



TEST REPORT

EN 17128

Light motorized vehicles for the transportation of persons and goods and related facilities and not subject to type approval for on-road use - Personal light electric vehicles (PLEV) - Safety requirements and test methods

Report reference No. : CCTI-2021111211S**Date of issue** : Nov. 17, 2021**Total number of pages** : 61**Testing Laboratory name** : Shenzhen CCTI Technology Co., Ltd.**Address** : 7th Floor, Block A, Building E, Yongwei Industrial Park, No. 118, Yongfu Road, Qiaotou, Fuhai Street, Bao'an District, Shenzhen, Guangdong, China.**Applicant's name** : Jinhua Feimi Intelligent Technology Co., Ltd**Address** : No.252, Chengxin Road, Yongkang Economic Development Zone, Yongkang city, Zhejiang Province.**Test specification****Standard** : EN 17128: 2020**Test procedure** : CE Report**Non-standard test method** : N/A**Test Report Form No.** : EN17128_2020_1**TRF Originator** : SGS-CSTC**Master TRF** : Dated 2021-01

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Test item description : Electric Scooter**Trademark** : N/A**Manufacturer's name** : Shenzhen City Heng Zhi He Technology Co.Ltd**Address** : 4F4006, Shenzhou Computer Building, Madame Curie Avenue, Wankecheng Community, Bantian Street, Longgang District, Shenzhen, Guangdong, China**Model and/or type reference** : G2 Pro**Rating(s)** : For adapter: Input: 100V-240V~ 50/60 Hz, 3.0 A
Output: 54.6V== 2.0A, Class II
Electric vehicle input : 48V== 15A

Testing procedure and testing location:

Testing Laboratory.....: **Shenzhen CCTI Technology Co., Ltd.**

Address.....: 7th Floor, Block A, Building E, Yongwei Industrial Park,
No. 118, Yongfu Road, Qiaotou, Fuhai Street, Bao'an
District, Shenzhen, Guangdong, China..

Date of Test.....: Nov. 09, 2021 to Nov. 17, 2021

Tested by (name + signature).....: Nick Chan

Nick Chan

Reviewed by (name + signature).....: Sindy Wang

Sindy Wang

Approved by (name + signature).....: Corey Mao



中鉴检测
CCTI TESTING

List of Attachments (including a total number of pages in each attachment):

--Attachment 1: Including 5 pages for Photo documentation.

Summary of testing:

Tests performed (name of test and test clause):

All applicable test

Testing location:

Shenzhen CCTI Technology Co., Ltd.
 7th Floor, Block A, Building E, Yongwei Industrial
 Park, No. 118, Yongfu Road, Qiaotou, Fuhai Street,
 Bao'an District, Shenzhen, Guangdong, China.

Summary of compliance with National Differences (List of countries addressed):

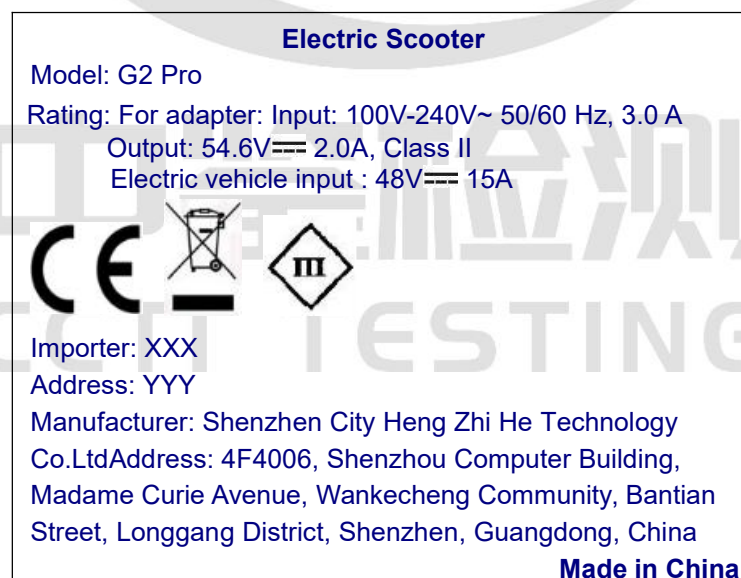
N/A.

☒ The product fulfils the requirements of **EN 17128: 2020**

Copy of marking plate:

The artwork below may be only a draft. The use of certification marks on a product must be authorized by the respective NCBs that own these marks.

(Additional requirements for markings. See 1.7 NOTE)



Remark on above marking:

- 1, The height of CE symbols is more than 5 mm;The height of WEEE symbols is more than 7 mm;
- 2, XXX means Importer name; YYY means Importer address.

Test item particulars..... : Electric Scooter	
Classification of installation and use..... : Portable appliance	
Supply Connection..... : For scooter: DC jack For adapter: appliance inlet	
Battery Voltage and Capacity..... : 48 V d.c., 15 Ah	
Battery type..... : Lithium battery pack	
Max. speed..... : 25 Km/h	
Technical Permissible Maximum Mass..... : About 45Kg	
Possible test case verdicts: - test case does not apply to the test object..... : N/A - test object does meet the requirement..... : P (Pass) - test object does not meet the requirement..... : F (Fail)	
Testing..... :	
Date of receipt of test item..... : Nov. 09, 2021	
Date (s) of performance of tests..... : Nov. 09, 2021 to Nov. 17, 2021	
General remarks:	
"(See Enclosure #)" refers to additional information appended to the report. "(See appended table)" refers to a table appended to the report. Throughout this report a ☐ comma / ☒ point is used as the decimal separator.	
Manufacturer's Declaration per sub-clause 4.2.5 of IEC 60335-1:	
The application for obtaining a CB Test Certificate includes more than one factory location and a declaration from the Manufacturer stating that the sample(s) submitted for evaluation is (are) representative of the products from each factory has been provided.....	☐ Yes ☒ Not applicable
When differences exist; they shall be identified in the General product information section.	
Name and address of factory (ies) :	Same as the applicant
General product information: 1. All models have same diagram circuit, except different colour and outward appearance; 2. All tests are carried out on model G2 Pro.	

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Clause	Requirement + Test	Result - Remark	Verdict																				
4	Classes of vehicles		--																				
	The main classes of vehicle are defined below combined with the main design choices that characterize them. Table 1 — Classes of vehicle (Design elements) <table border="1"> <thead> <tr> <th>Classes</th><th>With self-balanced system</th><th>Maximum design speed (km/h)</th><th>Seating position</th></tr> </thead> <tbody> <tr> <td>Class 1</td><td>No</td><td>Up to 6 km/h</td><td>No</td></tr> <tr> <td>Class 2</td><td>No</td><td>Up to 25 km/h</td><td>No</td></tr> <tr> <td>Class 3</td><td>Yes</td><td>Up to 6 km/h</td><td>with or without</td></tr> <tr> <td>Class 4</td><td>Yes</td><td>Up to 25 km/h</td><td>with or without</td></tr> </tbody> </table>	Classes	With self-balanced system	Maximum design speed (km/h)	Seating position	Class 1	No	Up to 6 km/h	No	Class 2	No	Up to 25 km/h	No	Class 3	Yes	Up to 6 km/h	with or without	Class 4	Yes	Up to 25 km/h	with or without	Max. designed speed: 25 km/h Class 2	P
Classes	With self-balanced system	Maximum design speed (km/h)	Seating position																				
Class 1	No	Up to 6 km/h	No																				
Class 2	No	Up to 25 km/h	No																				
Class 3	Yes	Up to 6 km/h	with or without																				
Class 4	Yes	Up to 25 km/h	with or without																				
5	General safety requirements and protective measures		--																				
	Machine shall be additionally designed according to EN ISO 12100 for relevant hazards	The risk assessment part has been considered according to EN ISO 12100:2010 by the manufactory.	P																				
	For vehicles which are not sold fully assembled, tools as well as assembly instructions shall be provided specifying by a text and a diagram the operations to be carried out as well as the clamping force.		P																				
6	Electrical components		—																				
6.1	General mechanical strength		--																				
	Compliance is checked by:		P																				
	— Spring hammer impact, three impacts, impact energy of $(0,7 \pm 0,05) \text{ J}$;	Plastic enclosure, control panel	P																				
	— Detachable ESA, subject to free fall on rigid surface at a height of 0,9m in three different positions (one surface, one edge and one corner);	No Detachable ESA	P																				
	After the test the ESA shall show no damage that could lead to emission of dangerous substances (gas or liquid) ignition, fire or overheating. After the test the ESA shall show no damage or malfunction that could impair the safe use of the vehicles.		P																				
	Batteries and other electric conductive power supply systems shall be assessed and tested in accordance with EN 62133-1:2017 and EN 62133-2:2017 or other relevant standards.		P																				
6.2	Electrical power on/off control		--																				
	An electrical power on/off control shall be fitted to on and power-off the driving power.		P																				
	It shall be apparent, easy to reach and unmistakable.		P																				

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Clause	Requirement + Test	Result - Remark	Verdict
	This electrical power on/off control shall be activated voluntary by the user to enable the driving power.		P
	This electrical power on/off control shall be activated voluntary by the user to enable the driving power.		P
	In the event of a malfunction, Vehicle shall still be able to stop or be able to be stopped with a smooth deceleration		P
	The electrical power on/off system shall be located in a position easily reachable by the user with appropriate symbol given in Annex F ()		P
	On self-balancing vehicles or vehicles with electric brake, the power -off control shall not disconnect the power while driving: the power-off control shall only work without user on the vehicle.	Mechanical brake	N/A
6.3	Electrical cables and connections		--
6.3.1	General, All electrical connectors shall be selected to prevent the corrosion.		P
6.3.2	Cable and plugs		P
6.3.2.1	After the test according to 6.3.2.2, there shall be no deterioration of the insulation on either assembly.		P
	The cable cross sections shall be selected in accordance with EN 61558-1:2005, EN 61558-2-16:2009, EN 60335-1:2012, EN 60335-2-29:2004, Table 11 or a temperature rise test shall be performed, in accordance with 6.3.2.2 the temperature of the cables and plugs in use shall be at least 5 °C lower than the maximum specified by the manufacturer.	EN 60335-1:2012; EN 60335-2-29:2004	P
6.3.2.2	Test method: At an ambient room temperature (20 ± 5)°C, discharge the fully charged vehicle battery to the discharging limit specified by the vehicles, and measure the cable and plug temperatures.		P
6.3.3	Wirings, by physical inspection and/or test		P
	a) Wireway shall be smooth and free from sharp edges.		P
	b) Wires shall be protected so that they do not come into contact with burrs, cooling fins or similar sharp edges that may cause damage to their insulation.		P
	c) Holes in metal through which insulated wires pass shall have smooth well-rounded surfaces or be provided with bushings.		P

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Clause	Requirement + Test	Result - Remark	Verdict
	d) Wires shall be effectively prevented from coming into contact with moving parts.		P
	e) Separate parts of the vehicles that can move in normal use or during user maintenance relative to each other, shall not cause undue stress to electrical connections and internal conductors, including those providing earthing continuity.		P
	f) If an open coil spring is used to protect wire, it shall be correctly installed and insulated. Flexible metallic tubes shall not cause damage to the insulation of the conductors contained within them.		N/A
	Compliance with e) f) shall be checked by inspection and by the following test method:		P
	1) If flexing occurs in normal use, the product is placed in its normal operational position and is supplied at rated voltage under normal operation. 2) The movable part is moved from an extreme position to the opposite extreme position, so that the conductor undergoes maximum flexion. 3) For conductors that are flexed in normal use, flex movable part for 10 000 cycles at a test frequency of 0,5 Hz. 4) For conductors that are flexed during user maintenance, flex the movable part for 100 cycles at the same frequency.		P
6.3.4	Wiring harness	No such part	N/A
	When a wiring harness is installed, it shall be positioned to avoid any damage related to contact with moving parts or sharp edges. All connections shall withstand a tensile force of 10 N in any direction.		N/A
6.3.5	Power cables and conduits		P
	Conduit entries, cable entries and knockouts shall be constructed or located so that the introduction of the conduit or cable does not reduce the protection measures adopted by the manufacturer.		P
	Compliance is checked by inspection.		P
	The insulation of internal wiring shall withstand the electrical stress likely to occur in intended use. The wiring and its connections shall withstand an electrical strength test with the following characteristics. The test voltage expressed in volts shall be equal to $(500+2U_r)$ where U_r is the rated voltage. The test voltage is applied for 2 min between live parts and other metal parts only.	500+2x48=596 V	P
6.3.6	External and internal electrical connections		P

