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**Information technology — Coded  
representation of immersive media —**

**Part 5:  
Visual volumetric video-based coding  
(V3C) and video-based point cloud  
compression (V-PCC)**

*Technologie de l'information — Représentation codée de média  
immersifs —*

*Partie 5: Codage basé sur la vidéo volumétrique (V3C) et compression  
de nuage de points basée sur la vidéo (V-PCC)*

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## Foreword

ISO (the International Organization for Standardization) and IEC (the International Electrotechnical Commission) form the specialized system for worldwide standardization. National bodies that are members of ISO or IEC participate in the development of International Standards through technical committees established by the respective organization to deal with particular fields of technical activity. ISO and IEC technical committees collaborate in fields of mutual interest. Other international organizations, governmental and non-governmental, in liaison with ISO and IEC, also take part in the work.

The procedures used to develop this document and those intended for its further maintenance are described in the ISO/IEC Directives, Part 1. In particular, the different approval criteria needed for the different types of document should be noted. This document was drafted in accordance with the editorial rules of the ISO/IEC Directives, Part 2 (see [www.iso.org/directives](http://www.iso.org/directives) or [www.iec.ch/members\\_experts/refdocs](http://www.iec.ch/members_experts/refdocs)).

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This document was prepared by Joint Technical Committee ISO/IEC JTC 1, *Information technology*, Subcommittee SC 29, *Coding of audio, picture, multimedia and hypermedia information*.

This second edition cancels and replaces the first edition (ISO/IEC 23090-5:2021), which has been technically revised.

The main changes are as follows:

- Additions needed for ISO/IEC 23090-12 MPEG Immersive video
- Various minor improvements and corrections.

A list of all parts in the ISO/IEC 23090 series can be found on the ISO and IEC websites.

Any feedback or questions on this document should be directed to the user's national standards body. A complete listing of these bodies can be found at [www.iso.org/members.html](http://www.iso.org/members.html) and [www.iec.ch/national-committees](http://www.iec.ch/national-committees).

## Introduction

Advances in 3D capturing and rendering technologies have unleashed a new wave of innovation in Virtual/Augmented/Mixed reality (VR/AR/MR) content creation and communication, of which visual volumetric video is an integral part.

Visual volumetric video, a sequence of visual volumetric frames, if uncompressed, may be represented by a large amount of data, which can be costly in terms of storage and transmission. This has led to the need for a high coding efficiency standard for the compression of visual volumetric data.

Visual volumetric frames can be coded by converting the 3D volumetric information into a collection of 2D images and associated data. The converted 2D images can be coded using widely available video and image coding specifications, such as ISO/IEC 14492-10 and ISO/IEC 23008-2 and the associated data can be coded with mechanisms specified in this document. The coded images and the associated data can then be decoded and used to reconstruct the 3D volumetric information. This document specifies a generic mechanism for visual volumetric video coding, i.e. visual volumetric video-based coding. The generic mechanism may be used by applications targeting volumetric content, such as point clouds, immersive video with depth, mesh representations of visual volumetric frames, etc.

In addition to the generic mechanism of coding volumetric content, this document specifies one of the applications of visual volumetric video-based coding targeting point cloud representations of visual volumetric frames. In a point cloud sequence, each point cloud frame contains a collection of points. Each point has a 3D position, i.e., geometry information, and each point may also be associated with a number of attributes, such as colour, reflectance, surface normal, etc.

# Information technology — Coded representation of immersive media —

## Part 5: Visual volumetric video-based coding (V3C) and video-based point cloud compression (V-PCC)

### 1 Scope

This document specifies the syntax, semantics, and decoding for visual volumetric media using video-based coding methods. Furthermore, this document specifies processes that may be needed for reconstruction of visual volumetric media, and may also include additional processes such as post-decoding, pre-reconstruction, post-reconstruction, and adaptation.

### 2 Normative references

The following documents are referred to in the text in such a way that some or all of their content constitute 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 10646, *Information technology — Universal coded character set (UCS)*

ISO/IEC 14496-10, *Information technology — Coding of audio-visual objects — Part 10: Advanced video coding*

ISO/IEC 14496-12, *Information technology — Coding of audio-visual objects — Part 12: ISO base media file format*

ISO/IEC 14496-15, *Information technology — Coding of audio-visual objects — Part 15: Carriage of network abstraction layer (NAL) unit structured video in the ISO base media file format*

ISO/IEC 23008-2, *Information technology — High efficiency coding and media delivery in heterogeneous environments — Part 2: High efficiency video coding*

ISO/IEC 23090-3, *Information technology — Coded representation of immersive media — Part 3: Versatile video coding*

ISO/IEC 23091-2, *Coding-independent code points for video signal type identification*

Rec. ITU-T T.35, *Procedure for the allocation of ITU-T defined codes for non standard facilities*

Rec. ITU-T H.271, *Video back-channel messages for conveyance of status information and requests from a video receiver to a video sender*

IEEE 754-2019, *IEEE Standard for Floating-Point Arithmetic*

IETF RFC 1321, *The MD5 Message-Digest Algorithm*

IETF RFC 5646, *Tags for Identifying Languages*

### 3 Terms and definitions

For the purposes of this document, the following terms and definitions apply.