

# Commission Implementing Regulation (EU) 2016/799

of 18 March 2016

implementing Regulation (EU) No 165/2014 of the European Parliament and of the Council laying down the requirements for the construction, testing, installation, operation and repair of tachographs and their components

## ANNEX I C

Requirements for construction, testing, installation, and inspection

### Appendix 9

#### TYPE APPROVAL LIST OF MINIMUM REQUIRED TESTS

##### 1. INTRODUCTION

##### 1.1. Type approval

The EC type approval for a recording equipment (or component) or a tachograph card is based on:

a **security certification**, based on Common Criteria specifications, against a security target fully compliant with Appendix 10 to this Annex,

a **functional certification** performed by a Member State authority certifying that the item tested fulfils the requirements of this Annex in terms of functions performed, measurement accuracy and environmental characteristics,

an **interoperability certification** performed by the competent body certifying that the recording equipment (or tachograph card) is fully interoperable with the necessary tachograph card (or recording equipment) models (see Chapter 8 of this Annex).

This Appendix specifies which tests, as a minimum, must be performed by a Member State authority during the functional tests, and which tests, as a minimum, must be performed by the competent body during the interoperability tests. Procedures to follow to carry out the tests or the type of tests are not specified further.

The security certification aspects are not covered by this Appendix. If some tests requested for type approval are performed during the security evaluation and certification process, then these tests do not need to be performed again. In this case, only the results of these security tests may be inspected. For information, the requirements expected to be tested (or closely related to tests expected to be performed) during the security certification, are marked with a ‘\*’ in this Appendix.

The numbered requirements refer to the Annex corpus, while the other requirements refer to the other appendices (e.g. PIC\_001 refers to requirement PIC\_001 of Appendix 3 Pictograms).

This Appendix considers separately the type approval of the motion sensor, of the vehicle unit, and of the external GNSS facility as components of the recording equipment. Each component will get its own type approval certificate in which the other compatible components will be indicated. The functional test of the motion sensor (or external GNSS facility) is done together with the vehicle unit and vice versa.

Interoperability between every model of motion sensor (resp. external GNSS facility) and every model of vehicle unit is not required. In that case the type approval for a motion sensor (resp. external GNSS facility) can be granted only in combination with the type approval of the relevant vehicle unit and vice versa.

## 1.2. References

The following references are used in this Appendix:

IEC 60068-2-1:

Environmental testing — Part 2-1: Tests — Test A: Cold

IEC 60068-2-2:

Basic environmental testing procedures; part 2: tests; tests B: dry heat (sinusoidal).

IEC 60068-2-6:

Environmental testing — Part 2: Tests — Test Fc: Vibration

IEC 60068-2-14:

Environmental testing; Part 2-14: Tests; Test N: Change of temperature

IEC 60068-2-27:

Environmental testing. Part 2: Tests. Test Ea and guidance: Shock

IEC 60068-2-30:

Environmental testing — Part 2-30: Tests — Test Db: Damp heat, cyclic (12 h + 12 h cycle)

IEC 60068-2-64:

Environmental testing — Part 2-64: Tests — Test Fh: Vibration, broadband random and guidance

IEC 60068-2-78

Environmental testing — Part 2-78: Tests — Test Cab: Damp heat, steady state

ISO 16750-3 —

Mechanical loads (2012-12)

ISO 16750-4 —

Climatic loads(2010-04).

ISO 20653:

Road vehicles — Degree of protection (IP code) — Protection of electrical equipment against foreign objects, water and access

ISO 10605:2008 + Technical Corrigendum:2010 + AMD1:2014

Road vehicles — Test methods for electrical disturbances from electrostatic discharge

ISO 7637-1:2002 + AMD1: 2008

Road vehicles — Electrical disturbances from conduction and coupling — Part 1: Definitions and general considerations.

ISO 7637-2

Road vehicles — Electrical disturbances from conduction and coupling — Part 2: Electrical transient conduction along supply lines only.

ISO 7637-3

Road vehicles — Electrical disturbances from conduction and coupling — Part 3: Electrical transient transmission by capacitive and inductive coupling via lines other than supply lines.

ISO/IEC 7816-1

Identification cards — Integrated circuit(s) cards with contacts — Part 1: Physical characteristics..

ISO/IEC 7816-2

Information technology — Identification cards — Integrated circuit(s) cards with contacts — Part 2: Dimensions and location of the contacts.

ISO/IEC 7816-3

Information technology — Identification cards — Integrated circuit(s) cards with contacts — Part 3: Electronic signals and transmission protocol.

ISO/IEC 10373-1:2006 + AMD1:2012

Identification cards — Test methods — Part 1: General characteristics

ISO/IEC 10373-3:2010 + Technical Corrigendum:2013

Identification cards — Test methods — Part 3: Integrated circuit cards with contacts and related interface devices

ISO 16844-3:2004, Cor 1:2006

Road vehicles — Tachograph systems — Part 3: Motion sensor interface (with vehicle units).

ISO 16844-4

Road vehicles — Tachograph systems — Part 4: CAN interface

ISO 16844-6

Road vehicles — Tachograph systems — Part 6: Diagnostics

ISO 16844-7

Road vehicles — Tachograph systems — Part 7: Parameters

ISO 534

Paper and board — Determination of thickness, density and specific volume

UN ECE R10

## 2.VEHICLE UNIT FUNCTIONAL TESTS

| No   | Test                                       | Description                                                                             | Related requirements          |
|------|--------------------------------------------|-----------------------------------------------------------------------------------------|-------------------------------|
| 1.   | Administrative examination                 |                                                                                         |                               |
| 1.1  | Documentation                              | Correctness of documentation                                                            |                               |
| 1.2  | Manufacturer test results                  | Results of manufacturer test performed during integration.<br><br>Paper demonstrations. | 88, 89,91                     |
| 2.   | Visual inspection                          |                                                                                         |                               |
| 2,1  | Compliance with documentation              |                                                                                         |                               |
| 2.2  | Identification / markings                  |                                                                                         | 224 to 226                    |
| 2.3  | Materials                                  |                                                                                         | 219 to 223                    |
| 2.4  | Sealing                                    |                                                                                         | 398, 401 to 405               |
| 2.5  | External interfaces                        |                                                                                         |                               |
| 3.   | Functional tests                           |                                                                                         |                               |
| 3.1  | Functions provided                         |                                                                                         | 02, 03, 04, 05, 07, 382       |
| 3.2  | Modes of operation                         |                                                                                         | 09 to 11*, 134, 135           |
| 3.3  | Functions and data access rights           |                                                                                         | 12* 13*, 382, 383, 386 to 389 |
| 3.4  | Monitoring cards insertion and withdrawal  |                                                                                         | 15, 16, 17, 18, 19*, 20*, 134 |
| 3.5  | Speed and distance measurement             |                                                                                         | 21 to 31                      |
| 3.6  | Time measurement (test performed at 20 °C) |                                                                                         | 38 to 43                      |
| 3.7  | Monitoring driver activities               |                                                                                         | 44 to 53, 134                 |
| 3.8  | Monitoring driving status                  |                                                                                         | 54, 55, 134                   |
| 3.9  | Manual entries                             |                                                                                         | 56 to 62                      |
| 3.10 | Company locks management                   |                                                                                         | 63 to 68                      |
| 3.11 | Monitoring control activities              |                                                                                         | 69, 70                        |
| 3.12 | Detection of events and/or faults          |                                                                                         | 71 to 88, 134                 |
| 3.13 | Equipment identification data              |                                                                                         | 93*, 94*, 97, 100             |
| 3.14 | Driver card insertion and withdrawal data  |                                                                                         | 102* to 104*                  |

