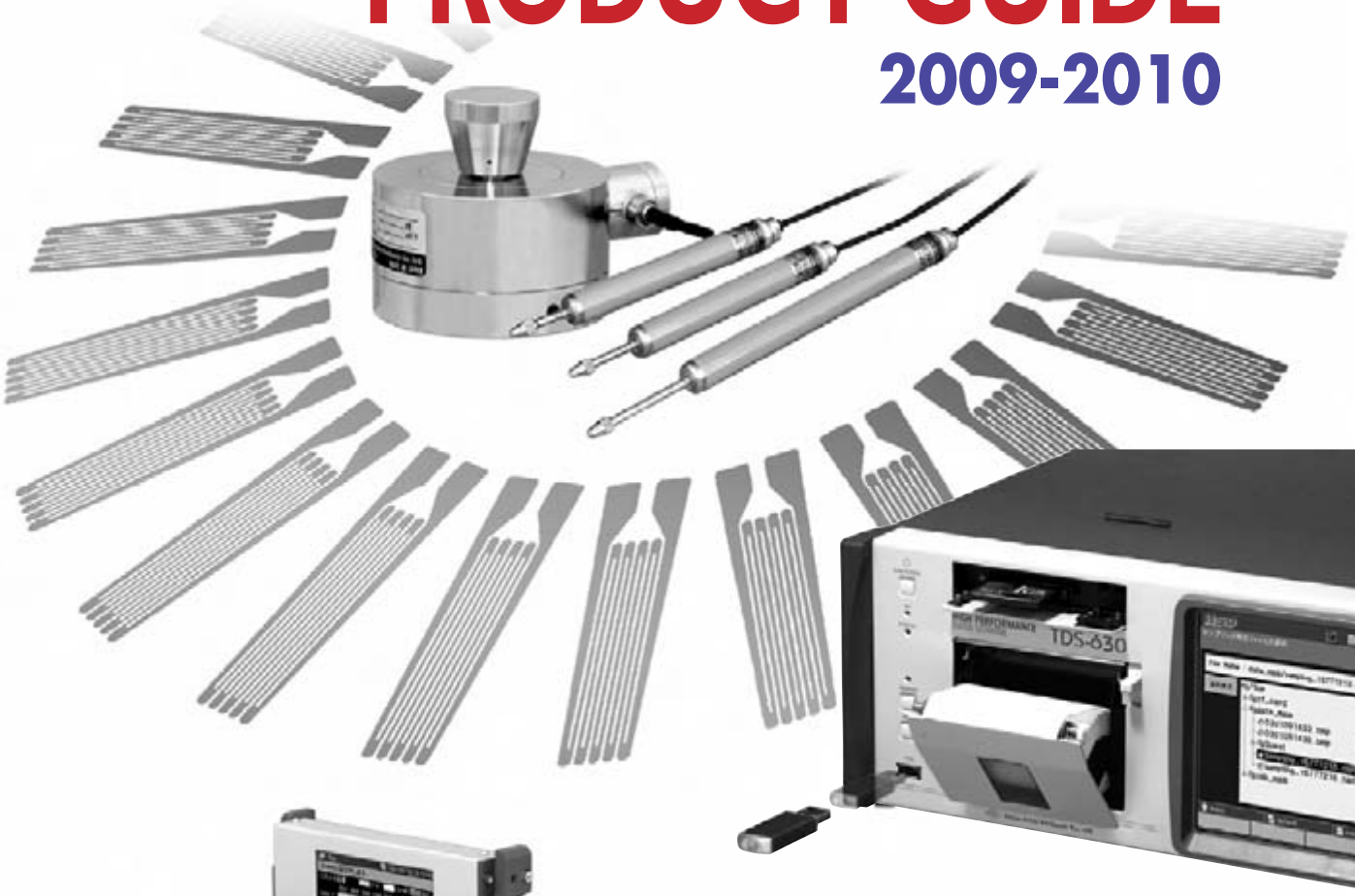
TML

Pam E-950P

PRODUCT GUIDE

2009-2010



STRAIN GAUGES

Strain Gauge TRANSDUCERS
General/Architecture/Civil Engineering

MEASURING INSTRUMENTS
Static/Dynamic/Multi-Recorder/Indicator

AUTOMOTIVE MEASURING SYSTEM
Vehicle powertrain/Driving Stability

SPECIAL PURPOSE MEASUREMENT

MEASUREMENT SOFTWARE *Visual LOG*

TML Tokyo Sokki Kenkyujo Co., Ltd.

TML Strain Gauges with a Proven Performance Record

Advances in technology have led to construction of new buildings that are more sophisticated and complex than any that have come before.
This trend has made strain measurement an even more critical part of ensuring structural integrity and safety.
TML is an industry leader in strain gauges. Our products enjoy an outstanding reputation both in Japan and abroad, where they meet the high-level needs of customers ranging from research facilities to civil engineering and construction companies.
We have also developed a wide variety of strain measurement accessory products to complement our strain gauges.
At TML, you can count on field-proven products that meet the industry's highest standards for quality, accuracy and performance.

TML is accredited in FORCE field.

ilac-MRA IAJapan JCSS
JCSS 0090

Tokyo Sokki Kenkyujo Co., Ltd. (TML) is accredited by Japan Calibration Service System (JCSS), conformed to international standards JIS Q 17025 (ISO/IEC 17025) under the laboratory accreditation body ISO/IEC 17011. International Accreditation Japan (IA Japan) plays as the accreditation body of JCSS and is a signatory to MRA of Asia Pacific Laboratory Accreditation Cooperation (APLAC) as well as International Laboratory Accreditation Cooperation (ILAC). Our Kiryu factory is certified as a JCSS-accredited laboratory working in compliance with an international Mutural Recognition Arrangement (MRA). The accreditation number of the Kiryu Factory is 0090.

TML Calibration Service

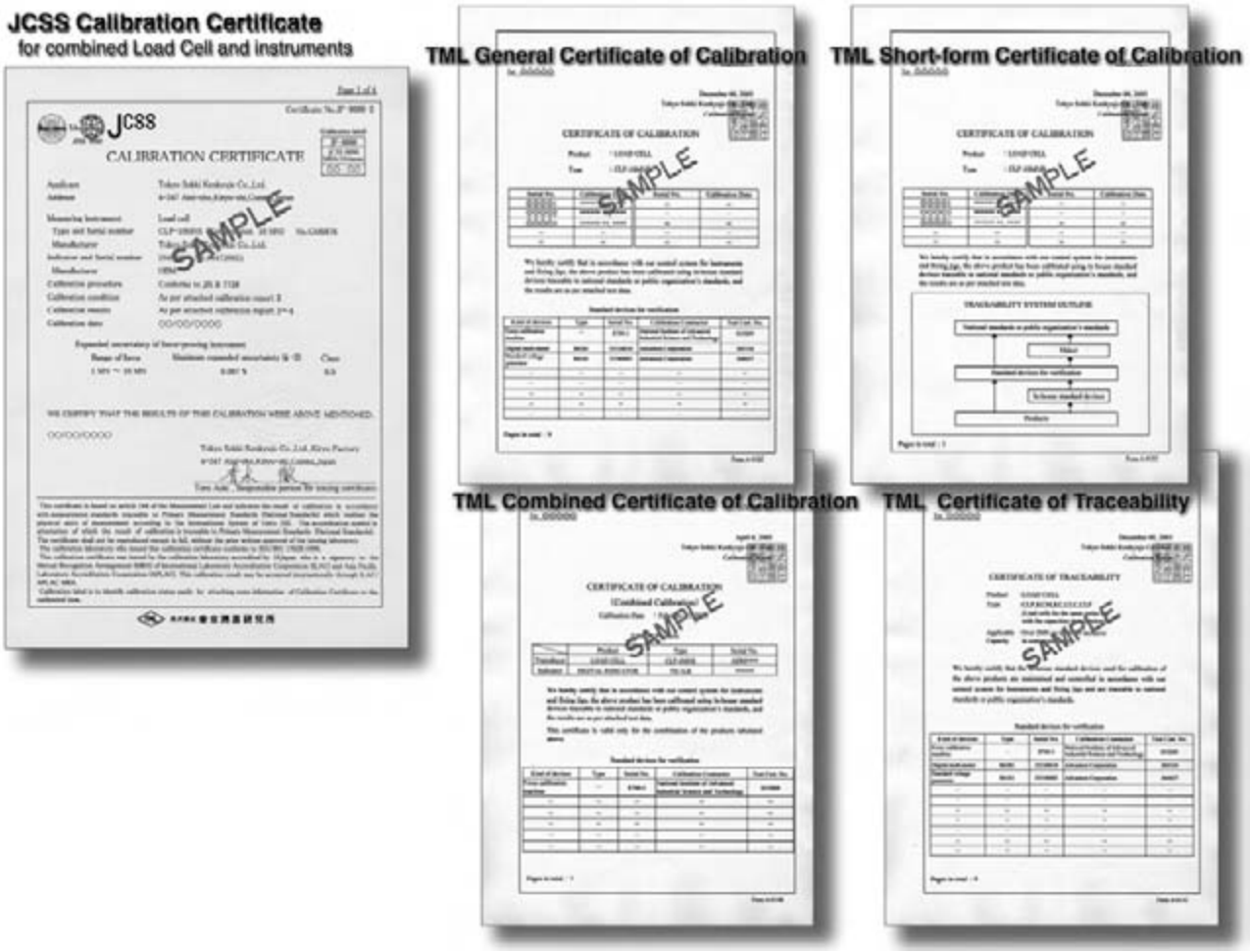
Offers calibration service and support for your measuring instruments.

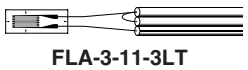
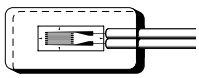
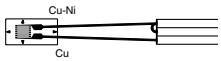
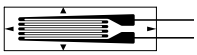
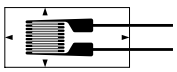
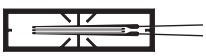
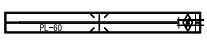
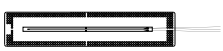
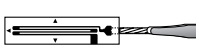
Maintaining strict calibration for various measuring instruments to be used is essential. We offer calibration service to certify that the instruments are traceable to National standards.

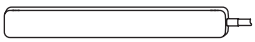
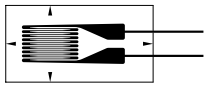
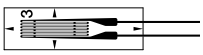
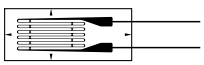
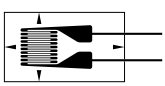
- Issue of calibration certificate with logo of MRA/JCSS for force transducers
  There are JCSS calibration and general calibration according to TML in-house regulations for force transducers (load cells). The JCSS calibration for universal load cells is only for either tension or compression. In the general calibration, both tension and compression are calibrated. The JCSS calibration is only for combination of a load cell and measuring instrument.
- TML 10MN force calibration machine calibrated directly by National Institute of Advanced Industrial Science and Technology (AIST)
- Combined calibration with other maker's product
  Calibration or traceability certificates for combined devices.
  N.B. Calibration for other maker's product only is out of service.
- A certificate for calibration of up to 10 force transducers with the same indicator can be issued.
- Measurement management in accordance with ISO9001
- EMC (Electromagnetic Compatibility) calibration for TML instruments

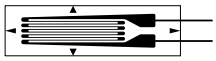
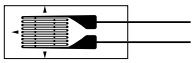
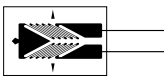
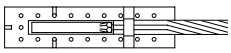
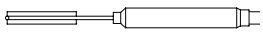
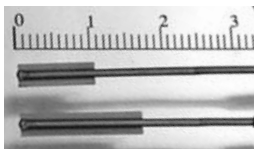
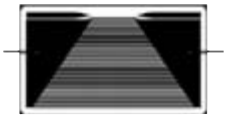
For the calibrated instruments, the following certificates are issued on request:

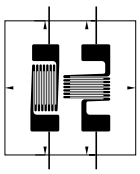
- [**JCSS Calibration Certificate/TML General Calibration Certificate**] or [**Short-form Certificate**] to certify calibration and traceability for individual products
- [**Detailed Calibration Certificate**] including calibration data for all devices used for calibration
- [**Certificate of Traceability**] showing that the devices used for calibration are traceable to National Standards or public calibration laboratories.
- [**Certificate of Combined Calibration**] for combination with our product or other maker's product



Gauge series	Gauge pattern (example)	Description	Gauge length (mm)	Operational Temperature Range (℃) (Normal)	Remarks
Integral Lead Strain Gauge "LW" Pam E-101	 **FLA-3-11-3LT**  **FLA-1-11-1L**	This gauge is ready for strain gauge series F/PF or P with vinyl lead wire pre-attached and capable of strain measurement by merely connecting the leadwire to a strainmeter. Pre-attachment among 2-wire parallel in 1-, 3-, and 5-meter long is available. Also, 3-wire parallel in 3- and 5-meter long are provided.	**1 ~ 90**	**-20 ~ +80**	**Single Cross Rosette**
Foil Strain Gauge "WF" Pam E-101	 **WFLA-3-11-1L**	This gauge is designed for eliminating moistureproofing-coating which sometimes makes troublesome in field test. The gauge has vinyl lead out wire and whole area of the gauge and junction of lead wire are fully overcoated with transparent flexible epoxy resin.	**3,6**	**0 ~ +80**	**Single Cross Rosette**
Temperature -integrated "FLA-T/QFLA-T" Pam E-101	 **FLA-2T-11-3LT**	This is TML's original strain gauge including T-thermocouple. One core of three-core parallel lead wire of the strain gauge is made of Cu-Ni wire, while other two cores are made of ordinary Cu wire. A T-thermocouple is composed of the Cu-Ni wire and one of the Cu wire. Strain measurement with quarter bridge 3-wire method and accurate temperature measurement are available using TML's data logger.	**1,2,5**	**FLA-T: -20 ~ +80 QFLA-T: -20 ~ +200**	**Single**
Foil Strain Gauge "F" Pam E-101	 **FLA-5-11**	This gauge is produced from specially controlled alloy foils. The grid is precision-etched and utilizes an extremely thin epoxy backing. Gauge length as short as 0.2mm or stress concentration measurement gauge is also available in this series.	**0.2 ~ 30**	**-20 ~ +80**	**Single Cross Rosette Special**
General Purpose "UF" Pam E-101	 **UFLA-1-11**	The operational temperature range of this general-purpose gauge series extends to 150℃. The gauges are temperature compensated for mild steel, stainless steel and aluminum. The gauge backing is color-coded according to the temperature compensated material type in the same method as for the F. The gauge backing is thin and flexible, thus allowing easy adhesion on curved surfaces to provide superb performance in measuring resistance change and thermal output.	**0.2 ~ 5**	**-20 ~ +150**	**Single Cross Rosette**
Foil Strain Gauge "PF" Pam E-101	 **PFL-10-11**	This is a foil strain gauge having the same transparent plastic backing as that of "P" series gauges. Electrical insulation is excellent, and installation is very easy. It is especially recommendable for the measurement on mortar.	**10 ~ 30**	**-20 ~ +80**	**Single Cross Rosette**
Polyester Strain Gauge "P" Pam E-101	 **PL-60-11**	This gauge is a standard wire strain gauge utilizing a transparent plastic backing impregnated with a polyester resin. Gauge length is available in 3 steps from 60 ~ 120mm, so it is suited for measurement of concrete strain.	**60 ~ 120**	**-20 ~ +80**	**Single Cross Rosette**
WOOD STRAIN GAUGE "PFLW/PFW" Pam E-101	 **PFLW-30-11**	The gauge has a thin metal backing for long term measurement on woods, not affected by moisture enclosed in wood. The gauge is bonded with PS adhesive.	**30,60**	**-20 ~ +80**	**Single**
Metal-backing Strain Gauge "FLM/WFLM" Pam E-101	 **FLM-60-11**	This gauge is designed for successful strain measurement on the concrete surface. It has a thin stainless-steel backing which prevents the penetration of moisture from the reverse side. It retains good electrical insulation to the concrete surface.	**30,60**	**-20 ~ +80**	**Single**
Foil Strain Gauge "MF" Pam E-101	 **MFLA-5-350-1LS**	This gauge is intended for strain measurement in the magnetic field. Sensing material and grid configuration make the gauge less sensitive to the influence of alternating field. This gauge is supplied with integral twisted lead wires.	**2,5,60**	**-20 ~ +80**	**Single**

