

# THOR-DTI Integration – from the concept study to the final design

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# Agenda

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- Current state based on analog dummy
- Concept study for integration solution
- New Data Recorder development
- Technical Realisation

## THOR analog Dummy

**THOR 50th**



**~ 122-channels**

High umbilical mass



**Onboard-DAS**

~ 4 x KiDAU for one  
ATD



## THOR In-dummy DAS

**THOR 50th**



**~ 122-channels**



**Onboard-DAS**



- Use of existing / available solutions
  - 144-channel data recorder incl. UPS
  - In-dummy HUB designs from WS-50 and Q-Dummy solutions
  
- New designs / developments
  - Design of spine box for recorder and UPS integration
  - Cable tree for sensor connection

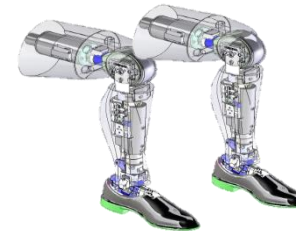
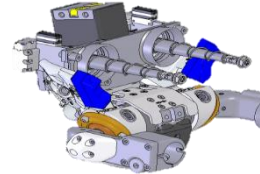
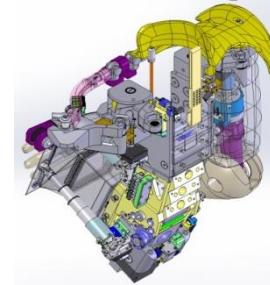
- 144-channel design bus concept, 12 bus lines

- Head/Neck – 2 – 24 channels

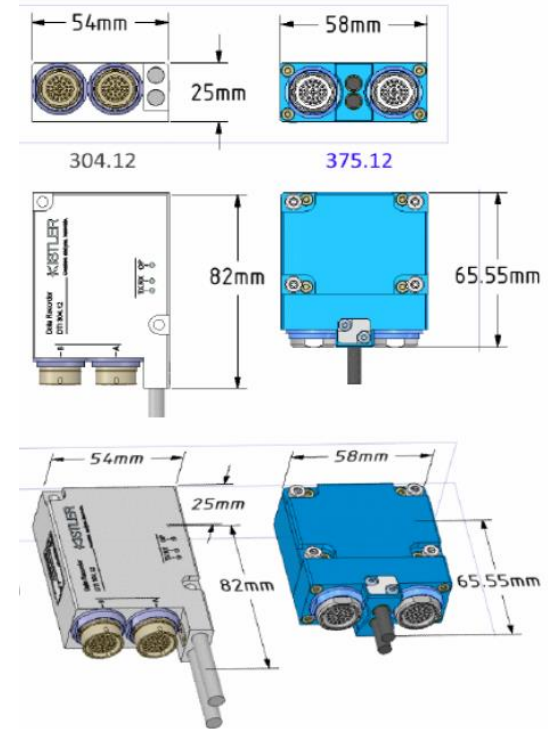
- Thorax – 4 – 48 channels

- Pelvis – 2 – 24 channels

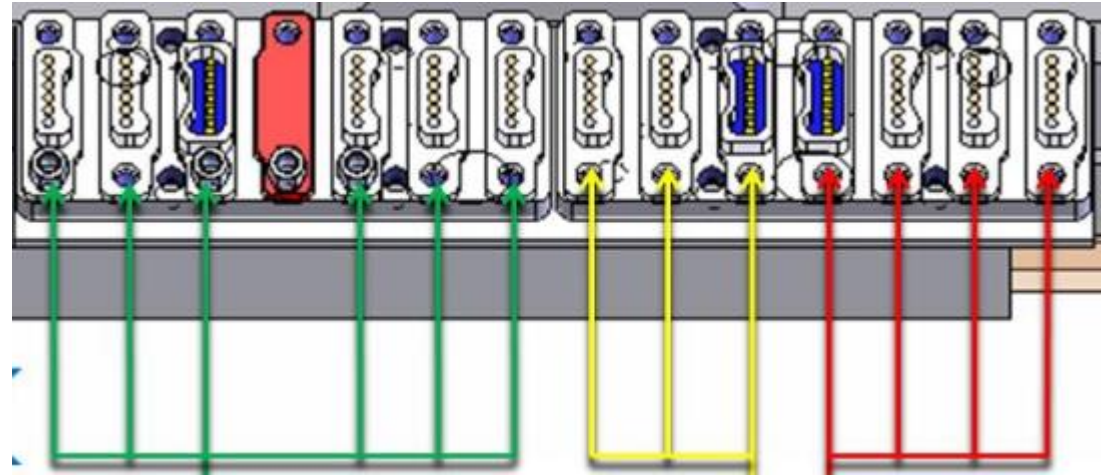
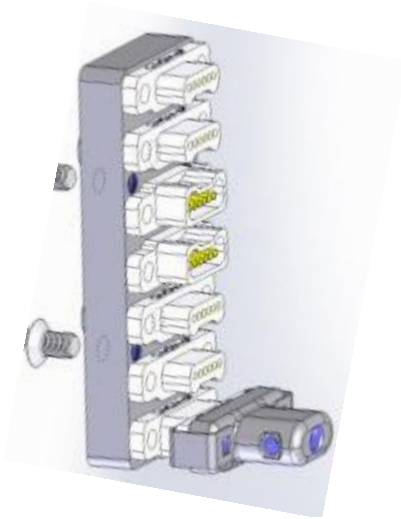
- Legs – 2 – 24 channels



- 144-channel recorder old vs. New
  - Dimensions
  - Technical Features
  - Mounting / Positioning



