TECHNICAL SPECIFICATION

**ISO/TS 20684-10**

First edition
2021-04

# Intelligent transport systems — Roadside modules SNMP data interface —

## Part 10: Variable message signs

*Systèmes de transport intelligents — Interface de données SNMP pour les modules en bord de route —*

*Partie 10: Panneaux à messages variables*

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Reference number
ISO/TS 20684-10:2021(E)

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Published in Switzerland

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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).

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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.

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This document was prepared by Technical Committee ISO/TC 204, *Intelligent transport systems.*

A list of all parts in the ISO 20684 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

## 0.1 Background

A variable message sign (hereinafter referred to as a “VMS”) is an electronic traffic sign installed on the roadside to provide real-time traffic information to travellers, thereby improving their efficiency in the utilization of road traffic, and is a major physical component of the intelligent transport system (hereinafter referred to as “ITS”) which supplies the system with information for improvement of the safety on the road.

More VMSs are expected to be installed and operated due to an increase in demand for establishment of ITS and for replacement of existing VMSs which have exceeded their durability terms.

The operator of the traffic management centre needs real time data exchange between a VMS and the centre to supply information to the VMS in real time and to control and manage the VMS.

However, no standards for the information transmitted and received between the traffic management centre and the VMSs have been established, leading to the development of various protocols and their application to each VMS construction project. As a result, a variety of problems have arisen, including redundant investment in development costs and forced dependence on the protocol of the previous operator when replacing the existing VMSs with new ones.

This document therefore defines the data items (messages), formats and communication protocols (Application, Presentation, Session, and Transport layers) required to ensure the interoperability of the information transmitted and received between the VMS and the traffic management centre, thereby ensuring interoperability between the VMS and the centre.

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## 0.2 Overview

This document defines the message, the data elements making up the message, and the application layer profile for message transmission in order to ensure the interoperability between the VMS and the traffic management centre.

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In particular, in order to ensure the interoperability between the VMS and the traffic management centre, the interoperability is developed based on OSI (open system interconnection) 7 layers. A collection of standard protocols for each layer is referred to as a "profile."

ISO/IEC TR 10000-2 defines the basic classification and object presentation of OSI profiles as follows:

a) Interchange Format and Representation profiles define the information on and message structure of the data exchanged by applications.

b) Application profiles define the transmission mechanism for data exchange (concerning OSI layers 5 to 7 — Session, Presentation, and Application layers).

c) Transport profiles define the procedures and methods for exchanging data packets between systems (concerning OSI layers 1 to 4 — Transport, Network, Data Link, and Physical layers).

d) Relay profiles define the relaying function which enables the interconnection between systems while using different transmission profiles.

This document defines "Interchange Format and Representation," defined in ISO/IEC TR 10000-2.

a) Components and data elements of basic messages define the messages and detailed data elements which the operator of the traffic information system needs for operation of the VMS.

b) The data exchange communication profile defines the procedures and encoding methods for information exchange between the traffic management centre and the VMS.


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### 0.3 Document approach and layout

This document defines:

a) Physical architecture for varible message signs (Clause 6).

b) User needs that are deemed to be common to many types of field devices (Clause 7).

c) Requirements for implementing the identified user needs, organized by major feature (Clause 8).

d) The management information base (MIB) for the features defined by this document (Annex A).

e) A requirements traceability table that traces requirements to the design elements (Annex B).

f) The relationship to NTCIP 1203 (Annex C).

In addition, a simplified version of the conformance table and the MIBs are available electronically at https://standards.iso.org/iso/ts/20684/-10/ed-1/en.

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# Intelligent transport systems — Roadside modules SNMP data interface —

# Part 10: Variable message signs

## 1 Scope

Variable message signs (VMSs) are installed in areas where traffic managers identify a frequent need to convey information to the travelling public, such as upstream from interchanges to alert the public to downstream congestion in time for them to alter their routes. This allows traffic managers to improve the efficiency, safety, and quality of traveller journeys.

In order to manage the operation of a VMS and the messages displayed, information exchange between the management systems and the VMS is needed.

This document identifies basic user needs for the management of light-emitting diode (LED) matrix VMSs and traces these needs to interoperable designs. This includes the ability to identify the device, its capabilities, and its status.

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NOTE 1 This document is similar to portions of NTCIP 1203 v03, which defines how to manage VMSs using an older version of SNMP and is a normative reference in this document.

NOTE 2 ISO 20684-1 provides additional details about how this series of standards relates to the overall ITS architecture.