Gauge series	Gauge pattern (example)	Description	Gauge length (mm)	Operational Temperature Range (℃) (Normal)	Remarks
Polyester Mold Strain Gauge "PM" "PMF" Pam E-101	 **PML-60-2L**	This gauge is designed for the measurement of interior strains in concrete under loading test by simply embedding the gauge.	**50,60,120**	**-20 ~ +60**	**Single**
ASPHALT STRAIN GAUGE "PMFLS" Pam E-101	 **PMFLS-60-50-2LT**	The gauge uses a super engineering plastics for carrier to feature waterproofing and heat resistance up to 200℃ in placement of asphalt.	**60**	**-20 ~ +60**	**Single**
Pavement surface strain gauge "SSM-360"	**SSM-360-X**  **SSM-360-Y**	The gauge has 16 strain elements in X or Y direction on the same gauge base. The gauge is stuck on the surface of pavement and can monitor strain distribution of the surface. This series is a joint development product with National Institute for Land and Infrastructure Management - Airport Department, Toa Road Corporation and TML.	**10**	**-20 ~ +80**	**Single 16-element**
Post-Yield Strain Gauge "YEF"/"YF" Pam E-101	 **YFLA-2**	These gauges feature a special plastic carrier base capable of withstanding extreme elongation without creeping or cracking. The YEF is available for 10~15%, and YF for 15~20% with high accuracy. These gauges must be bonded with CN or CN-Y adhesive. The YEF series is also suited for measurement of repeatedly applied strain in elastic range.	**2 ~ 20**	**-20 ~ +80**	**Single Cross Rosette**
Post-Yield strain gauge "YUF"	 **YUFLA-2**	The gauge is designed for measurement of large strain only upto 20 ~ 30%. This YUF series is not applicable to the measurement of repeated strain in both elastic and large range.	**2,5**	**-20 ~ +80**	**Single**
Composite strain gauge "UBF"	 **UBFLA-03**	The gauge is designed for measurement on composite materials. It has a specially designed grid configuration to reduce the tightening effect of the gauge to the specimen. Developing soft carrier backing, this series feature advanced characteristics of thermal cycle examination and gauge creep.	**0.3,1**	**Static -30 ~ +120 Dynamic -30 ~ +150**	**Single Cross Rosette**
Foil Strain Gauge "BF" Pam E-101	 **BFLA-2-3**	This is a foil strain gauge intended for the measurement of fibre reinforced plastics. It utilizes polyimide backing and special grid configuration, which allow a good performance in strain measurement up to +200℃.	**2,5**	**-20 ~ +200**	**Single Cross Rosette**
Foil Strain Gauge "GF" Pam E-101	 **GFLA-3-50**	This gauge is a foil strain gauge which is designed for the materials with low elastic modulus such as plastics. It has a special configuration to minimize effect of gauge installation. Self temperature compensation for thermal expansion coefficient of 50 and 70x10^{-6}/℃ are available.	**3 ~ 6**	**-20 ~ +80**	**Single Cross Rosette**
Wide range temperature strain gauge "CEF"	 **CEFLA-I**	The gauge has a polyimide-amide carrier backing for wide use in temperature range from cryogenic condition up to 200℃.	**1,3,6**	**-269 ~ +200**	**Single**
Cryogenic Temperature Strain Gauge "CF" Pam E-101	 **CFLA-1-350-11**	This is an epoxy backing foil gauge designed for measurement under cryogenic conditions. The specially selected and heat-treated sensing foil of this gauge shows very small zero shift under cryogenic temperature compared with conventional gauge.	**1 ~ 6**	**-269 ~ +80**	**Single Cross Rosette**

Gauge series	Gauge pattern (example)	Description	Gauge length (mm)	Operational Temperature Range (℃) (Normal)	Remarks
Foil Strain Gauge "QF" Pam E-101	 **QFLA-5-11**	This is a foil strain gauge having polyimide backing which exhibits excellent performance at high temperature. Stress concentration measurement gauge or shear stress measurement gauge is also available in this series.	**0.2 ~ 6**	**-20 ~ +200**	**Single Cross Rosette Special**
Foil Strain Gauge "ZF" Pam E-101	 **ZFLA-1-11**	This is a foil gauge having polyimide backing and special grid configuration designed on the basis of many tests and calculations. The strain sensing element is a Nickel-Chrome foil, so this gauge is successfully used for high temperature measurement.	**1 ~ 6**	**-20 ~ +300**	**Single Cross Rosette**
Stress Gauge "SF" Pam E-101	 **SFA-285-11**	This is a foil strain gauge designed for measuring the stress in the optional direction in a plane stress field. This gauge can detect the stress in the gauge axial direction regardless of the shearing strain. This gauge is available for mild steel, stainless steel SUS304 and aluminium.	**4**	**-20 ~ +200**	**—**
WELDABLE STRAIN GAUGE "AW" Pam E-101	 **AW-6-350-11-01LT**	The gauge is made of 0.08mm thick stainless steel carrier base and a high temperaute foil strain gauge usable up to 300℃. It is installed by spot-welding.	**6**	**-196 ~ +300**	**Single**
WELDABLE STRAIN GAUGE "AWC" Pam E-101, E-177	 **AWC-8B-11-3LT**	The gauge has hermetically sealed stainless steel strain tube and mounted by spot welding. Neither coating nor wiring is needed. Suitable for long term measurement in harsh environments.	**2,8**	**-20 ~ +100**	**Single**
Weldable Strain Gauge "AWM/AWMD" "AWH/AWHU" Pam E-101/-175 /-176/-177	 **AWHU**	These gauges have a metal carrier backing such as stainless steel and are designed to be spot-welded to the test specimen using our welder W-50R.	**AWM-8** **AWMD-5/-8** **AWH-4/-8** **AWHU-5/-8**	**8** **5,8** **4,8** **4,8** **5,8**	**-196 ~ +300℃** **-196 ~ +800℃** **-196 ~ +600℃** **-196 ~ +650℃** **-196 ~ +800℃**	**Static/Dynamic** **Dynamic only** **Static only** **Dynamic only** **Static/Dynamic**
Bolt Gauge "BTM" Pam E-101/-155	**BTM-6C** 	This gauge is intended for measuring a tensile force of bolt. A hole having 2mm diameter is drilled at the center of the bolt and the gauge is inserted into the hole with A-2 adhesive. This method has the advantage where an ordinary strain gauge cannot be installed on the bolt surface.	**1,6**	**-10 ~ +80**	**Single**
Bolt axial force measurement wrench "BTMP"	 **BTMP-10A** **Example of exclusive terminal**	The bolt axial force can be easily measured by merely sticking the exclusive terminal on the head of a hexagonal bolt and setting the wrench on the bolt head. There is no need for attaching or detaching the leadwires when tightening the bolt.	For the detail, consult us.		
One-side Strain Gauge "DD" Pam E-101/-180		This gauge is specially designed to separately measure bending and tensile stresses by bonding the gauge to one side of a plate or beam on the assumption that strain distribution in the section of the plate or beam subjected to both bending and tensile stress is linear.	**3**	**-10 ~ +70**	**Single**
Crack Detection Gauge "FAC" Pam E-101	 **FAC-20**	This gauge is designed to measure progress of crack length and rate of its growth at a pre-determined location on test specimen for which metal fatigue should be monitored. Special adaptor CGA-120A is required between the gauge FAC-20 and strainmeter.	**—**	**-20 ~ +80**	**Single**

Gauge series	Gauge pattern (example)	Description	Gauge length (mm)	Operational Temperature Range (℃) (Normal)	Remarks
Temperature gauge "TF" Pam E-101	 **TFL-8**	This gauge is bonded on specimen surface like strain gauge and measures temperature. Exclusive adapter for temperature gauge (TGA-1A, TGA-1B) is available for easy reading of temperature using strainmeter.	**2 ~ 8**	**-20 ~ +200**	—
STRAIN CHECKER "FGMH" Pam E-101	**FGMH-1B** 	While ordinary strain gauges measure the strain generated in a structure through adhesives, Strain Checker is directly pressed against the structure with the attractive force of a magnet to measure the strain by the friction produced at the interface. Strain is easily measured by directly attaching the Strain Checker to a position where can be easily moved, and the measurement can be repeated easily.	**6**	—	**Single**
TRANSDUCER-SPECIFIC STRAIN GAUGES Pam E-101	 **(CB)**	TML gauges are used not only for strain measurement, but also as sensors for strain gauge-type transducers such as force transducer (Load Cell), pressure transducer, acceleration transducer, displacement transducers, torque transducer. Detailed specifications must be discussed and decided before ordering gauges for transducers. Consult sales representatives.	—	—	**Single Cross Rosette Full bridge Special**

SPOT WELDER W-50R

Pam E-101

This is a capacitive discharge spot welder used for the installation of weldable strain gauge and fixing of leadwires. A weld energy is executed by 2 ranges of 1-10/5-50 watt second continuously variable, and not influenced by the change of power source voltage because of stabilized circuit. It is light, small and convenient for field applications.

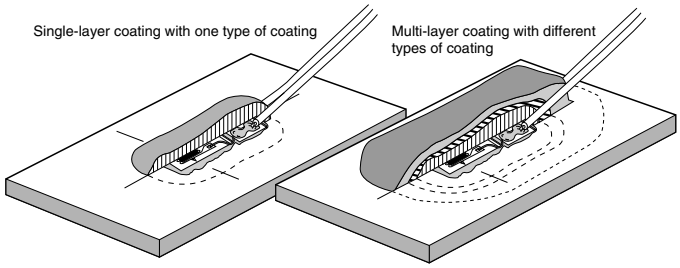
STRAIN GAUGE ADHESIVES

Type	Component	Operational temperature	Applications
P-2	Polyester	-30 ~ +180˚C	Two component room-temperature-curing (Mixing ratio: 1 ~ 3%), General use
RP-2	Polyester	-30 ~ +180˚C	Two component room-temperature-curing (Mixing ratio: 2 ~ 4%), Concrete use
NP-50	Polyester	-30 ~ +300˚C	Two component room-temperature-curing (Mixing ratio: 2 ~ 4%), Concrete use
PS	Polyester	-30 ~ +100˚C	Two component room-temperature-curing (Mixing ratio: 2 ~ 4%), Concrete use
CN	Cyanoacrylate	-196 ~ +120˚C	Single component room-temperature-curing, General use
CN-E	Cyanoacrylate	-30 ~ +120˚C	Single component room-temperature-curing, Concrete use
CN-Y	Cyanoacrylate	-30 ~ +80˚C	Single component room-temperature-curing, Post-yield gauge use
CN-R	Cyanoacrylate	-30 ~ +120˚C	Single component room-temperature-curing, Ambient lower temperature use
C-1	Phenol	-269 ~ +200˚C	Single component heat-curing
EA-2A	Epoxy	-269 ~ +50˚C	Two component room-temperature-curing (Mixing ratio: 2:1), Cryogenic temperature use
EB-2	Epoxy	-30 ~ +150˚C	Two component room-temperature-curing (Mixing ratio: 10:3), Cryogenic temperature use
A-2	Epoxy	-30 ~ +100˚C	Two component heat-curing (Mixing ratio: 10:1), BTM strain gauge use

MSDS : Material Safety Data Sheet
TML supplies an MSDS for all strain gauge adhesives and coatings. Contact your TML supplier for more information.

COATING MATERIALS

Pam E-101



Type	Content	Operational temperature	Materials	Applications
W-1	Hot-melting	0~+50˚C	Microcrystalline wax solid	General purpose coating for laboratory and field requirements where mechanical protection is not needed, or as a prime-coat for duplex coating
N-1	Air-drying solvent	-30~+80˚C	Neoprene rubber	General purpose coating for laboratory and less severe field requirement where a high degree of mechanical protection is not needed
K-1	Air-drying solvent	-269~+60˚C	Special rubber	Cryogenic temperature use Do not provide a high degree of mechanical protection
SB tape	Pressure sensitive	-30~+80˚C	Buthyl	3-mm thick tape-form coating, Very convenient use
VM tape	Pressure sensitive	-20~+80˚C	Buthyl	1-mm thick tape-form coating
Epoxy resin	Two component (Mixing ratio: 10:8)	-60~+100˚C	Epoxy	General purpose coating for mechanical protection
Epoxy resin AV138	Two component (Mixing ratio: 10:4)	-60~+180˚C	Epoxy	Mechanical protection use in high-temperature
Three Bond 1521B	Air-drying solvent	-30~+100˚C	Chloroprene rubber	Moisture- and Water-proof use Finish coating for multi-layer applications
KE-348	Air-drying solvent	-50~+200˚C	Silicon rubber	Heat-resistive
TSE3976-B	Air-drying solvent	-50~+300˚C (short term)	Silicon rubber	Heat-resistive, For long term use, elevated temperature is restricted up to +250˚C.

MSDS : Material Safety Data Sheet
TML supplies an MSDS for all strain gauge adhesives and coatings. Contact your TML supplier for more information.