- In-dummy HUB`s



Single channel  
sensors

3D ACC

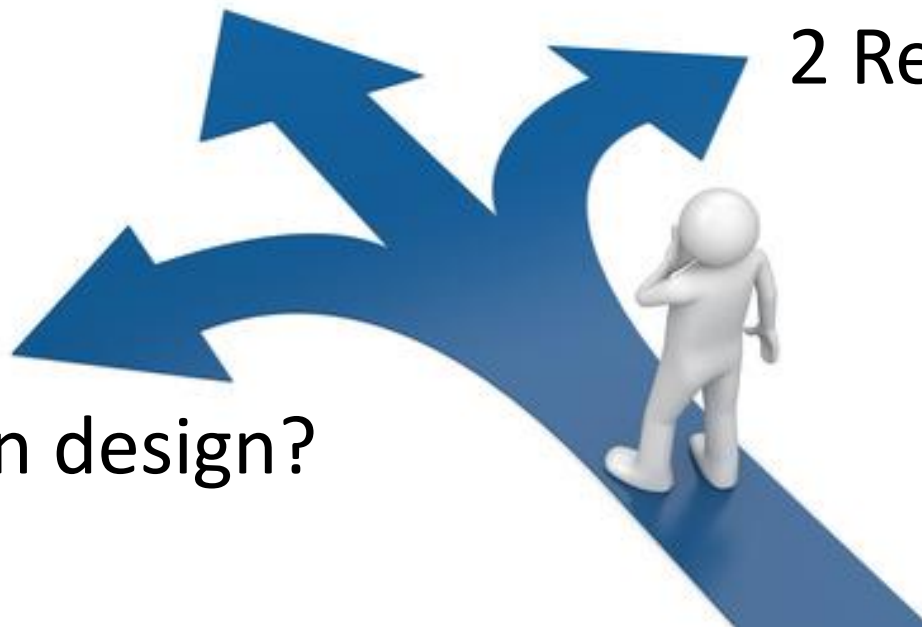
3D  
IRTRACC





# Stay on track?

## 2 Recorders?

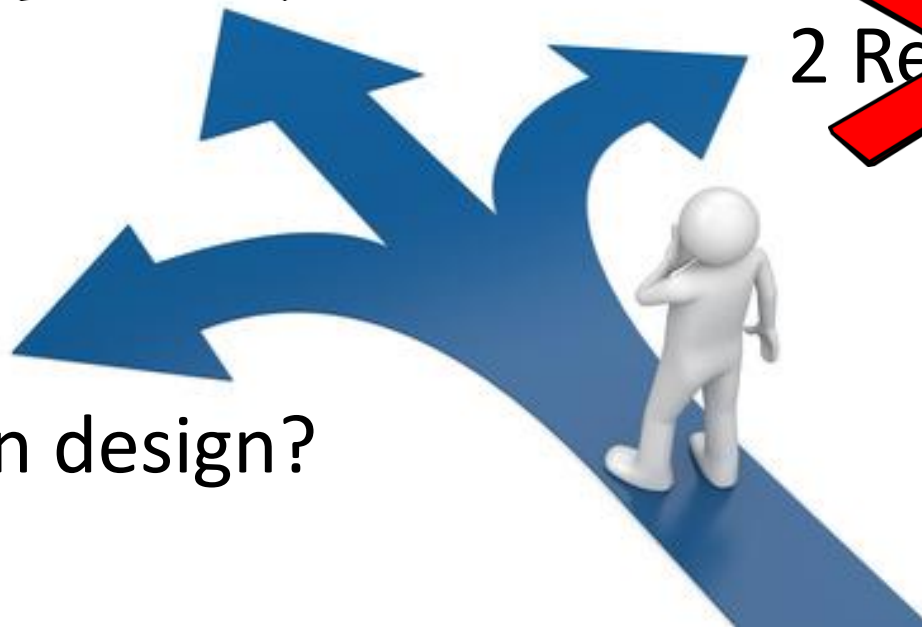


## New recorder and integration design?

Stay on track?

2 Riders?

New recorder  
and integration design?



## THOR Recorder

### Core element – New 288-channel DTI recorder

#### DTI375.TH

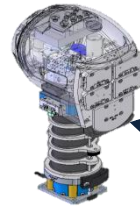
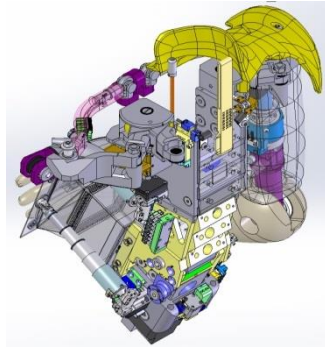


#### Main-Specs

- 8 Port-lines with each 36 channels
- Start/Record functionality
- Flash memory
- 100 sec recording time
- Integrated USV
- Compact housing
- Power safe mode

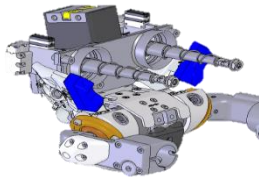
## Bus Concept

### High flexibility and easy disassembling of body parts

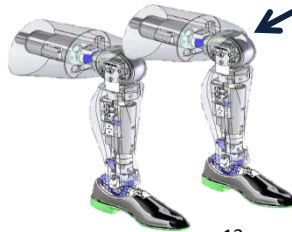


Head (1 Port)

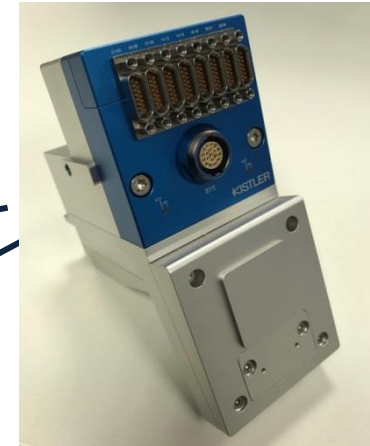
Thorax (3 Ports)



Pelvis (1 Port)

