

T-1000



T-1000 TELEPENDULUM

INCLINOMETERS
& PENDULUMS

T-1000
TELEPENDULUM





T-1000 APP
compatible with:



ANDROID



T - 1000 TELEPENDULUM

T-1000 Telependulum was designed to take automatic readings of the coordinates of pendulum's plumb line. Thanks to the new optical technology, without any moving part, it allows very high accuracy and resolution, wide measuring range and the possibility to measure plumb lines with different diameters.

T-1000 can be settled and read locally with dedicated mobile APP through Bluetooth connection, or can be integrated into automatic data acquisition system network through RS485 or 4-20mA output.

T-1000 is supplied with Calibration Report. Within the APP a tool is dedicated to check possible damages to the instrument's functionality and calibration after its delivery.

APPLICATIONS

- Arch dams
- Concrete dams
- Skyscrapers
- Slender structures
- Bell towers
- Minarets

FEATURES

- Simple and fast installation
- Wide measuring range
- Contactless measuring technology
- Simple local set-up with dedicated mobile APP
- FW upgrade through APP

TECHNICAL SPECIFICATIONS ⁽¹⁾

MODEL 0TELT100000

Measurement principle	optical (without moving parts)
Measurement range	X-axis: 0-150 mm (± 75 mm) Y-axis: 0-150 mm (± 75 mm)
Resolution	0.01 mm
Repeatability (both axis): in core area ⁽²⁾ whole measuring area ⁽³⁾	± 0.02 mm ± 0.05 mm
Accuracy MPE ⁽⁴⁾ in core area ⁽²⁾ for movements < 30mm in meas. area ⁽³⁾ for movements < 30mm in meas. area ⁽³⁾ for movements ≥ 30 mm	± 0.05 mm for both axis ± 0.10 mm for both axis ± 0.25 mm ($\pm 0.17\%$ FS) for both axis
Stability @60 hours	± 0.05 mm
Offset temperature dependency	± 0.01 mm / °C
Power supply	6 to 30 V DC, IP67 AC/DC converter overvoltage category: OVC II
Internal UPS battery	Supercapacitor 15F 5V Li-Po, 3.7 V, 2600 mAh
Output: - Local readings - Remote monitoring	Mobile APP through Bluetooth 4.2 RS-485 with Modbus RTU protocol ⁽⁵⁾ gauge not powered by modbus master 4-20mA 4-wires recommended power supply 8-26V dc
Sensitivity ⁽⁶⁾	see Calibration Report
On-board temperature sensor ⁽⁷⁾ • measuring range • accuracy / resolution	- 40°C to +125°C $\pm 0.5^\circ\text{C}$ (-10°C to +85°C) / 0.01 °C
On-board humidity sensor ⁽⁷⁾ • measuring range • accuracy / resolution	0 to 100% RH $\pm 5\%$ RH (0 to 95% RH) / 0.025% RH
On-board supply voltage monitor ⁽⁷⁾ • measuring range • accuracy / resolution	0 to 36 V $\pm 5\%$ FS / 0.01 V
Detectable wire (diameter)	from 0.8 mm to 2 mm best performance with 1 mm wire

(1) All performance data refer to 1mm wire

(2) Core area is the central measuring area for a range of 80x80mm

(3) Measuring area is the whole area where the gauge is able to read (see sketch)

(4) MPE is the Maximum Permitted Error on the measuring range (FSR). In the Calibration Report, the accuracies of the gauge are calculated using both linear regression (\leq Lin. MPE) and polynomial correction (\leq Pol. MPE). The accuracy value declared in this document is the Linear MPE.

(5) RS485 optoisolated Modbus communication with RTU Protocol. Default output is mm.

Sisgeo Modbus protocol manual is available for download at www.sisgeo.com.

(6) Sensitivity is a specific parameter different for every gauge. The sensitivity is calculated during gauge calibration test and inserted into the calibration report.

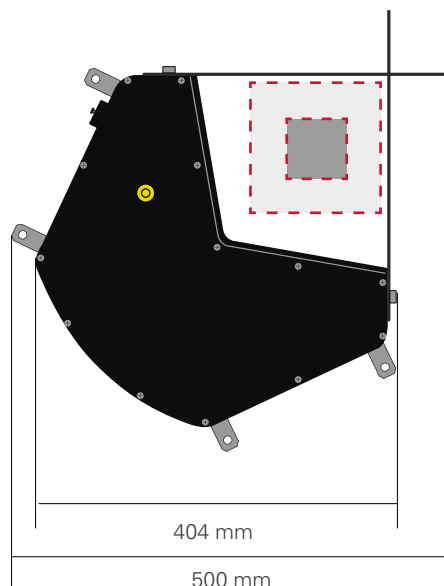
(7) On-board diagnostic sensors installed on the internal electronic board.

