

# Technical Specification

December 2015

**ARD\_ZDF\_SDF01**  
MXF Profile with D10, 576i/25  
and one 8-channel AES3 audio track

Version 1.0

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# ARD\_ZDF\_SDF01

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## 1. Introduction

The specification provided in this profile was developed within the working group Quality Management (WG QM), a group of the K-Prod/FSBL. The WG QM had the task to investigate and give recommendations on quality management in file based production. In particular, it should provide solutions for interoperability problems with MXF-files.

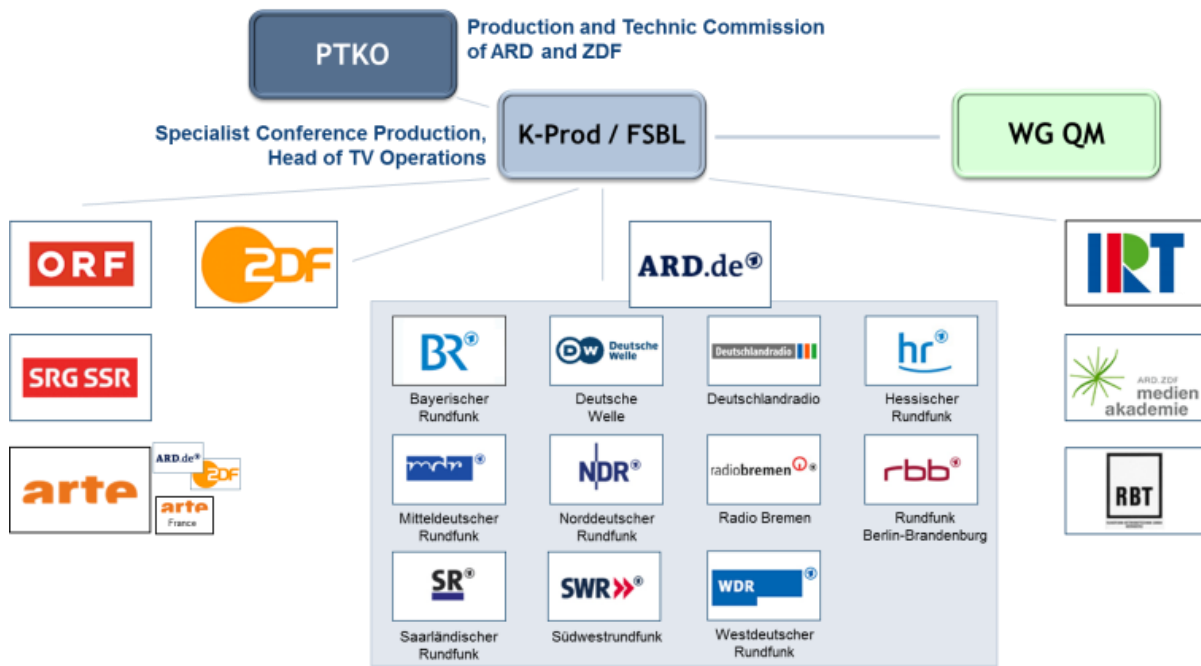


Figure 1 - Organisation of the working group Quality Management.

Findings lead to the specification of profiles for MXF-Files. These MXF-Profiles are the basis for the reduction of interoperability problems and a solid ground for automated quality control using file based QC-Tools.

The number of Standard Definition (SD) material that needs to be handled in production environments became more and more insignificant, due to the general switch to HDTV in broadcast. However broadcasters archives hold a great amount of content in SD. The archived SD material sometimes is rerecorded within a new MXF file, usually in large-scale projects. For these cases the profile ARD\_ZDF\_SDF02 provides MXF recommendations for D10 Files with focus on high decoder dependability.

## 2. Conformance Notation

This document contains both normative text and informative text.

All text is normative except for that in the Introduction, and any section explicitly labelled as 'Informative' or individual paragraphs which start with 'Note:'

Normative text describes indispensable or mandatory elements. It contains the conformance keywords 'shall', 'should' or 'may', defined as follows:

'Shall' and 'shall not': Indicate requirements to be followed strictly and from which no deviation is permitted in order to conform to the document.

'Should' and 'should not': Indicate that, among several possibilities, one is recommended as particularly suitable, without mentioning or excluding others.  
OR  
indicate that a certain course of action is preferred but not necessarily required.  
OR  
indicate that (in the negative form) a certain possibility or course of action is deprecated but not prohibited.