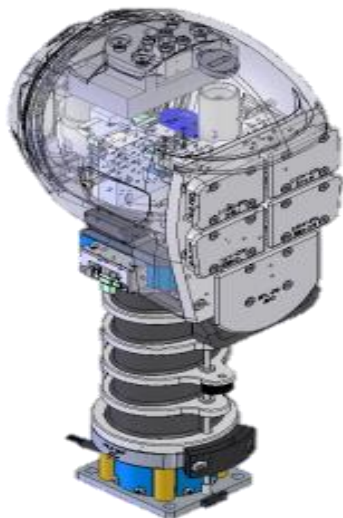


1 Port per leg



1 Port free for arm  
instrumentation or others

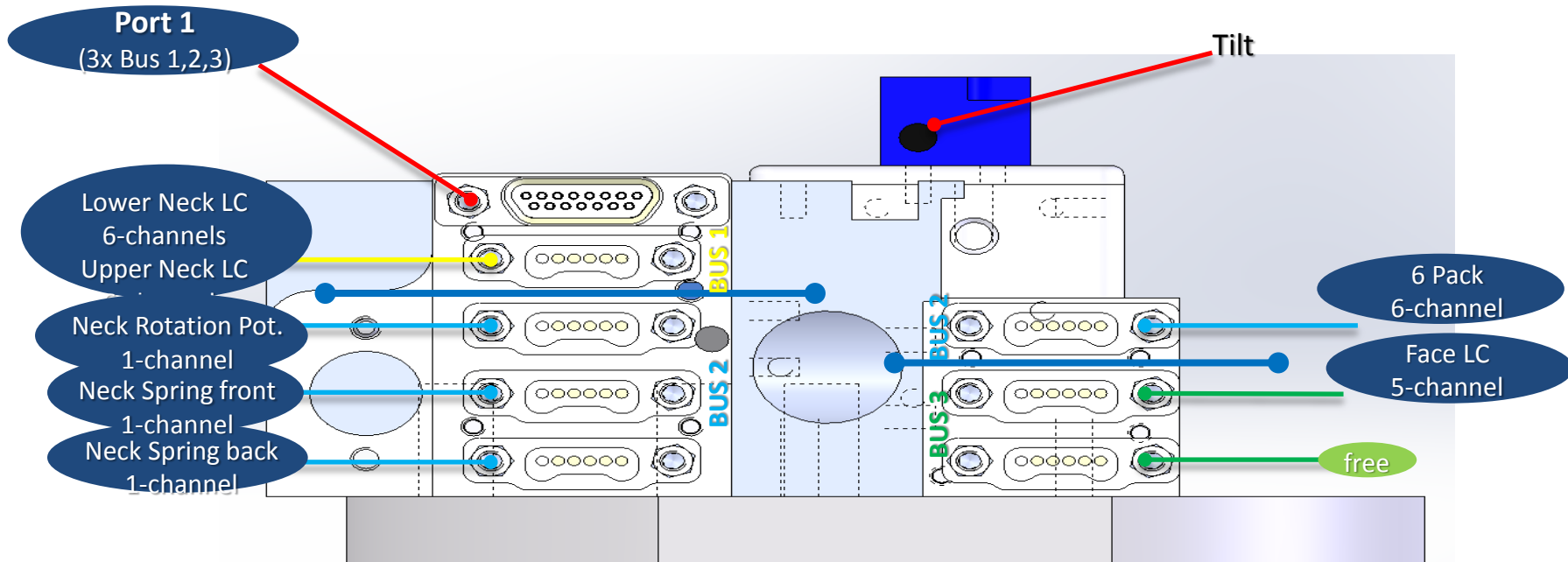
## Head/Neck



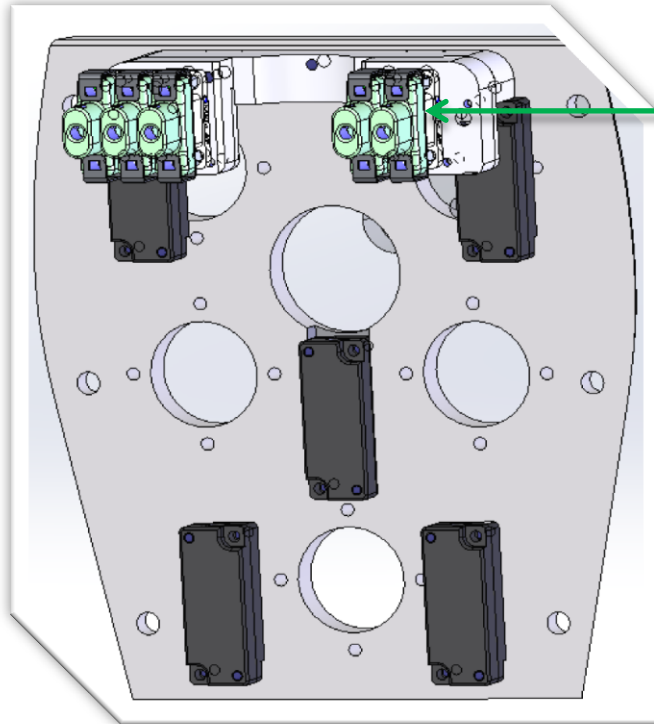
## Possible channels

THOR Data Channels		Projekt Nr.: G-104						
		No. of Channels	No. of Connectors	1 CH DMOD	3 CH DMOD	Internal	External	BUS ID
<b>Head</b>								
1	Neck Spring, Front	1	1	1			1	
	Neck Spring, Rear	1	1	1			1	
2								
3	Head Accel	Top / 2 Channels						
		Side / 2 Channels						
		Rear / 2 Channels						
4		CG / 3 Channels DTI-6 Pack	6	1		x		
5	Neck Rotation Pot	1	1	1			1	
		Left Eye	1	1	1		1	
		Right Eye	1	1	1		1	
6	Face	Left Cheek	1	1	1		1	
		Right Cheek	1	1	1		1	
		Chin	1	1	1		1	
7	Upper Neck Load	6	1		2	x		
8	Lower Neck Load	6	1		2	x		
		<b>26</b>	<b>11</b>	<b>8</b>	<b>4</b>		<b>8</b>	
Port 1 - Channels		<b>36</b>						
Tilt		1	1					

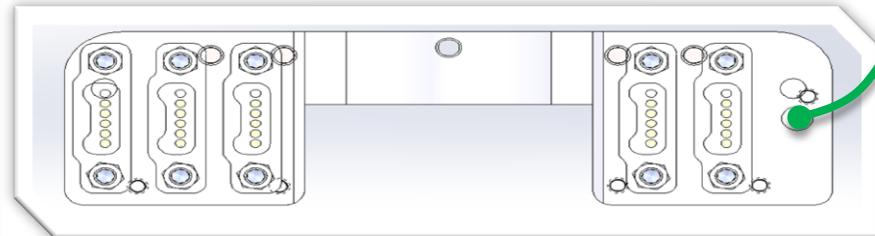
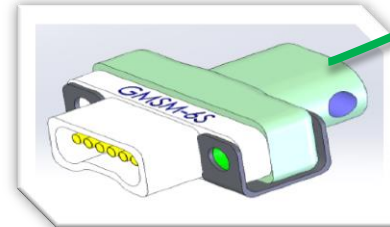
## Port distribution