ENVIRONMENTAL FEATURES

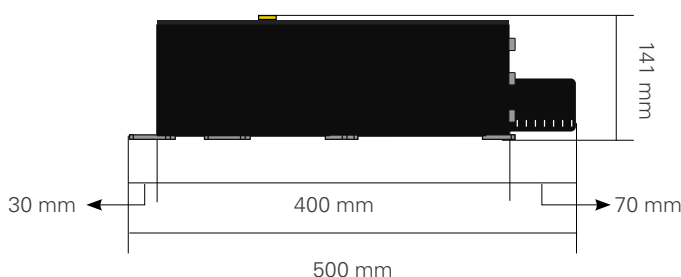
Environment	Indoor and outdoor (protect from brightness variations)
Maximum working altitude	5000 m asl (T-1000 gauge only)
Temperature range	operating: -25°C to +60°C storage: -25°C to +85°C
Relative humidity (without condensation)	operating: 0 to 99% storage: 0 to 99%
Pollution degree	3
IP class	IP67 as for EN 60529:1991 + A1:2000 + A2:2013

PHYSICAL FEATURES

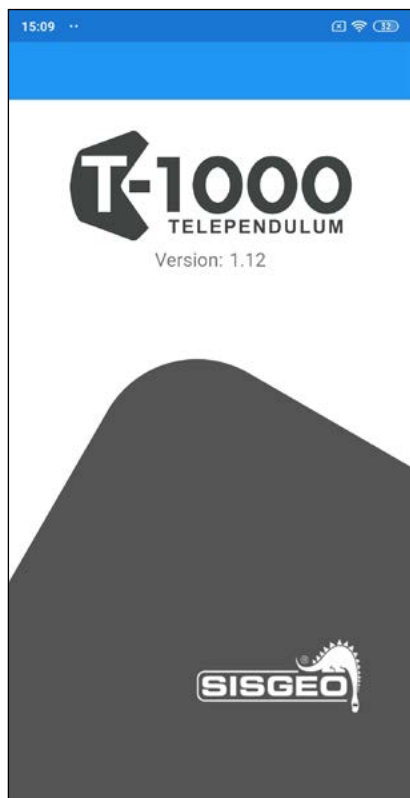
Gauge Dimensions (WxLxH)	404x404x141 mm
Overall Dimensions (WxLxH)	500x500x141 mm
Weight	15 kg
Housing material	Aluminium



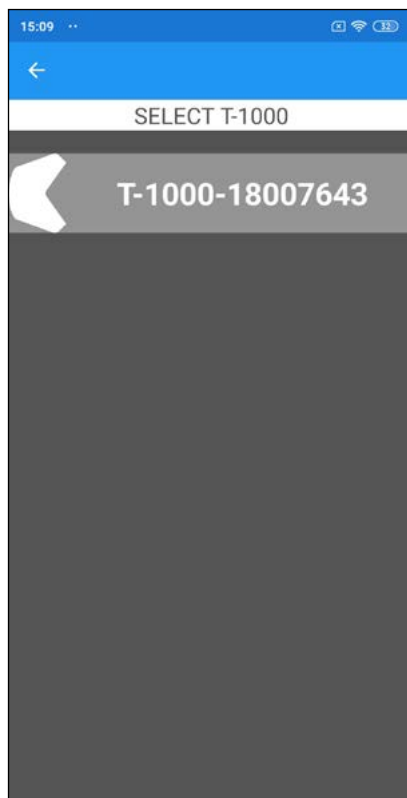
Measuring area 150x150 mm
Core area 80x80 mm



