First Technology Safety Systems

Design Freeze Status

FLEX-PLI-GTR Development Instrumentation and Electrical Design

Bernard Been
FTSS Europe

Comments addressed from Design Freeze meeting
February 20th 2008, JARI, Tsukuba, Japan
Updated March 31st, 2008

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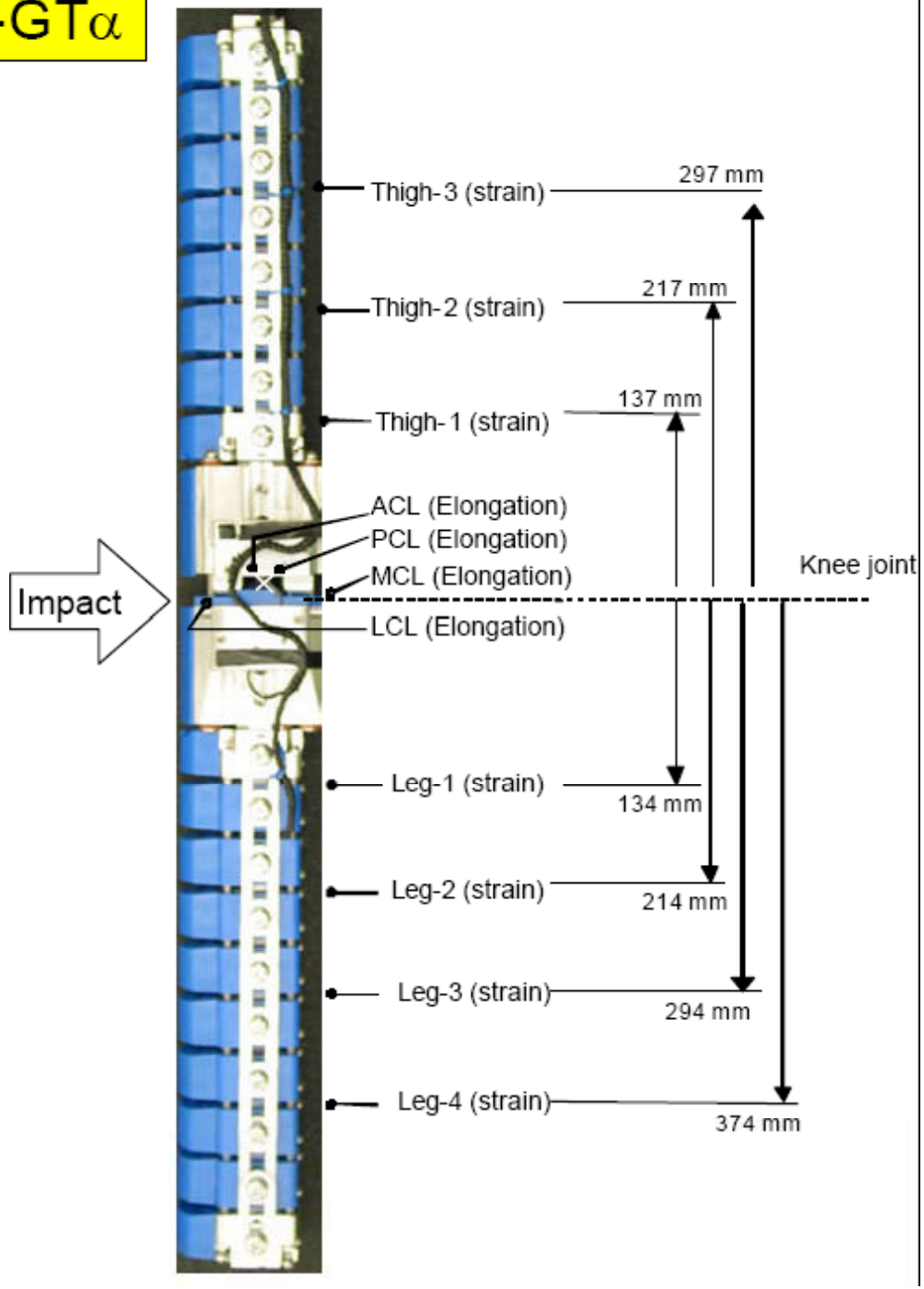
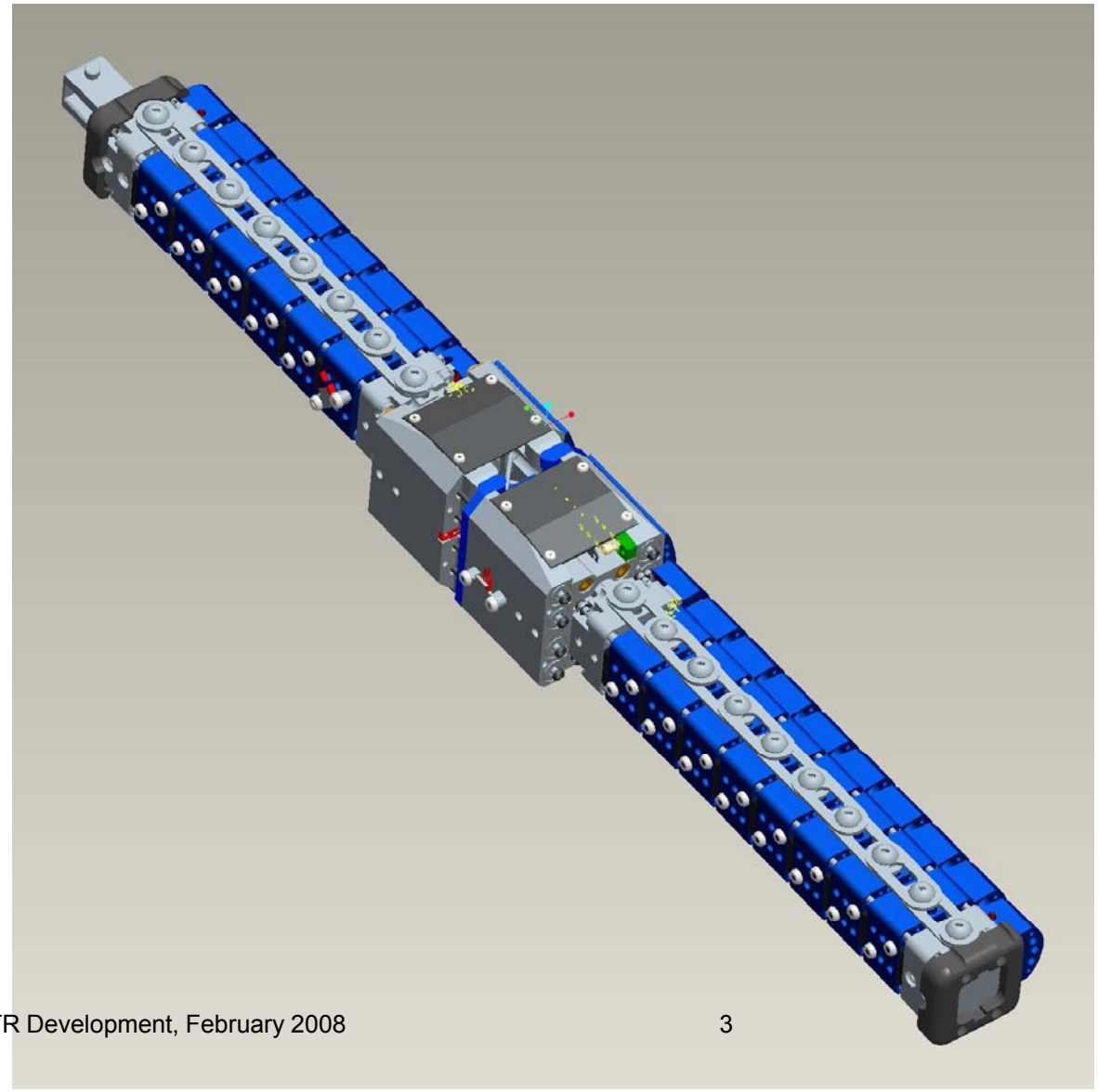
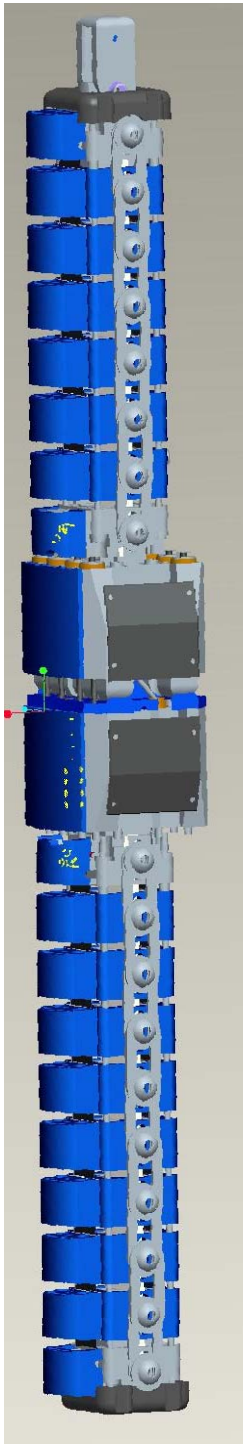
Introduction

