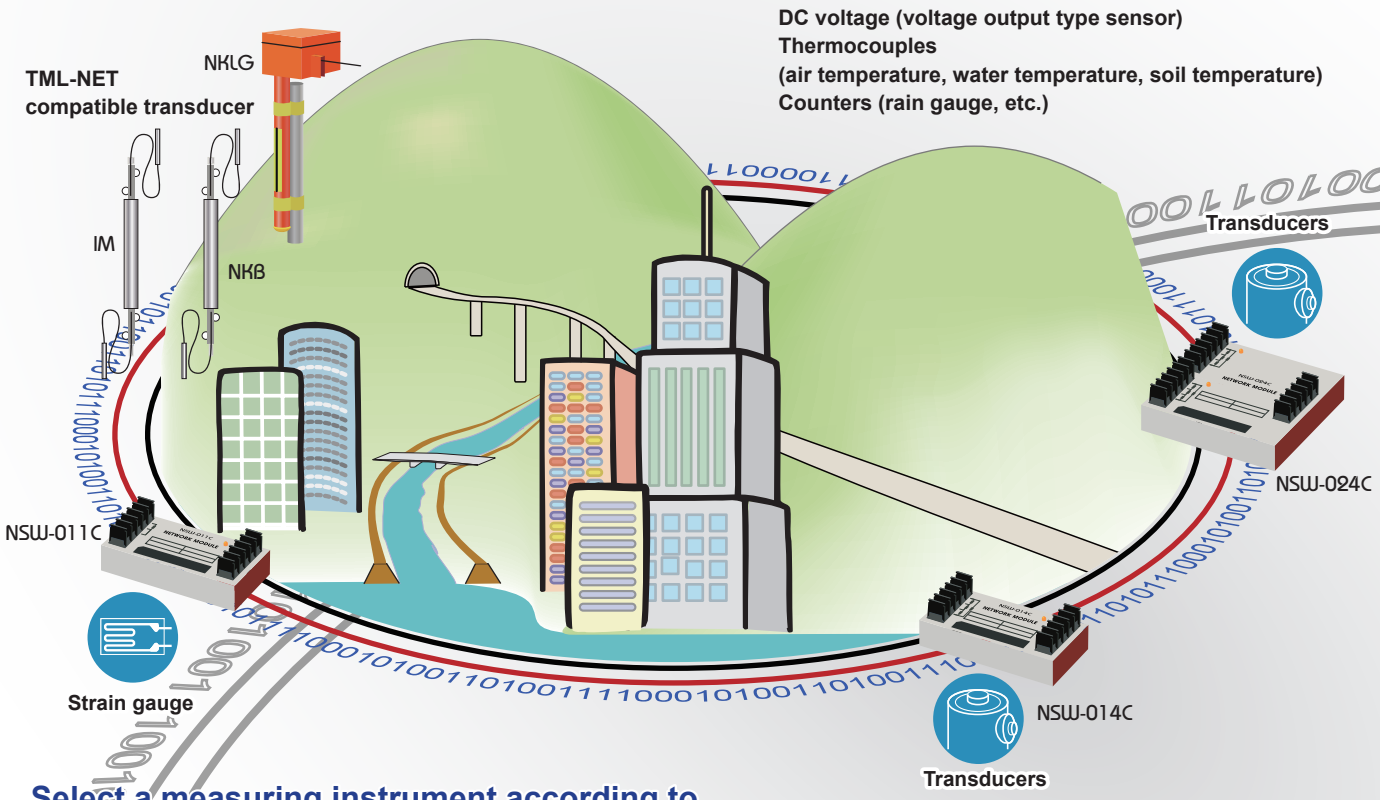
Network-Type Measurement System

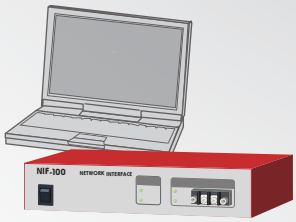
TML-NET

Flexible measurement system for various situations

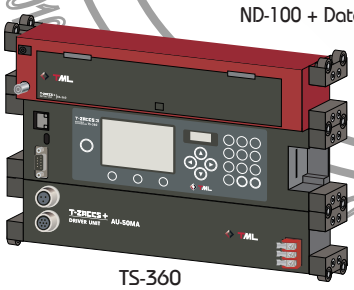


Select a measuring instrument according to the scale and application

ND-100 + Data Logger

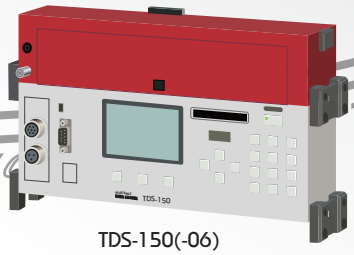


NIF-100 + PC



TS-360

MD-111



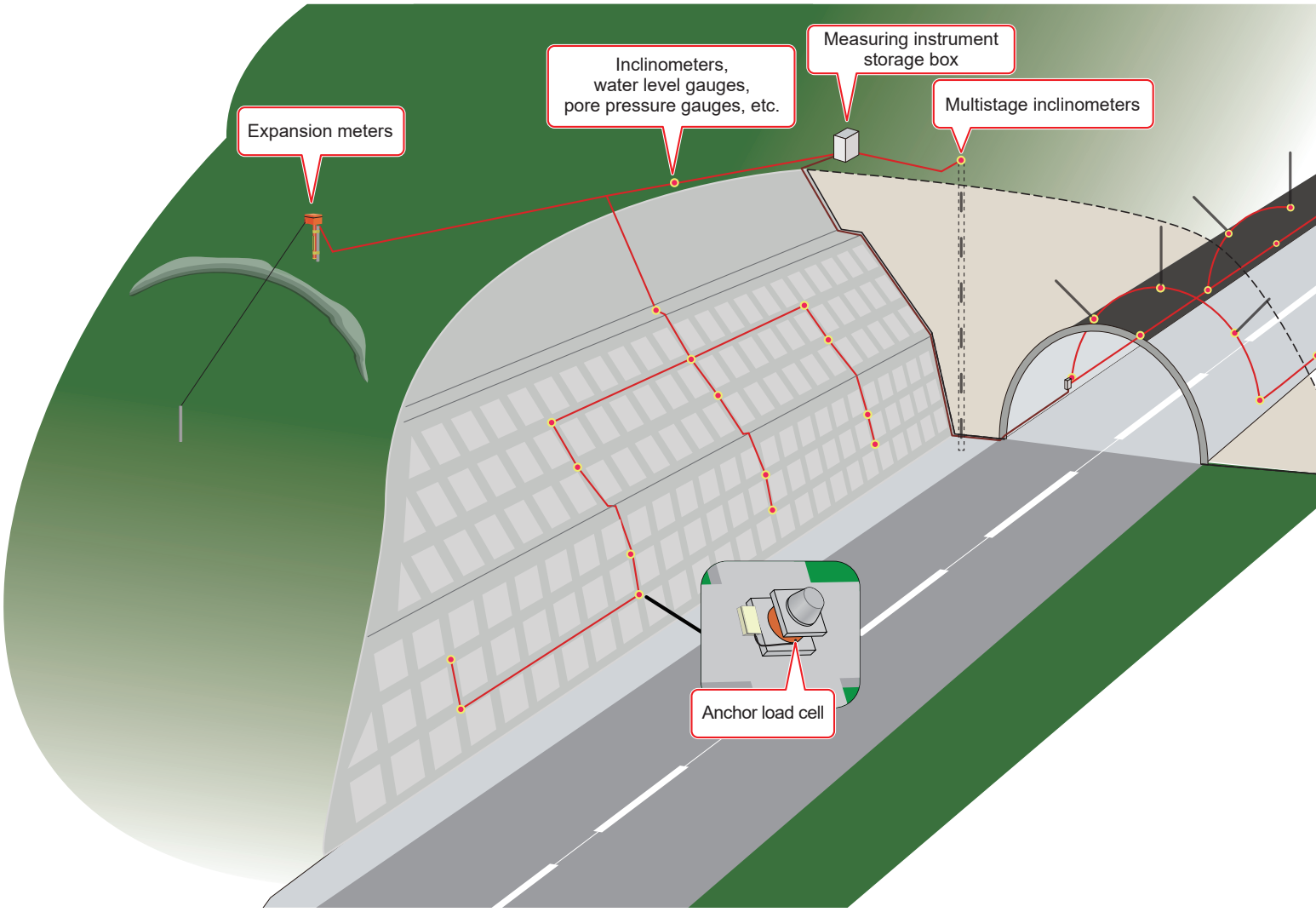
TDS-150(-06)

TC-35N

Tokyo Measuring Instruments Laboratory Co., Ltd.

TML-NET, a networked measurement system that realizes significant wiring savings and allows easy expansion of measurement systems

The networked measurement system TML-NET has high noise immunity due to its decentralized layout and digital transmission. It can be used for on-site measurement in a bad environment. It is also easy to add measurement points and branch out as construction progresses.



TML-NET is our original network that enables measurement control and data transfer via a 2-wire network line and also provides power supply.

Commands and data on the network are transferred together with a clock, enabling bi-directional communication.

The network module configures a measurement circuit in the vicinity of strain gages, DC voltage signals, and T-type thermocouples, digitizes the measurement data, and transfers the data to the corresponding measuring instruments connected to the network line.

Since the data is transmitted as a digitized signal, there is no influence of sensitivity degradation or cable insulation degradation due to cable extension, and stable measurement over a long period of time is possible.

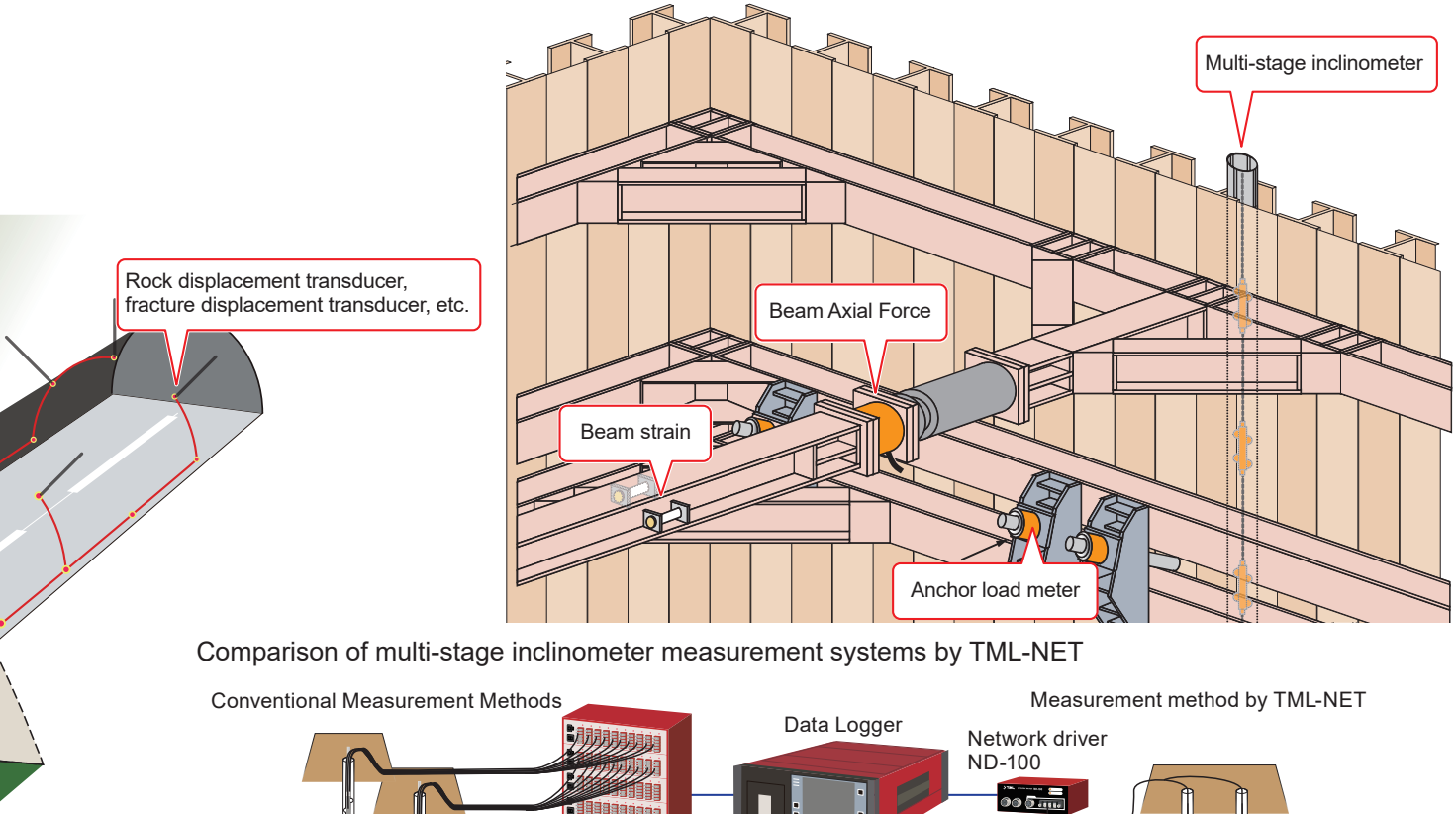
Another advantage is that with simple wiring, correlations such as strain, strain gage transducers, voltage, and temperature can be measured, processed, and recorded for the required number of channels all at once.

The lineup of compatible measuring instruments includes the TS-360 portable data logger, the TML-NET drive board (optional) for the ND-100 and TDS-150 network drivers that connect TML-NET to conventional data loggers, and the TC-35N, MD-111, and NIF-100 dedicated TML-NET measuring instruments.

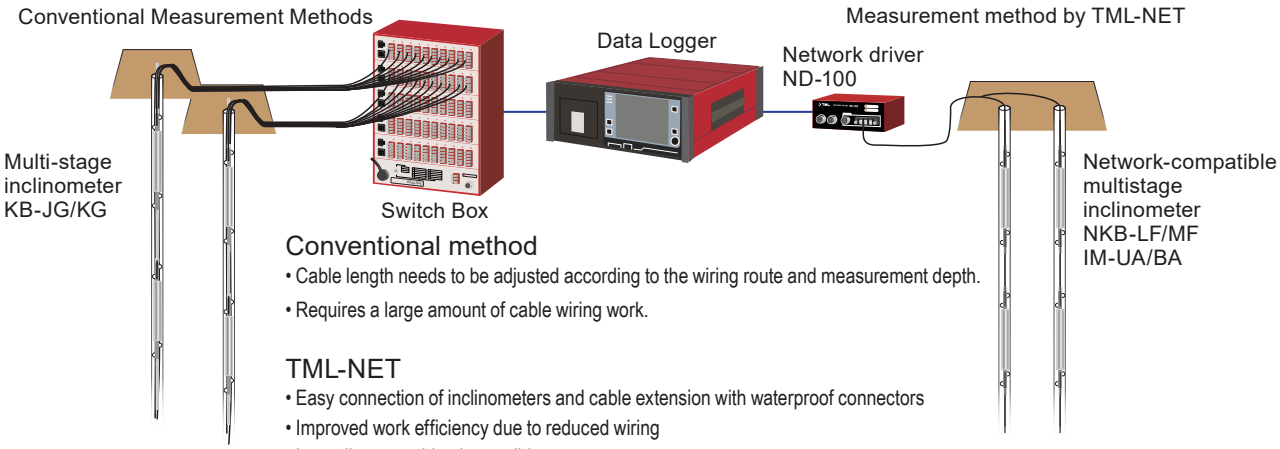
TML-NET dedicated measuring instruments TC-35N, MD-111 and NIF-100 are available in the lineup.

A measurement system can be constructed to suit your measurement conditions.

In mountain retaining construction, instruments and cabling are installed in limited space.
The networked measurement system TML-NET allows for reduced wiring, improved work efficiency, and easy reuse of sensors.



Comparison of multi-stage inclinometer measurement systems by TML-NET



Conventional method

- Cable length needs to be adjusted according to the wiring route and measurement depth.
- Requires a large amount of cable wiring work.

TML-NET

- Easy connection of inclinometers and cable extension with waterproof connectors
- Improved work efficiency due to reduced wiring
- Long distance wiring is possible.

Easy wiring and branching	**Module is compact and lightweight for easy installation**	**No sensitivity degradation due to cable extension**
Digital processing in the vicinity of the sensor makes it resistant to noise.	**Not affected by insulation resistance degradation**	**Total network module extension distance up to 2 km**
Can be used in combination with a switch box (when TDS is used)	**Each measuring instrument is isolated from each other**	**Cost reduction through reduced wiring is possible**
Compatible with surge arresters for TML-NET	**TML-NET compatible transducers are equipped with an insulation check function**	**Easy to add measuring points as construction progresses**

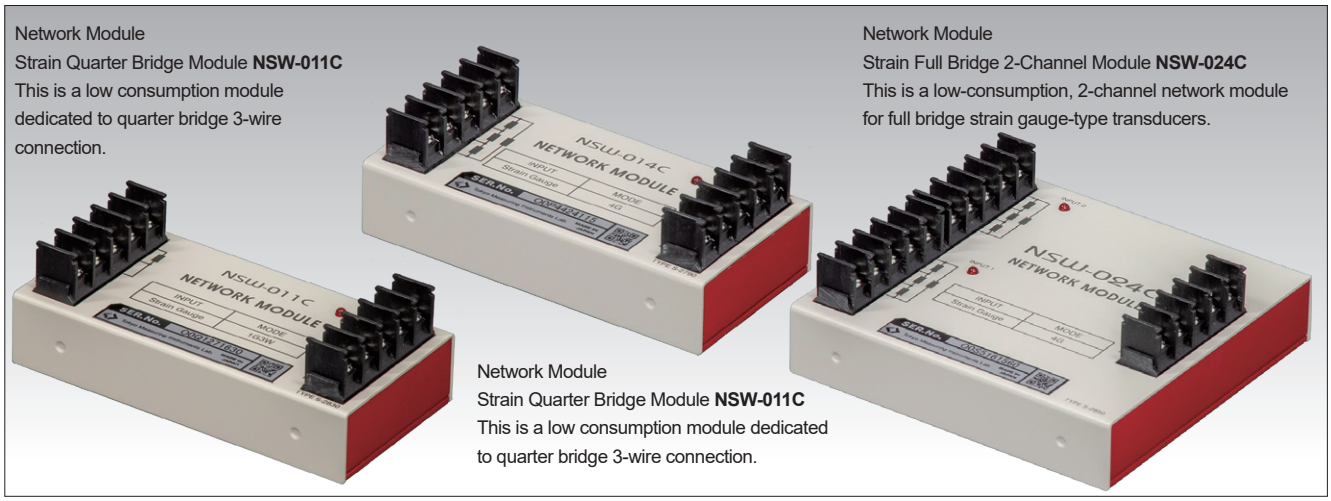
NSW Series

Distributed Data Recording System for Strain Measurement
Easy expansion of measuring points!