T-1000 APP



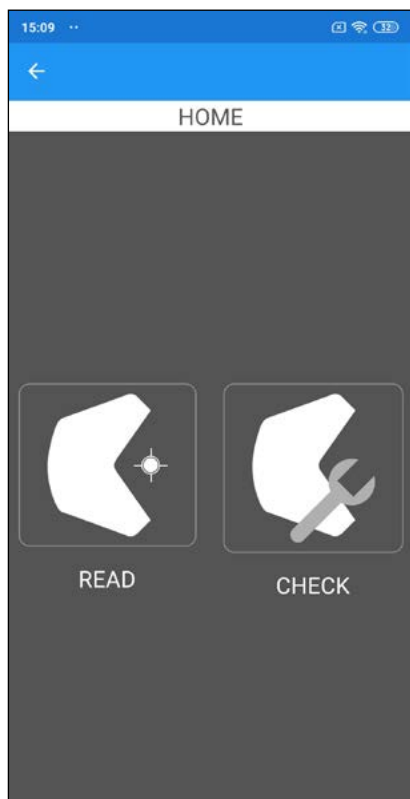
Welcome page



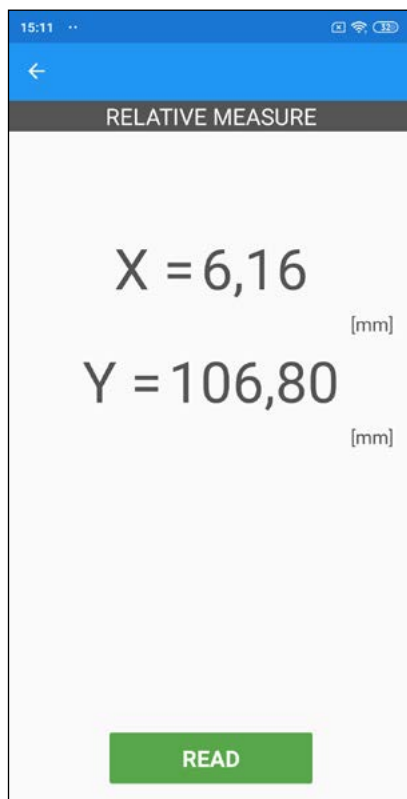
Device selection page



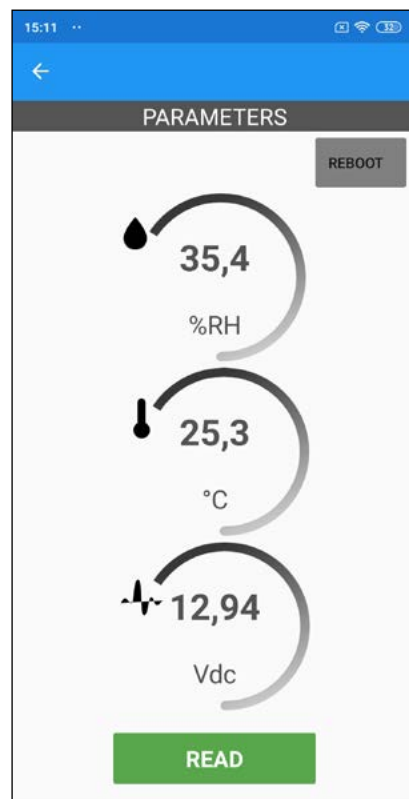
General information page with self-check and other options.



Main operations selection page



Output reading page



Diagnostic parameters output page

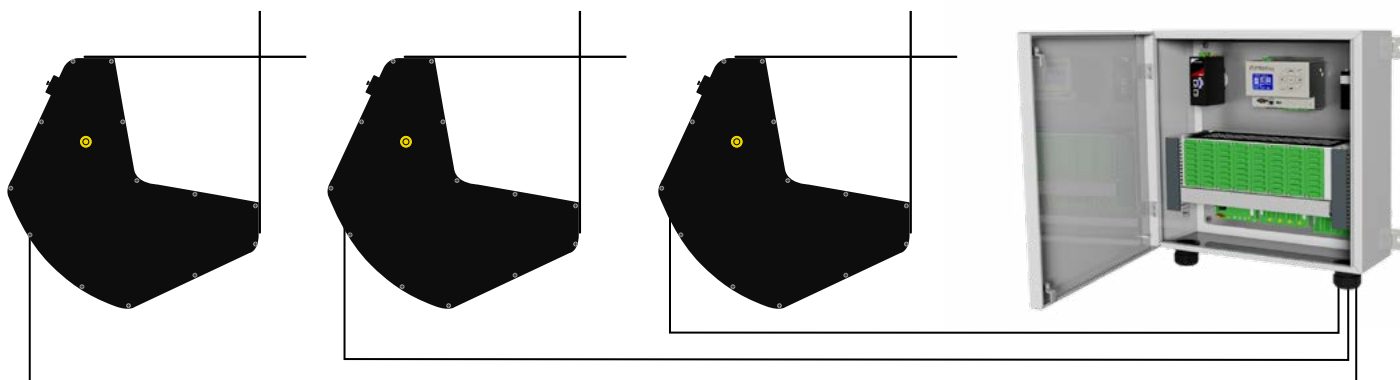
4-20mA CONNECTION

T-1000 N.1

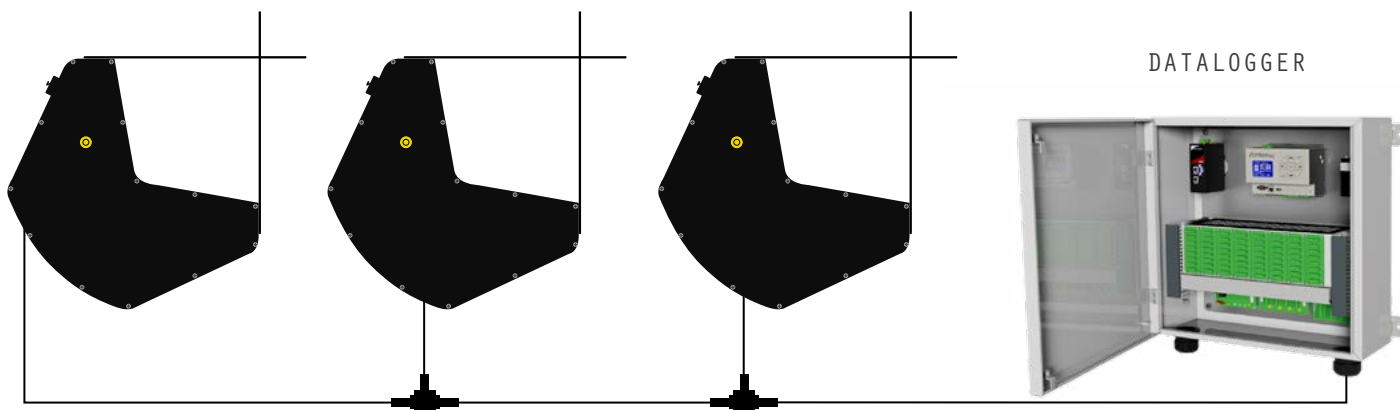
T-1000 N.2

T-1000 N...