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Clause	Requirement + Test	Result - Remark	Verdict
	Electrical connection shall comply with HD 60364-5-52:2011, 526.1 and tested in accordance with HD 60364-5-52:2011, 526.2.		P
6.4	Moisture resistance		P
	The electrical components of a fully assembled vehicles shall comply with IPX4 (min.)		P
6.5	Resistance to vibration for electric functions		P
6.5.1	The vehicle shall withstand a vibration test representing the foreseeable use on roads and public areas. All electric functions shall be fully maintained. Verification shall be by function test after the vibration test.		P
6.5.2	Test method		P
	A random vibration test in accordance with EN 60068-2-64:2008 shall be performed.		P
	Before the random vibration test, perform a 0,5 g-PK sinusoidal scan from 5 Hz to 500 Hz at a sweep rate not exceeding 1,0 octave/minute. Record plots of response accelerometers at selected position on the vehicle to determine resonant frequencies and amplification factors.		P
	Apply the appropriate test level PSD of Table 3 for 15 h. During this random vibration period, also perform a PSD analysis of the vibration response measurements on the equipment.		P
	Repeat the sinusoidal scan. Any changes in vibration resonant frequencies shall be recorded.		P
	The vibration tests shall be performed under normal ambient environmental conditions with a temperature of $+23^{\circ}\text{C} \pm 5^{\circ}\text{C}$ (relative humidity < 85 %, normal atmospheric pressure).		P
	The appropriate random vibration test curve shall be selected from Table 2 depending on the wheel size and design of the vehicle. The test curves are given in Table 3 and Figure 1.	Condition B	P
7	Driving power management		--
7.1	Driving power activation		--
7.1.1	Driving power shall only be provided following at least two independent and dissimilar intentional actions by the user.	Start and then enter code.	P
	a) For vehicles of class 1 or 2 with a partially electrically powered vehicle, the driving power shall not be delivered while moving forward at a speed of less than 3 km/h.	3 Km/h	P

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Clause	Requirement + Test	Result - Remark	Verdict
	b) For vehicles of class 1 or 2, it shall be possible for the user to power-off the driving power at any time during use in accordance with the driving power procedure described by the manufacturer in the instruction manual	The user can switch off the driving power an any time during use.	P
	For vehicles of class 3 or 4, the Driving power management shall not power-off motor power at any specified speed.	The product is not a self-balanced vehicle	N/A
	Verification shall be by inspection and function test.		P
	c) For vehicles of class 1 and 2, the cut-off of driving power shall take priority over the maintenance of power assistance	Meet the requirement	P
	d) Vehicles of class 3 or 4 shall act as follows:	The product is not a self-balanced vehicle	N/A
	1) Horizontal level foot rests (maintain constant speed)		N/A
	2) Tilt back of foot rest shall result in a progressive controlled braking		N/A
	3) Foot rest tilt to the front shall result in a progressive controlled acceleration		N/A
	4) The vehicle shall be self-balancing in all operating states.		N/A
	Verification shall be by inspection and function test.		N/A
	e) When the vehicle approaches the maximum speed of its class, the driving power shall be reduced in such a way that the maximum speed limit will not be exceeded. The driving power shall be managed smoothly and progressively.	The maximum speed limit is not exceeded	P
	f) In the case where a class 1 or 2 vehicle is equipped with a mechanical brake system, the driving power shall be cut off at the commencement of braking (according to 15.4.2).	Meet the requirement	P
	g) In the case where the vehicle is equipped with an electric brake, the driving power management shall be such that braking starts immediately.	Mechanical brake	N/A
	h) For self-balancing vehicles, the driving power shall ensure that the vehicle speed cannot exceed the maximum speed of the vehicle's class.	The product is not a self-balanced vehicle	N/A
	i) In case of overspeed during driving, the following shall apply to vehicles of class 3 or 4:		N/A
	1) There shall be audible and if possible (in the particular vehicle) visual and other (physical) warnings to alert the user of a system issue.		N/A

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Clause	Requirement + Test	Result - Remark	Verdict
	2) In all cases, the vehicle shall be slowed automatically and brought to a safe speed (lower than the maximum speed).		N/A
	j) In case of overheating of the driving power management during driving, the following shall apply for vehicles of class 3 or 4:		N/A
	1) There shall be audible and if possible (in the particular vehicle) visual and other (physical) warnings to alert the user of a system issue.		N/A
	2) In all cases, the vehicle shall be slowed automatically and brought to a safe stop.		N/A
	3) It shall not be possible to drive the self-balancing vehicle until the vehicle's control system detects that the initiating problem has been corrected.		N/A
	k) In case of insufficient battery power, the following shall apply for vehicles of class 3 or 4:		N/A
	1) There shall be audible and if possible (in the particular vehicle) visual and other (physical) warnings to alert the user of a system issue.		N/A
	2) In all cases, the vehicle shall be slowed automatically and brought to a safe stop.		N/A
	3) It shall not be possible to drive the self-balancing vehicle until the vehicle's control system detects that the initiating problem has been corrected.		N/A
	l) Acceleration Limitation		P
	1) The acceleration of the vehicle shall be smooth without shocks and limited to 2 m/s ² in order to avoid unstable riding conditions.	Lower than 2m/s ²	P
7.1.2	Test method		P
	a) For vehicles class 1 or 2, check that no driving power is delivered while moving forward at a speed of less than 3 km/h. Compliance shall be checked, in accordance with the technology used, either by:		P
	1) when attempting to drive the vehicle forward using the normal controls or procedures for speeds less than 3 km/h, measuring the no-load current or checking the torque delivered to the driving wheel		P
	b) For vehicles of class 1 or 2 check whether the power assistance is cut-off when the brake is applied.		P
	Compliance shall be checked, in accordance with the technology used, by:		P
	1) measuring the no-load current or checking the torque delivered to the driving wheel before and after actuating the direct or indirect braking system.		P

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Clause	Requirement + Test	Result - Remark	Verdict
	2) reproducing the power assistance cut-off situation 30 times. The power assistance shall not continue after actuation of the braking system. Power assistance may resume immediately after releasing the braking device.		P
	c) At the end of the tests, the power assistance cut-off systems shall be made to fail (to simulate, for example, cable detachment or failure of a sensor).		P
	It shall no longer be possible to activate the power assistance by any means whatsoever.		P
	d) With the vehicle at standstill or if the electric power doesn't start at 0 km/h: bring the vehicle in a stable riding position at 6 km/h (± 2 km/h) and with the vehicle operate under normal operation, but the motors are loaded to 33 % of their locked rotor current by adjusting the load on its rotational axis in the forward direction.		P
	Move the acceleration device to its maximum position and keep it in this position until the vehicle reaches 60 % of its maximum speed.		P
	Measure the time from the start until the vehicle reaches 50 % of its maximum speed.		P
	Calculate the acceleration.		P
7.2	Power failure of control system		--
	For class 1 and class 2 vehicles, in the event of an electrical power failure the vehicle shall be able to brake normally or, shall come to a standstill with a deceleration between (1,5 – 2) m/s ² .	Separate mechanical brake was fitted	P
	For class 3 and class 4 vehicles, a fault condition in the power control system shall be indicated by a warning signal (visual, audible, vibrating...) on the handlebar, the vehicle itself or to the remote control (see Clause 17).		N/A
	In a driving condition the loss of connection to the warning device, on the remote control, shall result in a speed reduction to 6 km/h or less for a Class 4 vehicle; the speed reduction shall happen in a safe manner without creating additional hazards with corresponding audio notification and tilt back of decks on self-balancing vehicles.		N/A
7.3	Unintended or unauthorized use of vehicle		--
	Means shall be provided to prevent an unintended or unauthorized use of the vehicle, e.g. keys, locks, electronic control device.	Electronic device to lock the vehicle	P
8	Speed limitation		--
8.1	Pedestrian mode		--

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Clause	Requirement + Test	Result - Remark	Verdict
8.1.1	Vehicles classes 2 and 4 shall be equipped with a pedestrian mode for limiting the speed to a maximum of 6 km/h	Provide a pedestrian mode for limiting the speed to 6 km/h maximum by manufactory.	P
	A distinctive and visible warning light shall be active only when the pedestrian mode is activated	The light is active.	P
8.1.2	Test method		P
8.1.2.1	Test conditions		P
	a) The test may be carried out on a test track, a test bench or on a roller.		P
	b) The speed measuring apparatus and test conditions shall have the following characteristics:		P
	1) accuracy: $\pm 2\%$;		P
	2) resolution: 0,1 km/h.		P
	c) The ambient temperature shall be between 5 °C and 35 °C.		P
	d) Maximum wind speed: 3 m/s.		P
	e) The battery shall be fully charged in accordance with the manufacturer's instructions.		P
	f) With the vehicle operate under normal operation, but the motors are loaded to 33 % of their locked rotor current by adjusting the load on its rotational axis in the forward direction.		P
8.1.2.2	Characteristic of the test track		P
	The gradient of the track shall not exceed 0,5 %. If the gradient is less than 0,2 % carry out all runs in the same direction. If the gradient lies between 0,2 % and 0,5 % carry out alternate runs in opposite directions.		P
	The surface shall be hard, of concrete or fine asphalt free from loose dirt or gravel. The minimum coefficient of friction between the dry surface and the vehicle tyre shall be 0,75.		P
8.1.2.3	Characteristic of the test bench		P
	The test bench shall simulate normal road conditions.		P
8.1.2.4	Characteristic of the roller		P
	The test roller shall support with bearing to decrease the resistance, load need to add to the roller to reach rated current (see Figure 2).		P
8.1.2.5	Test procedure		P

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Clause	Requirement + Test	Result - Remark	Verdict
	a) Prepare the vehicle by running it for 5 min at 80 % of the speed corresponding to maximum power as declared by the manufacturer, then stop it.		P
	b) Actuate the mode for limiting the speed to 6 km/h (or less) and check whether the speed operating range of the power assistance is limited to 6 km/h (or a lower value).		P
8.2	Maximum speed with power assistance		--
8.2.1	Requirements		P
	The maximum speed for which the electric motor gives assistance shall be in accordance with the maximum permitted speed for the class. It may differ by (± 10 %) of the maximum speed marked on the vehicle given in the instruction manual/sheet and determined according to the test method described in 8.2.2. The maximum speed in this mode shall not exceed 25 km/h.	Rated 25 km/h	P
8.2.2	Test method		P
8.2.2.1	Test conditions		P
	The test shall be performed in accordance with 8.1.2.1, 8.1.2.2 and 8.1.2.3.		P
8.2.2.2	Test procedure		P
8.2.2.2.1	Test for vehicle with 100 % electric propulsion		P
	If performed with a test bench:		P
	a) Put the vehicle on the bench and bring it to the maximum achievable speed and maintain the speed for 60 s at least;		P
	b) Measure the vehicle speed by measuring the speed of the test bench. If performed with a test track		P
	c) Put the vehicle on the track and bring it to the maximum achievable speed and maintain the speed for 60 s at least;		P
	d) Measure the vehicle speed.		P
	e) The measured speed shall not exceed 25 km/h (± 10 %) and the maximum speed (± 10 %) indicated by the manufacturer in the instruction manual/sheet if lower.		P
8.2.2.2.2	Test for vehicle partially electrically powered		N/A

