**Prüfbericht - Produkte**
*Test Report - Products*

TÜVRheinland®

| | | | | |
|---|---|---|---|---|
| **Prüfbericht-Nr.:**<br>*Test report no.:* | **NN25B3AZ 001** | **Auftrags-Nr.:**<br>*Order no.:* | 326095319 |  |
| **Kunden-Referenz-Nr.:**<br>*Client reference no.:* | 2114196 | **Auftragsdatum:**<br>*Order date:* | 14.02.2025 | |

**Auftraggeber:**
*Client:*
**Wuxi United Mobility Technology Inc.**
No. 21, South Industrial Park, Hongshan, Wuxi, P.R. China

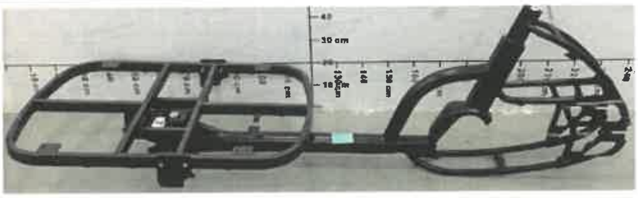
**Prüfgegenstand:**
*Test item:*
E-Cargo Frame

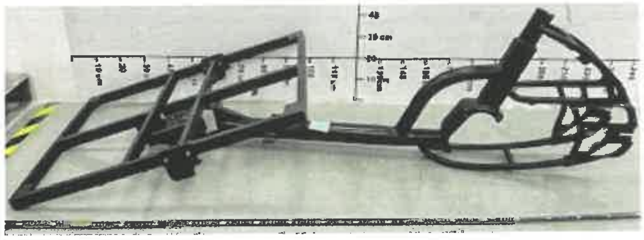
**Bezeichnung / Typ-Nr.:**
*Identification / Type no.:*
UM-PTC01PC
UM-PTC01PS

**Auftrags-Inhalt:**
*Order content:*
Test of selected parameters

**Prüfgrundlage:**
*Test specification:*
**DIN 79010:2020-02 clause 5.9.3, 5.9.4, 5.9.5, 5.9.6 and 5.9.7**
Cycles – Transportation bikes and cargo bikes – Requirements and test methods for single- and multi-track cycles

| | |
|---|---|
| **Wareneingangsdatum:**<br>*Date of sample receipt:* | 14.02.2025 |
| **Prüfmuster-Nr.:**<br>*Test sample no:* | A003926440 |
| **Prüfzeitraum:**<br>*Testing period:* | 14.02.2025 - 07.03.2025 |
| **Ort der Prüfung:**<br>*Place of testing:* | Kunshan |
| **Prüflaboratorium:**<br>*Testing laboratory:* | TÜV Rheinland (Shanghai) Co., Ltd. Kunshan Branch |
| **Prüfergebnis*:**<br>*Test result*:* | Pass |





**geprüft von:**
tested by:

**Datum:**
*Date:* 11.03.2025

Rain Wei

Date: 2025.03.11 13:51:44 +08'00'

**Stellung** / Position: Rain Wei / PE

**genehmigt von:**
*authorized by:*

**Ausstellungsdatum:**
*Issue date:* 11.03.2025

Nan Jiang

**Stellung** / Position: Nan Jiang / Reviewer

**Sonstiges** / *Other:*

**Zustand des Prüfgegenstandes bei Anlieferung:**
*Condition of the test item at delivery:*
Prüfmuster vollständig und unbeschädigt
*Test item complete and undamaged*

| | | | | | |
|---|---|---|---|---|---|
| * Legende: | 1 = sehr gut | 2 = gut | 3 = befriedigend | 4 = ausreichend | 5 = mangelhaft |
| | P(ass) = entspricht o.g. Prüfgrundlage(n) | | F(ail) = entspricht nicht o.g. Prüfgrundlage(n) | N/A = nicht anwendbar | N/T = nicht getestet |
| * *Legend:* | *1 = very good* | *2 = good* | *3 = satisfactory* | *4 = sufficient* | *5 = poor* |
| | *P(ass) = passed a.m. test specification(s)* | | *F(ail) = failed a.m. test specification(s)* | *N/A = not applicable* | *N/T = not tested* |