DATALOGGER



RS485 NETWORK



ACCESSORIES AND SPARE PARTS

OPTION MOUNTING PLATE OTELT100PLT

Optional steel plate for installing T-1000 telependulum.
It fits with adjustable
Sisgeo TEL-310S support and
Huggenberger Telelot support: needed
only where old telependulum has to be
substituted with T-1000.

SIGNAL CABLE OWE106IP0ZH

Signal cable with 6 conductors,
22 AWG wires and LSZH jacket.
External diameter 5.0 mm.
Rated from -30° to + 80°C.

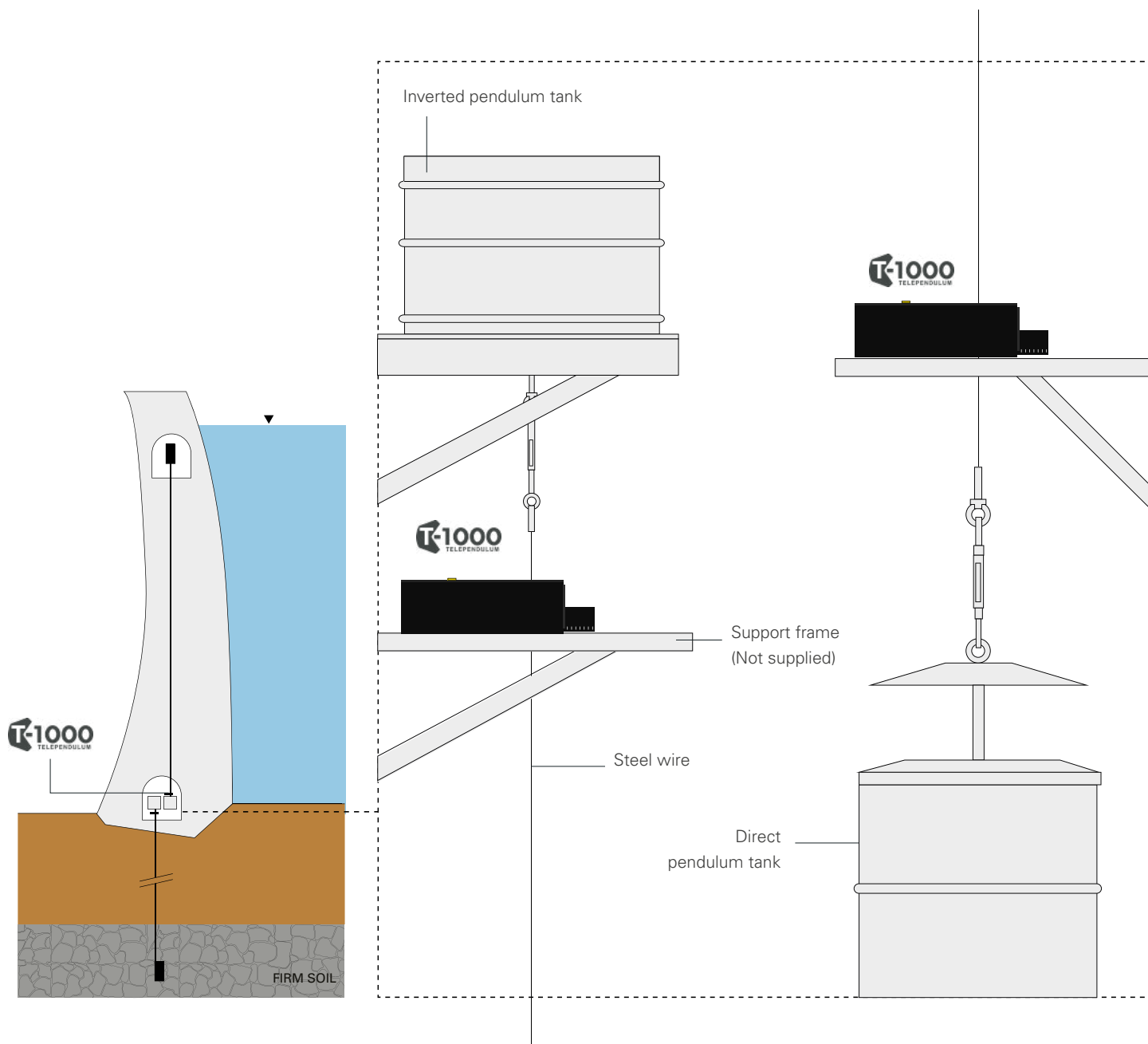
DIGITAL CONNECTORS KIT (SPARE) OECON05T3K

Kit composed by three complete "T"
shaped digital connectors, including
three female and three male 5-pins
M12 connectors.