|      |                                                   |                                                                                              |
|------|---------------------------------------------------|----------------------------------------------------------------------------------------------|
| 3.15 | Driver activity data                              | 105* to 107*                                                                                 |
| 3.16 | Places and positions data                         | 108* to 112*                                                                                 |
| 3.17 | Odometer data                                     | 113* to 115*                                                                                 |
| 3.18 | Detailed speed data                               | 116*                                                                                         |
| 3.19 | Events data                                       | 117*                                                                                         |
| 3.20 | Faults data                                       | 118*                                                                                         |
| 3.21 | Calibration data                                  | 119* to 121*                                                                                 |
| 3.22 | Time adjustment data                              | 124*, 125*                                                                                   |
| 3.23 | Control activity data                             | 126*, 127*                                                                                   |
| 3.24 | Company locks data                                | 128*                                                                                         |
| 3.25 | Download activity data                            | 129*                                                                                         |
| 3.26 | Specific conditions data                          | 130*, 131*                                                                                   |
| 3.27 | Recording and storing on tachographs cards        | 136, 137, 138*,<br>139*, 141*, 142,<br>143<br><br>144, 145, 146*,<br>147*, 148*, 149,<br>150 |
| 3.28 | Displaying                                        | 90, 134,<br><br>151 to 168,<br><br>PIC_001,<br>DIS_001                                       |
| 3.29 | Printing                                          | 90, 134,<br><br>169 to 181,<br>PIC_001,<br>PRT_001 to<br>PRT_014                             |
| 3.30 | Warning                                           | 134, 182 to 191,<br><br>PIC_001                                                              |
| 3.31 | Data downloading to external media                | 90, 134, 192 to<br>196                                                                       |
| 3.32 | Remote communication for targeted roadside checks | 197 to 199                                                                                   |

|      |                                                                                                                                                                                                                                                   |                                   |
|------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------|
| 3.33 | Output data to additional external devices                                                                                                                                                                                                        | 200, 201                          |
| 3.34 | Calibration                                                                                                                                                                                                                                       | 202 to 206*, 383, 384, 386 to 391 |
| 3.35 | Roadside calibration checking                                                                                                                                                                                                                     | 207 to 209                        |
| 3.36 | Time adjustment                                                                                                                                                                                                                                   | 210 to 212*                       |
| 3.37 | Non-interference of additional functions                                                                                                                                                                                                          | 06, 425                           |
| 3.38 | Motion sensor interface                                                                                                                                                                                                                           | 02, 122                           |
| 3.39 | External GNSS facility                                                                                                                                                                                                                            | 03, 123                           |
| 3.40 | Verify that the VU detects, records and stores the event(s) and/or fault(s) defined by the VU manufacturer when a paired motion sensor reacts to magnetic fields disturbing vehicle motion detection.                                             | 217                               |
| 3.41 | Cypher suite and standardized domain parameters                                                                                                                                                                                                   | CSM_48, CSM_50                    |
| 4.   | Environmental tests                                                                                                                                                                                                                               |                                   |
| 4.1  | Temperature                                                                                                                                                                                                                                       | 213                               |
|      | Verify functionality through:                                                                                                                                                                                                                     |                                   |
|      | Test according to ISO 16750-4, Chapter 5.1.1.2: Low temperature operation test (72 h @ – 20 °C)                                                                                                                                                   |                                   |
|      | This test refers to IEC 60068-2-1: Environmental testing - Part 2-1: Tests - Test A: Cold                                                                                                                                                         |                                   |
|      | Test according to ISO 16750-4: Chapter 5.1.2.2: High temperature operation test (72 h at 70 °C)                                                                                                                                                   |                                   |
|      | This test refers to IEC 60068-2-2: Basic environmental testing procedures; part 2: tests; tests B: dry heat                                                                                                                                       |                                   |
|      | Test according to ISO 16750-4: Chapter 5.3.2: Rapid change of temperature with specified transition duration (– 20 °C/70 °C, 20 cycles, dwell time 2h at each temperature)                                                                        |                                   |
|      | A reduced set of tests (among those defined in section 3 of this table) can be carried out at the lower temperature, the higher temperature and during the temperature cycles                                                                     |                                   |
| 4.2  | Humidity                                                                                                                                                                                                                                          | 214                               |
|      | Verify that the vehicle unit can withstand a cyclic damp (heat test) through IEC 60068-2-30, test Db, six 24 hours cycles, each temperature varying from +25 °C to + 55 °C and a relative humidity of 97 % at + 25 °C and equal to 93 % at +55 °C |                                   |

1.

Sinusoidal vibrations.

verify that the vehicle unit can withstand sinusoidal vibrations with the following characteristics:

constant displacement between 5 and 11 Hz: 10mm peak

constant acceleration between 11 and 300 Hz: 5g

This requirement is verified through IEC 60068-2-6, test Fc, with a minimum test duration of  $3 \times 12$  hours (12 hours per axis)

ISO 16750-3 does not require a sinusoidal vibration test for devices located in the decoupled vehicle cab.

2.

Random vibrations:

Test according to ISO 16750-3: Chapter 4.1.2.8: Test VIII: Commercial vehicle, decoupled vehicle cab

Random vibration test, 10...2000 Hz, RMS vertical  $21,3 \text{ m/s}^2$ , RMS longitudinal  $11,8 \text{ m/s}^2$ , RMS lateral  $13,1 \text{ m/s}^2$ , 3 axes, 32 h per axis, including temperature cycle – 20...70 °C.

This test refers to IEC 60068-2-64: Environmental testing - Part 2-64: Tests - Test Fh: Vibration, broadband random and guidance

3.

Shocks:

mechanical shock with 3 g half sinus according ISO 16750.

The tests described above are performed on different samples of the equipment type being tested.

