Full face helmets in impact testing

FOLLOW-UP

At the first impact test offside the standard CE test points in the February NEWS, several brands were missing. We have now reviewed a further six helmets in a second test.

by Sophie Schatter (text & photos)

Impact 1 (Schalg 1):
Front left, 7.5 m/s, flat anvil

Impact 2 (Schalg 2):
Front right, 5.5 m/s, flat anvil

Impact 3 (Schalg 3):
Rear right, 7.5 m/s, anvil edge

Test points in comparison: Grey is standard, red the NEWS test

We recall: During the first intern test six month ago, we took a look at how safely the manufacturers produce their helmets outside the impact points specified by the helmet standard ECE-R 22.05. To this end we sent nine full face helmets in the middle-class price region to the test bench of the TÜV Rhineland for testing according to our own criteria. The following helmets took part in the test: Caberg, HJC, Lazer, Nitro, Shark, Shoii, Soumy, X-Lite and the DIY store helmet from the Rex brand. Letters from owners of other helmets followed, who wanted to know how their brand ranked.

So we sent a second batch of helmets to undergo the impact test as well. Schuberth didn’t take part in the first round of tests, because the SI Pro has reached the end of its product life and its successor wasn’t yet on the starting blocks. Directly after its debut, the S2 also went for ECE testing.

NEWS tests

This time again, the full face helmets spent one day in the laboratory of the TÜV Rhineland in order to acclimatise. Our six room-temperature latecomers were then, like the helmets tested in the first round, submitted to the test bench and subjected to loads applied to the impact points. Two impact points were located on the left and right hand side of the forehead, exactly between the two ECE test points B and X (see detailed photo) where an even impact surface was hit:
At the left hand side at a speed of 7.5 metres per second (about 21 km/h), and on the right with 5.5 metres per second (about 19.8 km/h). The third impact hit the side area of the back of the head between the standard points R and X, exactly 7 cm to the right of R. We let this point drop down on a test edge at a speed of 7.5 metres per second. The shock absorption values were established by a metal test head equipped with sophisticated sensors, in our case with a circumference of 57 centimetres.

Held's new carbon helmet ST-6 was only launched on the market in the last six months, and yet it still took a hammering from the laboratory. The Marushin brand has in the meantime found a new home with MSP – the go-ahead for the 999RS. Nolan sent us the N85 Fight N-Com and Scorpion supplied its EXO-1000 Air. Arai Germany decided to generally not participate in any further tests. So we obtained the Axces II on the market.

As in the first test run, Peter Schaudt, an expert from the TÜV Rhineland, supervised the procedure. He has been involved in the testing of motorcycle helmets since eleven years.

Apart from several parameters, the helmet standard ECE-R 2205, applicable since 2002, also checks shock absorption values at six exactly specified points. The helmet manufacturers know exactly at which points the full face helmet is tested and on which criteria the tests are based. In order to determine whether their helmets are designed with exactly these aspects in mind or to check whether they may even be reinforced at said points, we have tested the helmets at impact points offside those specified.

We have determined our test points in accordance with practically orientated criteria. In doing so, we based our criteria on the impact traces on actual helmets worn during accidents, the experience reports of bikers having been involved in accidents and contacted Florian Schuler, who, in his function as an accident researcher at the University of Heidelberg, has analysed more than 1400 motorcycle accidents since 1980, and has examined accident helmets by means of computer tomography. The US test procedure Snell was also a source of inspiration, in which testers can freely choose their test points within a certain zone.

Many readers wanted to know what their helmet brand is capable of. Which is why we decided to carry out tests.

As opposed to the ECE test, which take place at minus 20 and plus 50 degrees, we let the helmets crash down onto the anvil at normal ambient temperature. Because what use is it, if the material has been developed to provide good impact values in extreme conditions, if it possibly fails at real temperature levels?

The ECE allows test helmets to fall onto the impact surface at a falling speed of 7.5 metres per second. We have tested the sides of the helmets at an impact speed of 7.5 and 5.5 metres per second respectively. "The performance of the shock absorbing shell at low speeds may potentially not yet be sufficient", TÜV expert Schaudt explains this test.

Sensitive: The standardised test head is equipped with sensors
Arai Axces II

**Price**
from 429 Euro (single-coloured)

**Sizes**
XS-XXL

**Helmet shells**
three

**Colours**
two decors,
single-coloured: white, black, matt black finish

**Material**
Fiberglass

**Closure**
Double D ring

**Weight**
1560 g +/- 50 g

**Features**
large field of vision, detachable and washable cheek pads, easily operable ventilation openings at the chin, forehead, top and back of the head, pinlock visor, stylish and easily operable visor with a catch for the prevention of inadvertent opening

**Accessories**
cheek pads in various thickness grades (seven thicknesses, 49.95 Euro/set), visors: transparent, slightly tinted, strongly tinted (69.95 Euro each)

**Impact 1**
195g / HIC 1889

**Impact 2**
144g / HIC 798

**Impact 3**
163g / HIC 1295

**Detail**
Nimble-fingered: With as little practice, the visor can be locked for the race track

HELD ST-6

**Price**
EUR 279

**Sizes**
XS-XXL

**Helmet shells**
two

**Colours**
Carbon (black), from 2013 black-white-red, black-white, black-blue

**Material**
Carbon

**Closure**
Ratchet

**Weight**
1250 g +/- 50 g

**Features**
Wind deflector at the chin and nose (detachable at the nose), outlast lining and cheek pads detachable and washable, easily operable ventilation openings at the chin and on both sides if the head slightly fiddly, sun visor with easily operable lever, pump system for the adaptation of the cheek pads