MAINS POWER SUPPLY (SPARE) 0AXBC022058

AC/DC charger, IP67 protection class
Operating temperature -25 to +60°C
Vin 90-264 Vac, 47-63 Hz
Vout 12 Vcc, 2.1 A
Supplied with military connector for
linking to T-1000 body.

TYPICAL DAM INSTALLATION



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CRD



— CRD 400 READOUT

READOUT UNITS
AND DATALOGGERS





CRD - 400 READOUT

CRD-400 is a new generation multipurpose readout designed to take readings of all instruments including vibrating wire.

CRD-400 permits readings in both electrical and engineering units. Battery level, readout temperature and date are always displayed.

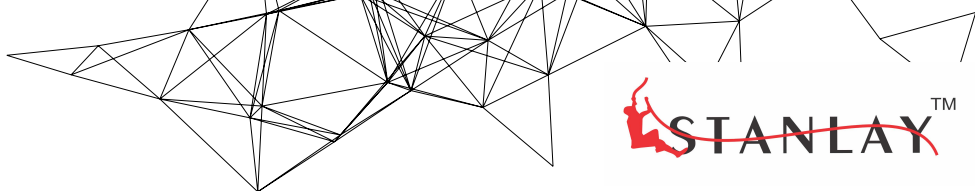
CRD-400 comes with shoulder/belt bag, battery charger, sensor cable with 6 alligator clips and USB flash drive with user manual.

FEATURES

- Compatible with all SISGEO analog sensors
- Large coloured display
- Accurate and precise measurements
- Splash-proof hand-held case
- Powered by Ni-MH rechargeable batteries

BENEFITS

- Easy to use
- Lightweight and portable
- Right and left hand users
- Auto shutdown
- Sunlight reliable display
- Reads both electrical and engineering units



TECHNICAL SPECIFICATIONS

Type of measurements	mA - mV - V - mV/V - °C - Hz (µsec - digit - µε)
A/D converter	24-bit Sigma-Delta ADC (22 true bit)
Range and power supply	Current loop (2 wires): range 0÷21 mA - Power supply: 24V DC Transmitter (3 wires): range 0÷21mA - Power supply: 24V DC Voltage (4 wires): range ±10V - Power supply: 24V DC Wheatstone bridge (6 wires): range ±10 mV/V - Power supply: 5 V DC Servo-inclinometer: range ±10000 mV - Power supply: ±12V DC Platinum RTD (Pt100): range -150°C to +150°C - Power supply: 1 mA Thermistor (NTC): range -30°C to +150°C - Power supply: 0.04mA, 0.1mA, 1mA Vibrating Wire: range 400Hz to 6000Hz - Excitation sine wave signal (adaptive): ±10 V
Reading resolution	1µA at FS 20mA - 1µV at FS ±20mV - 10µV at FS ±1V - 100µV at FS ±10V 0.001mV/V at FS 10mV/V - 0.1°C for PT100 - 0.1°C for NTC 0.1 Hz at FS from 400 to 6000Hz
Accuracy	0.01 % FS (0.1% for Voltage and Servo-inclinometer, 0.2% FS for PT100 and NTC)
Temperature drift	0.001 % FS / °C
Rechargeable battery	4 x AA, NiMH, 2400 mAh
Operating time	min. 4h (constant use, 24 Vdc @ 20 mA @ 25 °C, maximum backlight, 2400 mAh batteries) min. 6h (constant use, 24 Vdc @ 20 mA @ 25 °C, 50% backlight, 2400 mAh batteries)
Battery charger	Programmable charger, IP41, input voltage: 100-240 V AC, 50-60 Hz, 1.3A
Display	Amorphous silicon TFT LCD panel with LED backlight unit, 320 x 240, 3.5", sunlight reliability
ENVIROMENTAL CONDITIONS	
Operating temperature	from -20°C to +60°C
Storage temperature	from -30°C to +70°C
PHYSICAL CHARACTERISTICS	
Weight	0.5 Kg
Dimensions (L x W x H)	100 x 230 x 45 mm
Protection Degree	IP67
Material	ABS
Connectors	1 x instrument, 1 x battery charger
CERTIFICATIONS	
Eletromagnetic compatibility	EN 61326-1 (2006)
Safety requirements	EN 61010-1 (2001)

We reserve the right to change our product without prior notice.

ITEMS INCLUDED

TRAVEL BAG

Splashproof shoulder/belt carrying bag.