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Clause	Requirement + Test	Result - Remark	Verdict
	a) The test shall be carried out on a bench powered such that the speed of the PLEV can be increased to 120 % of the maximum speed achievable solely under electrical power and the speed of the vehicle shall be measurable in accordance with 8.1.2.1;		N/A
	b) Put the vehicle on the bench and bring it to the maximum speed achievable solely with vehicle electrical power.		N/A
	c) Using the test bench drive increase the vehicle speed to 120 % of the maximum speed achievable solely with vehicle electrical power and maintain for 30 s.		N/A
	The measured speed shall not exceed 25 km/h (± 10) % and the maximum speed (± 10) % indicated by the manufacturer in the instruction manual/sheet if lower.		N/A
	d) Disconnect the test bench drive while maintaining the vehicle speed control at maximum achievable setting.		N/A
	Measure the vehicle speed.		N/A
8.3	Reverse mode		--
8.3.1	Requirement	No reverse mode	N/A
	Vehicles with a reverse driving function shall be equipped with a device limiting its speed to 6 km/h when travelling in reverse. If travelling in reverse, an active sound signal shall be audible.		N/A
8.3.2	Test method		N/A
	The test shall be carried out on a test bench as follows:		N/A
	a) Prepare the vehicle by running it for 5 min at 80 % of the speed corresponding to maximum power as declared by the manufacturer, then stop it.		N/A
	b) Drive the test bench to simulate driving the vehicle in the reverse direction of travel at the maximum achievable speed.		N/A
	Check that the speed operating range of the power assistance is limited to 6 km/h (or a lower value).		N/A
9	Electromagnetic compatibility		--
9.1	Emission		--
	Vehicle class 1 and 2 shall conform to Annex B.		P
	The vehicle operated as described in B.2.2.3.		N/A
9.2	Immunity		--

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Clause	Requirement + Test	Result - Remark	Verdict
	Vehicle class 1 and 2 shall conform to Annex B.		P
	Vehicle class 3 and 4 shall conform to EN IEC 61000-6-1:2019 apply with the following modification.		N/A
	The vehicle operated as described in B.4.4.		P
	Specific performance criterion for PLEV:		P
	— Class A: all functions of vehicle perform as designed during and after exposure to a disturbance.		P
	— Class B: all functions of vehicle perform as designed during exposure; however, one or more of them may go beyond the specified tolerance. All functions return automatically to within normal limits after exposure is removed. Memory functions shall remain class A.		N/A
	— Class C: one or more functions of vehicle do not perform as designed during exposure but return automatically to normal operation after exposure is removed.		N/A
9.3	Battery charger		--
	As a PLEV is not intended to be used while charging on the electric network, for integrated charger the whole PLEV plus integrated charger shall be tested for EMC according to the applicable standards.		P
	The following European Standards are applicable EN 55014-1, EN 55014-2, EN 61000-3-2, EN 61000-3-3.		P
10	Charging of batteries		--
10.1	General		--
	If a vehicle has an integrated and built-in battery charging system (i.e; integrated charger), the user shall be protected against hazards due to accidental contact with the charging connections on the vehicle and its charging systems.		N/A
	For enclosures of charging system, see 6.4 Moisture resistance (IPX4).		P
	Battery charging systems shall be in accordance with EN IEC 62485 series and EN 60204-1 or EN 60335-2-29:2004 as appropriate.	Approved charger	P
	The charging system shall prevent any hazards arising because of overloading, overcharge and overcurrent and over discharge determined according to the test method described in 10.2.		P
10.2	Test method		--

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Clause	Requirement + Test	Result - Remark	Verdict
	Component parts in the charging system are faulted as below 1) to 4), one at a time, if the outcome of such a fault is uncertain based upon analysis.		P
	1). Open-circuit at the terminal of any component, other than a monolithic integrated circuit.		P
	2). Short-circuit of capacitors, unless they comply with EN 60384-14:2013.		P
	3). Short-circuit of any two terminals of an electronic component, other than a monolithic integrated circuit.		P
	This fault is not applied between the two circuits of an optocoupler.		P
	4). Short-circuit is introduced to the charging system across a component or between adjacent PCB tracks at a location expected to produce the most unfavourable results to evaluate the effect of back-feed from the battery.		P
	For each fault condition introduced, the state of the battery before charging is as follows:		P
	A series configured battery shall have a deliberate imbalance. The imbalance is introduced into a fully discharged battery by charging one cell to approximately 50 % of full charge or less.		P
	Conduct the charging test, each cell voltage is continuously monitored to determine if it has exceeded the limit condition. Venting of the cells is permitted.		P
	For vehicles with external battery charging system, charging contacts and plugs shall be designed in a way that accidentally touching live parts is prevented (e.g. caps for plugs and outlets).		P
	Voltage between charging contacts shall conform to appropriate standards according to the application and/or environment of the charging systems, such as EN 60204-1, EN 61140:2016, EN 60335-2-29:2004 and EN 61851:2001 (all parts).		P
	Battery charging currents shall be chosen to be as low as reasonably practicable.		P
10.3	Safeguarding and complementary protective measures		--
	The following measures shall be applied where appropriate:		P
	— charging systems shall be designed in such a way that the charging connections are only activated when the vehicle is connected to them;		P

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Clause	Requirement + Test	Result - Remark	Verdict
	— charging systems shall display the charging status or give a signal when the battery is fully charged;	LED indicator	P
	— charging systems shall be designed in such a way that the correct charging of the battery is automatically supervised, and thus hazards caused by overloading or charging of deeply discharged batteries are prevented.		P
11	Energy storage within the vehicle		--
11.1	Requirements		--
	The vehicle as well as the sets of energy storage (i.e. battery) shall be designed and constructed such as to prevent any risk of fire and mechanical deterioration resulting from foreseeable abnormal use.	Certified battery pack	P
	Compliance with this requirement is checked by the test described in 11.2.		P
	During the test, the vehicle and the batteries shall not emit any flames, molten metal or release any toxic or flammable gas in hazardous amounts. Protective enclosures shall show no damage when checked visually.		P
	Safety and compatibility of the charger/battery assembly shall be provided in accordance with the charger/battery manufacturer's specifications.		P
	Any exposed person shall be protected from direct or indirect contact with live parts on the vehicle.		P
	The energy storage shall be protected in order to prevent any accidental short circuit.		P
	It is necessary to ensure that batteries are protected against any overcharging, a suitable protective device against overheating and short circuits shall be provided.		P
11.2	Test method		--
	The test shall be conducted according to EN 62133 (all parts) or, as follows:	Certified battery charge	P
	a) Battery terminals are short-circuited using fully charged batteries	Battery "+" and "-"	P
	b) Motor terminals are short-circuited; all of the controls are in ON position and batteries fully charged.	motor "+" and "-"	P
	c) The vehicle is operated with the electric motor or drive system locked so as to fully discharge the battery or until the system stops.		P

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Clause	Requirement + Test	Result - Remark	Verdict
	d) The battery is charged for double the recommended charging period or for 24 h, choosing the longest of these two periods.		P
	Verification: there shall be no visible damage for a), b), c) and d) and no overvoltage for d).		P
12	Structural integrity		--
12.1	General		--
12.2	Static load test		--
12.2.1	Deck/frame		P
12.2.1.1	Requirement		P
	When tested according to the method described in sub Clauses 12.2.1.2, 12.2.1.3 or 12.2.1.4 there shall be no cracks or fractures, or collapse of the structure, or unfolding.		P
	Where the construction of the vehicle does not allow the full mass to be applied in normal use to each deck then the maximum mass is divided by two to achieve the test load for each deck.		P
12.2.1.2	Test method – 2-wheeled single track vehicle		P
	Progressively apply a mass of 100 kg or, when greater, a mass equal to the maximum permissible payload marked on the vehicle in accordance with 19.2.1 and multiplied by a safety factor of 2,5 during 1 min with a flat device having a surface of 100 mm × 100 mm to the centre of one or two deck(s).		P
	If plastic material is used for the deck or steering system the kick scooter has to be conditioned for at least 6 h at a temperature of $(-5 \pm 1) ^\circ\text{C}$.		P
	Start the test within 1 min of removing the PLEV from the conditioning environment and complete it within 5 min.		P
12.2.1.3	Test method – 3-wheeled vehicle		N/A
	Progressively apply a mass of 100 kg or, when greater, a mass equal to the maximum permissible payload marked on the vehicle in accordance with 19.2.1 and multiplied by a safety factor of 2,5 during 1 min with a flat device having a surface of 100 mm × 100 mm to the centre of the two following positions a and b simultaneously.		N/A
	If plastic material is used for the deck or steering system the 3-wheeled vehicle has to be conditioned for at least 6 h at a temperature of $(-5 \pm 1) ^\circ\text{C}$.		N/A
	Start the test within 1 min of removing the PLEV from the conditioning environment and complete it within 5 min.		N/A

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Clause	Requirement + Test	Result - Remark	Verdict
12.2.1.4	Test method – self-balancing vehicle		N/A
	Progressively apply a mass of a minimum of 100 kg or, when greater, a mass equal to the maximum permissible payload marked on the vehicle in accordance with 19.2.1 and multiplied by a safety factor of 2,5 during 1 min with a flat device having a surface of 100 mm × 100 mm to the centre of each deck.		N/A
	If plastic material is used for the deck or steering system the self-balancing vehicle has to be conditioned for at least 6 h at a temperature of $(-5 \pm 1) ^\circ\text{C}$.		N/A
	Start the test within 1 min of removing the PLEV from the conditioning environment and complete it within 5 min.		N/A
12.2.2	Handle bar and steering column		P
12.2.2.1	Bending test		P
12.2.2.1.1	Requirements		P
	When tested according to the method described in 12.2.2.1.2, there shall be no cracks or fractures, or deterioration of the operation of the handlebar or steering column.		P
12.2.2.1.2	Test methods		P
	The steering column shall be in maximum high position and centrally loaded with a 50 kg mass, applied in directions A and B, each for 1 min, as shown in Figure 6.		P
	The handlebar shall be in maximum high position and loaded with a 50 kg mass divided in two, for 1 min, as shown in Figure 7.		P
12.2.2.2	Vertical loading test		P
12.2.2.2.1	Requirements		P
	Following the test performed according to the method described in 12.2.2.2.2, there shall be no cracks or fractures, or deterioration of the operation of the handlebar or steering column. Nor shall there be any movement of the telescopic part.		P
12.2.2.2.2	Test method		P
	The handlebar shall be assembled in accordance with the manufacturer's instruction manual/sheet.		P
	Draw out the telescopic tube up to half of its adjustment range (± 1 cm) and engage the locking system.		P

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Clause	Requirement + Test	Result - Remark	Verdict
	Load the vehicle by applying a mass “m” of 50 kg simultaneously to the centre of each hand grip in directions A as shown in Figure 8.		P
	Maintain the load for 1 min.		P
	Determine whether the head tube has not become separated, the handlebar has not moved, the locking systems are still operational and engaged and whether the operation of the handlebar or steering column has not deteriorated.		P
12.2.2.3	Torque test		P
12.2.2.3.1	Requirement		P
	When tested according to the method described in 12.2.2.3.2, there shall be no movement of the handlebar stem in relation to the steering tube.		P
12.2.2.3.2	Test method		P
	If necessary, assemble the handlebar and the steering column according to the manufacturer's instructions.		P
	— Lock the fork in rotation.		P
	— Apply a torque C of 20 Nm once in each direction of possible rotation in a plane perpendicular to the axis of the handlebar/fork assembly. Maintain each torque for 1 min.		P
12.2.2.4	Handlebar grips and plugs		P
12.2.2.4.1	Requirements		P
	The ends of the handlebar shall be fitted with grips or end plugs. When tested according to the method described in 12.2.2.4.2, the grips or plugs shall withstand a dismantling force of 70 N.		P
12.2.2.4.2	Test method		P
	Leave the handlebar to reach ambient temperature then apply a force of 70 N to the grip or plug in the dismantling direction.		P
	Maintain the force for 1 min.		P
12.2.2.5	Telescopic handlebar (if fitted)		N/A
	The handlebar stem shall be provided with one of the two following means to guarantee a safe insertion depth into the steering column:		N/A
	a) the handlebar stem shall be provided with a permanent, transverse mark, of a length greater than or equal to the external diameter of the handlebar stem clearly indicating the minimum depth for inserting its rod into the steering column.		N/A