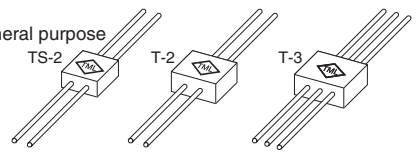
CONNECTING TERMINALS

Pam E-101

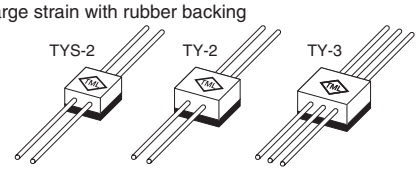
Connecting terminals provide convenient junction points to connect strain gauges to instrumentation leads.

Cubic shape

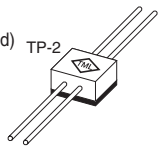
for general purpose



for large strain with rubber backing

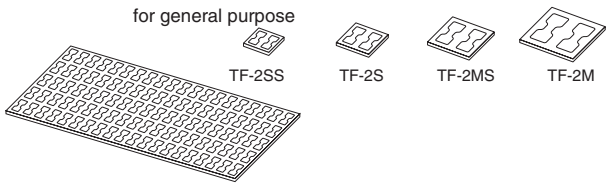


Self-bonding type
(No adhesive required)



Foil shape

for general purpose



for large strain with rubber backing

High temperature use with polyimide resin backing

Cubic shape

Type	Dimensions in mm	Operational temperature (℃)	Quantity per box
TS-2	7.5x7.5x5	-20 ~ +90	100
T-2	10x10x5	-20 ~ +90	100
T-3 (3-wire system)	10x10x5	-20 ~ +90	100
TYS-2	7.5x7.5x7	-20 ~ +90	100
TY-2	10x10x7	-20 ~ +90	80
TY-3 (3-wire system)	10x10x7	-20 ~ +90	80
TP-2	10x10x6	-20 ~ +60	100

Foil shape

Type	Dimensions in mm	Operational temperature (℃)	Quantity Pairs/sheet
TF-2SS	5x4x0.2	-196 ~ +180	50
TF-2S	6x5x0.2	-196 ~ +180	50
TF-2MS	8x6.8x0.2	-196 ~ +180	50
TF-2M	10x9x0.2	-196 ~ +180	50
TFY-2SS	5x4x0.8	-20 ~ +120	50
TFY-2S	6x5x0.8	-20 ~ +120	50
TFY-2MS	8x6.8x0.8	-20 ~ +120	50
TFY-2M	10x9x0.8	-20 ~ +120	50
TPF-2SS	5x4x0.2	-196 ~ +200	50
TPF-2S	6x5x0.2	-196 ~ +200	50
TPF-2MS	8x6.8x0.2	-196 ~ +200	50
TPF-2M	10x9x0.2	-196 ~ +200	50
TPFH-2SS	3.8x4.8x0.1	-269 ~ +350	50
TPFH-2S	5.5x6x0.1	-269 ~ +350	50
TPFH-2MS	7.5x8x0.1	-269 ~ +350	50

NB: TPFH series features heat-resistive connecting terminals with polyimide resin backing to TPF. It allows high temperature measurement using QF/ZF series gauges and bonding repetition on the terminals.

CONNECTOR INTEGRATED STRAIN GAUGES

●Connector integrated strain gauges (standard length: 1m)

2-wire strain gauges

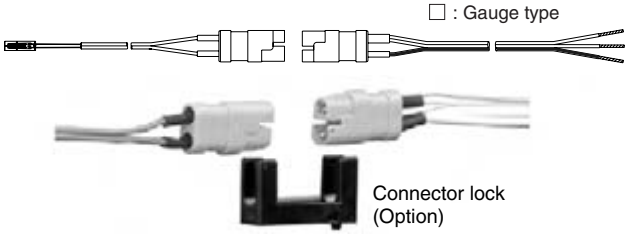
Type (with 1m leadwires)	□ -1LC
No. of cores/wire diameter (cross sectional area)	10/0.12 (0.11mm²)

□ : Gauge type

Irregular 3-wire strain gauges

Type (with 10m leadwires)	□ 10LC
No. of cores/wire diameter (cross sectional area)	20/0.18 (0.5mm²)

□ : Gauge type



●Connector Integrated Leadwires

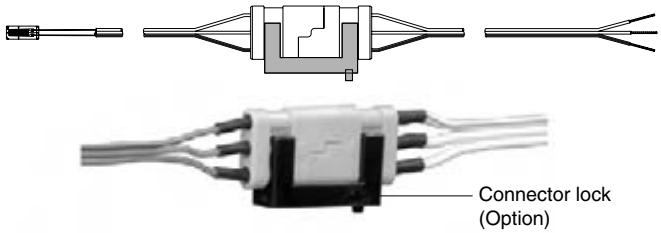
3-wire strain gauges

Type (with 1m leadwires)	□ -1LCT
No. of cores/wire diameter (cross sectional area)	10/0.12 (0.11mm²)

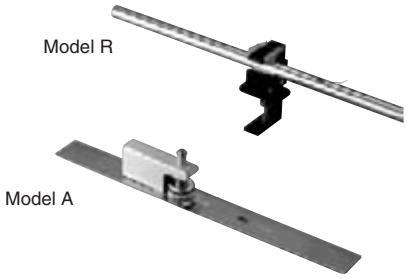
□ : Gauge type

3-wire strain gauges

Type (with 10m leadwires)	10LCT
No. of cores/wire diameter (cross sectional area)	20/0.18 (0.5mm²)



STRAIN GAUGE CLAMP - GAUGE MATE A AND R



When bonding the strain gauges, a fixing pressure should be applied to the gauge until curing is completed. This can be easily done using the TML Gauge Mate, which is a gauge clamp device consisting of a coil spring and a permanent magnet. For use on specimens of different shapes, two types are available. Model A is for flat specimens, and model R is for round specimens. Both can be used with room-temperature curing type bonding adhesive.

Type	Applicatioin
Gauge Mate R	Round specimen use (∅5~∅32mm)
Gauge Mate A	Flat specimen use (1mm thick or over)

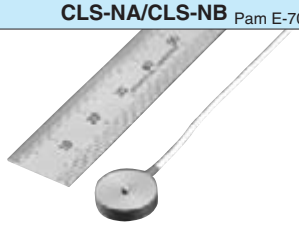
NB: Strain gauge clamp should be used in room temperature.

TML STRAIN GAUGE USERS' GUIDE / TML STRAIN GAUGE PERFORMANCE CHARACTERISTICS

A wide range of TML strain gauges are available to match diverse measuring conditions. Since strain gauges provide their designed functions only when they are attached to specimens, it is important to select the most appropriate gauge type in consideration of the specimen material type, gauge type in consideration of the specimen material type, operation temperature, measurement environment and installation dimensions. The Strain Gauge Users' Guide provide inexperience users with comprehensive information on strain gauges, covering various subjects ranging from step-by-step strain gauge installation instructions to cautions in handling strain gauges. The Strain Gauge Performance Characteristics compile a guide to the technology of current strain gauge for use in consideration of a limit in detection with regard to the materials and size of a test specimen, humidity, the amount of strain, speed, fatigue, environments, etc.

LOAD CELLS

CLS-NA/CLS-NB Pam E-701



Compression, Miniature
2N ~ 10kN

CLB-NA Pam E-701

Low range, Compression
50 ~ 200N

CLA-NA Pam E-701

Compression
500N ~ 20kN

CLG-NB Pam E-701

Compression, Low profile
10 ~ 200kN

CLP-NB/CLP-NB-D Pam E-701

Compression 10kN ~ 10MN(CLP-NB)
Dual outputs 30kN ~ 5MN(CLP-NB-D)

CLU-NA/CLU-NA-D Pam E-701

Compression 10kN ~ 1MN(CLU-NA)
Dual outputs 100kN ~ 1MN(CLU-NA-D)

CLM-NB Pam E-701

Compression, High performance
10kN ~ 2MN

CLJ-NA Pam E-701

Compression, High performance
Remote sensing available
5 ~ 30kN

CLJ-NB Pam E-701

Compression, High performance
Remote sensing available
10kN ~ 10MN

CLF-NA Pam E-701

Compression, Low profile
500kN ~ 10MN

CLL-NA/CLH-NA Pam E-701

Compression, Flat face
500kN ~ 1MN(CLL-NA)
1 ~ 2MN(CLH-NA)

CLR-NAH

High temperature use
500N ~ 200kN
Temperature range -10 ~ +160℃

KCE-NA Pam E-701 Pam E-720

Compression, Center-hole
500kN ~ 2MN

KCM-NA Pam E-701 Pam E-720

Compression, Center-hole
10kN ~ 5MN

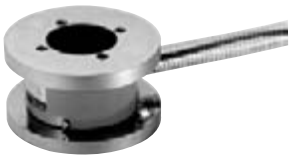
CLC-NA Pam E-701 Pam E-720

Compression, Center-hole
50kN ~ 5MN

KCG-NA

Compression, Center-hole
200kN
Strand force measurement

KCC-NA Pam E-701 Pam E-720



Compression, Center-hole
200kN ~ 1MN

TCLB-NA Pam E-701

Tension/Compression
50 ~ 200N

TCLA-NB

Tension/Compression
500N ~ 20kN

TCLK-NA Pam E-701

Tension/Compression
5 ~ 50kN

TCLZ-NA Pam E-701

Tension/Compression, High performance
10N ~ 10kN

TCLM-NB Pam E-701

Tension/Compression, High performance
10 ~ 200kN

TCLY-NA

Tension/Compression, High precision
300kN ~ 2MN

TCLP-NB/TCLP-NB-D Pam E-701

Tension/Compression 10kN ~ 2MN(TCLP-NB)
Tension/Compression, Dual outputs 20kN ~ 2MN(TCLP-NB-D)

TCLU-NA/TCLU-NA-D Pam E-701

Tension/Compression 10 ~ 200kN(TCLU-NA)
Tension/Compression, Dual outputs 100/200kN(TCLU-NA-D)

TCLN-NA Pam E-701

Miniature Tension/Compression
500N ~ 5kN

TLJ-NA Pam E-701

Tension, High performance
Remote sensing available
10 ~ 100kN

TLP-NB/TLP-NB-D

Tension 10kN ~ 1MN(TLP-NB)
Tension/Dual outputs 20kN ~ 1MN(TLP-NB-D)

TORQUE TRANSDUCERS

LTA-NA Pam E-701

Socket wrench torque meter
50 ~ 500N·m

LTB-NA Pam E-701

Flange type torque meter
10N·m ~ 1kN·m

DISPLACEMENT TRANSDUCERS

CDP/CDP-D Pam E-701

High sensitivity 5 ~ 100mm(CDP)
Spring loading Dual outputs 50/100mm(CDP-D)

CDP-B Pam E-701

Water drop-proofing, High sensitivity
Spring loading
5 ~ 25mm

CDP-M/CDP-MT Pam E-701 Pam E-751

Miniature, High sensitivity 5 ~ 100mm

DDP-A Pam E-701

Dial gauge type
10 ~ 50mm

SDP-C/SDP-D/SDP-D-D Pam E-701

Spring loading 50/100mm(SDP-C)
Spring loading 200/300mm(SDP-D)
Dual outputs 200mm(SDP-D-D)

SDP-CT Pam E-701

Spring loading, Tension type
50/100mm

DP-E Pam E-701 Pam E-760

Tape measure type, Large span
500 ~ 2000mm

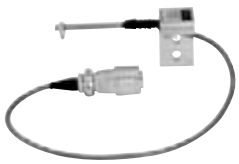
FDP-A

Waterproofing LVDT type
10 ~ 50mm

PI Pam E-701

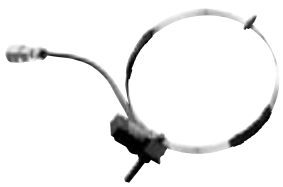
Large span ±2/±5mm
Gauge length 50 ~ 300mm

CE Pam E-701



Cantilever type
2 ~ 10mm

OU Pam E-701



Ring type
10 ~ 30mm

RA/RA-L Pam E-701

"COD" measurement 2/5mm
Cryogenic temperature use (RA-L)

UB/UB-A Pam E-701

"COD" measurement
ASTM compatible for UB-A
2/5mm(UB) 5mm(UB-A)

EXTENSOMETER

EDP-A/EDP-B Pam E-701

5mm
For round bar (EDP-A)
For flat plate (EDP-B)

PRESSURE TRANSDUCERS

PW-PA Pam E-701

Cavity type
General purpose 100kPa ~ 50MPa

PWH-PA Pam E-701

Cavity type
High range 70 ~ 200MPa

PWF-PA/PWFC-PA Pam E-701

Flush diaphragm type
1 ~ 50MPa (PWF-PA)
Small 2 ~ 50MPa (PWFC-PA)

PWA-PAH Pam E-701 Pam E-746

Amplifier-integrated, High temperature
2 ~ 50MPa
Voltage output type PWA-PAHV
Current output type PWA-PAHA
Operating temp. -20 ~ +120℃

PRESSURE TRANSDUCERS

PW-PAH
Pam E-701
Pam E-747

Small, High temperature
2 ~ 50MPa
Maximum operating temperature+170℃

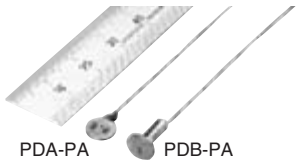
PWFD-PB
Pam E-701

Hexagonal Head Bolt type(M8)
2 ~ 20MPa

PWFE-PA

Hexagonal Head Bolt type(M6)
2 ~ 20MPa

PDA-PA/PDB-PA
Pam E-701



Miniature
200kPa ~ 3MPa

ACCELERATION TRANSDUCERS

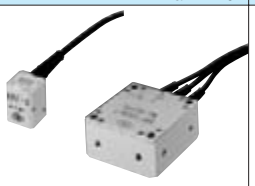
ARS-A

High sensitivity
10m/s^2

ARM-A-T

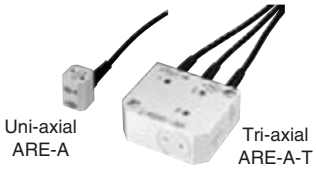
Small, Tri-axial
X, Y:100m/s^2, Z:400m/s^2

ARF-A/ARF-A-T
Pam E-701



Small, Low range
Uni-axial 10 ~ 500m/s^2 (ARF-A)
Tri-axial 20 ~ 500m/s^2 (ARF-A-T)