4.4 Protection against water and foreign bodies

Test according to ISO 20653: Road vehicles – Degree of protection (IP code) – Protection of electrical equipment against foreign objects, water and access (No change in parameters); Minimum value IP 40

220, 221

|     |                                       |                                                                                                                                                                                                                |     |
|-----|---------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----|
| 4.5 | Over-voltage protection               | <p>Verify that the vehicle unit can withstand a power supply of:</p> <p>24 V versions</p> <p>:</p> <p>34V at + 40 °C 1 hour</p> <p>12V versions</p> <p>:</p> <p>17V at + 40 °C 1 hour</p> <p>(ISO 16750-2)</p> | 216 |
| 4.6 | Reverse polarity protection           | <p>Verify that the vehicle unit can withstand an inversion of its power supply</p> <p>(ISO 16750-2)</p>                                                                                                        | 216 |
| 4.7 | Short-circuit protection              | <p>Verify that input output signals are protected against short circuits to power supply and ground</p> <p>(ISO 16750-2)</p>                                                                                   | 216 |
| 5.  | EMC tests                             |                                                                                                                                                                                                                |     |
| 5.1 | Radiated emissions and susceptibility | Compliance with Regulation ECE R10                                                                                                                                                                             | 218 |
| 5.2 | Electrostatic discharge               | <p>Compliance with ISO 10605:2008 +</p> <p>Technical Corrigendum:2010 +</p> <p>AMD1:2014: +/- 4 kV for contact and +/- 8 kV for air discharge</p>                                                              | 218 |

For 24V versions: compliance with ISO 7637-2 +  
ECE Regulation No. 10 Rev. 3:

pulse 1a:  $V_s=450V$   $R_i=50\text{ ohms}$

pulse 2a:  $V_s=+37V$   $R_i=2\text{ ohms}$

pulse 2b:  $V_s=+20V$   $R_i=0,05\text{ ohms}$

pulse 3a:  $V_s=-150V$   $R_i=50\text{ ohms}$

pulse 3b:  $V_s=+150V$   $R_i=50\text{ ohms}$

pulse 4:  $V_s=-16V$   $V_a=-12V$   $t_6=100ms$

pulse 5:  $V_s=+120V$   $R_i=2,2\text{ ohms}$   $t_d=250ms$

For 12V versions: compliance with ISO 7637-1 +  
ECE Regulation No. 10 Rev. 3:

pulse 1:  $V_s=-75V$   $R_i=10\text{ ohms}$

pulse 2a:  $V_s=+37V$   $R_i=2\text{ ohms}$

pulse 2b:  $V_s=+10V$   $R_i=0,05\text{ ohms}$

pulse 3a:  $V_s=-112V$   $R_i=50\text{ ohms}$

pulse 3b:  $V_s=+75V$   $R_i=50\text{ ohms}$

pulse 4:  $V_s=-6V$   $V_a=-5V$   $t_6=15ms$

pulse 5:  $V_s=+65V$   $R_i=3ohms$   $t_d=100ms$

Pulse 5 shall be tested only for vehicle units designed  
to be installed in vehicles for which no external  
common protection against load dump is  
implemented

For load dump proposal, refer to ISO 16750-2, 4th  
edition, chapter 4.6.4.

### 3.MOTION SENSOR FUNCTIONAL TESTS

| No  | Test                              | Description                  | Related<br>requirements |
|-----|-----------------------------------|------------------------------|-------------------------|
| 1.  | <b>Administrative examination</b> |                              |                         |
| 1.1 | Documentation                     | Correctness of documentation |                         |
| 2.  | <b>Visual inspection</b>          |                              |                         |

|      |                                                                                                                                                                                                                                                          |                 |
|------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------|
| 2.1. | Compliance with documentation                                                                                                                                                                                                                            |                 |
| 2.2. | Identification/markings                                                                                                                                                                                                                                  | 225, 226,       |
| 2.3  | Materials                                                                                                                                                                                                                                                | 219 to 223      |
| 2.4. | Sealing                                                                                                                                                                                                                                                  | 398, 401 to 405 |
| 3.   | <b>Functional tests</b>                                                                                                                                                                                                                                  |                 |
| 3.1  | Sensor identification data                                                                                                                                                                                                                               | 95 to 97*       |
| 3.2  | Motion sensor — vehicle unit pairing                                                                                                                                                                                                                     | 122*, 204       |
| 3.3  | Motion detection                                                                                                                                                                                                                                         | 30 to 35        |
|      | Motion measurement accuracy                                                                                                                                                                                                                              |                 |
| 3.4  | Vehicle unit interface                                                                                                                                                                                                                                   | 02              |
| 3.5  | Check that the motion sensor is immune to constant magnetic field. Alternatively, verify that the motion sensor reacts to constant magnetic fields disturbing vehicle motion detection so that a connected VU can detect, record and store sensor faults | 217             |
| 4.   | <b>Environmental tests</b>                                                                                                                                                                                                                               |                 |
| 4.1  | Operating temperature                                                                                                                                                                                                                                    | 213             |
|      | Verify functionality (as defined in test No 3.3) in temperature range [– 40°C; + 135°C through:                                                                                                                                                          |                 |
|      | IEC 60068-2-1 test Ad, with a test duration of 96 hours at the lowest temperature $T_{\min}$ ,                                                                                                                                                           |                 |
|      | IEC 60068-2-2 test Bd, with a test duration of 96 hours at the highest temperature $T_{\max}$                                                                                                                                                            |                 |
|      | Test according to ISO 16750-4: Chapter 5.1.1.2: Low temperature operation test (24 h @ – 40 °C)                                                                                                                                                          |                 |
|      | This test refers to IEC 60068-2-1: Environmental testing — Part 2-1: Tests — Test A: Cold IEC 68-2-2 test Bd, with a test duration of 96 hours at the lowest temperature of – 40°C.                                                                      |                 |
|      | Test according to ISO 16750-4: Chapter 5.1.2.2: High temperature operation test (96 h @ 135 °C)                                                                                                                                                          |                 |
|      | This test refers to IEC 60068-2-2: Basic environmental testing procedures; part 2: tests; tests B: dry heat                                                                                                                                              |                 |

