Flex PLI Logbook for the IG GTR9-PH2 Round Robin Tests

Please return to: gehring@boehme-gehring.de or fax-no. +49 2204 962513

User Information

Company: BASt, Federal Highway Research Institute
(Name, Location)

Contact person: Oliver Zander
(Name, zandero@bast.de, +492204 43621
E-mail-address, Peter Lessmann
Tel.-no.) Lessmann@boehme-gehring.de, +492204 964154

Impactor Information

Serial number: E-Leg
(SN01, SN03, E-Leg)

Test period: Week 35, 2012
(Date from/to or calendar week)

Number of vehicle tests performed: 12
(At least approximately)

Number of tests (if known) in which a result exceeds the threshold limit by more than 10%:
(Threshold limits: Tibia Bending Moments: 340 Nm,
MCL: 22 mm, ACL and PCL: 13 mm.
+10%=> 374 Nm, 24.2 mm, 14.3 mm)

No test exceeded the GTR threshold limit.

Problems or any specific observations during this test series:
(Repairs, adjustments, failures, etc.)

- DTS Base module connection problems
- Damaged neoprene skin and zipper

Laboratory (company name, location) in which the impactor certification was performed before this vehicle test series (if known): BASt

Laboratory (company name, location) in which the impactor certification will be performed after this vehicle test series (if known): BASt

Other remarks:

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User Information

Company:
Ford Motor Company, Dearborn, MI

Contact person:
Michelle Chaka
mchaka@ford.com
313-621-0813

Impactor Information

Serial number:
E-Leg

Test period:
January 23rd 2013 – February 13th 2013

Number of vehicle tests performed
2 vehicle tests / 3 speed verification tests / 3 inverse cert tests / 5 pendulum cert tests (2 pre & 3 post-tests)

Number of tests (if known) in which a result exceeds the threshold limit by more than 10%:
(Threshold limits: Tibia Bending Moments: 340 Nm,
MCL: 22 mm, ACL and PCL: 13 mm.
+ 10%=> 374 Nm, 24.2 mm, 14.3 mm)

None of our testing exceeded the GTR threshold + 10% limit.

Problems or any specific observations during this test series:

As delivered, the E-leg was missing the quick release cable, cable housing and hanging bracket. We were able to borrow parts from DTS. The outer flesh cover zipper was damaged and could not be zipped. The outer flesh cover was worn and had holes. DTS provided quick release cable and housing. Humanetics provided new skin cover. The new skin cover was shipped with the leg and was never used.

The E-leg had connection issues, the “Slice bus up to PC” connector disconnected from the circuit board inside the base slice. The base slice is an older version and inside the unit the wire is not strain relieved due to space. The wire tension inside caused the connector to separate then the software could not recognize the leg. DTS was able to repair the base slice. We continued to have connection issues but were able to disconnect the capacitor between runs in order for the software to recognize the leg.

Laboratory (company name, location) in which the impactor certification was performed before this vehicle test series (if known): Ford Motor Company, Dearborn, MI

Laboratory (company name, location) in which the impactor certification will be performed after this vehicle test series (if known): Ford Motor Company, Dearborn, MI

Other remarks: PCL did not met corridor on post-test pendulum calibration tests

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User Information

Company:

Vehicle Research and Test Center

Contact person:

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937-666-3319

Brian Suntay
Brian.Suntay.CTR@dot.gov
937-666-4511

Impactor Information

Serial number:

SN01
E-Leg

Test period:

01/30/2013 – 03/07/2013

Number of vehicle tests performed:

SN01 – 5 vehicle tests / 6 speed verification tests / 3 pendulum certification tests
E-Leg – 2 vehicle tests / 6 speed verification tests / 7 pendulum certification tests

Number of tests (if known) in which a result exceeds the threshold limit by more than 10%:

Threshold limits were reached and exceeded by more than 10% in all vehicle tests (5 tests –SN01 / 2 tests – E-Leg). Maximum values are shown in the tables below. Values highlighted in grey indicate that the threshold limits were exceeded by more than 10%.