ARE-A/ARE-A-T
Pam E-701

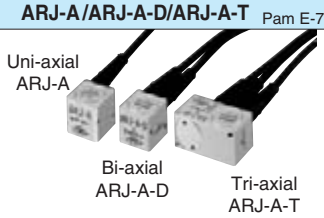


Small, Low range
ARE-A 1000 ~ 10000m/s^2
ARE-A-T 1000 ~ 5000m/s^2

ARH-A
Pam E-701

Waterproof, Low range
10 ~ 500m/s^2

ARJ-A/ARJ-A-D/ARJ-A-T
Pam E-701

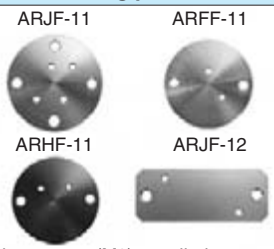


High frequency response
50 ~ 2000m/s^2

ARK-A
Pam E-701

Small, High frequency response
1000/2000m/s^2

Fixing plates



*Fixing screws (M2) supplied

STRAIN TRANSDUCERS

KM/KM-AT/KM-BT
Pam E-720

±5000x10^{-6}strain
With built-in thermocouple (KM-AT/-BT)

REINFORCING BAR METER

KSA-A/KSAT-A
Pam E-720

300N/mm^2
With built-in thermocouple (KSAT-A)

JOINT METER

KJA-A/KJB-A
Pam E-720

5 ~ 50mm

SHEAR DISPLACEMENT TRANSDUCERS

KU-A
Pam E-720

For concrete construction ±2.5mm

CRACK DISPLACEMENT TRANSDUCERS

KG-A
Pam E-720

For concrete construction ±2/±5mm

KG-B
Pam E-720

For concrete construction
Bi-axial X:+4/-2mm Y:±3mm

COMPRESSOMETER

CM/CM-H
Pam E-720

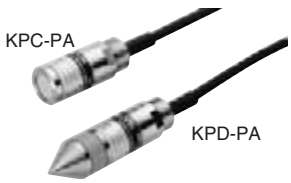
Compression destructive proof CM-H

PORE PRESSURE GAUGES

KPA-PA/KPB-PA
Pam E-720

∅40mm(KPA/KPB)
200kPa ~ 2MPa

KPC-PA/KPD-PA
Pam E-720



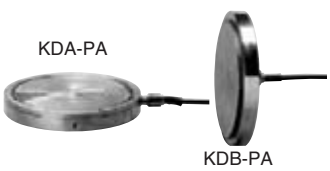
∅30mm(KPC/KPD)
200kPa ~ 2MPa

KPE-PA

Small, Model-kit test
200kPa ~ 2MPa

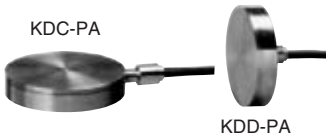
SOIL PRESSURE GAUGES

KDA-PA/KDB-PA
Pam E-720



∅200mm 200kPa ~ 2MPa

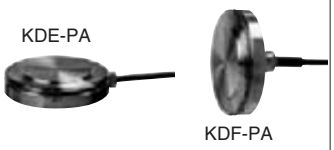
KDC-PA/KDD-PA
Pam E-720



∅100mm 200kPa ~ 2MPa

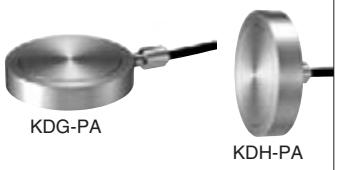
SOIL PRESSURE GAUGES

KDE-PA/KDF-PA Pam E-720



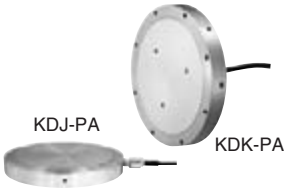
∅50mm 200kPa ~ 2MPa

KDG-PA/KDH-PA Pam E-720



Load cell type
∅100mm 200kPa ~ 2MPa

KDJ-PA/KDK-PA Pam E-720



Load cell type
∅200mm 200kPa ~ 2MPa

KDL-PA Pam E-720

∅180mm 200kPa

INCLINOMETER

KB-AB/KB-AC Pam E-720

±1 ~ 5 deg.
1-directional (-AB) 2-directional (-AC)

KB-B Pam E-720

Impact proof type ±0.5 ~ 2 deg.

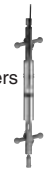
KB-DB/KB-EB Pam E-720

Small 5/±10 deg.
1-directional (-DB) 2-directional (-EB)

KB-JE/KB-KE Pam E-720

Multi-layer use ±5/±10 deg.
1-directional (-JE) 2-directional (-KE)

KB-JF/KB-KF Pam E-720



Multi-layer use ±5/±10 deg.
1-directional (-JF) 2-directional (-KF)

KB-KD Pam E-720

Multi-layer, 2-directional, High outputs
±5/±10 deg.

NKB-LD/NKB-MD Pam E-720

Multi-layer use for TML-NET ±5/±10 deg.
1-directional (-LD) 2-directional (-MD)

KB-P Pam E-720

Built-in arrestor

Embedment type ±5/±10 deg.

MICRO CREEP METER

KB-GC/KB-HC Pam E-720

Insertion type ±5/±10 deg.
1-directional (-GC) 2-directional (-HC)

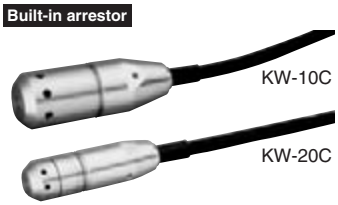
KH-A Pam E-720

5mm

WATER LEVEL METER

KW-C Pam E-720

Built-in arrestor



10,20,30,50m

WATER-TUBE DISPLACEMENT TRANSDUCERS

KWL-B Pam E-720

Water pressure type 1/2m

GROUND EXTENSION GAUGE

KWL-E Pam E-720

Built-in arrestor

Water level type 100,200mm

KLG-A/NKLG-A Pam E-720

Built-in arrestor

Land slide measurement
200mm(KLG-A)
TML-NET compatible 200mm (NKLG-A)

KLG-B/NKLG-B Pam E-720

Built-in arrestor

Land slide measurement
50/100mm(KLG-B)
TML-NET compatible 50/100mm (NKLG-B)

SETTLEMENT TRANSDUCER

KLA-A/NKLA-A Pam E-720

Settlement measurement
Multi-layer 6 levels at max. 100mm
TML-NET compatible 6 levels 100mm

ROCK DISPLACEMENT TRANSDUCER

KLB-A Pam E-720

Multi-layer 8 levels at max. 100mm

Multi-layer settlement transducer

KLC-A

Max 8 layers 50mm (-20 ~ +30mm)

ROCKBOLT AXIAL FORCE TRANSDUCER

KRA-A Pam E-720

2 ~ 4 measuring points 80kN

TEMPERATURE GAUGE

KT-110A Pam E-720

-30 ~ +80℃

Thermocouple Pam E-720

Type : T and K

SENSOR FOR COMPUTERIZED-

KZA-1C

Concrete filling sensor

CONSTRUCTION OF CONCRETE

KZL-A Pam E-720

Concrete level sensor

KZW-A Pam E-774

Concrete free water transducer

CAISSON SKIN-FRICTION METER

KKA-PA Pam E-720

200kPa

CAISSON CUTTING-EDGE REACTION METER

KKB-PA Pam E-720

2MPa

DATA LOGGER/STATIC STRAINMETERS/SWITCHING BOXES

DATA LOGGER TDS-630

Pam E-330

- Measures up to 1000 channels
- High speed 1000 channels in 0.1 seconds
- Color LCD monitor with touch-panel
- Display toggle between Japanese and English
- 3-interface available with Ethernet LAN, USB2.0 or RS-232C
- High resolution mode of 0.1×10^{-6} strain available
- Built-in 30-channel switching box with semiconductor relay (10-channel as standard specification)
- Direct reading in physical quantity available with coefficient set
- Lightning surge arrestor onboard (internal switching box)
- 1-Gauge 4-Wire strain measurement compatible
- New compensation methods of measuring strain provided

DATA LOGGER TDS-530

Pam E-338

- Measures up to 1000 channels
- High speed 1000 channels in 0.4 seconds
- Color LCD monitor with touch-panel
- Display toggle between Japanese and English
- With built-in CF card slot for maximum 1GB
- 3-interface available with RS-232C, USB2.0 or Ethernet LAN
- High resolution mode of 0.1×10^{-6} strain available
- Built-in 30-channel switching box with semiconductor relay available (10-channel as standard specification)
- New compensation methods of measuring strain provided
- Simultaneous measurement of strain and temperature with one channel
- 1-Gauge 4-Wire strain measurement

SWITCHING BOX IHW-50H

- Compatible with high speed communication method TML-LINK
- Fastest measurement of 1000 channels in 0.1 sec. with Data Logger TDS-630
- High resolution mode of 0.1×10^{-6} strain available
- 1-Gauge 4-Wire strain measurement compatible
- Simultaneous measurement of strain and temperature with one channel
- Onboard lightning surge arrester on each channel
- New compensation methods of measuring strain provided

HIGH SPEED SWITCHING BOX IHW-50G

Pam E-338/-369

- Electrically insulated from Data Logger
- Strain, DC voltage and thermocouple / PtRTD temperature measurement
- Sampling speed of 0.04 sec./channel, 1000 channels in 0.4 sec. with parallel operation of built-in ADCs
- Fiber optical or RS-422 cable connection with data loggers
- Onboard lightning surge absorber
- Connectable data loggers: TDS-530/TDS-602/TDS-303
- Complete compensation of strains
- PCU-4A compatible: IHW-50G-01

SWITCHING BOX ISW-50G

Pam E-338/-369

- Electrically insulated from Data Logger
- Strain, DC voltage and thermocouple / PtRTD temperature measurement
- Sampling speed of 0.04 sec./channel, 1000 channels in 2 sec. with built-in ADC
- Onboard lightning surge absorber
- Fiber optical or RS-422 cable connectioin with data loggers
- Complete compensation of strains
- Connectable data loggers: TDS-530/TDS-602/TDS-303

PARALLEL COMMUNICATION UNIT PCU-4A

- Combination use with only IHW-50G-01 (optional)
- Direct connection to the TDS-630 by TML-LINK special cable
- Possible control upto 4 units of the IHW-50G-01
- With 5 units PCU-4A, parallel measurement is available with 20 units IHW-50G-01, enabling 1000 channels in 0.1 sec. repeatable

DATA LOGGER/STATIC STRAINMETERS/SWITCHING BOXES

SWITCHING BOX SSW-50D

Pam E-393

- Compatible with TML 1-Gauge 4-Wire strain measurement method
- Available for strain, DC voltage and thermocouple measurements
- Can be used with conventional models SSW/ASW-50C
- Complete strain correction method provided
- Cascade connection by one cable of 9mm-dia. with data logger
- Applicable Data Logger: TDS-530/TDS-602/TDS-303

SWITCHING BOX ISW-10D FOR DIGITAL DISPLACEMENT SENSOR

- By combination use with the TDS-630 or TDS-530, digital displacement sensor is available
- Compatible for 2 type digital displacement sensors
- Digital signals is provided, no deterioration of signal occurred

SWITCHING BOX ASW-30C/ASW-50C

- Measurement of strain, DC voltage and thermocouple available
- Semiconductor relay is used in SSW-50C/-30C that is ideal for multi-channel monitoring
- Sensor mode set for each channel using data logger program
- Cascade connection to data logger using just one cable measuring 9mm in diameter
- Either screwing or soldering is available to the terminal

SWITCHING BOX SSW-10MC/SSW-10SC

- SSW-10MC (master unit) with built-in control unit for measurement of up to 10 points
- Master unit can be connected with up to four SSW-10SC satellite units
- The number of measuring points can be increased every 10 channels by adding the necessary number of satallite units
- Optional booster unit for master unit for cable extension
- Equipped with the Complete strain correction method

PORTABLE DATA LOGGER TDS-150

- Connectable five decade Channel Unit FSW-10 for 50 channels max
- Possible long-term automatic measurement using sleep interval timer
- Low power consumption
- 1-Gauge 4-Wire strain measurement compatible
- TEDS compatible
- New compensation methods of measuring strain provided

CHANNEL UNIT FSW-10

- Exclusive 10 channel unit for use with the TDS-150
- Connectable 5 models for 50 channels max
- 1-Gauge 4-Wire strain measurement compatible

HANDHELD DATA LOGGER TC-32K

Pam E-3000

- Measures strain, DC voltage, thermocouples, PtRTD
- Insulation resistance measurement function is provided to check sensors
- Standard interface USB and RS-232C provided
- 1-Gauge 4-Wire strain measurement compatible
- New compensation methods of measuring strain provided
- TEDS compatible
- One touch connection of sensor cable
- Possible automatic measurement using sleep interval timer
- Multiple measurement available with exclusive switching box CSW-5A

SWITCHING BOX CSW-5A

Pam E-3000

- Multi-channel available with the TC-32K
- Measures strain, DC voltage, thermocouples, PtRTD
- Parameter set by the TC-32K
- Terminal connection available with both screwing and soldering
- CSW-5A-05 provides both terminal and one-push connectors

REMOTE POWER CONTROLLER RPC-1A/RPC-05A

- Makes battery drive of our instrument possible
- Onboard battery charging system is available for a long-term automatic measurement with solar battery
- ON-OFF power control makes computer's control possible via RS-232C
- Applicable instruments
  Data Logger : TDS-530, TC-32K, TDS-150
  Network use Handheld Strainmeter TC-35N
  Dynamis strainmeter : SDA-810C, SDA-830

EXTERNAL DISPLAY UNIT EDU-11

- Remote display with large, high-brightness LED for monitoring TDS-530, TDS-150, TC-32K
- Any channel available for monitor
- By cascading connection, multi-channel monitoring is possible

DYNAMIC STRAINMETERS

DIGITAL DYNAMIC STRAINMETER DRA-162B

- 16-channel carrier wave type
- 16-bit A/D transformer is built-in each channel, recording waveform in dgital data
- Data memory of 256k words per channel
- TEDS compatible
- Binary high-speed transfer by LAN
- Connectable 16 unit (250 channels) max., synchronous measurement available
- Data read-in software supplied

HIGH SPEED DIGITAL DYNAMIC STRAINMETER DRC-3410

Pam E-434

- Each channel incorporates A/D converter for simultaneous measurement for all 30 channels
- Waveform data stored in digital values
- Built-in large capacity memory
- High speed sampling at 1M samples/sec.
- High speed and large data transfer by LAN interface

DIGITAL DYNAMIC STRAINMETER DRA-101C

Pam E-426

- Built-in A/D converter at each channel for digital waveform recording
- Built-in large-capacity data memory (standard 48k words/channel, expandable up to 496k words/channel at the maximum)
- Various functions of digital processing
- Analog output of calibration voltage and recorded waveform through A/D converter
- External sampling clock input capability
- High resolution mode (0.1×10^{-6} strain)

DIGITAL DYNAMIC STRAINMETER DRA-107A

Pam E-427

- Built-in A/D converter at each channel for digital waveform recording
- Built-in large-capacity data memory of 496k words/channel
- Various functions of digital processing
- High resolution mode (0.1×10^{-6} strain)
- Data read-in software DRA-7107 supplied as an accessory

