

Dionisio Caloiero

**RELAZIONE ANNUALE
SULL'ATTIVITA' DEL SERVIZIO
IMPIANTI E MISURE DI CAMPAGNA**

Rapporto interno n.610 – Marzo 2003

1 - PREMESSA

In questo Rapporto viene fatto un bilancio dell'attività svolta dal Servizio Impianti e Misure di Campagna (SIMC) nel corso del 2002.

Allegati a questo rapporto sono la scheda del Servizio (Consuntivi 2002 del CNR-IRPI), il Regolamento del Servizio e Circolare del Direttore.

Viene inoltre proposto materiale illustrativo ed applicazioni della sonda inclinometrica Digitilt sensor (comprata nel corso del 2001)

2 - ATTIVITA' SVOLTA

Il tabellino delle missioni di campagna, effettuate dal 1988 al 2002, può essere così riassunto:

Anno	Numero persone	Giornate
1988	8	267
1989	8	137
1990	8	275
1991	9	152
1992	5	185
1993	7	186
1994	7	232
1995	6	205
1996	6	219
1997	4	192
1998	4	211
1999	4	178
2000	4	226
2001	4	196
2002	5	195

3 – COLLABORATORI DEL SERVIZIO

Ecco l'elenco dei collaboratori ed il tempo dedicato:

Caloiero Dionisio	CTER	Mesi dedicati	6
D'Onofrio Duilio	CTER		6
De Simone Mario	CTER		1
Reali Claudio	CTER		3
Guardia Salvatore	Ausiliario Tecnico		4

4 – PREVISIONI FINANZIARIE

Le previsioni finanziarie per il 2003 sono di 8.000 Euro, così sommariamente suddivisi:

- 1) Partecipazione a corsi di aggiornamento (compresa iscrizione) e convegni di studio Euro 3.000
- 2) Missioni routinarie per controllo strumentazione a registrazione continua, installata in campagna Euro 1.500
- 3) Missioni per eventi alluvionali ed altre misure non previste dai progetti di ricerca Euro 1.000
- 4) Piccoli acquisti, riparazioni, pezzi di ricambio, materiale di consumo Euro 2.500

5 – ELENCO STRUMENTAZIONE

IL Servizio ha in dotazione diversa strumentazione, parte installata in campagna e parte disponibile in Istituto.

Si rimanda ai precedenti rapporti per l'elenco completo delle apparecchiature a disposizione del SIMC.

Le principali apparecchiature sono:

2 pluviografi mensili Salmoiraghi

1 mulinello idrometrico SIAP

1 mulinello idrometrico SIAP ME 4001

1 mulinello idrometrico A. Ott

1 Sonda inclinometrica Digitilt sensor (completa di lettore e registratore Psion)

1 sonda inclinometrica Digitilt sensor (completa di centralina di acquisizione)

1 teodolite Elta 3 Zeiss

1 livello di precisione Zeiss

1 metro ad ultrasuoni Lem 30

1 video camera Hitachi

1 macchina fotografica Canon

1 macchina fotografica digitale HP

6 – RAPPORTI INTERNI (periodo 2000-2002)

118 – CALOIERO D.- DE SIMONE M.- GUARDIA S. : Stazioni di misura pluviometriche del CNR-IRPI. Dati del 1999.

CNR-IRPI - Rapporto interno n. 553. Cosenza, Febbraio 2000

119 – CALOIERO D. : Relazione annuale sull'attività del Servizio Impianti e Misure di Campagna.

CNR-IRPI – Rapporto interno n. 554. Cosenza, Febbraio 2000

120 – CALOIERO D. : Relazione annuale sull'attività del Servizio Impianti e Misure di Campagna.

CNR-IRPI – Rapporto interno n. 572. Cosenza, Marzo 2001

121 – CALOIERO D.-DE SIMONE M.-GUARDIA S. : Stazioni di misura pluviometriche del CNR-IRPI. Dati del 2000.

CNR-IRPI – Rapporto interno n. 573. Cosenza, Marzo 2001

122 – CALOIERO D. : Relazione annuale sull'attività del Servizio Impianti e Misure di Campagna.

CNR-IRPI – Rapporto interno n.580. Cosenza, Febbraio 2002

123 – CALOIERO D.-DE SIMONE M.-GUARDIA S. : Stazioni di misura pluviometriche del CNR-IRPI. Dati 2001.

CNR-IRPI – Rapporto interno n. 581. Cosenza, Febbraio 2002

124 – REALI C.-CALOIERO D.- D'ONOFRIO D. : Campagna di misura nel sito di studio di Plati (RC) nel maggio 2002.