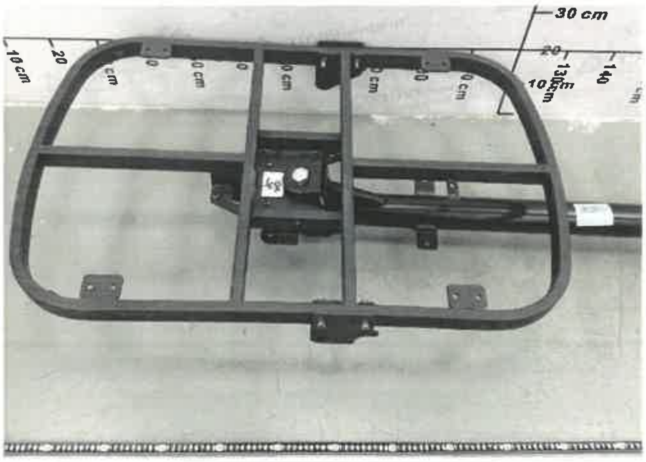
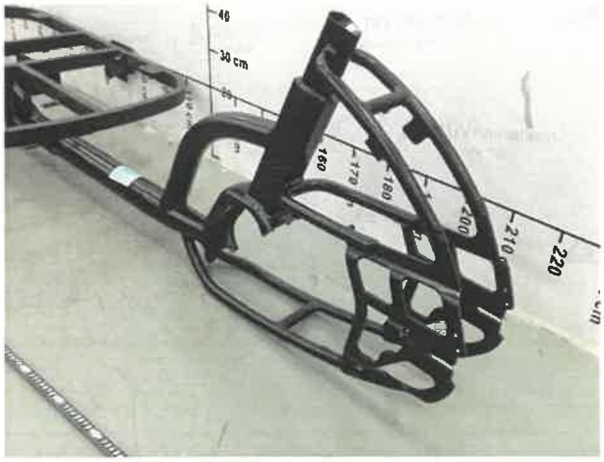
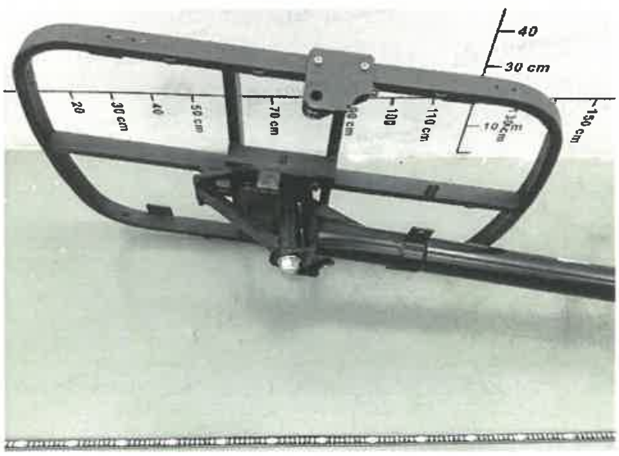
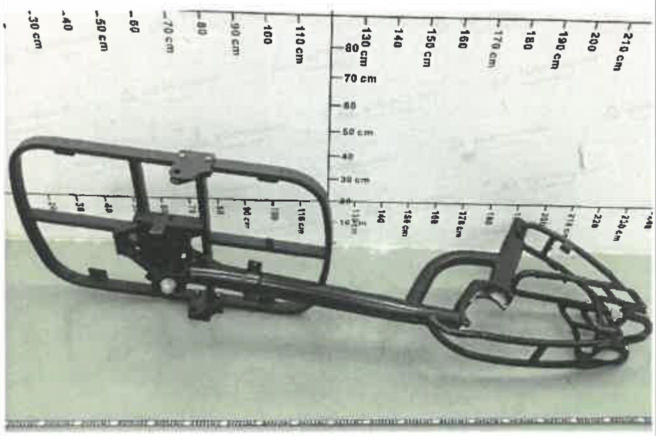
V05