DYNAMIC STRAINMETER SDA-810C/SDA-830C

Pam E-430

- Small and light
- Indication of input waveform, digital value, bar-graph and stored waveform
- Sampling speed of 50 μsec at maximum
- Built-in 20k words/channel data memory
- Function for automatically detecting peaks in stored data waveforms
- Built-in bridge box
- Computer control via RS-232C

SMART DYNAMIC STRAIN RECORDER DC-204R/DC-204Ra

- 4-channel configuration with miniature size like postcard
- Sampling speed of max. 5 μ-sec./channel
- Data recording on compact flash card of 2G-byte capacity
- Parallel connection up to 8 units (32 channels)
- Upgraded model DC-204Ra with analog output of ±5V
- Data format conforms to commercial analysis software DADiSP/2000

Static strain mode

Dynamic strain mode

MULTI-CHANNEL DIGITAL STRAINMETER DRA-30A

Pam E-456

- Either dynamic or static strain measurement available by switching
- Possible quarter (in 3-wire system), half and full bridge and voltage measurements
- Each channel incorporates A/D converter for simultaneous measurements and records in digital values for all channels
- Data memory of 112k words for each channel
- On-line measurement with built-in GP-IB and USB 1.1 interface
- Control software DRA-730A supplied as an accessory

DYNAMIC STRAINMETER DA-16A/DA-36A

Pam E-401

- 1-channel dynamic strainmeter of carrier wave type
- Minimum sensitivity fluctuation due to gauge resistance
- Improved electronic auto-balancing performance
- Automatic tracking type capacity balance
- Built-in low-pass filter
- External control for balancing and calibration output
- Dual power supply of AC and DC
- Frequency response
  DA-16A: DC ~ 2.5kHz
  DA-36A: DC ~ 10kHz

DYNAMIC STRAINMETER DC-96A/DC-97A

Pam E-401

- 1-channel dynamic strainmeter of DC Exciting type
- High response frequency ranging from DC to 200kHz (DC-96A), while DC to 500kHz (DC-97A)
- Minimum sensitivity fluctuation due to gauge resistance
- Improved electronic auto-balancing performance
- Automatic tracking type capacity balance
- Built-in low-pass and high-pass filters
- External control for balancing and calibration output
- Dual power supply of AC and DC

DYNAMIC STRAINMETER DA-37A

Pam E-407

- A high frequency response of 10kHz
- Less sensitivity drop due to gauge resistance
- Digital sensitivity setting
- Electronic auto-balancing
- Automatic tracking type capacity balance
- Built-in low-pass filter
- External control for balancing and calibration output
- Dual power supply of AC and DC

OPTIONS

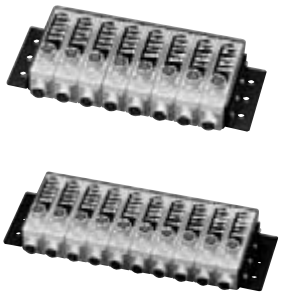
THERMOCOUPLE ADAPTER TA-01KT

- ●K or T type thermocouple measurements
- ●Small, light
- ●Direct connection to strainmeter receptacle
- ●Unnecessary external power source
- ●Built-in reference contact
- ●Isolated input and output
- ●Good linearity with digital linearizer
- ●Onboard burn-out function
- ●Calibration output function provided
- ●Applicable instruments
  DC type Dynamic Strainmeters
  DC-204R/-204Ra
  DC-96A, DC-97A
  Histogram Recorder HR-908A
  Multi-Recorder TMR-200
  Multi-channel Digital strainmeter DRA-30A

BRIDGE BOX SB-121A/SB-351A

Pam E-401

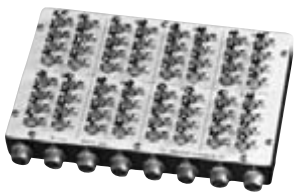
- ●Quarter bridge 3-wire system SB-121A : 120Ω
  Quarter bridge 3-wire system SB-351A : 350Ω
- ●Half bridge, Full Bridge : 60 ~ 1000Ω for both models
- ●Compact size - 1/3 size of previous models



BRIDGE BOX SB-120B-8/SB-120SB-10

Pam E-401

- ●Number of channels SB-120SB-8 : 8
  SB-120SB-10 : 10
- ●Quarter bridge, Quarter bridge 3-wire : 120Ω
- ●Half bridge, Full Bridge : 60 ~ 1000Ω for both models
- ●One-touch NDIS connector input



BRIDGE BOX SB-128A/SB-128A-10

Pam E-401

- ●Number of channels SB-128A-8 : 8
  SB-128A-10 : 10
- ●Quarter bridge, Quarter bridge 3-wire : 120Ω
- ●Opposite half bridge, Opposite half bridge 3-wire : 120Ω
- ●Half bridge, Full Bridge : 60 ~ 1000Ω for both models
- ●One-touch NDIS connector input

BRIDGE BOX SB-120B/SB-350B

Pam E-401

- ●Quarter bridge, Quarter bridge, Opposite half bridge, Opposite half bridge 3-wire
  120Ω : SB-120B 350Ω : SB-350B
- ●Half bridge, Full Bridge : 60 to 1000Ω for both models
- ●One-touch NDIS connector input

P-4A

P-6A

P-8A

Example of 4units DA/DC series housed

CARRYING CASE P-4A/P-6A/P-8A/P-10A

Pam E-401

- ●For configuration of multi-channel system with DA and DC series
  These carrying cases are used to configure multi-channel system with DA series, and DC series units. Each is equipped with a power switch for simultaneous ON/OFF of all channels, a calibration strain generation switch, and a balance button.

  P-4A : 4 channels use
  P-6A : 6 channels use
  P-8A : 8 channels use
  P-10A : 10 channels use

RACK R-10A

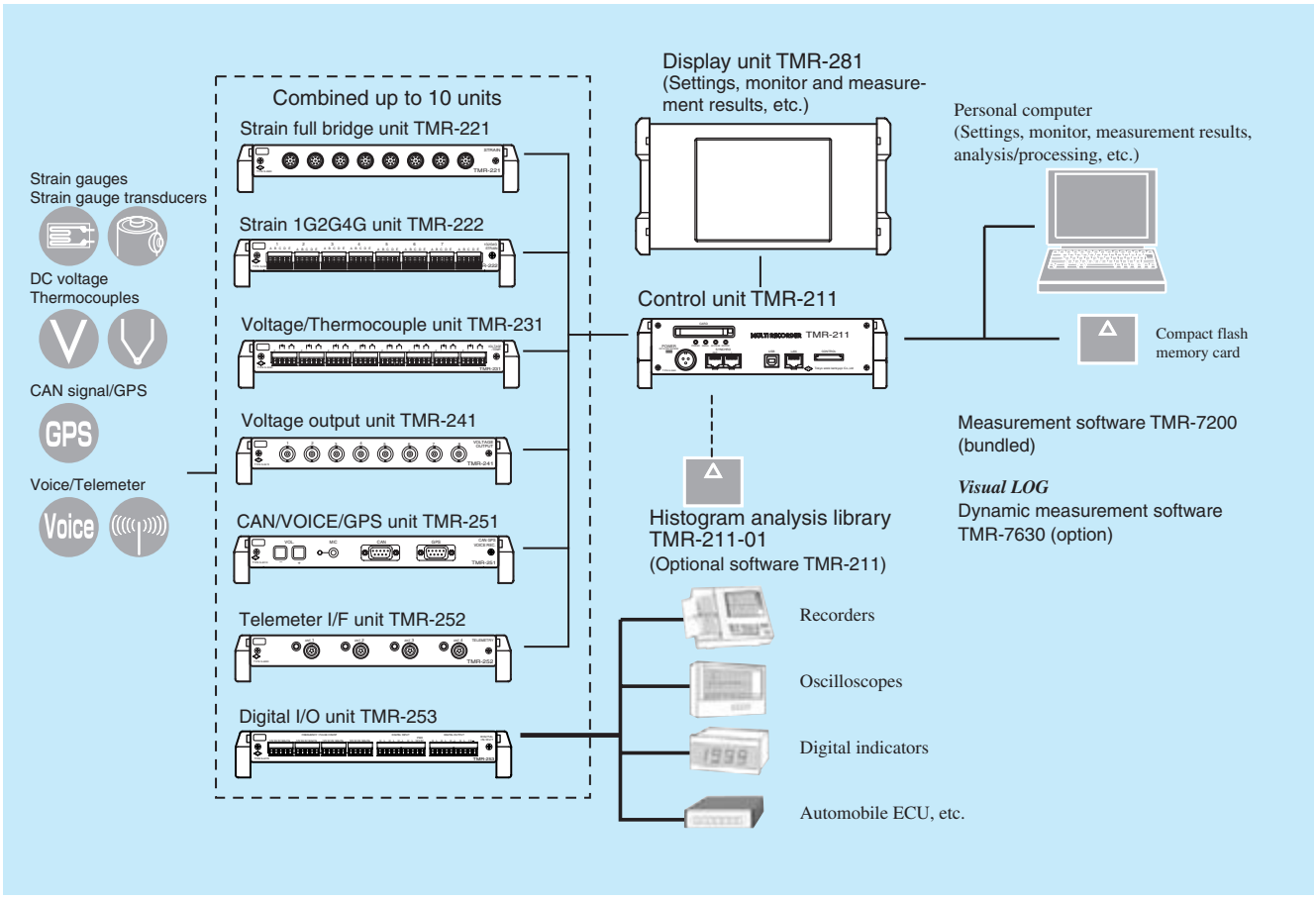
Pam E-401

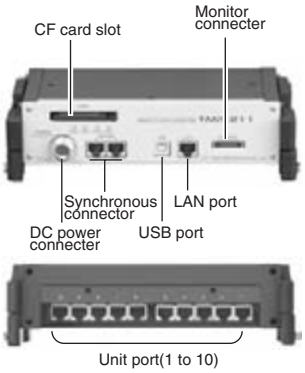
- ●JIS rack to configure a system with up to 10 units DA or DC series
  This rack lets you configure a system with up to 10 channels using DA series, or DC series units. It is equipped with a power switch for simultaneous ON/OFF of all channels, a calibraiton strain generation switch, and a balance button.

MULTI-RECORDER

The multi-recorder TMR-200 series is a small multichannel data acquisition system enabling combination of various sensor input units according to purposes. A high speed sampling of 100kHz is possible and sensor input units include not only analog input/output for strain, voltage, temperature, etc. but also digital input/output unit for CAN, etc. up to 80 channels. Real-time histogram analysis (option) as well as waveform recording is available. Connection with the display unit with color LCD makes data acquisition without computer from various settings to monitoring and measurement result display possible. Hooking up to a computer allows more sophisticated various histogram analysis system to be constructed.

SYSTEM BLOCK DIAGRAM





CONTROL UNIT TMR-211

- Possible combination of various sensor input/output units such as strain, temperature, voltage, CAN, etc.
- Maximum 80-channel measurements
- High speed sampling of 100kHz
- Anti-vibration and small size to suite vehicle onboard
- Data recovery during power failure and measurement restart function after power recovery
- Display of monitor and measuring results from various settings with a display unit
- Compatible large capacity memory card
- Onboard USB and LAN interfaces
- Frequency analysis processing in real time (Option)

DISPLAY UNIT TMR-281

- 5.7" color TFT LCD touch panel display
- Display of various analysis results such as numerical monitor, wave monitor, frequency analysis, etc.
- Possible measurement start/stop, balance control, setting to various measurement units, etc.

FULL BRIDGE STRAIN UNIT TMR-221

- For full bridge strain measurement
- 8 measuring channels
- Strain input (120 ~ 350Ω)
- Available voltage measurement with attenuation cable CR-4010

STRAIN 1G2G4G UNIT TMR-222

- 1/4, 1/2 and full bridge measurements using an exclusive small bridge box
- 8 measuring channels
- Strain input (120 ~ 350Ω)
- Supplied with 8 pieces of exclusive bridge box SB-120T or SB-350T to be selected when ordering

VOLTAGE/THERMOCOUPLE UNIT TMR-231

- For voltage/thermocouple measurements
- 8 measuring channels
- Voltage/thermocouple (T,K,J) input
- Isolated between channels

VOLTAGE OUTPUT UNIT TMR-241

- For voltage output of measuring data using other measurement units
- 8 analog output channels (BNC connector)
- Optionally settable corresponding measuring channels
- Possible output of addition, subtraction and average operation results up to 4 channels

CAN/Voice/GPS UNIT TMR-251

[CAN]
Applicable protocol Conforms to CAN Spec. V2.0B active
Transfer speed 10k - 1Mbps
Number of messages 64 (Up to 64 for receiving, Up to 8 for transmitting)
[GPS]
Applicable receiver TMR-251-3
[Speed measurement] Measurement interval 100Hz
[Voice recording] Number of input: 1
Voice trigger selected among 3 steps
GPS Receiver TMR-251-3
[GPS] Measurement of Longitude, Latitude, Elevation, Speed, Direction and Time Digital signal input
[Digital input] Number of input: 1

TELEMETER I/F UNIT TMR-252

- Connectable 4 units of receiver
- For connecting a digital telemeter receiver DT-24R
- Compatible sensor: Wheel torque transducer LTW-ND
- Number of data: 8 points

DIGITAL I/O UNIT TMR-253

[Frequency measurement and Pulse counter part]
Number of inputs : 4
Maximum input voltage : ±15V
Frequency response : 1Hz ~ 100kHz
Output voltage : 5V/12V
Output current : 5V/50mA, 12V/25mA
Count range : 0 ~ 29999 counts
Frequency measurement, Count number measurement, Rotary encorder calculation
Phase A phase B count number calculation
Phase A phase B phase Z angle calculation

[Digital input part]
Number of inputs : 4
[Digital output part]
Trigger singnal ouptut 1 point, Upper and lower alarm each 1 point, Sampling signal output 1 point

Multi-Recorder Options

- Histogram Analysis Library TMR-211-01
- Bridge Box SB-120T/SB-350T
- Attenuation cable CR-4010
- Carrying Handle
- Fixing Bracket
- Display unit mounting stand

HISTOGRAM RECORDER SYSTEM

HISTOGRAM RECORDER HR-908A

- Simultaneous measurement and analysis as well as histogram recording
- Number of slices can be set up to ±50
- Six control input and two output channels enable measurement by preset conditions as well as alarm output
- Input checks available by real-time multiple channel monitoring and FFT monitoring

INDICATOR

DIGITAL INDICATOR TC-31M

Pam E-371

- Strainmeter exclusively used for measuring strain gauge based transducer
- Built-in data memory for recording 10000 data at maximum
- Powered by four AA size alkaline dry batteries, which can be replaced on measuring site
- Flash memory card accepted

