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agenda item 2.7.)

PROPOSAL FOR DRAFT AMENDMENTS TO REGULATION No. 94

(Frontal collision protection)

Transmitted by the Expert from Italy

Note: The text reproduced below was prepared by the expert from Italy in order to align the present text of the Regulation to the technical progress pursued in the corresponding European Community Directive.

Note: This document is distributed to the Experts on Passive Safety only.

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Paragraphs 11 to 11.3., amend to read:

"11. TRANSITIONAL PROVISION

11.1. As from the official date of entry into force of the 02 series of amendments, no contracting Party applying this Regulation shall refuse to grant ECE approval under this Regulation as amended by the 02 series of amendments.

11.2. As from [1 October 2001] Contracting Parties applying this Regulation shall grant ECE approvals only to those types of vehicles which comply with the requirements of this Regulation as amended by the 02 series of amendments."

Annex 5, paragraph 2.9.2., amend to read:

"2.9.2. A size 11XW shoe, which meets the configuration size, sole and heel thickness specifications of the US military standard MIL S 13192, change "P" and whose weight is 0,57 ± 0,1 kg, shall be placed and fastened on each foot of the test dummies."

Annex 10, amend to read:

"Annex 10

CERTIFICATION PROCEDURE FOR THE DUMMY LOWER LEG AND FOOT

1. UPPER FOOT IMPACT TEST

1.1. The objective of this test is to measure the response of the Hybrid III foot and ankle to well-defined, hard faced pendulum impacts.

1.2. The complete Hybrid III lower leg assembly, left (86-5001-001) and right (86-5001-002), equipped with the foot and ankle assembly, left (78051-614) and right (78051-615), shall be used, including the knee assembly.

The load cell simulator (78051-319 Rev A) shall be used to secure the knee assembly (78051-16 Rev B) to the test fixture.

1.3. Test procedure

1.3.1. Each leg assembly shall be maintained (soaked) for four hours prior to the test at a temperature of 22EC ± 3EC and a relative humidity of

40 ± 30 per cent. The soak period shall not include the time required to reach steady state conditions.

1.3.2. Clean the impact surface of the skin and also the impactor face with isopropyl alcohol or equivalent prior to the test. Dust with talc.

1.3.3. Align the impactor accelerometer with its sensitive axis parallel to the direction of impact at contact with the foot.

1.3.4. Mount the leg assembly to the fixture shown in Figure 1. The test fixture shall be rigidly secured to prevent movement during impact. The centre line of the femur load cell simulator (78051-319) shall be vertical with a tolerance of ± 0.5E. Adjust the mount such that the line joining the knee clevis joint and the ankle attachment bolt is horizontal with a tolerance of ± 3E, with the heel resting on two sheets of a flat low friction (PTFE sheet) surface. Ensure that the tibia flesh is located fully towards the knee end of the tibia. Adjust the ankle such that the plane of the underside of the foot is vertical and perpendicular to the direction of impact with a tolerance of ± 3E and such that the mid sagittal plane of the foot is aligned with the pendulum arm. Adjust the knee joint to 1.5 ± 0,5 g range before each test. Adjust the ankle joint so that it is free and then tighten just sufficiently to keep the foot stable on the PTFE sheet.

1.3.5. The rigid impactor comprises a horizontal cylinder diameter 50 ± 2 mm and a pendulum support arm diameter 19 ± 1 mm (Figure 4). The cylinder has a mass of 1.25 ± 0.02 kg including instrumentation and any part of the support arm within the cylinder. The pendulum arm has a mass of 285 ± 5 g. The mass of any rotating part of the axle to which the support arm is attached should not be greater than 100 g. The length between the central horizontal axis of the impactor cylinder and the axis of rotation of the whole pendulum shall be 125 ± 1 mm. The impact cylinder is mounted with its longitudinal axis horizontal and perpendicular to the direction of impact. The pendulum shall impact the underside of the foot, at a distance of 185 ± 2 mm from the base of the heel resting on the rigid horizontal platform, so that the longitudinal centre line of the pendulum arm falls within 1E of a vertical line at impact. The impactor shall be guided to exclude significant lateral, vertical or rotational movement.

1.3.6. Allow a period of at least 30 minutes between successive tests on the same leg.

1.3.7. The data acquisition system, including transducers, shall conform to the specifications for CFC 600, as described in appendix 5 of this annex.

