MDOO

MD-PROFILE
SYSTEM

INCLINOMETERS
& PENDULUMS

SISGEO®

MD00_EN_01_09/2021

MD-PROFILE

SYSTEM

MD-Profile gauges are designed to be placed within internally flush pipes (grooveless tube needed). The system is suitable for geotechnical and structural applications, where vertical or horizontal accurate profiling is required.
Each segment is mechanically and electrically linked to one another through connectors in a RS485 Modbus daisy chain configuration.
Its unique centering device (under patenting process) allows to keep the orientation of the whole chain in the middle of the tube and to avoid unwanted movements of the nearby gauges.
The inclination data are provided directly in engineering units. Each gage is also equipped with sensors for internal diagnostics at each measuring point (temperature and voltage supply). Customers may utilize any electronic device compatible with RS485 and Modbus RTU protocol as a logger.
The MD-Profile system gives a complete and transparent set of data.
The MD-Profile system was developed in collaboration with Parma University which tested the system's high accuracy and long-term stability.

MAIN APPLICATIONS

- Deep excavations
- Retaining walls / Slurry walls
- Tunneling
- Dams
- Landslides
- Embankments

FEATURES

- each sensor is individually calibrated
- saving time for installation and higher flexibility in change the system's arrangement at site.
- special joint and centering device avoid the generation of torque
- no twist between segments
- light, simple and fast to install

CE *Meet the essential requirements of the EMC Directive 2014/30/UE*

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GAUGE TECHNICAL SPECIFICATIONS

PRODUCT CODE	0MDP30V0500, 0MDP30V1000 0MDP30V1500, 0MDP30V2000	0MDP30H0500, 0MDP30H1000 0MDP30H2000
INCLINOMETER [1]		
Application and number of axis	Vertical, biaxial	Horizontal, uniaxial
Measurement principle	MEMS accelerometer	MEMS accelerometer
Measuring range	±30° (other ranges from ±10° to ±80° available under request)	
Sensor resolution	0.0002°	
Sensor repeatability	<±0.008°	
Sensitivity [2]	see Calibration Report	
Sensor accuracy (MPE [3])	<±0.025% F.S. (<±0.015°) with ±30° standard measuring range <±0.035% F.S. (<±0.007°) with ±10° measuring range, on request <±0.020% F.S. (<±0.032°) with ±80° measuring range, on request	
Sensor mechanical bandwidth	10 Hz	
Sensor offset temperature dependancy	A axis: <±0.01°/°C B axis: <±0.004°/°C	A axis: <±0.004°/°C
Temperature operating range	from -30°C to +70°C	
Repeatability (precision) of a string of MD-Profile gauges[4]	±1.0 mm / 30 m	
Azimuth max. mechanical error of a string of MD-Profile gauges[5]	±0.5° / 30 m	
TEMPERATURE SENSOR [6]	Embedded on electronic board	
Measuring range	- 40°C to +125°C	
Accuracy	±1°C with temperature range -10°C to +85°C	
SUPPLY VOLTAGE MONITOR [6]	Embedded on electronic board	
Measuring range	0 to 36 V	
Accuracy	±5% FS	
ELECTRICAL INFORMATION		
Signal output	RS485 non-optoisolated communication with MODBUS RTU protocol [7]	
Powering modes	ALWAYS-ON (max 120 gauges each array) TIMED (max 247 gauges each array)	
Reading speed [8]	1.6 sec/gauge in ALWAYS-ON mode - 3.6 sec/gauge in TIMED mode (3"-3")	
Power supply	from 8 to 28 Vdc	
Gauge average consumption	3.2 mA @ 24 Vdc, 4.6 mA @ 12 Vdc	
Max cable length to logger	1000 m (for more information see F.A.Q.#077 on Sisgeo web site)	

(1) Technical characteristics are referred to ±30° measuring range. Other ranges available under request.
(2) Sensitivity is a specific paramenter different for every gauge. The sensitivity is calculated during gauge calibration test and inserted into the Calibration Report.
(3) MPE is the Maximum Permitted Error on the measuring range (FSR).
(3) 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 (≤ Lin. MPE) and polynomial correction (≤ Pol. MPE). The accuracy value declared in this document is the Linear MPE.
(4) Calculated with mathematicall methods based on validation tests performed by Parma University on arrays composed by 6 gauges of 500mm length each.
(5) Calculated with mathematical methods knowing the maximum mechanical torsion allowed by one gauge on the next one.
(6) These sensors are installed on the internal electronic board for sensor diagnostics.
(7) RS485 not-optoisolated Modbus communication with RTU Protocol. Legacy mode is not supported by this instrument Default output is sin-angle, other units available are degree, mm/m and inch/feet (to be requested at order). Sisgeo Modbus protocol manual is available for download on www.sisgeo.com.
(8) Faster reading are available under request, but the performance of the system will be lower due to the increment of noises.