DIGITAL LOAD METER TC-31L

Pam E-370

- Direct reading of load, displacement, etc.
- Parameters of 20 transducers at maximum can be stored
- Peakhold function provided
- Simultaneous indication of monitored value and peakhold value
- Data memory available

DIGITAL INDICATOR TD-97A

- Large size color LCD for easy reading
- Graphic indication available
- Touch panel operation for good operability
- High speed sampling of 2000 times/second
- Digital peakhold function by high speed CPU
- Analog/digital filter provided for stable reading
- Various hold functions provided

DIGITAL INDICATOR TD-95A

- Automatically sets sensitivity by connecting TEDS (IEEE1451.4 class 2) compatible transducers
- Direct digital display (±19999) in any physical unit
- Possible high/low limit comparison
- Equivalent calibration signal input provided to make sensitivity adjustment easy without actual loading
- Analogue output with D/A conversion (Option)

DIGITAL INDICATOR TD-23L

Pam E-528

- High bright color LCD(5.7" 320x240 dots) available in both Japanese and English
- A least resolution of 0.01×10^{-6} strain
- Wide measuring range
- Possible Pt RTD measurement (Option)
- Excellent accuracy and stability
- Possible remote sensing method
- Interface: RS-232C and Ethernet LAN

INSTRUMENTATION DIGITAL INDICATOR TD-91B/TD-91BB

Pam E-527

- Small and lightweight
- Analog peak-hold and HI/LOW limit functions
- Wide balance adjustment range
- Easy operation with jog dial
- Direct reading in physical quantity with calibration of equivalent input
- Posssible panel mounting, Desk-top portable available with TD-91BB
- Voltage and current outputs

DIGITAL TELEMETER SYSTEM

DIGITAL TELEMETER TRANSMITTER DT-031T

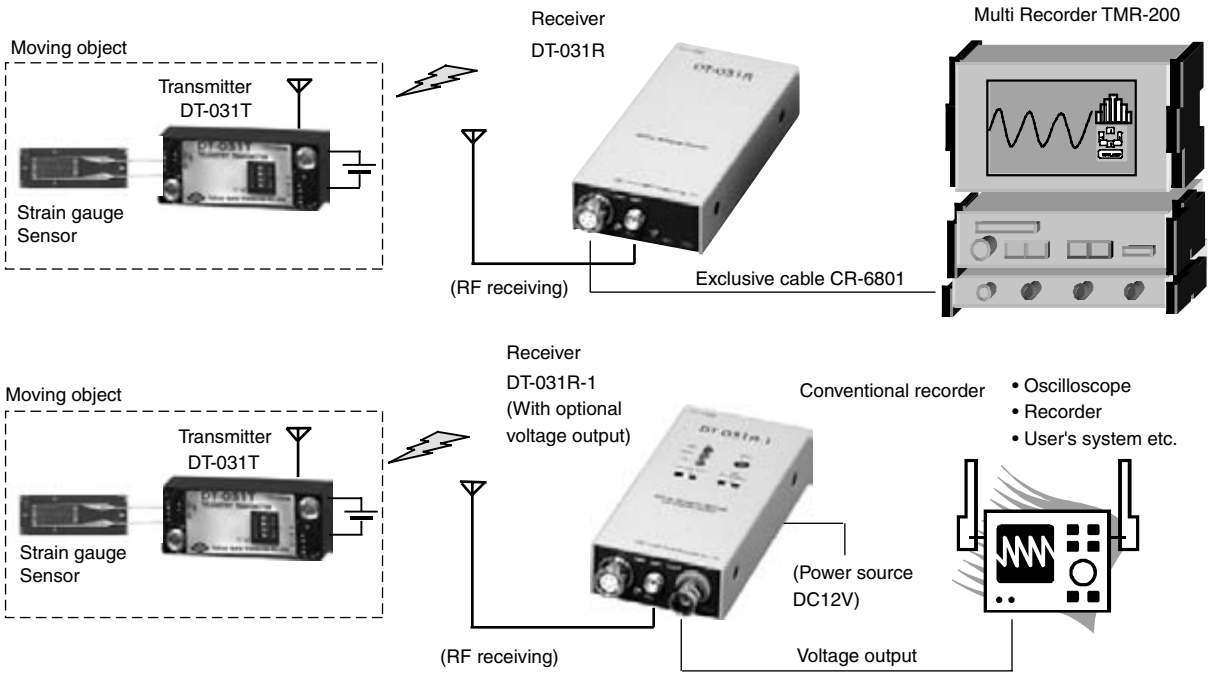
- Transmits strain value and transmitter power source voltate in digital values
- No calibration required because strain value is already calibrated
- Measurement data are easily filed by combination with TMR-200
- Constructed very small
- Very low power wireless system of 315MHz band

DIGITAL TELEMETER RECEIVER DT-031R

- Very small and easy operation
- Expandable system configuration by combination with TMR-200
- DT-031R-1 is equipped with voltage output function for standalone use with a recorder

DIGITAL TELEMETER SYSTEM

■Measurement Block Diagram



TELEMETRY SYSTEM

TELEMETRY TRANSMITTER TT-91

- No wireless-license is required because of a very weak electric wave used.
- Possible transfer of data with good quality and less noise owing to the use of FM wave

TELEMETRY RECEIVER TR-90/TR-87

RECEIVER TR-90
- With digital display of band frequency, multiple units are easy to select.
- Receiving signal levels with LED indication
- Power supply available on both AD and DC

RECEIVER TR-87
- Miniature in name-card size
- Band frequency and signal levels are displayed in digital values.
- 12V DC power supply and low power consumption

STRAIN CALIBRATOR

AUTOMATIC CALIBRATOR CBA-2310A

- 10-ch simultaneous calibration
- Wide calibration range of 109999x10⁻⁶strain/ ±20.0000V
- Available for both static and dynamic strainmeters
- Generating dynamic phenomena in a simulated manner
- Computer control with GP-IB

STRAIN CALIBRATOR CBM/CBA/CB

Pam E-540

- Wide calibration range
- Available for both static and dynamic strainmeters with bridge excitation frequency of 20kHz or lower
  Models: CBM-122A/CBM-352A and CBA-131A
- Generating dynamic effects in a simulated manner (CBA-131A)

STRAIN CALIBRATOR CBA-3308A

- 8-ch simultaneous calibration
- Isolated among channels
- Computer control available
- Wide calibration range
- High resolution
- Generating dynamic phenomena in a simulated manner in quarter bridge, full bridge method, DC voltage mode
  NB: For use in mixed type of instruments, DC output only available

AUTOMOTIVE MEASURING SYSTEM

Steering torque transducer HLA-A

By attaching the transducer to passenger car's steering column, driving torque and angle are measured. This application is designed not to disturb its steering functions including air bag safty.

Frictional Torque Transducer FGDH-A

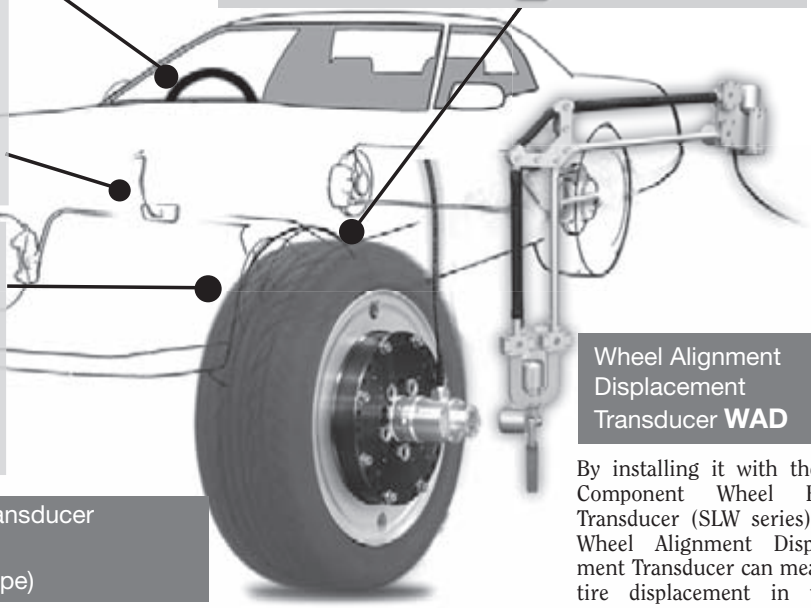
This transducer is easily applied to driving shaft to measure torque using digital telemeter.

Braking pedal force transducer MLA-NA

This transducer is a load cell to measure brake pedal force, and can easily be attached without modifying the pedal.

Tie-rod load cell TCLT-NA

This load cell measures tension and compression force loaded to tie-rod.



Wheel Alignment Displacement Transducer **WAD**

By installing it with the 6-Component Wheel Force Transducer (SLW series), the Wheel Alignment Displacement Transducer can measure tire displacement in three orthogonal directions passed from a road surface while driving, as well as camber angle and steering angle.

6-Component Wheel Force Transducer
SLW-NC (slip-ring type)
SLW-ND (digital telemeter type)

The signals sent from the 6-Component Wheel Force Transducers (SLW series) attached to the axle shafts are amplified by the exclusive force analyzer (MFT series) to be converted into digital values. The digitalized measurements are used to perform real-time computational correction for the crosstalk correction between each component force, the rotation correction to cancel the rotational influences on the sensor, and the moment position correction, which allows the front/back (Fx), right/left (Fy), and up/down (Fz) loads and each component force's torque (Mx, My, Mz) to be output in analog form or to be recorded in the CF card. The digital telemeter model has been newly added to the line up so you can build a wireless all-in-one system when used with the exclusive receiver.

Wheel Torque Transducer **LTW-ND** (digital telemeter type) **LTW-NA** (slip-ring type)

The wheel torque measuring system can measure the drive torque and braking torque while driving, in analog output form. The slip-ring built-in model, which incorporates an encoder, can also measure rotation speed. The model incorporating a miniature transmitter is lightweight and has almost no projections and so can take measurements without disturbing driving conditions.

6-COMPONENT WHEEL FORCE MEASURING SYSTEM

SLIP-RING TYPE SLW-NC 6-component wheel force transducer	MFT-306 Miniature 6-component force analyzer CF CARD RECORDING MFT-306R 6-Component Force Analyzer	DC-204R/DC-204Ra Smart Dynamic Strain Recorder
DIGITAL TELEMETER TYPE SLW-ND 6-component wheel force transducer	DIGITAL TELEMETER TYPE MFT-306T 6-Componennt Force Analyzer DT-24R Telemeter Receiver	Small multi-channel data acquisition system TMR-200 Multi-Recorder

WHEEL TORQUE MEASURING SYSTEM

DIGITAL TELEMETER TYPE LTW-ND Wheel Torque Transducer	DIGITAL TELEMETER TYPE DT-24R Telemeter Receiver	Small multi-channel data acquisition system TMR-200 Multi-Recorder
SLIP-RING TYPE LTW-NA Wheel Torque Transducer	DA/DC series Dynamic Strainmeter	Small multi-channel data acquisition system TMR-200 Multi-Recorder

WHEEL ALIGNMENT MEASURING SYSTEM

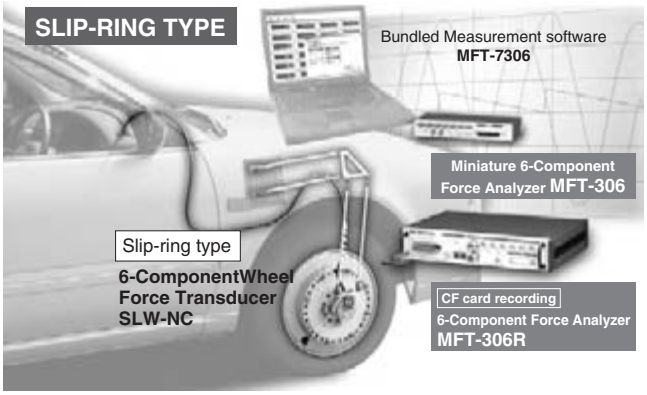
WAD-1B Wheel Alignment Displacement Transducer	WAM-1A Wheel Alignment Analyzer	Small multi-channel data acquisition system TMR-200 Multi-Recorder

BRAKING PEDAL FORCE MEASURING SYSTEM

MLA-NA Braking Pedal Force Transducer	DA/DC series Dynamic Strainmeter

6-COMPONENT WHEEL FORCE MEASURING SYSTEM

Pam E-695



The 6-component wheel force measuring system consists of 6-component force transducer and its exclusive force analyzer. The slip-ring type 6-component wheel force measuring system is a combination of SLW-NC 6-component transducer and MFT-306R force analyzer. The MFT-306 is as small as 160(W) x 25(H) x 75(D)mm, computer-controlled setting and monitoring, and the maximum 4 units controlled. The MFT-306R enables digital recording on CF card of 6-component force measurement data after measurement and computation, and voltage output of the number of tire rotations. Synchronous recording on CF card of up to 4 units and synchronous measurement with smart dynamic strain recorder DC-204R are possible.