**Accessories**
Pinlock visor (26.50 Euro), visors available in transparent (12.95 Euro), strongly tinted and silver (14.95 Euro)

**Impact 1**
145g / HIC 1065

**Impact 2**
105g / HIC 534

**Impact 3**
167g / HIC 1156

**Detail**
Silver arrow: Operation works even with thick gloves

Marushin 999RS

**Price**
EUR 299.90

**Sizes**
XS-XXL

**Helmet shells**
two

**Colours**
nine designs and seven single-coloured models (test helmet: "Carat" in black/white/red)

**Material**
Fiberglass

**Closure**
Double D ring

**Weight**
1100 g +/- 50 g

**Features**
Wind protectors for chin and nose (detachable at the nose), anti-roll-off-system, detachable and washable lining (tested for harmful substances), easily operable ventilation at the chin and forehead, easy to handle visor edge

**Accessories**
Cheek pads and lining XS-XXL, visors in iridium, silver, gold, tinted, gradually tinted, pinlock, photochromic (self-tinting)

**Impact 1**
189g / HIC 1133

**Impact 2**
97g / HIC 481

**Impact 3**
160g / HIC 1145

**Detail**
Neatly sealed: Marushin checks the interior for harmful substances

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**Result**
The Axces II is considered to be the starting model into the world of Arai. The outer shell is a completely new construction, and the section for the field of vision is larger. All of the impact values are within the range, but are slightly higher than those of the other test helmets.

HELD's brand new high-tech helmet made of 100 percent carbon has practical features. Excellent impact values on the anvil – winner on points. Very good overall package in the low-price segment.

The lightweight amongst the tested helmets, a comfortable touring helmet, achieving good results in the TÜV laboratory. Potentially record-setting results upon the second impact with 97g. Even the best value from the first impact test was unable to compare.

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**Purchase**

Weight: *Manufacturer’s specification, ** weighed. ECE limit values: Acceleration in g max. 275, HIC max. 2400
Nolan
N85 Fight N-Com
from 194.95 Euro (test helmet Fight
279.95 Euro)

Schuberth
S2
from 499.99 Euro (single-coloured)

Scorpion
EXO-1000 Air
from 299.90 Euro (test helmet Fight
339.90 Euro)

Sizes
XXS-XXL

XS-XXL

XS-XXL

Helmet shells
one

two

two

Colours
Fight series with four decors,
twelve more N85 series with colour
variants

Black and white (high gloss and
matt finish), Fluo Yellow, three
decors

five single colours, 23 decor
models

Material
Lexan (polycarbonate)

fiberglass-reinforced
thermosetting plastic matrix

Fiberglas/Kevlar

Closure
Ratchet

Ratchet

Double D ring

Weight
1650 g

1450 g +/- 50g

1485 g

1450 g

1502 g

1470 g

154 g / HIC 1073

Weights
1599 g

1450 g

1450 g

1450 g

1450 g

1470 g / HIC 1231

1470 g / HIC 1231

154g / HIC 1061

138g / HIC 677

138g / HIC 770

130g / HIC 451

Impact 1: 184g / HIC 1416

Impact 2: 138g / HIC 677

Impact 3: 143g / HIC 1029

Detail
Fresh noode: Air circulates
through large openings as on the
back of the head

Pinlock visor, sun visor, pump
system for adaptation of cheek
pads, three locking levels for
ventilation gap, detachable chin bar
and breath deflector at the nose,
detachable and washable lining,
spoiler at the back of the head

Result
The stylish representative of the
N85 family with its multitude of
designs and colour options is
unfortunately only manufactured in
one outer shell. But safety doesn't
suffer for it: The impact values all
lay within the very good standard
range.

Schuberth’s new sports tourer
competes with good features –
the first helmet with an integrated
antenna. In the impact test, the
S2 made a supreme appearance
and provided good values,
particularly upon the third impact.

Scorpion’s exemplary street helmet
offers well thought-out details; the
manufacturer also emphasises that
the interior consists of layers with
different strengths. They are for
protection – and achieved good all-
round test values.

MOTORRAD EVALUATION
Impact 1:
Impact 2:
Impact 3:
TOTAL: 12 points

MOTORRAD NEWS

Impact 1:
Impact 2:
Impact 3:
TOTAL: 12 points

Impact 1:
Impact 2:
Impact 3:
TOTAL: 13 points

MOTORRAD EVALUATION

Impact 1:
Impact 2:
Impact 3:
TOTAL: 12 points

MOTORRAD NEWS

Impact 1:
Impact 2:
Impact 3:
TOTAL: 13 points

Purchase
Weight: *Manufacturer’s specification, ** weighed. ECE limit values: Acceleration in g max. 275, HIC max. 24
Precision landing: The testers meticulously mark the impact targets

Satisfying conclusion: Whilst we had an outlier in the first test, all six models adhered to the ECE limit values this time, even offside the specified points. Several crash tests were even substantially below the ECE values.

Attention: All helmets passed the test. Our points classification is therefore only an assessment of the impact values within the limits. As all helmets adhere to these limits, there is no NEWS tip this time. However, that’s not really anything to cheer about. Because the standard does not take into account the latest results of accident research. According to ECE 22.05, the maximum deceleration must not exceed 275 g, whereby g describes the acceleration. The second test value, the so-called HIC (Head Injury Criterion), is calculated amongst other things by the time structure of the impact and must not exceed 2400.

Accident researchers and biomechanics know that these are only minimum requirements and that the standard test operates with requirements that are not practically related. For a long time there are already new approaches to new methods; many industrious specialists have been puzzling over realistic test set-ups for years. Unfortunately, none of them have matured yet.