1.4. Performance specification

1.4.1. When each ball of the foot is impacted at 6.7 (± 0.1) m/s in accordance with paragraph 1.3., the maximum lower tibia bending

momentum about the y-axis (My) shall be 120 ± 25 Nm.

2. LOWER FOOT IMPACT TEST WITHOUT SHOE

2.1. The objective of this test is to measure the response of the Hybrid III foot skin and insert to well-defined, hard faced pendulum impacts.

2.2. The complete Hybrid III lower leg assembly, left (86-5001-001) and right (86-5001-002), equipped with the foot and ankle assembly, left (78051-614) and right (78051-615), shall be used, including the knee assembly.

The load cell simulator (78051-319 Rev A) shall be used to secure the knee assembly (78051-16 Rev B) to the test fixture.

2.3. Test procedure

2.3.1. Each leg assembly shall be maintained (soaked) for four hours prior to the test at a temperature of 22 ± 3 EC and a relative humidity of 40 ± 30 per cent. The soak period shall not include the time required to reach steady state conditions.

2.3.2. Clean the impact surface of the skin and also the impactor face with isopropyl alcohol or equivalent prior to the test. Dust with talc. Check that there is no visible damage to the energy absorbing insert to the heel.

2.3.3. Align the impactor accelerometer with its sensitive axis parallel to the impactor longitudinal centre line.

2.3.4. Mount the leg assembly to the fixture shown in Figure 2. The test fixture shall be rigidly secured to prevent movement during impact. The centre line of the femur load cell simulator (78051-319) shall be vertical with a tolerance of ± 0.5E. Adjust the mount such that the line joining the knee clevis joint and the ankle attachment bolt is horizontal with a tolerance of ± 3E with the heel resting on two sheets of a flat low friction (PTFE sheet) surface. Ensure that the tibia flesh is located fully towards the knee end of the tibia. Adjust the ankle such that the plane of the underside of the foot is vertical and perpendicular to the direction of impact and such that the mid sagittal plane of the foot is aligned with the pendulum arm. Adjust the knee joint to 1.5 ± 0.5 g range before each test. Adjust the ankle joint so that it is free and then tighten just sufficiently to keep the foot stable on the PTFE sheet.

2.3.5. The rigid impactor comprises a horizontal cylinder diameter 50 ± 2 mm and a pendulum support arm diameter 19 ± 1 mm (Figure 4). The cylinder has a mass of 1.25 ± 0.02 kg including instrumentation and any part of the support arm within the cylinder. The pendulum arm has a mass of 285 ± 5 g. The mass of any rotating part of the axle to which the support arm is attached should not be greater than 100 g. The length between the central horizontal axis of the impactor

cylinder and the axis of rotation of the whole pendulum shall be 1.250 ± 1 mm. The impact cylinder is mounted with its longitudinal axis horizontal and perpendicular to the direction of impact. The pendulum shall impact the underside of the foot, at a distance of 62 ± 2 mm from the base of the heel resting on the rigid horizontal platform, so that the longitudinal centre line of the pendulum arm falls within 1E of a vertical line at impact. The impactor shall be guided to exclude significant lateral, vertical or rotational movement.

2.3.6. Allow a period of at least 30 minutes between successive tests on the same leg.

2.3.7. The data acquisition system, including transducers, shall conform to the specifications for CFC 600, as described in appendix 5 of this annex.

2.4. Performance specification

2.4.1. When each heel of the foot is impacted at 4.4 ± 0.1 m/s in accordance with paragraph 2.3., the maximum impactor acceleration shall be 295 ± 50 g.

3. LOWER FOOT IMPACT TEST (WITH SHOE)

3.1. The objective of this test is to control the response of the Shoe and Hybrid III heel flesh and ankle joint to well-defined hard faced pendulum impacts.

3.2. The complete Hybrid III lower leg assembly, left (86-5001-001) and right (86-5001-002), equipped with the foot and ankle assembly, left (78051-614) and right (78051-615), shall be used, including the knee assembly. The load cell simulator (78051-319 Rev A) shall be used to secure the knee assembly (78051-16 Rev B) to the test fixture. The foot shall be fitted with the shoe specified in annex 2; appendix 3, paragraph 2.9.2.

