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**ISO 17215-3**

Second edition
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# Road vehicles — Video communication interface for cameras (VCIC) —

## Part 3: Camera message dictionary

*Véhicules routiers — Interface de communication vidéo pour caméras (ICVC) —*

*Partie 3: Dictionnaire de message de caméra*

Reference number
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# Foreword

ISO (the International Organization for Standardization) is a worldwide federation of national standards bodies (ISO member bodies). The work of preparing International Standards is normally carried out through ISO technical committees. Each member body interested in a subject for which a technical committee has been established has the right to be represented on that committee. International organizations, governmental and non-governmental, in liaison with ISO, also take part in the work. ISO collaborates closely with the International Electrotechnical Commission (IEC) on all matters of electrotechnical standardization.

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 ISO documents 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).

Attention is drawn to the possibility that some of the elements of this document may be the subject of patent rights. ISO shall not be held responsible for identifying any or all such patent rights. Details of any patent rights identified during the development of the document will be in the Introduction and/or on the ISO list of patent declarations received (see www.iso.org/patents).

Any trade name used in this document is information given for the convenience of users and does not constitute an endorsement.

For an explanation of the voluntary nature of standards, the meaning of ISO specific terms and expressions related to conformity assessment, as well as information about ISO's adherence to the World Trade Organization (WTO) principles in the Technical Barriers to Trade (TBT), see www.iso.org/iso/foreword.html.

This document was prepared by Technical Committee ISO/TC 22, *Road vehicles*, Subcommittee SC 31, *Data communication*.

This second edition cancels and replaces the first edition (ISO 17215-3:2014), which has been technically revised.

The main changes compared to the previous edition are as follows:

— corrections of Formulae and scaling in 7.6.8;

— editorial adoptions and corrections.

A list of all parts in the ISO 17215 series can be found on the ISO website.

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.

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# Introduction

Driver assistance systems are increasingly common in road vehicles. From the beginning, cameras were part of this trend. Analogue cameras were used in the beginning because of the lower complexity of the first systems. With increasing demand for more advanced functionality, digital image processing has been introduced. So-called one box design cameras (combining a digital image sensor and a processing unit) started being used in vehicles.

Currently, the market demands such systems with multiple functions. Even different viewing directions are in use. It seems plausible that in the near future a single vehicle could have between 6 and 12 cameras. For this reason and others like limitations in size, power consumption, etc., designs have been made where the cameras are separated from the processing unit. Therefore, a high-performance digital interface between camera and processing unit is necessary.

This document has been established in order to define the use cases, the communication protocol, and the physical layer requirements of a video communication interface for cameras, which covers the needs of driver assistance applications.

The video communication interface for cameras:

— incorporates the needs of the whole life cycle of an automotive grade digital camera,

— utilizes existing standards to define a long-term stable state-of-the-art video communication interface for cameras, usable for operating and diagnosis purposes,

— can be easily adapted to new physical data link layers including wired and wireless connections by using existing adaption layers, and

— is compatible with AUTOSAR.

This document is related to the general information and use case definition. This is a general overview document which is not related to the OSI model.

To achieve this, it is based on the Open Systems Interconnection (OSI) basic reference model specified in ISO/IEC 7498-1 and ISO/IEC 10731, which structures communication systems into seven layers. When mapped on this model, the protocol and physical layer requirements specified by this document, in accordance with Table 1 are broken into following layers:

— application (layer 7), specified in this document (ISO 17215-3);

— presentation layer (layer 6), specified in ISO 17215-2;

— session layer (layer 5), specified in ISO 17215-2;

— transport protocol (layer 4), specified in ISO 17215-4, ISO 13400-2;

— network layer (layer 3), specified in ISO 17215-4, ISO 13400-2;

— data link layer (layer 2), specified in ISO 17215-4, ISO 13400-3;

— physical layer (layer 1), specified in ISO 17215-4, ISO 13400-3.