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Clause	Requirement + Test	Result - Remark	Verdict				
	The insertion mark shall be positioned at least 2,5 times the external diameter of the rod from the lower end of the handlebar stem. The length of the solid section of the handlebar stem below the mark shall be at least equal to the external diameter of the rod.		N/A				
	b) the handlebar stem shall be provided with a permanent stop to prevent it from being drawn out of the steering column beyond the minimum insertion depth defined in a).		N/A				
12.3	Frontal impact resistance		--				
12.3.1	Requirements for class 2		P				
	When tested according to the method described in 12.3.3, there shall be no visible cracks or fractures in any point of the folding mechanism-head tube-handlebar assembly.		P				
	There shall be no visible cracks or fractures in any part of the frame and there shall be no separation of any elements of the suspension system.		P				
	The assembly remains operational even if significant clearances are found.		P				
	These clearances are acceptable if they do not involve the safety of the user.		P				
	In particular, the locking of the folding system, if any, shall be checked when the scooter is unfolded		P				
	If applicable, the folding mechanisms shall remain locked.		P				
12.3.2	Test method for vehicle of class 2		P				
	Adjust the handlebar at the maximum height.		P				
	The frame is mounted on a rigid fixture by the rear axle attachment points.		P				
	The frame is loaded with masses and can turn around the rear axle. The assembly is rotated about the rear axle and then let falling down on the anvil.		P				
	<table><tr><td>M1</td><td>M2</td></tr><tr><td>50 kg</td><td>2x10 kg</td></tr></table>	M1	M2	50 kg	2x10 kg		
M1	M2						
50 kg	2x10 kg						
	As shown in Figure 11, mount the assembly at its rear axle attachment points so that it is free to rotate about the rear axis in a vertical plane.		P				
	The sample shall be fitted with the front wheel		P				

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Clause	Requirement + Test	Result - Remark	Verdict
	Securely fix mass M1 on the deck. The centre of the mass is aligned with the centre of the deck (Figure 11). The length of the platform is 100 mm and it shall cover the whole width of the deck.		P
	Securely fix masses M2 on each side of the handlebar		P
	Support the front fork on a flat steel anvil so that the frame is in its normal position of use.		P
	Rotate the assembly around the rear axis until the distance d between the wheel and the anvil is (200 ± 1) mm (see Figure 12). Then allow the assembly to fall freely to impact on the anvil.		P
	Repeat the test and then check for damages.		P
12.3.3	Requirements for class 4		N/A
	When tested according to the method described in 12.3.4, there shall be no visible cracks or fractures in any part of the frame and there shall be no separation of any elements of the suspension system.		N/A
	The assembly remains operational even if significant clearances are found.		N/A
	These clearances are acceptable if they do not involve the safety of the user.		N/A
12.3.4	Test method for vehicle of class 4		N/A
	The vehicle shall jump/drive over at 8-10 km/h of a pavement step down (foreseeable risk) where the step should be limited to 1/4 height of the wheel diameter (see Figure 13).		N/A
	The test shall be conducted with the mass of the maximum design load separated to the two platforms.		N/A
	If appropriate, tyre pressure shall be adjusted according to the maximum value given by the manufacturer.		N/A
	Repeat the test and then check for damages.		N/A
12.4	Fatigue test (dynamic)		--
12.4.1	General		P
	All types of vehicles fitted with a mechanical linked handlebar shall be subjected to this test.		P

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Clause	Requirement + Test	Result - Remark	Verdict
	The head tube/steering clearance/fork link can influence failures during handlebar fatigue tests. For this reason, a handlebar shall always be tested on a complete product. When there is a folding mechanism, this enables the handlebar's strength to be tested at the same time.		P
	In the case of suspension frames where the rigidity of the suspensions can be adjusted, adjust the suspensions to provide maximum stiffness.		P
	In the case of a pneumatic damper for which the air pressure cannot be adjusted, replace the suspension unit with a rigid link, making sure that the end fastening systems and the lateral rigidity accurately simulate the characteristics of the original system.		P
	For suspension frames on which the chain stays do not have pivots but use the bending phenomenon, check that any dampers are adjusted to provide the minimum strength in order to ensure a suitable check of the frame.		P
	When a suspension frame has adjustable supports or links to vary the strength of the scooter against the ground-contact forces or to modify the attitude of the scooter, position these adjustable components to ensure maximum forces in the frame.		P
12.4.2	Requirements		P
	When tested according to the method described in 12.4.3 to 12.4.5, there shall be no visible cracks or fractures in any point of the folding mechanism-head tube-handlebar assembly.		P
	There shall be no visible cracks or fractures in any part of the frame and there shall be no separation of any elements of the suspension system.		P
	The assembly remains operational even if significant clearances are found.		P
	These clearances are acceptable if they do not involve the safety of the user.		P
	In particular, the locking of the folding system, if any, shall be checked when the scooter is unfolded.		P
12.4.3	Test method for a 2-wheeled single track vehicle		P
	Use a new product for the test.		P
	A complete vehicle shall withstand the fatigue test.		P
	This test is carried out on a test apparatus as shown in Figure 14:		P

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Clause	Requirement + Test	Result - Remark	Verdict
	— a circumferential speed of 0,8 m/s		P
	— a distance of 25 km		P
	— a diameter of the drum of minimum of 700 mm		P
	— a mass of 100 kg shall be placed centrally on the free space of the deck		P
	— a mass of 10 kg shall be placed on the handlebar in maximum extended position		P
	— the distance between the raised sections shall be such that the vehicle passes over one ramp every 1,5 s.		P
	For testing multi-track vehicles, the raised sections shall be displaced so that the wheels do not travel over these raised sections simultaneously.		P
	The sections shall be spaced so that each wheel travels over two sections per second.		P
12.4.4	Test method for a 3-wheeled vehicle		N/A
	Use a new product for the test.		N/A
	A complete vehicle shall withstand the fatigue test.		N/A
	This test is carried out on a test apparatus as shown in Figure 14:		N/A
	— a circumferential speed of 0,8 m/s		N/A
	— a distance of 25 km		N/A
	— a diameter of the drum of minimum of 700 mm		N/A
	— a mass of 100 kg shall be placed centrally on the free space of the deck		N/A
	— a mass of 10 kg shall be placed on the handlebar in maximum extended position.		N/A
	— the distance between the raised sections shall be such that the vehicle passes over one ramp every 1,5 s.		N/A
	For testing multi-track vehicles, the raised sections shall be displaced so that the wheels do not travel over these raised sections simultaneously.		N/A
	The sections shall be spaced so that each wheel travels over two sections per second.		N/A
12.4.5	Test method for a self-balancing vehicle		N/A
12.4.5.1	This test consists of 3 steps: (1) setting-up for the test, (2) test motion and (3) inspection.		N/A

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Clause	Requirement + Test	Result - Remark	Verdict
	This test utilizes three apparatus: (1) test road, (2) a test load and (3) a supporting device (if necessary for maintaining the position of the vehicle during testing).		N/A
	Determine the specifications of the (2) test load according to the maximum permissible load or according to the weight of intended users.		N/A
12.4.5.2	Apparatus		N/A
	The apparatus required shall include the following:		N/A
	a) Swept Sinusoidal Vibration test		N/A
	The vehicle is firmly secured to the platform of the vibration machine in its normal operating position.		N/A
	Supports may be used to maintain the normal operating position but care shall be taken to ensure these do not affect the results of the test.		N/A
	The vibration shall be a sinusoidal waveform with logarithmic sweep between 7 Hz and 200 Hz and back to 7Hz traversed in 15 min.		N/A
	This cycle shall be repeated 12-times for a total of 3 h.		N/A
	From 7 Hz to a peak acceleration of 1 gn is maintained until 18 Hz is reached.		N/A
	The amplitude is then maintained as 0,8 mm (1,6 mm total excursion) and the frequency increased until a peak acceleration of 2 gn occurs (approximately 25 Hz).		N/A
	A peak acceleration of 2 gn is then, maintained until the frequency is increased to 200 Hz.		N/A
	b) Test weight:		N/A
	The test mass shall be applied to the vehicle by a test dummy or where a dummy is not required by an appropriate mass in accordance with the following:		N/A
	— Test dummy		N/A
	A test dummy shall be used when it is necessary to simulate the body mass distribution and kinematics of the user and any accessories.		N/A
	Its mass shall simulate the weight of the self-balancing vehicle user where applicable.		N/A
	The total mass shall be the maximum mass of intended user and any accessories.		N/A
	— Mass		N/A

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Clause	Requirement + Test	Result - Remark	Verdict
	When a test dummy is not required a mass equivalent to the maximum mass of the intended users and any accessories (e.g. back pack) shall be applied.		N/A
	c) Supporting device		N/A
	When the self-balancing vehicle is not able to maintain its position on the test road by itself, a supporting device shall be provided.		N/A
	The supporting device shall hold the self-balancing vehicle either directly or through a suitably connected dummy without affecting the outcome of the test.		N/A
12.5	Procedure		--
	a) The self-balancing vehicle is positioned on the vibration machine supporting if necessary in accordance with 12.4.5.2 and either, as appropriate, with the test load or test dummy applying the load(s) in accordance to 12.4.5.2.		N/A
	b) Visible damage such as fractures, deformation, jiggling, looseness or disengagement of parts, and changes in self-balancing vehicle function shall be recorded.		N/A
13	Edges and protrusions		--
13.1	General		--
	These requirements are intended to address the hazards associated with the users of vehicles falling on projections or rigid components (e.g. handlebars, levers) on vehicle possibly causing internal injury or skin puncture.		P
13.2	Sharp edges		--
	Adequate shape shall be given to avoid puncturing of the body.		P
13.3	Protrusions		--
	Tubes and rigid components in the form of projections which constitute a puncture hazard to the user shall be protected.		P
	Screw threads which constitute a puncture/cut hazard shall be limited to a protrusion length of one major diameter of the screw beyond the internally threaded mating part.		P
14	Moving parts		--
14.1	Clearance between moving parts		--

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Clause	Requirement + Test	Result - Remark	Verdict
	To prevent crushing of fingers the distance separating accessible moving parts from other moving parts or from fixed parts of the vehicle shall, either be less than 5 mm, or greater than 18 mm in any position. This requirement does not apply to the wheel with its support systems, or to the rear brake/braking system, if any, or to brake actuating levers.	Warning symbol used ISO 7010-W024  And this residual risk is described in the manual	P
14.2	Guarding of moving parts		--
	Wheels shall be covered to avoid unintentional contact between a foot of the user and the moving wheel.	Wheel covered with mudguard	P
14.3	Folding mechanism		--
14.3.1	General requirement		P
14.3.1.1	General		P
	The function of any operating or locking device shall not be impaired after being tested in accordance with 14.3.1.2.		P
	Folding mechanisms shall be designed so that the vehicles can be locked for use in a simple, stable and safe way and folding shall not damage cables.		P
	No locking mechanism shall contact the wheels or tyres during riding, and it shall be impossible to unintentionally loosen or unlock the folding mechanisms during riding.		P
14.3.1.2	Incomplete deployment		P
	To avoid hazards due to incomplete deployment, at least one locking device shall engage automatically when the vehicle is unfolded for use.		P
	If the locking device is not visible without damaging the vehicle, a second sample may be used.		N/A
14.3.1.3	Unintentional release of locking mechanism(s)		P
	To avoid unintentional release, one of the following conditions shall be fulfilled:		P
	a) there shall be at least one operating device which fulfils the following:		P
	1) the operating device shall require at least two consecutive actions, the second being dependent on the first having been carried out and maintained by the user; and 2) the operating device shall not be activated or damaged in one single action during testing in accordance with 14.3.1.3		P