The network module that makes up TML-NET configures a measurement circuit in the vicinity of the sensor, digitizes the measurement data, and transfers it to a data logger or PC via a 2-wire network cable.
Since the data is transmitted as digitized signals, there is no sensitivity degradation due to cable extension and no effect of cable insulation degradation, thus ensuring stable long-term measurement.
In addition, the measurement system can be constructed by freely connecting modules with bus or star type wiring, which reduces cabling and wire costs. The number of measurement points can be easily expanded by simply adding or branching between modules.

Low consumption network module NSW series (strain measurement)

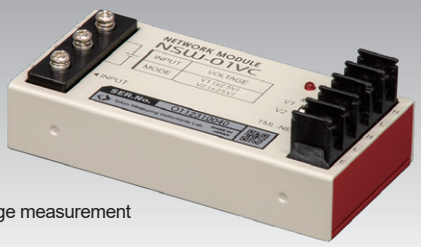
This is a network module with low power consumption of 1/10 compared to older strain measurement network modules.
In addition to NSW-011C/-014C/-024C/-01VC/-01TC, TML-NET compatible transducers NKB-LF/-MF, NKLA-B, and NKLG-AB/-BB also incorporate low power consumption network modules.



Specification

Type	Network Module Strain Quarter Bridge Module NSW-011C	Network Module Strain Full Bridge Module NSW-014C	Network Module Strain Full Bridge 2-Channel Module NSW-024C
Number of measurement point	1 point		2 point
Measurement time	200ms/points (including transfer time)		
Programmable item	Channel number (000 to 999)		Channel number for input 0 : 000 to 998 input 1 : INPUT 0+1
Measurement mode	Strain quarter bridge 3-wire method	Strain full bridge	Strain full bridge
Applicable gauge resistance	Either 120 Ω or 350 Ω (to be specified when ordering)	120 to 1000 Ω	120 to 1000 Ω
Bridge power supply	DC1V 60ms (50Hz)		
Measuring range	±30000×10^{-6}strain		
Resolution	1×10^{-6}strain		
Accuracy Temperature coefficient Change over time	± (0.05% rdg +2 digit) (23°C±5°C) *Loss of sensitivity due to lead wires is not included. 0.005%rdg/°C 0.05%rdg/year		
Check function	Over check, sensitivity check, open check		
Power supply voltage	DC10 to 28V		
Current consumption	1mA MAX. in standby During measurement 36mA MAX.		
Operating temperature range	-20 to +60°C, 85%RH or less (excluding condensation)		
Dimensions	50 (W) ×20 (H) ×100 (D) mm		95 (W) ×20 (H) ×100 (D)mm
Weight	Approx. 250g		Approx. 300g
Standard accessories	Operation manual ..... 1 Warranty card..... 1		

Low consumption network module NSW series (voltage and thermocouple measurement)



Module for DC voltage measurement

Module to measure voltage-output type sensors; current 4 to 20 mA output sensors can also be used by using a shunt resistor resistor.

Used to measure air temperature, water temperature, and temperature for sensor temperature compensation.

Module for measuring T-type thermocouples

Specification

Type	Network Modules Voltage Module NSW-01VC	Network Module Thermocouple module NSW-01TC
Number of measurement point	1 point	
Measurement time	200 ms/points (including transfer time)	
Programmable item	Channel number (000 to 999)	
Measurement Mode	DC Voltage	T-type thermocouple
Measuring range	V1 ±2.5000V V2 ±25.000V	−100 to +200°C
Resolution	V1 0.1mV , V2 1mV	0.1°C
Input Resistance	Approx. 2MΩ	—
Applicable thermocouple	—	T [JIS C1602 (2015)]
Reference contact	—	Internal temperature compensation method
Linearization	—	Digital operation
Accuracy (23°C±5°C)	± (0.08% rdg +3 digit)	External reference contact ±(0.11%rdg+0.2°C) Internal reference contact ±(0.11%rdg+0.9°C)
Temperature coefficient of accuracy	±0.01% rdg	±0.01% rdg
Aging coefficient of accuracy	±0.1% rdg/year	±0.1%rdg/year
Temperature coefficient of zero	—	0.03°C/°C
Check function	Over check, sensitivity check	sensitivity check
Power supply voltage	DC10 to 28V	
Current consumption	Current consumption in standby : 1mA MAX. , At measurement : 36mA MAX.	
Operating temperature range	-20 to +60°C, 85%RH or less (excluding condensation)	
Dimensions	50 (W)×20(H)×100(D)mm	
Weight	approx. 250g	
Standard accessories	Operation manual ..... 1 Warranty card..... 1	

Counter Module NSW-01CC

This module counts rainfall, flow rate, quantity, number of vehicles passing by, number of machine operations, etc. with no-voltage contact or open collector input.
The built-in backup battery allows counting to continue even when power is not supplied.

(Note) The counter module NSW-01CC is not a low-consumption type, but 4 units of NSW-01CC can be connected when 100 units are connected and the total length is 2000 m.
*More than 4 units can be connected depending on conditions.

(Note) H on the TML-NET connection terminal is connected to H (hot side) of the network driver, and L to L (cold side) of the network driver. It will not work if connected in the opposite direction.

Number of measurement point	1 point	
Measurement time	200 ms/point (including transfer time)	
Programmable item	Channel number (000-999)	
Power supply voltage	DC10 to 28V	
Current consumption	In standby:	12mA MAX.
	At measurement:	12mA MAX.
Maximum number of units connected	Up to 4 units of NSW-01CC can be connected out of 100 units in a 2 km extension	
Input signal	No-voltage contact/open collector signal Short wave	
Input Waveform	Count on edge at close	
Input pulse width	0.01s or more	
Input contact current	Approx. 120μA	
Counting direction	Up Count	
Measurement Data	Integral count	
Measuring range	0 to 31999 counts	
Resolution	1 count	
Measurement Accuracy	Within ±1digit	
Overflow processing	0 reset	
Check function	Sensitivity check (10000 fixed value returned)	
Reset	At power on / Full count / External rese	
Back up	Alkaline AA dry batteries x 3 pcs. Approx. 3 months	
Operating temperature and humidity range	-20 to +60°C, 85%RH or less (excluding condensation)	
Dimensions	95 (W) ×35 (H) ×100 (D) mm	
Weight	Approx. 250 g (Alkaline AA dry batteries x 3 pcs. 70 g not included)	
Standard accessories	Operation manual ..... 1 Warranty card ..... 1 AA dry batteries 4	

TML-NET Compatible Transducers

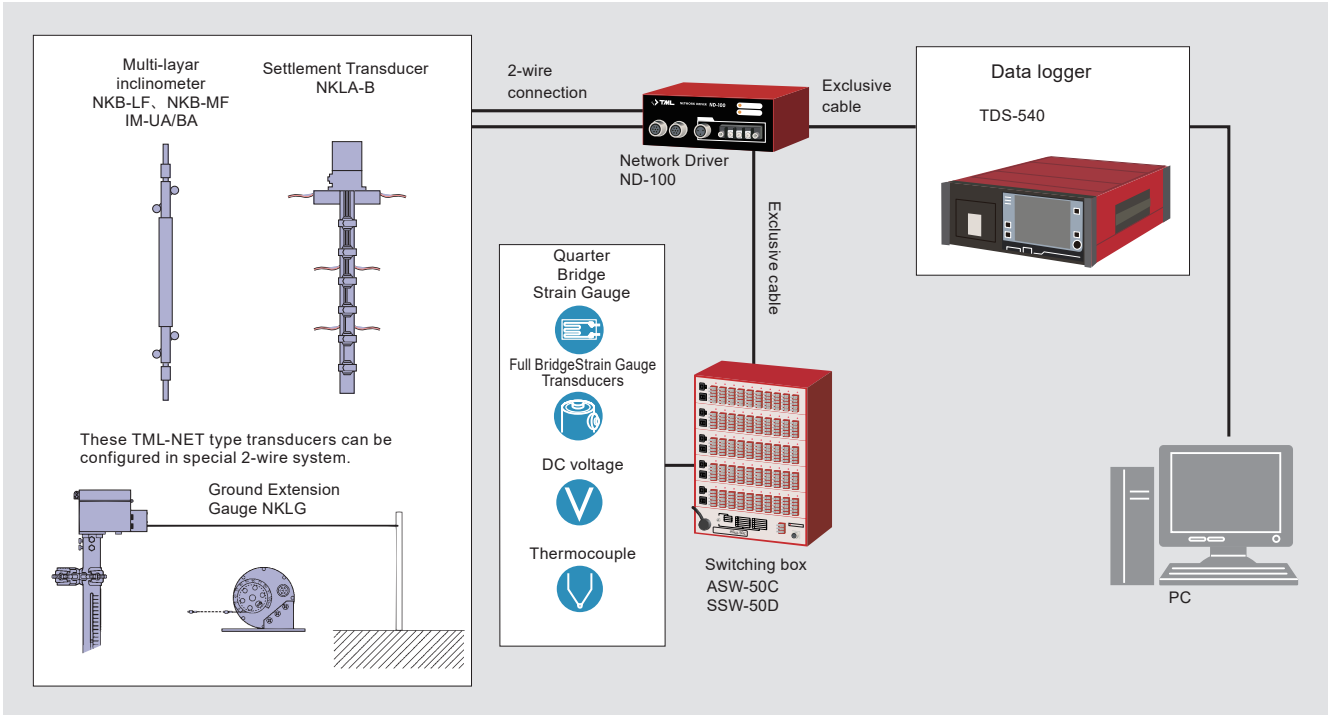
Features

- **Built-in digital conversion module for TML-NET**
  A low-consumption network module is used to support multi-point and wide-range measurements. The network driver ND-100 is separately required for connection to data loggers.
  Please contact us for compatible data loggers and measuring instruments.
- **Not influenced by lowering of insulation resistance and no sensitivity decrease**
  Since data is transferred by digital signals, there is no effect of sensitivity or insulation degradation due to cable extension.
- **Easy wiring**
  Data can be transferred simply by using a 2-wire cable instead of the conventional 7-conductor cable.
  In addition, temperature measurement using conventional strain gage transducers, thermocouples, and platinum resistance thermometers can be used together via the switch box.
- **Insulation check feature**
  A function for measuring insulation resistance is provided as an indicator of soundness in the condition in which the transducer is installed.
  Please contact us for the corresponding data loggers and measuring instruments.

Designed for network measurement, this strain gage transducer has a built-in digital conversion module.
Data can be transferred by connecting to a network driver or a TML-NET-compatible measuring instrument.
Since the data transfer is digitized, only a 2-wire cable is required for connection.
Conventional strain gages, transducers, thermocouples, and platinum resistance thermometers can also be incorporated into the network system using a switch box.

Applicable transducers	Multi-stage inclinometer	NKB-LF/MF, IM-UA/BA
	Settlement transducer	NKLA-B
	Extensometer	NKLG-AB/-BB (with built-in arrester)

TML-NET Digital Network System Example



Settlement Transducer NKLA-B 100mm/200mm

The NKLA-A is also for the same measurement while it can be used with the network measurement system TML-NET. Special anchors are mounted at specified positions inside a borehole and the amount of positional displacement between each anchor and the ground surface level is measured. Anchors can be mounted at the maximum of six levels inside one borehole.

Protection ratings : IP 45 equivalent

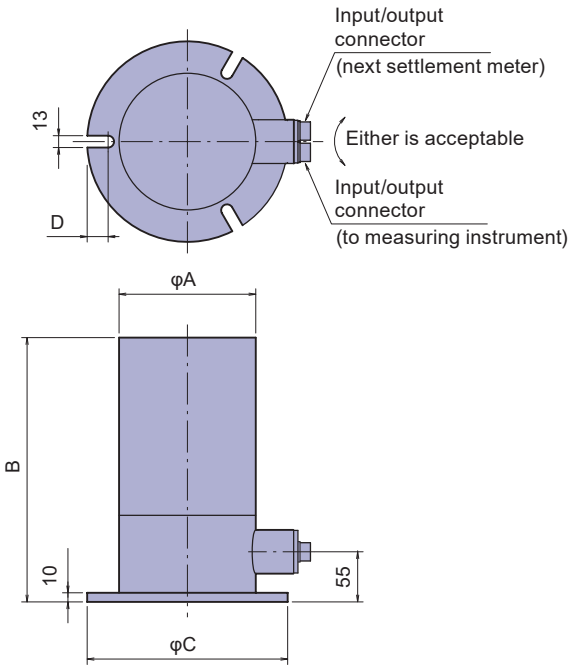
Specification

Type	NKLA-100B-X	NKLA-200B-X
Measuring point	1~6 points (-X filled with the specified points)	
Capacity	100mm	200mm
Rated indication	Approx. 5000 digits	
Non-linearity	1%RO	
Allowable temperature range	-20 ~ +60°C (No icing)	
Channel set Factory default	(000~ 999)	
Supplied cable	CT6-2R2/WP-STB φ6mm 0.5mm^2 2-core shielded vinyl cable 2m	
Weight	5kg	5~7 kg

To activate electrical insulation function it requires the dedicated instrument as below.
TDS-540-03 and ND-100, TS-360 or TDS-150-06 including an option for Switching box/ TML-NET driving board

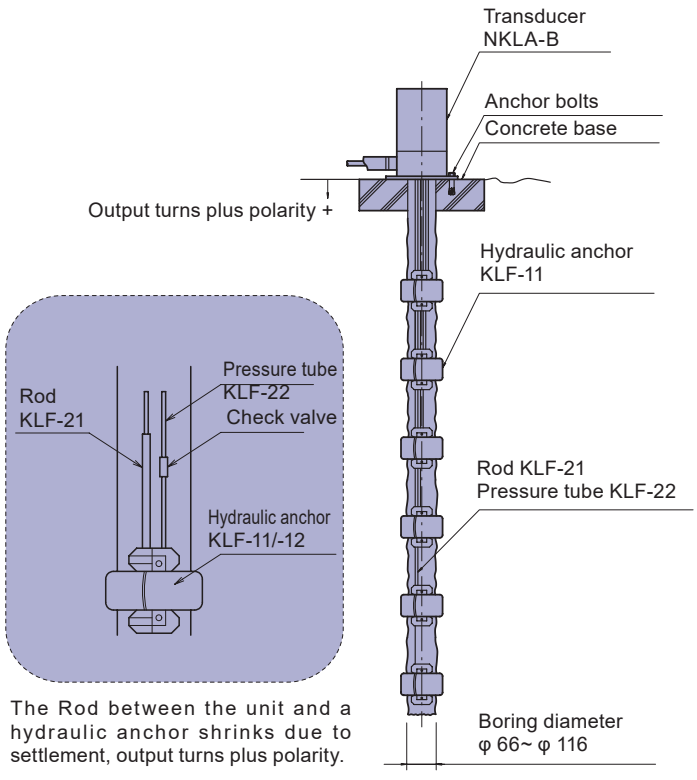
Displacement is measured between a settlement meter installed on the ground surface and a hydraulic anchor installed at the desired location in the ground

External Dimensions



Type	φA	B	φC	D
NKLA-100B	150	290	220	23
NKLA-200B	200	360	260	15

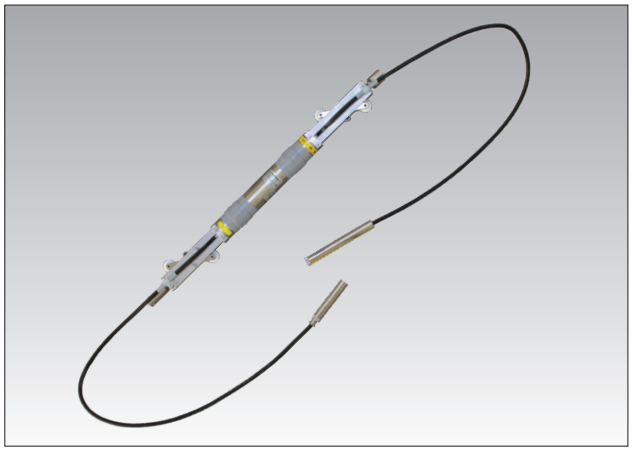
Principle and Application



The Rod between the unit and a hydraulic anchor shrinks due to settlement, output turns plus polarity.