|     |                                                                                                                                                                                                                                          |     |
|-----|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----|
| 4.2 | Temperature cycles                                                                                                                                                                                                                       | 213 |
|     | Test according to ISO 16750-4: Chapter 5.3.2:<br>Rapid change of temperature with specified<br>transition duration (– 40°C/135 °C, 20 cycles, dwell<br>time 30 min at each temperature)                                                  |     |
|     | IEC 60068-2-14: Environmental testing; Part 2-14:<br>Tests; Test N: Change of temperature                                                                                                                                                |     |
| 4.3 | Humidity cycles                                                                                                                                                                                                                          | 214 |
|     | Verify functionality (as defined in test No. 3.3)<br>through IEC 60068-2-30, test Db, six 24 hours<br>cycles, each temperature varying from + 25°C to +<br>55°C and a relative humidity of 97 % at + 25°C and<br>equal to 93 % at + 55°C |     |
| 4.4 | Vibration                                                                                                                                                                                                                                | 219 |
|     | ISO 16750-3: Chapter 4.1.2.6: Test VI:<br>Commercial vehicle, engine, gearbox                                                                                                                                                            |     |
|     | Mixed mode vibration test including                                                                                                                                                                                                      |     |
|     | a)                                                                                                                                                                                                                                       |     |
|     | Sinusoidal vibration test, 20...520 Hz, 11,4 ...<br>120 m/s <sup>2</sup> , <= 0,5 oct/min                                                                                                                                                |     |
|     | b)                                                                                                                                                                                                                                       |     |
|     | Random vibration test, 10...2 000 Hz, RMS<br>177 m/s <sup>2</sup>                                                                                                                                                                        |     |
|     | 94 h per axis, including temperature cycle –<br>20...70°C)                                                                                                                                                                               |     |
|     | This test refers to IEC 60068-2-80: Environmental<br>testing — Part 2-80: Tests — Test Fi: Vibration —<br>Mixed mode                                                                                                                     |     |
| 4.5 | Mechanical shock                                                                                                                                                                                                                         | 219 |
|     | ISO 16750-3: Chapter 4.2.3: Test VI: Test for<br>devices in or on the gearbox                                                                                                                                                            |     |
|     | half-sinusoidal shock, acceleration to be agreed in<br>the range 3 000...15 000 m/s <sup>2</sup> , pulse duration to be<br>agreed, however < 1 ms, number of shocks: to be<br>agreed                                                     |     |
|     | This test refers to IEC 60068-2-27: Environmental<br>testing. Part 2: Tests. Test Ea and guidance: Shock                                                                                                                                 |     |

|     |                                             |                                                                                                                                                                                        |          |
|-----|---------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------|
| 4.6 | Protection against water and foreign bodies | Test according to ISO 20653: Road vehicles — Degree of protection (IP code) — Protection of electrical equipment against foreign objects, water and access<br><br>(Target value IP 64) | 220, 221 |
| 4.7 | Reverse polarity protection                 | Verify that the motion sensor can withstand an inversion of its power supply                                                                                                           | 216      |
| 4.8 | Short circuit protection                    | Verify that input output signals are protected against short circuits to power supply and ground                                                                                       | 216      |
| 5.  | <b>EMC</b>                                  |                                                                                                                                                                                        |          |
| 5.1 | radiated emissions and susceptibility       | Verify compliance with Regulation ECE R10                                                                                                                                              | 218      |
| 5.2 | Electrostatic discharge                     | Compliance with ISO 10605:2008 + Technical Corrigendum:2010 + AMD1:2014: +/- 4kV for contact and +/- 8kV for air discharge                                                             | 218      |

For 24V versions: compliance with ISO 7637-2 +  
ECE Regulation No. 10 Rev. 3:

pulse 1a:  $V_s = -450\text{ V}$   $R_i = 50\text{ ohms}$

pulse 2a:  $V_s = +37\text{ V}$   $R_i = 2\text{ ohms}$

pulse 2b:  $V_s = +20\text{ V}$   $R_i = 0,05\text{ ohms}$

pulse 3a:  $V_s = -150\text{ V}$   $R_i = 50\text{ ohms}$

pulse 3b:  $V_s = +150\text{ V}$   $R_i = 50\text{ ohms}$

pulse 4:  $V_s = -16\text{ V}$   $V_a = -12\text{ V}$   $t_6 = 100\text{ms}$

pulse 5:  $V_s = +120\text{ V}$   $R_i = 2,2\text{ ohms}$   $t_d = 250\text{ms}$

For 12V versions: compliance with ISO 7637-1 +  
ECE Regulation No. 10 Rev. 3:

pulse 1:  $V_s = -75\text{ V}$   $R_i = 10\text{ ohms}$

pulse 2a:  $V_s = +37\text{ V}$   $R_i = 2\text{ ohms}$

pulse 2b:  $V_s = +10\text{ V}$   $R_i = 0,05\text{ ohms}$

pulse 3a:  $V_s = -112\text{ V}$   $R_i = 50\text{ ohms}$

pulse 3b:  $V_s = +75\text{ V}$   $R_i = 50\text{ ohms}$

pulse 4:  $V_s = -6\text{ V}$   $V_a = -5\text{ V}$   $t_6 = 15\text{ ms}$

pulse 5:  $V_s = +65\text{ V}$   $R_i = 3\text{ ohms}$   $t_d = 100\text{ ms}$

Pulse 5 shall be tested only for vehicle units  
designed to be installed in vehicles for which no  
external common protection against load dump is  
implemented

For load dump proposal, refer to ISO 16750-2, 4th  
edition, chapter 4.6.4

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#### 4.TACHOGRAPH CARDS FUNCTIONAL TESTS

Tests according to this Section 4,

no. 5 'Protocol tests',

no. 6 'Card structure' and

no. 7 'Functional tests'

can be performed by the evaluator or certifier during the Common Criteria (CC) security certification process for the chip module.

Tests number 2.3 and 4.2 are the same. These are the mechanical tests of the combination card body and chip module. If one of these components (card body, chip module) is changed, then these tests are necessary.

| No  | Test                              | Description                  | Related requirements |
|-----|-----------------------------------|------------------------------|----------------------|
| 1.  | <b>Administrative examination</b> |                              |                      |
| 1.1 | Documentation                     | Correctness of documentation |                      |
| 2   | <b>Card Body</b>                  |                              |                      |

Make sure that all features for protection and visible data are correctly printed on the card and compliant.

[Designator

Annex 1C, chapter 4.1 'Visible data', 227)

The front page shall contain:

the words 'Driver card' or 'Control card' or 'Workshop card' or 'Company card' printed in capital letters in the official language or languages of the Member State issuing the card, according to the type of the card.

[Member State name

Annex 1C, chapter 4.1 'Visible data', 228)

The front page shall contain:

the name of the Member State issuing the card (optional).

[Sign

Annex 1C, chapter 4.1 'Visible data', 229)

The front page shall contain:

the distinguishing sign of the Member State issuing the card, printed in negative in a blue rectangle and encircled by 12 yellow stars.

[Enumeration

Annex 1C, chapter 4.1 'Visible data', 232)

The reverse page shall contain:

an explanation of the numbered items which appear on the front page of the card.

[Colour

Annex 1C, chapter 4.1 'Visible data', 234)

Tachograph cards shall be printed with the following background predominant colours:

driver card: white,

workshop card: red,

control card: blue,

company card: yellow.