Flex-GTα



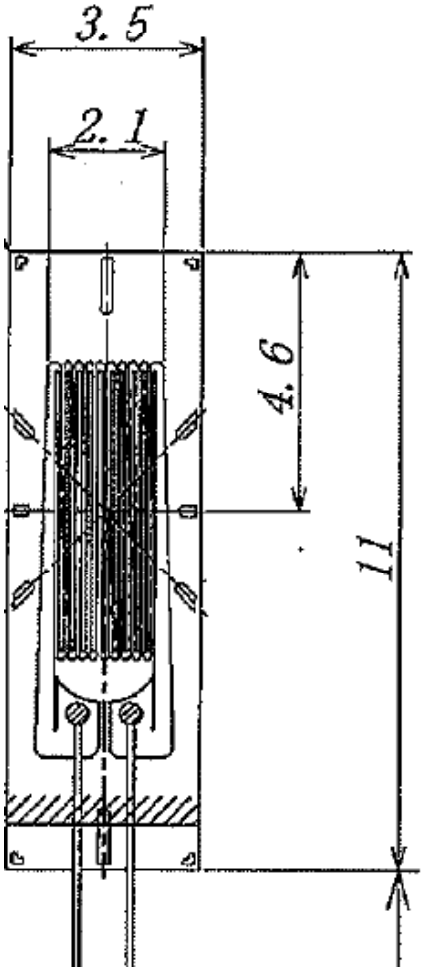
Introduction



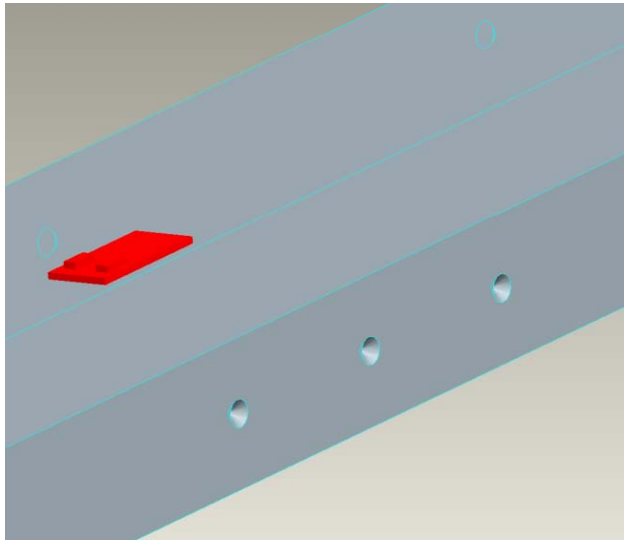


Channel	Purpose	Standard	Option	DAS	Priority
Femur moment 1, 2 and 3	Calibration	3	0	Standard option On board DAS	
Tibia moment 1, 2, 3 and 4	Injury&Cal	4	0		
Tibia top acceln ax	Calibration	1	-1		
MCL elongation	Injury&Cal	1	0		
ACL elongation	Calibration	1	0		
PCL elongation	Calibration	1	0		
LCL elongation	Calibration	1	0		
Tibia top acceln ax, ay, az	Motion	0	3	optional on board if feasibl	1
Femur bottm acceln ax, ay, az	Motion	0	3		1
Tibia angular rate ωx, ωy, ωz	Motion	0	3		2
Femur angular rate ωx, ωy, ωz	Motion	0	3		2
Femur top acceln ax, ay, az	Motion	0	3	Lab	3
Tibia bottom acceln ax, ay, az	Motion	0	3	Lab	3
Segment acceln ax	Research	0	15	Lab	4
Total		**12**	**32**		