BATTERY CHARGER 0ECABCRD400

100-240 Vac / 12 Vdc
battery charger



SENSOR CABLE 0ECAV8P6A00

Jumper cable with 6
alligator clips



USB FLASH DRIVE

User manual



ACCESSORIES

JUMPER CABLE 0ECAV08V2J0

Jumper cable with
2 connectors

SWITCH BOX CABLE 0ECAV08V2S0

Jumper cable for
switch measuring box



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For the specific accuracy performance of each product, please refer to the Calibration Report issued for each instrument.
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MI ND



— MIND
READOUT

READOUT UNITS
AND DATALOGGERS





MIND READOUT

Mind is a portable and compact multichannel readout unit able to read all Sisgeo instruments, both analogue and digital. It is compact, rugged, with IP65 protection class and it is supplied with a specially designed carrying bag. The BLE (Bluetooth Low Energy) wireless technology permits a fast and safe communication with Mind App, with a very low batteries' consumption. Mind is fully managed by Mind App which is compatible with Android operating system and with iOS. Thanks to its App, Mind is a fast and light system for a quick and handy interface with the instruments, furthermore the data storage and sharing is made simpler and immediate. Mind App is also useful to read and utilize the QRcode placed on every analog Sisgeo instrument, having the identification, calibration and reading information always available.

When configuring sensors on the MIND app, calibration parameters of analog gauges (e.g. vibrating wire) can be downloaded from the Internet by entering the serial number.

MAIN ADVANTAGES

- Long battery life: minimum 8 hours continuously
- Supplied with Calibration Report issued following high level metrologic procedures
- High accuracy and resolution
- Simultaneous display of electrical and engineering measures
- Real time charts
- Quick read for immediate readings without configuration
- Multiplexers reading
- One-touch reading of digital gauge arrays
- Geolocation and search engine for sites and sensors
- Display the plot of vibrating wire sensor signal's spectrum with peak value
- Embedded Digital Sensor Configuration (DSC) tool

MIND APP

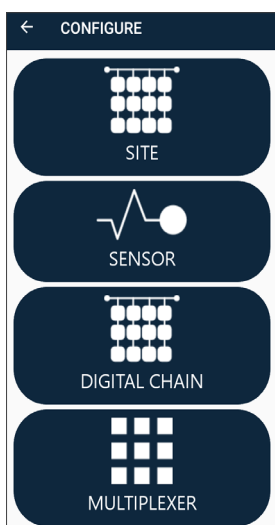
Thanks to its app, Mind is light system for a quick and handy interface with the instruments. The data storage and sharing is made simpler and immediate. Mind APP is also useful to read the QRcode placed on every analog Sisgeo instrument, having the identification, calibration and reading information always available.

Minimum Device Specifications
(device not supplied by SISGEO)

Bluetooth Low Energy BLE 4.2
APPLE iOS 16 or higher
Android OS 10 or higher



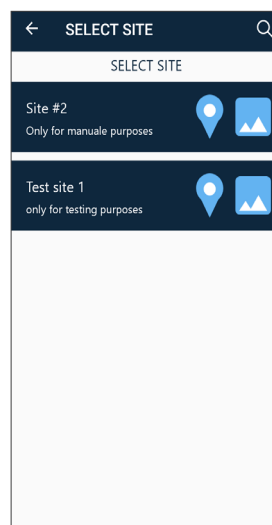
APP OVERVIEW



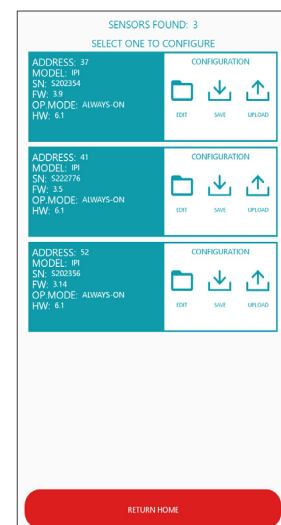
Instruments configuration main page.



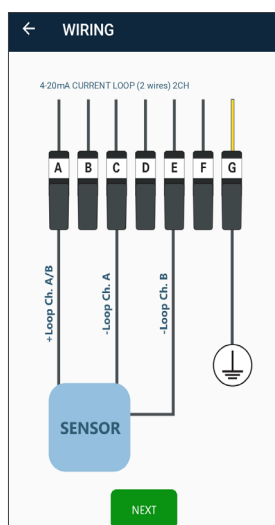
QR code scanner for automatic configuration of analog sensors.



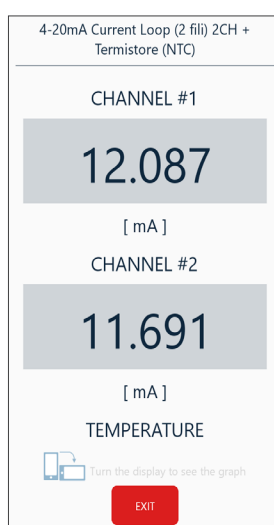
List of site with selectable icons to have info of geographical positioning and related picture.