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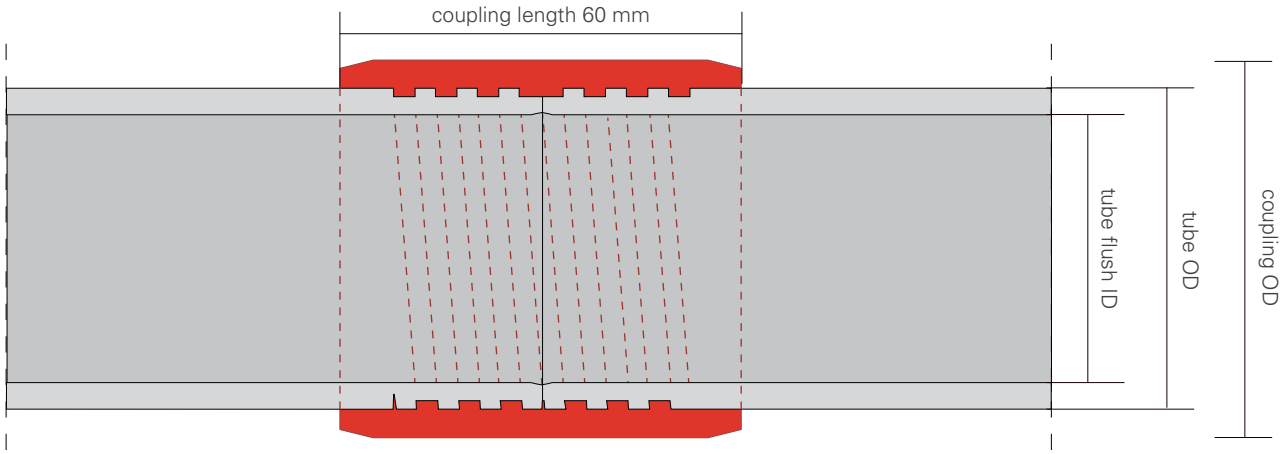
PHYSICAL FEATURES

Application	Vertical	Horizontal
Main body material	Carbon fibre rod with steel joints	
IP class	IP68 up to 1.5 MPa	
Tube compatibility	MDP tube 1.5" (gauge length up to 1m) or 2.0"	MDP tube 2.0"m
Standard gauge length / weight weights include the centering devide	0.5 m length/ 0.65 kg - 1.0 m length / 0.77 kg 1.5 m length / 0.90 kg - 2.0 m length / 1.05 kg	0.5 m length/ 0.65 kg - 1.0 m length / 0.77 kg 2.0 m length / 1.05 kg
Max. string length with 1.5" or 2.0" centering device longer arrays available under request	150m array composed by 1.0m, 1.5m or 2.0m gauges 70m array composed by 0.5m long gauges for mixed gauge lengths array contact SISGEO	100m array composed by 1m, 1.5m or 2.0m gauges 50m array composed by 0.5m long gauge (both tube ends open) for mixed gauge lengths array contact SISGEO

MD-PROFILE TUBES

PRODUCT CODE	0MDP15TPV30 (1.5")	0MDP20TPV30 (2.0")
Applications	Vertical MD-Profile array composed by 0.5 m or 1.0m long gauges	Vertical MD-Profile array Horizontal MD-Profile array
Tube diameters and characteristic	flush ID 40 mm, OD 48 mm	flush ID 52 mm, OD 60 mm
Length	3000 mm	
Collapse test	15 bar	
Material	PVC DURVINIL®	
Coupling	Threaded joint without internal discontinuity OD 55 mm, length 60 mm	Threaded joint without internal discontinuity OD 70 mm, length 60 mm



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MD-PROFILE SYSTEM VALIDATION

In order to test the performance of the entire MD-Profile system, not only of the single gauge, SISGEO collaborated with the Parma University (Italy) which performed different tests in its laboratories through a machine specifically designed for the scope by the University Dept. of Engineering and Architecture.
The set-up utilized tested the MD-Profile system in both static conditions and under an applied and repeated known movement with an uncertainty of ±0.01 mm.

The most interesting outcome of the tests are reported in this page.

Test A: simulated the typical behaviour within diaphragm walls. Application to a chain of six 500mm long gauges a cumulative movement along a parabolic profile. The movement was applied along either A-axis and B-axis, for both positive and negative directions.