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Clause	Requirement + Test	Result - Remark	Verdict
	b) there shall be two separate and independent operating devices which fulfil one of the following:		N/A
	1) where one operating device is intended to be operated by foot (e.g. by its position, shape, according to the manufacturer's instructions for use.) it shall automatically return to its original status and the locking device shall reengage; or		N/A
	2) where both operating devices are intended to be operated by hand(s) (e.g. by their position, shape, according to the manufacturer's instructions for use.) they shall both automatically return to their original status and the locking devices shall reengage.		N/A
	When tested in accordance to 14.3.2, the vehicle shall not fold and the locking device(s) shall not be released.		P
14.3.2	Test methods		P
14.3.2.1	Preconditioning		P
	Operate the locking devices 200 times.		P
14.3.2.2	Unintentional release of the locking mechanism by one single action		P
	Place the vehicle fully deployed and ready for use on a horizontal flat surface.		P
	Apply a force of 150N or a torque of 2,2 Nm to the locking device.		P
	This force or torque shall be applied to the locking device in the direction most likely to open the locking device in one single action.		P
	The force or torque shall be applied for a period of 5 s.		P
	Folding mechanism shall not be released.		P
15	Adequate stability		--
15.1	Footrest/ deck		--
	In case the user is standing permanently, each deck shall be equipped with an anti-slide surface with an area of at least 150 cm ²		P
	In case the user is seating normally (not standing) while driving, the footrest shall be anti-slide and shall have a minimum length of 6,5 cm.	No seat	N/A
	In case the user is standing momentarily and the vehicle has an integrated seat, the footrest shall be anti-slide and shall have a minimum length of 6,5 cm and a minimum width of 10 cm	Not such condition	N/A
15.2	Handlebar adjustment		--

EN 17128			
Clause	Requirement + Test	Result - Remark	Verdict
	The handlebar height adjustment system shall be fitted with devices to avoid inadvertent separation or detachment during use.	No handlebar height adjustment system	N/A
15.3	Surface		--
15.3.1	Slippery surface		P
15.3.1.1	Requirements for wheel adhesion		P
	The wheels shall be constructed from non-slip material. This requirement is considered to be fulfilled if a coefficient of adhesion, μ_0 , of at least 0,30 is achieved in the test according to 15.3.1.2.		P
15.3.1.2	Wheel adhesion test		P
	Wheel adhesion shall be tested by pulling a clean wheel along a steel plate having a fine brushed and degreased surface of arithmetical mean roughness R_a of 1,5 μm to 2,0 μm		P
	A vertical force F_1 of 100 N shall be applied to the wheel which is moved along the steel plate perpendicular to the vehicle's longitudinal axis and perpendicular to the surface brush direction by a horizontal force F_2 , applied at the height of the wheel's axis.		P
	The maximum force shall be recorded.		P
	The test shall be repeated 10 times and the mean value of F_2 shall be calculated.		P
	The test shall be carried out at a speed of approximately 1 mm/s.		P
15.3.2	Irregular surface		P
	When loaded with a 90 kg mass, the dimensions of the tyres of the vehicle shall be:		P
	a) For vehicle with aligned wheels or with one front wheel:		P
	— the front tyre shall have a minimum diameter of 125 mm and a minimum width of 25 mm — the rear tyre shall have a minimum width of 25 mm		P
	b) For self-balancing vehicle:		N/A
	— the tyre shall have a minimum diameter of 125 mm and a minimum width of 25 mm		N/A
	c) For all others vehicles:		N/A
	— the tyre shall have a minimum diameter of 125 mm or a minimum width of 25 mm		N/A
15.4	Braking devices		--

EN 17128			
Clause	Requirement + Test	Result - Remark	Verdict
15.4.1	General		P
	All vehicles shall be equipped with service brake system and, when indicated, a parking brake or parking device as follows:		P
	a) Class 1 and 2 single track vehicles (e.g. vehicle with aligned wheels) shall be equipped with at least one braking device;		P
	b) Class 1 and 2 multi-track vehicles (e.g. vehicle with unaligned wheels) shall be equipped with a parking device and one of the following:		N/A
	1) If there are two rear wheels, the vehicle shall be equipped with a braking device on all rear wheels or an independent front and a combined rear wheels brake.		N/A
	The braking device shall be operated by the actuation of a single control or all wheel integrated braking system		N/A
	2) If there is one rear wheel, the vehicle shall be equipped with all wheel integrated braking system or with independent front wheel and rear wheel brakes		N/A
	c) Class 3 and 4 multi-track vehicles shall be equipped with an acceleration controlled braking system.		N/A
	d) Class 3 and 4 single track self-balancing vehicles shall be equipped with a brake.		N/A
	When a parking brake or parking device is not required, instructions to avoid the vehicle running away when unattended shall be provided in the owner's manual.		N/A
15.4.2	Braking performance		P
15.4.2.1	General requirements		P
	All vehicle shall meet each of the requirements specified in the following paragraphs unless otherwise indicated.		P
	A vehicle shall have a configuration that enables a user to actuate the braking device by hand with a lever or by foot while being in a normal driving position and with both hands on the steering control.		P
	In case the vehicle is not equipped with a handle bar, the actuation of the braking device shall be performed according to the instructions provided by the manufacturer. These instructions shall be a part of the user's manual.		N/A

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Clause	Requirement + Test	Result - Remark	Verdict
15.4.2.2	Hand operated braking system – Strength test		P
	There shall be no failure of the braking system or of any component thereof when tested in accordance with 15.4.3.2.	Tested with 450 N	P
15.4.2.3	Dry stop		P
	When the brakes are tested in accordance with the test procedure set out in 15.4.3.4, the following condition shall be met: — the Mean Fully Developed Deceleration (MFDD) shall be: $\geq 1,7 \text{ (m/s}^2\text{)}$. The vehicle speed at the start of braking shall be 90 % of the maximum speed of the vehicle achievable solely by power assistance.		P
15.4.2.4	Vehicle behaviour during braking		P
	During the tests (see 15.4.3), the following shall not occur in a way which causes the user to have to use his feet, other than for the application of the brake, to control the vehicle: a) excessive juddering; b) front wheel locking; c) vehicle instability (for example, uncontrollable lifting of the rear wheel); d) user's loss of control or balance; e) excessive side-skidding.	The skidding of rear wheel occurred during braking. The condition of d) and e) did not occur.	P
15.4.2.5	Electric failure braking compensation		P
	In the event of an electric braking failure, the vehicle shall be able to brake normally or, shall come to a standstill with a minimum deceleration of $1,25 \text{ (+/- } 0,25) \text{ m/s}^2$ as describe in 15.4.3.5.		P
15.4.2.6	Parking device		N/A
	When required in accordance with 15.4.1, the parking device shall make it possible to maintain the vehicle stationary on up or down gradient of 18 % even in the absence of the user. The user shall be able to achieve this parking action from the riding position.		N/A
	The parking device system shall have a control which is separate from the service braking device controls. The vehicle shall be held in the locked in the parking position by a purely mechanical device.		N/A
15.4.3	Test methods		P
15.4.3.1	Braking test force applications		P

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Clause	Requirement + Test	Result - Remark	Verdict
	a) Actuation by hand The braking actuation forces shall be less than 200 N when measured at 25 mm from the end of the hand lever.	<200N for proper braking actuation.	P
	b) Actuation by foot After checking that the braking system is correctly adjusted in accordance with the manufacturer's instructions, apply a force to the brake pedal so that the resulting force is vertical to the direction of riding. The vertical force on the brake pedal shall be 700 N, or any other lesser value required to achieve the required performance.		N/A
15.4.3.2	Hand operated brake strength test		P
	The test shall be performed on a fully-assembled vehicle. The brake operating systems shall withstand the applied force. After checking that the braking system is correctly adjusted in accordance with the manufacturer's instruction manual/sheet, apply a force to the brake lever at the point specified in 15.4.3.1. This force shall be 450 N, or any other lesser value required to bring: a) the brake lever into contact with the handlebar grip or, where there is no grip, the handlebar; b) the brake lever extension to the same level as the surface of the handlebar or into contact with the handlebar.	The brake lever contacted the grip with a force < 450N. No brake lever extension fitted. 10 times finished.	P
	Repeat the test 10 times for each brake lever or brake lever extension.		P
15.4.3.3	Brake performance test conditions (classes 2 and 4)		P
	The mass (Mt) of the vehicle shall be Technical Permissible Maximum Mass (TPMM).	The test track and condition complied with the requirements. Non-pneumatic tyres. Complied with a), 5 measurements in dry and 5 measurements in wet were recorded. See Appendix B.	P
	The test track shall be a clean, dry, level surface, with a gradient $\leq 1\%$; with good adherence (e.g. asphalt or concrete) and with the test lane of 1,20 m width.		P
	The ambient temperature shall be between 5 °C and 35 °C.		P
	The wind speed shall be no more than 3 m/s.		P

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Clause	Requirement + Test	Result - Remark	Verdict
	The user shall be in a position as for normal riding and shall maintain the same position throughout the test.		P
	The speed and distance shall be determined using instrumentation having an accuracy of $\pm 1\%$ at the prescribed speed for the test.		P
	The mean fully developed deceleration (MFDD) may be determined by other methods than the measurement of speed and distance;		P
	in this case, the accuracy of the MFDD shall be within $\pm 3\%$.		P
	Pneumatic tyres shall be inflated in accordance with the manufacturer's instruction manual/sheet for the vehicle loading condition for the test.		P
	Vehicle position and wheel locking:		P
	— The vehicle is positioned in the centre of the test lane for the beginning of each stop;		P
	— Stops are made without the vehicle wheels passing outside the applicable test lane and without wheel locking.		P
	A running-in cycle shall be performed on each brake before the performance tests are carried out.		P
	Actuate the brakes for at least three seconds to obtain steady deceleration whilst the vehicle is riding at a speed of approximately 90 % of the maximum speed achievable solely with power assistance.		P
	Repeat this operation 10 times.		P
	All types of brakes shall be subject to this running-in phase.		P
	The following tests shall be carried out to measure the data required to determine MFDD in accordance with 15.4.3.4, Formula (5):		P
	a) If the gradient of the track is less than 0,2 %, the following measurements shall be taken in the order presented:		P
	1) five valid measurements in dry conditions;		P
	2) two preparation tests in wet conditions (results not recorded);		P
	3) five consecutive valid measurements in wet conditions.		P
	b) If the gradient of the track is between 0,2 % and 0,5 %, the following measurements shall be taken in the order presented:		P

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Clause	Requirement + Test	Result - Remark	Verdict
	1) six consecutive valid measurements in dry conditions, alternating the direction of travel with each test;		P
	2) two preparation tests in wet conditions (results not recorded);		P
	3) six consecutive valid measurements in wet conditions, alternating the direction of travel with each test.		P
	c) For each series of five or six consecutive measurements, the test results corresponding to the longest measured stopping distance shall be used in the determination of MFDD in accordance with 15.4.3.4 for the tests of 15.4.3.3 a) 1) and a) 3) or b) 1) and b) 3) as appropriate.		P
	A rest period between two successive measurements shall not exceed 3 min.		P
15.4.3.4	Stop performance calculation (classes 2 and 4)		P
	For the calculation of MFDD, the following formula shall be used: $MFDD = \frac{V_b^2 - V_e^2}{25,92 \cdot (S_e - S_b)}, \text{ in m/s}^2$		P
15.4.3.5	Electric braking failure compensation test		P
15.4.3.5.1	Requirement		P
	The requirement of 15.4.2.5 shall be achieved.	The vehicle can brake normally in an electric braking failure condition.	P
	In case of electric braking failure, the vehicle shall stop with a smooth deceleration regarding 7.2.	The vehicle can brake normally in an electric braking failure condition.	P
15.4.3.5.2	Test method for an electrical braking system		P
	This test is not conducted when the vehicle is equipped with a completely mechanical braking system.		P
	— Bring the vehicle to Vmax and interrupt the power from the battery.		P
	— Measure the deceleration during the complete stop but excluding the final 0,5 s.		P
	— The test track shall be a clean, dry, level surface,		P
	with a gradient ≤ 1 %;		P
	with good adherence (e.g. asphalt or concrete)		P
	with the test lane of 1,20 m width.		P