## Anmerkungen
*Remarks*

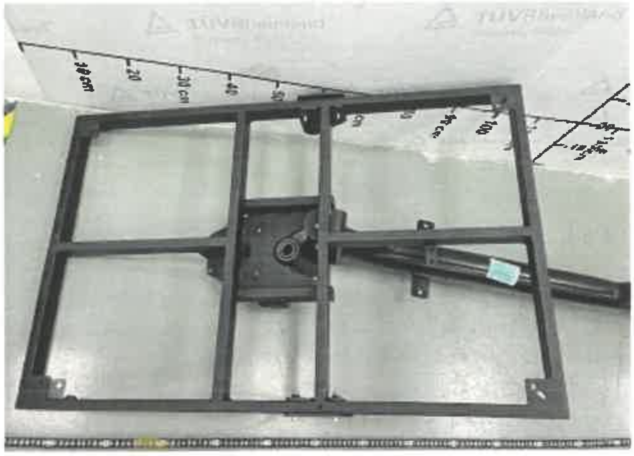
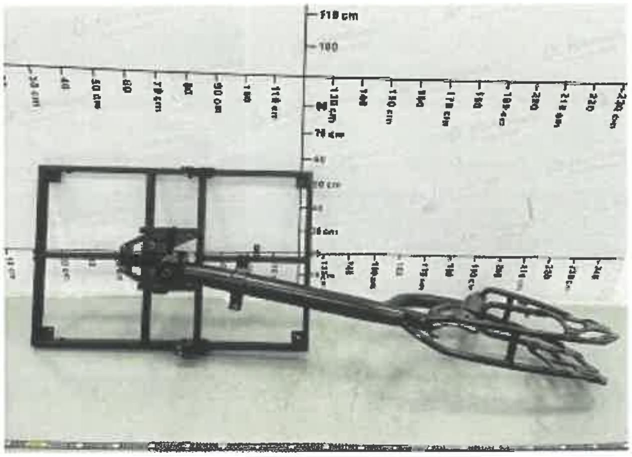
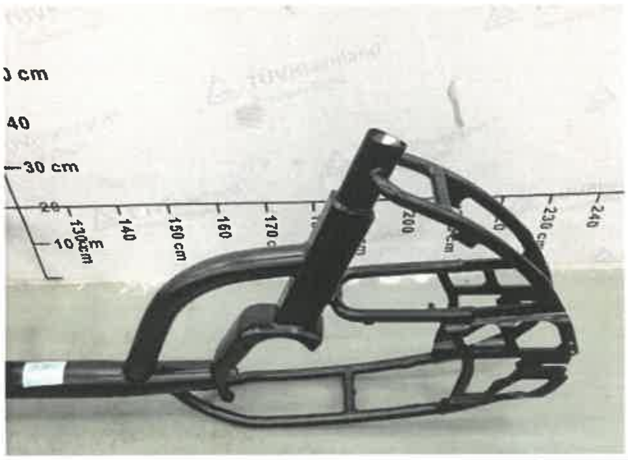
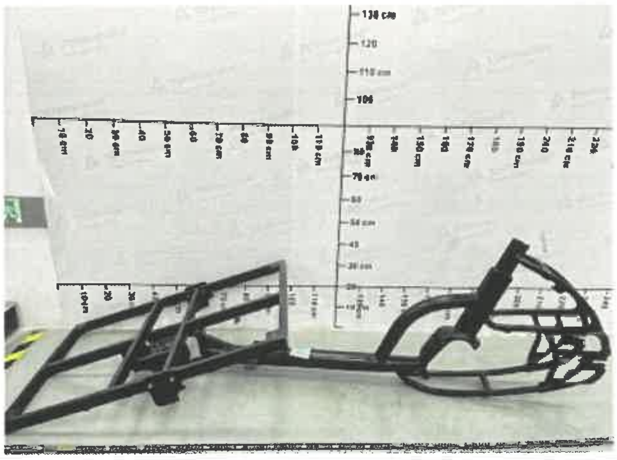
| | |
|---|---|
| 1 | Alle eingesetzten Prüfmittel waren zum angegebenen Prüfzeitraum gemäß eines festgelegten Kalibierungsprogramms unseres Prüfhauses kalibriert. Sie entsprechen den in den Prüfprogrammen hinterlegten Anforderungen. Die Rückverfolgbarkeit der eingesetzten Prüfmittel ist durch die Einhaltung der Regelungen unseres Managementsystems gegeben.<br>Detaillierte Informationen bezüglich Prüfkonditionen, Prüfequipment und Messunsicherheiten sind im Prüflabor vorhanden und können auf Wunsch bereitgestellt werden.<br><br>*The equipment used during the specified testing period was calibrated according to our test laboratory calibration program. The equipment fulfils the requirements included in the relevant standards. The traceability of the test equipment used is ensured by compliance with the regulations of our management system. Detailed information regarding test conditions, equipment and measurement uncertainty is available in the test laboratory and could be provided on request.* |
| 2 | Wie vertraglich vereinbart, wurde dieses Dokument nur digital unterzeichnet. Der TÜV Rheinland hat nicht überprüft, welche rechtlichen oder sonstigen diesbezüglichen Anforderungen für dieses Dokument gelten. Diese Überprüfung liegt in der Verantwortung des Benutzers dieses Dokuments. Auf Verlangen des Kunden kann der TÜV Rheinland die Gültigkeit der digitalen Signatur durch ein gesondertes Dokument bestätigen. Diese Anfrage ist an unseren Vertrieb zu richten. Eine Umweltgebühr für einen solchen zusätzlichen Service wird erhoben.<br><br>*As contractually agreed, this document has been signed digitally only. TUV Rheinland has not verified and unable to verify which legal or other pertaining requirements are applicable for this document. Such verification is within the responsibility of the user of this document. Upon request by its client, TUV Rheinland can confirm the validity of the digital signature by a separate document. Such request shall be addressed to our Sales department. An environmental fee for such additional service will be charged.* |
| 3 | Prüfklausel mit der Note * wurden an qualifizierte Unterauftragnehmer vergeben und sind unter der jeweiligen Prüfklausel des Berichts beschrieben.<br>Abweichungen von Prüfspezifikation(en) oder Kundenanforderungen sind in der jeweiligen Prüfklausel im Bericht aufgeführt.<br><br>*Test clauses with remark of * are subcontracted to qualified subcontractors and descripted under the respective test clause in the report.*<br>*Deviations of testing specification(s) or customer requirements are listed in specific test clause in the report.* |
| 4 | Die Entscheidungsregel für Konformitätserklärungen in diesem Prüfbericht basiert auf der "Null-Grenzwert-Regel" und der "Einfachen Akzeptanz" gemäß ILAC G8:2019 und IEC Guide 115:2021, es sei denn, in der auf Seite 1 dieses Berichts genannten angewandten Norm ist etwas anderes festgelegt oder vom Kunden gewünscht. Dies bedeutet, dass die Messunsicherheit nicht berücksichtigt wird und daher auch nicht im Prüfbericht angegeben wird.<br><br>*The decision rule for statements of conformity in this test report is based on the "Zero Guard Band Rule" and "Simple Acceptance" in accordance with ILAC G8:2019 and IEC Guide 115:2021, unless otherwise specified in the applied standard mentioned on Page 1 of this report or requested by the customer. This means that measurement uncertainty is not taken in account and hence also not declared in the test report.* |

