



**Intelligent Transport Systems (ITS);  
Testing;  
Conformance test specifications for  
Facilities layer protocols and communication requirements  
for infrastructure services;  
Part 2: Test Suite Structure and Test Purposes (TSS & TP)**

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## Foreword

This Technical Specification (TS) has been produced by ETSI Technical Committee Intelligent Transport Systems (ITS).

The present document is part 2 of a multi-part deliverable covering Conformance test specifications for Facilities layer protocols and communication requirements for infrastructure services, as identified below:

- Part 1: "Test requirements and Protocol Implementation Conformance Statement (PICS) pro forma";
- Part 2: "Test Suite Structure and Test Purposes (TSS & TP)";**
- Part 3: "Abstract Test Suite (ATS) and Protocol Implementation eXtra Information for Testing (PIXIT)".

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## Modal verbs terminology

In the present document "**shall**", "**shall not**", "**should**", "**should not**", "**may**", "**need not**", "**will**", "**will not**", "**can**" and "**cannot**" are to be interpreted as described in clause 3.2 of the [ETSI Drafting Rules](#) (Verbal forms for the expression of provisions).

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# 1 Scope

The present document provides the Test Suite Structure and Test Purposes (TSS & TP) for MAPEM-SPATEM, IVIM and SREM-SSEM as defined in SAE J2735 [1] and ETSI TS 103 301 [2] in compliance with the relevant requirements and in accordance with the relevant guidance given in ISO/IEC 9646-7 [i.4]. The ISO standards for the methodology of conformance testing (ISO/IEC 9646-1 [i.2] and ISO/IEC 9646-2 [i.3]) as well as the ETSI rules for conformance testing (ETSI ETS 300 406 [i.5]) are used as a basis for the test methodology.

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## 2 References

### 2.1 Normative references

References are either specific (identified by date of publication and/or edition number or version number) or non-specific. For specific references, only the cited version applies. For non-specific references, the latest version of the referenced document (including any amendments) applies.

Referenced documents which are not found to be publicly available in the expected location might be found at <http://docbox.etsi.org/Reference>.

NOTE: While any hyperlinks included in this clause were valid at the time of publication, ETSI cannot guarantee their long term validity.

The following referenced documents are necessary for the application of the present document.

- [1] SAE J2735 (2016-03): "Dedicated Short Range Communications (DSRC) Message Set Dictionary™".
- [2] ETSI TS 103 301 (V1.1.1) (2016-11): "Intelligent Transport Systems (ITS); Vehicular Communications; Basic Set of Applications; Facilities layer protocols and communication requirements for infrastructure services".
- [3] ETSI TS 103 191-1 (V1.2.1): "Intelligent Transport Systems (ITS); Testing; Conformance test specifications for Facilities layer protocols and communication requirements for infrastructure services; Part 1: Test requirements and Protocol Implementation Conformance Statement (PICS) pro forma".

### 2.2 Informative references

References are either specific (identified by date of publication and/or edition number or version number) or non-specific. For specific references, only the cited version applies. For non-specific references, the latest version of the referenced document (including any amendments) applies.

NOTE: While any hyperlinks included in this clause were valid at the time of publication, ETSI cannot guarantee their long term validity.

The following referenced documents are not necessary for the application of the present document but they assist the user with regard to a particular subject area.

- [i.1] ETSI EG 202 798 (V1.1.1): "Intelligent Transport Systems (ITS); Testing; Framework for conformance and interoperability testing".
- [i.2] ISO/IEC 9646-1 (1994): "Information technology -- Open Systems Interconnection -- Conformance testing methodology and framework -- Part 1: General concepts".
- [i.3] ISO/IEC 9646-2 (1994): "Information technology -- Open Systems Interconnection -- Conformance testing methodology and framework -- Part 2: Abstract Test Suite specification".

- [i.4] ISO/IEC 9646-7 (1995): "Information technology -- Open Systems Interconnection -- Conformance testing methodology and framework -- Part 7: Implementation Conformance Statements".
- [i.5] ETSI ETS 300 406 (1995): "Methods for testing and Specification (MTS); Protocol and profile conformance testing specifications; Standardization methodology".