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Clause	Requirement + Test	Result - Remark	Verdict
	— The ambient temperature shall be between 5 °C and 35 °C.		P
	The wind speed shall be no more than 3 m/s.		P
16	Presence awareness		--
16.1	Lighting		--
16.1.1	Retro-reflectors		P
	Vehicles shall be fitted with front, side and rear retro-reflector according to ISO 6742-2:2015.		P
	The rear reflector shall be red in colour.		P
	The front reflector shall be white (clear) in colour.		P
	All side reflectors shall be of the same colour, either white (clear) or yellow.		P
16.1.2	Front and rear lightning		P
	Vehicles of class 2 and 4 shall be fitted with active front and rear lights according to ISO 6742-1:2015.	See above	P
	The manufacturer shall indicate in the user's manual how an active front and rear light can be fitted to the vehicles of class 1 and 3.		N/A
	The controls for lighting shall be marked in accordance with Annex F.		P
16.2	Audible warning to alert persons		--
	An audible device shall be provided to allow a warning to be given to persons in the vicinity of the vehicle.		P
	The audible warning device shall be controlled by a command from a device on the handlebar.		P
	On a vehicle without a handlebar, a warning device which can be carried by the user of a vehicle (remote control) shall be provided with the vehicle. The vehicle shall only be able to start if the remote control is connected either physically and/or via wireless.		N/A
	The control for the audible warning shall be marked in accordance with Annex F.		P
	The device shall comply with ISO 14878:2015 Class II.		P
	A remote control shall comply with 17.1.		N/A
17	System failure and malfunction warning devices		--
17.1	General		--
	The warning symbols audible signal are given in Annex F.	No such symbol	N/A

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Clause	Requirement + Test	Result - Remark	Verdict
	Audible warning devices provided with the vehicle shall be unambiguous and easily perceived. The operator shall be able to check the operation of the audible warning devices at all times.	A bell fitted on handlebar which is unambiguous and easily perceived;	P
	If the vehicle is equipped with a remote control for any audible warning device required by this standard, the vehicle shall only be able to start if the remote control is connected either physically and/or via wireless.	Not remote control	N/A
17.2	Audible/ vibrating signalling		--
	Audible devices required by this standard shall comply with ISO 14878:2015 Class II.		P
17.3	Loss of connection to the warning system		--
	Loss of connection to the warning system shall be relayed by a warning signal (visual, audible, vibrating) on the vehicle or on the remote control.	Error code will appear on screen	P
	In a driving condition the loss of connection to the warning device shall result in a speed reduction to 6 km/h for a Class 4 vehicle; the speed reduction shall happen in a safe manner without creating additional hazards and with corresponding audio notification and tilt back of decks on self-balancing vehicles.		N/A
18	Hot surfaces		--
18.1	Requirements		--
	Hot surfaces of the vehicle (temperatures above 57 °C), except brake systems, which are not in continuous contact with the user shall be protected to prevent inadvertent contact.		P
	The seat, handgrips, handgrip levers, footrests and decks are parts that are considered in continuous contact with the user. In no circumstance during the test of 18.2 shall their temperature exceed 43 °C.	Not exceeding 43°C during the discharging test for the handgrips, levers, and footrest/deck.	P
	A durable visible warning shall be fixed as close as possible to the brake if the temperature of the brake system could be above 60 °C		N/A
	The instructions manual shall contain a notice warning of the possible danger of burns if the brakes are touched after a prolonged or severe use.		P
	Outer surface temperature of cables and connections that can be reached by the user shall not exceed 57 °C while in use on performance test rig.		N/A
18.2	Test method		--

EN 17128			
Clause	Requirement + Test	Result - Remark	Verdict
	To be tested by measurement (tolerance $\pm 2^{\circ}\text{C}$) only if there are heat producing elements in the direct vicinity of the grips, the footrest or the deck.		P
	Put the vehicle on the bench with a fully charged battery.		P
	Operate the vehicle under maximum load until 20 % of battery charge remains (maximum warm up).		P
	Measure temperature of grips, footrest(s) and deck(s).		P
19	Product information and marking		--
	The following product information should accompany each product.		P
	All text shall be printed in the official language or at least one of the official languages of the country of sale. If other languages are included, they shall be easy to distinguish, e.g. by separate presentation.		P
	All text shall be clearly legible. Sentences shall be short and of simple construction. The words used shall be uncomplicated and in everyday use.		P
	Information and warnings on the vehicle should preferably be provided in the form of readily understandable symbols or pictograms when available.		P
19.2	Marking		--
19.2.1	General		P
	The vehicle shall be legibly, visibly and permanently marked with at least the following:		P
	— the business name and full address of the manufacturer or, where applicable, his authorized representative, importer or organization responsible for its sale;		P
	— designation of the vehicle;		P
	— the mandatory marking;		P
	— reference to this document, i.e. EN 17128:2020;		P
	— designation of series or class with maximum speed (e.g. kick scooter, class 2, 25km/h);		P
	— serial or identification number;		P
	It is recommended that the identification number is in accordance with ISO 3779.		P
	— year of construction, that is the year in which the manufacturing process is completed;		P
	— nominal power expressed in watts (W);		P

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Clause	Requirement + Test	Result - Remark	Verdict
	— mass of the most usual configuration, in kilograms (kg);		P
	— maximum permissible payload, user including luggage.		P
19.2.2	Durability of marking of the frame or chassis		--
	Rub the marking by hand for 15 s with a piece of cloth soaked in water and again for 15 s with a piece of cloth soaked in petroleum spirit.		P
	After the test the marking shall remain easily legible.		P
	It shall not be easy to remove any label nor shall any label show any sign of curling. After rubbing the text shall still be clearly legible.		P
19.2.3	Battery		P
	Information concerning the battery shall comply with existing corresponding standards.		P
	Additionally, the following information shall appear on the battery: — the output voltage; — the charging voltage; — the power; — warning on the risks.		P
19.2.4	Tyres		N/A
	The maximum pressure for inflatable tyres (if present) shall be marked on the tyre or in the instructions for use.		N/A
19.3	Purchase information		--
19.3.1	General		P
	Information at point of sale could be given on the packaging, on an information sheet in the store or on internet.		P
19.3.2	Information at point of sale		P
	The following information shall be given:		P
	— Only use the product in accordance with local regulations;		P
	— For which age the vehicle is designed;		P
	— Protective helmet is strongly recommended.		P
	All product information as required in this standard shall be provided in the official language(s) of the country of sale.		P

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Clause	Requirement + Test	Result - Remark	Verdict
	Warning sentences shall be written in letters whose upper case shall be at least 2,5 mm in height. The word "WARNING" shall be written in upper case. The word "WARNING!" can be given at the top of a list of warnings:		P
	— "WARNING! Never use the product close to a water source"		P
	— "WARNING! Stop using the product when damaged"		P
	The information needed to control machinery shall be provided in a form that is unambiguous and easily understood.		P
	It shall not be excessive to the extent of overloading the operator.		P
	Visual display units or any other interactive means of communication between the operator and the machine shall be easily understood and easy to use		P
19.3.3	Information on the packaging		P
	In the case where the product is delivered in a package to the final customer, the following information shall appear on the packaging:		P
	— the business name and full address of the manufacturer and, where applicable, his authorized representative,		P
	— the designation: PLEV,		P
	— use warnings: "WARNING! Never use the product out of the spaces authorized by the regulations"		P
	— the number of this standard followed by the use class, specified as follows: EN 17128 (class xx)		P
	— for which age the vehicle is designed		P
	— indication of the maximum weight of the user in accordance with manufacturer recommendation, specified as follows: MAX XXX kg		P
	— indication of the maximum speed according with manufacturer declaration and within the range of permitted speed corresponding with the declared class, specified as follows: XX km/h.	25 Km/h	P
19.4	Instructions for use		--
19.4.1	General		P
	Instructions concerning safe use of the vehicle shall be provided with the vehicle in the form of instruction sheet, instruction manual, leaflet or other similar physical support.		P

EN 17128			
Clause	Requirement + Test	Result - Remark	Verdict
	These instructions shall include at least the following and shall be headed as follows:		P
	"IMPORTANT! Read carefully and keep for future reference"		P
	— The intended use of the vehicle.		P
	— The name or trade mark of the manufacturer, importer or organization responsible for its sale.		P
	— Means to identify the product.		P
	— The description of the propulsion system technology and its detailed method of operation;		P
	— Instructions for initial assembly, folding and erection, when applicable		P
	— Explanation for light indicators.		P
	— Instructions covering all functions of the vehicle, specially driving power assistance start mode (e.g. pushing the vehicle by more than 3 km/h and activating the power assistance mode).		P
	— Instructions for operating parking and/or braking device(s).		P
	— An instruction that the parking device, if available, shall be engaged when vehicle is not on use.		P
	— For vehicles fitted with load carrying accessory (ies), details of the maximum permissible load.		P
	— A statement that any load attached to the handlebar will affect the stability of the vehicle.		P
	— Instructions for routine inspection, maintenance, cleaning and/or washing.		P
	— A statement that the vehicle shall be used only for one person.		P
	— A statement that accessories and any additional items which are not approved by the manufacturer shall not be used.		P
	— Instruction concerning safe use of the vehicle together with an indication of: 1) the maximum weight of the user in kg 2) the maximum and if relevant minimum height of the user 3) the maximum and/or minimum age of the user as appropriate		P
	— Indication the maximum continuous rated power of the electric motor according with manufacturer declaration, specified as follows: XX W.		P

EN 17128			
Clause	Requirement + Test	Result - Remark	Verdict
	— The mandatory marking.		P
	— The user should check the limits of use in accordance with the local regulations (e.g. use in pedestrian areas, on-road).		P
	— Description of the correct methods of use including braking techniques and warning on the extension of braking distances during wet weather.		P
	— Description of intended surfaces (flat, clean, dry, level and if possible, distance from other road users).		P
	— The use of protective equipment such as: hand/wrist, knee, head and elbow protections.		P
	— The necessary preparations for using the product, for example: the notification that it is necessary to check that the steering system is correctly adjusted, that all connection elements (such as a folding system) are correctly tightened and not broken, and that the brakes and wheels are in good condition.		P
	— Obligation to always wear shoes.		P
	— Others recommendations such as: special precautions for use at dark; not to touch the brake disc.		P
	— The method for adjusting the suspensions if the product has any.		P
	— The maximum permissible mass of the user.		P
	— Warning aiming to draw the user's attention to any damages related to intensive use and to recommend periodic inspections of the frame, fork and suspension attachments (if any). The warning may be formulated as follows: “WARNING ! As with any mechanical component, a vehicle is subject to high stresses and wear. The various materials and components may react differently to wear or fatigue. If the expected service life for a component has been exceeded, it may break suddenly, therefore risking causing injuries to the user. Cracks, scratches and discoloration in the areas subject to high stresses indicate that the component has exceeded its service life and should be replaced.”		P

EN 17128			
Clause	Requirement + Test	Result - Remark	Verdict
	— Traffic in the city has many obstacles to cross such as curbs or steps. It is recommended to avoid obstacle jumps. It is important to anticipate and adapt your trajectory and speed to those of a pedestrian before crossing these obstacles. It is also recommended to get out of the vehicle when these obstacles become dangerous due to their shape, height or slippage.		P
	— An instruction to keep the printed instructions for further reference and to be read carefully before use.		P
	WARNING Keep plastic covering away from children to avoid suffocation.		P
	— For inflatable tyres the maximum pressure shall be marked on the tyre or in the instructions for use.		P
	Additionally, the following recommendations shall be given:		--
	— Take the time to learn the basics of the practice to avoid any serious accident that can take place in the first months;		P
	— Get closer to your seller so he can refer you to an appropriate training organization.		P
	— Avoid high traffic areas or overcrowded areas.		P
	— In any case, anticipate your trajectory and your speed while respecting the code of the road, the code of the sidewalk and the most vulnerable.		P
	— Notify your presence when approaching a pedestrian or cyclist when you are not seen or heard.		P
	— Cross the protected passages while walking.		P
	— In all cases, take care of yourself and others.		P
	— Do not divert the use of the vehicle.		P
	— This vehicle is not intended for acrobatic use.		P
	— Caution, the brake may become hot in use. Do not touch after use.		P
	— Regularly check the tightening of the various bolted elements, in particular the wheel axles, the folding system, the steering system and the brake shaft.		P
	— Eliminate any sharp edges caused by use.		P
	— Do not modify or transform the vehicle, including the steering tube and sleeve, stem, folding mechanism and rear brake.		P
	Any other relevant information may be added, at the manufacturer's discretion.		P