## 5 x 1-channel Face Load Cells

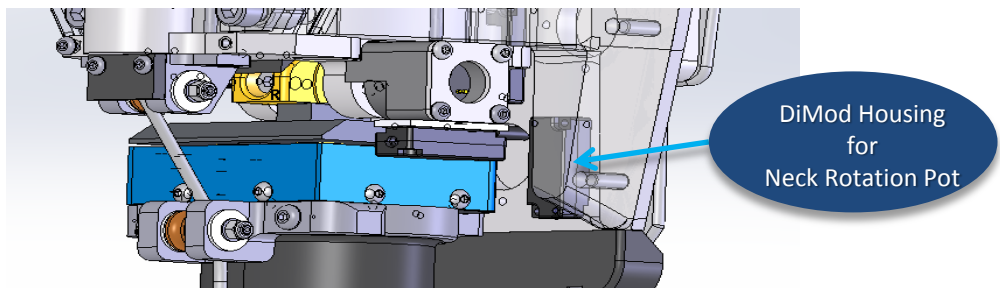
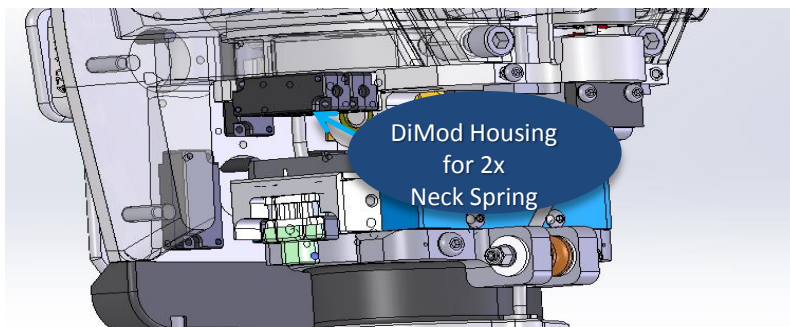
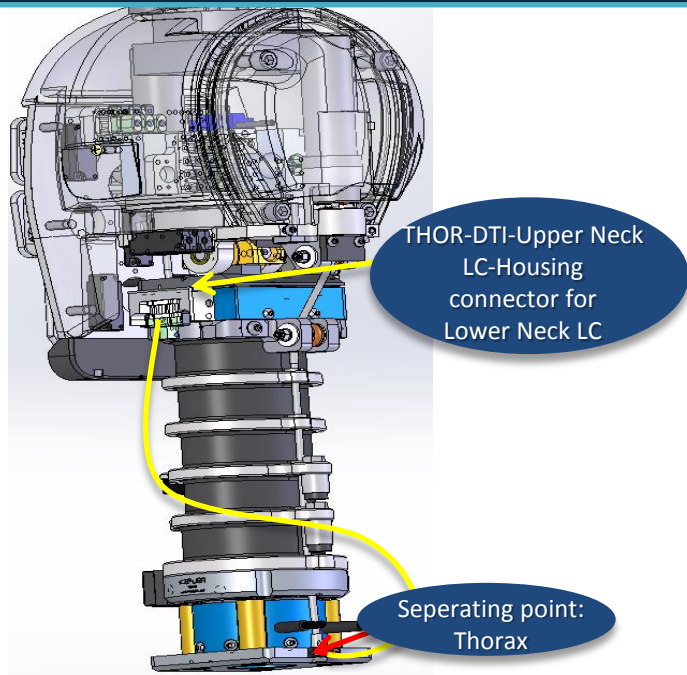


Connector to  
THOR-DTI-channel collector-head

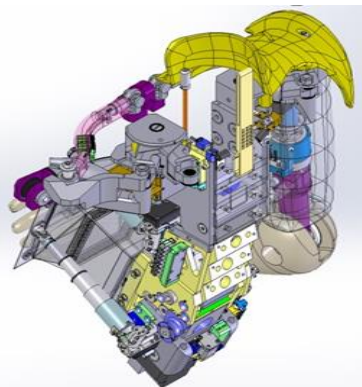




## Separating points



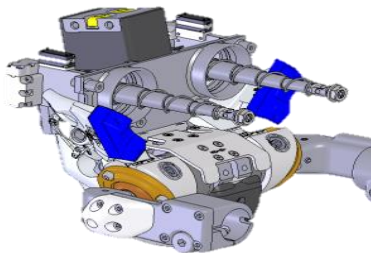
## Thorax



## Possible channels

THOR Data Channels				Projekt Nr.: G-104		No. of Channels No. of Connectors 1 Ch DMOD 3 Ch DMOD Internal External BUSS ID Hub									
Thorax															
Lower-Neck-Load															
1	T1 Angular Rate T1 Accel	Neck	DTI Rucksack	6	1					x					
2	Clavicle	Left	Inner	2	1	2				x					
			Outer	2											
		Right	Inner	2	1	2				x					
			Outer	2											
3	Arm	Left	Dom 3F	6	1			2	x						
		Right	Dom 3F	6	1			2	xR						
4	T4 Accel T4 Angular Rate	3 3	DTI-6 Pack	6	1					x					
5	IRTRACC	Upper Left Chest	Rucksack	3	1			1			xR				
		Lower Left Chest	Rucksack	3	1			1			xR				
		Upper Right Chest	Rucksack	3	1			1			xR				
		Lower Right Chest	Rucksack	3	1			1			xR				
6	Mid-Sternum Accel			1	1	1					1				
7	Upper Abdomen Accel			1	1	1					1				
8	T12 Load	5		5	1										
9	T12 Accel	3	DTI-Rucksack	6	1					x					
				57	14	6	8			2					
				Port 2, 3 & 4 - Channels	72										
Tilt				3	3										

## Pelvis



## Possible channels

### THOR Data Channels

Projekt Nr.: G-104

				No. of Channels	No. of Connectors	1 CH DMOD	3 CH DMOD	Internal	External	BUS ID	H
<b>Pelvis</b>											
1	<b>INTRACC</b>	Left Abdomen	<b>Rucksack</b>	3	1		1		xR		
		Right Abdomen		3	1		1		xR		
2	<b>Accel Angular Rate</b>	Pelvis	<b>DTI 6Pack</b>	6	1			x			
3	<b>ASIS Load</b>	Left		2	1		1		1		
		Right		2	1		1		1		
4	<b>Acetabulum Load</b>	Left		3	1		1	x			
		Right		3	1		1	x			
5	<b>Lower Lumbar LC</b>			6	1		2	x			
				<b>28</b>	<b>8</b>		8		2		
				<b>Port 5 - Channels</b>	<b>36</b>						
<b>Tilt</b>				1	1						