Multi-layer inclinometer IM-10UA/BA ±10°

Network Compatible



An inclinometer developed to automatically measure the displacement of ground and structures.

The dedicated guide pipes are installed vertically in the ground or structure in advance, and multiple inclinometers are connected to the guide pipes via relay rods (KBF-33JG) and fixed to the measurement positions. The built-in network module in the inclinometer provides the connection of inclinometers with a single cable in succession. It is used for measuring underground displacement of landslides and deformation state of earth retaining walls. The IM-10UA can measure only in one direction, and the IM-10BA can measure in both the X- and Y-directions simultaneously with a single unit.

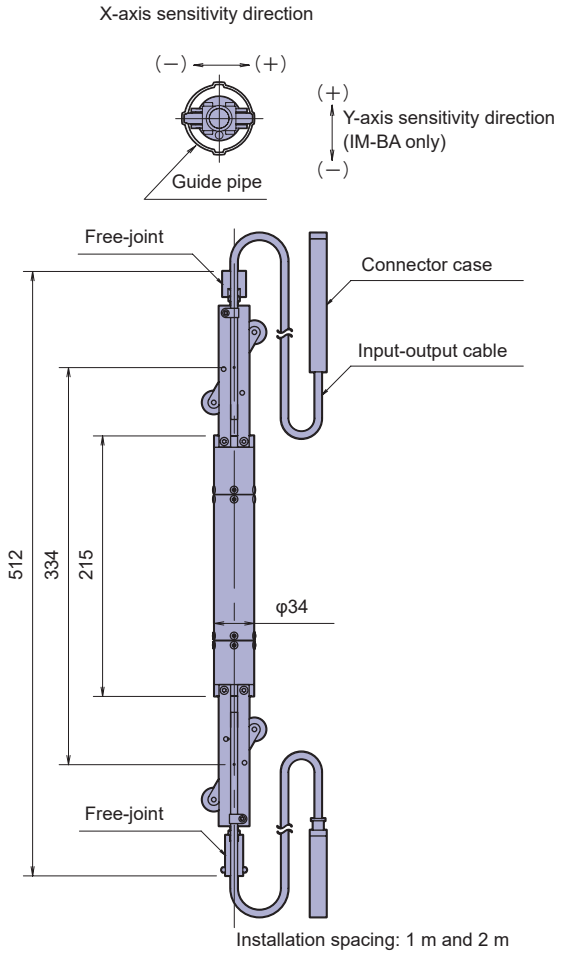
Protection rating: IP68 equivalent

Easier to handle! High resolution, reduced wiring, improved workability

Features

- **Eliminated transportation constraints (horizontal transportation supported)**
- **Connection using only single cable**
- **All stainless-steel structure that provides excellent anti-corrosion resistance**
- **Adoption of new small diameter guide pipe (IM-GP: φ50.5)**
- **Also compatible with conventional guide pipes (φ56) (optional)**
- **High resolution, compared to conventional NKB-10 (Cap.10° : Res. 0.005° → 0.001°)**
- **Compact overall length (identical with KB-JG)**
- **Built-in temperature sensor allows temperature measurement per depth (optional)**
- **Can be mixed with older model NKBs**

External Dimensions



Compatible measuring instruments

- **Data logger TDS-540 (model with ASW/SSW switch box control unit) and network driver ND-100**
- **Portable data logger TS-360**
- **Portable data logger TDS-150-06 (switchbox TML-NET drive board)**
- **Monitoring system controller MD-111**
- **Hand-held measuring instrument for network TC-35N**

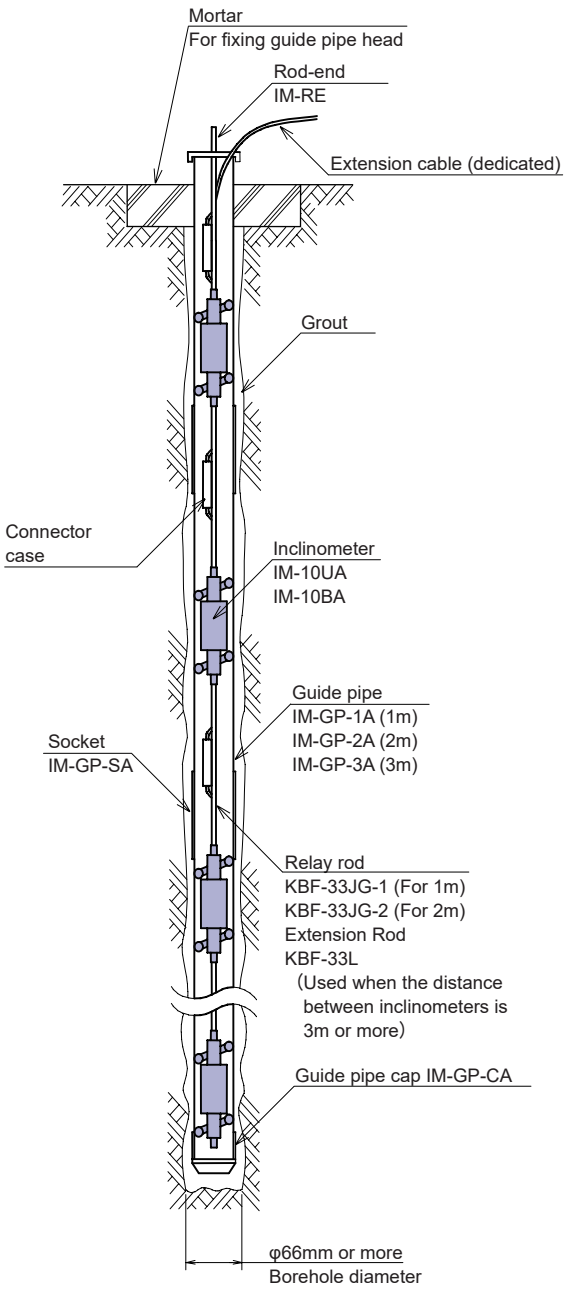
Specification

Type	IM-10UA	IM-10BA
No. of measuring axis	1	2
Capacity	±10°	
Rated indication	±10000 digit	
Non-Linearity	0.5%RO	
Cross sensitivity	——	3%RO
Temperature range	-20 to +60°C	
Channel set	000 to 999	
input-output cable	φ6mm 0.5mm² 2-conductor shielded vinyl cable Special waterproof connector at the end	
weight	Approx. 1.7kg	
Standard installation interval	1m or 2m	
Total Extension Distance / Maximum Number of Units Connected	Within 2000m per system / Maximum of 100 units can be connected. (within 1 km when TDS-150-06 or MD-111 is used)	
	Within 100m depth per hole / Max. 50 units (within 100 channels when TDS-150-06, TC-35N, MD-111 are used)	

We also offer extension rods, head caps, rivets, riveters, and demountable pliers. Please contact us for details.

Related products

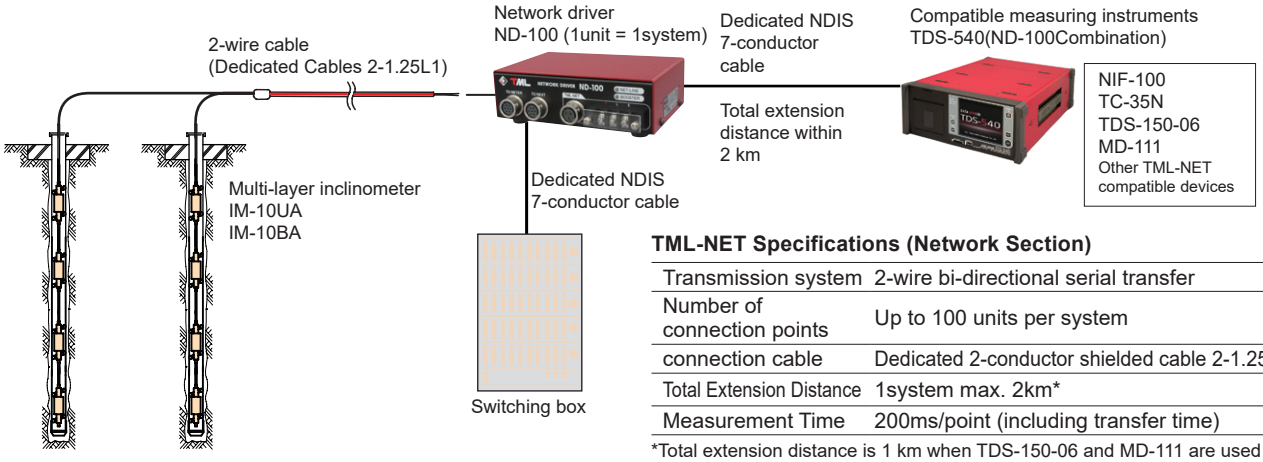
Example of installation with inclinometer IM and related products



Specification

Guide pipe	IM-GP-1A (1m) / IM-GP-2A (2m) / IM-GP-3A (3m)
Guide pipe socket	IM-GP-SA
Guide pipe cap	IM-GP-CA
Rod end	IM-RE
Relay rod	KBF-33JG-1 (1m) / KBF-33JG-2 (2m)
Relay rod for mixed use	IM-RR-1A-LF (1m) / IM-RR-2A-LF (2m) IM-RR-1A-MF (1m) / IM-RR-2A-MF (2m)
Extension rod	KBF-33L-1/ KBF-33L-2
Rivet	KBF-38 (IM-GP / Rivets for KBF-31 (80 pcs.))
SB Tape	— (IM-GP/ SB tape for KBF-31 (10 pcs.))

System Block Diagram



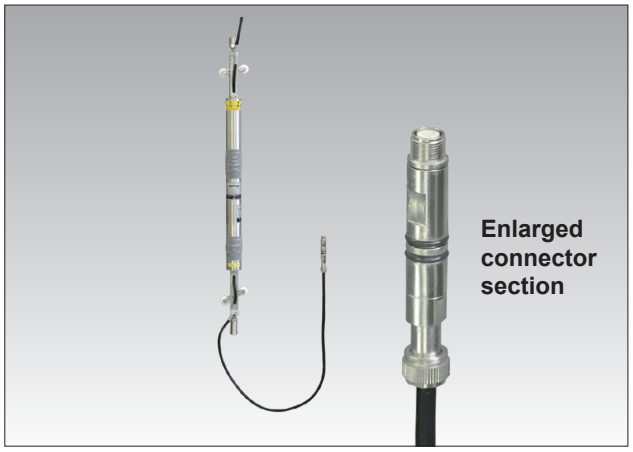
TML-NET Specifications (Network Section)

Transmission system	2-wire bi-directional serial transfer
Number of connection points	Up to 100 units per system
connection cable	Dedicated 2-conductor shielded cable 2-1.25L1
Total Extension Distance	1system max. 2km*
Measurement Time	200ms/point (including transfer time)

*Total extension distance is 1 km when TDS-150-06 and MD-111 are used

Multi-layer inclinometer NKB-LF/-MF ±5/±10°

Network Compatible



This is the inclinometer developed to automatically measure the displacement of the ground or structure.

A special guide pipe is installed vertically in the ground or structure in advance, and several inclinometers are connected to the guide pipe with a relay rod (KBF-33) so that they come to the measurement position and are fixed in place.

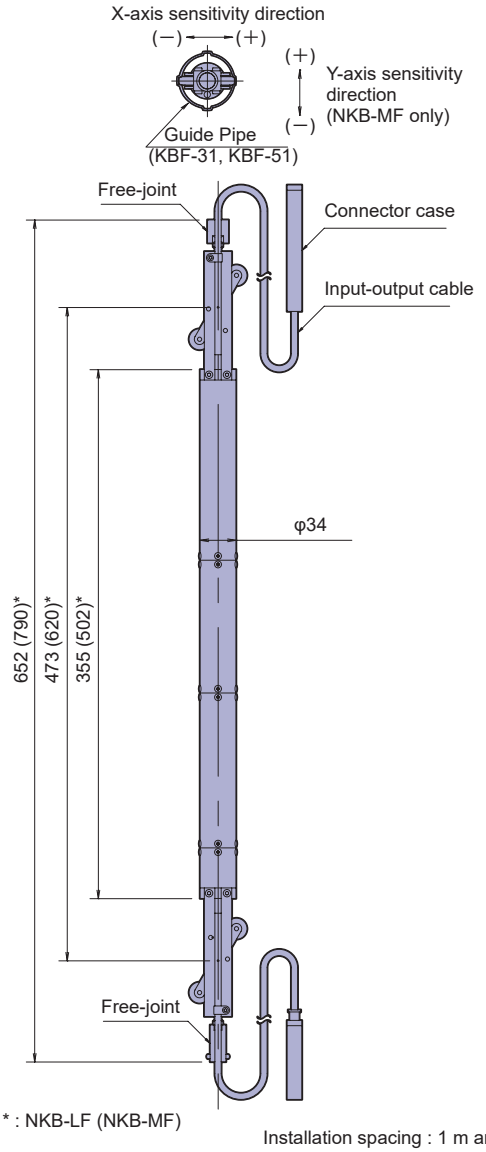
As the inclinometers have a built-in network module, the inclinometers are connected successively with a single cable.

The system is used for measuring landslide displacement and the displacement of earth retaining walls.

The NKB-LF model only measures in one direction, while the NKB-MF can simultaneously measure in X and Y direction with a single unit.

Protection rating: IP68 equivalent

External Dimensions



* : NKB-LF (NKB-MF)

Installation spacing : 1 m and 2 m

Highly reliable data network-compatible with improved insulation functionality

Features

- **Connection possible with a single cable**
- **Insulation check function included**
- **Made of corrosion-resistant all stainless steel**
- **No sensitivity loss**
- **Easy automatic measurement**

Compatible measuring instruments

- **Data logger TDS-540 (model with ASW/SSW switch box control unit) and network driver ND-100**
- **Portable data logger TS-360**
- **Portable data logger TDS-150-06 (switchbox TML-NET drive board)**
- **Monitoring system controller MD-111**
- **Hand-held measuring instrument for network TC-35N**

Specifications

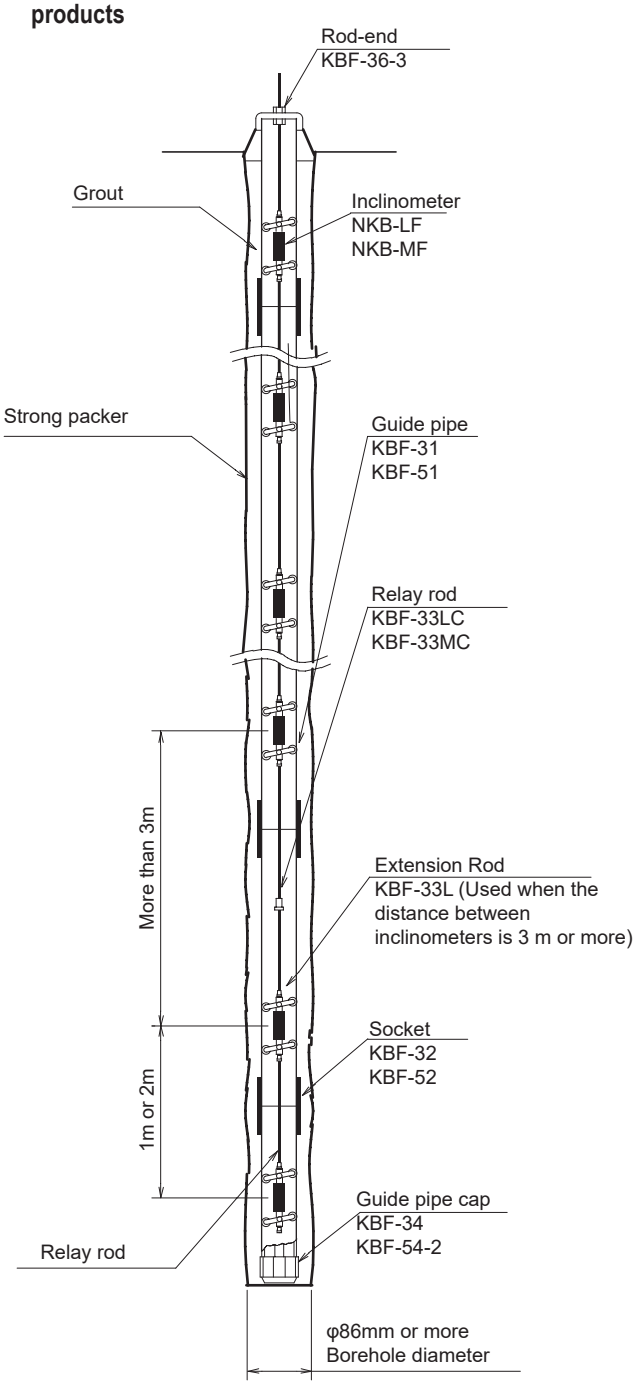
Type	NKB-5LF	NKB-10LF	NKB-5MF	NKB-10MF
No. of measuring axis	1 direction		2 direction	
Capacity	±5°	±10°	±5°	±10°
Rated indication value	Approx. 2000 digit			
Nonlinearity	0.5%RO			
Mutual Interference	-		3% RO or less	
Temperature range	-20 to +60°C			
Channel setting	factory set (000-999)			
Check function	Insulation check			
Input/output cable	φ6mm 0.5mm^2 2-conductor shielded vinyl cable with special waterproof connector at the end			
Weight	Approx. 2kg		Approx. 3kg	

Shield of input/output cable is connected to the main unit.

In addition to the above, we also manufacture custom-made products, so please consult us.