## 2 Normative references

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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 20684-1, *Intelligent transport systems – Roadside modules SNMP data interface – Part 1: Overview*

ISO 20684-2:—[1)], *Intelligent transport systems – Roadside modules SNMP data interface – Part 2: Generalized field device basic management*

IETF RFC 3584, *Coexistence between Version 1, Version 2, and Version 3 of the Internet-standard Network Management Framework*

NTCIP 1203:2014, *National Transportation Communication for ITS Protocol — Object Definitions for Dynamic Message Signs (DMS)*

## 3 Terms and definitions

For the purposes of this document, the terms and definitions given in ISO 20684-1 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/

1) Under preparation. Stage at the time of publication: ISO/PRF TS 20684-2:2021.

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**3.1**
**architecture**
fundamental concepts or properties of a system in its environment embodied in its elements, relationships, and in the principles of its design and evolution

[SOURCE: ISO/IEC/IEEE 42010:2011, 3.2]

**3.2**
**centre system**
ITS component that provides application, management, and/or administrative functions from a centralized location (i.e. not at the roadside)

**3.3**
**intelligent transport system**
**ITS**
technology system that is designed to benefit a surface transport system

**3.4**
**message**
data concept that is a grouping of data elements, data frames, or data elements and data frames that is used to convey a complete set of information

**3.5**
**traffic management system**
*centre system* (3.2) that monitors and controls traffic and the road network

**3.6**
**variable message sign**
**VMS**
field device that can display real-time traveller information to the public

Note 1 to entry: A VMS typically consists of one sign display, one sign controller, a cabinet that houses the sign controller and potentially other components.

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## 4 Symbols and abbreviated terms

| | |
|---|---|
| ASCII | American Standard Code for Information Interchange |
| ASN.1 | Abstract Syntax Notation One |
| CRC | cyclical redundancy check |
| I/O | input/output |
| MULTI | markup language for transportation information |
| MIB | management information base |
| NTCIP | national transportation communications for ITS protocol |
| RFC | request for comments |
| NOTE | RFCs published by the Internet Engineering Task Force |
| SNMP | simple network management protocol |
| UTF-8 | universal coded character set transformation format – 8-bit |


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# 5 Conformance

This conformance section follows the rules defined in ISO 20684-1. Table 1 traces each user need to a set of software features. Table 2 traces each feature to a set of requirements, in accordance with ISO 20684-2. For a full understanding of these tables and codes, see ISO 20684-1[2)].

**Table 1 — User need to feature conformance**

| User need | Feature | Conformance |
|---|---|---|
| **Inherited user needs (ISO/TS 20684-2)** | | |
| ISO/TS 20684-2:—, 7.1: Monitor the field device | | M |
| ISO/TS 20684-2:—, 7.3.1: Monitor cabinet doors | | O |
| ISO/TS 20684-2:—, 7.3.2: Monitor and control cabinet fans | | O |
| ISO/TS 20684-2:—, 7.3.3: Monitor and control heaters | | O |
| ISO/TS 20684-2:—, 7.3.4: Monitor cabinet humidity | | O |
| ISO/TS 20684-2:—, 7.3.5: Monitor cabinet temperature | | O |
| ISO/TS 20684-2:—, 7.3.6: Monitor cabinet AC power | | O |
| ISO/TS 20684-2:—, 7.3.7: Monitor cabinet battery power | | O |
| ISO/TS 20684-2:—, 7.3.8: Monitor cabinet generator power | | O |
| ISO/TS 20684-2:—, 7.3.9: Monitor cabinet solar power | | O |
| ISO/TS 20684-2:—, 7.3.10: Monitor cabinet wind power | | O |
| **User needs defined in this document** | | |
| 7.1: Manage the control mode of the VMS | | M |
| | 8.1: Message sign control mode | M |
| 7.2: Manage the sign display (this document) | | M |
| | 8.2: Message library | M |
| | 8.3: Sign display | M |
| | 8.7: Sign display light sensors | O |
| | 8.8: Sign display pixels | O |
| 7.3: Monitor the sign display doors | | O |
| | 8.4: Sign display doors | M |
| | ISO/TS 20684-2:—, 8.2 General-purpose I/O | M |
| 7.4: Monitor the sign display mains power | | O |
| | 8.5: Sign display mains power | M |
| | ISO/TS 20684-2:—, 8.2 General-purpose I/O | M |
| 7.5: Monitor the sign display power supplies | | O |
| | 8.6: Sign display power supplies | M |
| | ISO/TS 20684-2:—, 8.2 General-purpose I/O | M |

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2) The development of the content of this document followed a formal systems engineering process, which entails (1) defining needs, (2) developing a set of interface requirements, (3) developing features as a part of a high-level design to meet the requirements, (4) refining the interface requirements from Step 2 to reflect the high-level design, and (5) developing a low-level design defining the dialogues and data elements necessary to implement the requirements. The documentation omits the original requirements as they are refined in Step 4 and listing the original requirements would make the document highly redundant. The revised requirements ensure more consistent terminology and traceability among the tables.

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