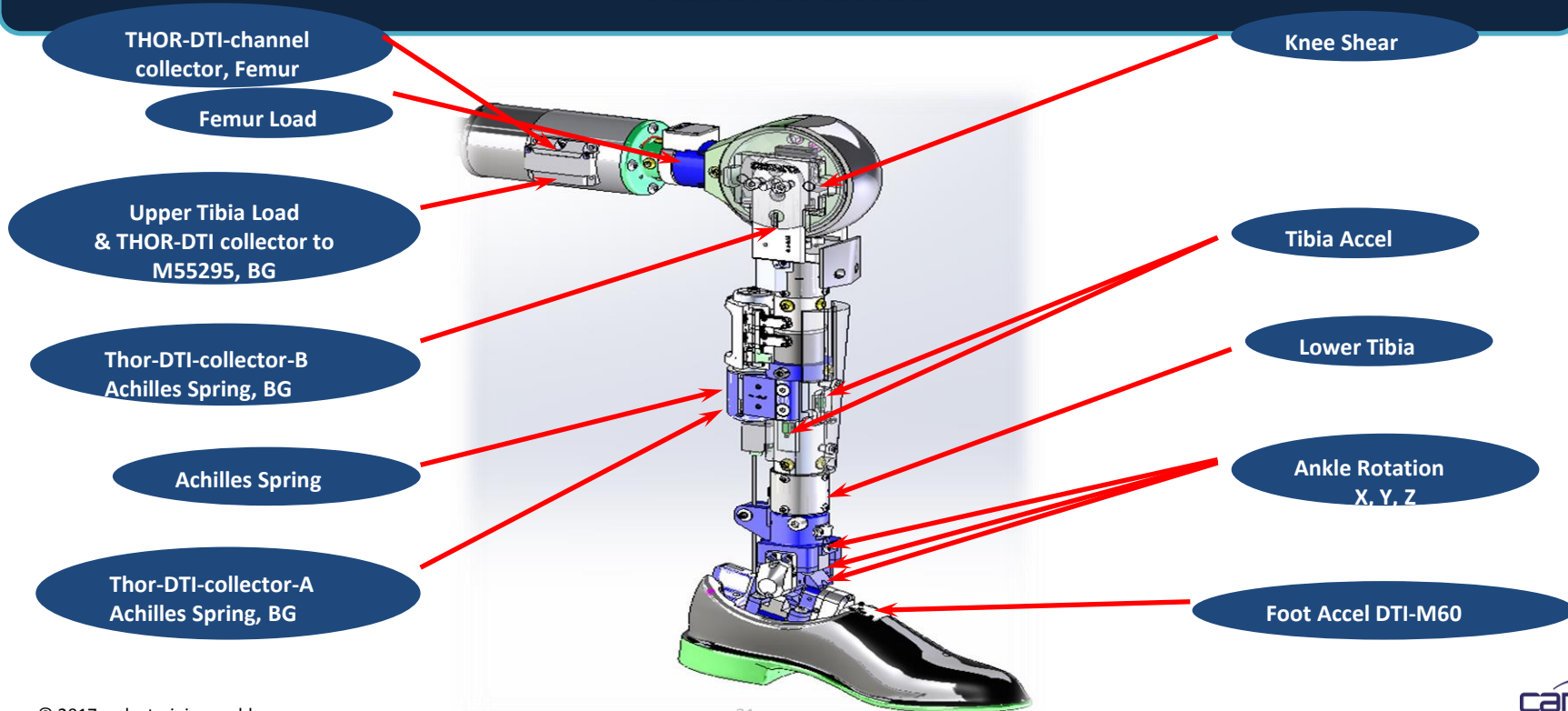
## Legs



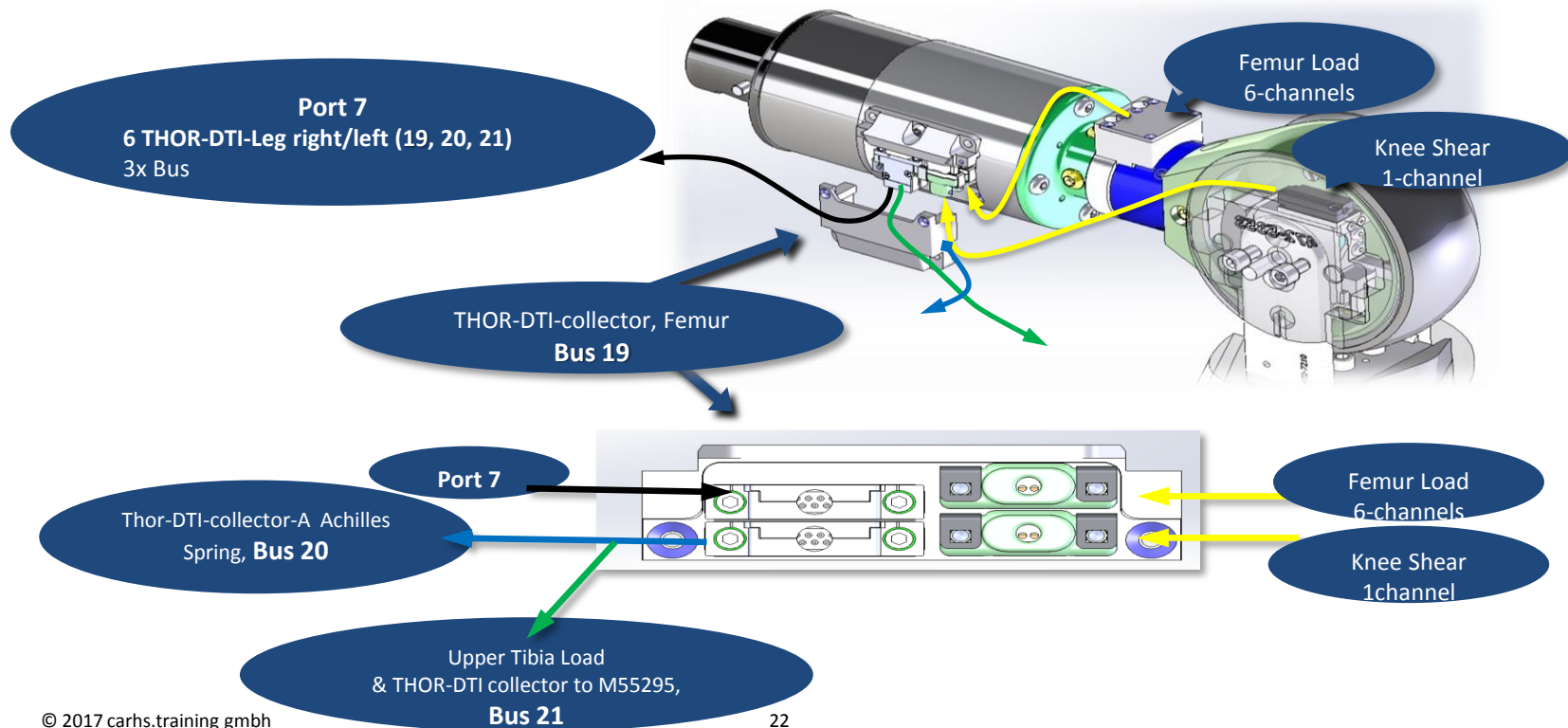
## Possible channels

THOR Data Channels				Projekt Nr.: G-104		<div>No. of Channels No. of Connectors 1 CH DMOD 3 CH DMOD Internal External BUS-ID</div>							
Leg/Foot													
1	Femur Load	Left	Rucksack	6	1			2	xR				
		Right	Rucksack	6	1			2	xR				
2	Knee Shear	Left		1	1	1					1		
		Right		1	1	1					1		
3	Upper Tibia Load	Left	Rucksack	5	1		2	xR					
		Right	Rucksack	5	1		2	xR					
4	Lower Tibia Load	Left	Rucksack	5	1		2	xR					
		Right	Rucksack	5	1		2	xR					
5	Tibia Accel	Left	front & side	2	2	2					2		
		Right	front & side	2	2	2					2		
