FIM Racing Homologation Programme for helmets

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Workshop EN 22.06, Paris, 6 February 2019
FRHP

Does it deal with SAFETY? YES

Is the check of NORMS needed? YES

Is the homologation MANDATORY for the access to races? YES

Application

Check of norms

FIM test

Issue of labels for identification and visibility

Controls

Admission to competitions

FRHP@fim.ch

FIM RACING HOMOLOGATION PROGRAMME

Product
Discipline

Homologation manual
Ex. FHRPhe-01
FRHP for helmets

FIM Racing Homologation Programme

Helmets
Circuit Racing Disciplines
Homologation manual
Ex. FHRPhe-01

- FIM Grand Prix World Championship
- FIM SBK World Championship
- FIM Supersport World Championship
- FIM Supersport 300 World Championship
- FIM Sidecar World Championship
- FIM MotoGP Rookies Cup
- FIM Moto3 Junior World Championship
- FIM Land Speed World Records
- FIM MotoE World Cup
- FIM Endurance World Championship
- FIM Endurance World Cup

Extract available on fim.live.com
Sampling

ELIGIBLE HELMETS

- UNECE 22.05 Type P
- Snell M 2015
- JIS T8133 2015 Type 2 Full face
- Protective lower face cover: not detachable, not moveable and made of the same material of the shell
- One-piece shell
- Retention system with strap and double D-ring

10 SAMPLES

- Samples #1, #2 and #3: Conditioning, Weight, Linear impact tests
- Samples #4 and #5: Conditioning, Weight, Oblique impact tests
- Sample #6: Conditioning, Weight, Penetration tests
- Sample #7: Storage
- Sample #8, #9 and #10: Conditioning, Weight, Extra tests if needed
Helmet stability

• The helmets are homologated per **Size** and per declared **Combination of accessories** (e.g. aerodynamic devices).

• The Applicant **undertakes not to modify**
  • trademark(s)
  • commercial name(s)
  • design
  • materials and dimensions of
    • shell
    • protective padding
    • accessories (including spoilers).

• The Applicant **can modify**
  • cover paint
  • comfort padding
  • visor.
Headforms

- Dimensions, mass, inertia matrix*, COG and resonance frequency according to EN960:2006
- Head Positioning Index (HPI): according to UNECE 22.05
- Roughness: as per manufactured, except oblique testing (see later)
- Wireless data acquisition: 1 tri-axial accelerometer + 3 angular rate sensors (+D cone)

*Reference values for Cadex inertia matrix (as measured by Resonic K):

<table>
<thead>
<tr>
<th>Headform denomination</th>
<th>Circumference [mm]</th>
<th>Mass [Kg]</th>
<th>Ixx [Kg cm²] (± 5%)</th>
<th>Iyy [Kg cm²] (± 5%)</th>
<th>Izz [Kg cm²] (± 5%)</th>
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<tbody>
<tr>
<td>A</td>
<td>495*</td>
<td>3.1 (± 0.10)</td>
<td>142.2</td>
<td>166.6</td>
<td>95.0</td>
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<td>C</td>
<td>515*</td>
<td>3.6 (± 0.10)</td>
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<td>203.3</td>
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<td>E</td>
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<td>4.1 (± 0.12)</td>
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<td>J</td>
<td>575*</td>
<td>4.7 (± 0.14)</td>
<td>264.0</td>
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<td>M</td>
<td>605*</td>
<td>5.6 (± 0.16)</td>
<td>337.4</td>
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<td>O</td>
<td>625*</td>
<td>6.1 (± 0.18)</td>
<td>383.6</td>
<td>461.1</td>
<td>293.5</td>
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Headforms

CORRESPONDENCE HEADFORM-SIZE

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<tr>
<th>Smallest Size Specified (cm)</th>
<th>Largest Size specified (cm)</th>
<th>A</th>
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Table 2: Correspondence between test headforms and Helmet Sizes.