## Produktbeschreibung
*Product description*

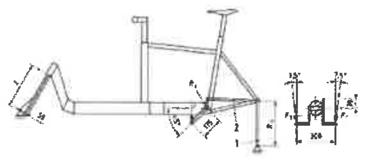
| | | |
|---|---|---|
| 1 | **Produktdetails** *Product details* | Frame for E cargo bike. Maximum payload weight: 80kg+120kg; Rear-rack: 25kg; multi-track cycles, Maximum permissible total weight: 300Kg; |
| 2 | **Maße / Gewicht** *Dimensions / Weight* | UM-PTC01PC: 21.00kg;<br>UM-PTC01PS: 21.05kg; |
| 3 | **Bedienelemente** *Operating elements* | N/A. |
| 4 | **Ausstattung / Zubehör** *Equipment / Accessories* | N/A. |
| 5 | **Verwendete Materialien** *Used materials* | Steel, Aluminum alloy,etc. |
| 6 | **Sonstiges** *Other* | A complete cargo bike provided by client to check the centre of gravity.<br>WB is the wheelbase: 1405mm; $G_{ges}$ is total weight of the cycle: 86kg |
| 7 | **Prüfmusterbereitstellung:** *Test sample obtaining:* | ☒ Sending by customer ☐ Sampling by TÜV Rheinland Group<br>☐ others: |