6	Achilles Spring	Left		1	1	1					1		
		Right		1	1	1					1		
7	Ankle Rotation	Left	3x1 Pot	3	3	3					3		
		Right	3x1 Pot	3	3	3					3		
8	Foot Accel	Left	DTI-M60	3	1			x					
		Right	6Pack	3	1			x					
ges.				52	22	14	12				14		
pro. Leg				26	11	7	6				7		
Port 6 right & 7 left - Channels				72									

## Sensor overview



## Separating points



## Simple Angle Adjustment (-9, 0, 9 and 12° Degrees)

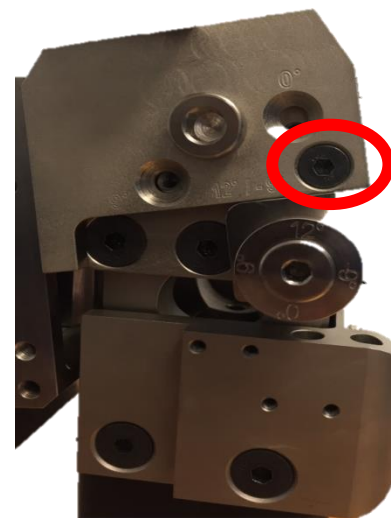
### Adjustable DTI Spine Box



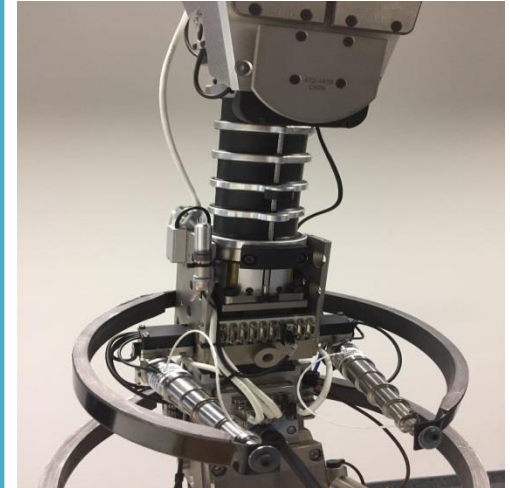
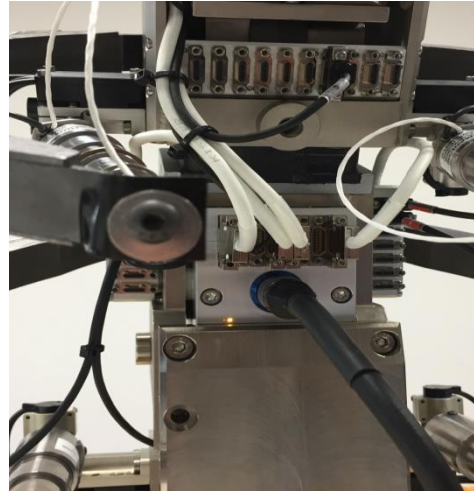
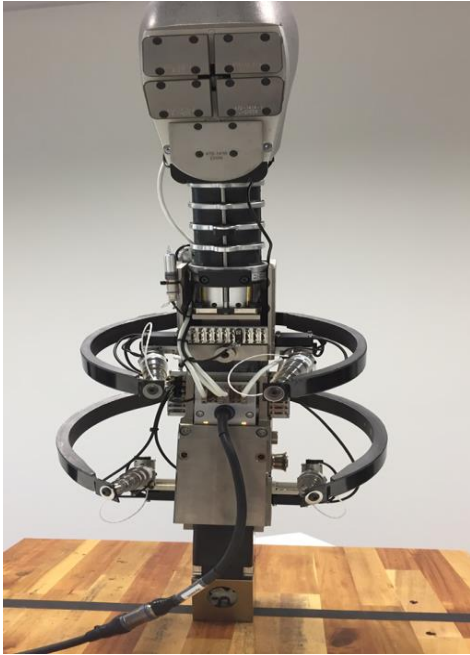
### 9° Degrees