Strain Gauges

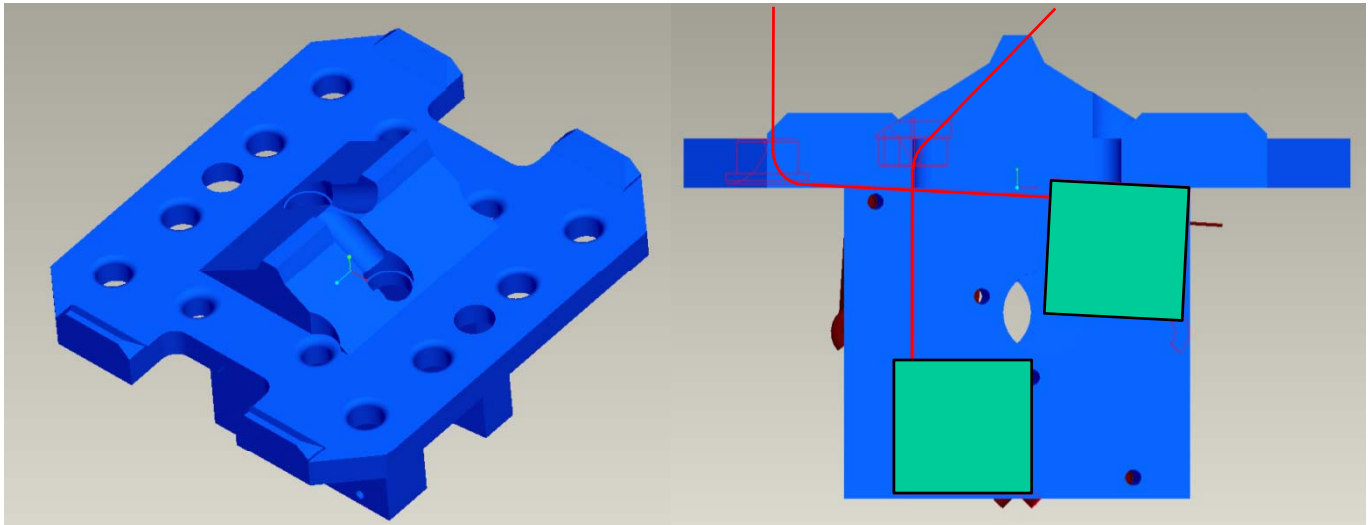


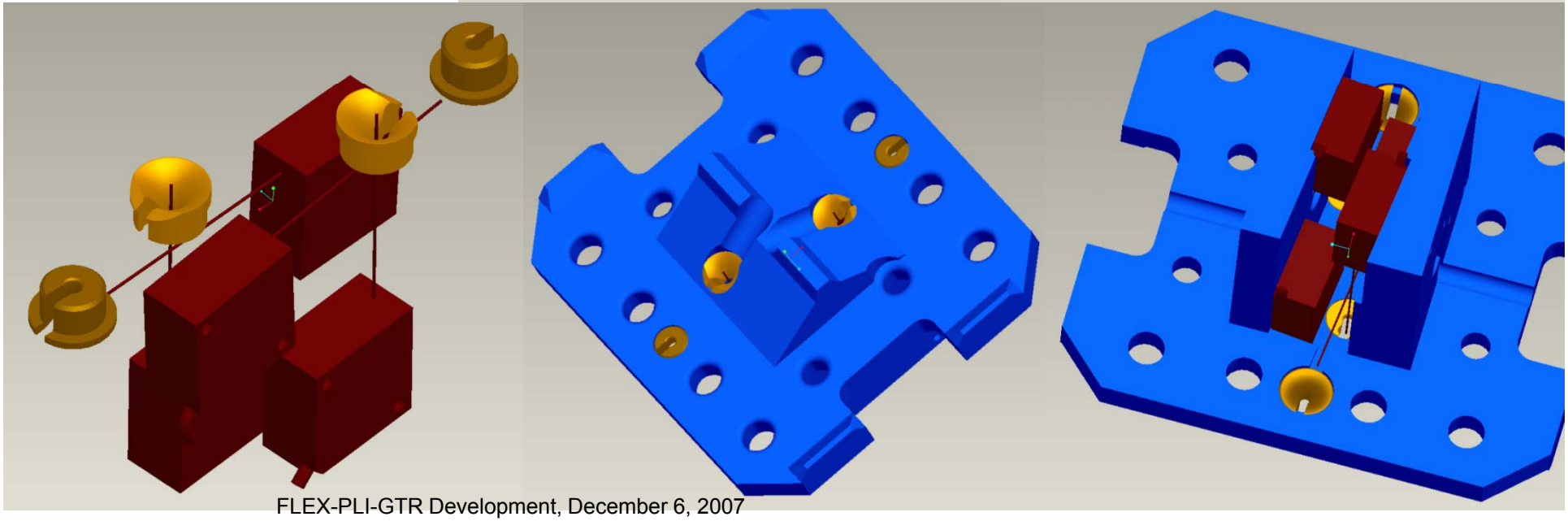
- FLEX-GT specs and adhesive provided by Kyowa
- Uni-axial, 5mm length, 350 Ohm



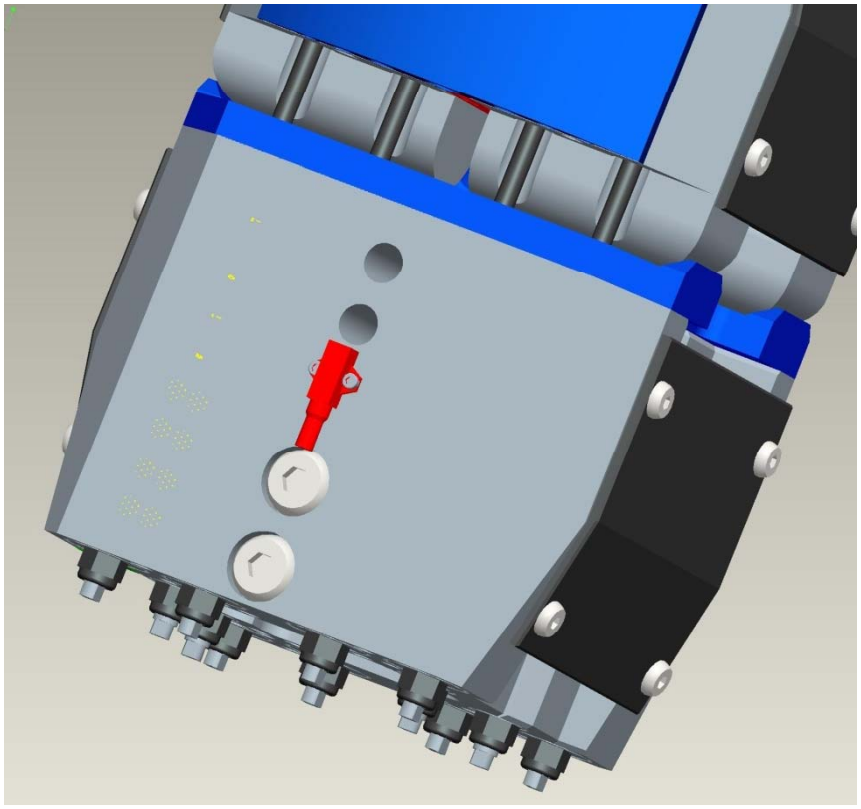
Packaging ligament elongation stringpots