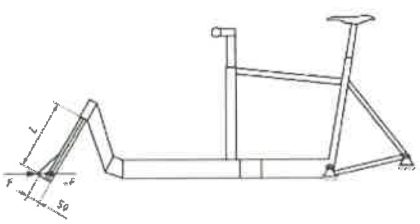
| UM-PTC01PC | UM-PTC01PC |
|---|---|
|  |  |
| UM-PTC01PC | UM-PTC01PC |
|  |  |

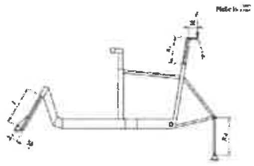
## Produktbeschreibung
*Product description*

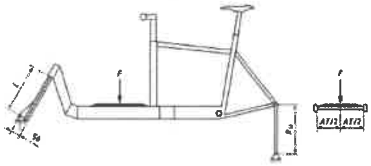
| UM-PTC01PS | UM-PTC01PS |
|---|---|
|  |  |
| UM-PTC01PS | UM-PTC01PS |
|  |  |

| **Absatz** *Clause* | **Anforderungen - Prüfungen /** *Requirements - Tests* | **Messergebnisse – Bemerkungen /** *Measuring results - Remarks* | **Ergebnis** *Result* |
|---|---|---|---|
| **5.9.3** | **Frame - Dynamic test with pedaling forces** | | |
| **5.9.3.1** | **General**<br><br>When testing sprung frames with articulated joints, adjust the spring, air pressure or damper so that the greatest possible resistance is achieved; or replace the spring assembly with a rigid joint, ensuring that the frame mounts and lateral rigidity of the original design are accurately modeled. | | |
| **5.9.3.2** | **Test procedure**<br><br>The front fork can be replaced by a replacement test fork (see Appendix E) with the same length and at least the same rigidity as the original fork.<br><br>The frame unit shall be clamped in a device as shown in Figure 18 with the front wheel axle of the fork or spare test fork fixed in a rigid mounting of height $R_w$ (radius of the wheel / tire unit ± 30 mm), with the hub freely rotatable about the axle. The rear dropouts are clamped to the axle in a rigid vertical support of the same height as the rigid front device. Here, the upper attachment of the support must be freely rotatable about the rear axle, but laterally rigidly clamped, and the lower end of the support must be provided with a ball joint.<br><br>On the bottom bracket shell according to figure 18 and according to item a) or item b), either a crank / chain-ring unit or preferably a rigid stiff replacement test unit with the dimensions of the original parts is to be attached.<br><br>a) When using a crank / chain-ring unit, both cranks should be inclined forwards and downwards by 45 ° (to ± 2.0 °) to the horizontal, and the front end of the chain shall be centered on three chain-rings and two on chain-rings to hang up the smaller or on the only chain-ring. The rear end of the chain is to be fixed at right angles to the rear wheel axle.<br><br>b) If an adapter unit is used (as shown in Figure 18), it must be freely rotatable about the axle of the bottom bracket shell and both replacement test cranks must be 175 mm (L) long; Both spare test cranks should be pointed forward and mounted at 45 ° (± 2,0 °) to the right of the scale, inclined downwards. The replacement of the replacement cranks is done by a vertical lever arm (which replaces the chain-ring) and by a pull rod with ball joints at both ends, which is fixed at right angles to the rear axle. The length of the vertical lever arm (Rc) shall be 75 mm, and the axis of the drawbar shall be at a distance of 50 mm parallel to the vertical plane through the central axis of the frame. | See next page; | P ☒<br>F ☐<br>N/A ☐<br>N/T ☐ |