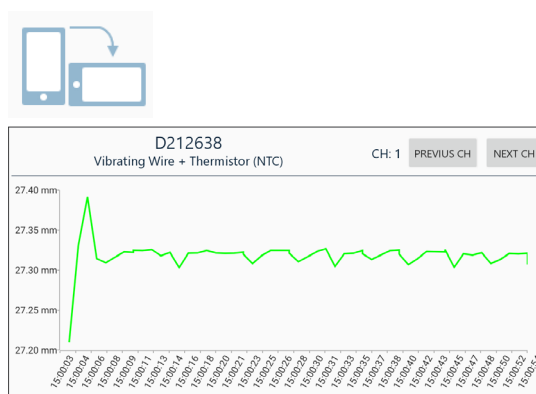
DSC (Digital Sensors Configuration) tool main page.



Guided clips wiring connection.



Instrument reading page with both biaxial 4-20mA current loop channels reading. The temperature measure is displayed scrolling down.



Graph of connected sensor's readings. It is generated just turning the mobile device in horizontal position.

MIND READOUT PHYSICAL FEATURES

Material / Weight	Aluminum / 1 Kg
IP class ⁽¹⁾	IP65
Overall dimensions	205x128x45 mm
Operating temperature	-20 to +55°C (charging +5°C to +40°C)
Storage temperature ⁽²⁾	-10 to +45°C for max 6 months, -20 to -10°C for max 1 month
Relative humidity	Operating: 60 ±25% RH Storage: 60 ±25% RH

(1) IP65 protection class is granted with closed connectors (i.e. with their own cap or with the cable connected) and with the on/off button not pressed.

(2) The periods indicated (6 months and 1 month) are the maximum time frames within which MIND must be recharged to not lose capacity and performance of its battery.



SISGEO COMPATIBLE INSTRUMENTS

Uniaxial 4-20mA current loop 2-wire gauges	Ratiometric 6-wire gauges	Vibrating wire gauges
Biaxial 4-20 mA current loop 2-wire gauges	RTD PT-100 temperature gauges	Vibrating wire + NTC Thermistor gauges
Biaxial 4-20 mA current loop 2-wire gauges + Thermistor	NTC Thermistor temperature gauges	Digital gauges or arrays with RS-485 Modbus RTU

OTHER COMPATIBLE SENSORS

Uniaxial and biaxial 4-20mA transmitters, 3-wire and 4-wire gauges	Carlson instruments 4-wire gauges	Uniaxial and biaxial servo-inclinometer gauges
Uniaxial and biaxial 4-20mA transmitters, 3-wire gauges + Thermistor	Carlson thermometers 3-wire gauges	RTD PT-100 temperature gauges 3-wire gauges
Ratiometric 4-wire gauge	Uniaxial and biaxial voltage gauges	Vibrating wire double coils gauges
Resistive strain gauge 1/2 bridge and 1/4 bridge	Uniaxial and biaxial potentiometers	

TECHNICAL SPECIFICATIONS⁽¹⁾

A - ANALOG INPUTS

Number of channels	3
Analog-to-Digital Conversion (ADC)	Resolution: 24bit, sampling rate: 2.5 Hz per channel with 50/60 Hz mains frequency rejection, Modulation method sigma-delta
Input impedance	>10 kΩ

A.1 - MEASUREMENT TYPES

A.1.1 - 4-20mA current loop (2 wires)

Range Resolution Accuracy	0-24 mA 1 μA at range 20 mA 6.0 μA
Internal shunt resistor	100 Ω
Power supply (up to 100 mA)	24V DC, 12V DC, external (selectable by the software)
Temperature drift	< 10 ppm / °C, range -30°C to +70°

A.1.2 - Wheatstone full bridge (6 wires, with sensing)

Range resolution accuracy	±15mV/V 0.001 mV/V 0.005mV/V
Power supply (up to 80 mA)	5 Vdc, external
Max and min bridge resistance	Max 10 kΩ - min 200 Ω
Temperature drift	< 10 ppm / °C, range -30°C to +70°C

A.1.3 - Platinum RTD (Pt100) 4-wire

Range resolution accuracy	-150°C to +150°C 0.1°C 0.3 °C
Power supply	1 mA
Temperature drift	< 10 ppm / °C, range -30°C to +70°C

A.1.4 - Thermistor (NTC 3 kΩ @ 25 °C)

Range resolution accuracy	-50°C to +150°C 0.1°C 0.2°C
Power supply	2-100 uA
Temperature drift	< 10 ppm / °C from 0 to 150 °C < 20 ppm / °C from 0 to -30 °C < 100 ppm/°C from -30°C to -50 °C;

A.1.5 - Vibrating Wire sensors

Range accuracy	300 to 6000 Hz 0.0033% FS
Excitation sine wave signal	Up to 12 Vpp (selectable by the software)
Resolution	0.01Hz at range 300÷1000Hz 0.02Hz at range 1000÷3000Hz 0.1Hz at range 3000÷6000Hz
Temperature drift	<10ppm/°C (-30°C to +70°C)

(1) The information and data in the "Technical specifications" table refer to tests performed with a calibrated control unit in an environment with controlled temperature and humidity, and using signal generators with cables shorter than 5 m.

