

# ISO 22733-2:2023-11 (E)

## Road vehicles - Test method to evaluate the performance of autonomous emergency braking systems - Part 2: Car to pedestrian

| <b>Contents</b> |  | <b>Page</b> |
|-----------------|--|-------------|
| Foreword        |  | v           |
| Introduction    |  | vi          |
| <b>1</b>        | <b>Scope</b>   | <b>1</b>    |
| <b>2</b>        | <b>Normative references</b>  | <b>1</b>    |
| <b>3</b>        | <b>Terms and definitions</b>   | <b>1</b>    |
| <b>4</b>        | <b>Reference system and variables</b>  | <b>4</b>    |
| 4.1             | Coordinate system  | 4           |
| 4.2             | Lateral path errors  | 5           |
| 4.3             | Profiles for impact speed determination  | 5           |
| <b>5</b>        | <b>Variables to be measured</b>  | <b>6</b>    |
| <b>6</b>        | <b>Measuring equipment</b>   | <b>7</b>    |
| 6.1             | Description  | 7           |
| 6.2             | Transducer installation  | 7           |
| 6.3             | Calibration  | 7           |
| 6.4             | Data processing  | 8           |
| <b>7</b>        | <b>Test conditions</b>   | <b>8</b>    |
| 7.1             | General  | 8           |
| 7.2             | General data   | 8           |
| 7.3             | Test track   | 8           |
| 7.4             | Weather conditions   | 8           |
| 7.5             | Surroundings   | 8           |
| 7.6             | VUT  | 8           |
| 7.6.1           | General vehicle condition  | 8           |
| 7.6.2           | AEBS settings  | 8           |
| 7.6.3           | Deployable pedestrian protection systems   | 8           |
| 7.6.4           | Tyres  | 8           |
| 7.6.5           | Braking system   | 9           |
| 7.6.6           | Other influencing system   | 9           |
| 7.6.7           | Loading conditions   | 9           |
| <b>8</b>        | <b>Test procedures</b>   | <b>9</b>    |
| 8.1             | Test preparation   | 9           |
| 8.1.1           | Brake conditioning   | 9           |
| 8.1.2           | Tyre conditioning  | 9           |
| 8.2             | Test scenarios   | 9           |
| 8.3             | Test conduct   | 13          |
| 8.4             | Test execution   | 13          |
| 8.4.1           | Speeds   | 13          |
| 8.4.2           | Validity criteria  | 14          |
| 8.4.3           | End of test conditions   | 14          |
| <b>9</b>        | <b>Performance metrics</b>   | <b>14</b>   |
| 9.1             | Performance metrics for test until collision   | 14          |
| 9.1.1           | Speed of VUT ( $V_{VUT}$ ) and speed of VUT at which collision is last avoided ( $(V_{VUT})_{cla}$ )                       | 15          |
| 9.1.2           | Impact speed of VUT at which collision first occurs: $V_{IMPACT}$  | 15          |
| 9.1.3           | Activation time of AEBS ( $T_{AEB}$ ) and activation time of AEBS at which collision is last avoided ( $(T_{AEB})_{cla}$ ) | 15          |