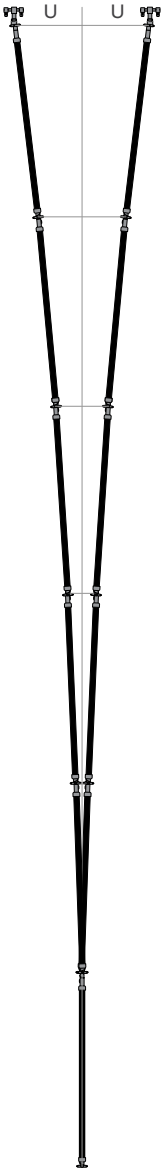
Test B: simulated the typical behaviour in landslide areas. Application to a chain of six 500mm long gauges a localized movement. The movement was applied along either A-axis and B-axis directions, for both positive and negative directions.

The tests also confirmed that the special design of the centering device avoids any unwanted movement on the previous and next instruments connected to the moving gauge.

Here below the summary table of the main test results. Data refer to the worst tests result.

	Applied movement (U)	String repeatability	String cumulative error
TEST A	±20 mm	±0.05 mm	±0.1 mm
TEST B	±20 mm	±0.05 mm	±0.1 mm

VALIDATION TEST A



VALIDATION TEST B

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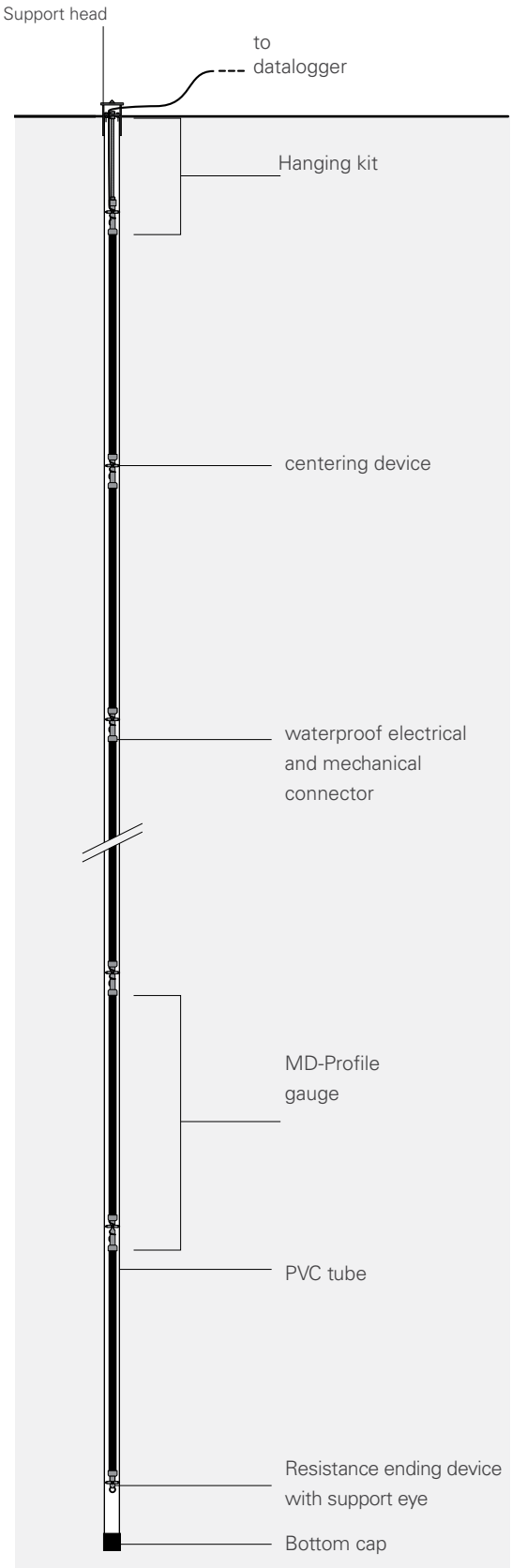
ACCESSORIES AND SPARE PARTS FOR VERTICAL APPLICATION



MDP HANGING KIT
OMDHANGKIT00

It includes the electro-mechanical connector for the upper gauge, 5m long signal cable and three 1m steel positioning rods. One MDP centering device for each kit shall be added.

DSC SW CONFIGURATION KIT
OEDSCKIT000

The kit includes an RS-485 to USB interface and a Windows desktop software for changing the set-up of MDP gauges (i.e. addresses, power supply mode, firmware up-grade).

SUPPORT HEAD
OS4TS101000

It is installed at the top of the tube for loking the hanging kit. It includs the locking cap with topographic bolt.

