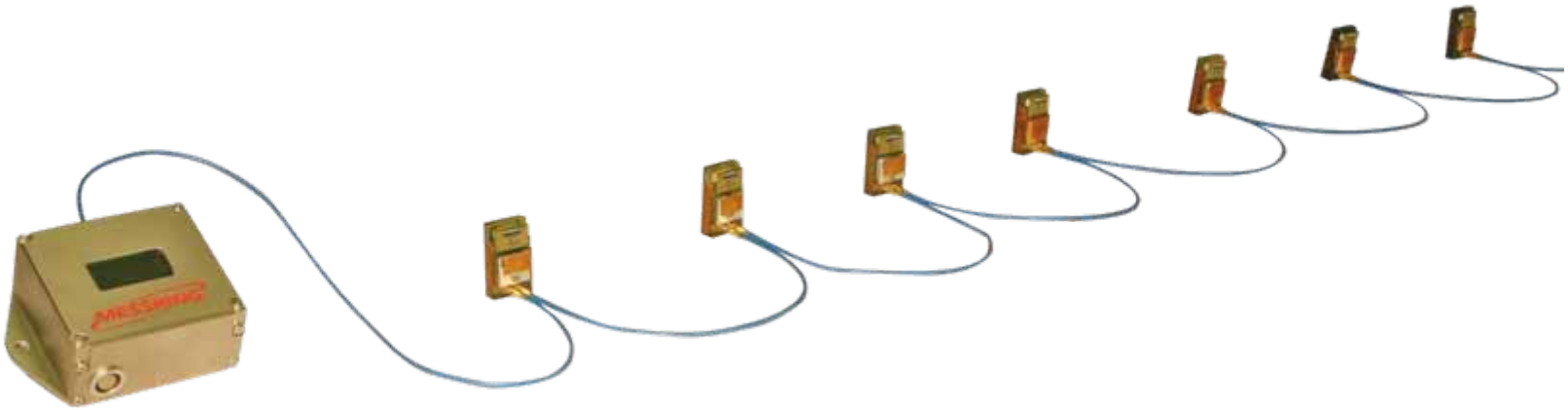
The M=BUS Concept



The next generation of shock proof data acquisition

presented file on February 20th 2008 meeting at

JARI 財団法人 日本自動車研究所 Japan Automobile Research Institute

Overview

1. M=BUS® Concept
2. Efficiency
3. Integration
4. Calibration
5. Summary

1. M=BUS Concept

Current situation in crash testing

- Strict standards and increasing requirements to the car safety
- Higher density of measuring locations in crash tests
- Need of more accurate measurements
- Reduction of transducer sizes
- Restrictions by connector sizes
- Higher effort of data management
- Complex wiring and analogue front end
- Complex database to manage sensor parameters

On-Board data acquisition

Load cell wall

… the M=BUS data acquisition fulfils the new demands…

Components & wiring

M=BUS simplifies the wiring!

Adaptor Plugs with soldering tags for the analogue sensor wires and necessary bridge completions.

Separable Adaptor PCBs

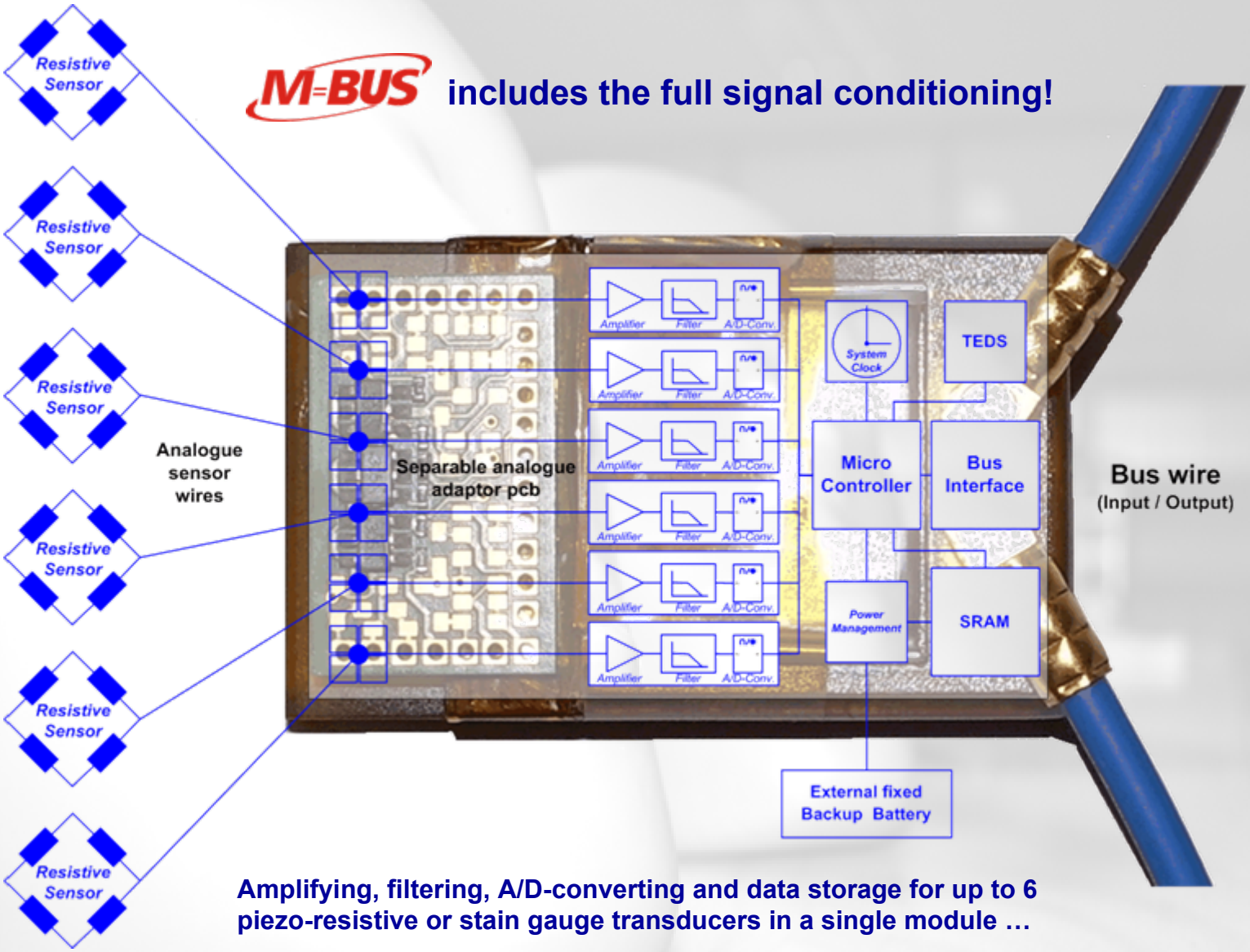
Shrinking length of analogue sensor cables due to locating the M=BUS® units near or in the transducers.

Daisy-Chain wiring of up to 32 participants with support of 6 channels each in one M=BUS® strand with high flexible 2.5mm diameter coax cables.

MMCX-Connectors for easy handling

Operating Scheme

M=BUS includes the full signal conditioning!

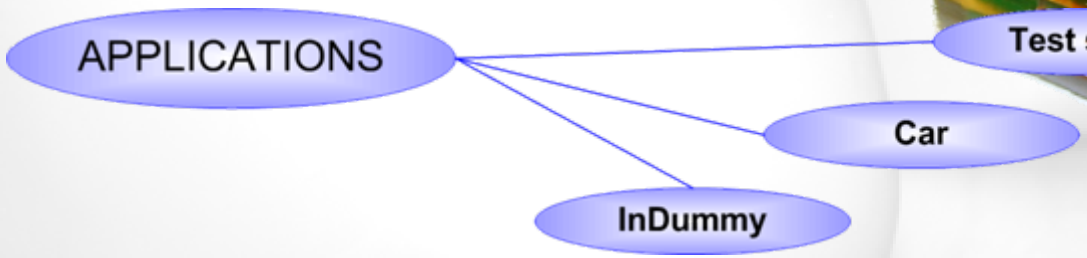


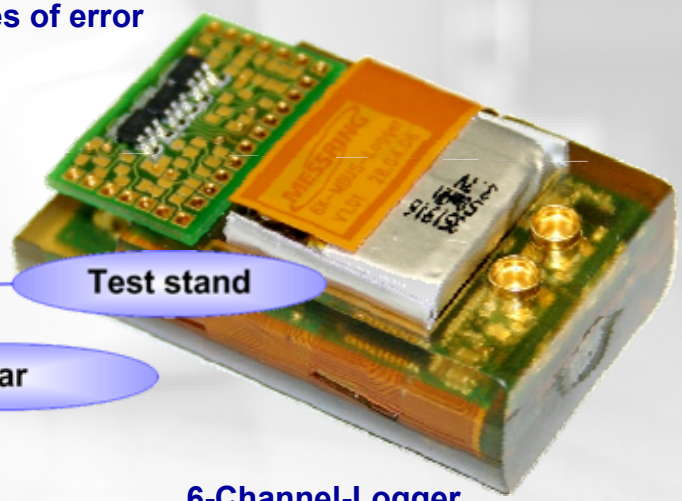
Amplifying, filtering, A/D-converting and data storage for up to 6 piezo-resistive or stain gauge transducers in a single module …

M=BUS is the miniaturized data acquisition system based on the MESSRING-BUS-Technology which enables power supply and communication via a single 2.5mm coax cable.

Benefit shortlist:

- Enormous miniaturisation of electronics
- Support of a sufficient amount of measuring channels for all applications
- System decentralisation (better heat and mass distribution)
- Simplification of wiring
- Minimization of disturbances by wiring and sources of error
- Prevention of failure and operating errors
- Well designed for a wide range of applications





6-Channel-Logger

Main System Components:

Hot Mold Logger 3C / 6C
(3 or 6 channels)

M=BUS® Ethernet Gateway

M=BUS® Terminator

Additional System Components:

M=BUS® USB Gateway

M=BUS® NA33 Gateway

M=BUS® Status display

M=BUS® Interface Triax Accelerometer

Components & wiring

M=BUS as a compact system!

Crash Analysis PC

Sensors in cars

Sensors in dummies

Trigger Source

Sensors in test stands

Sensors on sled

Power Supply *or* Battery Pack

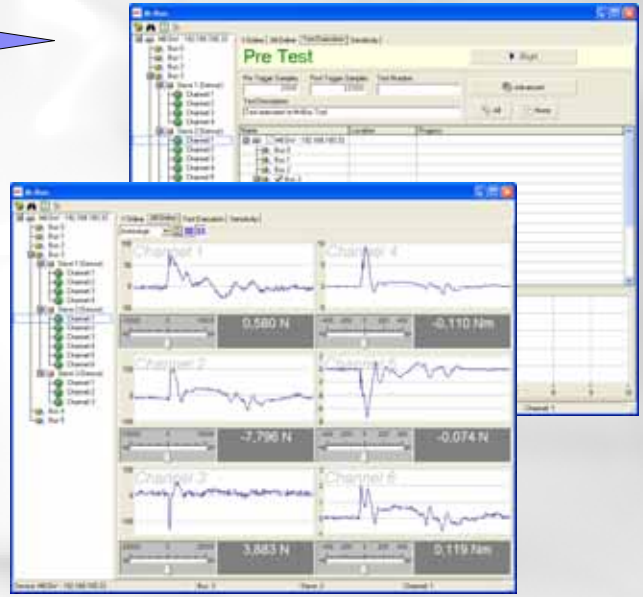
Direct connection to PC with support of up to 1152 channels.

Data Analysis

M=BUS - Ready for test!

Get started with the supplied M=BUS® Software Tool for the test execution:

- Sensor Check
- Online View
- TEDS Editor
- Test Preparation and Execution
- Data providing in ISO-files



Complete data analysis with the additional CrashSoft3® Package...

...and full compatibility to other data analysis software products.

Data loss prevention

M=BUS acquires the data autonomically!

External fixed Backup Battery with status monitoring by software.

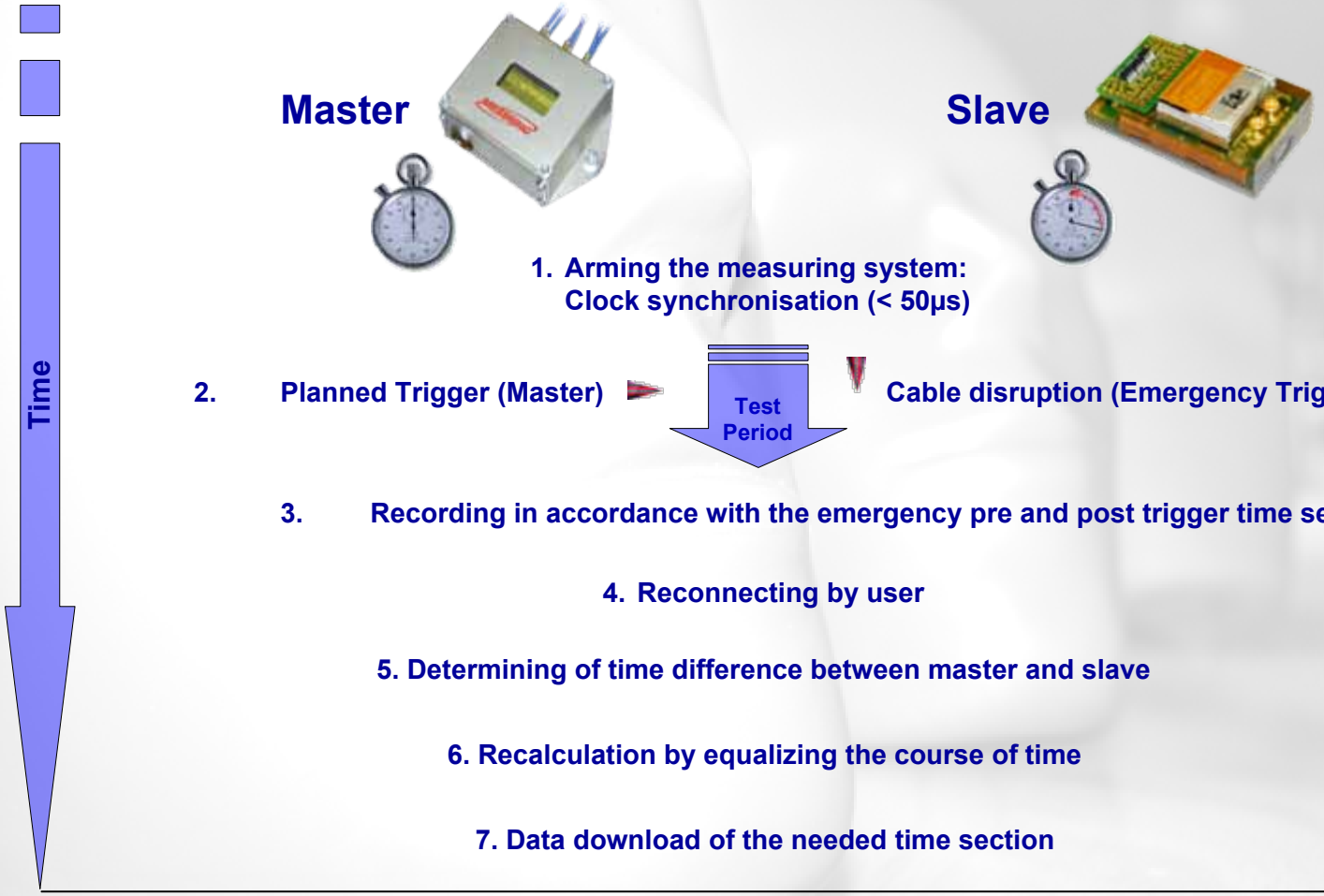
A integrated Backup System saves the data after cable disruption.

- Accidental interrupt (cable break)
- Interrupt on purpose (wireless operation)
- Automatic Trigger
- Data recording until memory is filled to capacity
- Reconnecting
- Data Download (automatic trigger time recalculation)
- Data recovery
- Stand-alone service

Data loss prevention

M=BUS synchronizes data and time!

Recalculation of the trigger time (t_0) realized by synchronized clocks in master and slaves:



Conformity

M=BUS meets the requirements!

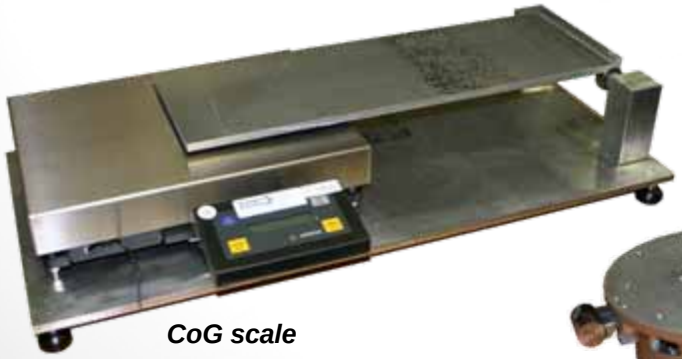
Proved compliance to SAE, ECE/EG, CFR, ISO and MISRA standards:

- Conformable Engineering
- Shock tests
- Sled tests
- Climate chamber tests
- Electronics check
- Electrostatic discharge test
- Mass property check
- Durability tests
- Software reliability research


HydroBrake sled test facility

Drop tower


Climate chamber


CoG scale

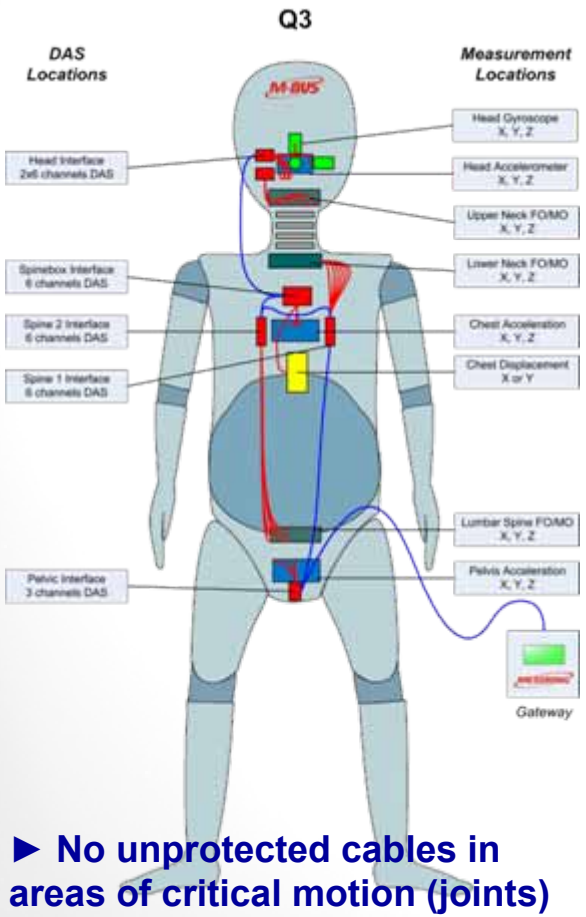

Oscillating table

2. M=BUS Efficiency

Efficiency

M=BUS - Technology ahead!

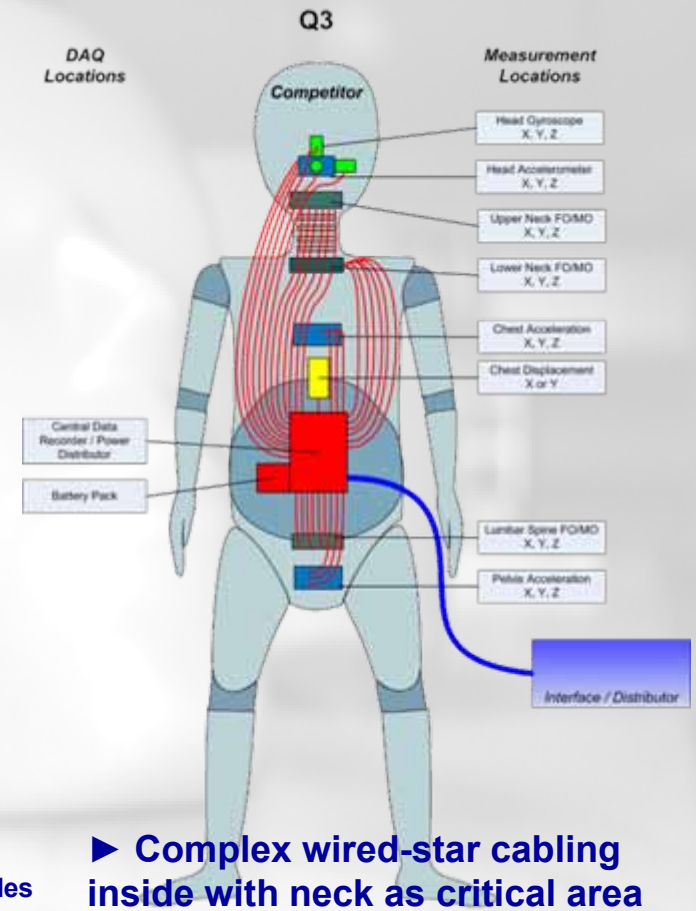
Decentralized M=BUS®



► No unprotected cables in areas of critical motion (joints)

Protected cables
Unprotected cables

Centralized systems



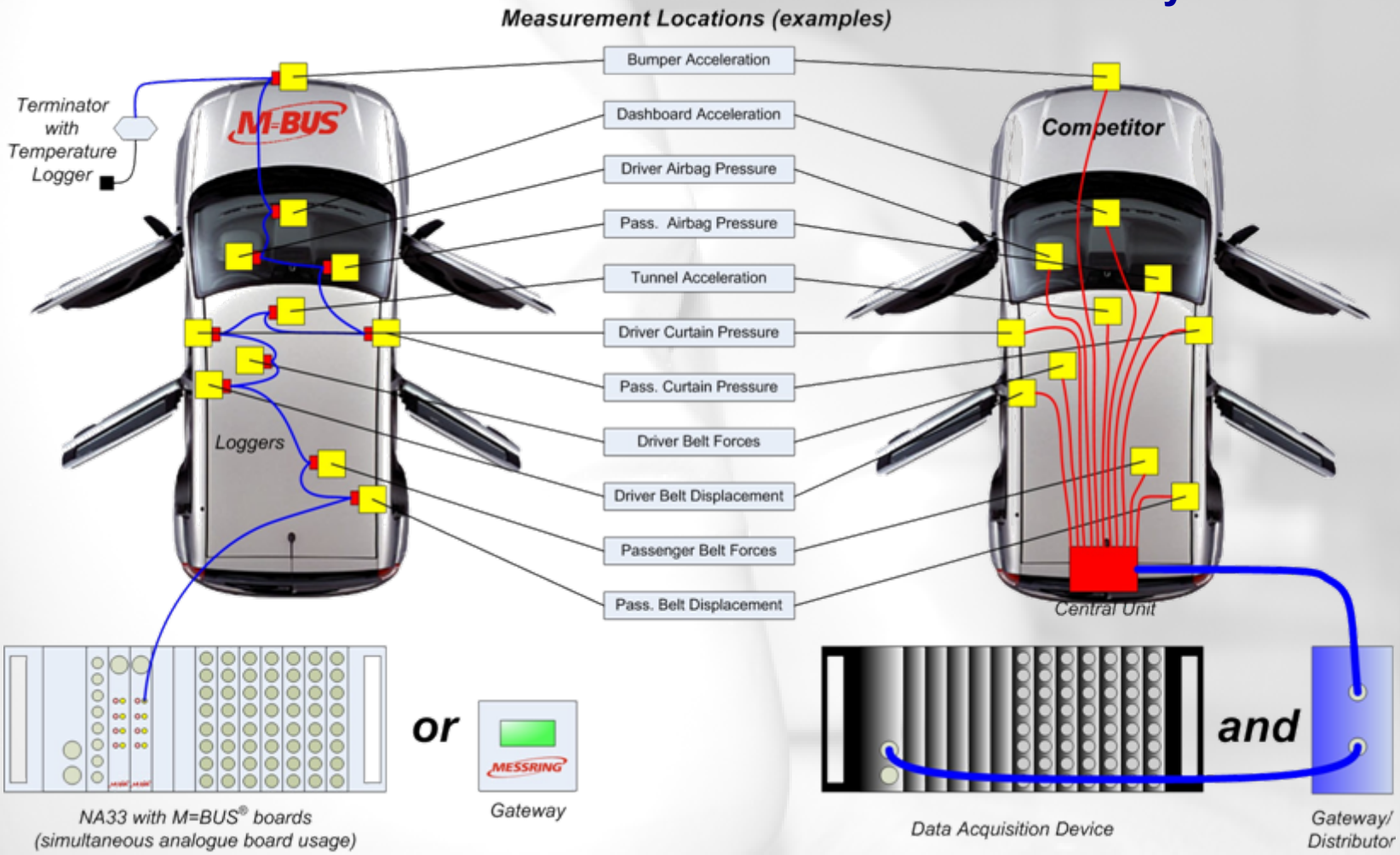
► Complex wired-star cabling inside with neck as critical area

MESSRING Since 1968

M=BUS - Technology ahead!

M=BUS®

Centralized systems



Protected cables
Unprotected cables

3. M=BUS Integration

M=BUS - The Closer Look:

Hybrid III Family

ES2

Q-series

Adaptation:

- Standard dummy parts
- No modifications
- Balanced component masses
- Balanced centers of gravity
- Adapted Moments of Inertia
- Protected Wires (cable routing inside the structures, joints bridged by M=BUS®)

Hybrid III – 5th percentile female

M=BUS Head Interface

??HEAD0000HFACX?
??HEAD0000HFACY?
??HEAD0000HFACZ?
??NECKUP00HFFOX?
??NECKUP00HFFOY?
??NECKUP00HFFOZ?
??NECKUP00HFMOX?
??NECKUP00HFMOY?
??NECKUP00HFMOZ?

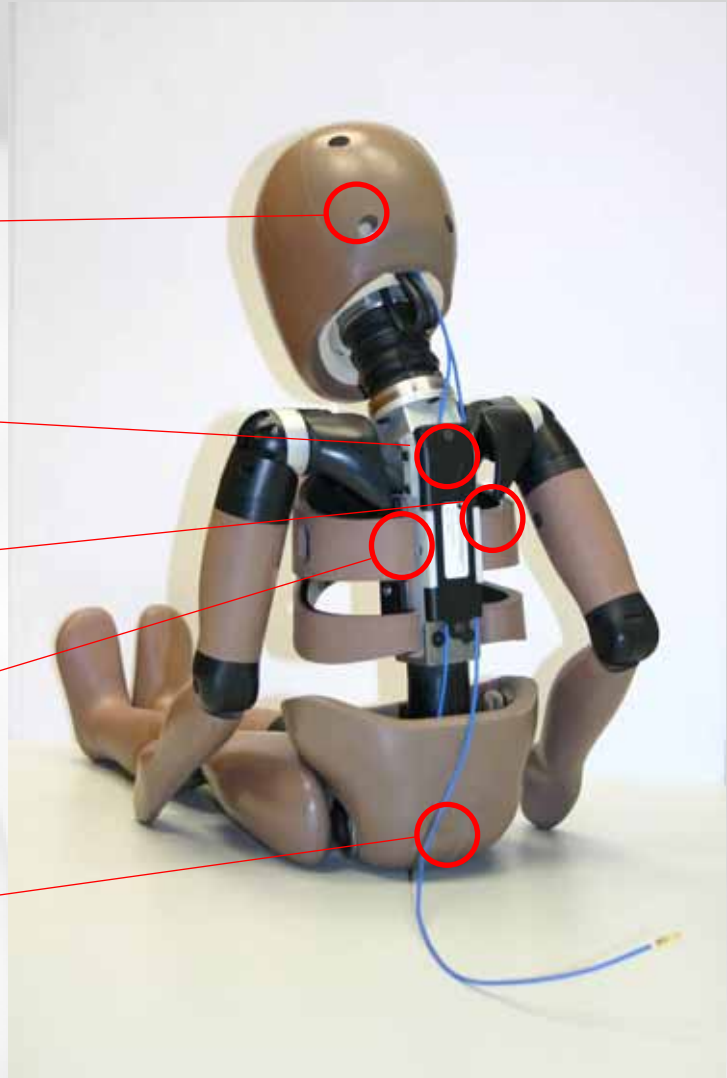
Extensible to:

??HEAD0000HFAVX?
??HEAD0000HFAVY?
??HEAD0000HFAVZ?

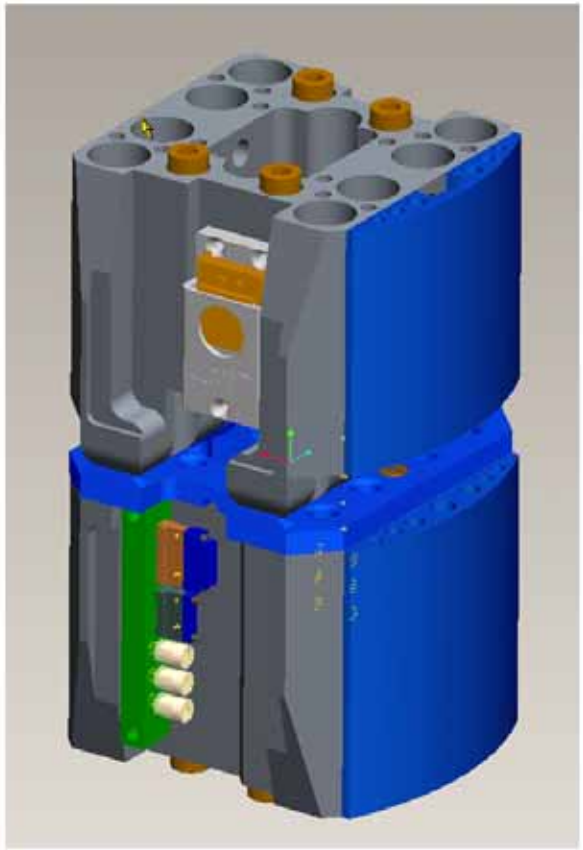
MESSRING Since 1968

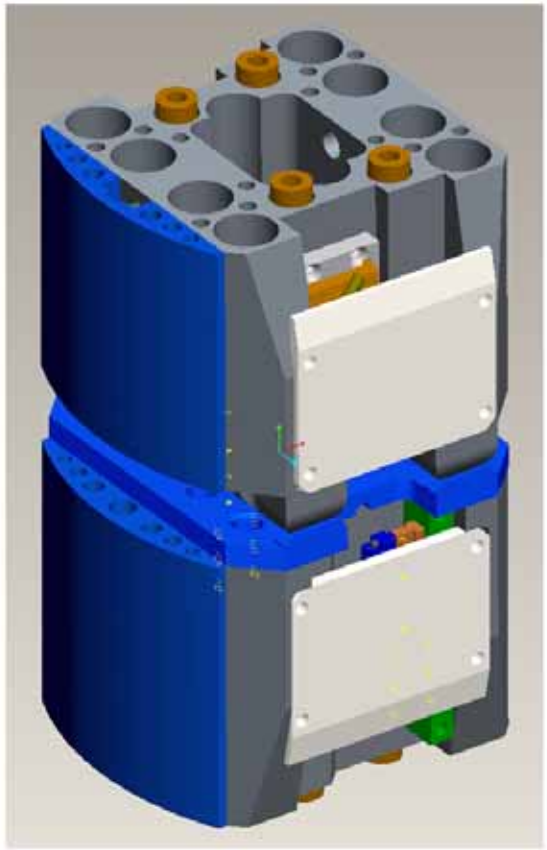
M=BUS - Interfaces:

1. Head Interface Q3
2. Spinebox Interface Q3
3. Spine 1 Interface Q3
4. Spine 2 Interface Q3
5. Pelvic Interface Q3



Body Form: Flex PLI

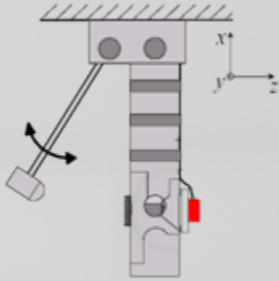




- 2 M=BUS Logger with 12 channels
- Wireless operation with M=BUS tear off connector

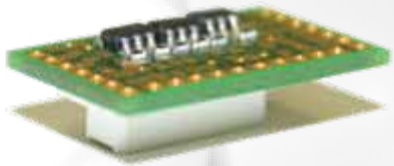
4. M=BUS Calibration

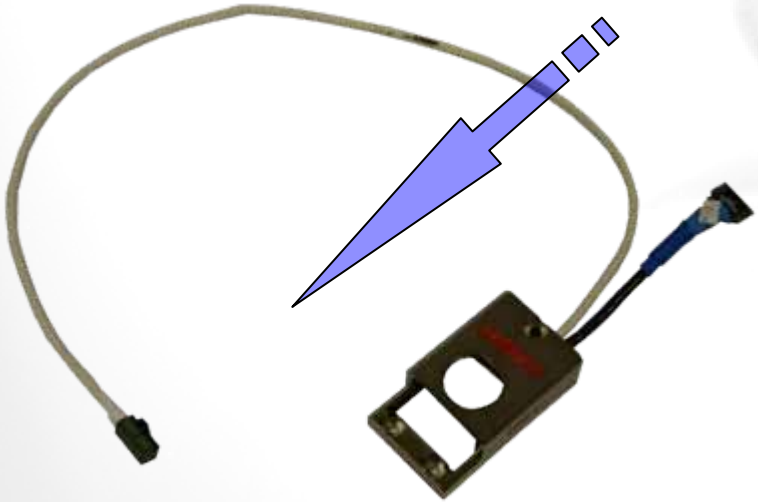
MESSRING Since 1968



Separate Calibration of Sensor and Data Acquisition

Separation of Sensor and Logger with adapter PCB

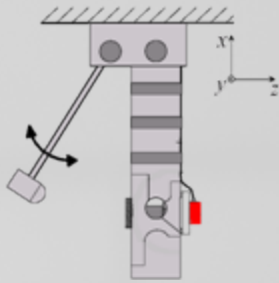




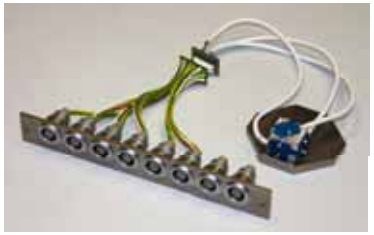
Analogue Sensor Calibration

Voltage Calibration

Sensor – DAS – Calibration

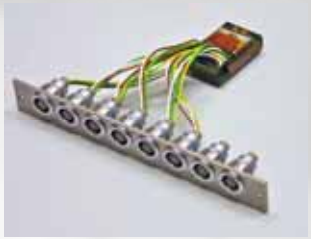


Analogue Sensor Calibration



Connection of Sensor with LEMO-Adapter to conventional Calibration System

Voltage Calibration of Data Acquisition



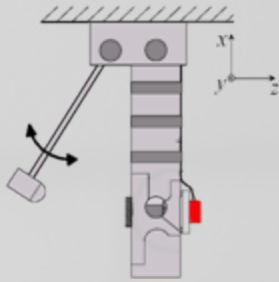
Connection of Logger with LEMO-Adapter to conventional Calibration System

Manual Input of Calibration Data into electronic data sheet (TEDS)

Report Sensor Calibration

Report DAS-Calibration

Common Calibration of Sensor and Data Acquisition



M=BUS®-Sensor-Module

10101010

Analog Reference Sensor

Data Acquisition System

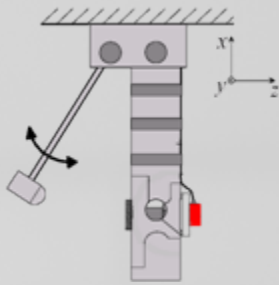
CrashSoft3®

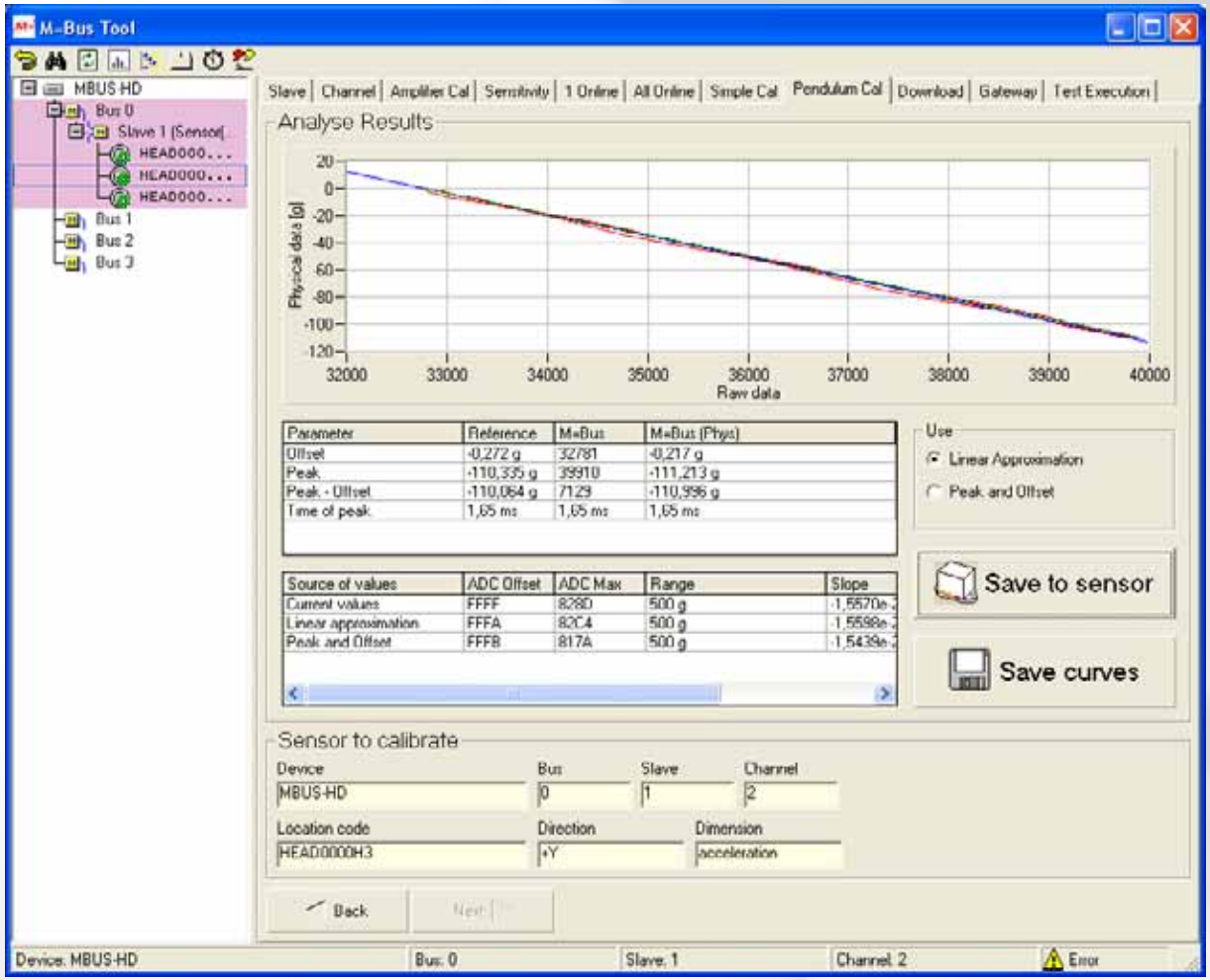
Sensor Calibration Software

Report

M=BUS® - Calibrierung

Software for M=BUS®-Calibration





5. M=BUS Summary

User's benefits

M=BUS simplifies work!

- More freedom in wiring (Daisy-Chain)
- Quicker maintenance and test preparation (One-wire-bus connectors)
- Easier dummy equipping and full reversibility (no structure modification)
- Less faults (user oriented development)
- More security (backup system)
- More flexibility (spectrum of applications)
- Fast simultaneous download
- Less effort in data management (TEDS and software organisation)
- Analogue as well as digital sensor calibration
- Less costs per channel (efficient concept)

The End

???

Thanks for your attention!!!