'May' and 'need not': Indicate a course of action permissible within the limits of the document.

Informative text is potentially helpful to the user, but it is not indispensable and it does not affect the normative text. Informative text does not contain any conformance keywords.

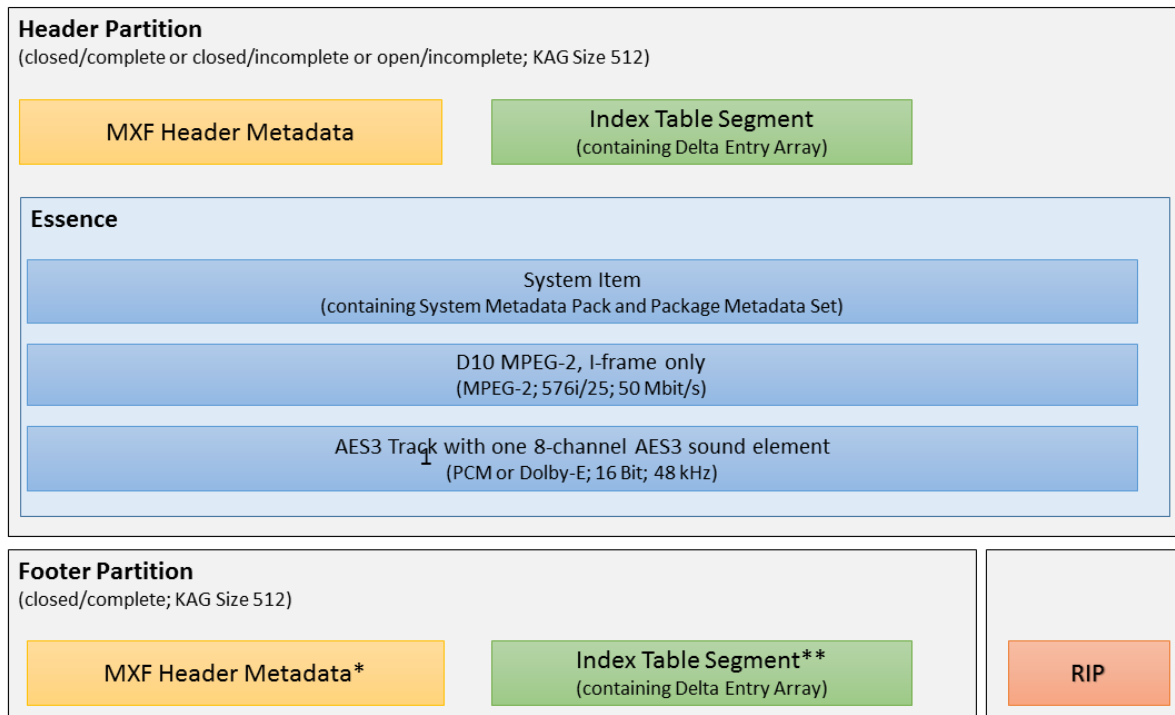
### 3. Specification of MXF file properties

This section contains the core specification for the MXF profile ARD\_ZDF\_SDF01. The MXF profile provides further restrictions to the MXF standards as defined by SMPTE in st377-1:2011, Amendment 2:2012 to SMPTE ST 377-1:2011, st381-2:2011 and st382:2007. These standards always apply if not explicitly stated otherwise.

Basis for ARD\_ZDF\_SDF01 was the specification SMPTE st386:2004.

To match the ARD\_ZDF\_SDF01 Profile an MXF file shall comply with all parameters specified in this document.

Figure 2 gives an overview of the MXF file structure according to the profile specified by this document.



\* if Header Partition Status open/incomplete or closed/incomplete

\*\* optional

*Figure 2 - Structure of the MXF file according to MXF-Profile ARD\_ZDF\_SDF01*

**Note:** Not all specified parameters represent concrete items in the MXF Header Metadata. Thus some parameters might be difficult to check automatically with Quality Control Tools.

**Note:** Some parameters specify values that do not restrict the MXF Standards any further. They are listed to express explicitly that all values are supported or that they shall be present.

The following table gives an overview of the nomenclature used for the parameter specification.