Related products

Example of installation with inclinometer nkb and related products

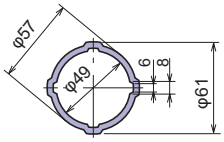


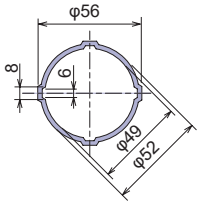
Guide Pipe KBF-31/KBF-51

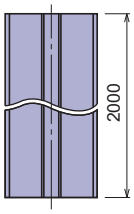
These pipes are used to hold inclinometers for insertion in the ground.

Aluminium pipe
KBF-31-1 : 1m
KBF-31-2 : 2m
KBF-31-3 : 3m

ABS resin guide pipe
KBF-51-2 : 2m





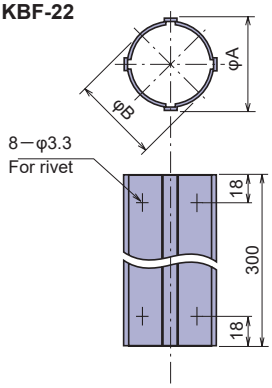


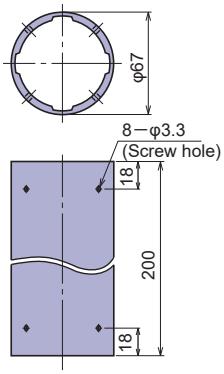
Guide Pipe Socket KBF-32/KBF-52

These pipes Socket are used to connect guide pipes.

Aluminium Pipe Socket
KBF-32
KBF-22

ABS resin guide pipe Socket
KBF-52



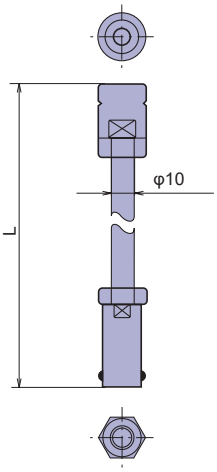


Type	φA	φB
KBF-32	59.5	55.5
KBF-22	83.5	79.5

Relay Rod

This rods are used to connect Multi-layer Inclinometers on multiple levels.

Type		L (mm)
1m	KBF-33LC-1	372
2m	KBF-33LC-2	1372
	KBF-33MC-2	1225



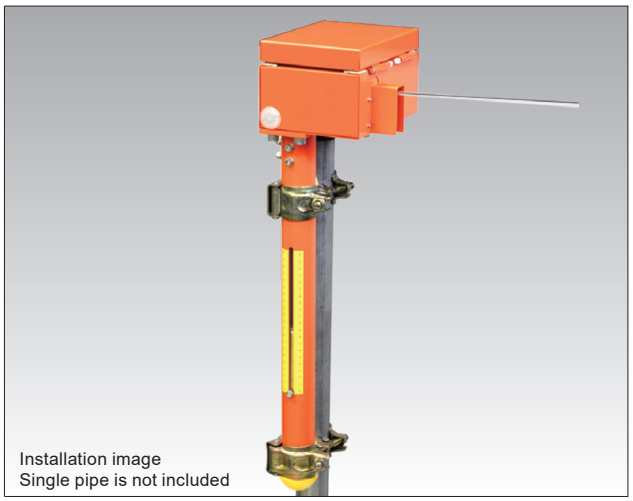
Extension Rod KBF-33L

The KBF-33 Rods are used to extend Relay Rods.

Type	L (mm)
KBF-33L-1	1012
KBF-33L-2	2012

Ground Extension Gauge NKLG-AB 200mm

BUILT-IN ARRESTOR



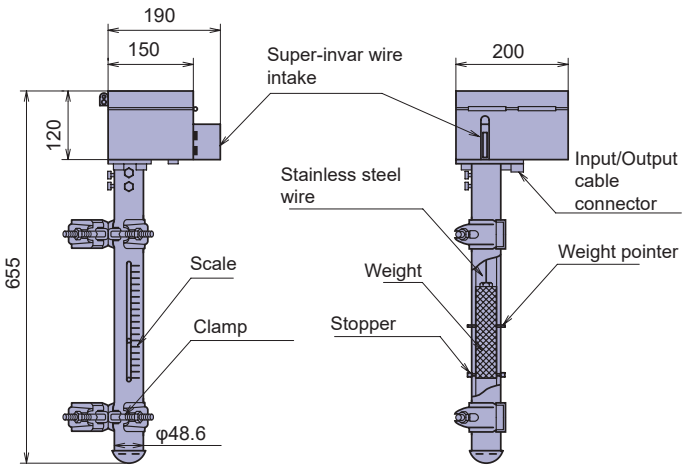
Installation image
Single pipe is not included

The NKLG-AB ground extension gauge is used to measure the displacement of a ground surface. A super-invar wire is set

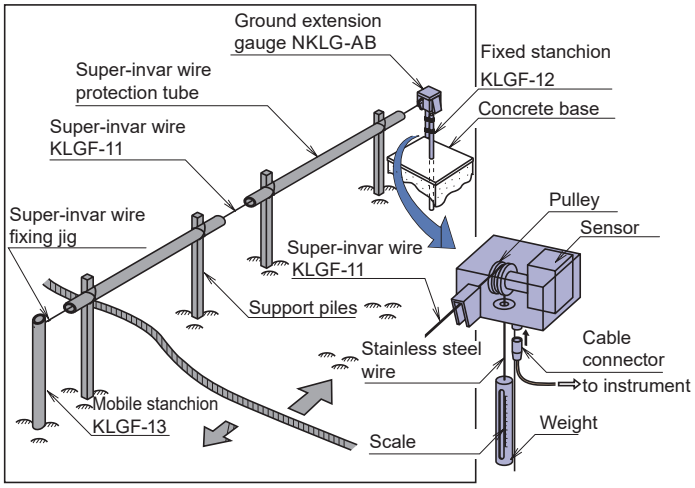
between a stanchion at a reference point (fixed stanchion) and a stanchion at a measurement position (mobile stanchion) and this gauge is mounted on the stanchion at the reference point. The waterproof and environmental resistance features make this gauge suitable for on-site measurement work. The NKLG-AB model is designed specif ically for use with the network measurement system TML-NET.

Protection ratings : IP 25 equivalent

External Dimensions



Principle and Application



Ground surface movement measurement Network-compatible NKLG-AB for telemetry

Features

- **Remote measurement**
- **Excellent stability**
- **Easy to handle**
- **Electrical insulation function**

Specifications

Type	NKLG-200AB
Capacity	200mm
Rated indication	Approx. 5000 digits
Non-linearity	1%RO
Allowable temperature range	-20 ~ +60°C (No icing)
Channel set	Factory default (000~ 999)
Supplied cable	CT6-2R2/WP-STB (φ6mm 0.5mm^2 2-core shielded vinyl cable 2m)
Weight	10 kg

To activate electrical insulation function it requires the dedicated instrument as below.
TDS-540-03 and ND-100, TS-360 or TDS-150-06 including an option for Switching box/TML-NET driving board

In addition to the above, we can also manufacture custom-made products.

Compatible accessories with NKLG-AB/NKLG-BB

KLGF-11

KLGF-14

- **Super-Invar wire KLGF-11**
  The KLGF-11 Super-Invar Wire is a wire used to connect an extension gauge to a mobile stanchion in order to to transmit displacement.
  0.5mm-dia. × 30m (Thermal expansion 1ppm or less)

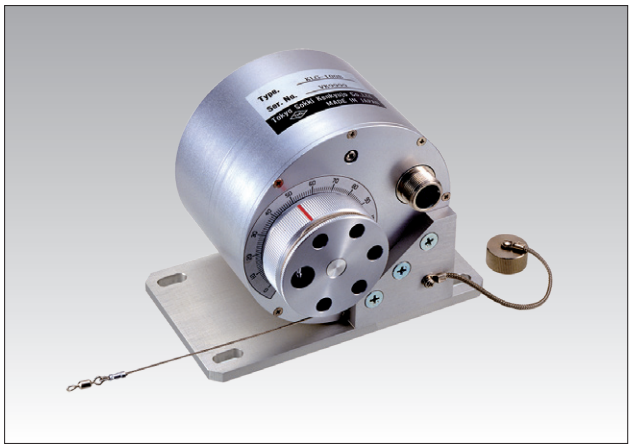
- **Fixed Stanchion KLGF-12**
  The KLGF-12 Fixied Stanchion is installed at a reference point and is used to mount an extension gauge.
  48.6mm-dia. × 1.5m

- **Mobile Stancion KLGF-13**
  The KLGF-13 mobile Stanchion is installed at a measurement point and is used for fixing the other end of the Super-Invar Wire drawn from the extension gauge.
  48.6mm-dia. × 1.5m

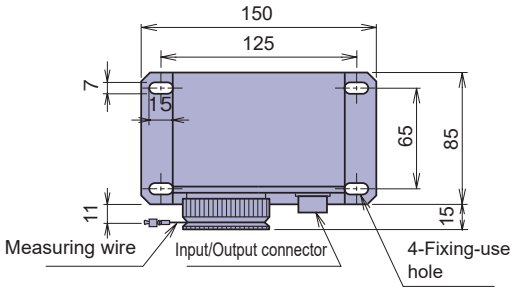
- **Crimp Pliers KLGF-14**
  The KLGF-14 Crimp Pliers are used to crimp the wire locks supplied with the Super-Invar Wire.

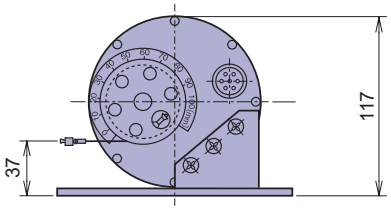
Ground Extension Gauge NKLG-BB 100mm

BUILT-IN ARRESTOR



External Dimensions





The NKLG-BB ground extension gauge is placed near the ground surface to measure the displacement of a ground slide. A super-Invar wire is set between a stanchion at a reference point (fixed stanchion) and a stanchion at a measurement position (mobile stanchion) and this gauge is mounted on the stanchion at the reference point. The waterproof and environmental resistance features make this gauge suitable for on-site measurement work.

The NKLG-BB model is designed specifically for use with the network measurement system TML-NET.

Protection ratings : IP 55 equivalent

Installed near the ground surface to measure movement
Telemetry is possible
Network-compatible NKLG-BB

Features

- **Remote measurement**
- **Excellent stability**
- **Easy to handle**
- **Electrical insulation function**

Specifications

Type	NKLG-100BB
Capacity	100mm
Rated indication	Approx. 5000 digits
Non-linearity	1%RO
Allowable temperature range	-20 ~ +60°C (No icing)
Channel set	Factory default (000~ 999)
Input/Output cable	CT6-2R2/WP-STB (φ6mm 0.5mm² 2-core shielded vinyl cable 2m)
Weight	1.2 kg

To activate electrical insulation function it requires the dedicated instrument as below.
TDS-540-03 and ND-100, TS-360 or TDS-150-06 including an option for Switching box/TML-NET driving board

In addition to the above, we can also manufacture custom-made products.

NKLG-BB Dedicated Accessory

- **Mounting plate KLGF-15**
  This dedicated plate is usable to mount the extension gauge KLG-B/NKLG-BB.

- **Protective cover KLGF-16**
  This dedicated cover is usable to protect the extension gauge KLG-B/NKLG-BB mounted on plate KLGF-15

- **Stanchion mount adapter KLGF-17**
  This dedicated adapter is usable to fix the extension gauge KLG-B/NKLG-BB mounted on the plate KLGF-15 to the stanchion accessory KLGF-12.

Thunder proof for TML-NET NNZ-2A

The NNZ-2A is used for protecting TML-NET network measurement system from induced lightning. When the cable of instrument or network-module receives induced lightning, failure may be caused in the network driver and/or network module by the lightning surge. The NNZ-2A is connected to the connection cable of the network, and works to flow the surge current to the earth when induced lightning occurs. In addition, during standby of measurement, it automatically shuts off the network line to protect the network driver and network modules from the lightning surge.

Preventing measurement system failures due to induced lightning

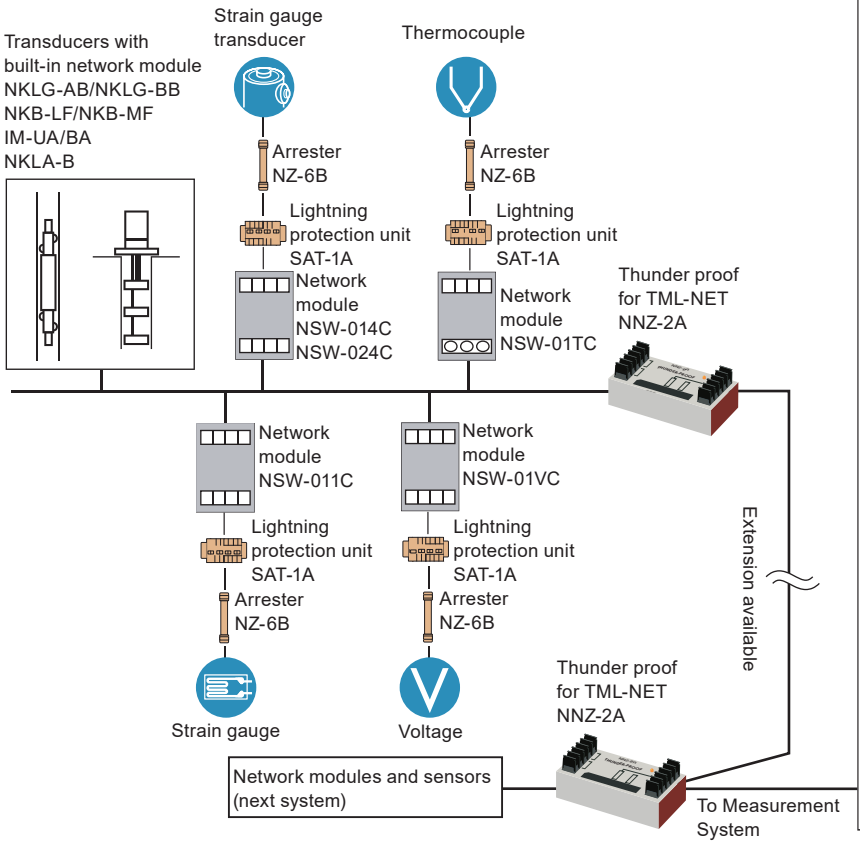
Features

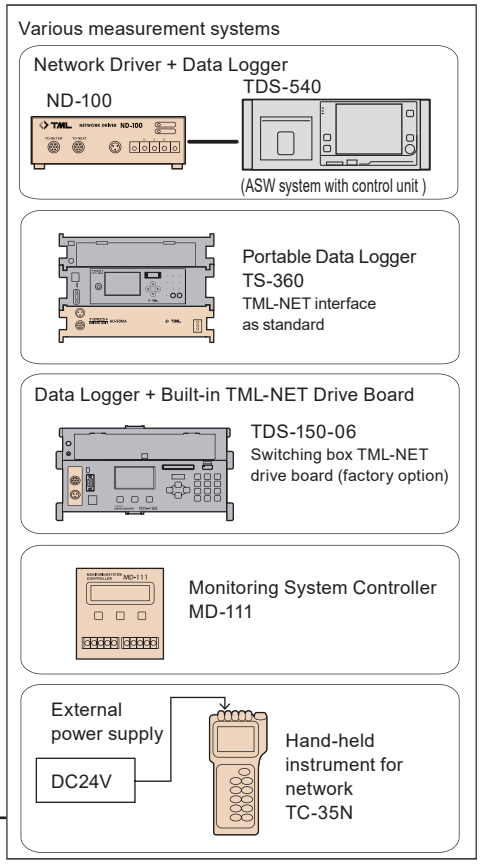
- **Shuts off network line automatically during measurement standby status to avoid induced current**
- **Power is supplied from network line**
- **Monitors voltage of network line and current of network modules, and shuts off immediately if abnormal condition occurs**

Specifications

Surge tolerance	100A (8/20μs impulse)
Available number for one system	NNZ-2A: up to 10 Low-comsumption network module: up to 100
Rated power supply voltage	DC18 to 24V
Standard Cable	Exclusive 2-core shielded cable Total extension distance: 2km or less (when power supply voltage is DC24V) 1km or less (when power supply voltage is DC18V)
Display function	Drop of voltage in the network line Over current of network module (Shuts off the network modules at over current)
Environment	−20 to +60°C 85%RH or less (no condensation)
Dimensions	50 (W) x 28 (H) x 100 (D) mm (except projecting parts)
Weight	Approx.120g

System Block Diagram





*TDS-540 and TDS-630 use sleep intervals
*TS-360, TDS-150, and MD-111 use AC power adapter

Arrester for sensor protection

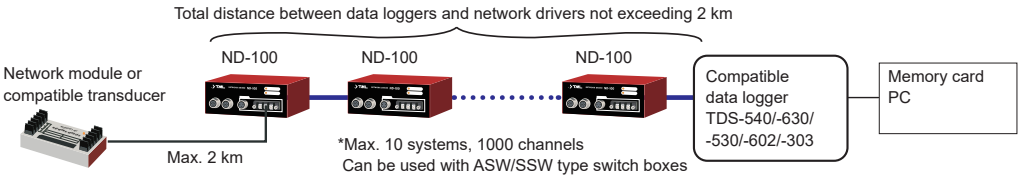
Arrester NZ-6B		Lightning protection unit SAT-1A	
	•High discharge withstand capacity •Equal discharge circuit •Completely waterproof •Compatible with platinum resistance thermometers and KMs with temperature measurement function		Terminal blocks for sensors and measuring instruments using 3-terminal gas tube arresters

TML-NET Compatible Measuring Instruments

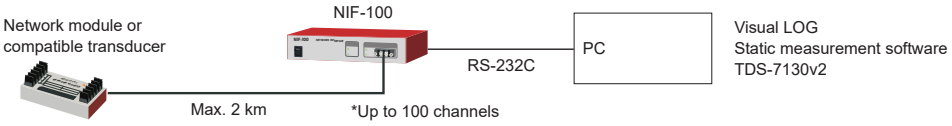
TML-NET's measurement system allows you to choose the measuring instrument that best suits your purpose and scale.