| **Absatz** *Clause* | **Anforderungen - Prüfungen /** *Requirements - Tests* | **Messergebnisse – Bemerkungen /** *Measuring results - Remarks* | **Ergebnis** *Result* |
|---|---|---|---|
| | c) A downward test load F1 is repeatedly applied to each pedal (or equivalent adapter component) by 7.5 ° (± 0.5 °) from the vertical center axis at a distance of 150 mm from the central axis of the frame as shown in Figure 16 , When applying these test loads, the force acting on a "pedal axle" must be reduced to ⩽ 5% of the maximum force before the force is applied to the other "pedal axle".<br><br>The test load of 1 200 N shall be applied for 100 000 cycles, with one cycle of loading and unloading with two test loads. The maximum test frequency must be observed in accordance with the specifications of DIN EN ISO 4210-3: 2014, 4.5.<br><br><br><br>Key<br>Rw height of rigid fixture and vertical connector<br>Rc length of the vertical lever arm<br>L Length of replacement test fork<br>1 ball joint<br>2 drawbar<br><br>Picture 18 - Frame - dynamic test with pedaling forces | Apply a repeated downward force of 1 200N.<br><br>Test cycles: 100 000;<br>Test frequency: 1.5Hz;<br><br>No visible cracks or fractures in any part of the frame. | P ☒<br>F ☐<br>N/A ☐<br>N/T ☐ |
| **5.9.4** | **Frame - dynamic testing with horizontal forces** | | |
| **5.9.4.1** | **General**<br><br>The use of the fork for testing is recommended - see 5.10.<br><br>A suspended fork or a spring element of the rear axle is to be blocked by adjusting the spring / damping unit, by an external device or by replacing the spring element with a solid connecting piece of a suitable size so that the elements can be adjusted by 20% according to the manufacturer's specification or if not specified Total travel are compressed.<br><br>In the case of cargo bikes with front wheel mounts that are not designed in the form of a fork (e.g. steering knuckle steering), the test force determined in accordance with 5.9.4.2 should not be applied to the wheel axis in a forward and backward direction, but on the rear axle as a force acting in the direction of travel and the resulting braking torque to introduce the respective front axles into the frame.<br><br>For this purpose, the front axle must be fixed at the wheel contact point via the intended wheel or wheels, or the axle must be supported with suitable levers so that the wheels blocked by the brake support are simulated. The resulting braking torque around the wheel axle (s) must be appropriately supported at the corresponding brake attachment points on the frame. The test force must then be introduced in the direction of travel via the rear wheel axle (or axles) | | |
| **5.9.4.2** | **Determination of the test forces** | | |
| **5.9.4.2 .1** | **General**<br><br>To determine the test forces, the total mass and position of the center of gravity of the cargo bike must be known.<br>If the center of gravity of the cargo bike is not known, it can be determined experimentally (see Appendix B.1) or calculated (see Appendix B.2). | | |