Type	Description	Example Notations
Concrete Values	Designates those values that directly represent a value in the MXF file, are written in italic letters. Depending on the context, they can be expressed in decimal, hex or binary numbers, or as true or false.	"24", "06.0e.2b.34.04.01.01.01.0d.0 1.03.01.02.06.03.00"
Description	Descriptions for concrete values are written in round brackets after the value itself.	"130 (= 422P@HL)"
Value ranges	If more than one value is valid in the Profile all possible values are listed in square brackets, separated with a comma. Or they are listed as a range with "-" between the smallest and highest possible value.	"[true, false]", "[1-12]"
Plain text	Explanation of the corresponding property of the MXF File.	"Shall be present", "1 Audio Track (containing PCM or Dolby-E)"

The following table contains the MXF file properties specified by this Profile.

Property Name	Property Specification
<b>Profile short description</b>	
Type	MXF OP1a / D10 (SMPTE st386-2004)
MXF structure	Header partition including complete essence, Footer partition
Essence Mapping	According to SMPTE st386-2004
Generic Container	Frame-based mapping according to SMPTE st379-2:2010
Video Coding Syntax	D10, MPEG-2, I-frame only (SMPTE st356 and ISO/IEC 13818-2)
Scanning raster	576i/25
Audio	1 Audio Track with one 8-channel AES3 sound element (containing PCM or Dolby-E)

<b>General</b>	
File format	MXF (SMPTE st377-1:2011)
Operational Pattern	OP1a (SMPTE st378:2004)
Header Partition Status	Closed, Complete (preferred) / Closed, Incomplete / Open, Incomplete
Body Partition Status	Body partitions shall not be present
Footer Partition Status	Closed, Complete
KAG Size	512 (consistent for all Partition Packs)
Header Metadata in Header Partition	The size of header metadata in Header Partition shall be at least 2 000 000 Byte. The size can be achieved using one or more KLV Fill Items
System Item	Shall be present (SMPTE st326 and st385) includes System Metadata Pack and Package Metadata Set
Essence location	Complete Essence in Header Partition

Index table location	The Index Table segment shall be located in the Header Partition (Forward Indexing).
Header Metadata Location	Header Metadata shall be located in the Header Partition. If the Header Partition Status is "Open, incomplete" or "Closed, incomplete" (e.g. update needed because of "on the fly generation") they shall be completed ("Closed, completed") in Footer Partition.
Descriptive Metadata	Shall not be present
Random Index Pack	Shall be present
Essence Elements in Essence Container	Shall be in the ordered sequence: System Item, Picture Item, Sound Item.
Tracks in Material Package	1 Timecode Track, 1 Video Track, 1 Audio Track
Tracks in Source Package	1 Timecode Track, 1 Video Track, 1 Audio Track (referencing the 8-channel AES3 sound element)
Timecode Material Package	Shall be present
Timecode Source Package	The Timecode Track shall contain one Timecode Component Set. The start value shall match with the timecode value of the first System Item.
Timecode System Item	Shall be present

### Index Table Segment Set

Index Edit Rate	25 / 1
Index Start Position	0
Index Duration	shall either be set to 0 or to the total number of Edit Units in the Essence Container
Edit Unit Byte Count	>0
Slice Count	0
Delta Entry Array	Shall be present and complete
Index Entry Array	Shall not be present

### Timeline Track

Edit Rate	25 / 1
Origin (Pre-Charge)	May be present (0)

### Video

Essence Container Label (Video essence mapping)	<i>06.0e.2b.34.04.01.01.01.0d.01.03.01.02.01.01.01</i> (= MXF-GC SMPTE D-10 625x50I 50Mbps; MXF-GC Frame-wrapped SMPTE D-10 625x50I 50Mbps DefinedTemplate)
Picture Element Key	<i>06.0e.2b.34.01.02.01.01.0d.01.03.01.05.01.01.00</i> (= MXF Generic Container Version 1 MPEG-2 4:2:2 P@ML Picture Essence)
<b>Picture Descriptor (CDCI Descriptor)</b>	