## 3 Definitions and abbreviations

### 3.1 Definitions

For the purposes of the present document, the terms and definitions given in SAE J2735 [1], ISO/IEC 9646-1 [i.2] and in ISO/IEC 9646-7 [i.4] apply.

### 3.2 Abbreviations

For the purposes of the present document, the following abbreviations apply:

ATS	Abstract Test Suite
BTP	Basic Transport Protocol
BV	Valid test events for Behaviour tests
GN	GeoNetworking
ISO	International Organization for Standardization
ITS	Intelligent Transport Systems
IUT	Implementation Under Test
IVI	Infrastructure to Vehicle Information
IVIM	IVI-message
MAPEM	MapData Messages
MSD	Message Dissemination
MSP	Message Processing
PDU	Protocol Data Unit
PICS	Protocol Implementation Conformance Statement
RLT	Road and Lane Topology
SAE	Society of Automotive Engineers
SHB	Single Hop Broadcast
SPATEM	Signal Phase And Timing Messages
SREM	Signal Request Message
SSEM	Signal Response Message
TLC	Traffic Light Control
TLM	Traffic Light Manoeuvre
TP	Test Purposes
TSS	Test Suite Structure

## 4 Test Suite Structure (TSS)

### 4.1 Structure for MAPEM-SPATEM tests

Table 1 shows the MAPEM-SPATEM Test Suite Structure (TSS) including its subgroups defined for conformance testing.

**Table 1: TSS for MAPEM-SPATEM**

Root	Group	Category
MAPEM-SPATEM	Message Dissemination	Valid
	Message processing	Valid

The test suite is structured as a tree with the root defined as MAPEM-SPATEM. The tree is of rank 2 with the first rank a Group and the second a category. The second rank is the standard ISO conformance test categories.

#### 4.1.1 Test groups

##### 4.1.1.1 Introduction

The test suite has a total of three levels. The first level is the root. The second level separates the root into various functional areas. The third level is the standard ISO conformance test categories.

##### 4.1.1.2 Root

The root identifies the MapData and SPAT Messages given in SAE J2735 [1] and ETSI TS 103 301 [2].

##### 4.1.1.3 Groups

This level contains two functional areas identified as:

- Message Dissemination
- Message Processing

##### 4.1.1.4 Categories

This level contains the standard ISO conformance test categories limited to valid behaviour.

## 4.2 Structure for IVIM tests

Table 2 shows the IVIM Test Suite Structure (TSS) including its subgroups defined for conformance testing.

**Table 2: TSS for IVIM**

Root	Group	Category
IVIM	Message Dissemination	Valid
	Message processing	Valid

The test suite is structured as a tree with the root defined as IVI. The tree is of rank 2 with the first rank a Group and the second a category. The second rank is the standard ISO conformance test categories.



## 4.2.1 Test groups

### 4.2.1.1 Introduction

The test suite has a total of three levels. The first level is the root. The second level separates the root into various functional areas. The third level is the standard ISO conformance test categories.

### 4.2.1.2 Root

The root identifies the IVI Messages given in ETSI TS 103 301 [2].

### 4.2.1.3 Groups

This level contains two functional areas identified as:

- Message Dissemination
- Message Processing

### 4.2.1.4 Categories

This level contains the standard ISO conformance test categories limited to valid behaviour.

## 4.3 Structure for SREM-SSEM tests

Table 3 shows the SREM-SSEM Test Suite Structure (TSS) including its subgroups defined for conformance testing.

**Table 3: TSS for SREM-SSEM**

Root	Group	Category
SREM-SSEM	Message Dissemination	Valid
	Message processing	Valid

The test suite is structured as a tree with the root defined as SREM-SSEM. The tree is of rank 2 with the first rank a Group and the second a category. The second rank is the standard ISO conformance test categories.

## 4.3.1 Test groups

### 4.3.1.1 Introduction

The test suite has a total of three levels. The first level is the root. The second level separates the root into various functional areas. The third level is the standard ISO conformance test categories.