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**Table 1 — Specifications applicable to the OSI layers**

<table>
<tr><th>Applicability</th><th>OSI 7 layers</th><th colspan="2">Video communication interface for cameras</th><th>Camera diagnostics</th></tr>
<tr><td rowspan="7">Seven layers according to ISO 7498–1 and ISO/IEC 10731</td><td>Application (layer 7)</td><td colspan="2">ISO 17215-3</td><td></td></tr>
<tr><td>Presentation (layer 6)</td><td colspan="2">ISO 17215-2</td><td></td></tr>
<tr><td>Session (layer 5)</td><td colspan="2">ISO 17215-2</td><td></td></tr>
<tr><td>Transport (layer 4)</td><td rowspan="2">ISO 17215-4</td><td rowspan="3">Other future interface standards</td><td rowspan="2">ISO 13400-2</td></tr>
<tr><td>Network (layer 3)</td></tr>
<tr><td>Data link (layer 2)</td><td rowspan="2">ISO 17215-4</td><td rowspan="2">ISO 13400-3</td></tr>
<tr><td>Physical (layer 1)</td></tr>
</table>

ISO 17215-1 has been established in order to define the use cases for vehicle communication systems implemented on a video communication interface for cameras; it is an overall document not related to the OSI model.

ISO 17215-2 covers the presentation layer implementation of the video communication interface for cameras.

This document, ISO 17215-3, covers the application layer implementation of the video communication interface for cameras; it includes the API.

ISO 17215-4 is the common standard for the OSI layers 1 to 4 for video communication interface for cameras. It complements ISO 13400 2 and ISO 13400 3 and adds the requirement for video transmission over Ethernet.

ISO 17215-2 and ISO 17215-3 (OSI layer 5 to 7) services have been defined to be independent of the ISO 17215-4 (OSI layer 1 to 4) implementation. Therefore, ISO 17215-4 could be replaced by another future communication document.

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# Road vehicles — Video communication interface for cameras (VCIC) —

## Part 3:
## Camera message dictionary

## 1 Scope

This document specifies the standardized camera messages and data types used by a VCIC camera (OSI layer 7).

Applications hosted on ECUs want to communicate with one or more cameras (e.g. “Ask camera for parameters.”). If the applications can use standardized services supported by the cameras (API layer 7), the development of a vision application is independent on the camera used. The services can be implemented by general libraries.

The definition of streaming data is not an issue of this API.

## 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 17215-1, *Road vehicles — Video communication interface for cameras (VCIC) — Part 1: General information and use case definition*

ISO 17215-2, *Road vehicles — Video communication interface for cameras (VCIC) — Part 2: Service discovery and control*

ISO 17215-4, *Road vehicles — Video communication interface for cameras (VCIC) — Part 4: Implementation of communication requirements*

## 3 Terms and definitions

For the purposes of this document, the terms and definitions given in ISO 17215-1 and the following apply.

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

— ISO Online browsing platform: available at https://www.iso.org/obp

— IEC Electropedia: available at http://www.electropedia.org/

**3.1**
**extrinsic parameter**
parameter that denotes the coordinate system transformations from 3D world (vehicle) coordinates (m,°) to 3D-camera coordinates (m,°)

**3.2**
**frame rate**
update rate per time of camera images

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**3.3**
**global shutter**
exposure that exposes all pixels at the same time

**3.4**
**histogram**
type of chart that acts as a graphical representation of the tonal distribution in a digital image

**3.5**
**intrinsic camera parameter**
parameter that denotes the coordinate system transformations from 3D camera (m) to 2D pixel coordinates (pixel)

## 4 Symbols and abbreviated terms

| Abbreviated term | Symbol | Full term |
|---|---|---|
| API | | Application Programming Interface |
| AEC | | Automatic Exposure Control |
| AGC | | Automatic Gain Control |
| DAS | | Driver Assistance System |
| ECU | | Electronic Control Unit |
| HDR | | High Dynamic Range |
| HMI | | Human Machine Interface |
| ID | | Identifier |
| ISO | | International Organization for Standardization |
| LDR | | Low Dynamic Range |
| LSB | | Least significant bit |
| MAC | | Media Access Control |
| OSI | | Open Systems Interconnection |
| PSE | | Persistent storage entry |
| ROI | $\rho$ | Region of Interest, i.e. sub-part of overall image |
| RPC | | Remote Procedure Call |

## 5 Conventions

This document is based on the conventions as specified in the OSI service conventions ISO/IEC 10731 as they apply for physical layer, protocol, network, and transport protocol and diagnostic services.


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