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Preparation

CONDITIONING

- Solvent conditioning (as defined in UNECE 22.05 7.2.1)
- >24h, (22±5)ºC, (55±5)% RH

POSITIONING

- HPI: as declared by the Applicant and checked according to UNECE 22.05 requirements (annex 5)
- Chinstrap tension: the retention system shall be adjusted under the chin of the headform and tightened to a tension of 75 ± 5 N (over strap friction) with a deflection angle of 45 ± 5°.
Impact testing

LINEAR IMPACT TEST

HIGH SPEED ECE POINTS
As defined in UNECE 22.05 (Impact-absorption test), with flat anvil only:

Helmet sample #1

- UNECE points B, X, P, R:
  
  \[ 8.2 \ (\pm 0.15, \ -0.0) \text{ m/s} \]

- UNECE point S:
  
  \[ 6.0 \ (\pm 0.15, \ -0.0) \text{ m/s} \]

THRESHOLDS

- PLA \leq 275g for all impact points
- HIC \leq 2880 for all impact points
Impact testing

LINEAR IMPACT TEST

HIGH SPEED EXTRA POINTS

Helmet sample #2

- 3 “extra” points (selected among 12 pre-defined points):
  - $8.2 \pm 0.15$ m/s

THRESHOLDS

- PLA $\leq 275$g for all impact points
- HIC $\leq 2880$ for all impact points
Impact testing

OBLIQUE IMPACT TEST
As defined in UNECE 22.05 (Impact-absorption test), with:
- platinum cure silicone coated headform (μ = 0.78)
- “oblique anvil”: 45° plane, abrasive paper to be substituted after significant damage
- impact velocity 8.00 (+0.15, -0.00)

Helmet sample #4: points 45, 180 and
Helmet sample #5: points 0 and 135

NOTE: neck upward

THRESHOLDS
- PLA ≤ 208g for all impact points
- HIC ≤ 1300 for all impact points
- PRA ≤ 10400 rad/s² for all impact points
- BrIC ≤ 0.78 for all impact points
Penetration testing

**PENETRATION TEST**

- As defined in JIS T8133: 2007 5.2 and 7.5 (Type 2), with:
  - spherical support
  - dropping height: 2m
  - 2 penetration sites, above the Snell “test line”, at least 75 mm separated

**THRESHOLDS**
- No contact between the striker tip and the spherical support surface
Evolution of the thresholds

<table>
<thead>
<tr>
<th>Samples #1 and #2</th>
<th>FRHPhe-01</th>
</tr>
</thead>
<tbody>
<tr>
<td>PLA ≤ 275 g</td>
<td>HIC ≤ 2880</td>
</tr>
</tbody>
</table>

| Sample #3         | |
|-------------------| PLA ≤ 208 g|
|                   | HIC ≤ 1300 |

| Samples #4 and #5 | |
|-------------------| PLA ≤ 208 g|
|                   | HIC ≤ 1300 |
|                   | PRA ≤ 10400 rad/s² |
|                   | BrIC ≤ 0.78 |

| Sample #6         | No contact between striker tip and the support surface. |

<table>
<thead>
<tr>
<th>Samples #1 and #2</th>
<th>FRHPhe-02*</th>
</tr>
</thead>
<tbody>
<tr>
<td>PLA ≤ 275 g</td>
<td>HIC ≤ 2400</td>
</tr>
</tbody>
</table>

| Sample #3         | |
|-------------------| PLA ≤ 160 g|
|                   | HIC ≤ 1000 |

| Samples #4 and #5 | |
|-------------------| PLA ≤ 160 g|
|                   | HIC ≤ 1000 |
|                   | PRA ≤ 8000 rad/s² |
|                   | BrIC ≤ 0.6 |

| Sample #6         | No contact between striker tip and the support surface. |

*The aforementioned timeline and the thresholds may be adjusted by FIM if changes notably in headforms and/or the international standards of reference and/or other important features of the FIM Helmet Standard FRHP-02 are implemented.
Further evolutions

- Headform inertia
- Impact simulations with FE model
- Headform surface
- OFFROAD HELMETS
- OFFROAD HELMETS
- OFFROAD HELMETS
- OFFROAD HELMETS
- OFFROAD HELMETS
- OFFROAD HELMETS
THANK YOU