3.3. Test procedure

3.3.1. Each leg assembly shall be maintained (soaked) for four hours prior to the test at a temperature of 22 ± 3 EC and a relative humidity of 40 ± 30 per cent. The soak period shall not include the time required to reach steady state conditions.

3.3.2. Clean the impact surface of the underside of the shoe with a clean cloth and the impactor face with isopropyl alcohol or equivalent prior to the test. Check that there is no visible damage to the energy absorbing insert to the heel.

3.3.3. Align the impactor accelerometer with its sensitive axis parallel to the impactor longitudinal centre line.

3.3.4. Mount the leg assembly to the fixture shown in Figure 3. The test fixture shall be rigidly secured to prevent movement during impact. The centre line of the femur load cell simulator (78051-319) shall be vertical with a tolerance of ± 0.5°. Adjust the mount such that the line joining the knee clevis joint and the ankle attachment bolt is horizontal with a tolerance of ± 3E, with the heel of the shoe resting on two sheets of a flat low friction (PTFE sheet) surface. Ensure that the tibia flesh is located fully towards the knee end of the tibia. Adjust the ankle such that a plane in contact with the heel and sole of the underside of the shoe is vertical and perpendicular to the direction of impact with a tolerance of ± 3E and such that the mid sagittal plane of the foot, and shoe is aligned with the pendulum arm. Adjust the knee joint to 1.5 ± 0,5 g range before each test. Adjust the ankle joint so that it is free and then tighten just sufficiently to keep the foot stable on the PTFE sheet.

3.3.5. The rigid impactor comprises a horizontal cylinder diameter 50 ± 2 mm and a pendulum support arm diameter 19 ± 1 mm (Figure 4). The cylinder has a mass of 1.25 ± 0.02 kg including instrumentation and any part of the support arm within the cylinder. The pendulum arm has a mass of 285 ± 5 g. The mass of any rotating part of the axle to which the support arm is attached should not be greater than 100 g. The length between the central horizontal axis of the impactor cylinder and the axis of rotation of the whole pendulum shall be

1,250 ± 1 mm. The impact cylinder is mounted with its longitudinal axis horizontal and perpendicular to the direction of impact. The pendulum shall impact the heel of the shoe in a horizontal plane which is a distance of 62 ± 2 mm above the base of the dummy heel when the shoe is resting on the rigid horizontal platform, so that the longitudinal centre line of the pendulum arm falls within one degree of a vertical line at impact. The impactor shall be guided to exclude.

3.3.6. Allow a period of at least 30 minutes between successive tests on the same leg.

3.3.7. The data acquisition system, including transducers, shall conform to the specifications for CFC 600, as described in appendix 5 of this annex.

3.4. Performance specification

3.4.1. When the heel of the shoe is impacted at 6.7 ± 0.1 m/s in accordance with paragraph 3.3, the maximum Tibia compressive force (Fz) shall be 3.3 ± 0,5 kN.