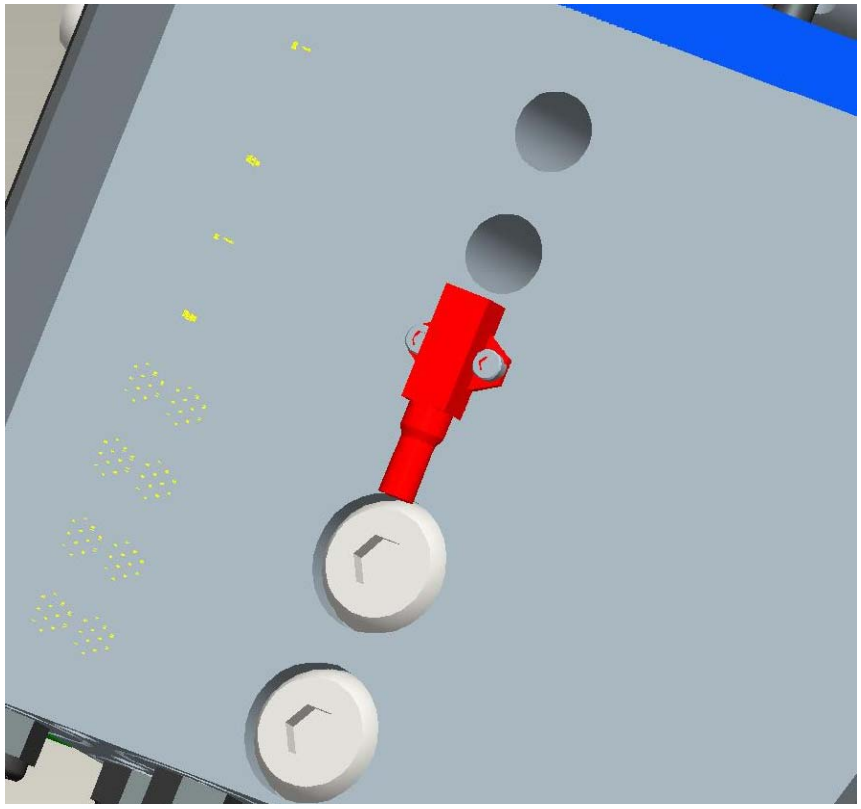
Space Age Control
150 series
19*19*10mm
49G acceleration
38mm stroke
2xLH & 2xRH pull
Bronze wire guides





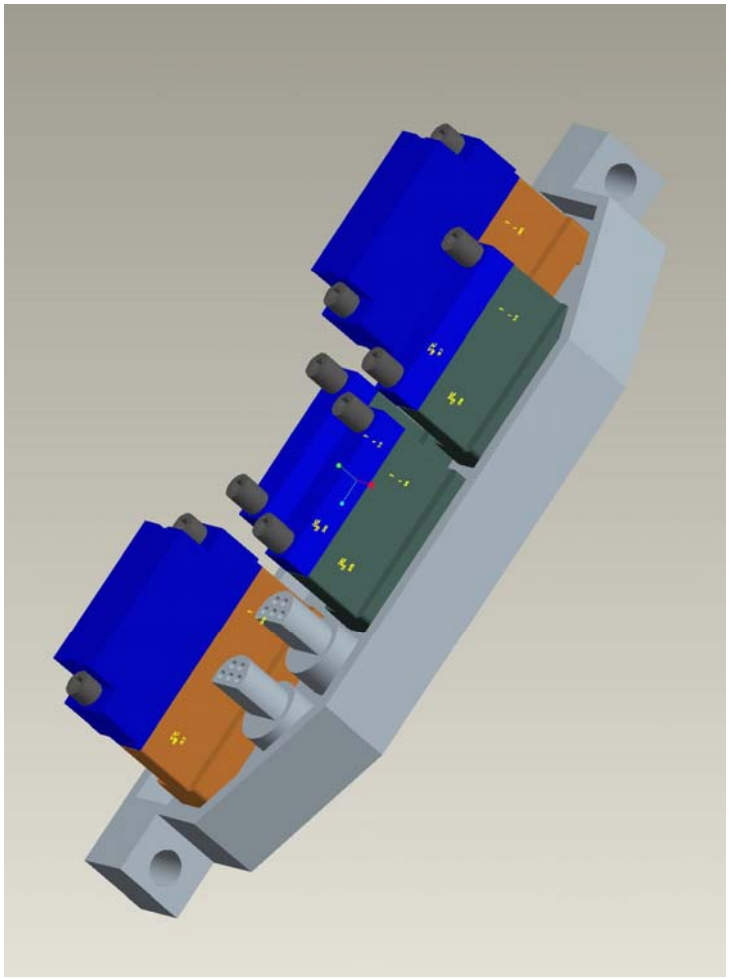
Single axis accelerometer x-direction for certification