SLIP-RING TYPE SLW-NC 6-component wheel force transducer	MFT-306 Miniature 6-component force analyzer	CF CARD RECORDING MFT-306R 6-Component Force Analyzer
Fx, Fy, Fz 20/30kN Mx, My, Mz 3/6kN·m 		
●High accuracy ●Light weight ●Possible fixture to various models of car with exclusive rim and hub adapter ●Easy mounting on an actual car ●Waterproof construction - possible running in the rain ●Possible installation of wheel alignment transducer	●Small and light weight ●Reduction of installation area ●High speed operation process of cross talk, rotation correction, etc. ●Voltage output of 6-component data and the number of tire rotations ●Possible forward and backward measurements by encoder ●Enables setting characteristics data of 6-component force transducer by computer ●Possible control of up to 4 unit ●Bundled software MFT-7306	●High speed operation process of cross talk, rotation correction, etc. ●Voltage output of 6-component force data and the number of tire rotations ●Possible forward and backward measurement by encoder ●Enables setting characteristics data of 6-component force transducer by computer ●Possible control of up to 4 units ●CF card recording of data between start and stop ●Synchronous recording of up to 4 units and synchronous measurement of maximum 8 units in combination with DC-240R ●Bundled software MFT-7306

6-COMPONENT WHEEL FORCE MEASURING SYSTEM

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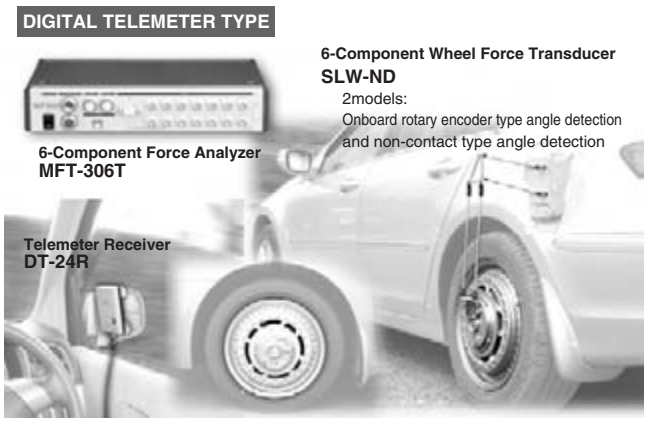
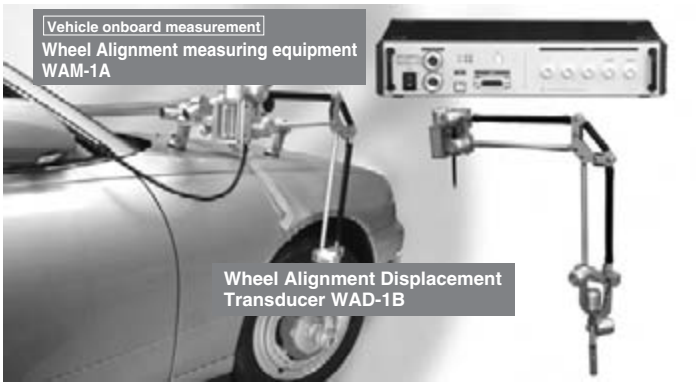


The digital telemeter type 6-component wheel force measuring system is composed of SLW-ND 6-component force transducer including miniature transmitter, MFT-306T force analyzer and DT-24R telemeter receiver. The SLW-ND are available with two models: onboard rotary encoder type angle detection (SLW-ND-A) and non-contact type angle detection (SLW-ND-B). The DT-24R receiver is so light weight to enable mounting with sucker. The force analyzer has a voltage output of 6-component force, the number of tire rotations and angle.

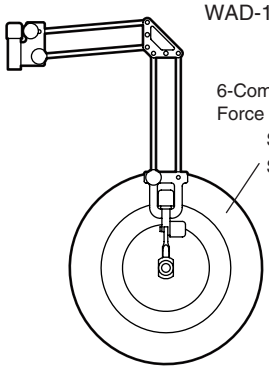
Digital telemeter type SLW-ND-A/SLW-ND-B 6-Component Wheel Force Transducer	MFT-306T Digital Telemeter type 6-Component Force Analyzer DT-24R Telemeter Receiver
 Fx, Fy, Fz 20kN/40kN Mx, My, Mz 4kN·m/8kN·m	6-Component Force Analyzer MFT-306T  Telemeter receiver DT-24R 
●Capable of safely driving owing to neither support device nor cable outside the wheel ●Possible wireless signal receiving in the car from the force transducer. Unnecessary wiring from the outside of car to the inside. ●Possible installation to various models of cars with exclusive rim and hub adapter ●AA (LR6) battery used, available secondary battery ●Rotary encoder type angle detection model (SLW-ND-A) can be equipped with wheel alignment transducer (WAD-1B)	●Small and light weight – Reduction of installation area ●High speed operation process of cross talk, rotation correction, etc. ●Voltage output of 6-component force data and the number of tire rotations ●Wireless transfer of measuring data with built-in telemeter ●Control of up to 4 units ●Capable of placing the receiver inside the car, easy wiring ●Bundled control software MFT-7306

WHEEL ALIGNMENT MEASURING SYSTEM

Pam E-695



The wheel alignment measurement system is composed of WAD-1B displacement transducer and its exclusive measuring equipment WAM-1A. By installing to the 6-component wheel force transducer that can measure 3 orthogonal force components applied on a tire during running and surrounding 3 moments, not only 3-directional displacements of wheel center but steering angle and camber angle can be measured at the same time. Measurement results are output in voltage in real time by the vehicle onboard measuring equipment.

WAM-1A **Wheel alignment measuring equipment**	**WAD-1B** **Wheel alignment displacement transducer**	Wheel alignment displacement transducer
		WAD-1B 6-Component Wheel Force Transducer SLW-NC SLW-ND-A 
●Small and lightweight - Reduction of installation area ●Possible setting of alignment transducer data and measuring equipment by computer ●Bundled control software (WAM-701A) ●Simultaneous control of maximum 4 units	●Measures displacements of wheel center in orthogonal 3 directions ●Steering angle ●Camber angle	

WHEEL TORQUE MEASURING SYSTEM

Pam E-695

The LTW series is a wheel torque transducer for measuring a driving torque or braking control torque when an actual car is running. There are two types: slip-ring type and digital telemeter type. The slip-ring and encoder integrated torque transducer LTW-NA is connected to a dynamic strainmeter to measure torque in analog output. As the slip-ring incorporates an encoder, by counting output pulse with the use of an F/V converter, rotation speed can be measured. The digital telemeter type wheel torque transducer LTW-ND has a miniature transmitter inside, so digital output is taken out from the vehicle onboard telemeter receiver DT-24R and data can be collected with the multi-recorder telemeter I/F unit TMR-252. Lightweight construction with little projecting parts makes it possible to measure without disturbing the running conditions, and cordless and compact system can be set up. The use of exclusive rim and hub adapter enables installation to various passenger cars.

Slip-ring and encoder type **LTW-NA Wheel Torque Transducer**	**Digital telemeter type** **LTW-ND Wheel Torque Transducer**	**DT-24R Telemeter Receiver** **TMR-252 Multi-Recorder and Telemeter I/F unit**
 2.5kN·m	 2.5/5kN·m	Telemeter Receiver DT-24R   Multi-Recorder Control Unit TMR-211 Telemeter I/F unit TMR-252
●Lightweight ●Waterproof construction enables measurement in the rain ●Rotation speed measurement with the encoder built-in the slip-ring ●The use of exclusive rim and hub adapter according to the type of cars enables measurement with the same offset as normal condition.	●Lightweight - equivalent to commercial wheel ●Little projecting parts ●Open construction to release braking heat ●Waterproof construction enables measurement in the rain ●Wireless data receiving. Unnecessary wiring from the outside of car ●Easy switching to measurement with slip-ring ●The use of exclusive rim and hub adapter according to the type of cars enables measurement with the same offset as normal condition.	●Easy installation to an actual car ●Wireless data receiving. Unnecessary wiring from the outside of car ●Easy exchange of telemeter unit and slip-ring unit ●Excellent system extensibility - connection of telemeter I/F unit TMR-252 to Multi-Recorder TMR-200 series

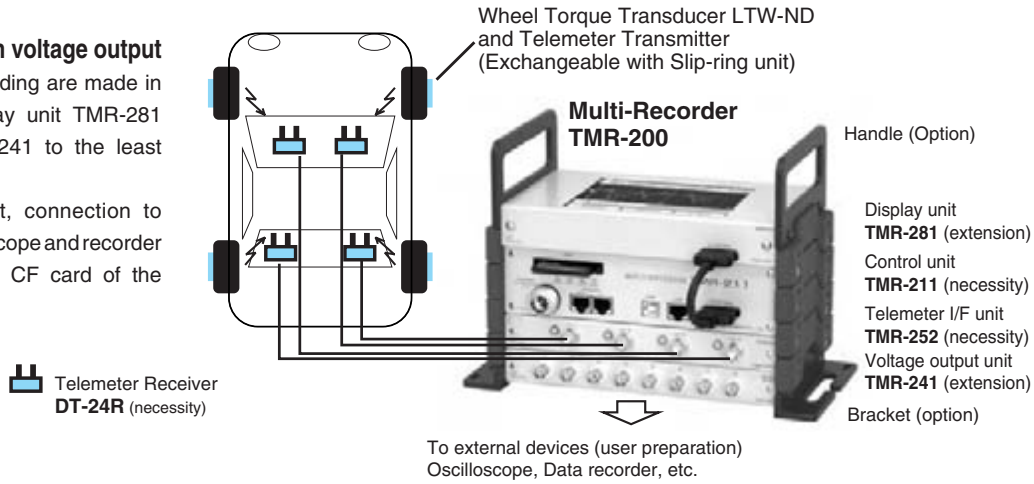
Vehicle onboard measurement using multi-recorder TMR-200

Pam E-695
Pam E-580

Wheel torque measurement system with the TMR-200 series is composed of digital telemeter type wheel torque transducer LTW-ND, receiver DT-24R, telemeter I/F unit TMR-252 and control unit TMR-211. The system can be expanded to user's need by adding other TMR-200 series units such as strain full bridge unit, voltage/thermocouple unit, CAN/Voice/GPS unit and display unit and also a PC for wave processing.

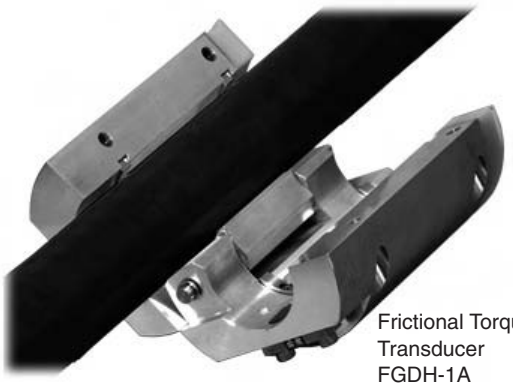
(Examples) All-in-one setup with voltage output

a. User interfacing and wave recording are made in all-in-one by adding the display unit TMR-281 and voltage output unit TMR-241 to the least necessary system.
b. Using the voltage output unit, connection to external devices such as oscilloscope and recorder
c. Recoding digital data onto the CF card of the control unit



Example of Driving shaft torque measurement system

- By attaching Frictional Torque Transducer FGDH-1A (with built-in DT-031T transmitter) to automotive driving shaft, torque is easily measured.
- Combination with FGDH-1A, DT-031R/-031R-1, TMR-211+ TMR-252+TMR-281 or computer, no wiring operation is required and onboard measurement is possible.
- Recording digital data onto the CF card of the control unit and a PC.



Frictional Torque
Transducer
FGDH-1A
(with built-in DT-031T
transmitter)

Digital Telemeter Receiver
DT-031R/-031R-1

Pedal Force Transducer MLA-NA

- Measures automotive brake pedal force
- No modifying is required, attachment is easy
- Low profile and lightweight
- Least measurement error caused by pedaling position

Tie-rod load cell TCLT-NA

- Attaches with joint screws between automotive tie-rods
- 3 type screws are available for installation to various tie-rod
- 6 models are available with combination of screw and capacity

Steering torque transducer HLA-50A

- Air-bag safety available
- Compatible with various type of automotive (Steering outer diameter: 365 ~ 390mm-dia.)
- Easy installation and removal
- Superior drivability
- Using strain gauges to measure torque, data is tranmitted by digital telemeter

Frictional Torque Transducer FGDH-1A

- Using frictional type strain gauge, bonding adhesive is not required.
- With Digital telemeter system, noise influence is least, no wiring is required.
- Easy attachment to automotive driving shaft
- Compatible with different driving shaft (20 ~ 30mm-dia.)
- Using the Multi-Recorder TMR-211, multiple torque measurement is available.

SPECIAL PURPOSE MEASURING SYSTEM

TML-NET Network Measurement System

TML NET is a data acquisition network for strain measurement to perform measurement control and data transfer using two-wire cable. Unlike ordinary analog measurement system, there is no influence of sensitivity drop due to cable extension and insulation lowering, so long term and stable measurement is achieved. Connection between measurement modules can be made by star type or ring type, wiring easily done as the case may be and wires saved to reduce cost. The NET is also compatible with 4-wire system wherein power supply is provided by another line for measurement channel and distance extension. Mixing with 2-wire system is possible. Also, the use of a handheld strainmeter makes in-situ data acquisition possible.

- Easy connection and branch
- Small and lightweight network module-Easy installation
- No sensitivity drop due to cable extension
- Resistive to noise owing to digital processing near sensors
- No influence of insulation lowering
- 2km total distance (between data logger and NDR-100)
- 2km total distance (between NDR-100 and network module)
- Possible mixing of 2-wire and 4-wire
- Available combination with external switching boxes-Isolated between instruments

Network driver NDR-100

- Connects network modules to data logger TDS-530/-602/-303
- 100 channels per unit, maximum 10 units, total 1000 channels
- Possible parallel use with ordinary switching box SSW/ASW
- 2km total distance between data logger and NDR-100

Network interface NIF-100

- Direct driving from a PC using the built-in RS-232C interface
- 100 channels per unit
- Compatible with Visual LOG TDS-7130 static measurement software

Network handheld strainmeter TC-35N

- Small and light weight, Waterproof
- AA(LR6) battery operation
- Available to build a small measuring system, or to check function on site
- RS-232C interface available
- 5 modules use with built-in battery AA(LR6) or AC adaptor
  100 modules use with external DC input
- Built-in compact flash card
- Measurement with Sleep interval function

Strain quarter bridge module NSW-011B

- 3-wire quarter bridge
- Either 120Ω or 350Ω
- Measurementrange±20000x10^{-6}strain

Connected to strain gauge transducer

Strain full bridge module NSW-014B

- Full bridge
- 120 to 1000Ω
- Measurementrange±20000x10^{-6}strain

Voltage module NSW-01VB

- DC voltage
- Measurement range
  V1 ±2.5V V2 ±25V

Thermocouple module NSW-01TB

- Applicable thermocouple T [JIS C1602(1995)]
- Measurement range -200 ~ +400℃

Counter module NSW-01C

- For non-voltage contact or open collect input of rain, flow rate, quantity, etc.
- Input signals: Contact/open collect, Rectangular wave
  NB: Not compatible with 4-wire system

TML-NET compatible transducers

- Built-in digital conversion modules for TML-NET
- No influence of sensitivity drop and insulating lowering
- Easy connection

Connection with the data logger needs network driver NDR-100. Consult us for compatibility with data logger and switching boxes.

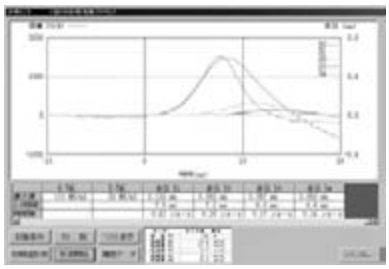
TML SMALL FWD SYSTEM FWD-Light®

Pam E-880

FWD - Falling Weight Deflectometer - is used for estimating construction of pavement or rigidity of subgrade. Also, plate loading test is used for estimating characteristics of subgrade. TML small FWD System FWD-Light® featuers excellent portability and enables simple and quick measurement of coefficient of subgrade reaction and modulus of subgrade elasticity.