### 4.3.1.2 Root

The root identifies the SREM and SSEM given in ETSI TS 103 301 [2].

### 4.3.1.3 Groups

This level contains two functional areas identified as:

- Message Dissemination
- Message Processing

### 4.3.1.4 Categories

This level contains the standard ISO conformance test categories limited to valid behaviour.

## 5 Test Purposes (TPs)

### 5.1 Introduction

#### 5.1.1 TP definition conventions

The TP definition is built according to ETSI EG 202 798 [i.1].

#### 5.1.2 TP Identifier naming conventions

The identifier of the TP is built according to table 4.

**Table 4: TP naming convention**

Identifier	TP/<root>/<gr>/<x>/<nn>	Example	
	<root> = root	IS_TLM	
		IS_RLT	
		IS_IVI	
		IS_TLC	
	<gr> = group	MSGF	Message Dissemination
		EVUP	Event Update
		EVGN	Event Generation
		EVTR	Event Termination
		COMM	Communication
		GFQ	Timers
		SEC_SND	Send behaviour of Security
		SSP_SND	Send behaviour of Specific service Permission
		SSP_RCV	Receive behaviour of Specific service Permission
	<x> = type of testing	BV	Valid event tests
	<nn> = sequential number		01 to 99

#### 5.1.3 Rules for the behaviour description

The description of the TP is built according to ETSI EG 202 798 [i.1].

SAE J2735 [1] does not use finite state machine concept. As consequence, the test purposes use a generic "Initial State" that corresponds to a state where the IUT is ready for starting the test execution. Furthermore, the IUT shall be left in this "Initial State", when the test is completed.

Being in the "Initial State" refers to the starting point of the initial device configuration. There are no pending actions, no instantiated buffers or variables, which could disturb the execution of a test.

## 5.1.4 Sources of TP definitions

All TPs have been specified according to SAE J2735 [1] and ETSI TS 103 301 [2].

## 5.1.5 Mnemonics for PICS reference

To avoid an update of all TPs when the PICS document is changed, table 5 introduces mnemonics name and the correspondence with the real PICS item number.

The PICS item column refers to tables and items of ETSI TS 103 191-1 [3]. The 'PICS item' as defined in ETSI TS 103 191-1 [3] shall be used to determine the test applicability.

**Table 5: Mnemonics for PICS reference**

Mnemonic	PICS item
PICS_SPATEM_GENERATION	A.2/3
PICS_SPATEM_RECEPTION	A.2/4
PICS_MAPEM_GENERATION	A.2/1
PICS_MAPEM_RECEPTION	A.2/2
PICS_IVIM_GENERATION	A.3/1
PICS_IVIM_RECEPTION	A.3/5
PICS_IVIM_UPDATE	A.3/2
PICS_IVIM_CANCELLATION	A.3/3
PICS_IVIM_NEGATION	A.3/4
PICS_SREM_GENERATION	A.5/1
PICS_SREM_RECEPTION	A.5/2
PICS_SSEM_GENERATION	A.5/3
PICS_SSEM_RECEPTION	A.5/4
PICS_IS_IUT_SECURED	A.1/1
PICS_T_GENIVIMMIN	A.4/1
PICS_T_GENIVIMMAX	A.4/2

## 5.2 Requirements

### 5.2.1 Traffic Light Manoeuvre (TLM) service

#### 5.2.1.1 Check the message protocol version

<b>TP Id</b>	TP_IS_TLM_MSGF_BV_01
<b>Summary</b>	Check that protocolVersion is set to 1 and messageID is set to 4
<b>Reference</b>	ETSI TS 103 301 [2], clause 5.3
<b>PICS Selection</b>	PICS_SPATEM_GENERATION
<b>Expected behaviour</b>	
<p>with  the IUT being in the "initial state"  and the IUT sending SPATEM  ensure that  when  a SPATEM is generated  then  the IUT sends a valid SPATEM  containing ITS PDU header  containing protocolVersion  indicating value '1'  and containing messageID  indicating value '4'</p>	