| **Absatz**<br>*Clause* | **Anforderungen - Prüfungen /**<br>*Requirements - Tests* | **Messergebnisse – Bemerkungen /**<br>*Measuring results - Remarks* | **Ergebnis**<br>*Result* |
|---|---|---|---|
| 5.9.4.2<br>.2 | **Position of the overall center of gravity far behind / below (Xs ≥ 0.8 Zs)**<br><br>Depending on the total mass m and the center of gravity (Xs / Zs), the test force $F_{test}$ is to be determined as the total braking force minus half the braking force acting on the rear wheel for a deceleration of 6 m / s² according to equation (4) and to a full 100 N. round up:<br>$F_{test} = m \cdot a - \frac{\mu}{2}\left(\frac{m \cdot g \cdot x_S}{WB} - \frac{m \cdot a \cdot z_S}{WB}\right)$<br>It is<br>a = 6 m / s²;<br>g = 9.81 m / s²;<br>μ = 0.8;<br>m the total mass, in kg;<br>WB is the wheelbase, in mm;<br>Xs is the horizontal distance of the center of gravity from the front axle, in mm;<br>Zs the height of the total center of gravity above the road, in mm. | xs ≥ 0,8 zs<br>Dynamic horizontal forces of +1608.8 N in a forward direction and -1608.8 N in a rearward direction.<br>Test cycles: 100 000;<br>Test frequency: 1.5Hz;<br><br>No visible cracks or fractures in any part of the frame. | P ☒<br>F ☐<br>N/A ☐<br>N/T ☐ |
| 5.9.4.2<br>.3 | **Position of the overall center of gravity front / high (x <0.8 z)**<br><br>Up to a total weight of 120 kg, the test force $F_{test}$ is ± 500 N; with a higher<br>total mass m of the cargo bike, the test force $F_{test}$ is determined as m / 120 kg · 500 N. | See clause 5.9.4.2.2; | P ☐<br>F ☐<br>N/A ☒<br>N/T ☐ |
| 5.9.4.3 | **Test procedure**<br><br>In the usual position, the frame can be rotated freely on the rear dropouts (i.e. preferably on the rear wheel axle), as shown in Figure 19. Make sure that the frame is clamped in the position that corresponds to the normal use of the cargo bike. If the front and rear wheel diameters are the same size, both axles must be aligned.<br><br>Dynamic horizontal forces Ftest must be applied forwards and backwards for 100,000 cycles on the axle support, as shown in Figure 19, with the front wheel fork being fixed in the vertical plane when the force is applied, but the fork being freely movable forwards and backwards. The maximum test frequency must be observed in accordance with the specifications in DIN EN ISO 4210-3: 2015-01, 4.5.<br><br><br>Bild 19 — Rahmen — dynamische Prüfung mit horizontalen Kräften<br><br>Figure 19 - Frame - dynamic test with horizontal forces | | |

| **Absatz**<br>*Clause* | **Anforderungen - Prüfungen /**<br>*Requirements - Tests* | **Messergebnisse – Bemerkungen /**<br>*Measuring results - Remarks* | **Ergebnis**<br>*Result* |
|---|---|---|---|
| **5.9.5** | **Frame - Dynamic test with a vertical force on the seat post** | | |
| **5.9.5.1** | **General**<br><br>When testing spring-loaded frames with articulated connections, the spring, air pressure or damper must be set so that the greatest possible resistance is achieved; or to replace the spring unit with a rigid connector, making sure that the attachments to the frame and the lateral rigidity of the original version are exactly reproduced. | | |
| **5.9.5.2** | **Test procedure**<br><br>The frame can be rotated freely in the usual position on the front or rear dropouts and a suitable device attached to the other axle so that the frame can be extended or shortened under the influence of the test forces. An example is shown in Figure 20. The intended seat post or an equivalent test post is inserted into the upper end of the seat tube up to the minimum insertion depth according to the manufacturer's specifications or up to a depth of 75 mm and secured with the usual clamp according to the manufacturer's instructions. A horizontally rearward-facing bracket must be attached to the upper end of this support so that its length (dimension h3 in Figure 20) brings point H into a position that corresponds to the center of the saddle clamp; if the bike has the maximum saddle height recommended by the manufacturer for the respective frame. If there is no recommendation for the saddle height, the dimension h3 must be 250 mm.<br><br>Dynamic vertical downward forces of 1 200 N must be initiated for 50 000 test cycles at a distance of 70 mm behind the intersection of the axes of the solid connecting piece and bracket element, as shown in Figure 20. The maximum test frequency must be observed in accordance with the specifications in DIN EN ISO 4210-3: 2015-01, 4.5.<br><br><br><br>Key<br>L Length of the test fork<br>h3 extension length of the seat post<br>$R_a$ wheel radius<br>F test load<br><br>Figure 20 - Frame - dynamic test with a vertical force | Dynamic, vertically-downward forces 1 200 N;<br>Test cycles: 50 000;<br>Test frequency: 1.5Hz;<br><br>No visible cracks or fractures in any part of the frame. | P ☒<br>F ☐<br>N/A ☐<br>N/T ☐ |
| **5.9.6** | **Frame - dynamic testing with vertical forces on the load bearing** | | |
| **5.9.6.1** | **General**<br><br>When testing spring-loaded frames with articulated connections, the spring, air pressure or damper must be set so that the greatest possible resistance is achieved or the spring unit is replaced by a rigid connecting piece, whereby it must be ensured that the fastenings on the frame and the lateral rigidity of the original version are exactly replicated. | | |