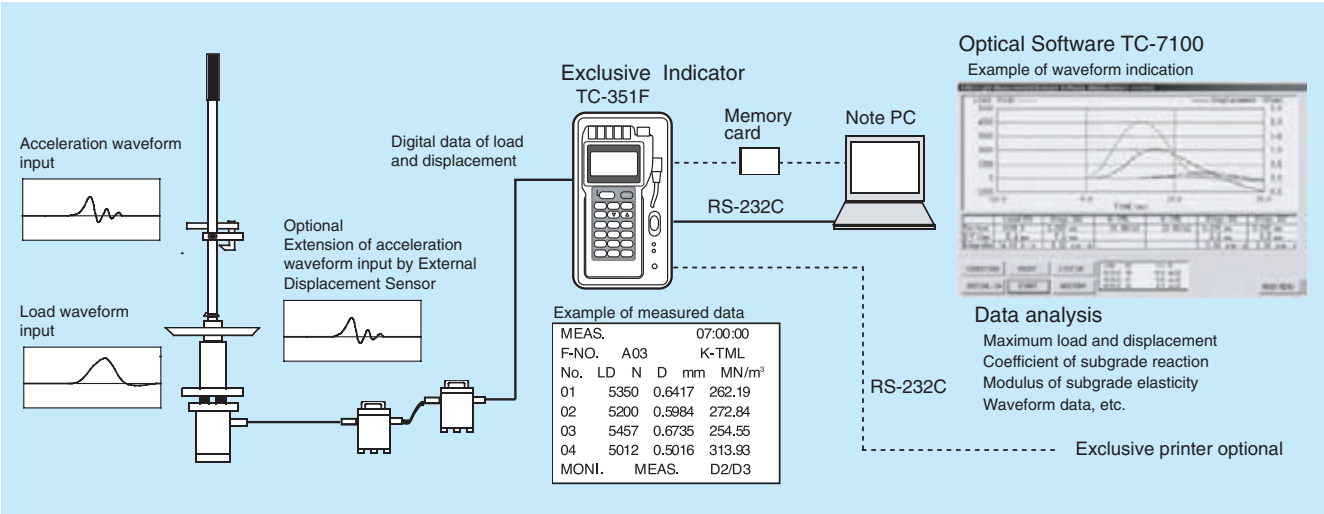
- Small, light and portable FWD system
- Weight, load cell, acceleration transducer etc. are integrated.
- Indicates and stores load, displacement, coefficient of subgrade reaction and modulus of subgrade elasticity.
- Good accuracy and stability obtained by TML's original process for integrating acceleration data.
- Optional external displacement sensor KFDS-1B expands measurements up to 4 points simultaneously.

Example of measured waveform by exclusive software TC-7100



Instruments	Type	Brief Specification
Small FWD unit	KFD-100A	Build-in load cell and acceleration transducer, Max. load: 20kN, Max. displacement: 2.5mm
Exclusive indicator	TC-351F	Displays max. load, max. displacement, subgrade reaction coefficient and subgrade elastic modulus and records/saves on memory card.
External displacement sensor	KFDS-1B	Built-in acceleration transducer, max. displacement of 1mm
Measurement/processing software	TC-7100	In addition to analysis result with exclusive display, waveform display of load, acceleration, velocity and displacement and display of O-P time and time accumulation is possible.

■Measuring System Block Diagram



LIGHTNING COUNTER-MEASURE SYSTEM for strain measurements

In outdoor measurement, product failure due to thunderbolts is often reported. Lightning is roughly classified into thunder strike and induced thunder. Most instrumentation struck by thunderbolts can not be used any longer. Induced thunder reaches several thousands volts or amperes even when thunderbolts are not acknowledged, and surge enters the instrumentation through cable and antenna. The surge current not released damages the instrumentation in the process of discharge to the earth.

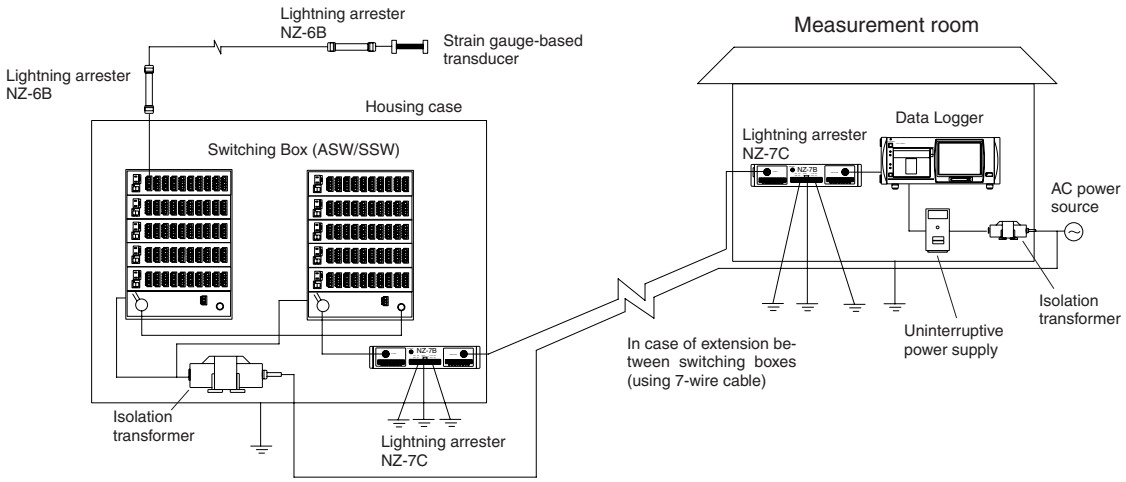
The entry routes of surge are

a. From power supply line
b. From extension cable for switching boxes
c. From sensors and sensor cable
d. From earth line
e. From public line

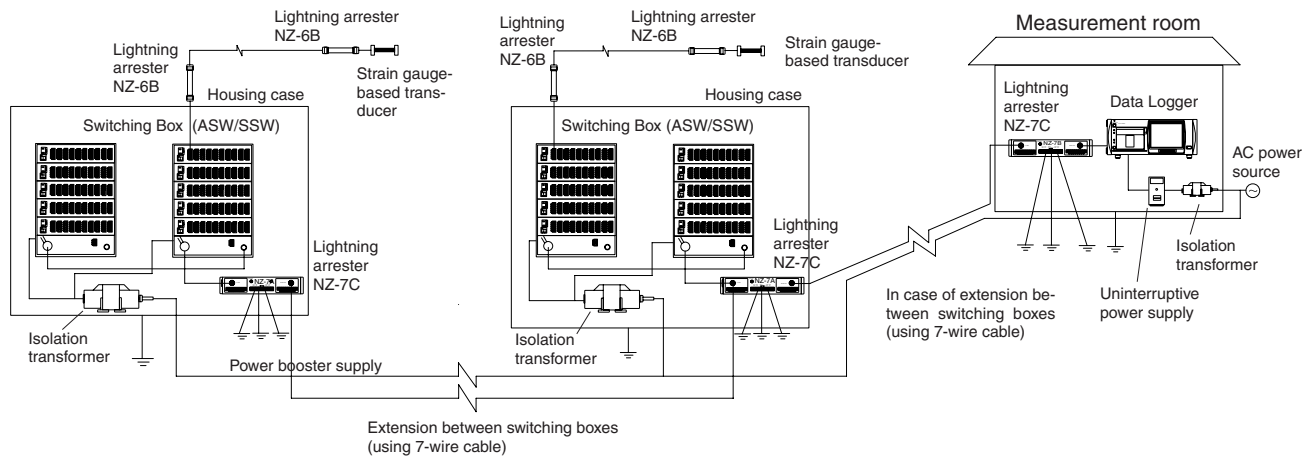
Thunderbolts counter-measure can be achieved by disconnecting these routes.

An example of in-situ application

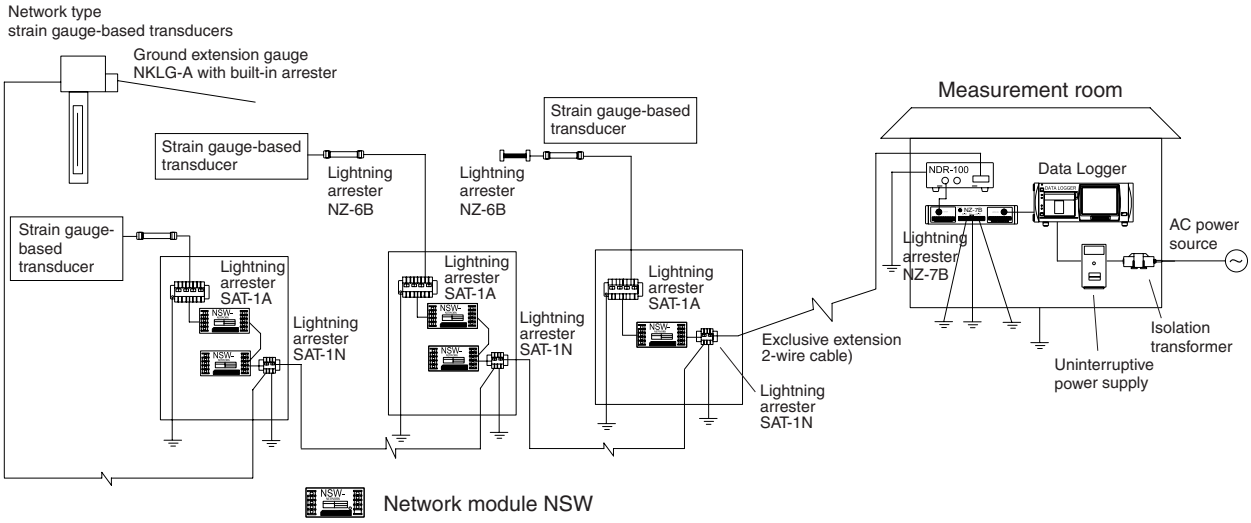
EX.1: Extending sensor cable between Data Logger and Switching Box



EX.2: Extending sensor cable among measuring instruments



EX.3: Extending sensor cable between TML-NET modules and driver



TML-NET Network type Transducers

TML-NET Network Driver NDR-100

TML-NET Network module NSW

■Lightning arrester

SAT-1A
for measuring instruments
including switching box

SAT-1N
for TML-NET

For the detail, consult us.

INSTRUMENTATION ARRESTER NZ-6B/NZ-7C/NZR-7B

Pam J-356

NZ-6B

NZ-7C

NZR-7B

NZ-6B Cable arrester
- Designed for strain gauge transducer cable
- Fully waterproof
- Compatible with PtRTD and temperature sensor integrated strain gauge transducers

NZ-7C Arrester
- For cable extension between switching box and data logger

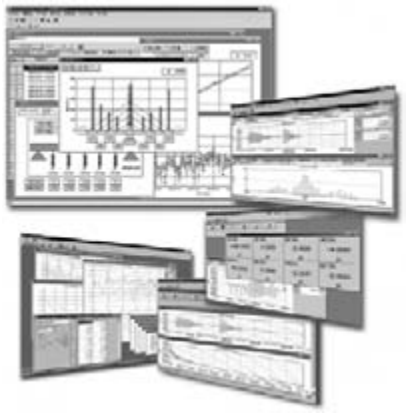
NZR-7B Arrester
- For cable extension between switching box and data logger
- In the sleep mode, circuit among individual instruments is automatically isolated for preventing an induced current.

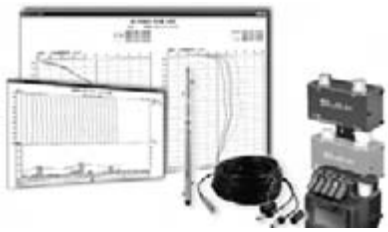
MEASUREMENT SOFTWARE *Visual LOG*®

MEASUREMENT SOFTWARE Visual LOG® for MS-Windows ™		
Measurement	**Software**	**Applicable instruments**
Static measurement	Static Measurement Software TDS-7130 Pam E-920	High Speed Data Logger THS-1100/-1000 Data Logger TDS-530/-602/-601/-601A/-303/-302/-300/-102 Multi-channel Digital Strainmeter DRA-30A (on static mode) TML-NET Interface NIF-100
Dynamic measurement	Dynamic Measurement Software DRA-7630 Pam E-931	Digital Dynamic Strainmeter DRA-101A/-101B/-101C/-107A Multi-channel Digital Strainmeter DRA-30A (on dynamic mode)
	Dynamic Strain Recorder Measurement Software DC-7630	Smart Dynamic Strain Recorder DC-104R/-104Ra, DC-204R/-204Ra
	Dynamic Measurement Software SDA-7910	Dynamic Strainmeter SDA-810C/-830C
Histogram measurement	Histogram Measurement Software HR-7610	Histogram Recorder HR-908A
	Histogram/Waveform Measurement Software HR-7916	Histogram Recorder HR-916A
FFT analysis	FFT Analysis Software DFA-7610	Smart Dynamic Strain Recorder DC-104R/DC-104Ra Histogram Recoreder HR-916A Data of software DRA-7630, DRA-7610, DC-7630, SDA-7910, HR-7916
Slope measurement	Inclinometer Measurement Software IMP-7210	Static Strainmeter TC-31K Type S238C Inclinoadapter IA-31, IA-32 (Inclinometer KB-GC, KB-HC)

MONITORING MEASUREMENT SOFTWARE Visual LOG Light for MS-Windows™		
Measurement	**Software**	**Applicable instruments**
Static measurement	TDS-700L for RS/GP	Data Logger TDS-530/-303/-302/-300/-102 Static Strainmeter TC-31K Type S238C Network (TML-NET) use Handheld Strainmeter TC-35N
	TDS-701L for MODEM	Data Logger TDS-303/-302/-300/-102 Static Strainmeter TC-31K Type S238C
	TDS-702L for MODEM-DM	

TML measurement software Visual LOG series have been developed for TML instruments including data loggers for multi-channel automatic measurements and can acquire measurement data periodically by connecting various and multiple sensors at the same time. An effective utilization and proper evaluation of the obtained data needs data process to materialize the measurement purposes. The Visual LOG is software for data acquisition and analysis on personal computer according to versatile measurement fields. Compatible computer operating system is MS-Windows.





Approval Certificate **ISO9001**
Design and manufacture of strain gauges, strain measuring equipment and transducers

Tokyo Sokki Kenkyujo Co., Ltd. (TML) is accredited by Japan Calibration Service System (JCSS), conformed to international standards JIS Q 17025 (ISO/IEC 17025) under the laboratory accreditation body ISO/IEC 17011. International Accreditation Japan (IA Japan) plays as the accreditation body of JCSS and is a signatory to MRA of Asia Pacific Laboratory Accreditation Cooperation (APLAC) as well as International Laboratory Accreditation Cooperation (ILAC). Our Kiryu factory is certified as a JCSS-accredited laboratory working in compliance with an international Mutural Recognition Arrangement (MRA). The accreditation number of the Kiryu Factory is 0090.

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