Figure 1

Upper foot impact test

Test set-up specifications

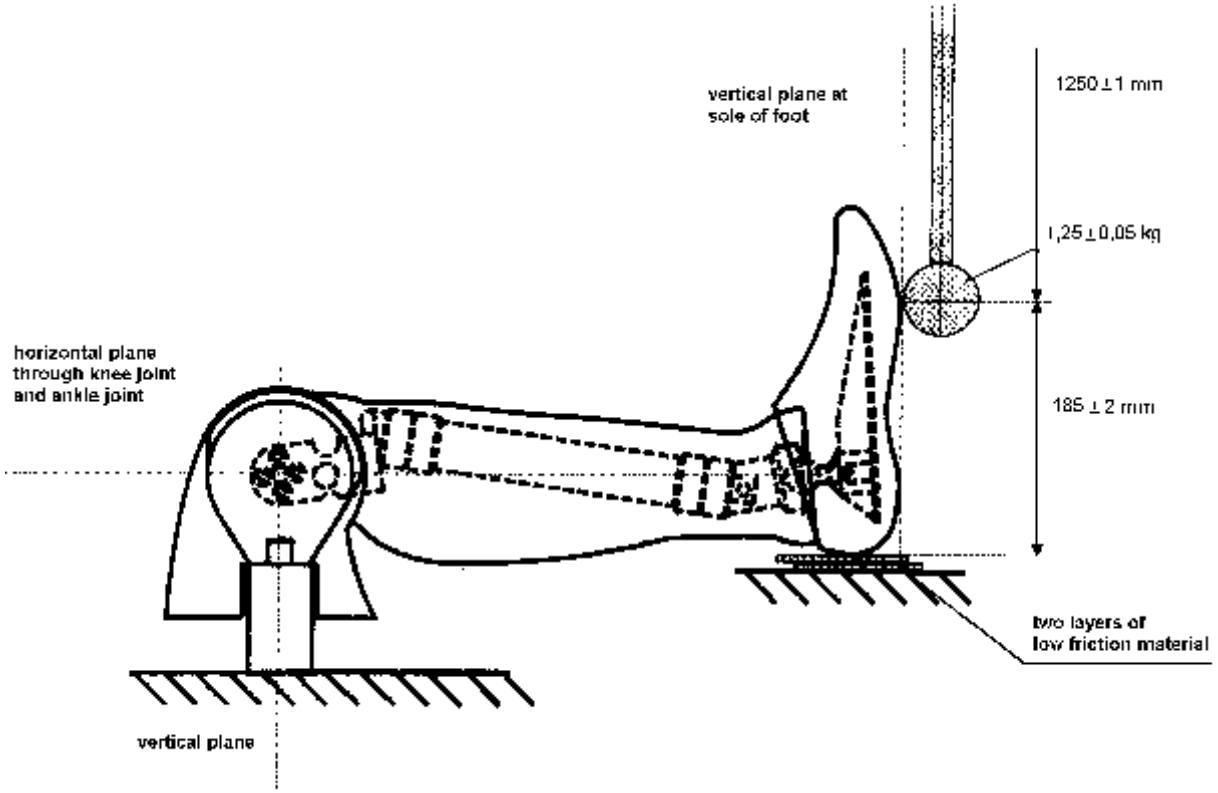

vertical plane at
sole of foot
1250 ± 1 mm
1,25 ± 0,05 kg
185 ± 2 mm
horizontal plane
through knee joint
and ankle joint
two layers of
low friction material
vertical plane

Figure 2

Lower foot impact test (without shoe)