MDP RESIST. ENDING DEVICE
OETERMRESMD

Termination resistance with connector, needed to close every digital MD-Profile chain. The value of resistor depends on the layout of the project. For more detail see the FAQ#076.

MDP 1.5" CENTERING DEVICE
OMDP4ASC150

4ASC centering device for installation of MDP gauges within 1.5" (40 mm ID) MDP tube. Tube shall be internally flush.

MDP 2.0" CENTERING DEVICE
OMDP4ASC200

4ASC centering device for installation of MDP gauges within 2.0" (52 mm ID) MDP tube. Tube shall be internally flush.

MDP TUBE, 1.5"
OMDP15TPV30

DURVINIL® 1.5" blind tube supplied in 3m long bars. Threaded couplings included. The tubes have internally flush profile.

MDP TUBE, 2.0"
OMDP20TPV30

DURVINIL® 2.0" blind tube supplied in 3m long bars. Threaded couplings included. The tubes have internally flush profile.

BOTTOM CAP FOR 1.5" TUBE
OMDPT015CAP

Threaded cap for 1.5" MD-Profile tube.

BOTTOM CAP FOR 2.0" TUBE
OMDPT020CAP

Threaded cap for 2.0" MD-Profile tube.

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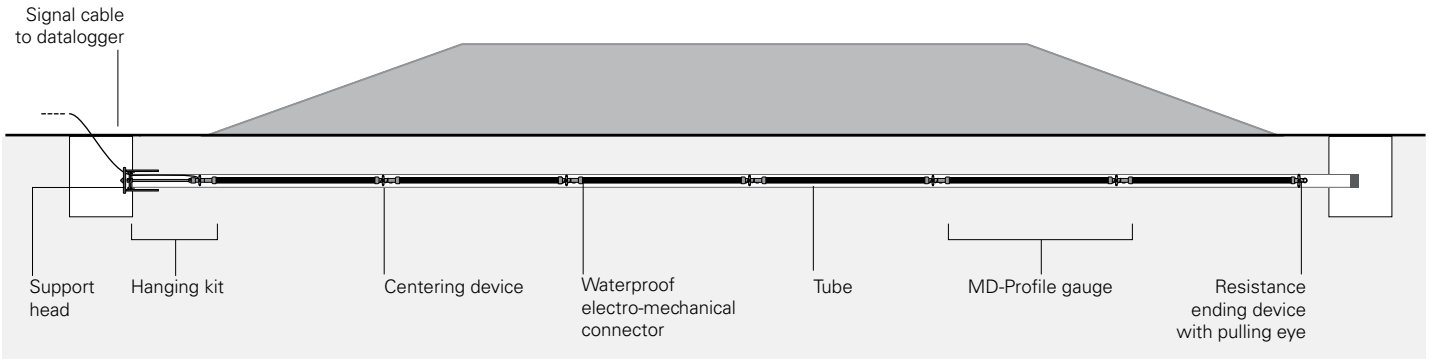
ACCESSORIES AND SPARE PARTS FOR HORIZONTAL APPLICATION



MDP HANGING KIT
OMDHANGKIT0

It includes the electro-mechanical connector for the upper gauge, 5m long signal cable and three 1m steel positioning rods. One MDP centering device for each kit shall be added.

STEEL PULLING WIRE
OWRAC250000

Pulling wire 2.5mm OD to be placed within MDP tube (open at both ends) for long array installation.

HORIZ. SUPPORT HEAD
ODEXOTS2350

It is installed on tube collar for loking the hanging kit. It includs the locking cap with topographic bolt.

MDP RESIST. ENDING DEVICE
OETERMRESMD

Termination resistance with connector and pulling eye, needed to close every digital MD-Profile chain. The value of resistor depends on the layout of the project. For more detail refer to F.A.Q.#076.

MDP 2.0" CENTERING DEVICE
OMDP4ASC200

4ASC centering device for installation of MDP gauges within 2.0" (52 mm ID) MDP tube. Tube shall be internally flush.

MDP TUBE, 2.0"
OMDP20TPV30

DURVINIL® 2.0" blind tube supplied in 3m long bars. Threaded couplings included. The tubes have internally flush profile.

CAP FOR PVC 2.0" TUBE
OMDPT020CAP

Threaded cap for 2.0" MD-Profile tube.

DSC SW CONFIGURATION KIT
OEDSCKIT000

The kit includes an RS-485 to USB interface and a Windows desktop software for changing the set-up of MDP gauges (i.e. addresses, power supply mode, firmware up-grade)

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ADDITIONAL SUPPORT

SISGEO offers on-line assistance service to the Customers in order to maximize the performance of the system and training on the correct use of the instrument/readout.

For more information contact mail: *assistance@sisgeo.com*