[Security

Annex 1C, chapter 4.1 'Visible data', 235)

## 2.2 Mechanical Tests

|                                           |              |
|-------------------------------------------|--------------|
| [Card size                                | 240, 243     |
| Tachograph cards must conform to standard | ISO/IEC 7810 |

ISO/IEC 7810, Identification cards — Physical characteristics,

[5 Dimension of card,

[5.1 Card size,

[5.1.1 Card dimensions and tolerances,

card type ID-1 Unused card

[Card edges

Tachograph cards must conform to standard

ISO/IEC 7810, Identification cards — Physical characteristics,

[5 Dimension of card,

[5.1 Card size,

[5.1.2 Card edges

[Card construction

Tachograph cards must conform to standard

ISO/IEC 7810, Identification cards — Physical characteristics,

[6 Card construction

[Card materials

Tachograph cards must conform to standard

ISO/IEC 7810, Identification cards — Physical characteristics,

[7 Card materials

[Bending stiffness

Tachograph cards must conform to standard

ISO/IEC 7810, Identification cards — Physical characteristics,

[8 Card characteristics,

[8.1 Bending stiffness

[Toxicity

Tachograph cards must conform to standard

[Bending

Tachograph cards must conform to standard

ISO/IEC 7810:2003/Amd. 1:2009, Identification cards —  
Physical characteristics, Amendment 1: Criteria for cards  
containing integrated circuits

[9.2 Dynamic bending stress

Total number of bending cycles: 4 000.

[Torsion

Tachograph cards must conform to standard

ISO/IEC 7810:2003/Amd. 1:2009, Identification cards —  
Physical characteristics, Amendment 1: Criteria for cards  
containing integrated circuits

[9.3 Dynamic torsional stress

Total number of torsion cycles: 4 000.

3 **Module**

Module is the chip encapsulation and the contact plate.

[Surface profile

Tachograph cards must conform to standard

ISO/IEC 7816-1:2011, Identification cards — Integrated circuit cards — Part 1: Cards with contacts — Physical characteristics

[4.2 Surface profile of contacts

[Mechanical strength

Tachograph cards must conform to standard

ISO/IEC 7816-1:2011, Identification cards — Integrated circuit cards — Part 1: Cards with contacts — Physical characteristics

[4.3 Mechanical strength (of a card and contacts)

[Electrical resistance

Tachograph cards must conform to standard

ISO/IEC 7816-1:2011, Identification cards — Integrated circuit cards — Part 1: Cards with contacts — Physical characteristics

[4.4 Electrical resistance (of contacts)

[Dimension

Tachograph cards must conform to standard

ISO/IEC 7816-2:2007, Identification cards — Integrated circuit cards — Part 2: Cards with contacts — Dimension and location of the contacts

[3 Dimension of the contacts

[Location

Tachograph cards must conform to standard

ISO/IEC 7816-2:2007, Identification cards — Integrated circuit cards — Part 2: Cards with contacts — Dimension and location of the contacts

[4 Number and location of the contacts

In case of modules with six contacts, contact 'C4' and 'C8' are not part of this test requirement.



## 4.1 Chip

|                                                                                                                                                                                                                                                                                                                                                 |               |
|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------|
| [Operating temperature                                                                                                                                                                                                                                                                                                                          | 241 to 244    |
| The Tachograph card chip shall operate in an ambient temperature range between – 25 °C and + 85 °C.                                                                                                                                                                                                                                             | ECE R10       |
| [Temperature and humidity                                                                                                                                                                                                                                                                                                                       | ISO/IEC 7810  |
| Annex 1C, chapter 4.4 ‘Environmental and electrical specifications’, 241)                                                                                                                                                                                                                                                                       | ISO/IEC 10373 |
| Tachograph cards shall be capable of operating correctly in all the climatic conditions normally encountered in Community territory and at least in the temperature range – 25°C to + 70°C with occasional peaks of up to + 85°C, ‘occasional’ meaning not more than 4 hours each time and not over 100 times during the life time of the card. |               |
| The Tachograph cards are exposed in consecutive steps to the following temperatures and humidities for the given time. After each step the Tachograph cards are tested for electrical functionality.                                                                                                                                            |               |
| 1.                                                                                                                                                                                                                                                                                                                                              |               |
| Temperature of – 20 °C for 2 h.                                                                                                                                                                                                                                                                                                                 |               |
| 2.                                                                                                                                                                                                                                                                                                                                              |               |
| Temperature of +/- 0 °C for 2 h.                                                                                                                                                                                                                                                                                                                |               |
| 3.                                                                                                                                                                                                                                                                                                                                              |               |
| Temperature of + 20 °C, 50 % RH, for 2 h.                                                                                                                                                                                                                                                                                                       |               |
| 4.                                                                                                                                                                                                                                                                                                                                              |               |
| Temperature of + 50 °C, 50 % RH, for 2 h.                                                                                                                                                                                                                                                                                                       |               |
| 5.                                                                                                                                                                                                                                                                                                                                              |               |
| Temperature of + 70 °C, 50 % RH, for 2 h.                                                                                                                                                                                                                                                                                                       |               |
| The temperature is increased intermittently to + 85 °C, 50 % RH, for 60 min.                                                                                                                                                                                                                                                                    |               |
| 6.                                                                                                                                                                                                                                                                                                                                              |               |
| Temperature of + 70 °C, 85 % RH, for 2 h.                                                                                                                                                                                                                                                                                                       |               |
| The temperature is increased intermittently to + 85 °C, 85 % RH, for 30 min.                                                                                                                                                                                                                                                                    |               |
| [Humidity                                                                                                                                                                                                                                                                                                                                       |               |
| Annex 1C, chapter 4.4 ‘Environmental and electrical specifications’, 242)                                                                                                                                                                                                                                                                       |               |
| Tachograph cards shall be capable of operating correctly in the humidity range 10 % to 90 %.                                                                                                                                                                                                                                                    |               |
| [Electromagnetic compatibility — EMC                                                                                                                                                                                                                                                                                                            |               |

|                                                                          |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |                                                                         |
|--------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------|
| 4.2 Mechanical tests chip module embedded in the card body-> same as 2.3 | <p>[Bending</p> <p>Tachograph cards must conform to standard</p> <p>ISO/IEC 7810:2003/Amd. 1:2009, Identification cards — Physical characteristics, Amendment 1: Criteria for cards containing integrated circuits</p> <p>[9.2 Dynamic bending stress</p> <p>Total number of bending cycles: 4 000.</p> <p>[Torsion</p> <p>Tachograph cards must conform to standard</p> <p>ISO/IEC 7810:2003/Amd. 1:2009, Identification cards — Physical characteristics, Amendment 1: Criteria for cards containing integrated circuits</p> <p>[9.3 Dynamic torsional stress</p> <p>Total number of torsion cycles: 4 000.</p> | ISO/IEC 7810                                                            |
| <b>5 Protocol tests</b>                                                  |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |                                                                         |
| 5.1 ATR                                                                  | Check that the ATR is compliant                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   | <p>ISO/IEC 7816-3</p> <p>TCS_14,<br/>TCS_17,<br/>TCS_18</p>             |
| 5.2 T=0                                                                  | Check that T=0 protocol is compliant                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              | <p>ISO/IEC 7816-3</p> <p>TCS_11,<br/>TCS_12,<br/>TCS_13,<br/>TCS_15</p> |
| 5.3 PTS                                                                  | Check that the PTS command is compliant by setting T=1 from T=0.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  | <p>ISO/IEC 7816-3</p> <p>TCS_12,<br/>TCS_19,<br/>TCS_20,<br/>TCS_21</p> |