|       |   |           |
|-------|---|-----------|
| 9.1.4 | Activation time of FCW ( $T_{FCW}$ ) and activation time of FCW at which collision is last avoided ( $T_{FCW}$ ) <sub>cla</sub> .....   | 15        |
| 9.1.5 | Mean longitudinal acceleration of the VUT ( $A_{VUT}$ ) and mean longitudinal acceleration of the VUT at which collision is last avoided ( $A_{VUT}$ ) <sub>cla</sub> .....                             | 15        |
| 9.1.6 | Maximum yaw rate of the VUT ( $\dot{\psi}_{VUT}$ ) <sub>max</sub> and maximum yaw rate of the VUT at which collision is last avoided ( $\dot{\psi}_{VUT}$ ) <sub>max,cla</sub> .....                    | 15        |
| 9.1.7 | Lateral path error of the VUT ( $Y_{VUT}$ ) and lateral path error of the VUT at which collision is last avoided ( $Y_{VUT}$ ) <sub>cla</sub> .....   | 15        |
| 9.1.8 | Maximum steering wheel velocity of VUT ( $\dot{\Omega}_{VUT}$ ) <sub>max</sub> and maximum steering wheel velocity at which collision is last avoided ( $\dot{\Omega}_{VUT}$ ) <sub>max,cla</sub> ..... | 15        |
| 9.2   | Performance metrics for test until the designated maximum speed where no collision occurs.....  | 16        |
| 9.2.1 | Speed of VUT ( $V_{VUT}$ ) until the designated maximum speed ( $V_{VUT}$ ) <sub>ds</sub> .....   | 16        |
| 9.2.2 | Activation time of AEBS ( $T_{AEB}$ ) and activation time of AEBS at the designated maximum speed ( $T_{AEB}$ ) <sub>dms</sub> .....  | 16        |
| 9.2.3 | Activation time of FCW ( $T_{FCW}$ ) and activation time of FCW at the designated maximum speed ( $T_{FCW}$ ) <sub>dms</sub> .....  | 16        |
| 9.2.4 | Mean longitudinal acceleration of the VUT ( $A_{VUT}$ ) and mean longitudinal acceleration of the VUT at the designated maximum speed ( $A_{VUT}$ ) <sub>dms</sub> .....                                | 16        |
| 9.2.5 | Maximum yaw rate of the VUT ( $\dot{\psi}_{VUT}$ ) <sub>max</sub> and maximum yaw rate of the VUT at the designated speed ( $\dot{\psi}_{VUT}$ ) <sub>max,dms</sub> .....                               | 17        |
| 9.2.6 | Lateral offset of the VUT ( $Y_{VUT}$ ) and lateral offset of the VUT at the designated maximum speed ( $Y_{VUT}$ ) <sub>dms</sub> .....  | 17        |
| 9.2.7 | Maximum steering wheel velocity of VUT ( $\dot{\Omega}_{VUT}$ ) <sub>max</sub> and maximum steering wheel velocity at the designated maximum speed ( $\dot{\Omega}_{VUT}$ ) <sub>max,dms</sub> .....    | 17        |
| 9.3   | Performance metrics for test until the designated maximum speed where collision occurs.....   | 17        |
| 9.3.1 | Speed of VUT ( $V_{VUT}$ ) and speed of VUT at which collision is last avoided ( $V_{VUT}$ ) <sub>cla</sub> .....   | 18        |
| 9.3.2 | Impact speed of VUT at which collision first occurs: $V_{IMPACT}$ .....   | 18        |
| 9.3.3 | Activation time of AEBS ( $T_{AEB}$ ) and activation time of AEBS at which collision is last avoided ( $T_{AEB}$ ) <sub>cla</sub> .....   | 18        |
| 9.3.4 | Activation time of FCW ( $T_{FCW}$ ) and activation time of FCW at which collision is last avoided ( $T_{FCW}$ ) <sub>cla</sub> .....   | 18        |
| 9.3.5 | Mean longitudinal acceleration of the VUT ( $A_{VUT}$ ) and mean longitudinal acceleration of the VUT at which collision is last avoided ( $A_{VUT}$ ) <sub>cla</sub> .....                             | 18        |
| 9.3.6 | Maximum yaw rate of the VUT ( $\dot{\psi}_{VUT}$ ) <sub>max</sub> and maximum yaw rate of the VUT at which collision is last avoided: ( $\dot{\psi}_{VUT}$ ) <sub>max,cla</sub> .....                   | 18        |
| 9.3.7 | Lateral offset of the VUT ( $Y_{VUT}$ ) and lateral offset of the VUT at which collision is last avoided ( $Y_{VUT}$ ) <sub>cla</sub> .....   | 18        |
| 9.3.8 | Maximum steering wheel velocity of VUT ( $\dot{\Omega}_{VUT}$ ) <sub>max</sub> and maximum steering wheel velocity at which collision is last avoided ( $\dot{\Omega}_{VUT}$ ) <sub>max,cla</sub> ..... | 18        |
|       | <b>Bibliography</b> .....   | <b>20</b> |