Combination of network measurement systems

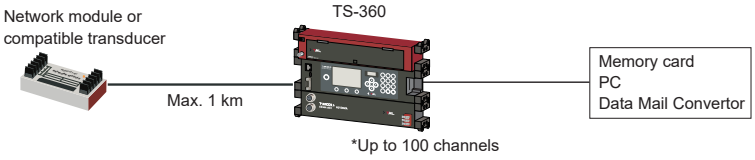
Network driver ND-100



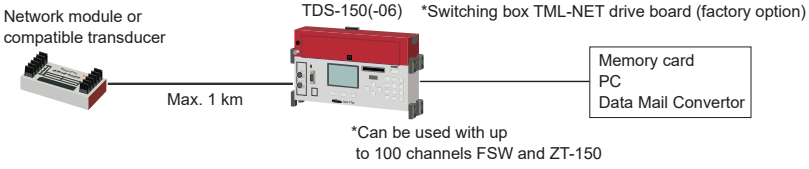
Network interface NIF-100



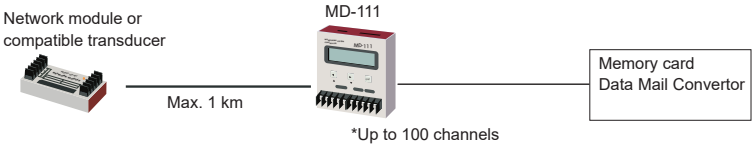
Portable Data Logger TS-360



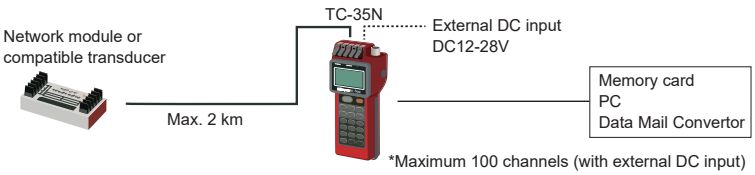
Portable Data Logger TDS-150



Monitoring system control MD-111



Hand-held instrument for network TC-35N



Number of network modules connected and distance extended

Type		ND-100	NIF-100	TS-360	TDS-150-06	MD-111	TC-35N Internal battery, when using AC	TC-35N External DC input
Number of units connected	When using low consumption type module	100 units		100 units	100 units		50 units	100 units
	When using conventional modules	80 units (100m or less)		Max. 20 units (150m or less)	Max. 20 units (150m or less)		5 units	100 units (200m or less)
Extension distance	When using low consumption type module	2km		1km	1km		50m	2km
	When using conventional modules	1.8 km (less than 10 cars)		Within 1 km (less than 10 cars)	1 km (10 cars or less)		50m	2 km (15 cars or less)

System using data logger TDS-540
Capable of measuring up to 10 systems and 1000 points

Network Driver ND-100 is connected to the Data Logger TDS-540 on the control side to create a system that controls network modules connected by a 2-wire cable from the driver.
Up to 100 network modules can be connected to one system (one driver) (200 points for 2-channel modules), and a maximum of 10 systems (10 drivers)/1000 points can be measured.
It can also be used with switch boxes for ASW/SSW systems.

Network driver ND-100

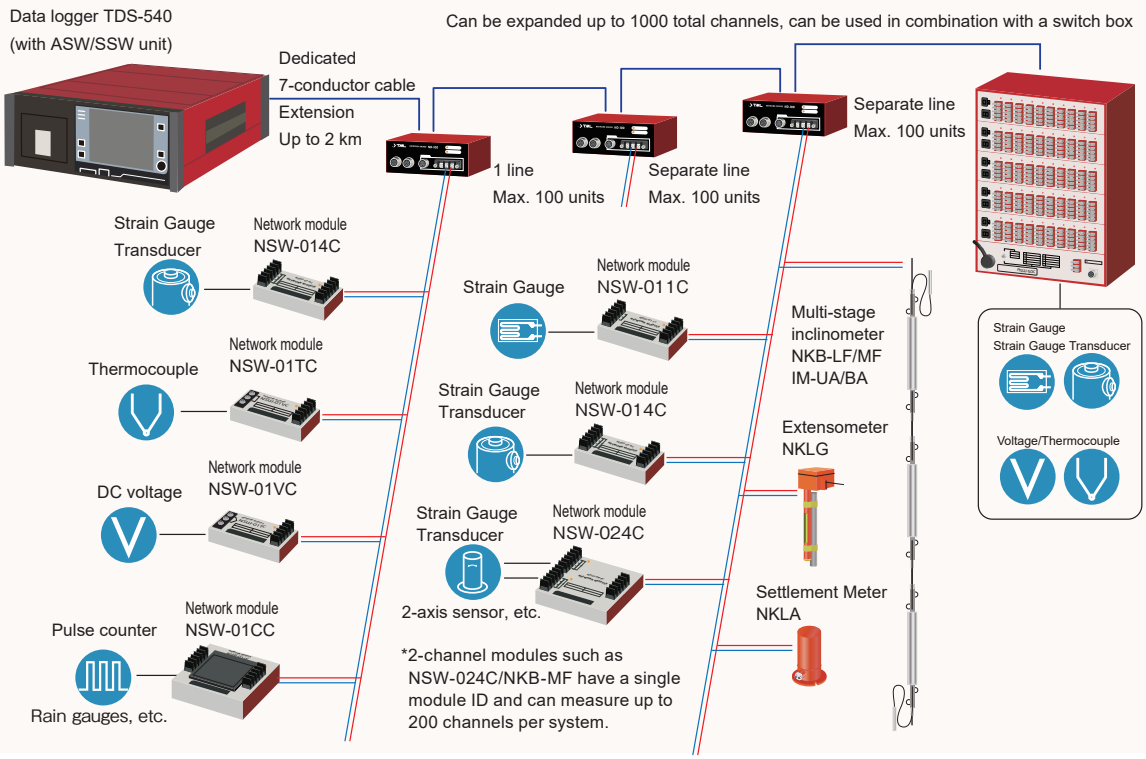
Driver interface to drive each module from the system of switch box extension cables of the ASW/SSW system of TDS series measuring instruments.

It is effective when adding measuring points to a conventional measurement system using a switch box from a site requiring multi-point, long-distance wiring.

Specification

Number of connection		100 modules for one ND-100 (1000 measurement points at the maximum)
Extension distance		With low consumption network module 2km
Applicable data logger		TDS-540
TML-NET Connection		Terminal block NDIS connector for connecting dedicated 2-conductor shielded cable
Features		Converts 3-wire signal into 2-wire signal Supplies power source to network modules
Power source		Supplied by data logger Booster power supply required when extending multiple systems
Booster power supply	AC power supply	Rated voltage AC100 to 240V 50/60Hz Maximum power consumption 80VA MAX
	DC power supply	Rated voltage DC 9 to 18V Maximum current consumption 2.0A MAX
Operating temperature and humidity range		0 to +50°C, 85%RH or less (excluding condensation)
External dimensions		150(W)×45(H)×100(D)mm (excluding protruding parts)
Weight		Approx. 500g
Standard accessories		Operation manual .....1 AC power cable (CR-01) .....1 Connection cable 1.5m (CR-65) .....1 Warranty card 1

System Block Diagram



Compatible Data Logger

Data Logger TDS-540

Static strain measuring instruments for various measurements using strain gauges, strain gauge transducers, DC voltage, thermocouples, and platinum resistance thermometers.
To connect the ND-100 network driver, an ASW/SSW unit is required to connect an ASW-type switching box.

- Up to 1000 measurement points
- Remote data logger function installed
- Scanning speed, fastest 1000 points in 0.4 sec. Color LCD monitor with touch panel
- Display switchable between Japanese and English mode
- SD card and USB memory supported
- Interfaces include LAN, USB 2.0, RS-232C, and wireless LAN (optional)
- High resolution (0.1 x 10-6 strain) mode
- Up to 30 semiconductor relay switchboxes can be integrated (10 as standard)
- CE marking compliant
- Equipped with full strain correction method
- Simultaneous measurement of strain and temperature with 1 CH of gage with temperature measurement function
- Compatible with 1-gauge 4-wire strain measurement method

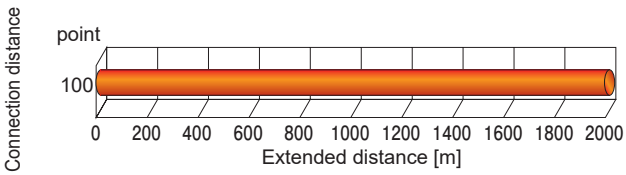
TML-NET (network section) specifications

When using ND-100 network driver

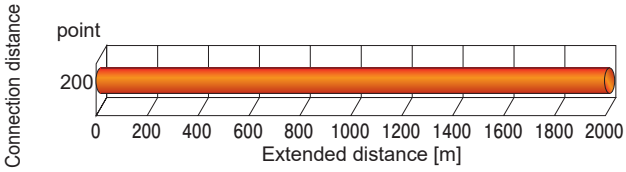
Communication System	
Transmission	2-wire bidirectional serial transfer
Number of connection	Up to 100 module for one system, 1000 measurement points at the maximum
Standard Cable	Exclusive 2-core shielded cable (2-1.125L1)
Total extension distance	2 km or less for one system (see below)
Measurement time	200 msec / 1 measurement point (including transfer time)
Loop connection	Possible
Terminator	Not required

***The number of network modules connected and the total extension distance vary depending on the usage conditions of individual instruments, so please refer to the respective specifications**

Network modules: NSW-011C, NSW-014C, NSW-01VC, NSW-01TC, NSW-01CC
2-wire Extended distance.

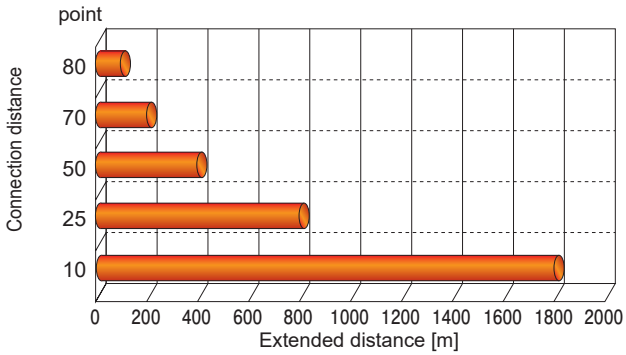


Network modules: NSW-024C (2-ch type)
2-wire Extended distance.



Dedicated shielded cables used 2-wire method: 1

Network modules: Conventional module



Data logger for various on-site measurements

Features

- Can be configured from small to large measurement systems
- LAN communication with remote measurement assistance function
- Low power consumption operation
- Measurement speed 0.08 sec/point
  *0.2 sec/point when measured by TML-NET
- External switch box can connect up to 20 units, 1000 points, 2 km when booster power is turned on
- Channel unit AU-10/AU-10-05: Color LED lights up when measuring (Strain [red]/DC voltage [blue]/Thermocouple [green])

This product is a portable data logger that can measure strain gages, strain gage transducers, DC voltage, and thermocouples by combining a control unit, battery unit, driver unit, and channel unit.

One channel unit can be connected to 10 measuring points and up to 5 units (50 measuring points). In addition, up to 1000 points can be measured by connecting an external switch box.

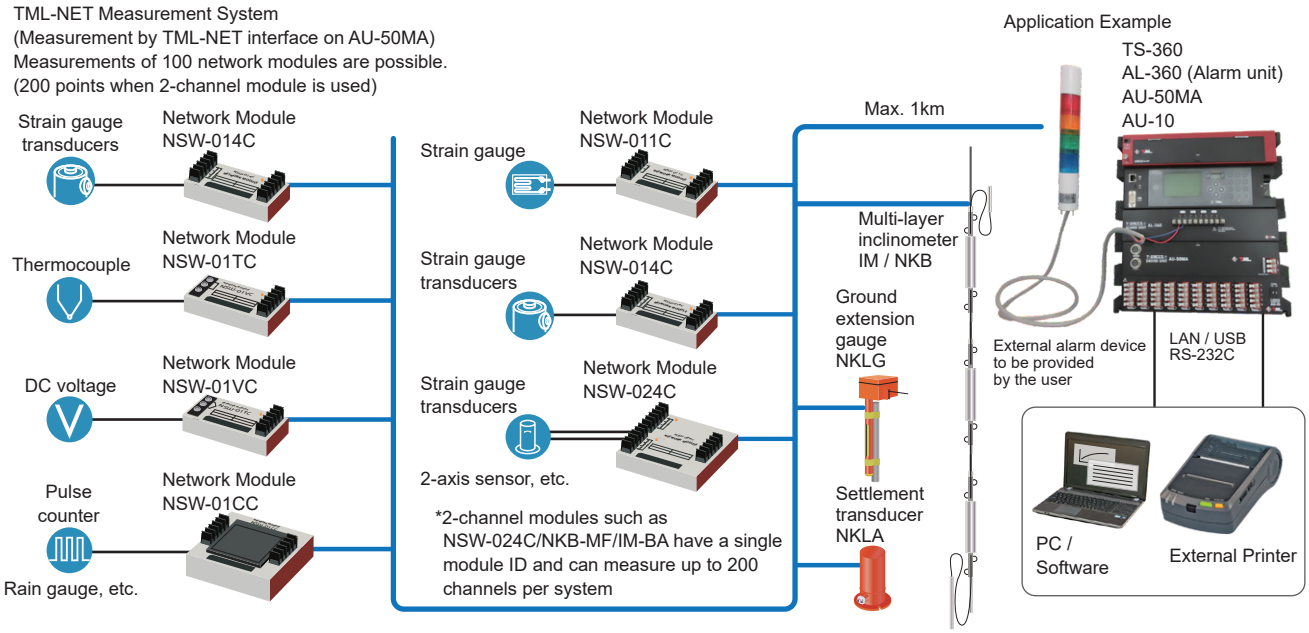
Even in locations where AC power is not available, the unit can be operated with commercially available single batteries or batteries, and is equipped with a large built-in data memory and a sleep interval timer function for long-term automatic measurement.

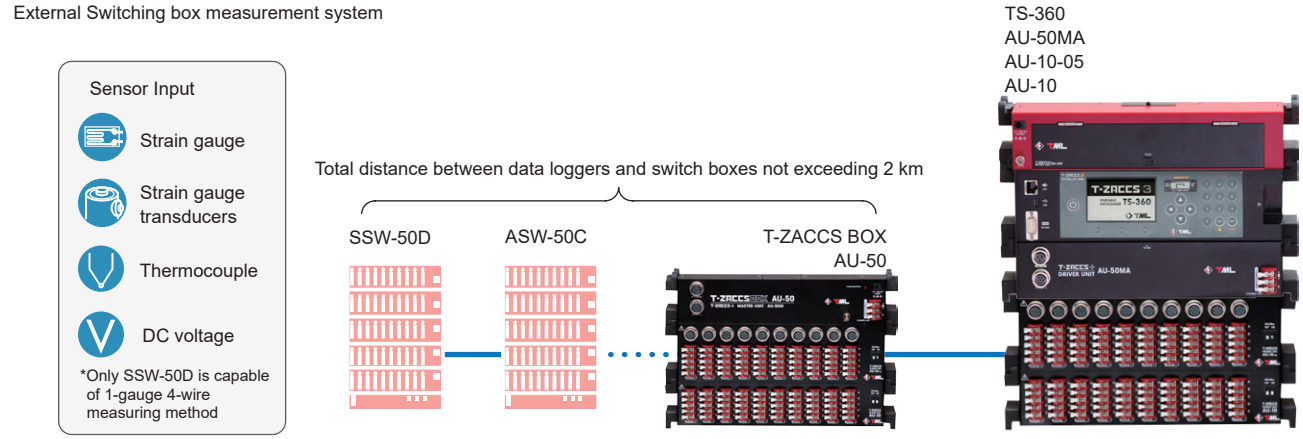
Measurement data and setting files can also be recorded and saved on an SD card.

LAN, USB, and RS-232C communication interfaces are provided as standard, allowing various settings and data to be imported from a PC.

For L AN communication, a remote measurement auxiliary function is provided to reduce the risk of communication errors when building a remote communication system with this product.

System Block Diagram





Specification

T-ZACCS 3 control unit TS-360

Measurement capabilities

Number of measurement points		1000 points at maximum
Measurement speed	Scanning measurement	0.080 sec/point (50 Hz) 0.067 sec/point (60 Hz)
	Monitor measurement	0.5 sec/point
Measurement mode		Initial, direct, measure (For temperature measurement, direct only)
Simple measure		Coefficient 1 Unit Interlocked with sensor mode Decimal point Interlocked with sensor mode
Compensation mode		Comet NON, Comet A, Comet B
Monitor	Display mode	OFF, value, scan
	Display channel	Numerical value display 1 - 8 points Scan display 1 - 1000 points
Measurement	Manual measurement	START key
	Automatic measurement	Interval measurement, comparator measurement
	Interface	LAN, USB, RS-232C
Channel setting	Coefficient	±(0.00000-200000)
	Unit	με, mV, °C, kgf, mm, etc.
	Decimal point	Possible to set the display below decimal point from 0 to 5 digit
	Offset	Writable for each channel
	Sensor mode	Strain: Quarter bridge 3-wire method, 120 / 240 / 350 Ω, 1-gauge 4-wire method *, 120 / 240 / 350 Ω*, Half bridge common dummy method, Half bridge method, Full bridge method, Full bridge method constant current 350 Ω,
		Voltage: 300 mV, 30 V
		Temperature: Thermocouple T, K, J, B, S, R, E, N
Check function	During measurement	Open check
	Sensor	Insulation check, Sensitivity check, Dispersion check, Thermocouple burnout check, Lead wire resistance check, Bridge output check, Coefficient check
	Display setting list	Initial value, lead wire resistance

* The 1-gauge 4-wire method is only compatible with SSW-50D.