Picture Essence Coding	<i>06.0e.2b.34.04.01.01.01.04.01.02.02.01.02.01.01</i> (= SMPTE D-10 MPEG-2 422P-ML; SMPTE D-10 50Mbps 625x50I)
Aspect Ratio	[16:9, 4:3, 0:0] (0:0 if aspect ratio is unknown)
Sample Rate	25 / 1
Container Duration	Shall be present and identical with audio Container Duration. If the partition status is incomplete, the value may be absent.
Field Dominance	1 (= Field 1 is first in temporal order)
Signal Standard	1 (= ITU-R BT.601 and BT.656, also SMPTE ST 125 (525 and 625 line interlaced))
Frame Layout	1 (= separate_fields)
Display Width x Display Height	720 x 288
Sample Width x Sample Height	720 x 304
Stored Width x Stored Height	720 x 304
Stored F2 Offset	0
Sampled X Offset	0
Sampled Y Offset	0
Display X Offset	0
Display Y Offset	16
Display F2 Offset	0
Active Format Descriptor	0000 0000 (= undefined, aspect ratio 4:3) 0010 0000 (= letterbox, aspect ratio 4:3) 0100 0000 (= full frame, aspect ratio 4:3) 0101 0000 (= letterbox, aspect ratio 4:3)  0000 0100 (= undefined, aspect ratio 16:9) 0010 0100 (= letterbox, aspect ratio 16:9) 0100 0100 (= full frame, aspect ratio 16:9) 0100 1100 (= pillarbox, aspect ratio 16:9)
Video Line Map	7, 320 (= for Interlace)
Capture Gamma (st377-2009 Transfer Characteristic)	<i>06.0E.2B.34.04.01.01.01.04.01.01.01.01.01.00.00</i> (= ITU-R BT470 Transfer Characteristic)
Image Start Offset	0
Image End Offset	0
Color Siting	0 (= coSiting as in ITU-R Rec 601)
Padding Bits	0
Black Ref Level	16
White Ref Level	235
Color Range	225
Horizontal Subsampling	2 (= 4:2:2)
Vertical Subsampling	1 (= 4:2:2)

Component Depth	8 bit
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<b>Audio</b>	
Essence Container Label (Audio essence mapping)	<i>06.0e.2b.34.04.01.01.01.0d.01.03.01.02.01.01.01</i> (= MXF-GC SMPTE D-10 625x50I 50Mbps; MXF-GC Frame-wrapped SMPTE D-10 625x50I 50Mbps DefinedTemplate)
Sound Element Key	<i>06.0e.2b.34.01.02.01.01.0d.01.03.01.06.01.10.00</i> (= MXF Generic Container Version 1 SMPTE 331M 8-Channel AES3 Sound Essence)
Audio channels per Sound Element	8
<b>Generic Sound Essence Descriptor</b>	
Sample Rate	25 / 1
Container Duration	Shall be present and identical with video Container Duration. If the partition status is incomplete, the value may be absent.
Audio sampling rate	48000 / 1
Locked/Unlocked	1 (= locked)
Dial Norm	If available the correct gain to be applied to normalize perceived loudness of the clip, defined by ITU-R BS.1196-2:2010
Audio Ref Level	If the value is known it shall be present
Channel Count	8
Quantization bits	16

<b>Ancillary Data</b>	
Data content (EssenceContainers)	Shall not be present

<b>Other</b>	
Dark Metadata	Private user data (Metadata Class 14) shall not be present. Only SMPTE Metadata Classes 1-7 and 13 are allowed.

## 4. Appendix B: Additional Decoder requirements (informative)

The following table is a collection of common MXF file properties that differ from the ARD\_ZDF\_SDF01 Profile. A decoder should be able to handle these properties.

Property Name	Additional Decoder requirements
<b>General</b>	
Header Metadata Location	May be located in other partitions
Descriptive Metadata	May be present
Tracks in Material Package	Optional ANC data track
Tracks in Source Package	Optional ANC data track
Timecode Material Package	May be absent
Timecode Source Package	May be absent If present, TC can be different from System Item
Timecode System Item	May be absent If present, TC can be different from Source Package

<b>Video</b>	
<b>Picture Descriptor (MPEG Video Descriptor; st381-2:2011)</b>	
Container Duration	May be absent
Frame Layout	3 (= mixed_fields)
Active Format Descriptor	Optional (including all values)
Color Siting	4 (= Siting in accordance with ITU-R Rec 601)

<b>Audio</b>	
<b>Generic Sound Essence Descriptor</b>	
Sample Rate	48000 / 1
Channel count	4
Quantization Bits	24

<b>Ancillary Data</b>	
Data content (EssenceContainers)	May be present

<b>Other</b>	
Dark Metadata	May be present



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