EN 17128			
Clause	Requirement + Test	Result - Remark	Verdict
	Any other valuable information specified by the manufacturer.		P
19.4.2	Noise emission		P
19.4.2.1	General		P
	In case of doubt, a-weighted sound pressure levels shall be measured to a maximum 70 dB according to EN ISO 3744:2010, if necessary		P
	The following information shall be inserted in the instructions for use:		P
	— the A-weighted emission sound pressure level at workstations, where this exceeds 70 dB(A); where this level does not exceed 70 dB(A), this fact shall be indicated,		P
	— the peak C-weighted instantaneous sound pressure value at workstations, where this exceeds 63 Pa (130 dB in relation to 20 µPa),		N/A
	— the A-weighted sound power level emitted by the machinery, where the A-weighted emission sound pressure level at workstations exceeds 80 dB(A).		N/A
19.4.3	Battery charging		P
	Information for use shall contain instructions for battery charging, in particular:		--
	— recommendations on charging the battery and use of the charger		P
	— procedure for charging the battery		P
	— environmental conditions (e.g. outdoor or indoor charging)		P
	— requirement to power-off the vehicle during charging, or into a certain non-operational mode		P
	— appropriate warnings		P
19.5	Instructions on servicing and maintenance		--
	It shall be clearly explained that regular maintenance of the vehicle is a factor of safety. These explanations include the following points:		--
	— list regarding the maintenance that can be performed by the user himself;		P
	— cleaning recommendations;		P
	— description regarding the maintenance and replacement of wear parts; (, wheels, brake pads, cables, etc.);		P
	— a note specifying that the self-tightening nuts as well as the other self-tightening fastenings may lose their efficiency and that they may need to be retightened;		P

EN 17128			
Clause	Requirement + Test	Result - Remark	Verdict
	— lubrication recommendations – locations and frequency of lubrication, recommended lubricant;		P
	— the method for adjusting the brakes and recommendations concerning the replacement of friction components;		P
	— method for adjusting or setting all of the components that would need to be adjusted regularly or after replacement of a part;		P
	— recommendation not make any modifications that are not noted in the manufacturer's instructions;		P
	— information on where the user can find a qualified maintenance shop for items he cannot do by himself (e.g. replacement of wear parts, electronic components, tightening torques ...).		P
A	Annex A (informative) List of significant hazards		--
	Table A.1, lists the main sources of risks and their effects identified for all of the vehicles concerned by the scope of this standard.		--
B	Annex B (normative) Electromagnetic compatibility of vehicle		--
		See EMC report CCTI-202111210E	P
C	Annex C (informative) Example of recommendation for battery charging		--
D	Annex D (informative) Rationale		--
D.1	Introduction		--
	This informative annex has been included with the purpose of providing the rationales for the inclusion of some of the requirements given in this standard.		P
	Where appropriate, relevant clause numbers in the standard are given in this annex and the relevant reference for the annex is given in the normative part of the standard.		P
D.2	Scope		--
	As this standard is developed under the umbrella of the European Directive n°2006/42/EC, experts had to deal with strong safety requirements coming more or less from the industry.		P
	The Machinery Directive had to be analysed and interpret to take into consideration the use of PLEV by the public and not professional and trained workers.		P

EN 17128			
Clause	Requirement + Test	Result - Remark	Verdict
	At the origin, vehicles were designed by manufacturers to be used by adults, but experts noted the evolution of the age range of users.		P
	The approach through the risk assessment proposed in standard EN ISO 12100:2010 is rather oriented to an industrial usage and the challenge consisted to adapt the requirements to a domestic panel.		P
	So, the risk assessment covering risks for children use is taken into account in this standard.		P
	That's why, many requirements of the present document are coming from other European standards dedicated to children products (e.g. EN 1888 series on strollers, EN 14619:2019 on kick scooters).		P
	According to this approach and considering that this standard does not deal with ergonomic issues, manufacturers decided to inform consumers on the age range (possibility to introduce children users) for which the vehicle is designed.		P
D.3	Power limits		--
	The fitment of a pedestrian mode has been required in order to ride between pedestrians.		P
	Self-balancing vehicles need at any moment have enough power to control the balance of the vehicle.		P
	Limiting the power of a self-balancing vehicle risk the inability to find the balance at any moment.		P
	Non self-balancing vehicles are intended to be used for the last mile and need to be portable so they can be carried while the voyage continues in other transport modes.		P
	The portability limits the mass and the size of the batteries and the motor and thus the power.		P
	It is estimated that in the timeframe of the next revision this situation will not change.		P
	For the reasons given no power limit is required.		P
D.4	Thermal hazards		--
	Contact with hot surfaces may cause burns.		P
D.5	Protective function		--
	Experts will be invited to consider the mandatory or recommended use of protective clothes, especially for vehicle 2 and 4.		P
D.6	Entrapment hazards		--

EN 17128			
Clause	Requirement + Test	Result - Remark	Verdict
	The requirements are intended to address the hazard associated with a c finger getting trapped in an opening which might stop the circulation of blood		P
	Reducing the dimensions as the depth of free openings and gaps may avoid any hazard.		P
	The shape is also to be considered for assessment of the risk: a bounded circular shape will cause reduction of blood circulation.		P
D.7	Hazards due to moving parts		--
	Hazards from moving parts are related to products and rigid parts of products that move in use.		P
	A finger may be crushed, cut or even severed if the fingers become trapped between parts of a product that move.		P
	Compression points may exist if one component can move relative to another part reducing the distance between the components.		P
	This risk is more severe if parts move under loads such as body weight, component weight or the application of powered mechanisms.		P
	Shearing hazards occurs when two parts move relative to each other and act like scissors.		P
	This risk is more severe if parts move under loads such as body weight, component weight or the application of powered mechanisms.		P
D.8	Hazardous edges, corners and protruding parts		--
	Sharp edges and protrusions on the product could cause cuts, lacerations or abrasions to skin.		P
	Sharp points could puncture a skin or eye.		P
D.9	Hazards from inadequate structural integrity		--
	Any major failure of the structure of the product could cause harm to the user, and might cause major injuries.		P
	Static strength requirements and endurance requirements for the attachment devices have been included.		P
D.10	Hazards due to inadequate stability		--
	Requirements and test methods have been included to ensure an adequate stability is provided for all class of vehicle.		P
	This section deal in particular with braking performance to cover any risk of crash.		P
D.11	EMC requirements		--

EN 17128			
Clause	Requirement + Test	Result - Remark	Verdict
	First, there are two types of EMC tests-Emissions, and Immunity (and all the tests listed below are common tests required for virtually ALL electronic products to be sold within the EU and elsewhere around the world):		P
	— Emissions – refers to signals generated by or altered by the product being tested, which means these EMC phenomena are being measured, and the values shall fall within certain standard limits.		P
	— Immunity – refers to signals be transmitted (through air) or conducted (through wire) at the product being tested, to see how well it is Immune to undesirable operation when under the influence of these potentially harmful (as far as hampering the operation of the product, or causing it to malfunction or operate outside of the operation that the user is commanding at that moment in time) signals.		P
D.11.2	Riding mode		--
	— There are 3 EMC phenomena which can be experienced during the Riding Mode (because they travel through air) on a vehicle – they are -		P
	— Electrostatic Discharge (ESD) the common “static shock”, we all receive occasionally especially in the dry winter months;		P
	— Radiated Field – a radio signal (intentionally generated – or could also be “radio static, or radio noise”) from any type of transmitter – such as a cell phone and cell towers, television and radio broadcast signals, a cordless telephone, Wi-Fi or Bluetooth-as well as interference caused by motors (vacuum cleaners or power drills, for instance);		P
	— Magnetic Fields – which are generated by any wire carrying electrical current, but which may be particularly present around electrical power-transformers (which may be located in closets, ceilings, sub-floors, etc.) and such devices, and which may also be particularly strong in subway/rail stations.		P
D.11.3	Charging mode		--
	— During Charging Mode – the 3 phenomena above are still also possible, and there are these 4 other added EMC phenomena which can be transmitted down the power line from other devices on the same circuit. These phenomena include -		P
	— Electrical Fast-Transient Bursts - such as generated by repetitive machinery;		P

EN 17128			
Clause	Requirement + Test	Result - Remark	Verdict
	— Surge - such as generated by turning on or off other equipment;		P
	— Conducted radio signals - such as radio noise either coupled to the power lines through air or as generated inside another product and transmitted down its' power cord to the distribution line;		P
	— Voltage Dips/Sags, Short Interruptions, or similar variations - such as from power station switching, voltage demand on the same line, heavy circuit loading, etc.		P
D.11.4	Both riding and charging modes		--
	— Radiated Emissions during either Riding Mode or Charging Mode - the vehicle is not allowed to emit radio-waves which may be of sufficient value to disrupt or interfere with valid radio transmission- such as television and radio broadcasts, cell phones, Wi-Fi, and police, fire, ambulance, aircraft, and marine radios (to name a few).		P
	In this test, an antenna is used to detect the unwanted radio signals which may be generated by the vehicle in its' various operating conditions.		P
	Class B Emissions are the more stringent, such as for residential, commercial, medical, and light-industrial environments use - where probably most vehicle may be used; Class A Emissions are reserved for heavy-industrial environments only.		P
D.11.5	Additional EMC (Emissions) requirements		--
	— Conducted Emissions – this is simply the amount of radio-noise any product transmits down its' own power cord, which could affect other products, and therefore shall be measured and regulated.		P
	— Flicker – Flicker is just as it sounds, when your old furnace or washing machine demands more power you may see your lights flicker as a result.		P
	Because this can affect other items on the power distribution line – it shall be limited, and tests are performed to ensure all products comply.		P
	— Harmonics - Harmonics are more difficult to explain to the non-Electrical Engineer, but are essentially a disruption which may be transmitted in large or small doses to the power distribution system, which among other things can unduly increase the demand on that power generator (especially when combined with many other products also behaving badly in this regard)- thus, they shall be regulated for all products.		P
D.11.6	Criteria for failure		--

EN 17128			
Clause	Requirement + Test	Result - Remark	Verdict
	— There are different schools of thought for setting failure criteria limits, when trying to write a standard for a wide range of vehicle types and uses, and for the range of functions of those vehicles.		P
	— One set of test limits (severity of phenomena) was set here, with different failure criteria for Self-Balancing vehicles features, where such operations may be more critical to user safety.		P
D.11.7	Immunity to specific radio technologies operating at frequencies of 800 MHz and above		--
	Wireless communication devices are considered to be the most significant sources of interference for MME in the range 800 MHz to 5 GHz. Consequently testing is only required at relevant spot frequencies.		P
	Immunity is assumed to be ensured for a whole band of any wireless technology, or even for a neighbouring band, when testing at one frequency only within that band.		P
	The expected field strengths in V/m radiated by the sources considered above at distances of 3 m, 1,5 m and 1 m were calculated using the formula: $E_{rms} = k \times \sqrt{P} / R$		P
	Also for distances at 0,5 m and 0,2 m using the formula: $E_{rms} = \sqrt{30 \times P \times G} / R$		P
	The above 'calculated' field strength corresponds to the rms value of field strength of the RF test signal that is subsequently 80 % AM modulated by a 1 kHz sine wave.		P
	The test levels specified in the basic standards are for unmodulated signals.		P
	The values given in Table D.1 are based upon the formulas given above and corrected to align with EN 61000-4-3 as presented in Table 1.		P
	Most GSM terminals have a nominal maximum ERP of 2 W.		P
	The ERP of GSM terminals is often lower than the maximum, except in areas where the terminal is far away from the base station.		P
	However a worst case value of 2 W has been used in Table D.1.		P