Interval measurement

Function	Automatic recording of measurement values at the set interval or real time
Time interval	Hour , minute , second , up to 99 hours, 59 minutes, and 59 seconds. Settable for every step.
Actual time start	Start time (hour / minute / second) can be set for each step
Number of start times	Up to 9999 times per step or infinite
Number of steps count	Programmable up to 10 steps
GOTO step	Program loop possible to one of the previous steps
GOTO comparator	Move to Step 1 of the comparator.
Sleep function	Turns the power ON/OFF automatically when the interval 1 minute or longer from the end of the scan to the start of the next scan.

Comparator measurement

Function	Automatic recording of the measurement value according to set variation of an arbitrary channel
Value for comparison	Settable for every step: Up to ±999999
Comparison method	Upper / lower limit values, relative value
Number of start times	Up to 9999 times per step or infinite
Number of steps count	Programmable up to 10 steps
GOTO step	Program loop possible to one of the previous steps
GOTO Interval	Move to Step 1 of the interval.

Time

Setting	Year, month, day, hour, minute, second
Accuracy	Daily error: ±1 sec (@ 23°C ± 5°C)
Retention	About 30 days (with full charge)

Display / operation

Display	Display unit	LCD panel	3.0-inch semi-transparent monochrome STN LED backlight
		Resolution	255 x 160 dots
		Point defect	10 dots or less (excluding aging deterioration)
Operation			POWER, START, ESC, ENT, 0-9, F1,F2,F3

Recording

Internal data memory	Function	Recording and reading of measured data Saving of setting file
	Recording format	CSV format, TDS format
	Capacity	16 GB
SD card	Function	Recording and reading and copying of measured data Saving and copying of setting file
	Physical format	FAT32
	Recording format	CSV format, TDS format
	Capacity	16 GB (Designated by us)

Interface

LAN	10BASE-T/100BASE-TX General-purpose command port server function (various settings, measurement, data acquisition)
USB	USB 2.0 protocol compatible General-purpose command compatible (various settings, measurement, data acquisition)
RS-232C	RS-232C compliant Baud rate 9600, 19200, 38400, 57600, 115200 bps Various settings, measurement, data acquisition

Power source

Power source voltage	Supplied by BA-360

Environment

Operating environment	-10°C to +50°C 85% RH or less (No dew condensation)

Others

Outside dimensions	280 (W) ×45 (H) ×80 (D) mm (Excluding rubber protectors and protrusions)
Weight	About 800 g

Standard accessories

Operation Manual (CD)	1
D size alkaline battery	4
SD card	1
Cross slot screwdriver	1
Warranty certificate	1 copy

Options

SD card	16 GB (Designated by us)
AC adapter	CR-1867
RS-232C cable	CR-5360
USB cable	CR-6189
External printer (RS-232C connection)	DPU-S245 (RS-232C connection)
Shoulder belt	TSB-360
For belt bracket 60 mm (BA-360, AU-50MA, AU-10)	TSB-366
For belt bracket 80 mm (TS-360, AU-10-05)	TSB-368

T-ZACCS+ driver unit AU-50MA

Measurement capabilities

Number of measurement points	When the switching boxes are connected	1000 points at maximum	
	When both the switching boxes channel units are connected		
	When the channel units are connected	50 points at maximum	
Measurement speed		0.080 sec/point (50 Hz) 0.067 sec/point (60 Hz)	
Measurement mode		Direct	
Strain measurement	Applicable connection method and gauge resistance	Quarter bridge 3-wire method	120/240/350 Ω
		1-gauge 4-wire method *	120/240/350 Ω
		Half bridge method	120 to 1000 Ω
		Half bridge common dummy method	120 to 1000 Ω
		Full bridge method	120 to 1000 Ω
		Full bridge method constant current	350 Ω
	Sensor cable extension range	Full bridge method, constant current, 350 Ω	Cable round-trip resistance: 400 Ω or less
		1-gauge 4-wire method *	Cable round-trip resistance: 200 Ω or less
	Sensitivity variation	Full bridge method, constant current, 350 Ω	+0.1 to -0.5% Per cable round-trip resistance of 100 Ω
	Lead wire resistance compensation range Comet B (1G3W)	Gauge resistance 120 Ω: About 100 Ω or less	
		Gauge resistance 240 Ω: About 200 Ω or less	
		Gauge resistance 350 Ω: About 300 Ω or less	
	Stability on zero	±1.0 × 10^{-6} strain/°C or less (Quarter bridge 3-wire method) ±0.5 × 10^{-6} strain/°C or less (1-gauge 4-wire method)	
	Initial unbalance	±750 × 10^{-6} strain or less (Quarter bridge 3-wire method) ±500 × 10^{-6} strain or less (1-gauge 4-wire method *) ±500 × 10^{-6} strain or less (Half bridge method)	
DC voltage measurement	Input impedance	1 MΩ or more	
	Allowable input voltage between B and D	± 50 VDC MAX	
Thermocouple temperature measurement		T, K, J, B, S, R, E, N JIS C 1602:2015 IEC 60584-1:2013	
Check function	During measurement	Open check	
	Sensor	Insulation check, Sensitivity check, Dispersion check, Thermocouple burnout check, Lead wire resistance check, Bridge output check	

* The 1-gauge 4-wire method is only compatible with SSW-50D.

Strain measurement

Bridge excitation	2 VDC 24 ms (50 Hz)	
Initial value memory range	±160000 × 10^{-6} strain	
Temperature coefficient of accuracy	±0.0002% rdg/°C	
Secular change of accuracy	±0.02% rdg/year	
Measurement range and resolution	Measurement range	Resolution
	±30000 × 10^{-6} strain	1 × 10^{-6} strain
	±300000 × 10^{-6} strain	10 × 10^{-6} strain
Accuracy (@ 23°C ± 5°C) (excluding 1-gauge 4-wire method)	± (0.08% rdg+1digit)	
Accuracy (@ 23°C ± 5°C) 1-gauge 4-wire method *	± (0.28% rdg+1digit)	

Constant current strain measurement (Full bridge method only)

Bridge excitation	DC 6 mA 24 ms (50 Hz)	
Bridge resistance	350 Ω	
Initial value memory range	±160000 × 10^{-6} strain	
Temperature coefficient of accuracy	±0.0002% rdg/°C	
Secular change of accuracy	±0.02% rdg/year	
Measurement range and resolution	Measurement range	Resolution
	±30000 × 10^{-6} strain	1 × 10^{-6} strain
	±300000 × 10^{-6} strain	10 × 10^{-6} strain
Accuracy (@ 23°C±5°C) (excluding 1-gauge 4-wire method)	±(0.08%rdg+1digit)	

DC voltage measurement

Initial value memory range	V1/1	±160.000mV	
	V1/100	±16.0000V	
Temperature coefficient of accuracy		±0.0024% rdg/°C	
Secular change of accuracy		±0.024% rdg/year	
Measurement range and resolution		Measurement range	Resolution
	V1/1	± 30.000mV	0.001mV
		±300.000mV	0.010mV
	V1/100	± 3.0000V	0.0001V
		±30.0000V	0.0010V
Accuracy (@ 23°C ± 5°C)	V1/1	±(0.08%rdg+3digit)	
	V1/100	±(0.08%rdg+2digit)	

Thermocouple temperature measurement (JIS C 1602:2015, IEC 60584-1:2013)

Applicable thermocouple		T, K, J, B, S, R, E, N		
Linearization		Digital processing		
Type	Measurement range	Resolution	Accuracy (@ 23°C ± 5°C) (External reference junction)	Accuracy (@ 23°C ± 5°C) (Internal reference junction)
T	–250~–200°C	0.1°C	0.38%rdg+0.6°C	0.38%rdg+3.9°C
	–200~–100°C	0.1°C	0.15%rdg+0.2°C	0.15%rdg+1.4°C
	–100~+400°C	0.1°C	0.10%rdg+0.2°C	0.10%rdg+1.0°C
K	–210~–160°C	0.1°C	0.19%rdg+0.3°C	0.19%rdg+1.6°C
	–160~0°C	0.1°C	0.12%rdg+0.2°C	0.12%rdg+1.0°C
	0~+960°C	0.1°C	0.08%rdg+0.1°C	0.08%rdg+0.5°C
	+960~+1370°C	0.1°C	0.10%rdg+0.9°C	0.10%rdg+1.4°C
J	–200~–160°C	0.1°C	0.16%rdg+0.2°C	0.16%rdg+1.2°C
	–160~0°C	0.1°C	0.12%rdg+0.1°C	0.12%rdg+0.8°C
	0~+700°C	0.1°C	0.08%rdg+0.1°C	0.08%rdg+0.5°C
	+700~+1200°C	0.1°C	0.08%rdg+0.6°C	0.08%rdg+0.9°C
B	+200~+280°C	0.5~0.4°C	0.04%rdg+4.0°C	0.04%rdg+4.0°C
	+280~+800°C	0.3~0.1°C	0.04%rdg+1.2°C	0.04%rdg+1.2°C
	+800~+1760°C	0.1°C	0.05%rdg+0.4°C	0.05%rdg+0.4°C
S	–10~+200°C	0.1°C	0.09%rdg+0.6°C	0.09%rdg+1.2°C
	+200~+1760°C	0.1°C	0.07%rdg+0.4°C	0.07%rdg+0.7°C
R	–10~+150°C	0.1°C	0.09%rdg+0.7°C	0.09%rdg+1.2°C
	+150~+1760°C	0.1°C	0.07%rdg+0.4°C	0.07%rdg+0.7°C
E	–210~+550°C	0.1°C	0.17%rdg+0.2°C	0.17%rdg+1.4°C
	+550~+1000°C	0.1°C	0.09%rdg+0.4°C	0.09%rdg+0.8°C
N	–200~0°C	0.1°C	0.18%rdg+0.4°C	0.18%rdg+1.6°C
	0~+1090°C	0.1°C	0.08%rdg+0.2°C	0.08%rdg+0.6°C
	+1090~+1300°C	0.1°C	0.08%rdg+0.9°C	0.08%rdg+1.2°C

Switching box drive unit

Applicable type		SSW-50D, ASW-50C
		AU-50M
Number of connectable units	No booster power supply	8 units connected, 400 points
	With booster power supply	20 units connected, 1000 points
Extension distance	No booster power supply	120 m
	With booster power supply	2km
Connection cable		Switching box connection cable (CR-65)

TML-NET drive unit

Applicable type		NSW series
Number of connectable units	Low power consumption type	100 units at maximum
	Traditional type	20 units at maximum (150 m or less)
Extension distance	Low power consumption type	1 km
	Traditional type	1 km or less (up to 10 units)
Connection cable		Dedicated TML-NET cable (CR-6930)

Channel unit connection

Applicable type	AU-10, AU-10-05
Number of connectable units	5 units at maximum
Connection connector	Dedicated connector for unit connection

Power source

Power source voltage	Supplied by TS-360

Environment

Operating environment	-10°C to +50°C 85% RH or less (No dew condensation)

Others

Outside dimensions	280 (W) ×45 (H) ×60 (D) mm (Excluding rubber protectors and protrusions)
Weight	About 800 g

T-ZACCS UNIT channel unit AU-10/AU-10-05

Function

Number of measurement points	10 points
Input terminal	Accepts both screwing and soldering
One-touch connector	NDIS 7-pin connector receptacle (AU-10-05 only)
Measurement capabilities	Equivalent to AU-50MA / AU-50M

Power source

Power source voltage	Supplied by AU-50MA / AU-50M

Environment

Operating environment	-10°C to +50°C 85% RH or less (No dew condensation)

Others

Outside dimensions	AU-10 280(W)×45(H)×60(D)mm AU-10-05 280(W)×45(H)×80(D)mm (Excluding rubber protectors and protrusions)	
Weight	AU-10 About 900 g AU-10-05 About 1.2 kg	
Standard accessories	Warranty certificate	1 copy

T-ZACCS+ battery unit BA-360

Function

Function	Supply power to TS-360
Battery used	D size alkaline battery x 4

Environment

Operating environment	-10°C to +50°C 85% RH or less (No dew condensation)

Power source

Power source	D size alkaline battery x 4	
	Dedicated AC adapter (CR-1867)	100 to 240 VAC 50/60 Hz
	External DC power input	9 to 18 VDC

Others

Outside dimensions	280 (W) ×60 (H) ×60 (D) mm (Excluding rubber protectors and protrusions)
Weight	Approx. 1.2 kg (including D size alkaline battery x 4)

T-ZACCS+ Alarm unit AL-360

Function

Number of contact points	4
Contact point	Semiconductor relay (a-contact: normally open) Contact capacity 140V AC / 200V DC MAX Rated current 0.6A MAX Inrush current 1.8A MAX ON resistance 2Ω MAX
Display	Status LED Lights up when each contact is closed
Comparison method	Relative value, upper/lower bounds
Number of setting tables	1000
Other Function	Alarm test
Power	Supplied via TS-360
Operating temperature and humidity range	-10 to +50°C 85%RH or less (excluding condensation)
External dimensions	280(W)×45(H)×60(D)mm (excluding rubber protectors and protrusions)
Weight	Approx. 600g

Expandable by unit! “T-ZACCS BOX AU-50”

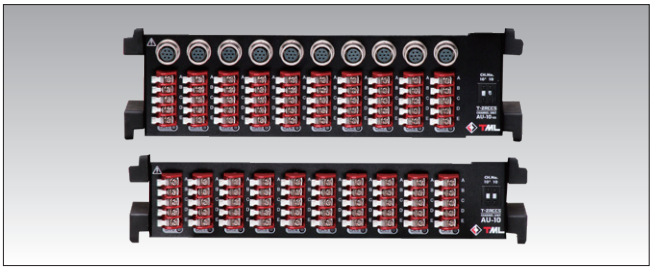
Channel Unit AU-50 consists of a master unit and a channel unit.

It can be used with TS-360, TDS-540, etc. and can be mixed with the conventional switch box ASW-50C/S SW-50D.

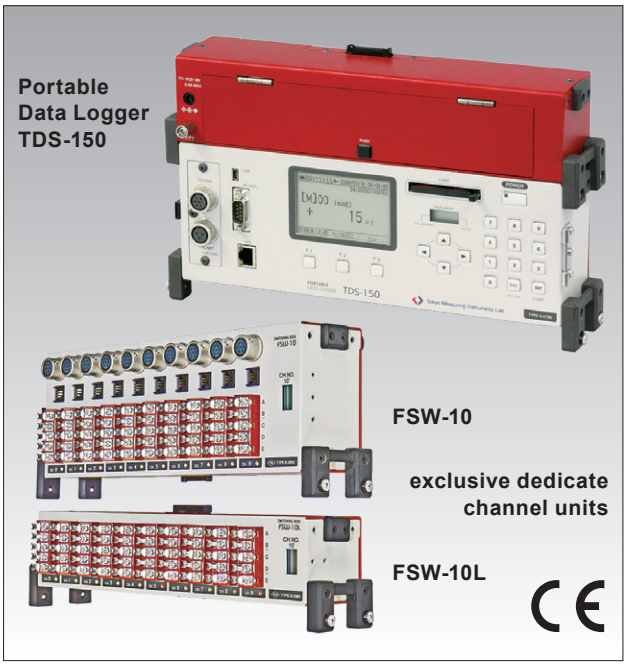
1 to 5 channel units can be added for each master unit

● T-ZACCS+ Master unit AU-50M

● T-ZACCS UNIT Channel unit AU-10/AU-10-05



With the TDS-150, which is suitable for on-site measurement, as the core, the system is highly expandable by adding various options



Features

- Network module can be connected (optional)
- Up to 5 (50ch) channel units (FSW-10/FSW-10L) can be connected (all optional)
- Sleep interval timer enables long-term automatic measurement
- Low power consumption
- Capable of strain measurement, DC voltage measurement, thermocouple and platinum resistance thermometer measurement
- Large data memory capacity
- 1-gauge 4-wire method available
- TEDS compatible
- Equipped with full strain correction method
- Measurement by wireless communication using wireless controller ZT-150 and wireless module ZT-014 (optional)
- Equipped with a sensor mode that allows measurement of concrete fill sensing sensor KZA and concrete moisture sensor KZW on a single channel

