

Issues with draft GTR

Errors and omissions:

Definition 3.12 is 'Centre of knee', which isn't, I think, used for the FlexPLI and therefore could be deleted.

Definitions 3.15 (femur) and 3.29 (tibia) are wrong for the FlexPLI as it defines them as everything above or below the centre of the knee, whereas the FlexPLI has a separate knee section. The femur definition mentions the damper.

Para 6.3.1.1.3 refers to connection parts being part of the tibia or femur. This refers to the spigots that slide into the knee, but it should make it clear that the screws that attach the femur & tibia to the knee are part of the knee. This is needed in order to be consistent with the manual, which refers to the drawing assemblies, and these screws are part of the knee assembly. Also, the mass limits were clearly set on this basis, and the knee could easily be underweight if the screws are not included.

Figs 12-14 maybe should show Z downwards to be consistent with the manual – or should manual be changed?

Para 8.1.2.3.1 (pendulum test analysis) has peaks to be within 200 ms but manual has 250 ms (which is correct?)

Figure 26 (knee bending test) has PCL & ACL labels both sides, with PCL one side going to ACL the other side. This is presumably a mistake, unless maybe one label is meant to show the potentiometer rather than the ligament. If wrong, which side has the correct labels? Probably the duplicate labels should be removed, rather than be repositioned.

More generally, figures need adequate resolution, especially where important dimensions are given. Any PDFs need to be checked carefully before publication to ensure that figures are fully readable. This has been an issue with the original version of the test procedures. Using vector graphics, as used in the two headform figures in annex 4 of the original version, would allow much higher resolution. The upper legform diagram in the Rev. 1 Word document also uses vector graphics, or maybe a high quality bitmap, but in the PDF version of the original version of Reg. 127 it had been converted to a bitmap so badly that parts of it were unreadable. All figures in the Rev. 1 Word document are at least adequate, and most are good quality.

There are several references to Neoprene that ought to say foamed neoprene, as neoprene is a specific type of synthetic rubber that can be used unfoamed, and probably has been, for the synthetic rubber ‘flesh’ sheets. We probably made the same mistake for the EEVC LL skin. They haven’t specified that it should be cloth lined, though.

Issues with draft Manual

GTR9-9-07r3.pdf has errors – probably from PDF conversion. In particular, a photo on p43 (Fig. 31, Meniscus Wire clamp) is missing.

In several places the text refers to ‘GTR9’. It ought to refer to Reg. 127 as well?

Omission: nowhere does it mention CACs. Test procedure has 400 Nm and 30 mm, but doesn’t give one for the accelerometer – should it be 500 g?

Omission: it ought to say what accelerometers can be used. Somewhere damped ones are recommended.

Omission: it should warn users against using the #0-80 bolts that come with the MS 64C accelerometer. Holes in knee block tibia will be M1.6.

Femur and tibia assembly: Figure 46 is hard to read due to limited resolution. It’s a bitmap, so expanding it on-screen doesn’t help much. The description of what to do is very little use; it mainly says to assemble it as shown in Fig. 46.

S1.2, p11, last paragraph has “An 8, 4 mm and 1/8” open ended wrenches are required, and later states these are all included in the tool box, but an 8 mm wrench is not listed in Table 1. An 8 mm wrench is mentioned in the Knee Assembly and Tibia Assembly sections, so it is needed.

S2.3.1, Fig. 15 (sign convention) is inconsistent with Reg. 127 (former has Z down, latter Z up – which is ‘wrong’?).

S3.3.2 on fitting the pots gets references to LH pull & RH pull reversed. Drg 52 / 133-5313 is correct, i.e. it’s consistent with the datasheet (see [FlexPLI Inst](#)). Section also has a ‘lose’ that should be ‘loose’.

S3.3.3 has title ‘Assembly After Certification’. This should be after Static certification. This includes fitting the accelerometer; the manual suggests using this as a trigger in the dynamic certification tests so it must be fitted before the dynamic tests.

S6: The weight specification in Section 6 includes one for the flesh system that isn't in the Reg. 127 test procedure. The mass can be derived, but the tolerance could potentially be much larger than that given.

S7.1, Table 14, FlexPLI certification steps:

The 'Dynamic Linear Guided Impact' description ought to include 'Inverse test', which is used elsewhere in the manual and in Reg. 127.

The 'When required' entry for the Inverse test isn't correct. Reg. 127 requires this test before starting a vehicle test series. Some of the other 'requirements' ought to be 'recommendations'.

S7.3 says to load the knee to 4 kN, but this doesn't necessarily go far enough to reach the end of the corridor if the response is near the upper limit. The top of the upper limit line is at 4.151 kN, so loading to 4.2 kN would be sensible.

S7.3: Figs. 51 and 53 have lost their captions to the respective next page

S7.3: Fig.52 has a spelling mistake on the X axis

S8.1: Diagram of Dynamic Pendulum Fixture (Figure 54) has a missing dimension (101 ± 2) compared with the one in the draft amended Reg. 127. (This was a late addition to the Reg., see GTR9-9-14.) Also, 'TBC' should be removed.

S8.5 (pendulum test analysis) has peaks to be within 250 ms but Reg. has 200 ms (which is correct?)

S8.5: Reference to Table 15 should be Table 16

S8.6, Table 17: 'Inverse Dynamic' should be 'Dynamic Pendulum'

S9.2, Fig. 62 (Inverse test) has 'Kg' not 'kg'

S9.4: Reference to document GTR9-5-15 in Section 9.4 is not ideal in a document that will be used by those not familiar with the recent development process. There ought at least to be a web address for the document. Better, include what is needed in manual.

S9.7: Reference to Table 17 should be Table 18

S9.7: Reference to ECE/TRANS/WP.29/GSRP/2009/26 is wrong in many ways:

See comment on S9.4 above.

'GSRP' should be 'GRSP'

There isn't a document 2009/26; they may mean 2009/21, which is a draft FlexPLI amendment.

If so, reference should have been updated to latest version (would now be Reg. 127 Rev. 1)

Why reference to test procedure for one test only, rather than for all tests?

Issues with draft Drawing set

Femur bone has wrong quantities.

Rubber sheet drawings omit to say 'synthetic', as 'synthetic rubber' is specified in Reg. 127.

5505 & 5507, Spacers: Drawings don't give an adequate material specification, especially as this will influence the impactor weight.

Drg 57 / 133-5330 (Knee block tibia) specifies a M3 thread for the accelerometer holes when it should be a M1.6 thread (Drg 39 / 133-5300 (Knee Assembly) specifies M1.6 bolts)

Drg 85 / 133-5534, Inner Segment Assembly, shows quantity as 2 off when it should be 12 off (5 in femur & 7 in tibia)

Drg 86 / 133-5535, "Inner Segment Assembly Closes to Knee"; presumably it should read 'Closest'.

Covers for knee over DTS, with clearance holes, don't have the same spacing & alignment as the holes in the knee for mounting the DTS SLICE.