SN01:

	Test #1	Test #2	Test #3	Test #4	Test #5
Tibia 1 (Nm)	422	427	413	433	411
MCL Elongation (mm)	33.4	34.1	34.0	27.3	29.3
ACL Elongation (mm)	29.8	29.6	29.6	7.8	14.1
PCL Elongation (mm)	6.9	7.0	6.8	7.8	6.7

E-Leg:

	Test #1	Test #2
Tibia 1 (Nm)	430	387
MCL Elongation (mm)	27.9	30
ACL Elongation (mm)	12.8	14.2
PCL Elongation (mm)	7.8	8.2

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Problems or any specific observations during this test series:

(1) **ZIPPER & NEOPRENE SKIN CONDITION:** Zipper and neoprene skin conditions upon receiving both FLEX PLI GTR leg impactors were poor. Teeth were missing at several locations on the outer flesh layer and the zipper track was also pulled away from the neoprene flesh in some areas prohibiting easy closure. The zipper detached from the track multiple times when trying to zip both legforms closed and Velcro was wrapped around the outer skin at two locations on the E-Leg to prevent unzipping. The plastic zipper tabs were also received in a broken condition. This made pliers necessary to pull the zippers closed. The neoprene flesh covers also showed signs of wear. The outer flesh cover had multiple holes and tears that may widen with repeated use.

(2) **DATA CONNECTION CABLE:** The data connection cable (cable that connects the Slice modules to the disconnect cable) was not included with the E-Leg upon arrival. The connection cable was taken out of the SN01 legform and used in the E-Leg. The connection cable was placed back into the SN01 legform prior to shipment to Humanetics.

(3) **COMMUNICATION BETWEEN SLICE AND SLICEWARE:** There were a couple instances in which the software failed to communicate with the SN01 legform and a blinking red STS LED on the base Slice was observed. We were informed by DTS that this could be due to a couple reasons: 1) That the Slice was not booted properly and was not receiving enough power due to a lower input voltage or due to the super capacitor drawing away current upon connection; and 2) That the super capacitor was not fully discharged, placing the base Slice in an unstable state. To resolve this issue we would need to (1) connect the legform for several seconds before turning on the Slice to allow for the super capacitor to charge; or to (2) give the super capacitor time (30 minutes to 1 hour) to discharge before re-connecting the leg. During the first occurrence of this problem, the software successfully connected to the legform after allowing the capacitory to fully discharge for an hour. During the second occurrence, grounding the leg seemed to solve the connection problems.

(4) **E-LEG PENDULUM CERTIFICATION:** Upon arrival at VRTC, both legforms were certified using the pendulum certification tests. SN01 passed certification. The E-Leg passed all criteria except for the PCL elongation requirement in which it failed by a small amount with a maximum value of 5.04 mm.

(5) **LEG LAUNCH COMPARISON:** Testing was also performed with FLEX PLI GTR leg impactor SNG8583 (VRTC legform) and it was observed that all three legforms had different masses. The VRTC legform had a mass of 13.096 kg, SN01 had a mass of 13.260 kg, and the E-Leg had a mass of 13.13 kg. All three masses were within the tolerance given in the FlexPLI user's manual. However, due to the slight differences in weight, different input pressures for launch were required. The VRTC legform required an input pressure of 9010 psi, SN01 required 9050 psi, and the E-Leg required 9030 psi. The heaviest leg required the largest input pressure while the lightest leg required the smallest input pressure. This is contrary to the

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observations made by Shape and is probably due to differences in equipment. The launch guide angle was set identically in all cases and the test setup was not changed. As Shape mentioned in their notes, the differences in friction of the launch guide may also be affecting the speed differences and should be kept in mind when testing one impactor to another with the same test setup.

*Photo's available for all above mentioned information.

Laboratory (company name, location) in which the impactor certification was performed before this vehicle test series (if known):

Ford Motor Company
20400 Oakwood Blvd
SIL Bldg (No. 5181)
Rec. 'B'
Dearborn, MI 48124

Contact:
Michelle Chaka
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1-313-621-0813

Laboratory (company name, location) in which the impactor certification will be performed after this vehicle test series (if known):

Other remarks: