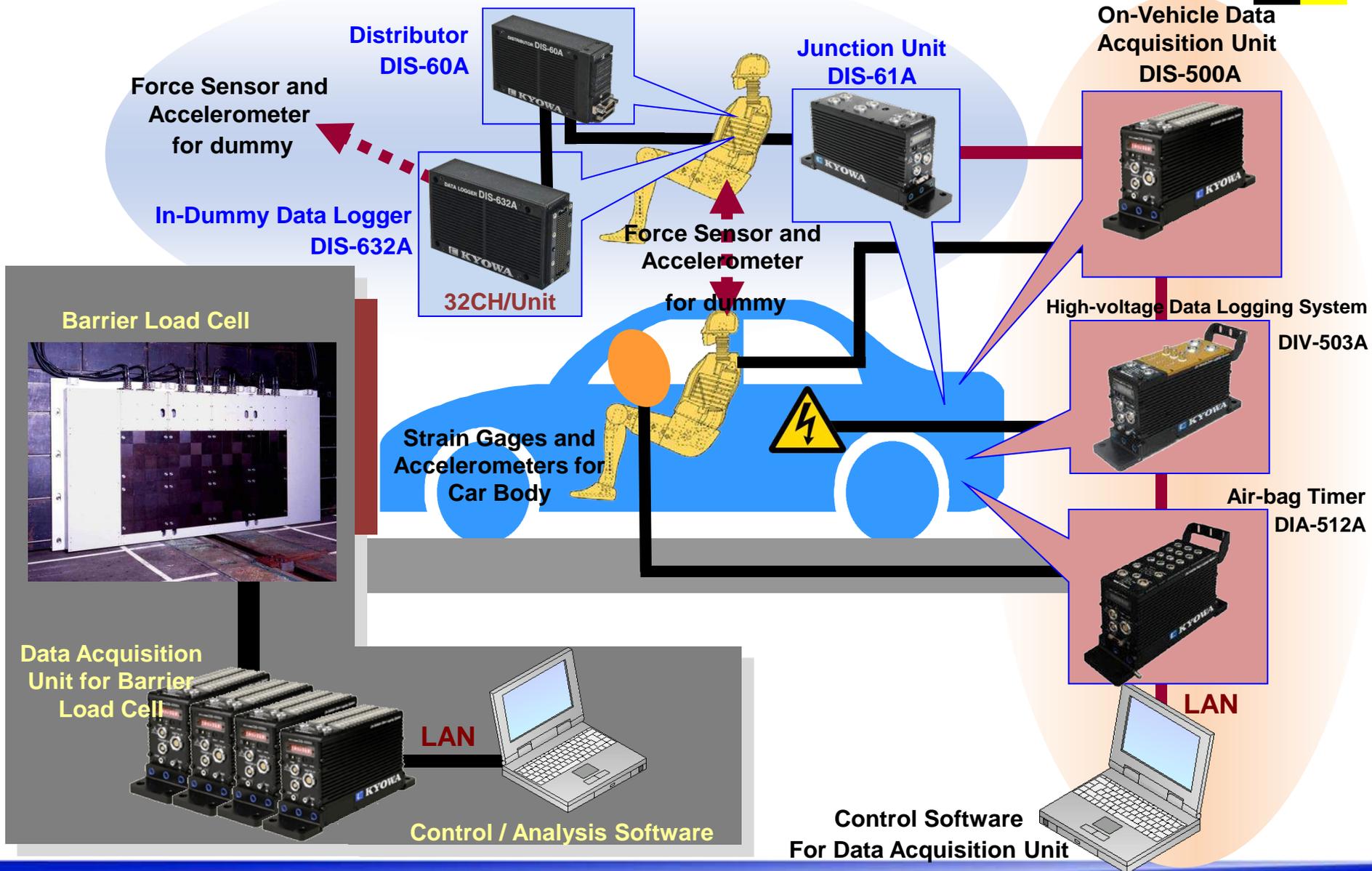
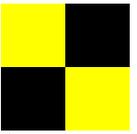


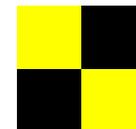
Applications & Products Overview for **Automobile Testing**



Comprehensive Block Diagram Crash Test Measurement System 1

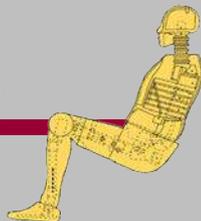
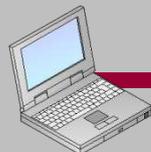


Comprehensive Block Diagram Crash Test Measurement System 2



Dummy Calibration

Data Acquisition Unit
DIS-5210A

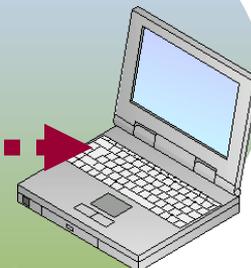
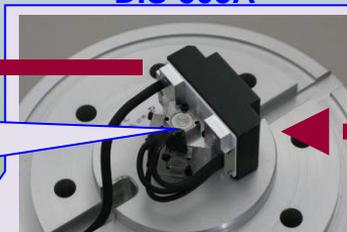


8CH/Unit

Pedestrian Head Protection Performance Test

Damped Accelerometer
ASE-A

Miniature Data Acquisition System
DIS-503A



Head-form Impactor

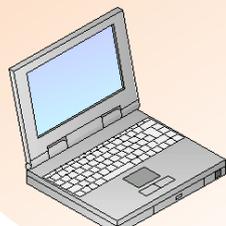
3CH/Unit

Control Software
for Data Acquisition Unit

Pedestrian Leg Protection Performance Test

Pedestrian Leg-form Impactor,
FLEX-PLI-GTR

Miniature Data Acquisition System
DIS-506A



Control Software for Data Acquisition Unit



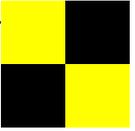
6CH/Unit



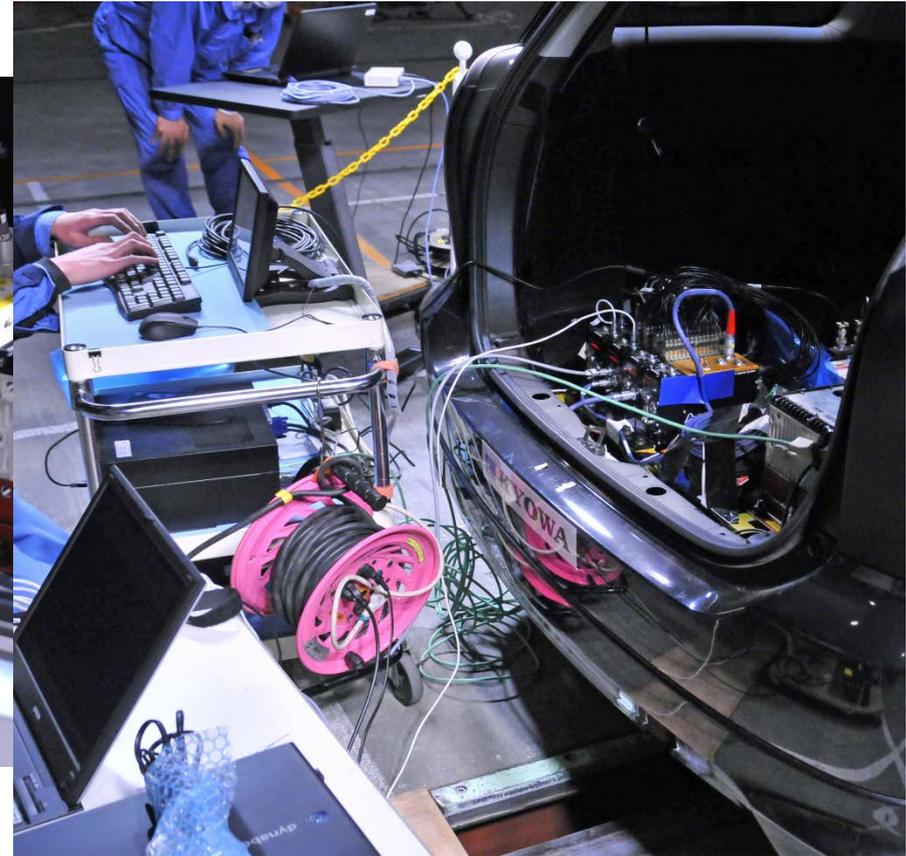
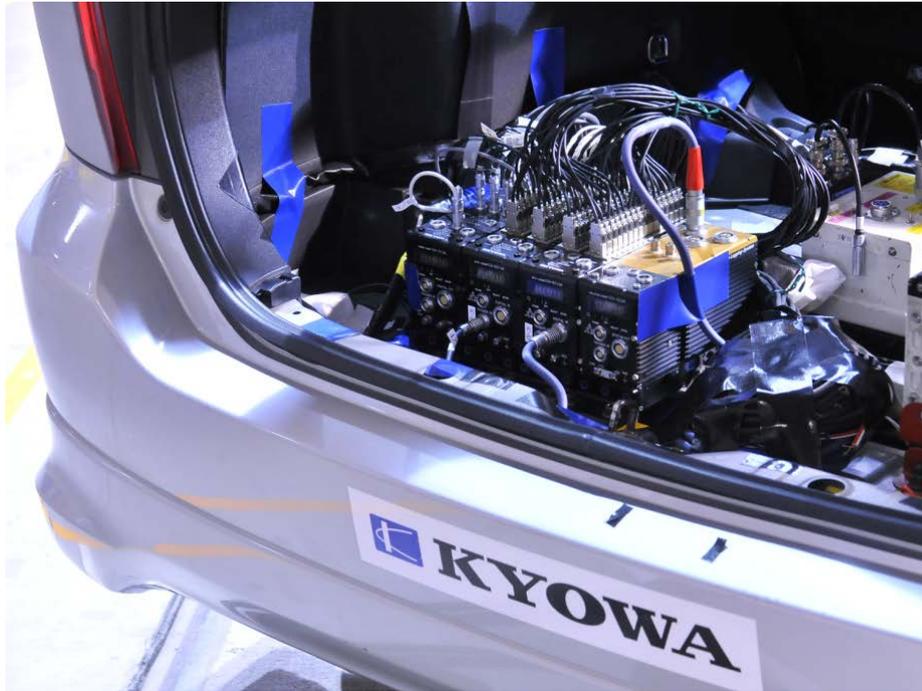
Damped Accelerometer
ASE-A



Pedestrian Protection Performance Test

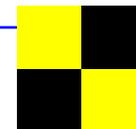


In case of full-scale automobile testing



In case of full-scale automobile testing, setting measuring condition and data retrieve is using PC which is connected temporarily.

Photo by courtesy of National Organization for Automotive Safety & Victims' Aid



On-Vehicle Data Acquisition Unit

Compact On-Vehicle Data Acquisition Unit for Automobile Crash Test

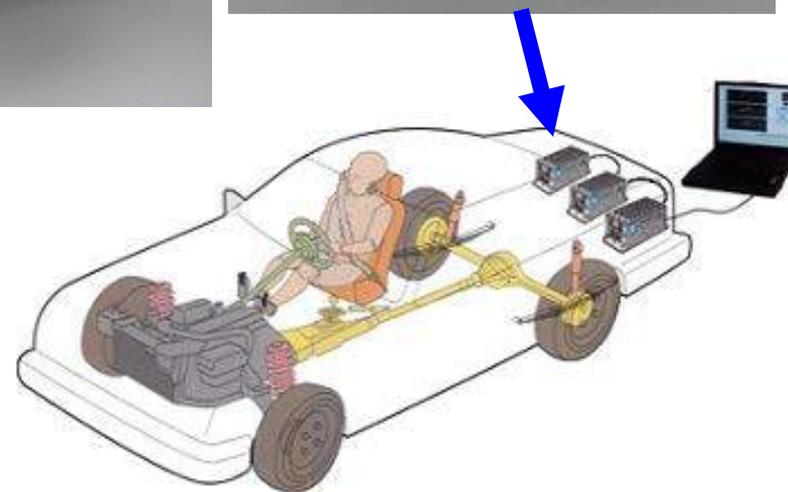
DIS-5010A

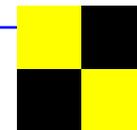
- ◆ Compact, light weight
- ◆ Max. 100kHz sampling
- ◆ 32ch/unit, Expansion of unit is available (without cable)
- ◆ Provide TEDS(IEEE1451-4) function
- ◆ Highly shock-resistant, lightweight
- ◆ Built-in Battery

compact size



LEMO 1B type





On-Vehicle Data Acquisition Unit

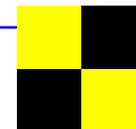
Compact On-Vehicle Data Acquisition Unit
for Automobile Crash Test

DIS-5010A

compact

Max.6un
Direct connection



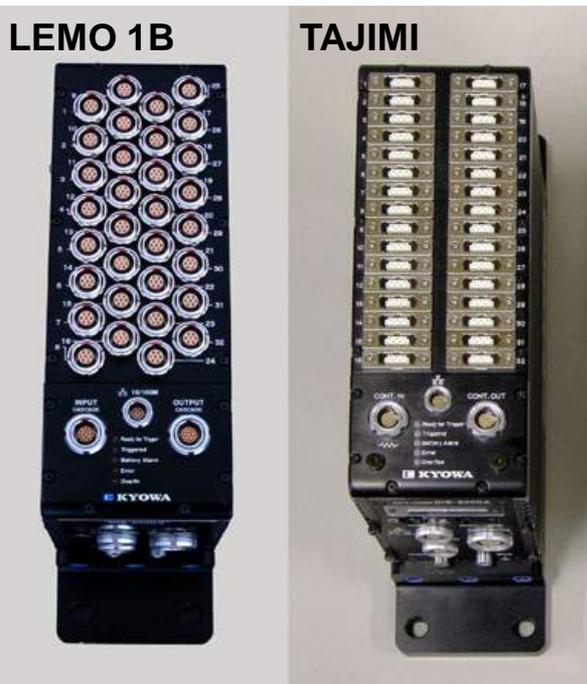


On-Vehicle Data Acquisition Unit

Compact On-Vehicle Data Acquisition Unit
for Automobile Crash Test

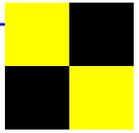
2 types
connector

DIS-5010A DIS-5000A



Display
function





Air-bag Timer (Airbag firing unit) DIA-512A

A trigger signal lets it output airbag firing current after a preset delay time.

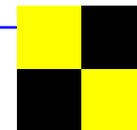
The firing current level and output duration can be set channel by channel.

- **Small and light weight (the same size as DIS-5010A)**
- **The ignition current value and the current output time of each channel can be set.**
- **The state of the ignition current can be recorded in an internal memory.**
- **Current output timing of each channel and synchronizing digital signal.**
- **Provide LED indicator and display the character for the state display function.**

Cable clamp



12ch outputs



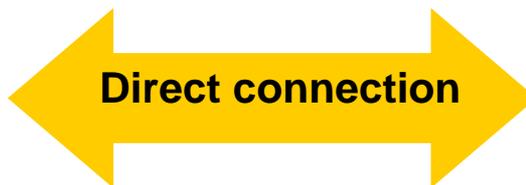
On-Vehicle Data Acquisition Unit

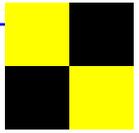
DIS-5010A



Air-bag Timer (Airbag firing unit)

DIA-512A





On-Vehicle High-voltage Data Logging System DIV-503A

The crash data-logger for high voltage electric signals used in Electric Vehicles (EV) and Hybrid Electric Vehicles (HEV)



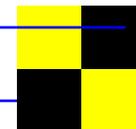
- High voltage measurements, $\pm 500\text{VDC}$
- Long term recording, Approx. 62sec@20 kHz sampling
(Approx. 8hours@100 Hz sampling)
- Frequency response: DC ~ 1 kHz
- Number of measurement channels : 3
- Maximum sampling frequency: 20 kHz



The unit is rated to withstand up to $980.7\text{m/s}^2(100\text{g})$.

Crash Test Measurement System

In-Dummy Data Acquisition System



In-Dummy Data Logging System DIS-632A



32CH/Unit

Designed to install into impactors, crash test vehicle, and dummy to acquiring impact test data.

This can synchronize trigger signal with on-vehicle DIS series data-logger and DIA airbag timer.

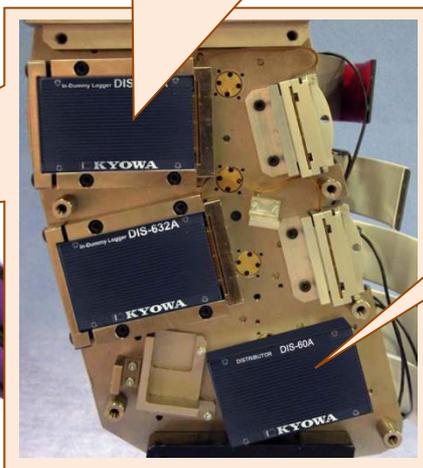
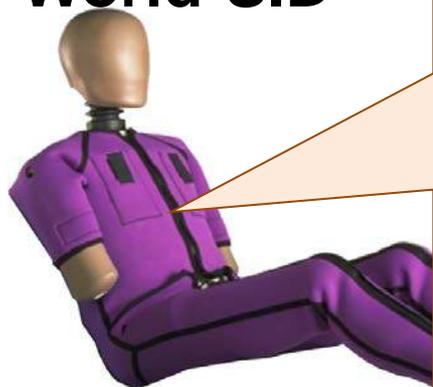
Distributor
DIS-60A



Junction Unit
DIS-61A



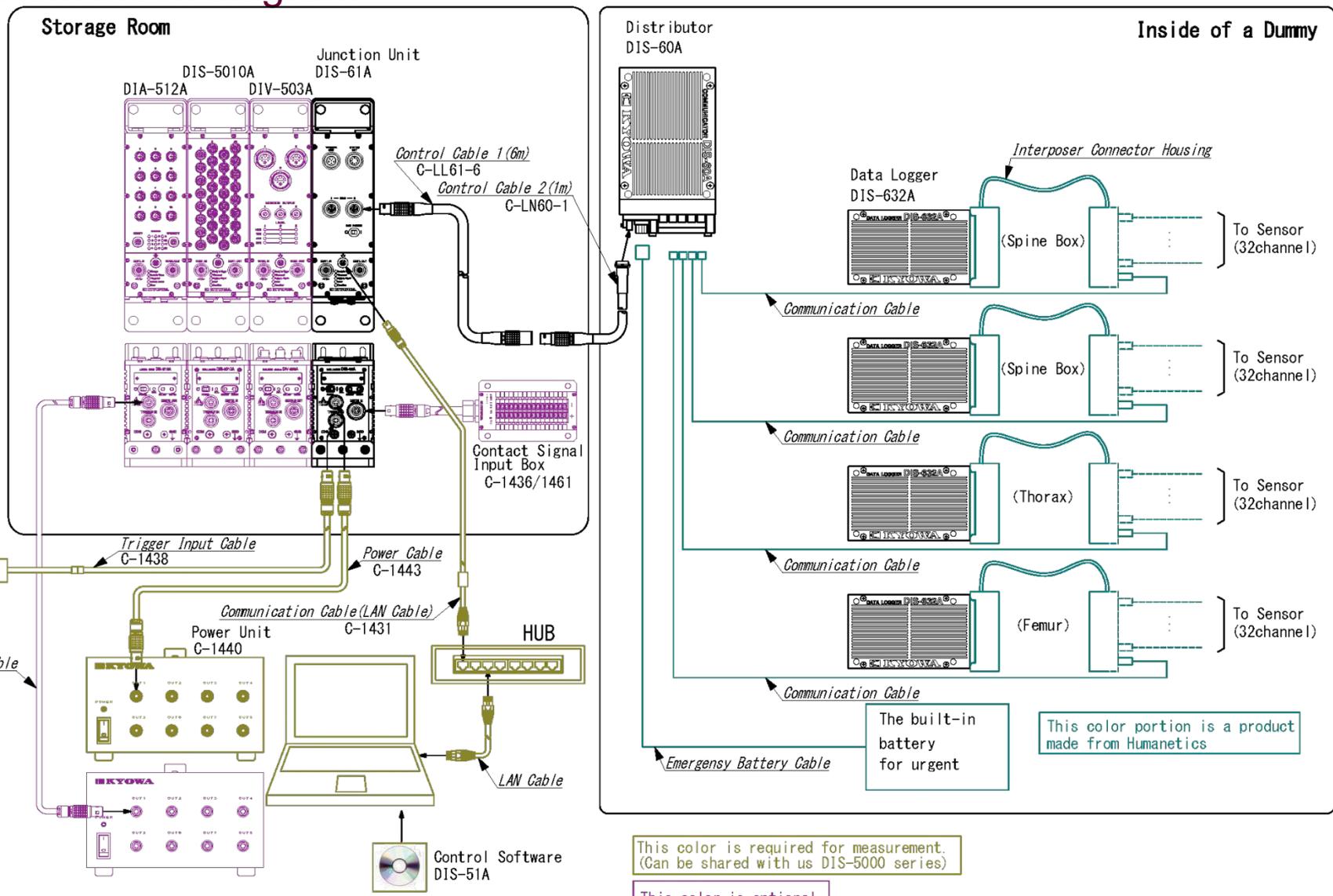
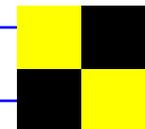
World-SID

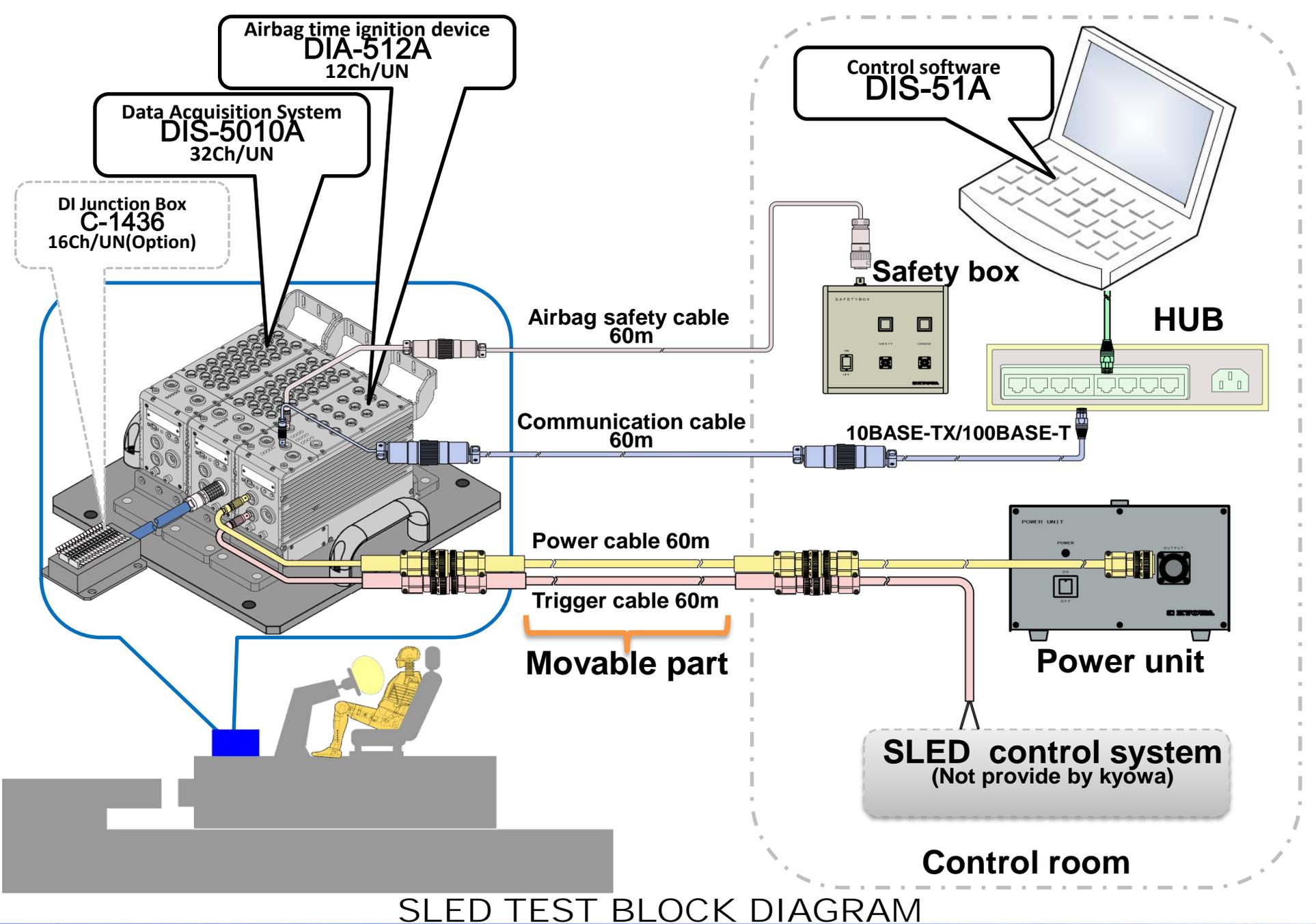


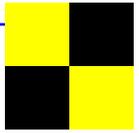
Crash Test Measurement System

In-Dummy Data Acquisition System

System block diagram







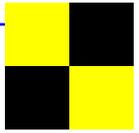
Barriers Force Sensor for car crash test



◆ This 160-channel force sensor array mounts directly on the front barrier wall to measure Impact force distribution.



◆ Each force sensor consists of strain gage-based load cell, and measure impact forces.



Force Sensor Matrix for Frontal Barrier

Impact force distribution measure at car crash testing



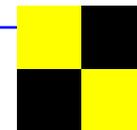
Each sensor unit can offer various rated capacities.

2 or 3 components force sensors are available.

124X124mm



Force Sensor Unit



Offset Deformable Barriers

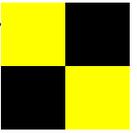
- 48 Force Sensor Matrix for Frontal Offset Barrier



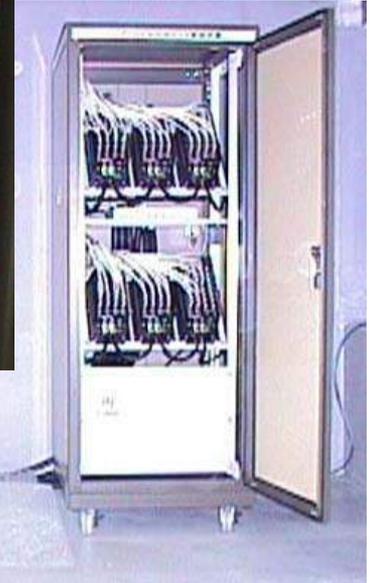
This 48 force sensor matrix is designed for installation on an Offset Barrier Frame. Each of 48 sensor units consists of a strain gage type 124mmX124mm load cell to evaluate compatibility.

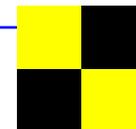
This 4 force sensor matrix consists of a strain gage type 3- component load cell.





Data Acquisition System for Barrier Load Cell



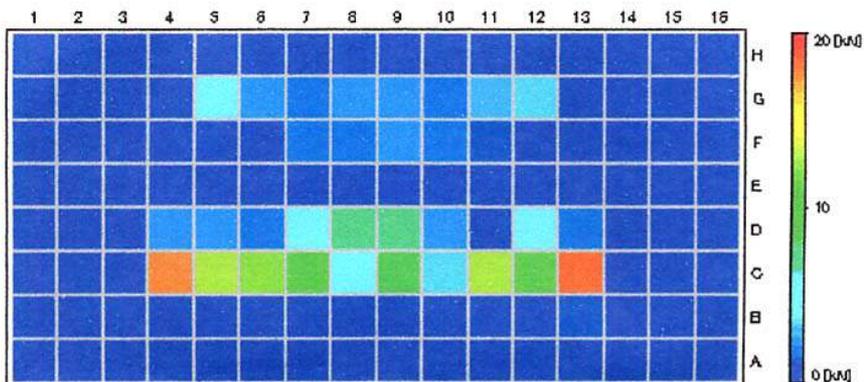


Analysis and Control Software for Force Sensor Matrix

Distribution Graph

Test Name : Test data 01
Test Date : 2001/12/05

Time : 11.5 [msec]



Load Distribution Graph

Identifies the values detected by all load cells by applying proper coded-colors to cells on the matrix pattern.



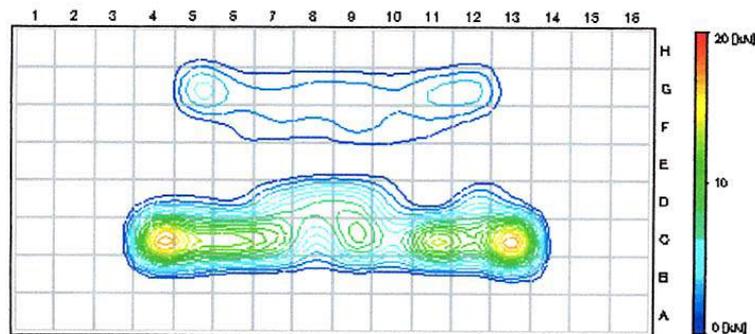
Contour Map

Plots the values detected by all load cells on the isobaric force graticule.

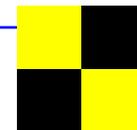
Contour Map

Test Name : Test data 01
Test Date : 2001/12/05

Time : 11.5 [msec]

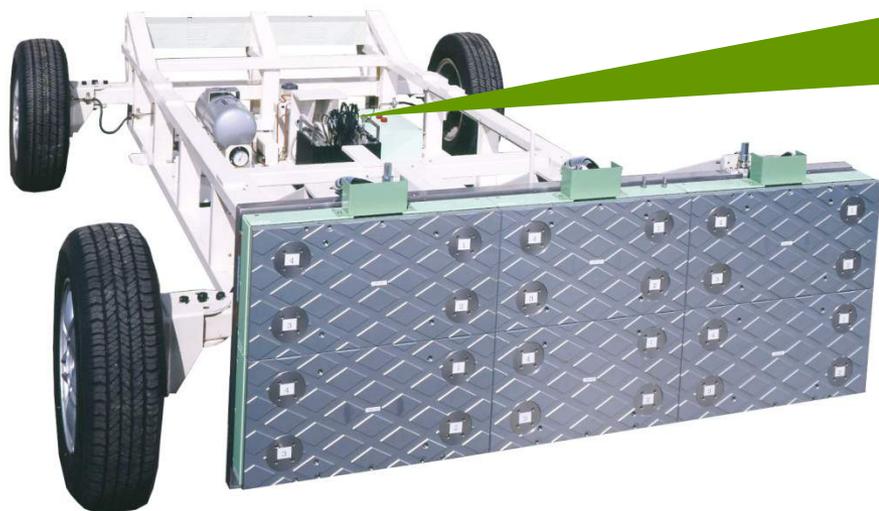


CONTOUR: MIN=0 [kN], MAX=20 [kN], WIDTH=1 [kN]



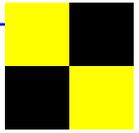
Moving Deformable Barrier Matrix for Side Impact Test

This 3 force sensor matrix is designed to be mounted to an impact giving cart. Each load cell contains 3-component force sensor with rated capacities of 100, 50 and 50kN or 50, 20, and 20kN.



Applicable carts:

FMVSS Cart / All Honeycomb (FMVSS / ECE / IIHS)
ECE Cart / All Honeycomb (FMVSS / ECE / IIHS)
IIHS Cart / All Honeycomb (FMVSS / ECE / IIHS)



Off-Vehicle Data Acquisition System

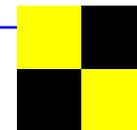
For Dummy calibration, Pedestrian testing and component testing



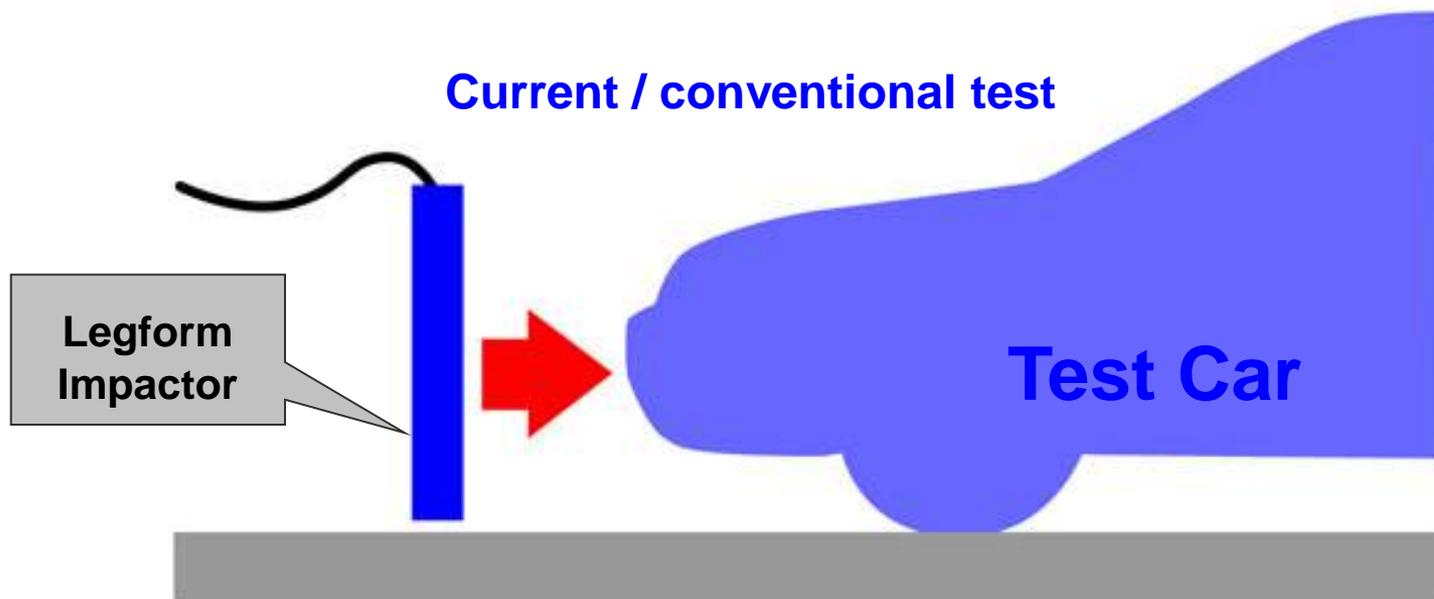
◆ **8ch / Unit,
Expansion is available
by cascade connection**

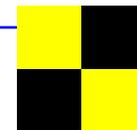
DIS-5210A





Pedestrian Leg Protection Performance Test





Miniature Data Acquisition System

KYOWA6

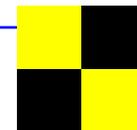


← FLEX-PLI (Pedestrian Leg-form Impactor)-GTR

Install 4-units of
DIS-506A into FLEX-PLI
to make 24channel
Measurement.

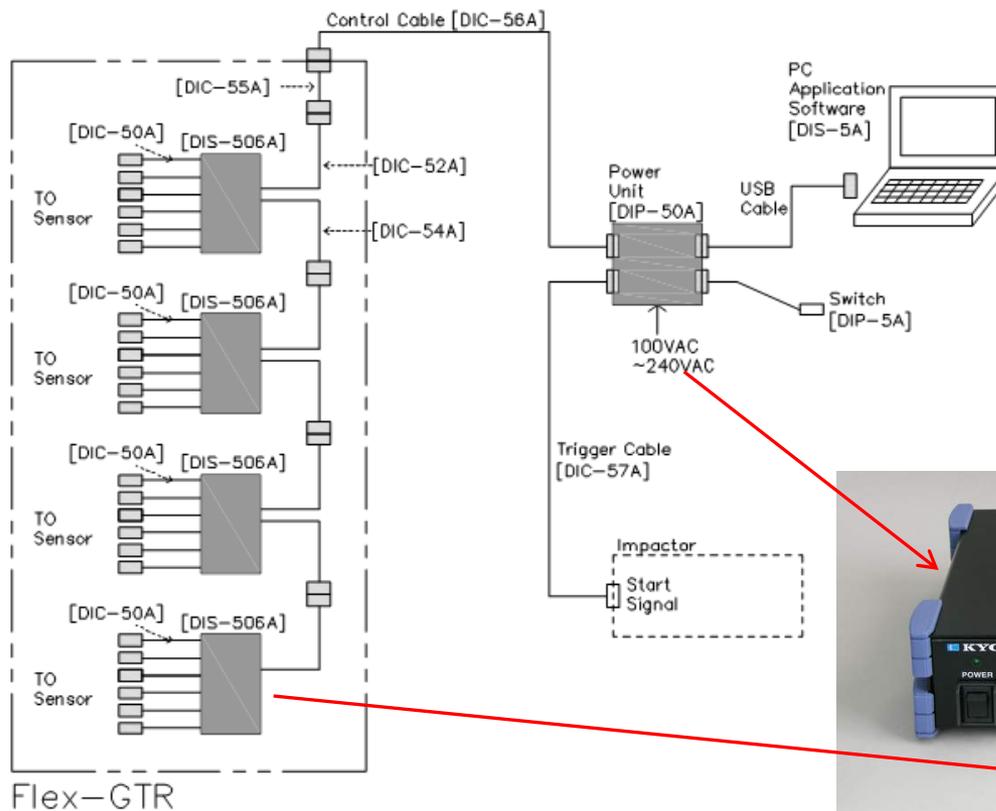


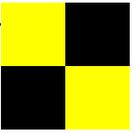
**Achieve cable-less
testing**



Miniature Data Acquisition Unit KYOWA6

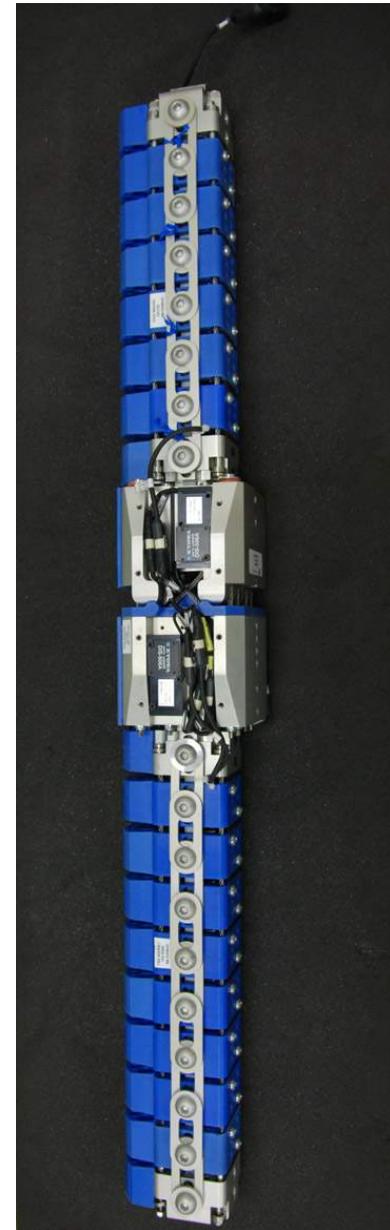
Flex-GTR Measurement System

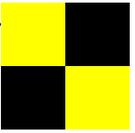




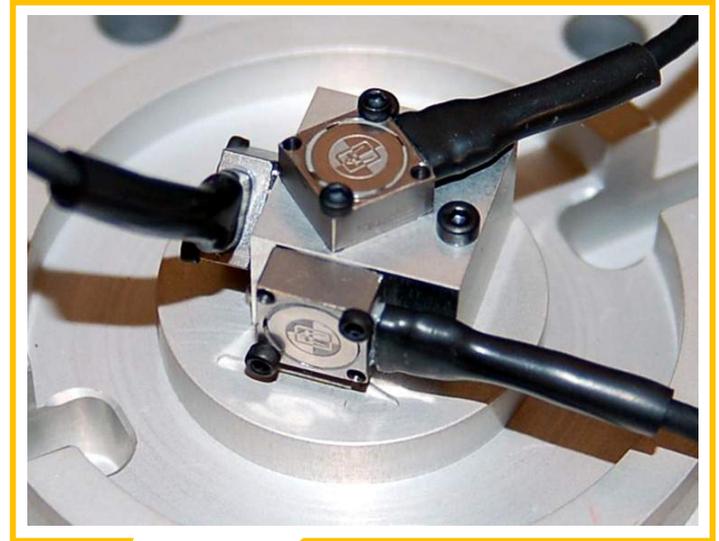
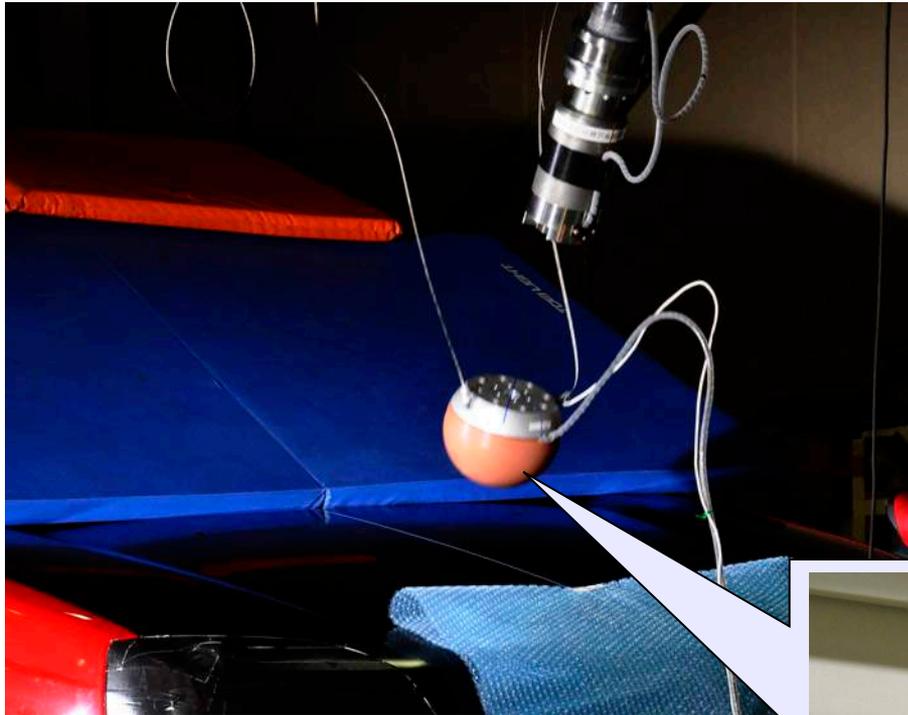
Features of Data Acquisition Unit DIS-506A

- ◆ Each unit has built-in battery
- ◆ High speed data transfer by USB 2.0
- ◆ Provide TEDS (IEEE1451-4) function
- ◆ Maximum sampling speed: 150kHz
- ◆ Cable outlet direction is selectable

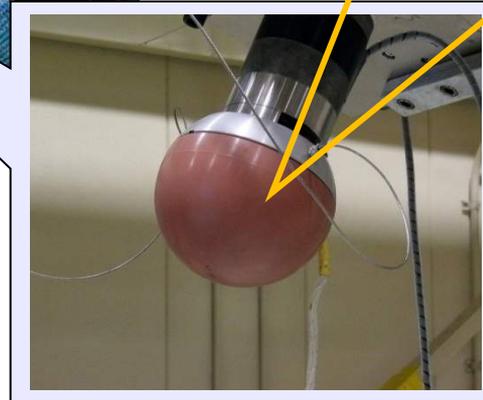




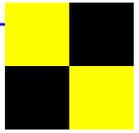
Current / conventional test



ASE-A mounted on
Three Axis Bracket



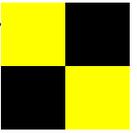
DIS-5210A



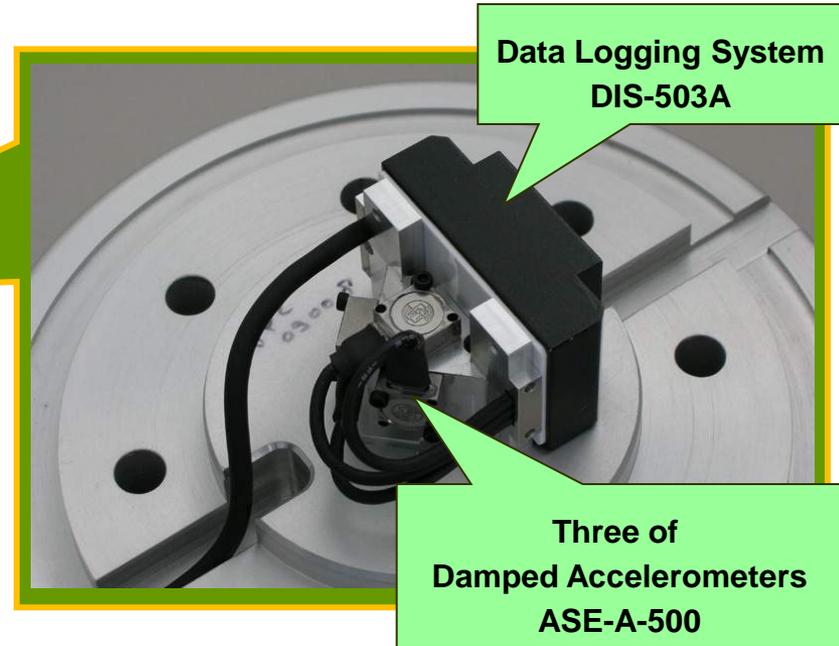
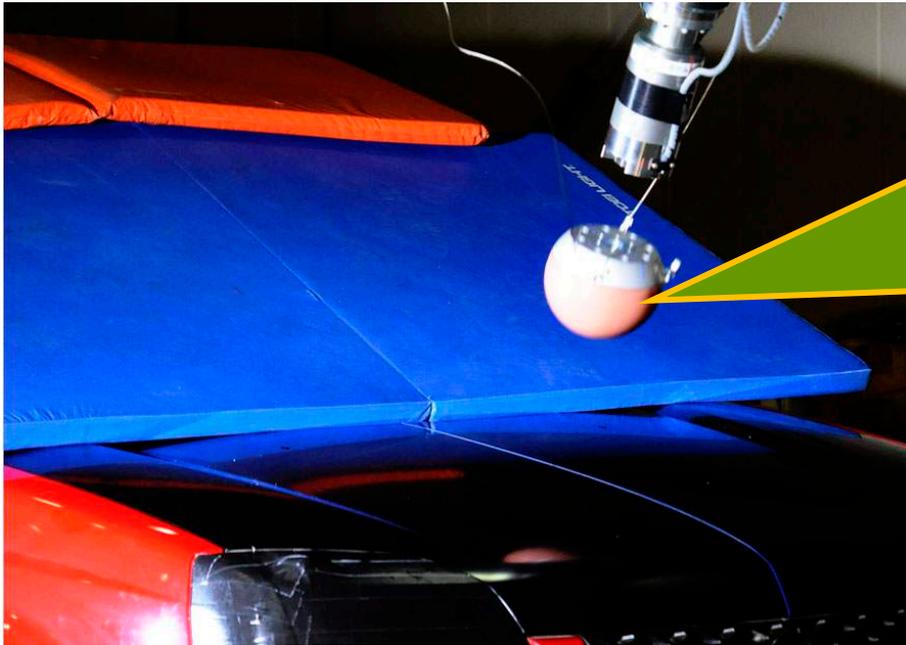
Miniature Data Acquisition System for Pedestrian Headform Impactor DIS-503A



- ◆ 3channels / 1 unit
- ◆ DAS unit has built-in battery
- ◆ Shock resistance 4903m/s^2 (500g), 3msec
- ◆ Maximum sampling speed: 150kHz
- ◆ High speed data transfer by USB 2.0



Application Example for Pedestrian Head Protection Performance Tests

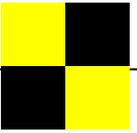


Data Logging System
and
Damped Accelerometer
mounted in the Headform Impactor

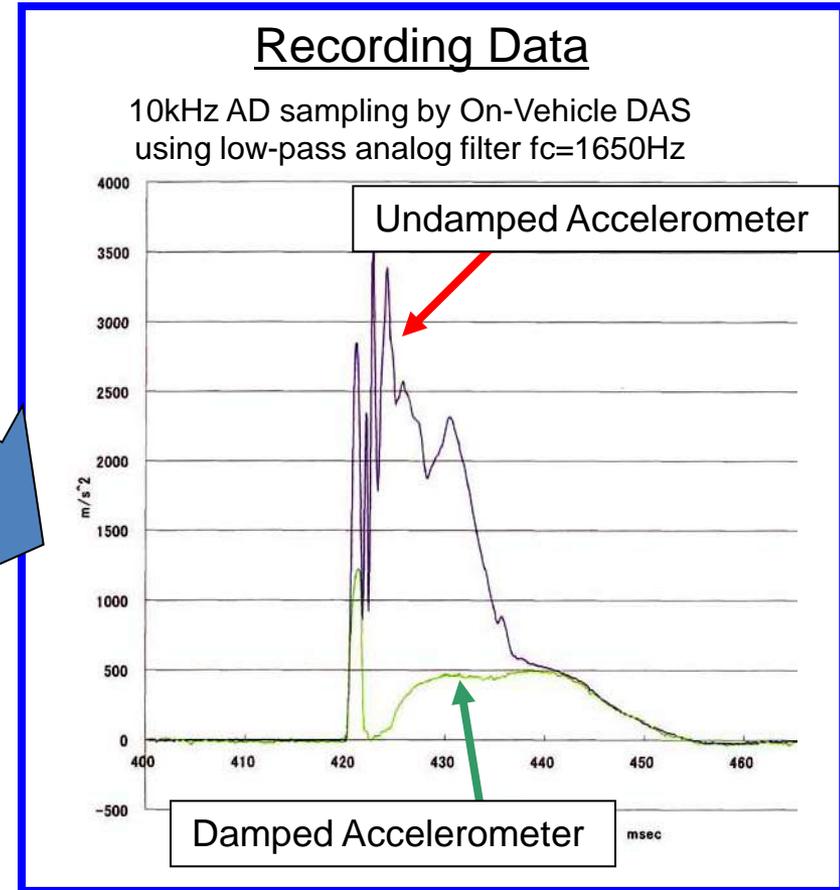
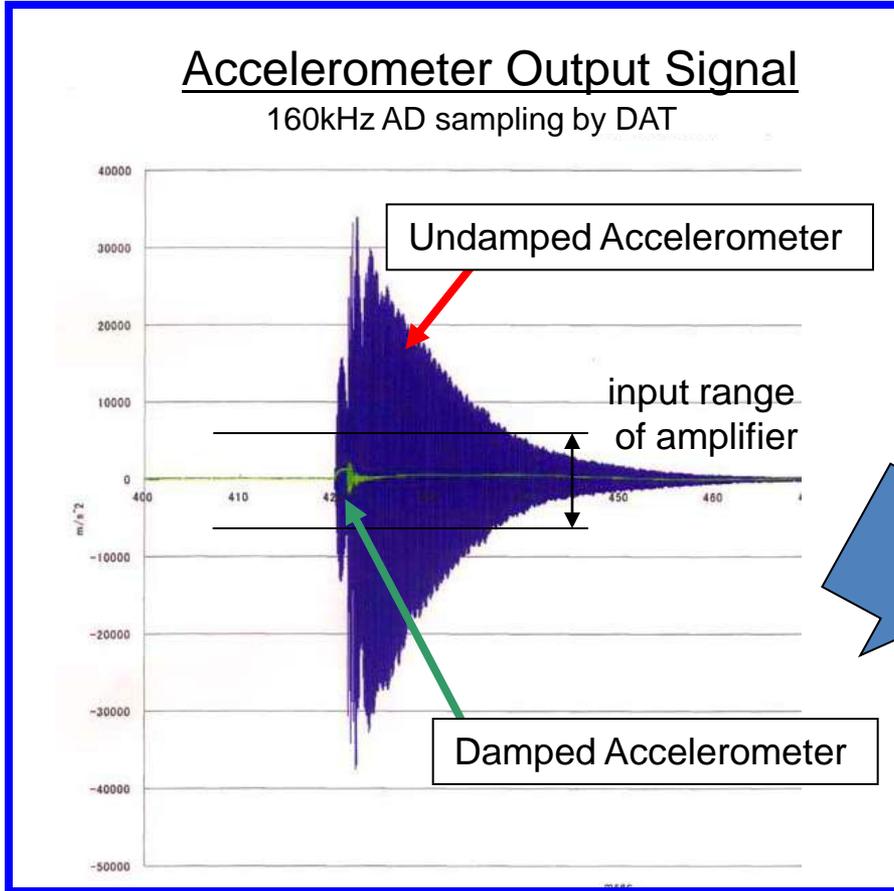


Achieve
cable-less testing

Undamped Accelerometer Measurement Problems

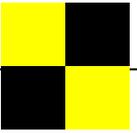


If the resonant waveform signals exceed input range of amplifier...

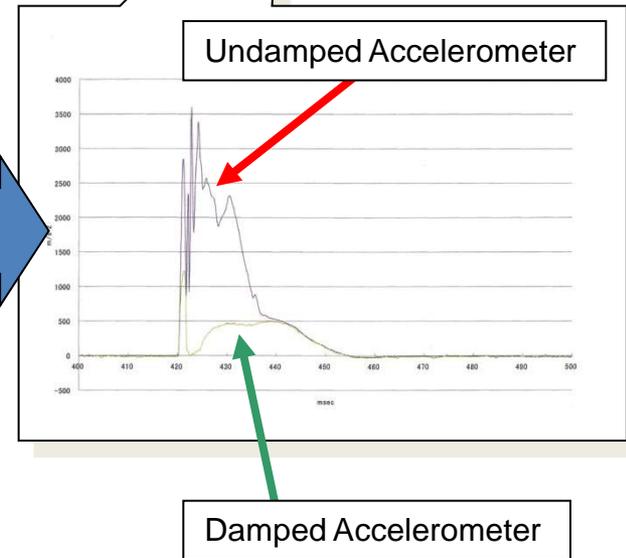
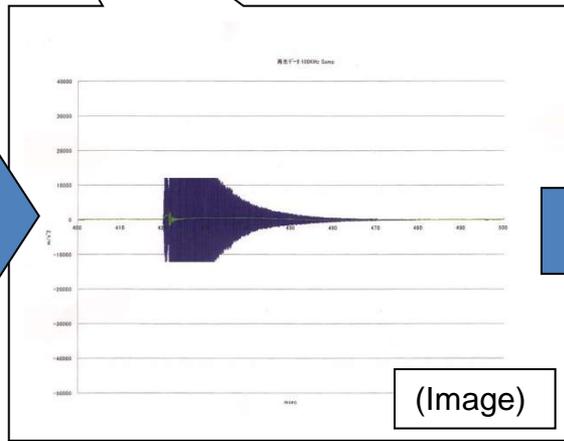
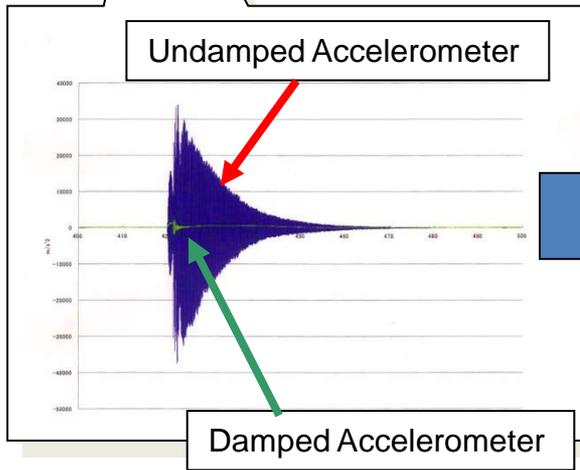
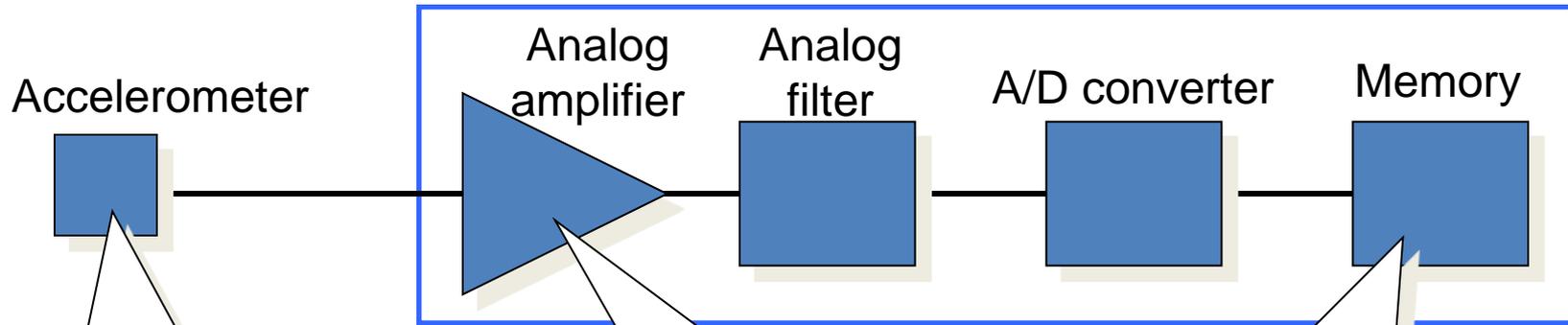


Reprinted by courtesy of Japan Automobile Research Institute

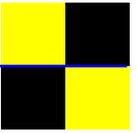
Undamped Accelerometer Measurement Problems



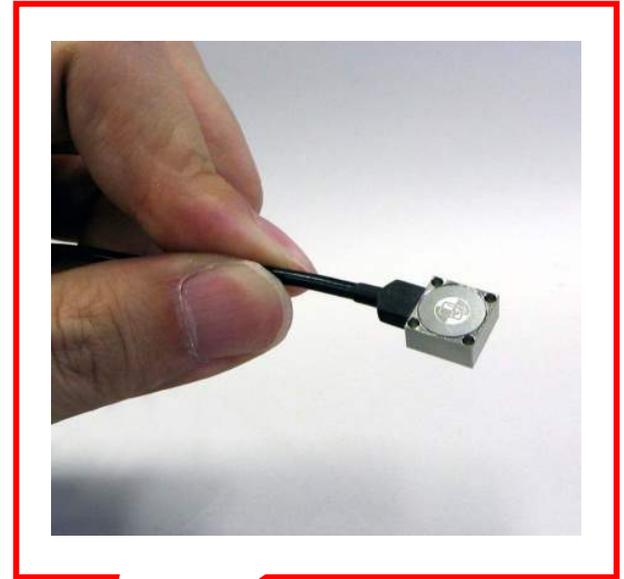
If resonance output signal appears...



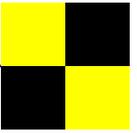
Damped Accelerometer ASE-A



- Model: ASE-A
- Rated capacity: $\pm 4903\text{m/s}^2$ (500g),
 $\pm 9807\text{m/s}^2$ (1000g),
- Dimensions: 10 x 10 x 5mm
- Rated Output: 1mV/V typical.
- Freq. Response(at 23C): DC to 1kHz, $\pm 3\%$
1 to 4kHz, $\pm 10\%$
- Non-linearity: $\pm 1\%$ RO max.
- Acceleration Limits: 2,000g
- Excitation Voltage: 1 to 10V AC or DC
- Cable: 7m long, terminated with LEMO
(FGG 1B 307) connector plug



Recommended by EURO NCAP
from 2008

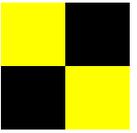


Minimizes the resonant peak to prevent overranging at any frequency

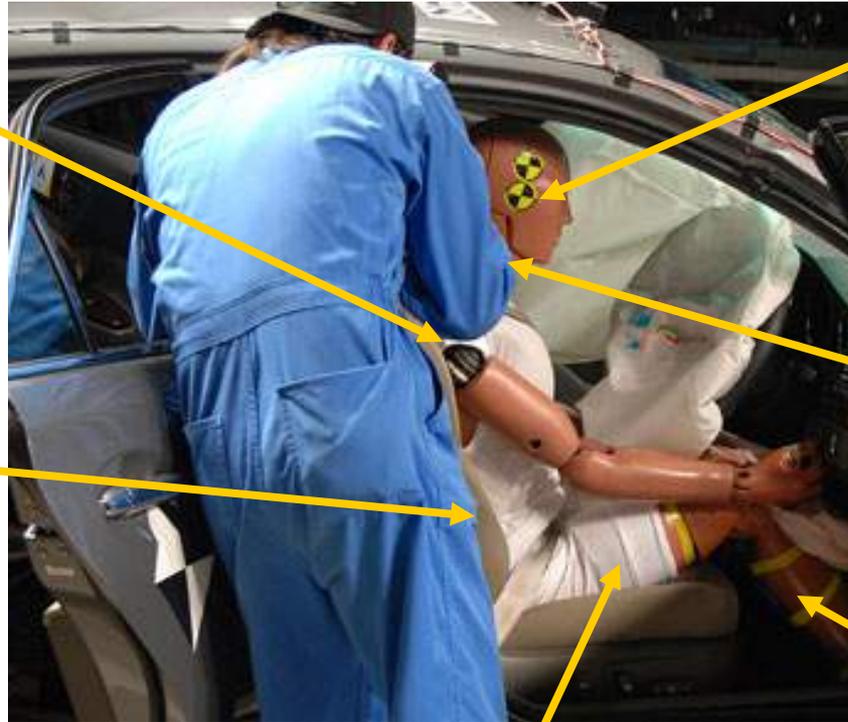
- ◆ **Weight:** Approx. 1.2g
- ◆ **Rated Capacity:** $\pm 9807\text{m/s}^2$ (1000G)
- ◆ **Fluid damped**



Multi Force Sensors for Crash Dummies



Upper Chest 4-component force transducer



Accelerometer



Cervical 6-component force transducer



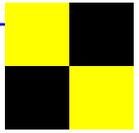
Pelvic 3-component force transducer



Superior Tibia 4-component force transducer



Femoral Load Cell

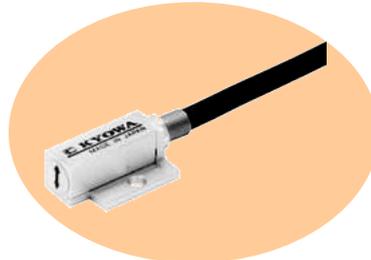


Accelerometers for Dummy and Car body



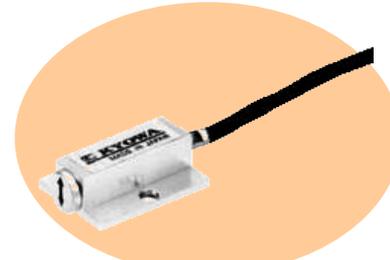
ASH-A

- Damped type
- Dummy / Car-body
- 20G to 1000G



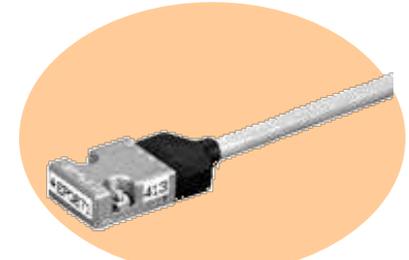
ASD- B

- Undamped type
- Dummy/Car-body
- 1000G



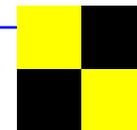
ASM-200BA

- Undamped type
- Dummy
- 200G



ASM-BC

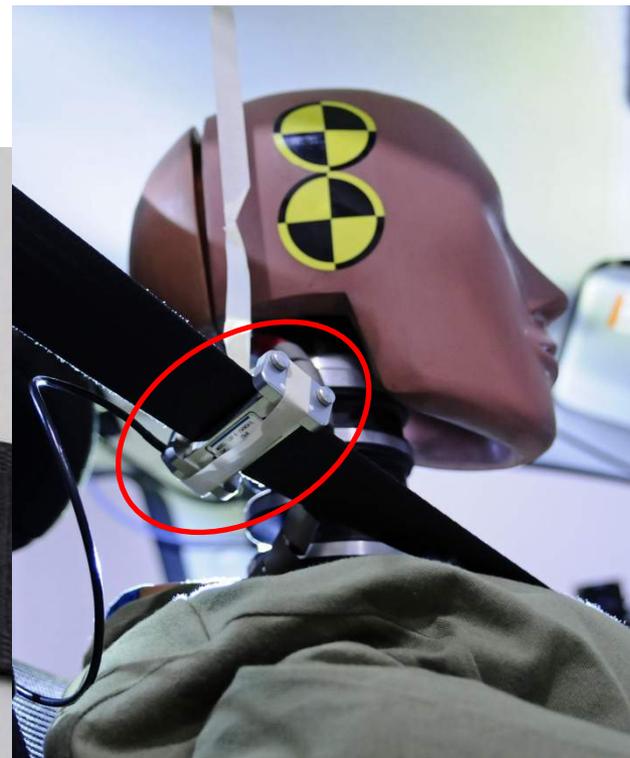
- Undamped type
- exchangeable cable
- Car-body
- 1000G



Seat Belt Tension Transducer

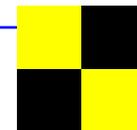


LBT-E-15KN
LBT-E-20KN



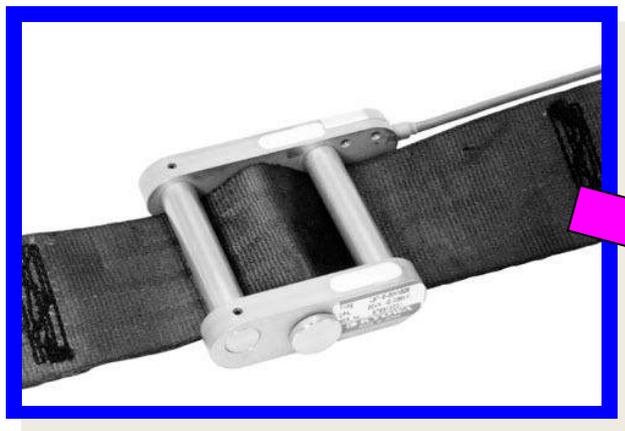
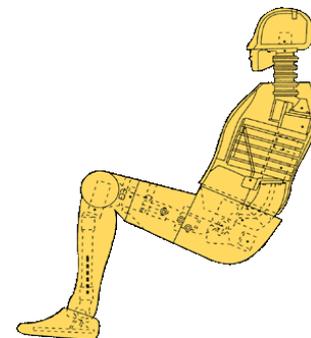
Small and Lightweight
Only 65g

- Small and lightweight.
- Rated Capacity 15kN,20kN
- Non-Linearity +/-1.5%RO
(with built-in compensating circuit)



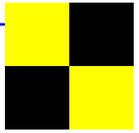
Seat Belt Tension Transducer

- ◆ This sensor detects the impact-initiated tension applied through the dummy to the seat belt.



LBT-A-20KNS

- ◆ Made of aluminum alloy, it is small and lightweight.
- ◆ Rated Capacity 20kN



Seat Belt Tension Transducer for CRS

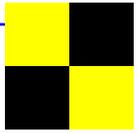
LBT-D-100NSA1

Use for measuring tensile force to install
CRS (Child Restraint Seat)



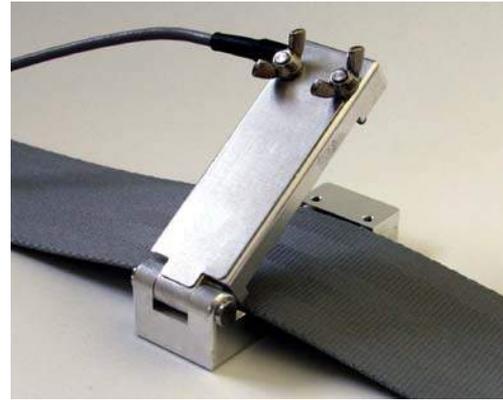
Child Restraint Seat





Seat Belt Tension Transducer for CRS

LBT-S-200NSA1



Child Restraint Seat

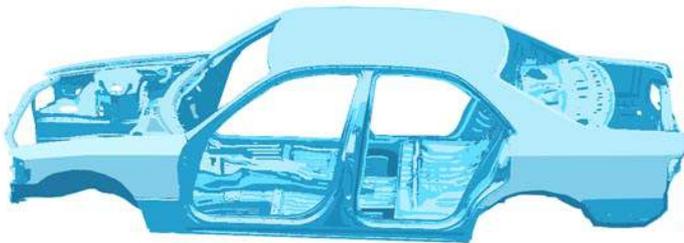
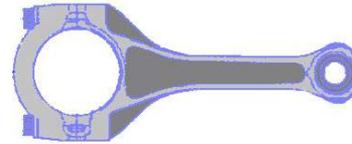


Use for measuring tensile force to install CRS (Child Restraint Seat)

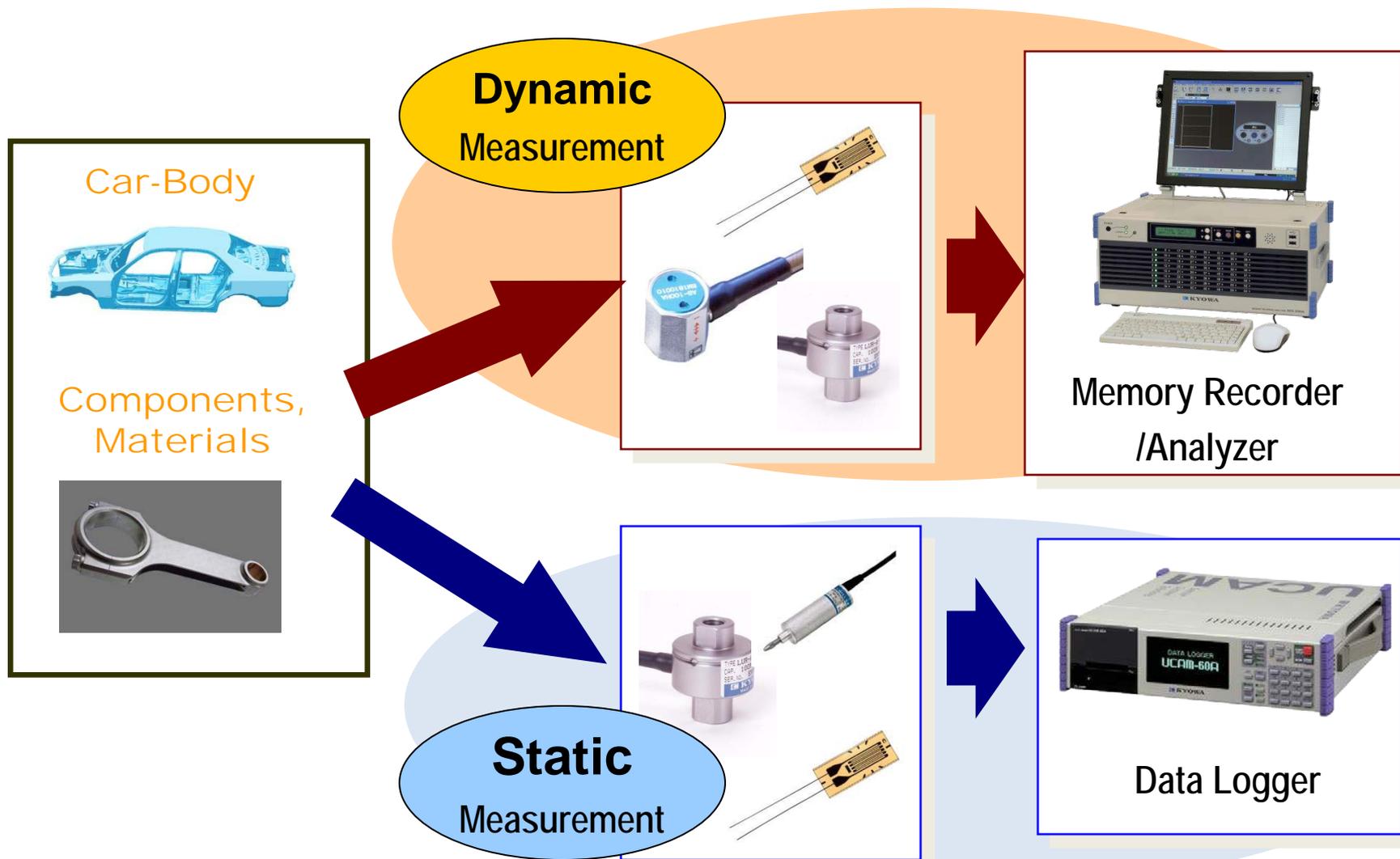
Measuring Instruments for Strength, Reliability

Strength, Reliability

- Car-Body Construction
- Characteristic of Components & Materials
- Dynamic Measurement
- Static Measurement
- Durability
- Road Input
- Strength

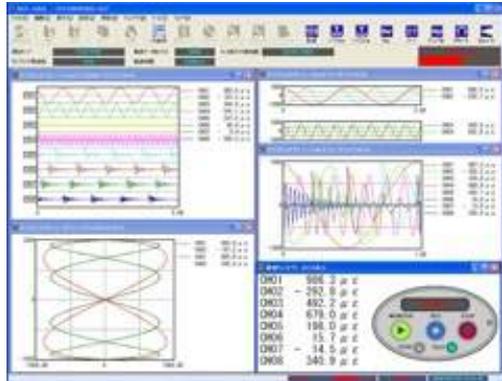
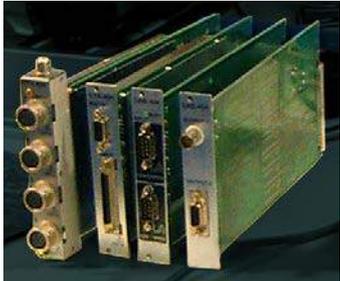


Dynamic/ Static Strength Evaluation



Universal Recorder EDX-100A

for Dynamic Measurement



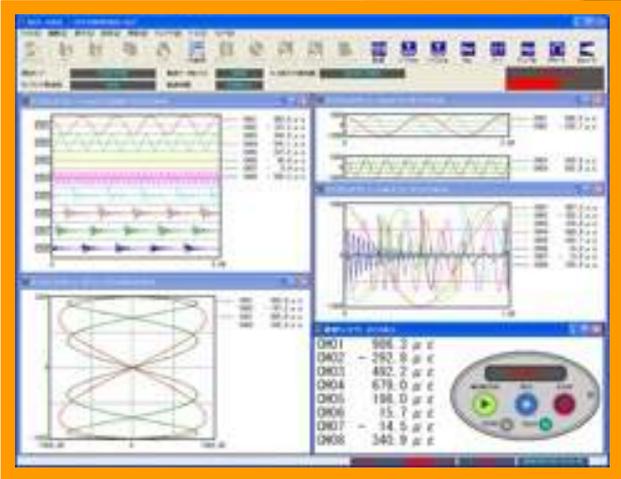
Universal Recorder

EDX-100A

for Dynamic Measurement

Universal Recorder
EDX-100A

Dynamic Data
Acquisition Software
DCS-100A



Universal Recorder

EDX-100A

for Dynamic Measurement



microphone

Signal conditioner card for EDX series

◆ Built-in signal conditioner card

- Strain/voltage measuring card
- Carrier type Strain measuring card
- CAN I/F card
 - for CAN data measuring
- F-V converter card
 - for measuring pulse
- Thermocouple card
 - for measuring temperature
- DA card
 - for analog signal output
- Charge amplifier card

◆ Applicable DAS

EDX-100A, EDX-3000A, EDX-2000B



EDX-100



EDX-2000B



EDX-3000A



Memory Recorder /Analyzer EDX-2000B



◆ Model

EDX-2000B-32 : Max. 32 channel

EDX-2000B-64 : Max. 64 channel

◆ Built-in signal conditioner card

◆ Data Logger with LCD

Useful for monitoring & check of data

◆ Built-in Memory

◆ Enhancement of Simultaneous Processing, Analysis Function

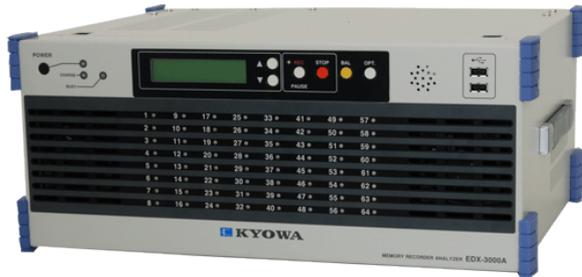
FFT Analysis, Histogram Analysis, Arithmetic Calculations etc.

◆ High speed data sampling

200kHz sampling (at 16 channel)

◆ Voice memo function

Memory Recorder /Analyzer EDX-3000A



◆ **High speed data sampling**
: Max. 200kHz / 32 channel

◆ **Input channel**
: Max. 64 channel

◆ **Movie simultaneously recordable**

◆ **Selectable built-in amplifier cards**

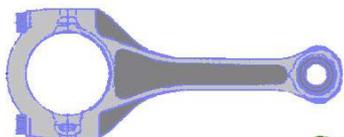
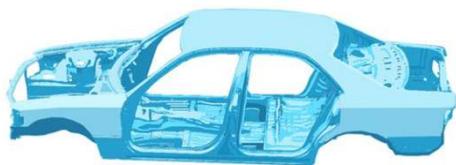
◆ **Built-in back-up battery**

◆ **Enhancement of Simultaneous Processing,
Analysis Function**

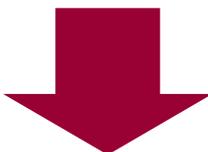
◆ **Voice memo function**



Characteristic of Components & Materials

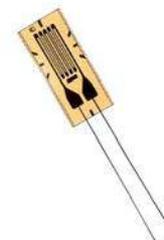
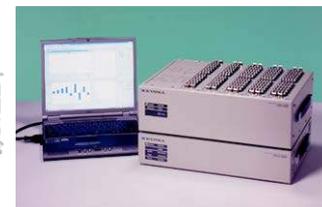


- ◆ Stress, load, displacement measurement is necessary for strength/durability test of parts & materials
- ◆ Multi channel measurement is available with Kyowa's data logger



All-in-one Data Logger for

- ◆ strain gages
- ◆ strain-gage transducers
- ◆ Potentiometer sensors
- ◆ Thermocouples
- ◆ DC voltage-output instruments



for Static
Measurement

All-in-one Data Logger

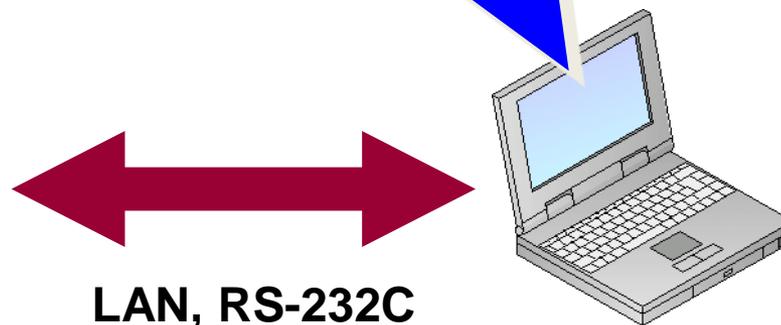
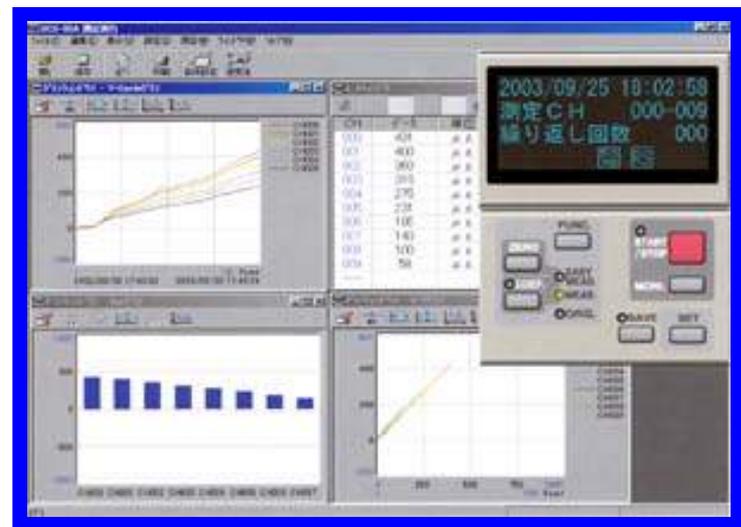
UCAM-60B



- ◆ Connectable sensors include strain gages, strain-gage transducers, potentiometer sensors, thermocouples and DC voltage-output instruments.
- ◆ Scanning at a speed of 50mS/channel, useful for stress measurement of materials and for multi-point measurement
- ◆ Built-in scanning units enable 30-channel measurement. Max. measurement channel is 1000ch (with external scanning unit)

Control Software UCS-60B

Control by PC via LAN, RS-232C are available
Measurement Data Graph Display
Numeric Display
Arithmetic Processing



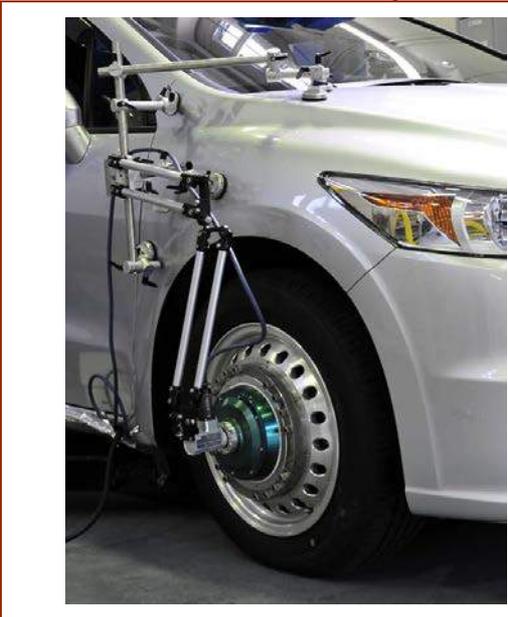
Strength Evaluation on Running Test



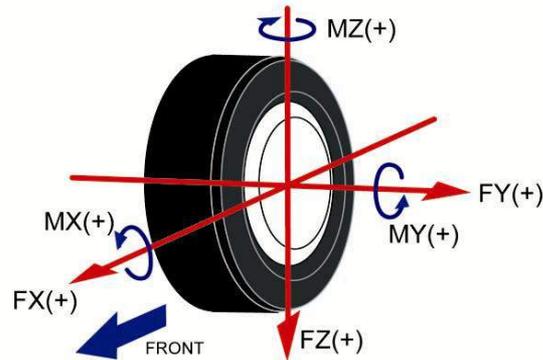
Road Input



Demand for measuring Forces and Moments



Wheel 6-component Force Transducer



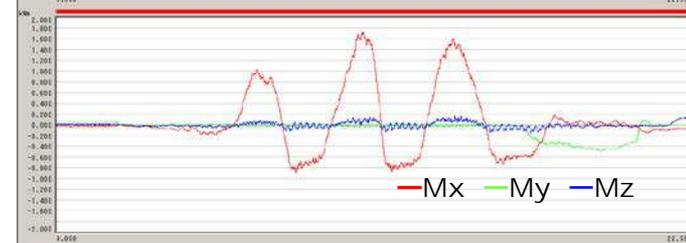
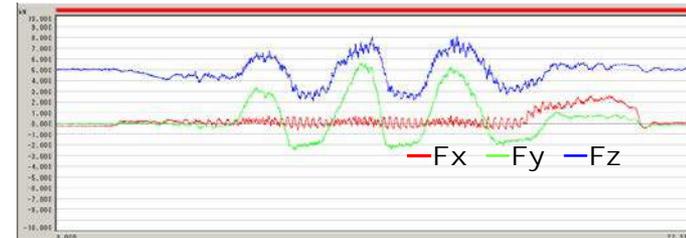
Road Input Measurement

Wheel 6-component Force Transducer

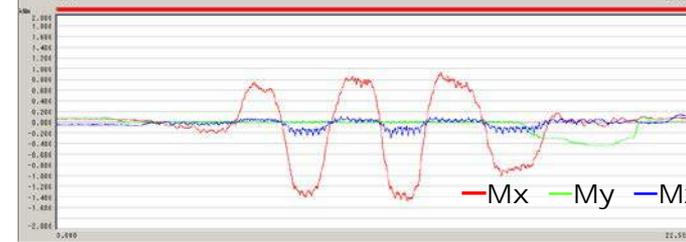
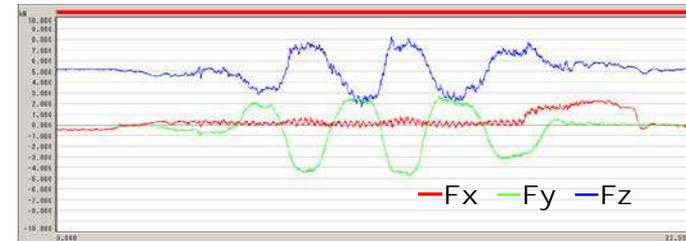
Thin and lightweight Wheel sensor



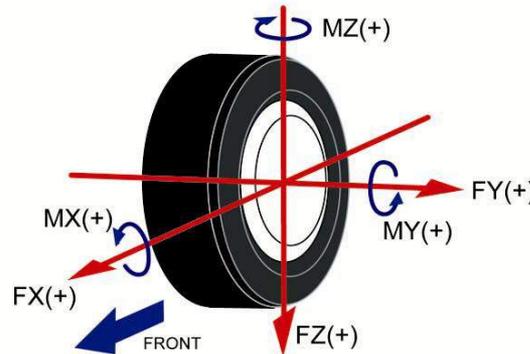
Wheel 6-component Force Transducer



Front-Left



Front-Right

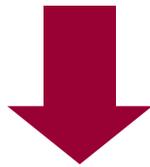


Measuring Instruments for Controllability

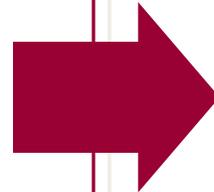


Controllability - Running

- ◆ Braking test
- ◆ Traction control test
- ◆ ABS performance test
- ◆ CVT performance test



**Wheel torque
measurement
of running vehicle**



Slip-ring type Wheel Torque Transducer



Slip-ring type Wheel Torque Transducer

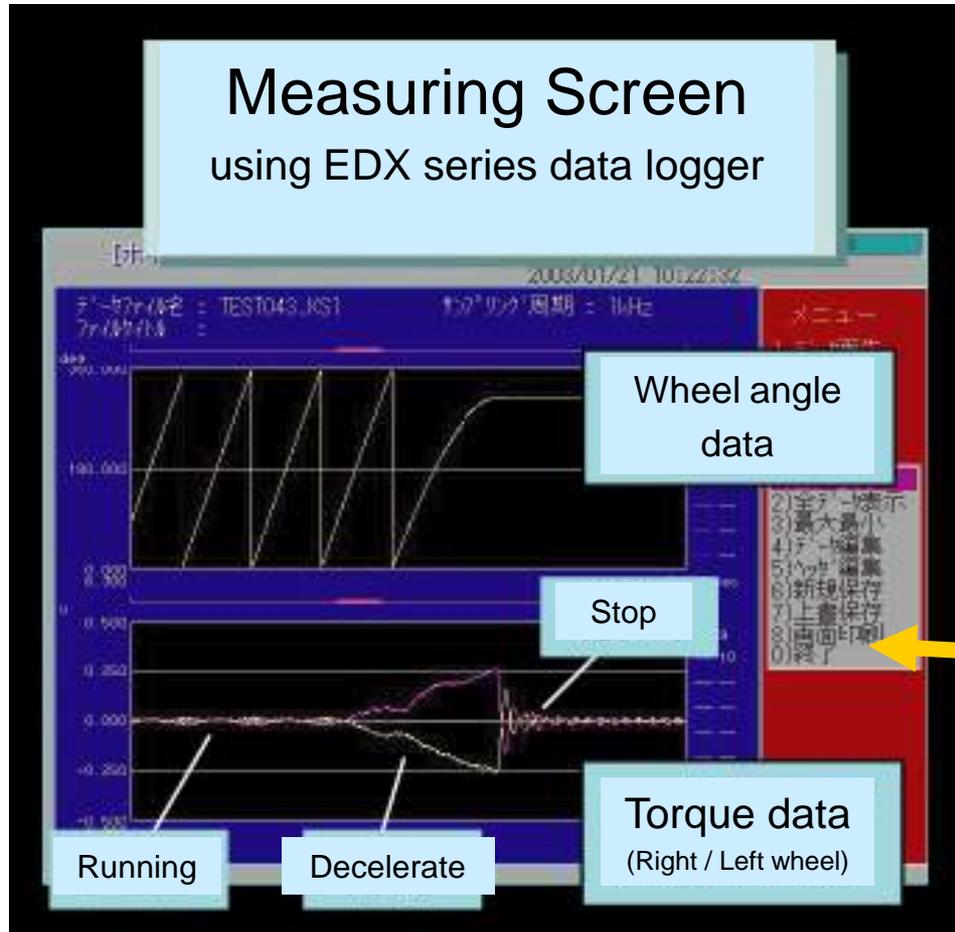
For Braking test, Traction control test, etc.



Features

- ◆ **Thin and lightweight**
- ◆ **Easy to install**
- ◆ **Attached Wheel Rotation Angle Detector (option), to measure wheel rotation behavior with wheel torque.**

Wheel Torque Transducer



Fasten the data acquisition system to the seat



Controllability - Operation

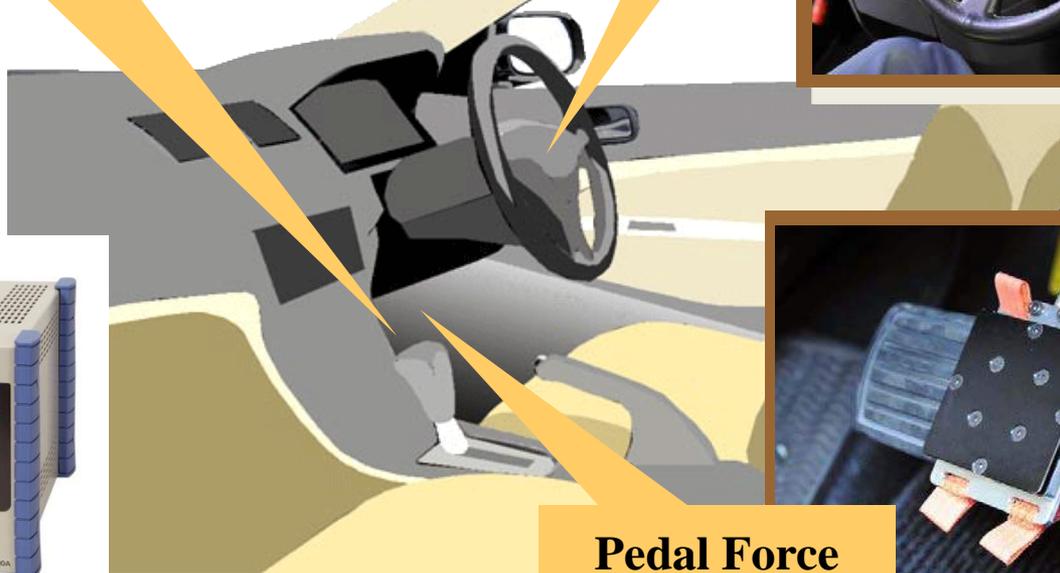
**Gear-change Lever
Operating Force
Transducer**



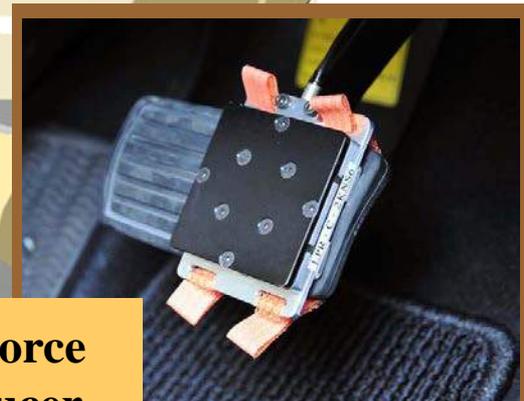
**Steering Force / Angle
Transducer**



**Small-size DAS
(8 to 32 channel)**



**Pedal Force
Transducer**



Steering Force/Angle Transducer **SFA-E**

- ◆ Measure steering force and angle with high accuracy on steering operation
- ◆ Torque: 20 to 200N·m Angle: 18000pulse / 360deg.

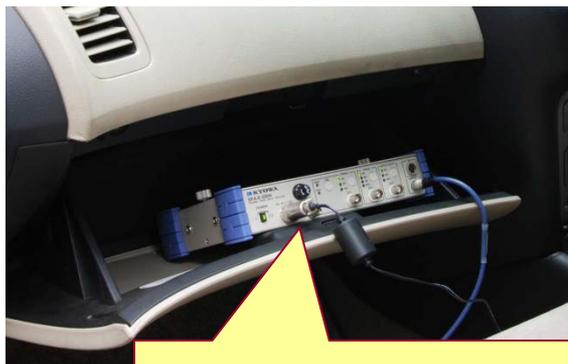


Steering Force/Angle Transducer **SFA-E**

Display Unit for SFA-E



SFA-E



Signal Conditioning Unit



Connected condition



Hand-Brake Operating Force Transducer LCR-S

Easy installation on the Hand brake to measure operating force

- ◆ Easy to install and use on a variety of hand brakes
- ◆ Rated capacity: 1kN
- ◆ Weight: Approx. 650g (excluding cable)



Gear-Change Lever Operating Force Transducer

- ◆ Measure 2 or 3-components force at gear-change.
- ◆ Minimal interference between axes to ensure precise measurement
- ◆ Small, lightweight and easy to install and handle

Miniature type



Standard type



custom design attachment

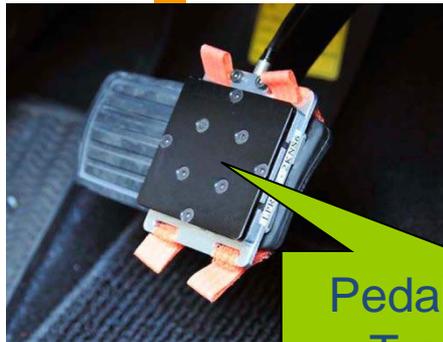
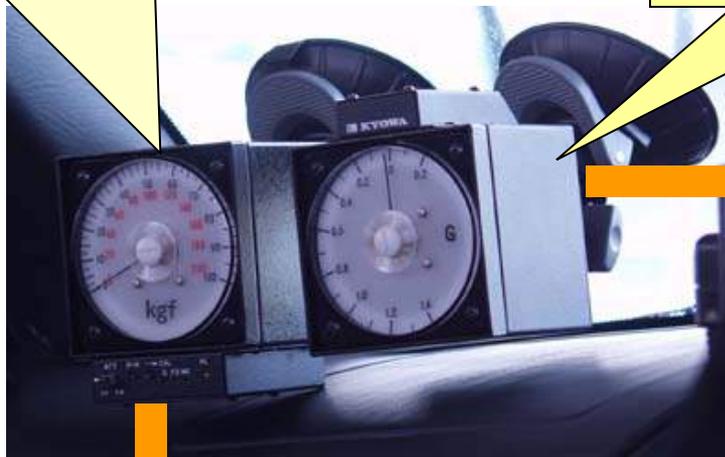


Braking Test

Pedaling Force Monitor

G-Meter
Acceleration Transducer &
Analog Monitor

On-Vehicle
Data Acquisition Unit



Pedaling Force
Transducer

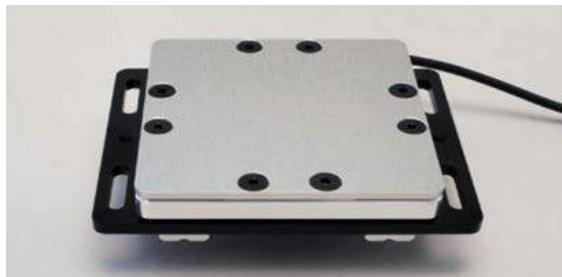


Pedal Force Transducer

LPR-C 12mm-thick



- ◆ Thin & Light Weight
- ◆ Rated Capacity 200N to 2kN



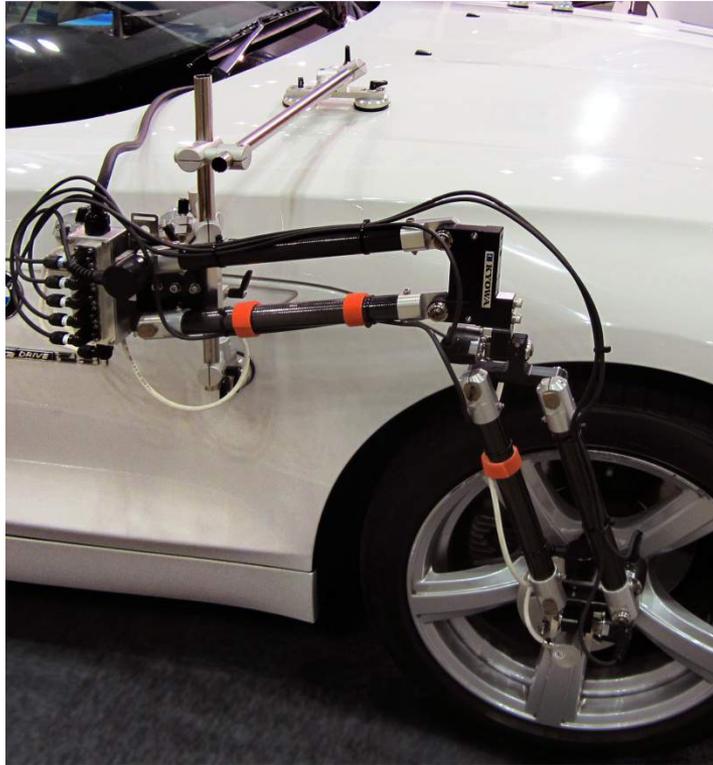
For parking brake pedal

LPR-S-S3



Wheel alignment measuring system

A system for measuring anteroposterior, transverse and vertical displacements of wheels to the vehicle body, and changes in steering and camber angles during driving.



The system can be used independently(left), or with the slip-ring type wheel 6-component force measuring system(right).

Wheel alignment measuring system

Wheel alignment sensor



Data processor



Data processing
Physical value output

DAS



Analog voltage
output

Measuring Instruments for Vehicle Controllability & Stability



On-Vehicle type Small-size DAS

Compact Recorder

EDS-400A

- ◆ Small-size DAS
- ◆ Power Supply is AC/DC
- ◆ Strain/Voltage Measurement / Unit (4ch/Unit)
- ◆ Max. 32ch (8units)
- ◆ On-line, Off-line measurement



Compact Recorder

EDS-400A

- ◆ Start & Stop Operation is available by Main body switch or Remote Controller
- ◆ Max. 20kHz/4ch & simultaneous measurement is available
- ◆ Data is saved to compact flash card. Long-time measurement is available.
- ◆ Control by PC via LAN interface and data recording are available.
- ◆ 4ch/unit, max.32ch/8units

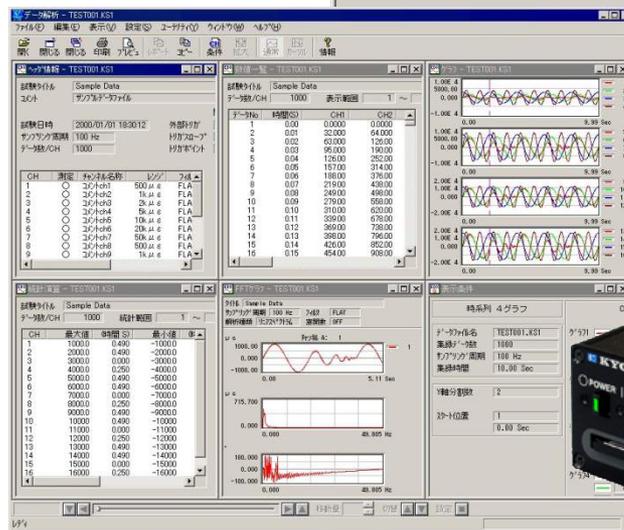
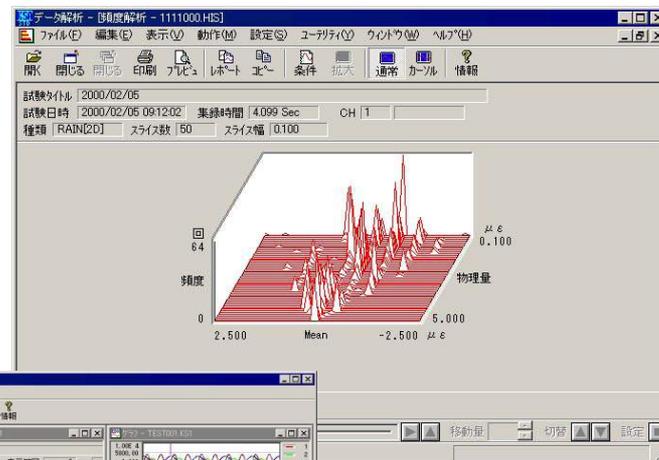


Analyzing Software DAS-200A

Data that is collected by EDS-400A can be analyzed by DAS-200A.

Main Functions

- Data file editing
- FFT analysis
- Histogram analysis
- Arithmetic calculations
- Filter processing
- Differential
/integral processing



Compact Recorder
EDS-400A



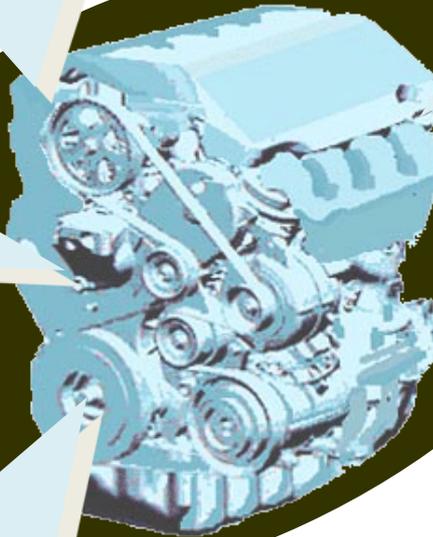
Measuring Instruments for Engine

Pressure measurement

*Stress measurement
of Exhaust Manifold*

*Stress
measurement of
Each portion*

Torque measurement



High Temperature Weldable Strain Gages

Stress/Strain measurement for exhaust manifold and muffler

- ◆ Operating Temp. up to 800°C and 650°C
- ◆ Designs for all Exhaust System Components
- ◆ Easy install by exclusive spot welder

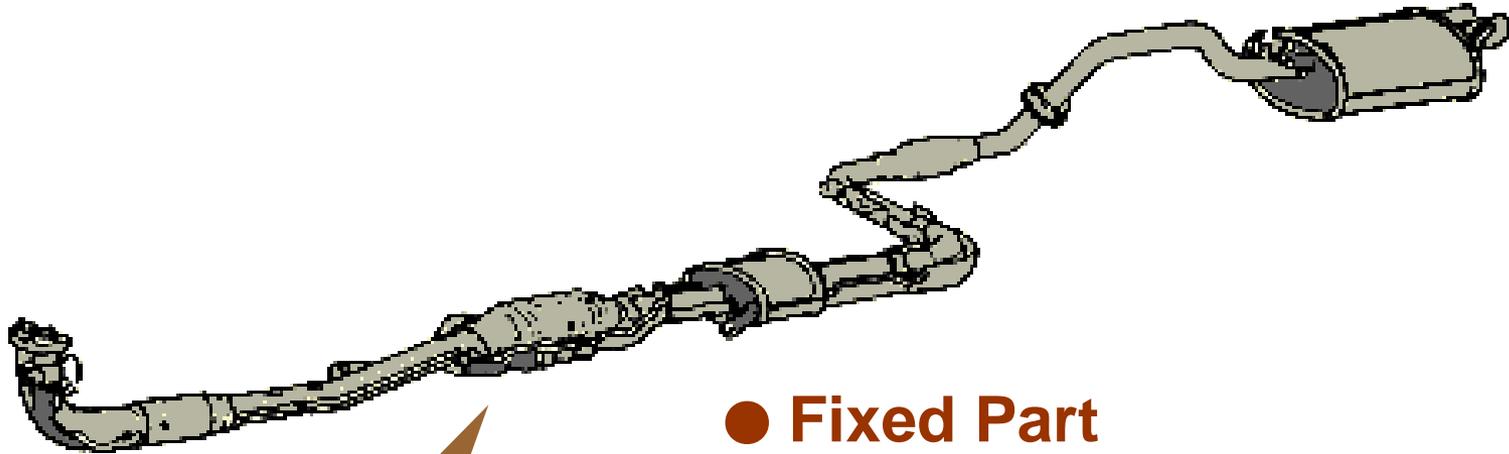
Spot welding



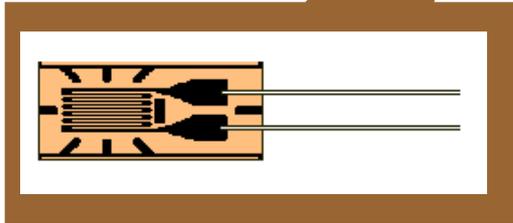
Install to exhaust manifold



Measurement Strain by Vibration Exhaust Pipe, Muffler



- Fixed Part
- Welding Part
- Joint Part

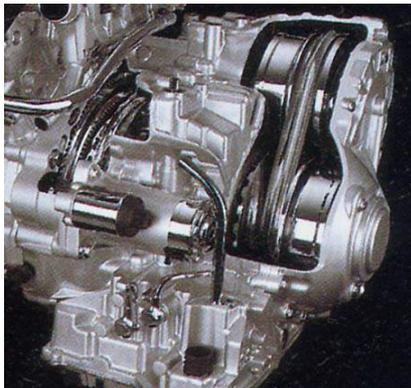
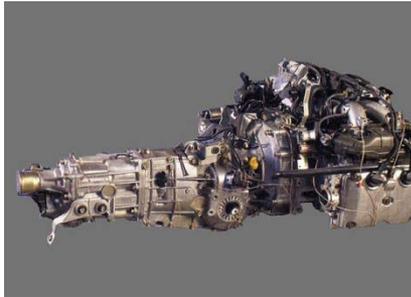


Evaluation of welding strength by vibration,

Use **High-Temperature Foil Strain Gages** KFH(Max.250deg.C), KH(Max.350deg.C)

Hydraulic pressure measurement of

- Transmission
- Gearbox
- CVT



Compact High-temp. Pressure Transducers



Compact High-temp. Pressure Transducers

- ◆ Maximum operating temp. 150°C (Max.302°F)
- ◆ Suitable for hydraulic pressure measurement of transmission, gear box, and CVT.



PHF-S-SA2

Feature

- ◆ **Outstanding Temp. Characteristics**
Thermal effect on zero:
 $\pm 0.008\% \text{RO}/^\circ\text{C}$
- ◆ **Compensated temp. range:**
-40 to 150°C (Max.302°F)
- ◆ **Endurance against vibration**
490. 3m/s²(50g)
- ◆ Provide air vent
- ◆ **Rated capacity:** 2MPa (20.39kgf/cm²)
to 10MPa (約102.0kgf/cm²)



PHF-S-SA4

Feature

- ◆ **Small size (length 32mm)**
It is useful on small space.
- ◆ **lightweight** (Approx.20g)
- ◆ **Maximum operating temp. 150°C**
- ◆ **Rated capacity:**
2MPa (20.39kgf/cm²)
to 10MPa (約102.0kgf/cm²)

- ◆ Suitable for hydraulic pressure measurement of transmission

PHF-S-SA27

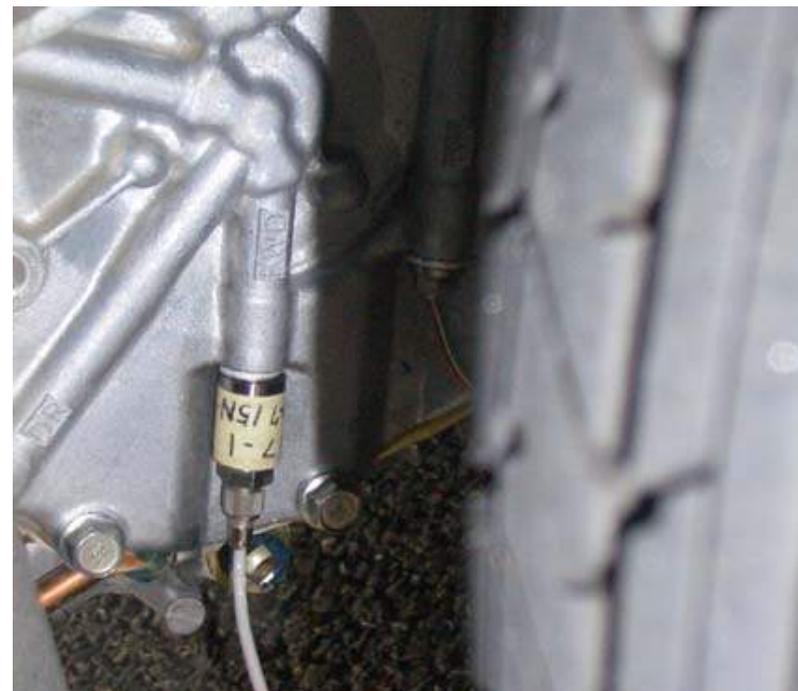
providing air vent screw

Removable cable by connector plug

PHF-S-SA28

Not providing air vent screw

Easy to install / remove sensor



Applications & Products Overview for Automotive Field

Thank you for your attention!