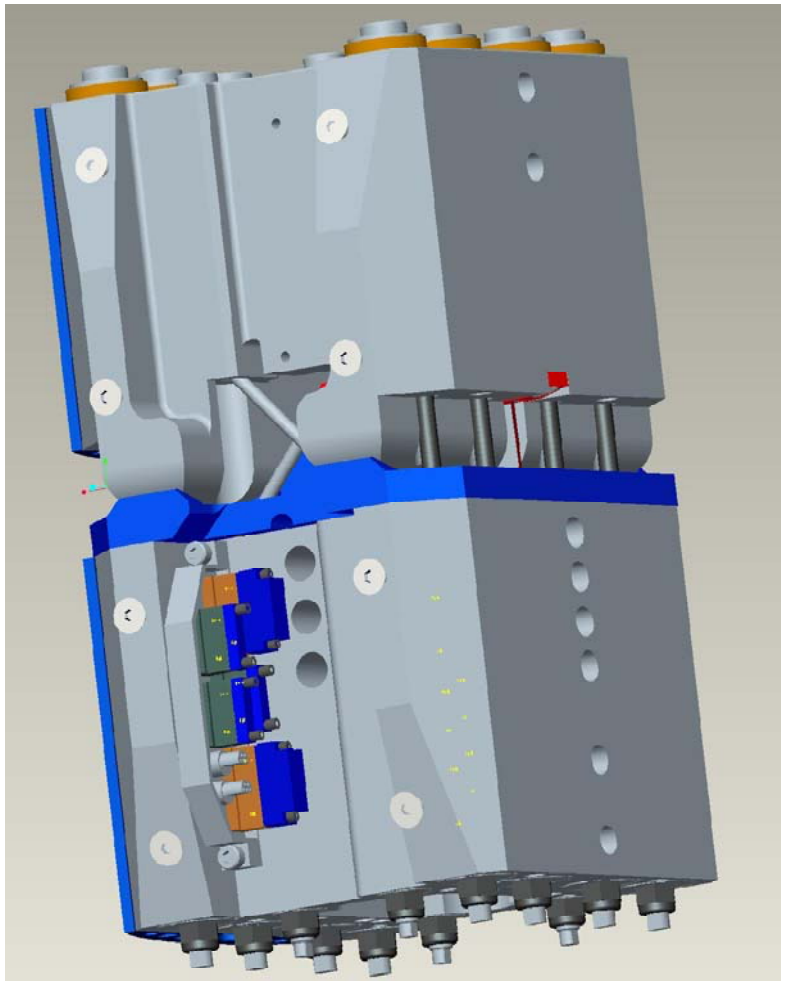




- Mounted behind Nylon Impact Cover
- Threaded metal inserts to enable thread repair
- Kyowa ASE, Measurement specialties M62, Endevco 7264,

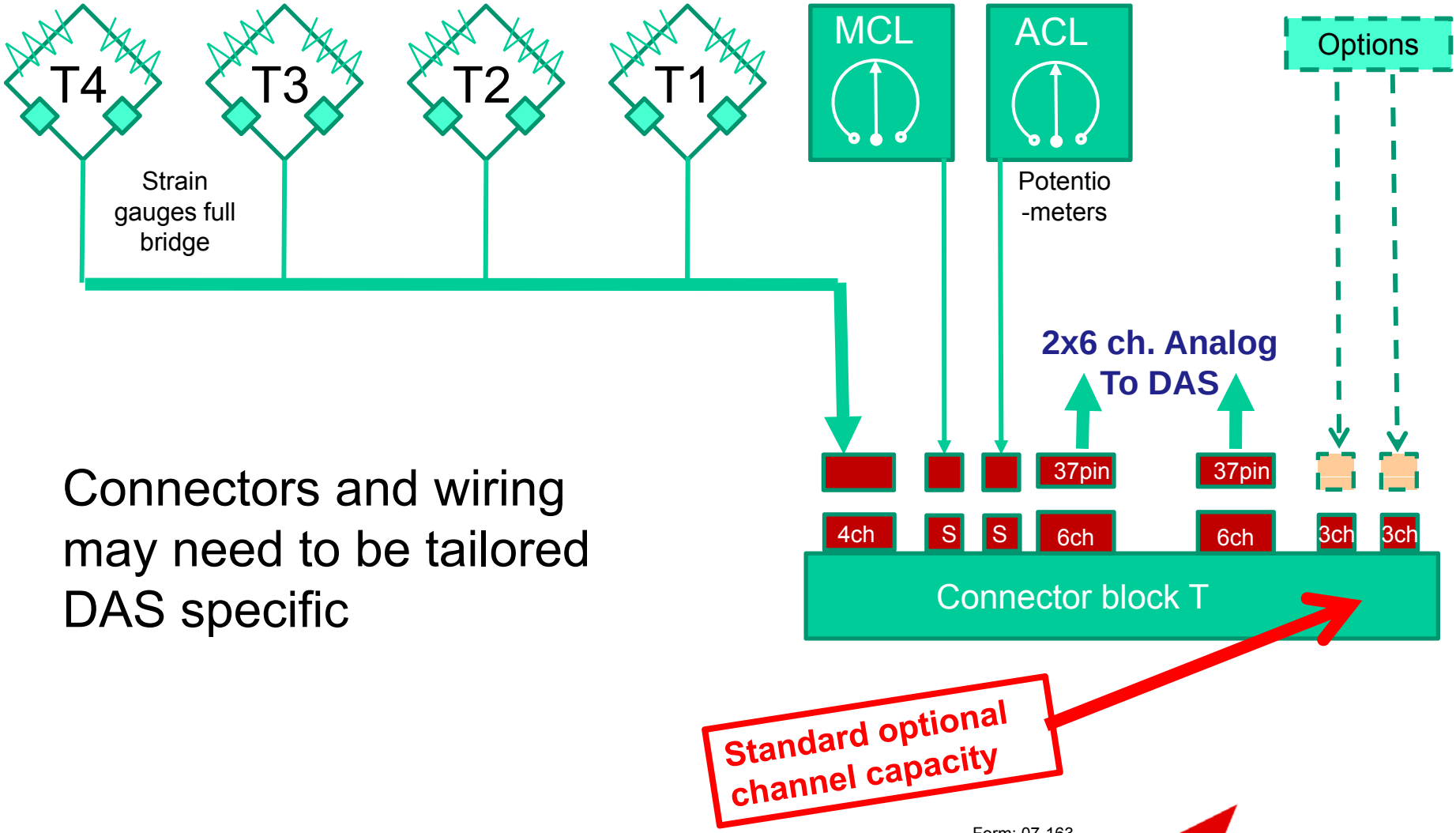
Packaging Connectors & Wiring





Develop wire count in co-operation with DAS application

Wiring Diagram Tibia 2*37 pin



Connectors and wiring may need to be tailored DAS specific

Form: 07-163
Revision: A
16 - May 07

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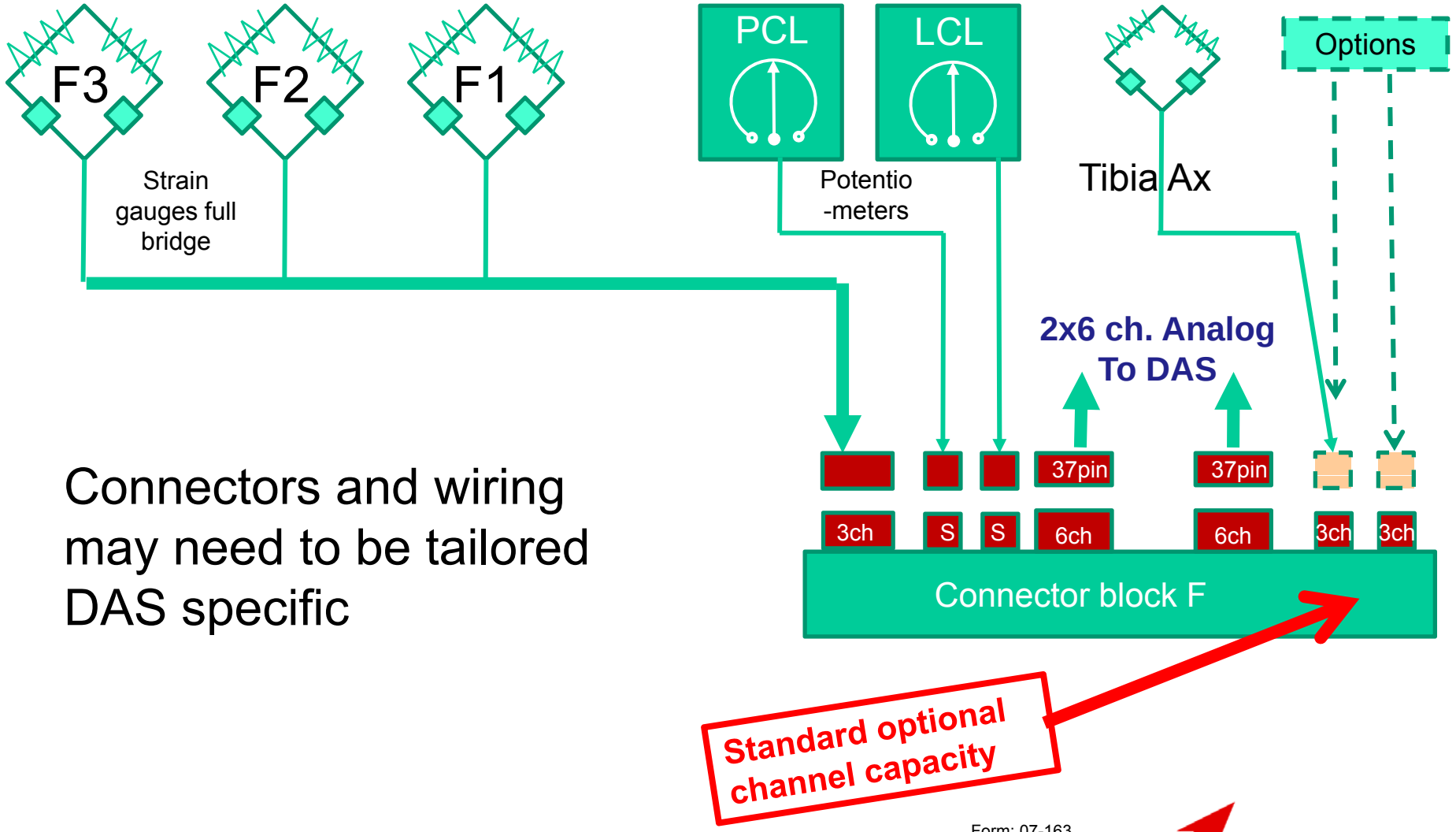
Wiring Diagram Femur 2*37 pin