Test set-up specifications

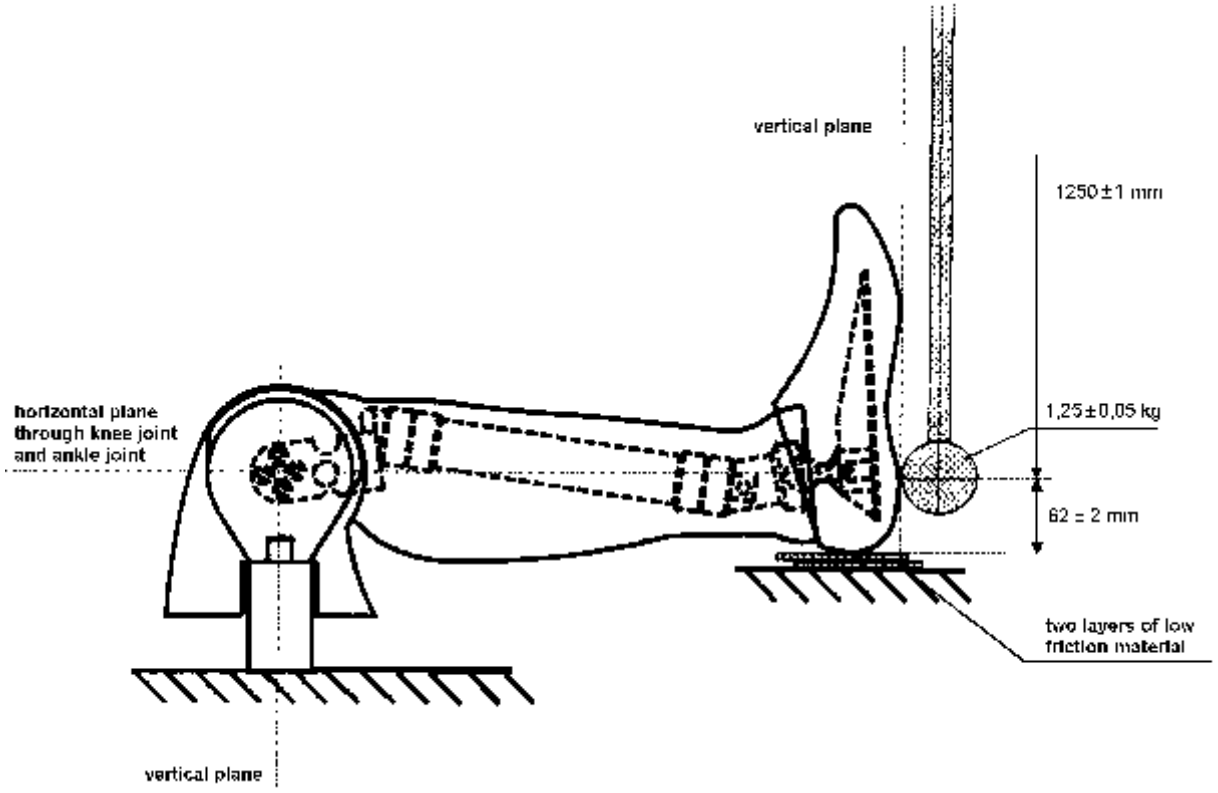


Figure 3

Lower foot impact test (with shoe)

Test set-up specifications

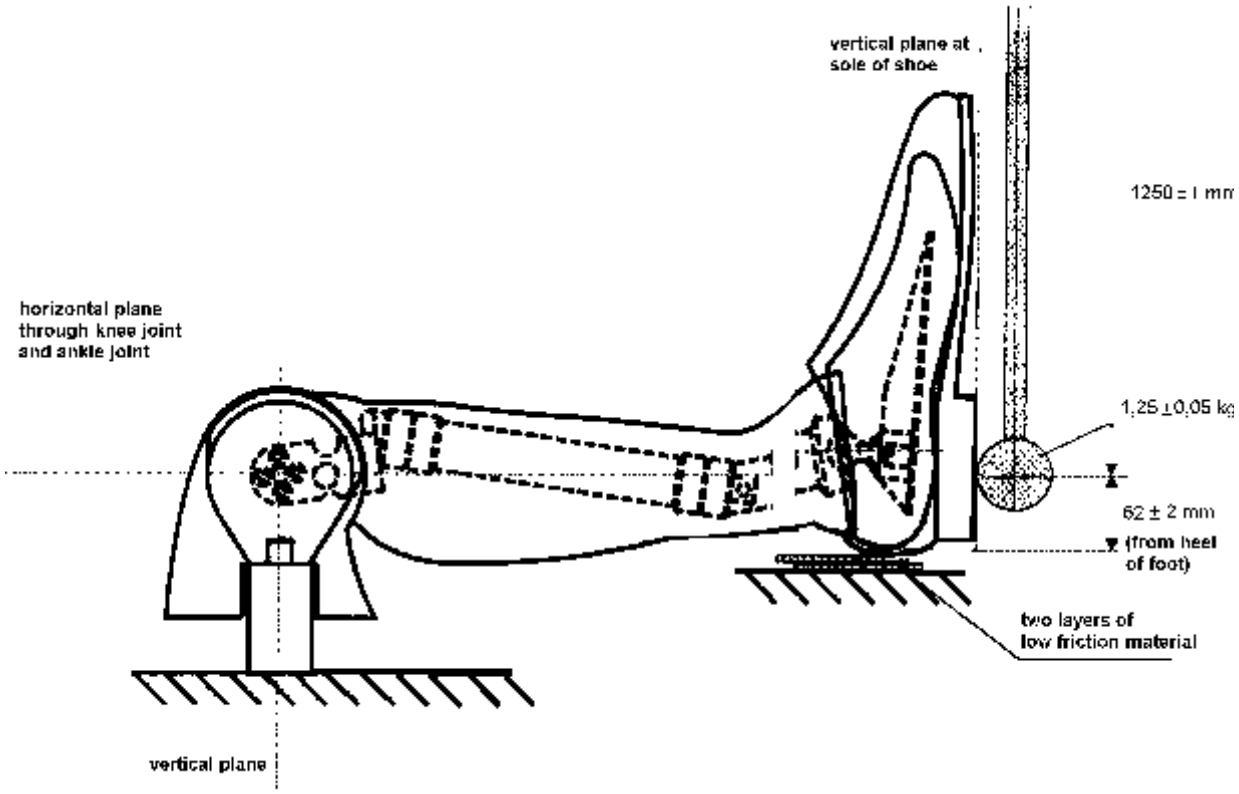
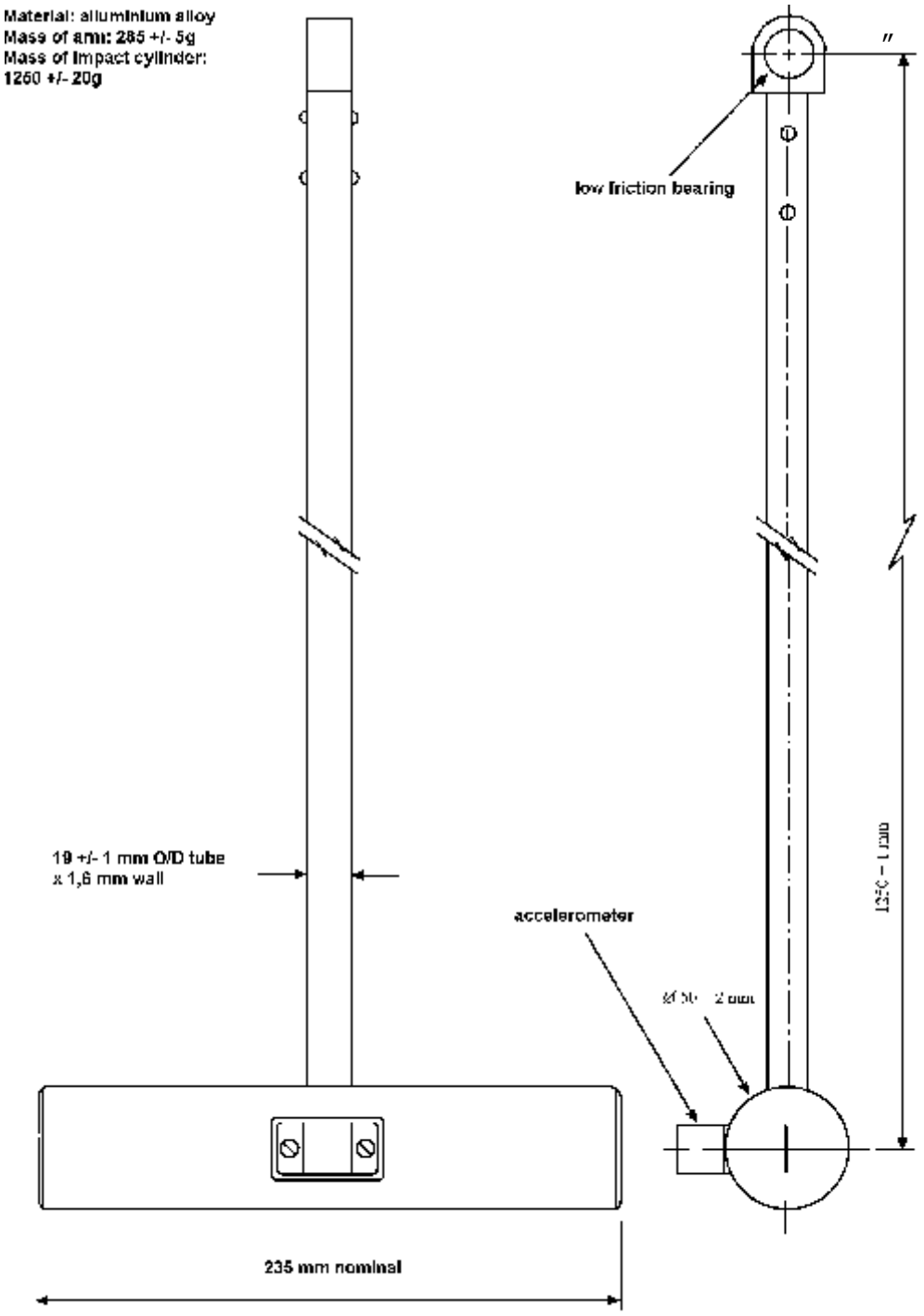


Figure 4

Pendulum impactor



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