|     |                                                 |                                                                                                                                                                                                                                                                                                                |                                                    |
|-----|-------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------|
| 5.4 | T=1                                             | Check that T=1 protocol is compliant                                                                                                                                                                                                                                                                           | ISO/IEC 7816-3<br><br>TCS_11,<br>TCS_13,<br>TCS_16 |
| 6   | <b>Card structure</b>                           |                                                                                                                                                                                                                                                                                                                |                                                    |
| 6.1 |                                                 | Test that the file structure of the card is compliant by checking the presence of the mandatory files in the card and their access conditions                                                                                                                                                                  | TCS_22 to TCS_28<br><br>TCS_140 to TCS_179         |
| 7   | <b>Functional tests</b>                         |                                                                                                                                                                                                                                                                                                                |                                                    |
| 7.1 | Normal processing                               | <p>Test at least once each allowed usage of each command (ex: test the UPDATE BINARY command with CLA = '00', CLA = '0C' and with different P1,P2 and Lc parameters)</p> <p>Check that the operations have actually been performed in the card (ex: by reading the file the command has been performed on)</p> | TCS_29 to TCS_139                                  |
| 7.2 | Error messages                                  | <p>Test at least once each error message (as specified in Appendix 2) for each command</p> <p>Test at least once every generic error (except '6400' integrity errors checked during security certification)</p>                                                                                                |                                                    |
| 7.3 | Cypher suite and standardized domain parameters |                                                                                                                                                                                                                                                                                                                | CSM_48,<br>CSM_50                                  |
| 8   | <b>Personalisation</b>                          |                                                                                                                                                                                                                                                                                                                |                                                    |

|                             |                                                                                                                                                                                                                                          |               |
|-----------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------|
| 8.1 Optical personalisation | Annex 1C, chapter 4.1 ‘Visible data’, 230)                                                                                                                                                                                               | 230, 231, 235 |
|                             | The front page shall contain:<br><br>information specific to the card issued.<br><br>Annex 1C, chapter 4.1 ‘Visible data’, 231)                                                                                                          |               |
|                             | The front page shall contain:<br><br>dates using a ‘dd/mm/yyyy’ or ‘dd.mm.yyyy’ format (day, month, year).<br><br>Annex 1C, chapter 4.1 ‘Visible data’, 235)                                                                             |               |
|                             | Tachograph cards shall bear at least the following features for protection of the card body against counterfeiting and tampering:<br><br>in the area of the photograph, the security design background and the photograph shall overlap. |               |

## 5.EXTERNAL GNSS FACILITY TESTS

| No   | Test                                                                          | Description                  | Related requirements |
|------|-------------------------------------------------------------------------------|------------------------------|----------------------|
| 1.   | <b>Administrative examination</b>                                             |                              |                      |
| 1.1  | Documentation                                                                 | Correctness of documentation |                      |
| 2.   | <b>Visual inspection for external GNSS facility</b>                           |                              |                      |
| 2.1. | Compliance with documentation                                                 |                              |                      |
| 2.2. | Identification/markings                                                       |                              | 224 to 226           |
| 2.3  | Materials                                                                     |                              | 219 to 223           |
| 3.   | <b>Functional tests</b>                                                       |                              |                      |
| 3.1  | Sensor identification data                                                    |                              | 98,99                |
| 3.2  | External GNSS module — vehicle unit coupling                                  |                              | 123, 205             |
| 3.3  | GNSS position                                                                 |                              | 36, 37               |
| 3.4  | Vehicle unit interface when the GNSS receiver is external to the Vehicle Unit |                              | 03                   |
| 3.5  | Cypher suite and standardized domain parameters                               |                              | CSM_48,<br>CSM_50    |
| 4.   | <b>Environmental tests</b>                                                    |                              |                      |

Verify functionality through:

Test according to ISO 16750-4, Chapter 5.1.1.2: Low temperature operation test (72 h @  $-20\text{ }^{\circ}\text{C}$ )

This test refers to IEC 60068-2-1: Environmental testing — Part 2-1: Tests — Test A: Cold

Test according to ISO 16750-4: Chapter 5.1.2.2: High temperature operation test (72 h @  $70\text{ }^{\circ}\text{C}$ )

This test refers to IEC 60068-2-2: Basic environmental testing procedures; part 2: tests; tests B: dry heat

Test according to ISO 16750-4: Chapter 5.3.2: Rapid change of temperature with specified transition duration ( $-20\text{ }^{\circ}\text{C}/70\text{ }^{\circ}\text{C}$ , 20 cycles, dwell time 1 h at each temperature)

A reduced set of tests (among those defined in section 3 of this table) can be carried out at the lower temperature, the higher temperature and during the temperature cycles

Verify that the vehicle unit can withstand a cyclic damp (heat test) through IEC 60068-2-30, test Db, six 24 hours cycles, each temperature varying from  $+25\text{ }^{\circ}\text{C}$  to  $+55\text{ }^{\circ}\text{C}$  and a relative humidity of 97 % at  $+25\text{ }^{\circ}\text{C}$  and equal to 93 % at  $+55\text{ }^{\circ}\text{C}$

1.

Sinusoidal vibrations.

verify that the vehicle unit can withstand sinusoidal vibrations with the following characteristics:

constant displacement between 5 and 11 Hz: 10 mm peak

constant acceleration between 11 and 300 Hz: 5g

This requirement is verified through IEC 60068-2-6, test Fc, with a minimum test duration of  $3 \times 12$  hours (12 hours per axis)

ISO 16750-3 does not require a sinusoidal vibration test for devices located in the decoupled vehicle cab.

2.

Random vibrations:

Test according to ISO 16750-3: Chapter 4.1.2.8: Test VIII: Commercial vehicle, decoupled vehicle cab

Random vibration test, 10...2 000 Hz, RMS vertical 21,3 m/s<sup>2</sup>, RMS longitudinal 11,8 m/s<sup>2</sup>, RMS lateral 13,1 m/s<sup>2</sup>, 3 axes, 32 h per axis, including temperature cycle – 20...70°C.

This test refers to IEC 60068-2-64: Environmental testing — Part 2-64: Tests — Test Fh: Vibration, broadband random and guidance

3.

Shocks:

mechanical shock with 3g half sinus according ISO 16750.

The tests described above are performed on different samples of the equipment type being tested.