### 12° Degrees

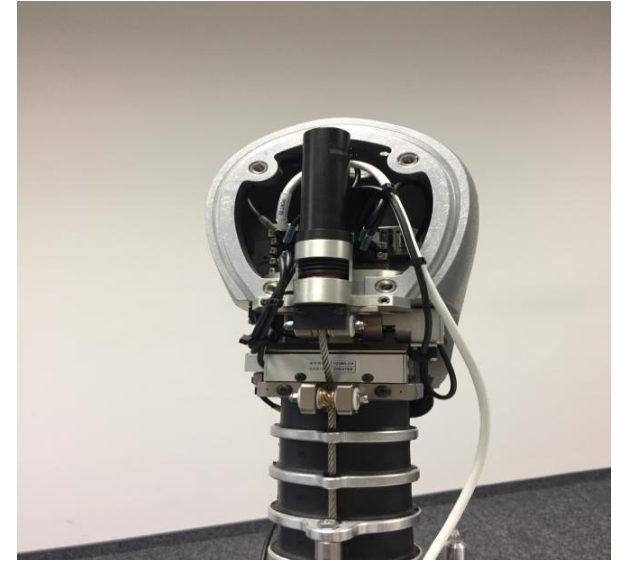
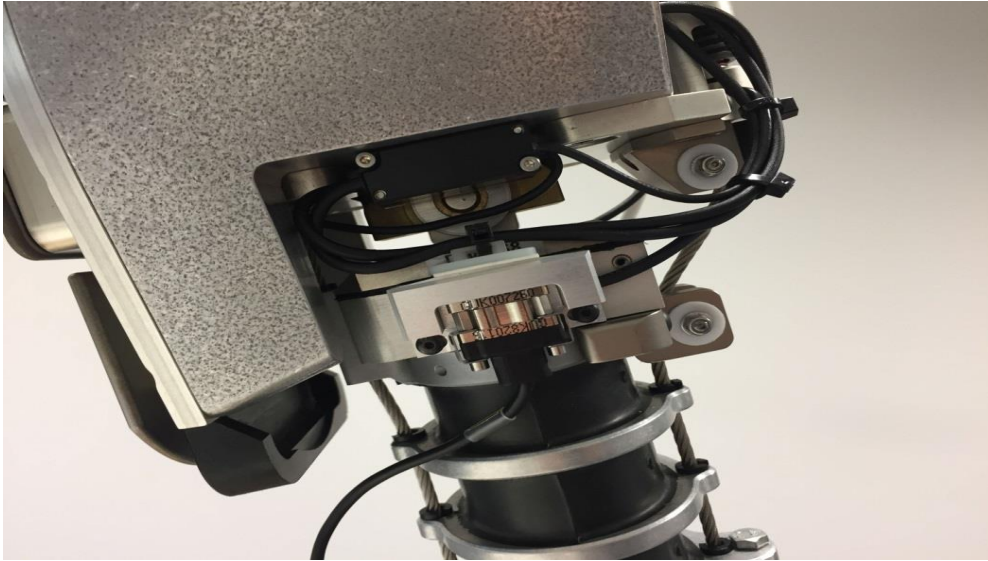