B - DIGITAL RS485 INPUTS

Max number of gauge per array	according to the consumption of each type of sensor and if configured in Always-on mode or in Timed mode
Interface and Protocol	RS485, MODBUS RTU
Power supply (up to 500 mA)	up to 24 V DC

C - COMMUNICATION WITH DEVICE

BLE (Bluetooth Low Energy) 5.2	band: 2.4 GHz ISM Band (2402-2480 MHz) - power: 4dBm Max
Led	Different colors for local notifications

D - ON-BOARD DIAGNOSTIC SENSORS

D.1 - INTERNAL TEMPERATURE	Range: -40°C to +125°C Resolution: 0.1°C Accuracy: ±1°C (-10°C to +85°C)
D.2 - INTERNAL HUMIDITY	Range: 0 to 100%RH Resolution: 0.1% RH Accuracy: ±5% (0 to 95%RH)
D.3 - BATTERY VOLTAGE MONITOR	Range: 0 to 18 V Resolution: 0.1 V Accuracy: ±5% FS

E - BATTERIES

Battery type - Voltage and capacity	Li-Ion rechargeable batteries - 7.4V - 2.6Ah
Operating time with Li-Ion batteries	min. 8h (constant use, 24 Vdc @ 20 mA x 2 @ 25 °C)
Charging temperature range	0°C to +45°C

F - BATTERY CHARGER

Input voltage	50-60 Hz 90-264 Vac
IP Class and temperature range	IP41 (for internal use only), Operating: -25°C to +40 °C
Max output power	10 W

G - OTHER COMPATIBLE SENSORS⁽²⁾

G.1 - 4-20mA transmitters (3-4 wires)

Range Resolution Accuracy	0-24 mA 1 µA 6.0 µA
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G.2 - Voltage 4 wires, differential

Range Resolution Accuracy	±12V 1 mV 4 mV
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G.3 - Servo inclinometers

Range resolution accuracy	±10V 1 mV 2 mV
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G.4 - 1/2 Wheats. bridge (5 wires, with sensing)

Range resolution accuracy	±15 mV/V 0.005 mV/V 0.05 mV/V
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G.5 - 1/4 Wheats. bridge (3 wires, w/o sensing)

Range resolution accuracy	±15 mV/V 0.005 mV/V 0.05 mV/V
-------------------------------	-----------------------------------

G.6 - Potentiometers

Range | resolution | accuracy

5V | 1 mV at range ± 5 V | 1 mV at range ± 5 V

G.7 - Wheatstone full bridge (4 wires, without sensing)

Range | resolution | accuracy

± 15 mV/V | 0.001 mV/V | 0.005 mV/V

G.8 - Carlson instruments (4 wires)

Range | resolution | accuracy

$\pm 10\%$ (ratio) | 0.01% (ratio) | 0.1% (ratio)

G.9 - Carlson thermometer (3 wires)

Range | resolution | accuracy

± 150 °C | 0.1°C | ± 1 °C

G.10 - PT-100 (Platinum RTD) (3 wires)

Range | resolution | accuracy

± 150 °C | 0.1°C | ± 1 °C

G.11 - Vibrating wire double coils (4 wires)

Range | accuracy

300 to 6000 Hz | 0.0033% FS

Excitation sine wave signal

Up to 12 Vpp (selectable by the software)

Resolution

0.01Hz at range 300÷1000Hz
0.02Hz at range 1000÷3000Hz
0.1Hz at range 3000÷6000Hz

Temperature drift

<10ppm/°C (-30°C to +70°C)



ACCESSORIES AND SPARE PARTS

JUMPER CABLE OECAV08V2J0

Jumper cable for MIND connection to an instrument supplied with military connector.



SWITCH BOX JUMPER CABLE OECAV08V2S0

Jumper cable for MIND connection to a switch terminal box.



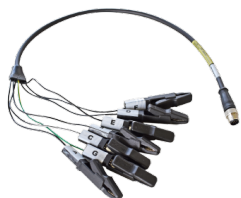
MUX BOX-MIND JUMPER CABLE OECAVMINDMU

Jumper cable for direct connection from MIND to multiplexer boxes. NOTE: only new MUX BOX with M12 connector can be read with MIND. Old MUX-BOX with MIL connector which could be read with New Leonardo cannot be read with MIND.



7-CLIPS SENSOR CABLE (SPARE) OECAV8P6A00

Jumper cable with 7 alligator clips for instrument reading on signal cable wires.



DIGITAL GAUGE JUMPER CABLE (SPARE) OECAV8PDIGO

Jumper cable for MIND connection to digital gauges.



MIND CARRYING BAG (SPARE) OMIND1BAG00

Specially designed carrying bag for MIND readout. It includes shoulder belt.



BATTERY CHARGER (SPARE) OECABMIND00

Charger for Li-Ion batteries. Input voltage 90-264 Vac, 50-60 Hz IP rate IP41 Max output power 10 W



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