*CE mark conformity is available for TDS-150 and FSW-10/-10L channel units

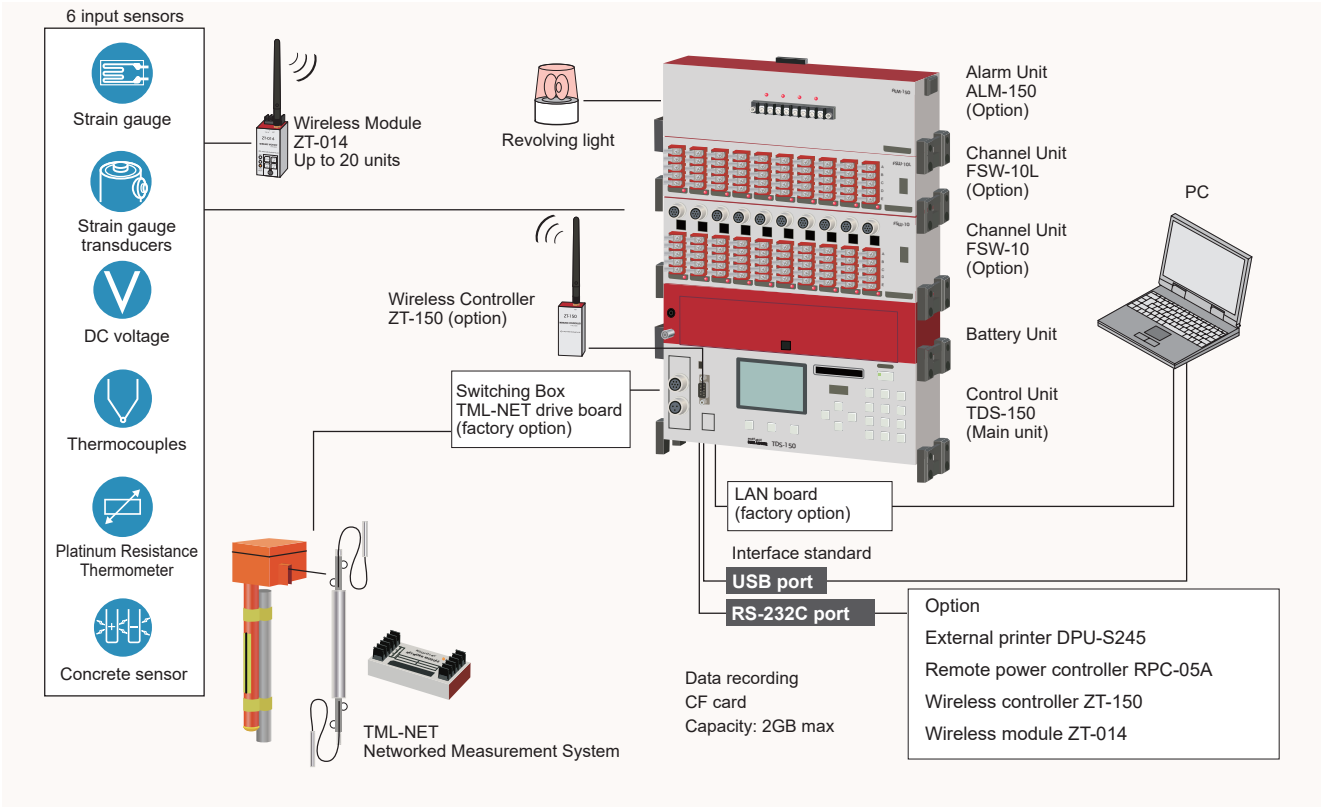
This portable data logger can measure strain gages, strain gage transducers, DC voltage, thermocouples, and platinum resistance thermometer by combining dedicated channel units (FSW-10/FSW-10L).

Up to five 10-channel units (FSW-10/FSW-10L) can be connected (50 channels). The TML-NET switchbox drive board (optional) allows connection of up to 100 channels, and even in places where AC power is not available, the TML-NET can be operated with commercially available AAA alkaline batteries or batteries. The system is equipped with a data memory and a sleep interval timer function.

Data and settings can be recorded on a CF card. USB and RS-232C interfaces are provided, allowing various settings and data to be imported from a PC.

Wireless controller ZT-150 and wireless module ZT-014 (optional) enable wireless measurement. The new CONCRETE mode enables measurement of the concrete filling sensor KZA and the concrete moisture sensor KZW on a single channel, whereas previously two channels were used.

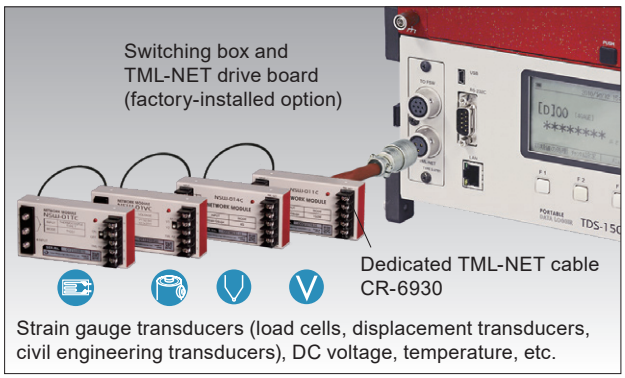
System Block Diagram



Factory option

● TML-NET Networked Measurement System

Switching box and TML-NET drive board (factory-installed option)



Add network driver functionality to TDS-150.

● LAN interface

LAN board (factory option)

This board adds a LAN interface to the TDS-150.

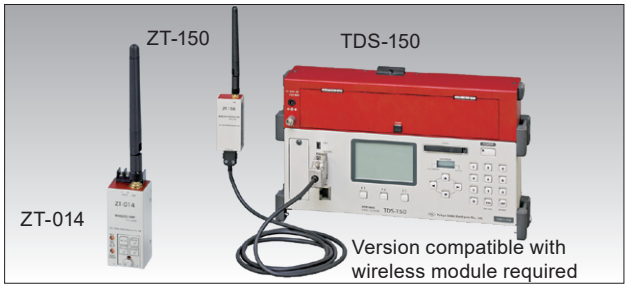
Factory Option Type

Type	Factory Option
TDS-150(-06)	Switching box and TML-NET drive board
TDS-150(-04)	LAN interface
TDS-150(-046)	Switch box TML-NET drive board + LAN interface

Option

● Wireless Measurement System

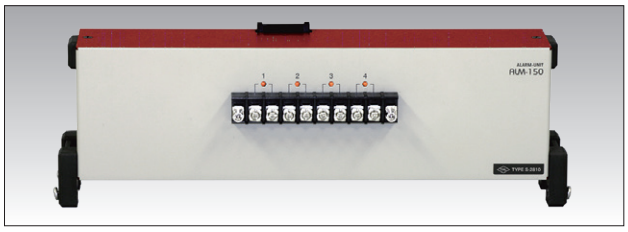
Wireless Controller ZT-150 /Wireless module ZT-014



This is a system for wireless data recording of measurement with strain gage transducers.
Data measured by the wireless module ZT-014 (max. 20 units) is digitally processed and sent to the wireless controller ZT-150.
Wiring from the sensor to the data logger can be made wireless, thus reducing wiring labor and costs.

● Alarm contact output

Alarm unit ALM-150

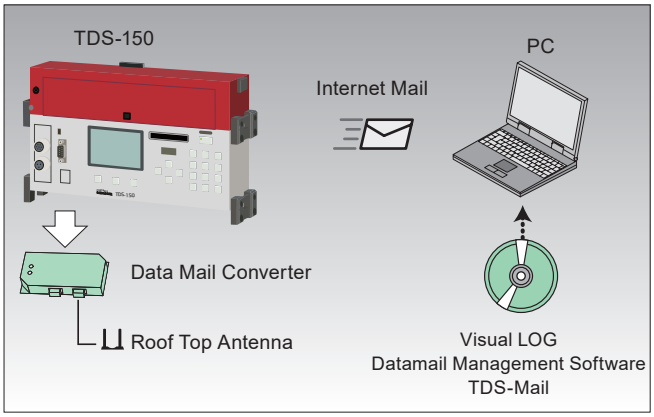


This is a dedicated alarm unit to be connected to TDS-150. The alarm output function monitors the specified channel and closes the specified contact when the measured value changes by a certain amount (relative value setting) or when the threshold value is exceeded (upper/lower limit setting).

Specification

Number of contact outputs	4 points
Contact capacity	AC140V／DC200V MAX.
	Rated current 0.5A MAX.
	Inrush current 1.5A MAX.
	ON resistance 3.2Ω MAX.
Display	Status LED Lights when each contact is closed
Comparison method	Relative value, upper and lower bounds
Number of setting tables	100 tables
Other Functions	Alarm test
Power Supply	Supplied through TDS-150
Dimensions	280(W)×60(H)×80(D)mm (excluding protruding parts)
Operating temperature and humidity range	-10 to +50°C, 85%RH or less (excluding condensation)
Weight	approx. 600 g
Standard accessories	Operation manual ..... 1 Warranty card 1

● Data Mail Converter (TDS-Mail)



The data mail converter sends measurement data from interval timers and other devices to a designated address by e-mail (data mail).
Received data mail is recorded and monitored for alarms by the TDS-Mail data mail management software.
Remote monitoring is easily achieved without the need to build a large server system.
"TDS-Mail-F" is available as an option, which adds rainfall measurement, multistage inclinometer horizontal displacement measurement, and quadrature calculation functions using measured channel data.

RS-232C cable CR-5360
Dsub9P-Dsub9 P cross 1.5m
Used for connection to a PC.

USB cable CR-6187
miniB- A (with ferrite core) 1.8m
Used for connection to a PC.

AC adapter CR-1867
Connects to AC100 V and supplies power

CF card
Supported card capacities: 128MB, 512MB, 1GB, 2GB (specified by us)

TDS-150 TML-NET cable CR-6930
1.5m with 2-1.25L connector PRC030-12A10-3AM10.5
Used to connect the switch box TML-NET drive board to the network module.

The disaster prevention system can be built with alarm outputs via contact outputs

The monitoring system is a measurement system utilizing the networked measurement system TML-NET.

The system consists of a controller, network module, and TML-NET-compatible transducers.

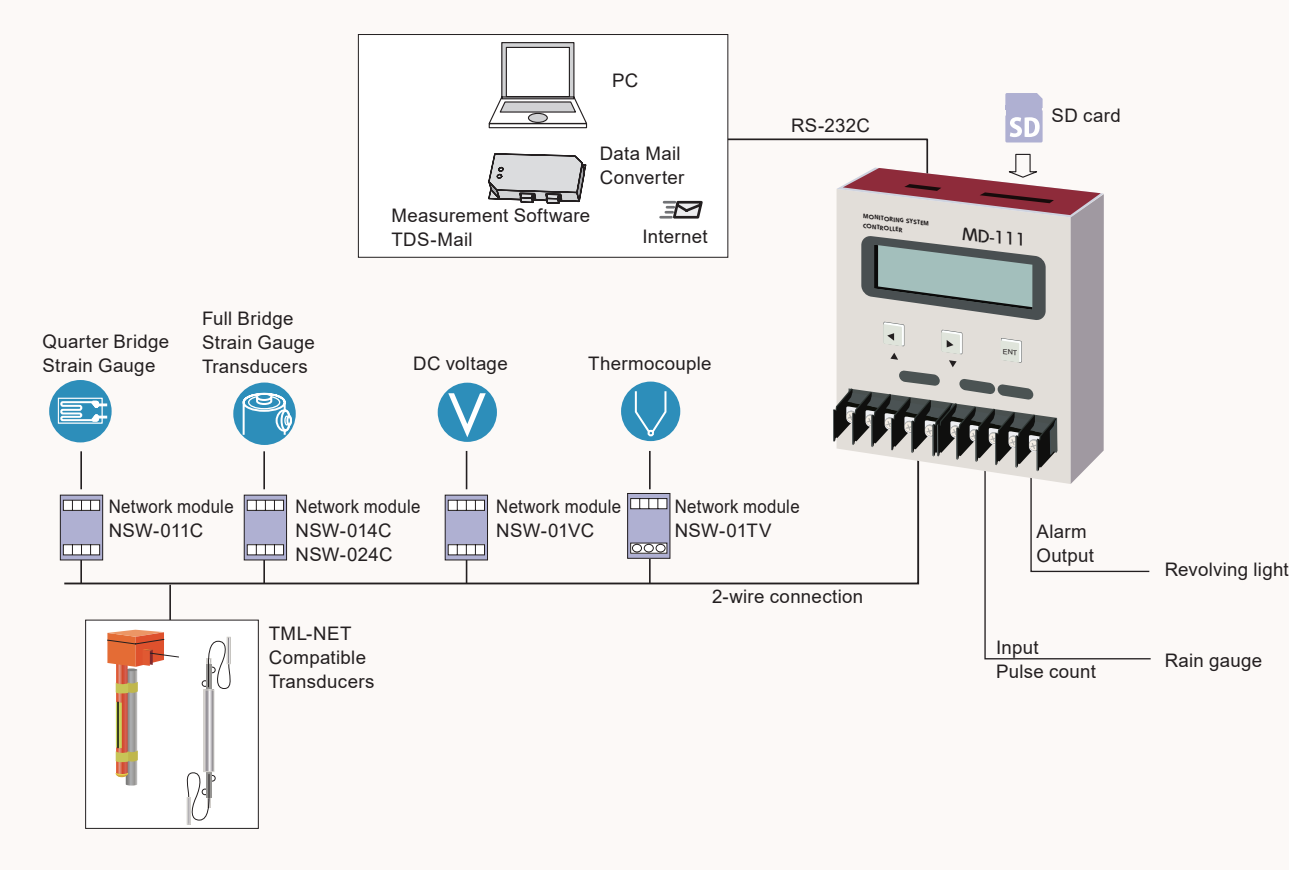
The controller controls the network module and TML-NET-compatible transducers at specified measurement intervals and records the measurement data on an SD card.

The controller is suitable for installation in an instrument storage box or cabinet, and is equipped with I/Fs for contact input/output and mail transducer, making it ideal for constructing a relatively small-scale disaster prevention system.

Features

- Automatic measurement with sleep interval
- Compact and lightweight for DIN rail mounting
- Easy to expand the number of measurement points with the distributed measurement system TML-NET
- Easy data management from remote locations by connecting to a mail converter
- Measurement data can be recorded by SD card.
- Counting and recording of rain gauge pulses by contact input
- Alarm output by contact output

System Block Diagram



Specification

TML-NET Drive Unit

Type	NSW series, TML-NET compatible transducers
Maximum number of connection	Low-comsumption module (excluding counter module NSW-01CC) 100 modules
	Conventional module 20 modules (Connection distance up to 150 m)
Maximum extension distance	Low-comsumption module 1km or less
	Conventional module 1km or less (for 10 modules or less)
Connecting cable	Exclusive 2-core shielded cable 2-1.25L1

Function

Number of measurement points	100
Function	Interval measurement and monitoring
Setting	First channel, last channel
Measurement Mode	Simple measure mode
TML-NET Setting Function	Channel number setting for network module (only when one unit is connected)

Interval timer

Function	Measurement by set time interval
Time interval	1, 2, 5, 10, 15, 20, and 30 minutes, 1, 2, 3, 4, 6, 12, 24 hours (measurement start time can be specified)
Sleep function	Automatic power on/off during interval measurement when sleep function is enabled

Clock

Function	Year, month, day, hour, minute, second
Accuracy	Daily difference ±3 sec(23°C±5°C)
Retention	Approx. 1 hour (when fully charged)

Display and Operation

Indicator	7-segment LCD
Operation key	Operated by key switch

Memory

Function	Recording of measurement data and setting files Readout
Adaptation Card	SD card (specified by the company)
Applicable Physical Format	FAT16
Recording Format	CSV format
Card Capacity	512M to 2GB

Contact input

Number of contact	1
Input signal	No-voltage contact, open collector signal
Response pulse width	0.01s or more
Measuring range	0 to 31999 counts
Accuracy	Within ±1 digit
Recorded content	Record pulse integrations for each recording interval
Measurement Data	Integral count

Contact output

Number of contact	1
Contact	Semiconductor Relay
Contact capacity	AC140V/DC200V MAX. Fixed current 0.5A MAX. Surge current 1.5A MAX.
Output form	a-contact
Comparison format	Relative value, upper and lower bound

Battery power supply

Rated power supply voltage	DC4.2 to 6.8V
Battery life	Approx. 3 months Conditions Battery : 4 AAA alkaline batteries Temperature : 23°C±5°C Measurement : 1 hour interval Number of connected units : 10 units (when using low-consumption network module)
Current consumption	Current consumption in sleep mode 1mA MAX. Current consumption during operation 300mA MAX. (when driving 1 unit) 360mA MAX. (when driving 10 units) 900mA MAX. (when driving 100 units)

External DC power supply

Rated power supply voltage	DC 9 to 18V
Current consumption	Current consumption in sleep mode 1mA MAX. Current during operation 500mA MAX. (when driving 100 units)

Interface

RS-232C	Compliant with RS-232C Baud rates 9600, 19200, 38400 bps For various settings, measurement, and data collection

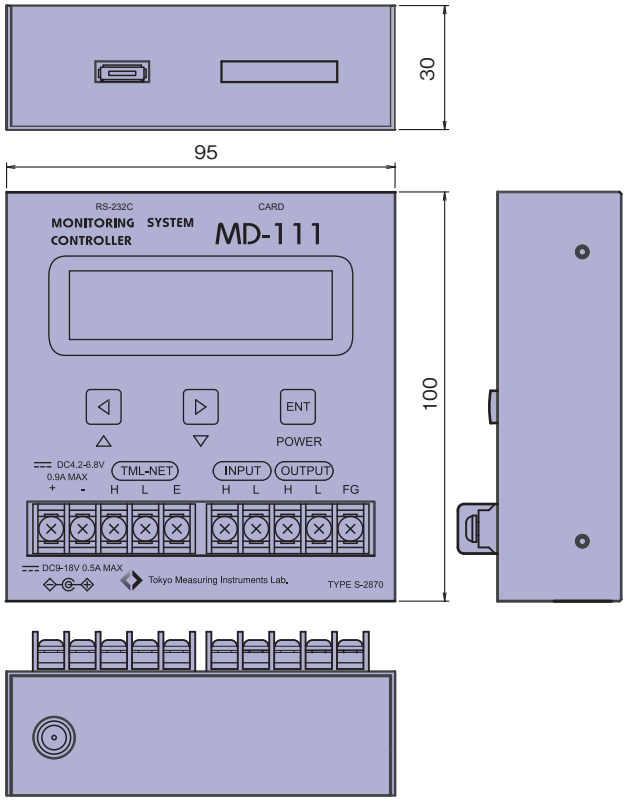
Environment

Operating temperature and humidity range	-10 to +50°C, 85%RH or less (excluding condensation)
Dimensions	95(W)×30(H)×100(D)mm (excluding protruding parts)
Weight	Approx. 200g

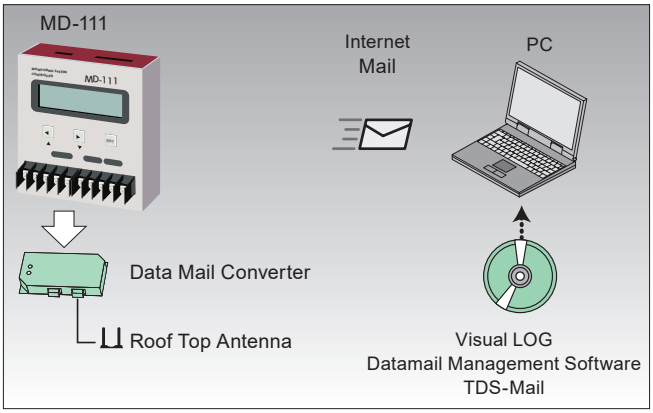
Standard accessories

User's manual 1
Certificate of Warranty 1
SD card (512MB) 1

External Dimensions



• Data Mail Converter (TDS-Mail)



The data mail converter sends measurement data from interval timers and other devices to a designated address by e-mail (data mail). Received data mail is recorded and monitored for alarms by the TDS-Mail data mail management software. Remote monitoring is easily achieved without the need to build a large server system. “TDS-Mail-F” is available as an option, which adds rainfall measurement, multistage inclinometer horizontal displacement measurement, and quadrature calculation functions using measured channel data.