4.4 Protection against water and foreign bodies

Test according to ISO 20653: Road vehicles — Degree of protection (IP code) — Protection of electrical equipment against foreign objects, water and access (No change in parameters)

220, 221

4.5 Over-voltage protection

Verify that the vehicle unit can withstand a power supply of: 216

24 V versions: 34 V at + 40 °C 1 hour

12V versions: 17 V at + 40 °C 1 hour

( ISO 16750-2, chapter 4.3)

|     |                                       |                                                                                                                                     |     |
|-----|---------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------|-----|
| 4.6 | Reverse polarity protection           | Verify that the vehicle unit can withstand an inversion of its power supply<br><br>(ISO 16750-2, chapter 4.7)                       | 216 |
| 4.7 | Short-circuit protection              | Verify that input output signals are protected against short circuits to power supply and ground<br><br>(ISO 16750-2, chapter 4.10) | 216 |
| 5   | <b>EMC tests</b>                      |                                                                                                                                     |     |
| 5.1 | Radiated emissions and susceptibility | Compliance with Regulation ECE R10                                                                                                  | 218 |
| 5.2 | Electrostatic discharge               | Compliance with ISO 10605:2008 + Technical Corrigendum: 2010 + AMD1:2014: +/- 4kV for contact and +/- 8kV for air discharge         | 218 |

For 24V versions: compliance with ISO 7637-2 + ECE Regulation No. 10 Rev. 3:

pulse 1a:  $V_s = -450V$   $R_i = 50$  ohms

pulse 2a:  $V_s = +37V$   $R_i = 2$  ohms

pulse 2b:  $V_s = +20V$   $R_i = 0,05$  ohms

pulse 3a:  $V_s = -150V$   $R_i = 50$  ohms

pulse 3b:  $V_s = +150V$   $R_i = 50$  ohms

pulse 4:  $V_s = -16V$   $V_a = -12V$   $t_6 = 100$  ms

pulse 5:  $V_s = +120V$   $R_i = 2,2$  ohms  $t_d = 250$  ms

For 12V versions: compliance with ISO 7637-1 + ECE Regulation No. 10 Rev. 3:

pulse 1:  $V_s = -75V$   $R_i = 10$  ohms

pulse 2a:  $V_s = +37V$   $R_i = 2$  ohms

pulse 2b:  $V_s = +10V$   $R_i = 0,05$  ohms

pulse 3a:  $V_s = -112V$   $R_i = 50$  ohms

pulse 3b:  $V_s = +75V$   $R_i = 50$  ohms

pulse 4:  $V_s = -6V$   $V_a = -5V$   $t_6 = 15$  ms

pulse 5:  $V_s = +65V$   $R_i = 3$  ohms  $t_d = 100$  ms

Pulse 5 shall be tested only for vehicle units designed to be installed in vehicles for which no external common protection against load dump is implemented

For load dump proposal, refer to ISO 16750-2, 4th edition, chapter 4.6.4.

## 6. EXTERNAL REMOTE COMMUNICATION FACILITY TEST

| No   | Test                          | Description                  | Related requirements |
|------|-------------------------------|------------------------------|----------------------|
| 1.   | Administrative examination    |                              |                      |
| 1.1  | Documentation                 | Correctness of documentation |                      |
| 2.   | Visual inspection             |                              |                      |
| 2.1. | Compliance with documentation |                              |                      |

|      |                                                   |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |                                                      |
|------|---------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------|
| 2.2. | Identification / markings                         |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           | 225, 226                                             |
| 2.3  | Materials                                         |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           | 219 to 223                                           |
| 3.   | Functional tests                                  |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |                                                      |
| 3.1  | Remote communication for targeted roadside checks |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           | 4, 197 to 199                                        |
| 3.2  | Recording and storing in data memory              |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           | 91                                                   |
| 3.3  | Communication with Vehicle Unit                   |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           | Appendix 14 DSC_66<br>to DSC_70, DSC_71<br>to DSC_76 |
| 4.   | Environmental tests                               |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |                                                      |
| 4.1  | Temperature                                       | <p>Verify functionality through:</p> <p>Test according to ISO 16750-4, Chapter 5.1.1.2:<br/>Low temperature operation test (72 h @ – 20 °C)</p> <p>This test refers to IEC 60068-2-1: Environmental<br/>testing - Part 2-1: Tests - Test A: Cold</p> <p>Test according to ISO 16750-4: Chapter 5.1.2.2:<br/>High temperature operation test (72 h @ 70 °C)</p> <p>This test refers to IEC 60068-2-2: Basic<br/>environmental testing procedures; part 2: tests; tests<br/>B: dry heat</p> <p>Test according to ISO 16750-4: Chapter 5.3.2:<br/>Rapid change of temperature with specified<br/>transition duration (– 20 °C/70 °C, 20 cycles, dwell<br/>time 1 h at each temperature)</p> <p>A reduced set of tests (among those defined in<br/>section 3 of this table) can be carried out at the<br/>lower temperature, the higher temperature and<br/>during the temperature cycles</p> | 213                                                  |
| 4.2  | Protection against<br>water and foreign<br>bodies | Test according to ISO 20653: Road vehicles –<br>Degree of protection (IP code) – Protection of<br>electrical equipment against foreign objects, water<br>and access (targeted value IP40)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 | 220, 221                                             |
| 5    | EMC tests                                         |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |                                                      |
| 5.1  | Radiated emissions<br>and susceptibility          | Compliance with Regulation ECE R10                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        | 218                                                  |
| 5.2  | Electrostatic<br>discharge                        | Compliance with ISO 10605:2008 + Technical<br>Corrigendum:2010 + AMD1:2014: +/- 4 kV for<br>contact and +/- 8 kV for air discharge                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        | 218                                                  |

For 24V versions: compliance with ISO 7637-2 + ECE Regulation No. 10 Rev. 3:

pulse 1a:  $V_s = -450V$   $R_i = 50\text{ ohms}$

pulse 2a:  $V_s = +37V$   $R_i = 2\text{ ohms}$

pulse 2b:  $V_s = +20V$   $R_i = 0,05\text{ ohms}$

pulse 3a:  $V_s = -150V$   $R_i = 50\text{ ohms}$

pulse 3b:  $V_s = +150V$   $R_i = 50\text{ ohms}$

pulse 4:  $V_s = -16V$   $V_a = -12V$   $t_6 = 100ms$

pulse 5:  $V_s = +120V$   $R_i = 2,2\text{ ohms}$   $t_d = 250ms$

For 12V versions: compliance with ISO 7637-1 + ECE Regulation No. 10 Rev. 3:

pulse 1:  $V_s = -75V$   $R_i = 10\text{ ohms}$

pulse 2a:  $V_s = +37V$   $R_i = 2\text{ ohms}$

pulse 2b:  $V_s = +10V$   $R_i = 0,05\text{ ohms}$

pulse 3a:  $V_s = -112V$   $R_i = 50\text{ ohms}$

pulse 3b:  $V_s = +75V$   $R_i = 50\text{ ohms}$

pulse 4:  $V_s = -6V$   $V_a = -5V$   $t_6 = 15ms$

pulse 5:  $V_s = +65V$   $R_i = 3ohms$   $t_d = 100ms$

Pulse 5 shall be tested only for vehicle units designed to be installed in vehicles for which no external common protection against load dump is implemented

For load dump proposal, refer to ISO 16750-2, 4th edition, chapter 4.6.4.