| **Absatz**<br>*Clause* | **Anforderungen - Prüfungen /**<br>*Requirements - Tests* | **Messergebnisse – Bemerkungen /**<br>*Measuring results - Remarks* | **Ergebnis**<br>*Result* |
|---|---|---|---|
| **5.9.6.2** | **Test procedure**<br><br>In the usual position, the frame can be rotated freely on the rear dropouts, as shown in Figure 21. A suitable test roller or other device must be attached to the front wheel axle in order to allow the frame to lengthen or shorten the wheelbase under the influence of the test forces.<br><br>The load is supported by a suitable pressure plate with an area of 400 mm × 300 mm for 100,000 cycles with a dynamic test force in the amount of the released payload in kg, multiplied by the gravitational acceleration of 9.81 m / s2 and a factor of 1.5 to load flat in an arrangement typical for use. The test force is to be applied as centrally as possible between the two wheel axles when carrying a load between the axles, or horizontally as far as practically possible from the axle when carrying a load in front of the front wheel axle or behind the rear wheel axle.<br><br><br><br>Key<br>AT gauge<br>L Length of the test fork<br>Rw wheel radius<br>F test load<br>Figure 21 - Dynamic test with vertical forces on the load bearing | The maximum load on the front luggage declared by the client: 120 kg;<br><br>Dynamic, vertically-downward forces 1765.8 N;<br>Test cycles: 100 000;<br>Test frequency: 1.0Hz;<br><br>No visible cracks or fractures in any part of the frame. | P ☒<br>F ☐<br>N/A ☐<br>N/T ☐ |
| **5.9.7** | **Frame - Dynamic test with lateral forces** | | |
| **5.9.7.1** | **General**<br><br>Lateral forces that do not occur on single-track vehicles arise when cornering on multi-track vehicles. | | |
| **5.9.7.2** | **Requirement** | | |
| | On multi-track vehicles, the wheel suspension of both the front and the rear axle shall be tested dynamically. Testing one side is sufficient with symmetrical designs. No visible cracks or fractures shall occur on any part of the frame or the wheel suspension in the test in accordance with 5.9.7.3. | $F_{Qdyn}$ front : 1931.8N;<br>$F_{Qdyn}$ rear : 458.6N;<br><br>Test cycles: 100 000;<br>Test frequency: 1.0Hz; | P ☒<br>F ☐<br>N/A ☐<br>N/T ☐ |

| **Absatz** *Clause* | **Anforderungen - Prüfungen /** *Requirements - Tests* | **Messergebnisse – Bemerkungen /** *Measuring results - Remarks* | **Ergebnis** *Result* |
|---|---|---|---|
| 5.9.7.3 | **Test method**<br><br>The test load, $F_{FQdyn}$, of the respective wheel suspension to be tested shall be applied in dynamically pulsating form with a suitable lever that is freely rotatable around the respective wheel axle with a wheel radius corresponding to the length, r, transverse to the direction of motion over 100 000 cycles. During this test, one wheel suspension on the other axle and the bottom bracket shall be supported horizontally. An opposite wheel suspension on the same axle shall be supported with a lever of the same kind with a rotary degree of freedom at the simulated centre of tyre contact.<br><br>$F_{\mathrm{Qdyn.vorne}} = \frac{0{,}8 \cdot g \cdot l}{z_s} \cdot (m - \frac{m \cdot x_s}{WB})$<br><br>$F_{\mathrm{Qdyn.hinten}} = \frac{0{,}8 \cdot g \cdot l}{z_s} \cdot (\frac{m \cdot x_s}{WB})$<br><br>Translator's note. "vorne" means front and "hinten" means rear.<br>where<br>$F_{FQdyn}$ is the dynamic test load;<br>m is the total mass, in kg;<br>g is the gravitational acceleration, 9,81 m/s2;<br>$xs$ is the horizontal distance of the overall centre of gravity from the front axle, in mm;<br>$zs$ is the height of the overall centre of gravity above the roadway, in mm;<br>WB is the wheelbase, in mm;<br>AT is the track;<br>l is the effective lever around the tilt axis;<br>r is the wheel radius. | | |

***** End of test report *****