EN 17128			
Clause	Requirement + Test	Result - Remark	Verdict
	The test at 1,8 GHz is considered sufficient to also cover the 2,1 GHz frequency band and the test at 2,6 GHz sufficient to cover the 2,4 GHz to 2,6 GHz band.		P
	Regarding the 2,6 GHz band, there are new technologies (for example, WiMAX) enabling > 1 W transmit power and therefore this band has been chosen for test frequency instead of the 2,4 GHz band.		P
D.12	Driving power management		--
	Up to 60 % and not 100 % is, because you will experience the highest acceleration normally at the beginning.		P
	Probably 50 % is even a bit high to find out if it is really a problematic acceleration.		P
	Maybe 30 % would be better		P
	Starting from a 'rolling' position in order to avoid variances due to kicking-off the ground to start for partially electrically powered vehicle.		P
D.13	Vibration hazard		--
	Vibration is not considered to be a significant hazard for these vehicles' users and a test method is not given (according to European Directive n°2002-44 of 2002-06-25).		P
	Vibration coming from power driving system are not significant (compare to e.g. non-motorized kick scooters).		P
	By design, vehicle have electric motor(s) and not a combustion engine, excentric moving masses are absent and thus there are no vibration generated by the motor(s).		P
	This does not mean that the manufacturer of the vehicle is absolved from reducing vibration.		P
D.14	Lightning		--
	As we are in presence of urban vehicles (or indoor), the most important safety requirement is not to see during the night use (or tunnels) but be seen from other traffic users.		P
D.15	Noise		--
	Noise is not considered to be a significant hazard for these vehicles' users and a test method is not given (according to European Directive n°2006/42/EC).		P
	No test values are available when drafting this standard.		P

EN 17128			
Clause	Requirement + Test	Result - Remark	Verdict
	However, only the user of the vehicle is considered by this measurement.		P
	Actually, the vehicles on the market are far away of the limit of 70 dB(A).		P
D.16	Unintended and unauthorized use		--
	The user of the vehicle (authorized to use it) could, during use, make a wrong action inadvertently (e.g. action on the folding mechanism).		P
	For this situation, the manufacturer could introduce a device or a combination of two actions to avoid this risk.		P
	Before use, the manufacturer provides a system to start the vehicle to avoid non authorized persons to use it (e.g. children).		P
D.17	Driving power management		--
	Switching off the power at any time during use, on self-balanced vehicles or vehicles with electric brake, introduce new increased risk.		P
	Emergency stop cannot be used for these kind of vehicles.		P
	Reference to the relevant paragraph of the Machinery Directive:		P
	"1.2.4.3. Emergency stop machinery in which an emergency stop device would not lessen the risk, either because it would not reduce the stopping time or because it would not enable the special measures required to deal with the risk to be taken,"		P
E	Annex E (informative) Examples of vehicles		--
F	Annex F (normative) Light, warning device, on-off symbols		--
G	Annex G (informative) Types of parking devices		--

EN 17128			
Clause	Requirement + Test	Result - Remark	Verdict

6.1-1	TABLE: Heating test		P	
	Test voltage (V).....:	1) 0,94 x 100 V = 94 V 2) 1,06 x 240 V = 254,4 V	—	
	Ambient (°C).....:	1) t1=23,5; t2=24,5 2) t1=22,8; t2=23,8	—	
Thermocouple locations:		Max. temperature rise measured, Δ T (K)		Max. temperature rise limit, Δ T (K)
		1)	2)	
Adapter enclosure		35,2	34,8	75
Adapter enclosure, inside		40,7	40,2	Ref.
Adapter inlet		29,1	28,0	Ref.
Adapter output cord		1,2	0,6	50
Appliance inlet		2,6	1,4	45
Connector, to motor		3,7	3,0	Ref.
Battery surface		5,0	4,4	Ref.
Battery cell		9,7	11,5	Ref.
Internal wire, battery		2,7	4,4	200-25=175
Internal wire, other		3,2	5,0	200-25=175
Connector, output of battery		3,3	5,0	Ref.
Connector, input of battery		3,4	5,3	Ref.
Main PCB		2,8	3,1	120
Plastic enclosure		2,5	3,0	50
Internal wire to motor		1,7	2,1	200-25=175
Motor winding		0,4	0,7	140
Deck/footrest		4,3	4,5	Ref.
Rear light cover		0,2	0,4	50
Control PCB		1,0	1,7	120
Lamp beads		0,3	1,3	Ref.
Switch		0,7	1,7	50
Handgrip		0,4	1,3	Ref.
Supplementary information: tested in charging mode.				

6.1-2	TABLE: Heating test		P
	Test voltage (V):	Supplied by the fully charged battery	—
	Ambient (°C):	T1 = 23,7; T2 = 23,5	—

Thermocouple locations:	Max. temperature rise measured, ΔT (K)	Max. temperature rise limit, ΔT (K)
Appliance inlet	11,0	45
Connector, to motor	17,1	Ref.
Battery surface	15,5	Ref.
Battery cell	20,2	Ref.
Internal wire, battery	18,8	200-25=175
Internal wire, other	24,2	200-25=175
Connector, output of battery	27,8	Ref.
Connector, input of battery	9,4	Ref.
Main PCB	32,0	120
Plastic enclosure	12,5	50
Internal wire to motor	22,1	200-25=175
Motor winding	19,2	140
Deck	8,5	Ref.
Rear light cover	3,7	50
Control PCB	8,7	120
Lamp beads	1,8	Ref.
Switch	4,5	50
Handgrip	1,7	Ref.
Supplementary information: tested in operating mode with 66 kg load and recorded the most unfavourable data.		

6.3.5	TABLE: Dielectric strength		P
Test voltage applied between:		Test potential applied (V)	Breakdown / flashover (Yes/No)
Internal wiring		500+2*Ur= 596 V 2 mins	No
Supplementary information: --			

10	TABLE: Critical components information					P
Object / part No.	Manufacturer/ trademark	Type / model	Technical data	Standard	Mark(s) of conformity ¹⁾	
Adapter	Shenzhen Fuyuanlian Power Co.,Ltd.	FY1505462000	Input; 100 V - 240 V; 50 Hz / 60 Hz; 3.0 A; Output: 54,6 VDC; 2 A	EN 60335-2-29 EN 60335-1	Tested with appliance	
- Plug	Yong Hao Electrical Industry Co., Ltd.	YH-E-001	AC 250 V; 2,5 A	DIN VDE 0620	VDE 40032353	

- Power cord	Yong Hao Electrical Industry Co., Ltd.	H03VVH2-F	2 x 0,75 mm ²	DIN VDE 0620	VDE 40027125
- Connector of power cord	Yong Hao Electrical Industry Co., Ltd.	YH-E-002	AC 250 V; 2,5 A	EN 60320-1:2016-04; EN 60320-1:2015 + AC:2016	VDE 40029601
- Appliance inlet	LECI Electronics Co., Ltd	DB-8	AC 250 V; 2,5 A	EN 60320-1:2016-04; EN 60320-1:2015 + AC:2016	VDE 40032028
Li-ion Power Battery Pack	Shenzhen Uni-sun Electronics Co., Ltd.	A1CC2B/L1A-0061	48V, 15Ah	IEC 62133-2:2017 EN 62133-2:2017	Tested with appliance
Motor	Changzhou Hanghong Electrical Co., Ltd	125 2330	48V; 450W; Class F	BS EN 17128:2020	Tested with appliance
PCB material	Jiangxi Xinchenghui Circuit Co., LTD	WA-M	V-0; 130°C	BS EN 17128:2020	Tested with appliance UL E321523
Inlet of appliance	Shenzhen City Chen Haotian Electronics Co Ltd	CHT12-4	300 V; 5 A; IP55; 3-pin	BS EN 17128:2020	Tested with appliance UL E483613
Input wire	SHENZHEN SHUNJIA ELECTRICAL TECHNOLOGY CO LTD	1332	18AWG; 200°C; 300V	BS EN 17128:2020	Tested with appliance UL E490463
Internal wire between battery pack and Main PCB	SHENZHEN SHUNJIA ELECTRICAL TECHNOLOGY CO LTD	3135	16AWG; 200°C; 300V	BS EN 17128:2020	Tested with appliance UL E490463
Internal wire to motor	SHENZHEN SHUNJIA ELECTRICAL TECHNOLOGY CO LTD	1332	16AWG; 200°C; 300V	BS EN 17128:2020	Tested with appliance UL E490463
Internal wire to control panel	Yong Hao Electrical Industry Co., Ltd.	1007	20AWG; 200°C; 300V	BS EN 17128:2020	Tested with appliance UL E240426
Internal wire of controller	Yong Hao Electrical Industry Co., Ltd.	1007	20AWG; 200°C; 300V	BS EN 17128:2020	Tested with appliance UL E240426
Other internal wire	Yong Hao Electrical Industry Co., Ltd.	1007	20AWG; 200°C; 300V	BS EN 17128:2020	Tested with appliance UL E240426

Connector (output of battery)	Guangdong Techeng Metal & Electronics Co Ltd	XT60U-F	500V; 30A; 80°C	BS EN 17128: 2020	Tested with appliance UL E495295
Connector (input of battery)	Guangdong Techeng Metal & Electronics Co Ltd	XT60U	60V; 15A; 80°C	BS EN 17128: 2020	Tested with appliance UL E495295
Connector (to motor)	Changzhou Amass Electronics Co Ltd	MR60	60V; 15A; 80°C	BS EN 17128: 2020	Tested with appliance UL E482722
Control panel	LG CHEM LTD	AF312C	V-0; 70°C	BS EN 17128: 2020	Tested with appliance UL E67171
Plastic enclosure	Formosa Chemical & Fibre Corp Plastics DIV	AC310(+)	V-0; 60°C	BS EN 17128: 2020	Tested with appliance UL E162823
Heat-shrinkable tube	Guangzhou Kaiheng New Material Co., Ltd.	K-2(+)	600 V; 125°C	BS EN 17128: 2020	Tested with appliance UL E214175
Headlight	Sate-Lite (Foshan) Plastics Co., Ltd.	C2-T	8 Vd.c.; White	ISO 6742-1: 2015	TUV SUD report No.: 70.402.18.03 8.03
Rear light	Sate-Lite (Foshan) Plastics Co., Ltd.	M4	Red	ISO 6742-1: 2015	ACT report No.: 531.0063.005
Reflector	Shenzhen Uni-sun Electronics Co., Ltd.	--	Red	ISO 6742-2: 2015	CQC report No.: 2021-AM-01054
Reflector	Shenzhen Uni-sun Electronics Co., Ltd.	--	White	ISO 6742-2: 2015	CQC report No.: 2021-AM-01148
Audible alarm device	Shenzhen Ai Qi Bicycle Co., Ltd.	EB07DQ	Background noise: 40,6dB	ISO14878: 2015	TUV Rheinland report No.: CN20VZFO
Supplementary information: --					

18.1-1	TABLE: Heating test			P
	Test voltage (V).....	Supplied by the fully charged battery		—
	Ambient (°C).....	t1= 23,7 ; t2= 23,5		—
Thermocouple locations:		Max. temperature rise measured, ΔT (K)	Max. temperature rise limit, ΔT (K)	
Handgrips		1,6	43-25=18	
Handgrip levers		1,7	43-25=18	
Deck		8,6	43-25=18	

Footrests	8,7	43-25=18
The brake system surface	1,5	43-25=18
Cables(surface)	1,2	43-25=18
Supplementary information: tested in operating mode with 100 kg load and recorded the most unfavourable data.		



Attachment I

Photo documentation



Figure 1 Overall view



Figure 2 Overall view

Photo documentation



Figure 3 Overall view



Figure 4 Overall view

Photo documentation



Figure 5 Overall view



Figure 6 Internal view

Photo documentation



Figure 7 Internal view



Figure 8 Internal view

Photo documentation



Figure 9 Internal view



Figure 10 Adapter view

***** END OF REPORT *****