Support from network module configuration and inspection to mid-size measurement systems

The TC-35N hand-held measuring instrument for networks acquires and processes digitized strain data from network modules.

Compact, lightweight, and splashproof, the TC-35N operates on AA alkaline batteries, making it suitable for on-site checks or as a small-scale measurement system.

Sleep intervals can be used for long-term automatic measurement.

Measured data can be transferred to a PC via the RS-232C interface or recorded in data memory or CF card.

Option (Related products)

AC adapter CR-183B
Connect to AC100V to supply power.

RS-232C cable
CR-553B（25P）、CR-5531（9P）
Used for connection to a PC.

External printer DPU-S245
Prints the measurement data of TC-35N

Printer cable CR-4512
TC-35N Dedicated cable for printer connection.

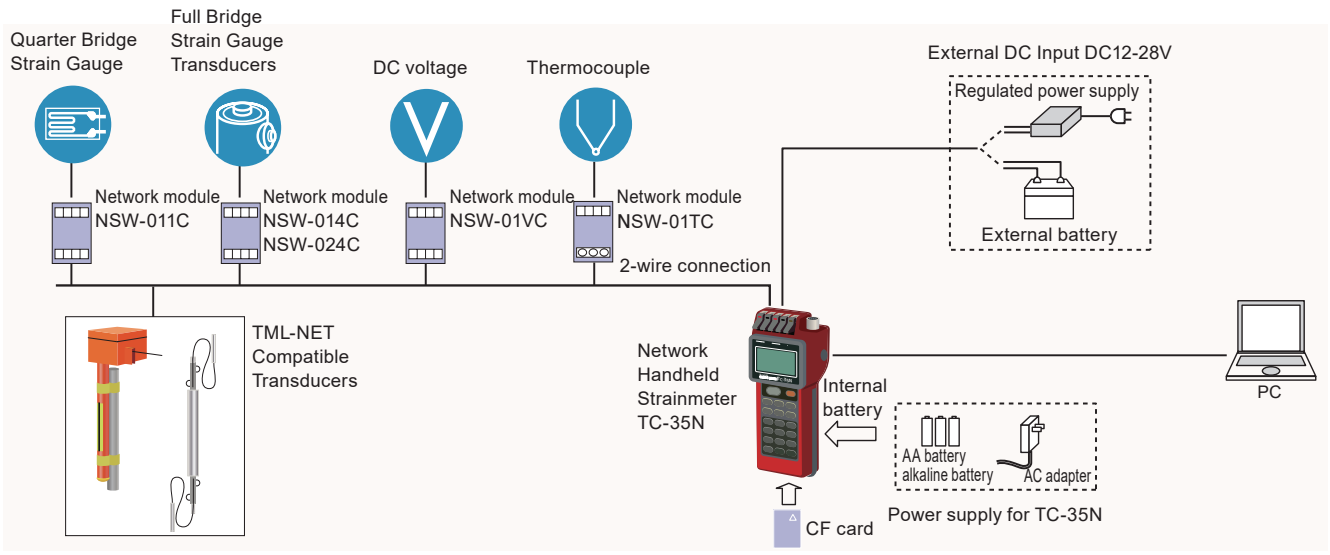
Remote power controller RPC-05A
Long-term measurement by external battery operation

Data Mail Converter (TDS-Mail)
The measurement data is sent by e-mail to the specified address.

Specification

Maximum number of connection	Low-comsumption module 50 modules (when using internal AA batteries or AC adaptor) 100 modules*1 (when using external DC power source; 2km or less for 2-wire connection) Conventional module 5 modules (when using internal AA batteries or AC adaptor) 100 modules (when using external DC power source; 200m or less for 2-wire conection)
Maximum extension distance	Low-comsumption module 50m (when using internal AA batteries or AC adaptor) 2km (when using external DC power source; 100 modules or less for 2-wire connection) Conventional module 50m (when using internal AA batteries or AC adaptor) 2km (when using external DC power source; 15 modules or less for 2-wire connection)
Cable	Dedicated 2-conductor shielded cable
Applicable transducer	Network module in order
Measuring range, resolution, accuracy	Network module in order
Data acquisition speed	Approx. 0.2 S/CH
External DC input	DC12 to 28V 1A MAX. external input for DC power supplied to TML-NET
Data Memory	Approx. 23,000 data (for 1-channel measurement)
Memory card	CF card (PC card adapter required) 128MB
Number of transducer setting points	1000 Setting record contents: coefficient, unit, decimal point, initial value
Function	Scanning measurement, monitor measurement, module check function, ID check function, network module channel setting function
Interval timer function	Function : Automatic start at set time interval and time Time : Year, month, date, hour, minute, second Time accuracy : ±2 sec. day difference (25°C±5°C) Interval : Hours, minutes, and seconds, settable up to 99 hours, 59 minutes, and 59 seconds per step Number of starts : Up to 99 times per step or infinite Number of Steps : Up to 10 steps can be set for each step. Real time start : Start time (hour, minute, second) can be set for each step GOTO step : Programmable loop to the previous step Sleeve function : Power ON 10 seconds before measurement time, power OFF after measurement is completed (Sleep can be set ON/OFF)
Auto power off function	Power off in approx. 10 minutes after the last key operation
Interface Functions	RS-232C functions: receiving control, measurement data, etc. Baud rates: 4800, 9600, 19200, 38400 bps
Display	128 x 64 dots LCD display with backlight
Vibration resistance	30 m/s² Shock resistance 50 m/s²
Drip-proof	IP-54 (with connector cap attached)
Operating temperature and humidity range	-10 to +50°C, 85%RH or less (excluding condensation)
Power source	Alkaline dry battery LR6×4 or Dedicated AC adaptor
Dimensions	102 (W) ×55 (H) ×223 (D) mm
Weight	Approx. 850g
Standard accessories	Operation manual ..... 1 Shoulder belt ..... 1 AA alkaline batteries ..... 4 Accessory box ..... 1 Warranty card 1

System Block Diagram



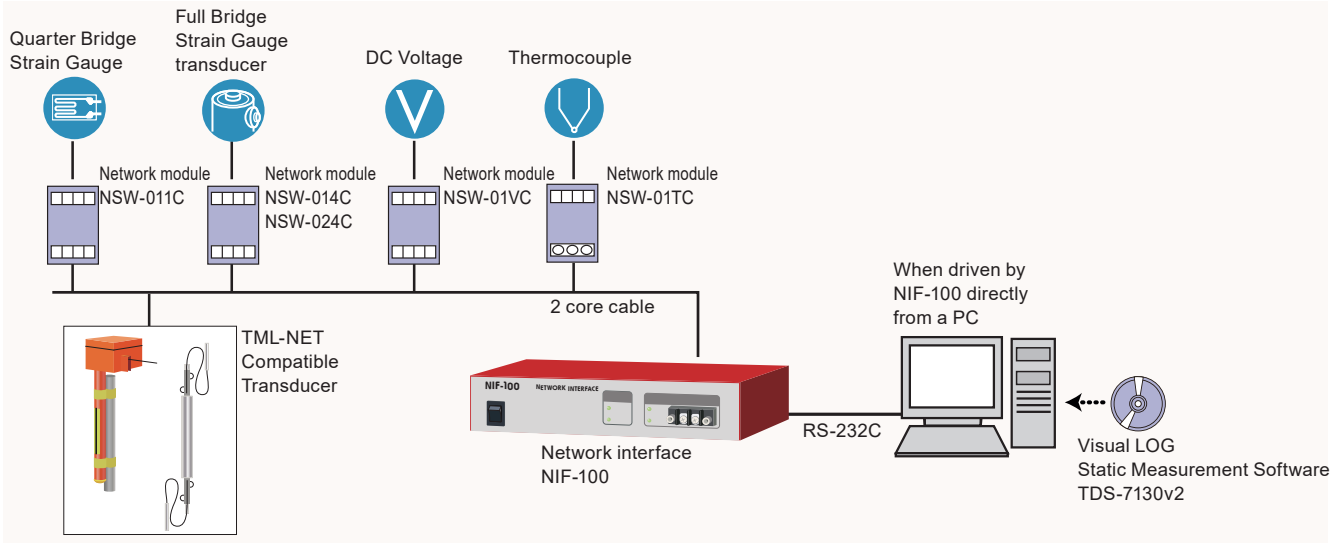
Interface driven directly from PC

The NIF-100 is a driver interface used to drive each network module directly from a personal computer, without using a data logger.

Specification

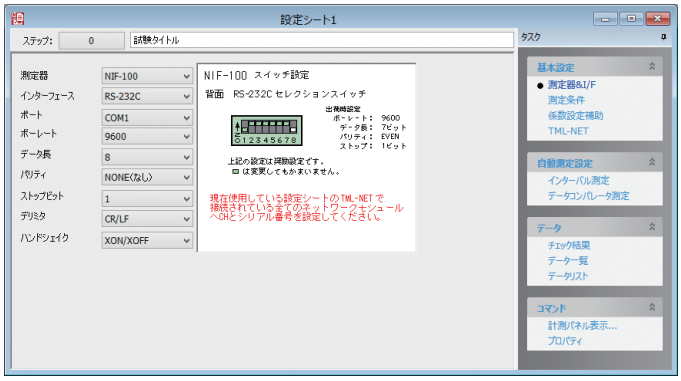
Number of connection	Low-comsumption module 100 modules Conventional module 80 modules
Maximum extension distance	Low-comsumption module 2km Conventional module 1.8 km (limited number of vehicles used)
Interface	RS-232C compliant Baud rates 300, 600, 1200, 2400, 9600, 19200 bps
TML-NET connection	Terminal block
Function	Scanning measurement, monitor measurement, Module check, ID check, Channel settings for network modules Power supply to network modules
Power	AC power supply Rated voltage AC100 to 240V 50/60Hz Allowable Voltage AC85 to 250V 50/60Hz Maximum power consumption 90VA MAX
Operating temperature and humidity range	0 to +50°C, 85%RH or less (excluding condensation)
Dimensions	235(W)×50(H)×160(D)mm (excluding protruding parts)
Weight	approx. 1.2kg
Standard accessories	Operation manual ..... 1 AC power cable (CR-01) ..... 1 RS-232C cable (CR-5321)..... 1 Warranty card 1

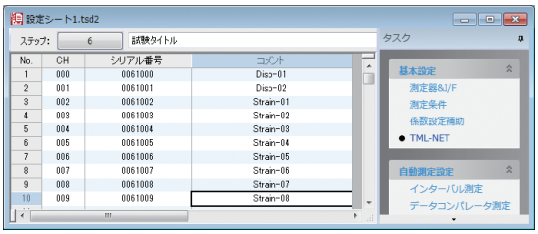
System block diagram



• NIF-100 Compatible Measurement Software TDS-7130v2

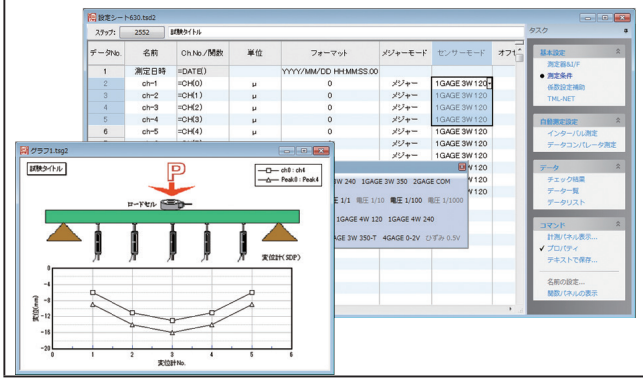
To use the NIF-100 for module configuration and measurement control, use the TDS-7130v2 static measurement software. The NIF-100 always performs direct measurements.
CHs set to measure mode will have their offset values updated when initial measurements are taken.





MEASUREMENT SOFTWARE *Visual LOG*®

Static Measurement Software TDS-7130v2

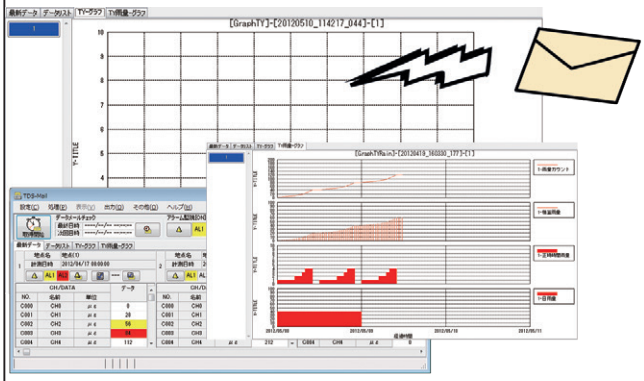


Software for static measurement using our data loggers
Applicable data logger: TS-963/TS-960/TS-560/TS-360/TDS-630/TDS-540/TDS-530/TDS-150/NIF-100/TC-35N
Operating environment

OS : MS Windows 7(SP1) / 8.1 / 10 / 11
Interface : LAN, GP-IB, RS-232C, USB (Depends on data logger type)
Memory : Free space of 10MByte or more
HDD : Free space of 3MByte or more (when setting up)

- Continuous monitoring measurement, Interval measurement, Data comparator measurement, Initial measurement, Alarm measurement, External trigger measurement
- Maximum number of measuring points: 4,000
- Maximum number of measuring times: 50,000 ~ 20,000,000
- Stroke change: Settings of measurement start point and measurement stroke

Datamail Management Software TDS-Mail

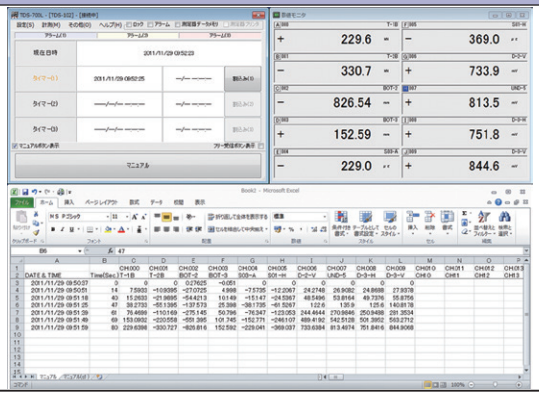


Measurement data from interval timers and other devices using our data loggers are sent via e-mail using a data mail converter.
This software receives the data and performs recording and alarm monitoring. Remote monitoring is easily achieved without the need to build a large server system.
"TDSMail-F" is also available as an option, which adds rainfall measurement, multistage inclinometer horizontal displacement measurement, and quadrature calculation functions using measured channel data.

Compatible measuring instruments:	TS-360/TDS-150/TC-32K (single, multi)/ TC-31K (multi)/MD-111/TC-35N
Number of registered measuring instruments:	5
Operating environment OS	MS Windows 7(SP1)/8.1/10/11
Data mail converter	DMA-ES/DMA-ESL manufactured by HANERON (Note: Converts RS-232C output from measuring instruments to mail)
▪ Measurement channel	100 points (CH.0-99)

- Alarm monitoring function
- Data absence monitoring function
- No need for complicated server management
- Sends alarm and data absence e-mails

Monitoring Measurement Software Visual LOG Light TDS-700L



Software for controlling measurement and monitoring with our static data loggers
Applicable instrument: TS-560, TS-360, TDS-540, TDS-530, TDS-150, TC-32K, TC-35N
Operating environment

OS : MS Windows 7(SP1) / 8.1 / 10 / 11
Graphic monitor : Using MS-Excel
Data file creation : Using MS-Excel, CSV

- Customized automatic measurement using three timer tables
- Alarm function with three level alarm values
- Velocity alarm suitable to disaster monitoring

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

The contents of this catalog are subject to change without prior notice.
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