

ISO 22133:2026-01 (E)

Road vehicles - Test object monitoring and control for active safety and automated/autonomous vehicle testing - Functional requirements, specifications and communication protocol

Contents

Page

- Foreword..... vi
- Introduction..... vii
- 1 Scope..... 1**
- 2 Normative references..... 1**
- 3 Terms and definitions..... 1**
- 4 Abbreviated terms..... 4**
- 5 Test scenario illustration..... 5**
- 6 General requirements and recommendations..... 6**
 - 6.1 Function overview..... 6
 - 6.2 Test object coordinate system..... 6
 - 6.2.1 Vehicle..... 6
 - 6.2.2 Moveable test objects other than vehicle..... 7
 - 6.3 Test scenario coordinate system..... 9
 - 6.3.1 Background info: tectonic/continental plate drift..... 9
 - 6.3.2 Coordinate system – Tests on proving ground..... 9
 - 6.3.3 Coordinate system – Test on other test areas..... 10
 - 6.4 Time requirements..... 11
 - 6.4.1 General time requirements..... 11
 - 6.4.2 Time representation..... 11
 - 6.4.3 Absolute time..... 11
 - 6.4.4 Relative time..... 11
 - 6.4.5 Time resolution..... 11
 - 6.4.6 Time accuracy (and precision)..... 12
 - 6.4.7 Time synchronization..... 12
 - 6.4.8 Date synchronization..... 13
 - 6.4.9 Network delay..... 13
 - 6.5 Communication requirements, recommendations and permissions..... 14
- 7 Safety and risk assessment requirements and recommendations..... 15**
 - 7.1 General..... 15
 - 7.2 Local test object fence and global geofence..... 15
 - 7.2.1 Common requirements and recommendations..... 15
 - 7.2.2 Global geofence..... 15
 - 7.2.3 Local test object fence..... 15
- 8 Communication security requirements..... 17**
- 9 Architecture and interfaces..... 17**
 - 9.1 General..... 17
 - 9.2 Control centre and test object states..... 18
 - 9.2.1 General..... 18
 - 9.2.2 Test objects state diagram..... 18
 - 9.2.3 Test object state change conditions..... 20
 - 9.2.4 Control centre state diagram..... 20
 - 9.2.5 Control centre state change triggers..... 21
 - 9.3 Communication setup..... 22
 - 9.3.1 General..... 22

9.3.2	Test object discovery	23
9.3.3	TCP communication setup (control channel)	24
9.3.4	UDP communication setup (process channel)	25
9.3.5	File transfer protocol (FTP)	26
9.4	Control functionalities	26
9.4.1	Automated and non-automated drive	26
9.4.2	Remote control manoeuvring	27
9.5	Monitoring functionalities	28
9.5.1	Introduction to test object monitoring	28
9.5.2	Test object monitoring communication	28
10	Trajectory and scenario-based testing	29
10.1	Introduction to trajectory and scenario-based testing	29
10.2	Static trajectories	29
10.3	Dynamic trajectories	30
10.4	Scenario description languages	30
11	Functional requirements	31
11.1	Device interface description XML (DIDX)	31
11.2	Control centre requirements and recommendations	32
11.3	Stationary test object requirements	32
11.4	Moveable test object requirements and recommendations	32
11.5	Functions with behaviour description	33
11.5.1	Arm and disarm test object	33
11.5.2	Start a test	33
11.5.3	Emergency stop of test scenario (initiated by the CC)	34
11.5.4	Emergency stop of test scenario (upon request from test object)	35
11.5.5	Normal stop of test scenario	36
11.5.6	Normal stop by test object	37
11.5.7	Download static (pre-planned) trajectories	37
11.5.8	Cyclic monitor and heartbeat	38
11.5.9	Adaptive synchronization point	38
11.5.10	Remote control manoeuvring	41
11.5.11	Trigger and action	42
12	Message requirements	43
12.1	General	43
12.2	Message	43
12.2.1	Message structure	43
12.2.2	Sequential byte order	43
12.2.3	Message header	44
12.2.4	Message content	46
12.2.5	Message footer	47
12.2.6	Protocol tunnel	47
12.2.7	Vendor-specific messages	47
12.3	Definition of messages	47
12.3.1	Collective message overview	47
12.3.2	Trajectory object message - TRAJ (MsgID 0x0001)	49
12.3.3	Object setting message - OSEM (MsgID 0x0002)	53
12.3.4	Object action state change request message - OSTM (MsgID 0x0003)	60
12.3.5	Start message - STRT (MsgID 0x0004)	61
12.3.6	Heartbeat message - HEAB (MsgID 0x0005)	62
12.3.7	Monitor message - MONR (MsgID 0x0006)	63
12.3.8	Monitor message 2 - MONR2 (MsgID 0x0007)	68
12.3.9	GPS second of week roll over message - SOWM (MsgID 0x0008)	69
12.3.10	Synchronization point configuration message - SYPM (MsgID 0x000B)	70
12.3.11	Leader time to synchronization point message - LTSP (MsgID 0x000C)	71
12.3.12	Remote control manoeuvring message - RCMM (MsgID 0x000A)	71
12.3.13	Remote control manoeuvring message 2 - RCMM2 (MsgID 0x0016)	74
12.3.14	Trigger configuration message - TRCM (MsgID 0x0021)	77
12.3.15	Action configuration message - ACCM (MsgID 0x0022)	79
12.3.16	Trigger event occurred message - TREO (MsgID 0x0023)	81

12.3.17 Execute action message – EXAC (MsgID 0x0024).....	82
12.3.18 Cancel or delete trigger and action – CADE (MsgID 0x0025).....	82
12.3.19 Action performed message – APEM (MsgID 0x0026).....	83
12.3.20 Discovery request DREQ (MsgID 0x0010).....	84
12.3.21 Discovery response DRES (MsgID 0x0011).....	84
12.3.22 Parameter request message – PREQ (MsgID 0x0012).....	85
12.3.23 Parameter response message PRES (MsgID 0x0013).....	86
12.3.24 Geofence message GEOF (MsgID 0x0009).....	87
12.3.25 General data message - GEDM (MsgID 0x0017).....	89
12.3.26 General response message - GREM (MsgID 0x0018).....	90
12.3.27 Dynamic position point message – DPPM (MsgID 0x0027).....	91
Annex A (normative) Trajectory file format	93
Annex B (informative) Message footer checksum calculation	96
Annex C (informative) Trigger and action	99
Annex D (normative) Device interface description XML (DIDX).....	104
Annex E (informative) An overtake by a test object with dynamic position points (DPP).....	106
Bibliography.....	116