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Form: 07-163
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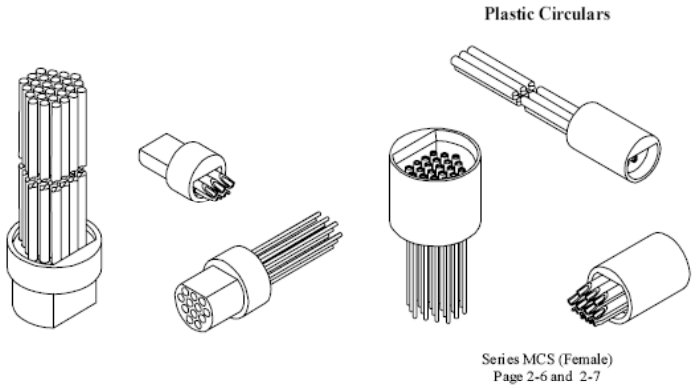
Connectors agreed

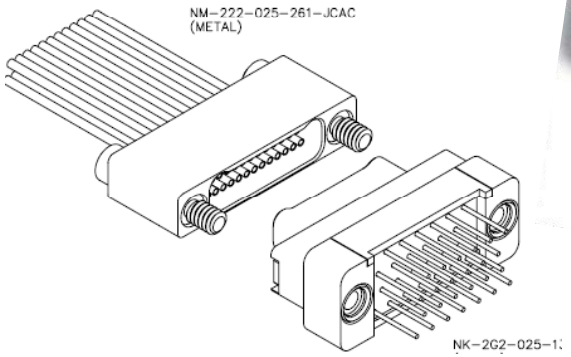
single channel

- Omnetics: www.omnetics.com
- Male and female connector pins protected
- Plastic circular design
- Plastic housing, screw strain relief
- Repair by hand soldering possible and need epoxy potting for strain relief
- Can be done trained staff



multi channel

- AirBorn: www.airborn.com
- Male and female connector pins protected
- Military spec. Nano D type
- High conductor density
- Spacing 0.025 inch = 0.64mm
- Metal housing, screw strain relief
- Cables pre wired by manufacturer by crimping and potting
- Repair by splitting the cable and a pig tail connector



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Cables agreed

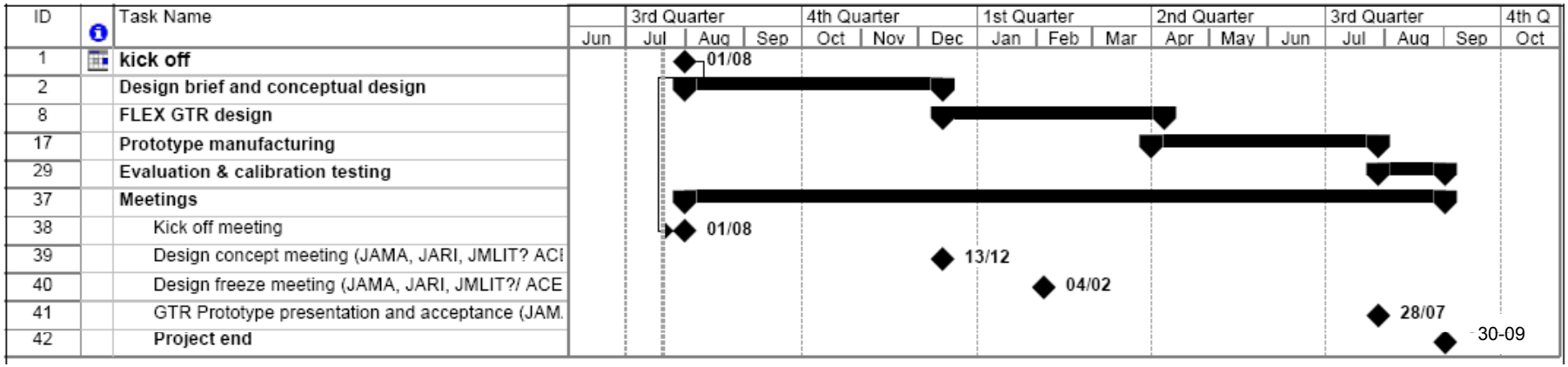
- Cables will influence free flight motion
- How much is highly dependent on test set up wire routing
- Wire gauge is a trade off:
  - thinner wires will easily damage
  - Thicker wires/cables will influence free flight accuracy
- We have to route 50 wires out, without compromising flexibility, the common practice is to use several smaller cables instead of a large one
- Four 21 conductor MSC Cable proposed, each of which has a diameter of 4 mm
- MSC Cable sample was agreed during the meeting

Detail Design Issues

- Detail design wire count and connectors in collaboration with DAS application
- Optimized wire routing and wire lengths
  - Allow for motion and stretching of wires
  - Wire clamping provisions
- Mark bone for assembly position reference
- Rounded edges in wire route
- Colour coded cables
- PCB design of standard features
- Wiring diagrams

Schedule, future activities, etc.

- 6th FLEX-PLI-TEG meeting, March 31st Germany
- Manufacturing Drawing release 15th April
- Prototype Manufacturing 15th April – 28th July
- Prototype assembly, Testing and Calibration 29th July- September
- GTR prototype Delivery End September 2008



Design frozen!