## Upgrade completed

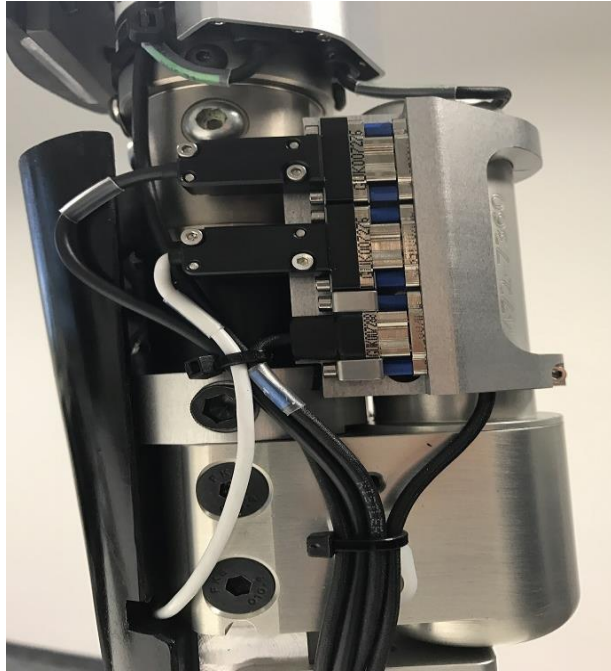




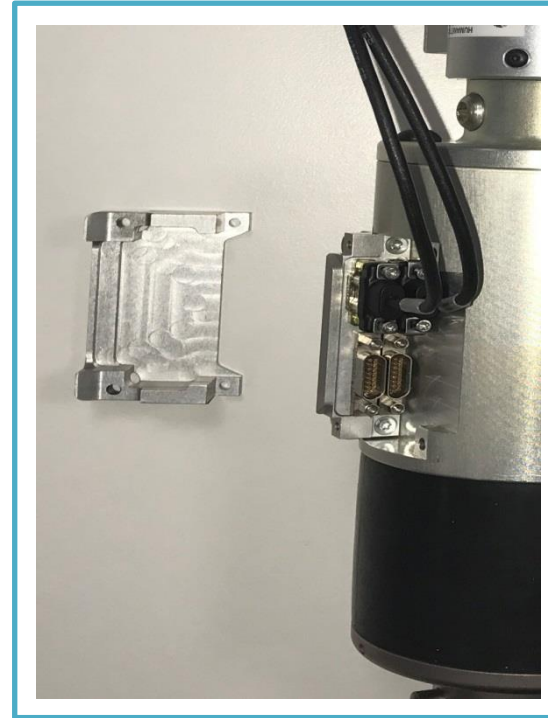
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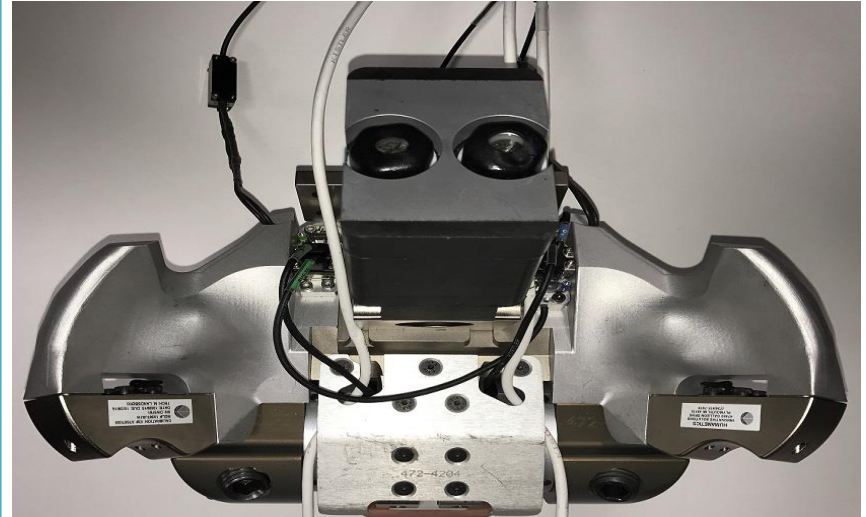
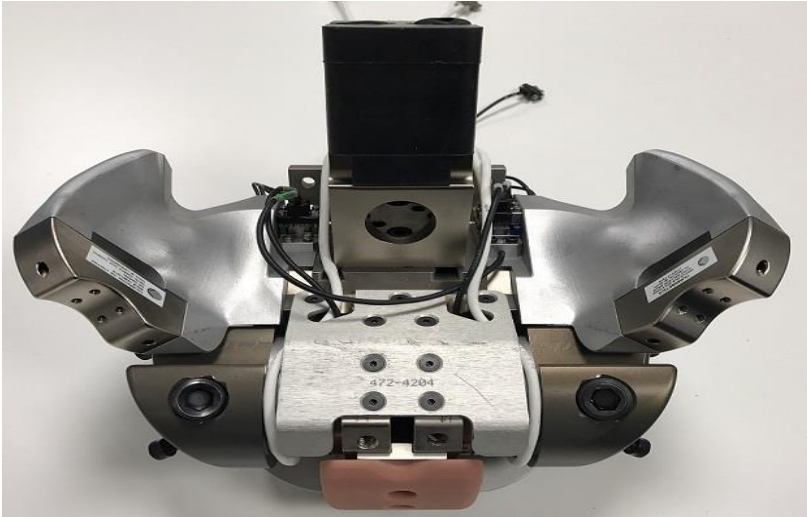
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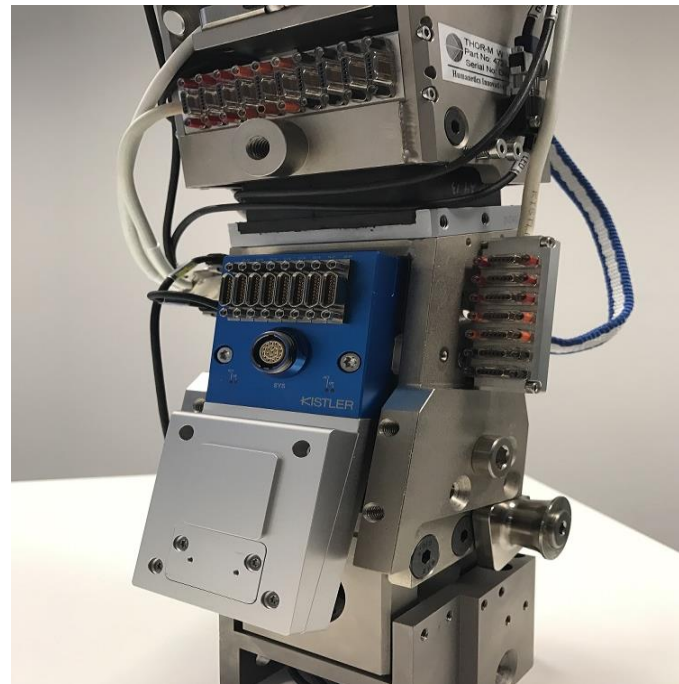
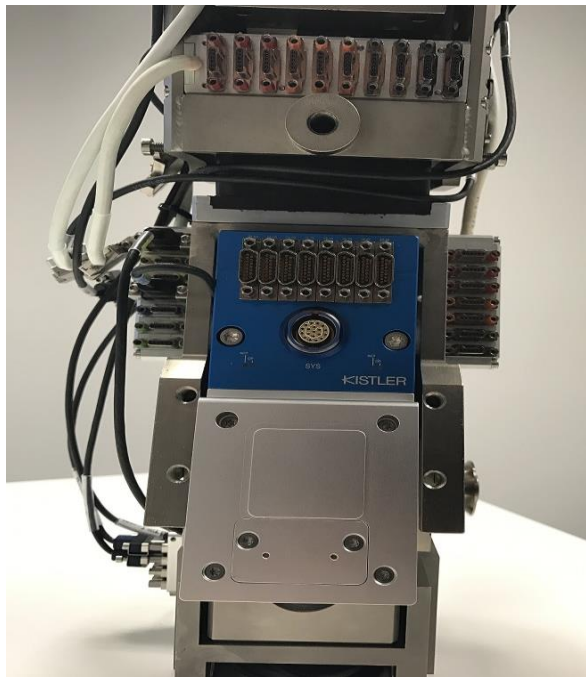
## Upgrade completed



## Upgrade completed

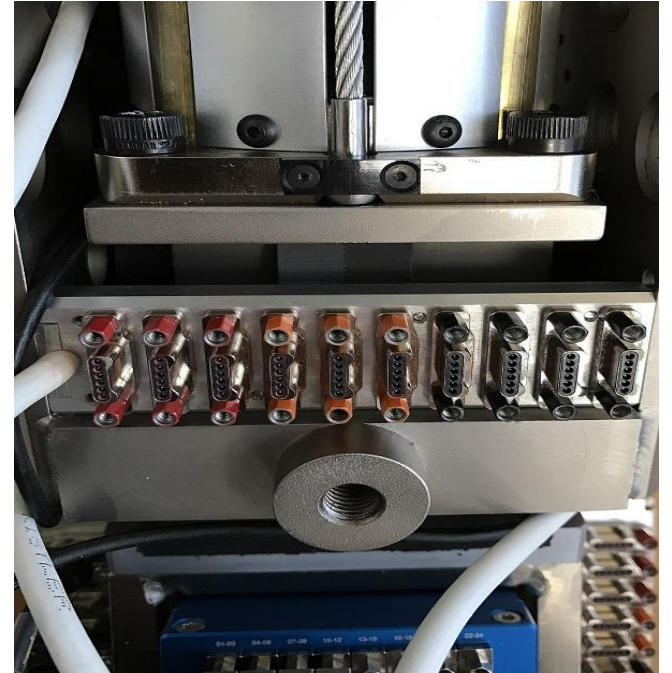


## Upgrade completed





## Upgrade completed



- High channel count configurations possible
- Easy separation of dummy segments due to clever bus concept
- Easy adaption of Hybrid III lower legs (EuroNCAP)
- One-operator spine angle adjustment
- 3 Dummies delivered, several integrations on order





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**Thank you very much!**

**Vielen Dank!**

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