## 7.PAPER FUNCTIONAL TESTS

| No  | Test                              | Description                  | Related requirements |
|-----|-----------------------------------|------------------------------|----------------------|
| 1.  | <b>Administrative examination</b> |                              |                      |
| 1.1 | Documentation                     | Correctness of documentation |                      |
| 2   | <b>General Tests</b>              |                              |                      |

|          |                                            |                                                                                                                                                                                                                              |                                         |
|----------|--------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------|
| 2.1      | Number of characters per line              | Visual inspection of printouts.                                                                                                                                                                                              | 172                                     |
| 2.2      | Minimum character size                     | Visual inspection of printout and character inspection.                                                                                                                                                                      | 173                                     |
| 2.3      | Supported character sets                   | The printer shall support characters specified in Appendix 1 Chapter 4 ‘Character sets’.                                                                                                                                     | 174                                     |
| 2.4      | Printouts definition                       | Check of tachograph type approval and visual inspection of printouts                                                                                                                                                         | 174                                     |
| 2.5      | Legibility and identification of printouts | <p>Inspection of printouts</p> <p>Demonstrated by test reports and test protocols by manufacturer.</p> <p>All homologation number(s) of tachographs with which the printer paper may be used are imprinted on the paper.</p> | 175, 177, 178                           |
| 2.6      | Addition of handwritten notes              | <p>Visual inspection: Field for signature of the driver is available.</p> <p>Fields for additional other handwritten entries are available.</p>                                                                              | 180                                     |
| 2.7      | Additional details on paper faces.         | <p>Paper's face and reverse side may feature additional details and information.</p> <p>These additional details and information may not interfere with the legibility of the printouts.</p> <p>Visual inspection.</p>       | 177, 178                                |
| <b>3</b> | <b>Storage Tests</b>                       |                                                                                                                                                                                                                              |                                         |
| 3.1      | Dry Heat                                   | <p>Preconditioning: 16 hours at + 23 °C ± 2 °C/55 % ± 3 % relative humidity</p> <p>Test environment: 72 hours at + 70 °C ± 2 °C</p> <p>Recovery: 16 hours at + 23 °C ± 2 °C/55 % ± 3 % relative humidity</p>                 | <p>176, 178</p> <p>IEC 60068-2-2-Bb</p> |

## 2.2 Damp Heat

Preconditioning: 16 hours at + 23 °C ± 2 °C/55 % ±3 % relative humidity 176, 178

Test environment: 144 hours at + 55 °C ± 2 °C and 93 % ± 3 % r.h. IEC 60068-2-78-Cab

Recovery: 16 hours at + 23 °C ± 2 °C/55 % ± 3 % relative humidity

## 4 Paper In-Service Tests

### 4.1 Humidity resistance background (unprinted paper)

Preconditioning: 16 hours at + 23 °C ± 2 °C/55 % ±3 % relative humidity 176, 178

Test environment: 144 hours at + 55 °C ± 2 °C and 93 % ± 3 % r.h. IEC 60068-2-78-Cab

Recovery: 16 hours at + 23 °C ± 2 °C/55 % ± 3 % relative humidity

### 4.2 Printability

Preconditioning: 24 hours at + 40 °C ± 2 °C/93 % ± 3 % relative humidity 176, 178

Test environment: printout produced at + 23 °C ± 2 °C

Recovery: 16 hours at + 23 °C ± 2 °C/55 % ± 3 % relative humidity

### 4.3 Heat resistance

Preconditioning: 16 hours at + 23 °C ± 2 °C/55 % ± 3 % relative humidity 176, 178

Test environment: 2 hours at + 70 °C ± 2 °C, dry heat IEC 60068-2-2-Bb

Recovery: 16 hours at + 23 °C ± 2 °C/55 % ± 3 % relative humidity

### 4.4 Low temperature resistance

Preconditioning: 16 hours at + 23 °C ± 2 °C/55 % ± 3 % relative humidity 176, 178

Test environment: 24 hours – 20 °C ± 3 °C, dry cold ISO 60068-2-1-Ab

Recovery: 16 hours at + 23 °C ± 2 °C/55 % ± 3 % relative humidity

Preconditioning: 16 hours at + 23 °C ± 2 °C/55 % ± 3 % relative humidity

Test environment: 100 hours under 5 000 Lux illumination at + 23 °C ± 2 °C/55 % ± 3 % relative humidity

Recovery: 16 hours at + 23 °C ± 2 °C/55 % ± 3 % relative humidity

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Legibility criteria for tests 3.x and 4.x:

Printout legibility is assured if optical densities comply with the following limits:

Printed characters: min. 1,0

Background (unprinted paper): max. 0,2

Optical densities of the resulting printouts shall be measured according to DIN EN ISO 534.

Printouts shall show no dimensional changes and remain clearly legible.

## 8.INTEROPERABILITY TESTS

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| No                                                                    | Test                  | Description                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |
|-----------------------------------------------------------------------|-----------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 8.1 Interoperability tests between vehicle units and tachograph cards |                       |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |
| 1                                                                     | Mutual authentication | Check that the mutual authentication between the vehicle unit and the tachograph card runs normally                                                                                                                                                                                                                                                                                                                                                                                                   |
| 2                                                                     | Write/read tests      | <p>Execute a typical activity scenario on the vehicle unit. The scenario shall be adapted to the type of card being tested and involve writings in as many EFs as possible in the card</p> <p>Verify through a vehicle unit downloading that all corresponding recordings have been properly made</p> <p>Verify through a card downloading that all corresponding recordings have been properly made</p> <p>Verify through daily printouts that all corresponding recordings can be properly read</p> |
| 8.2 Interoperability tests between vehicle units and motion sensors   |                       |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |
| 1                                                                     | Pairing               | Check that the pairing between the vehicle units and the motion sensors runs normally                                                                                                                                                                                                                                                                                                                                                                                                                 |

|                                                                                                 |                       |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |
|-------------------------------------------------------------------------------------------------|-----------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 2                                                                                               | Activity tests        | <p>Execute a typical activity scenario on the motion sensor. The scenario shall involve a normal activity and creating as many events or faults as possible.</p> <p>Verify through a vehicle unit downloading that all corresponding recordings have been properly made</p> <p>Verify through a card downloading that all corresponding recordings have been properly made</p> <p>Verify through a daily printout that all corresponding recordings can be properly read</p>          |
| 8.3 Interoperability tests between vehicle units and external GNSS facilities (when applicable) |                       |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |
| 1                                                                                               | Mutual authentication | Check that the mutual authentication (coupling) between the vehicle unit and the external GNSS module runs normally.                                                                                                                                                                                                                                                                                                                                                                  |
| 2                                                                                               | Activity tests        | <p>Execute a typical activity scenario on the external GNSS facility. The scenario shall involve a normal activity and creating as many events or faults as possible.</p> <p>Verify through a vehicle unit downloading that all corresponding recordings have been properly made</p> <p>Verify through a card downloading that all corresponding recordings have been properly made</p> <p>Verify through a daily printout that all corresponding recordings can be properly read</p> |

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