE ST 379-1:2009, *Material Exchange Format (MXF) – MXF Generic Container*

SMPTE ST 379-2:2010, *Material Exchange Format (MXF) – MXF Constrained Generic Container*

SMPTE ST 390:2011, *Material Exchange Format (MXF) – Specialized Operational Pattern "OP-Atom" (Simplified Representation of a Single Item)*

3 Terms, definitions,abbreviations and conventions

3.1 Terms and definitions

For the purposes of this document, the terms and definitions given in SMPTE ST 377-1, SMPTE ST 379-1 and SMPTE ST 379-2 apply.

3.2 Abbreviations

Abbreviation	Definition
MP	Material Package
FP	File Package

OP-1a	Operational Pattern 1a
OP-1b	Operational Pattern 1b
OP-1c	Operational Pattern 1c
OP-2a	Operational Pattern 2a
OP-2b	Operational Pattern 2b
OP-2c	Operational Pattern 2c
OP-3a	Operational Pattern 3a
OP-3b	Operational Pattern 3b
OP-3c	Operational Pattern 3c
OP-Atom	Operational Pattern Atom
CBR	Constant Bit Rate
VBR	Variable Bit Rate

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3.3 Conventions

In this Technical Specification, capital letters are used for terms defining the MXF file standardized in the SMPTE publications which are cited in the normative references.

4 Overview of the MXF file format

4.1 General

The MXF file format is standardized in SMPTE, and different aspects of the detailed specifications are covered in several standards. The general part is specified in SMPTE ST 377-1, which defines the data structure of the MXF file for the interchange of audio-visual material, all the components of the MXF file format and the requirements to enable these components to be added as a plug-in to an MXF file.

The MXF Generic Container is specified in SMPTE ST 379-1 and SMPTE ST 379-2. The Generic Container is the native Essence Container of the MXF file body and these standards are defined to enable the interchange of streamable audio-visual material. Appropriate essence and metadata payloads that can be mapped into the MXF Generic Container are defined in associated documents listed in the Bibliography.

The MXF file format includes Operational Pattern specifications that may define restrictions on the way in which this Essence Container type should be implemented. For example, OP-1a is specified in SMPTE ST 378 and OP-Atom is specified in SMPTE ST 390.

4.2 File structure

4.2.1 Overview

An overview of the MXF file structure is shown in Figure 1. The general structure of the MXF file comprises three components: the File Header, the File Body and the File Footer.

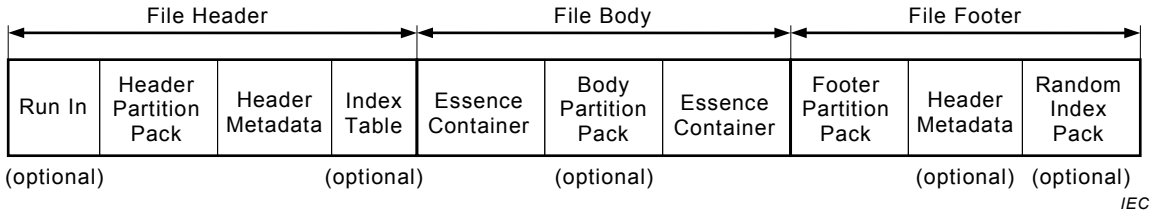

Figure 1 – Overview of MXF file structure

4.2.2 File Header

The File Header is located at the start of the MXF file and includes a Header Partition Pack and a Header Metadata. The file header may include a Run-In and an Index Table as an option.

4.2.3 File Body

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The File Body provides the mechanism for embedding Essence Data such as audio, video and other associated data within the MXF files. The File Body contains zero or more Essence Containers and, if there is more than one Essence Container in the File Body, the Essence Containers are multiplexed together using Partitions (see 4.3). Furthermore, the file body may include an index table and a repetition of the Header Metadata as an option.

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4.2.4 File Footer

The File Footer is located at the end of the file. As shown in Figure 1, the File Footer includes a Footer Partition Pack. It may include a repetition of the Header Metadata and a Random Index Pack. The File Footer may also include optional Index Table Segments.

4.3 Partitions

4.3.1 Overview

Partitions logically divide the MXF file to allow easier parsing, to help streaming and to manage the creation of Index Tables. As shown in Figure 2, there are three kinds of Partitions in the MXF file. The explanation of each Partition is described in the following sections.