CNR-IRPI – Rapporto interno n. 584. Cosenza, 2002

Consuntivi
2002Stato: In fase di compilazione
Data corrente: 11-04-2003 12:02:31Codice identificativo
(CDS) 066

Attività (Informazioni Generali) 1/6

.SCHEDA PR.01

Attività di Infrastruttura n.: 3c
Sezione: Sezione di Cosenza
Area: Protezione idrogeologica

Titolo attività (italiano): IMPIANTI E MISURE DI CAMPAGNA	
(inglese): FIELD MEASURE AND EQUIPMENT	
Attività totalmente nuova: NO	
01.Responsabile Attività	
Cognome: CALOIERO	Nome: DIONISIO
M	
Parole chiave Italiano : STRUMENTAZIONE DEI VERSANTI, TOPOGRAFIA, DINAMICA FLUVIALE Inglese : INSTRUMENTATION, TOPOGRAPHY, RIVER DYNAMIC mic	

02.Descrizione Obiettivo:
(Italiano) -Installazione, controllo e manutenzione di apparecchiature per monitoraggio di bacini idrografici e frane. -Misure di campagna. -Direzione lavori eseguiti da Ditte esterne. -Raccolta dati anche da altre Istituzioni presenti sul territorio.
(Inglese) -Installing, cheking and maintaining of facilities for hydrological basins and landslide monitoring. -Field measurements for data collecting. -Supervision of activities perfomed by esternal firms. -Collection of data available in other regional offices.
Cod. obiettivo (vedi all.2):
Cod. disciplina (vedi all.3)
Cod. prestazione (vedi tab.5) ALT ANA

03.Descrizione attività svolta:
(Italiano) -Manutenzione e controllo strumentazione meteorologica ed idrologica nei bacini del F.Crati, T.Licetto e F.ra Armaconi. -Misure idrologiche, geotecniche e topografiche in bacini e tratti di costa nelle regioni meridionali. -Raccolta ed elaborazione dati delle apparecchiature

installate in campagna.

-Indagine conoscitiva, misure idrologiche e topografiche in seguito agli eventi alluvionali del settembre 2000, nel versante ionico della Calabria.

Misure geotecniche e topografiche sulla frana di Acri.

(Inglese)

-Checking and maintenance of meteorological or hydrological instruments in the basins of river Crati, torrent Licetto and fiumara Armaconi.

-Hydrological, topographycal and geotechnical measurements in watersheds or along coastal segments of Southern Italy.

-Collecting and processing data from field instruments.

-Field reconnaissance and hydrologic and topographic measurements required after the september 2000 flood in the Ionian side of Calabria.

-Geotechnical and topographic measurements at the Acri landslide.

Indice Avanti >>

Consuntivi
2002Stato: In fase di compilazione
Data corrente: 11-04-2003 12:03:14Codice identificativo
(CDS) 066

Attività (Collaboratori) 3/6

SCHEDA PR.03

Attività di Infrastruttura n. 3c
05.Collaboratori

Cognome: CALOIERO	Nome: DIONISIO M
Matricola CNR: 03656	Data di nascita: (gg/mm/aaaa) 11/09/1947
Qualifica: CNR _10_ IV _ Collaboratore Tecnico Enti Ricerca	Mesi/persona dedicati (/11): 6
Note: (max 250 car.)	

Cognome: D'ONOFRIO	Nome: DUILIO M
Matricola CNR: 8543	Data di nascita: (gg/mm/aaaa) 19/12/2063
Qualifica: CNR _12_ V _ Collaboratore Tecnico Enti Ricerca	Mesi/persona dedicati (/11): 6
Note: (max 250 car.)	

Cognome: DE SIMONE	Nome: MARIO M
Matricola CNR: 4523	Data di nascita: (gg/mm/aaaa) 01/05/1943
Qualifica: CNR _12_ V _ Collaboratore Tecnico Enti Ricerca	Mesi/persona dedicati (/11): 1
Note: (max 250 car.)	

Cognome: GUARDIA	Nome: SALVATORE M
Matricola CNR: 07444	Data di nascita: (gg/mm/aaaa) 01/06/1959
Qualifica: CNR _25_ IX _ Ausiliario Tecnico	Mesi/persona dedicati (/11): 4
Note: (max 250 car.)	

Cognome: REALI	Nome: CLAUDIO M
Matricola CNR: 18435	Data di nascita: (gg/mm/aaaa) 05/08/1951
Qualifica: CNR _10_ IV _ Collaboratore Tecnico Enti Ricerca	Mesi/persona dedicati (/11): 4
Note: (max 250 car.)	

Indice Avanti >>

SERVIZIO MISURE DI CAMPAGNA

REGOLAMENTO

I responsabili dei programmi di ricerca faranno presente, nei mesi di novembre e dicembre, al responsabile del Servizio, tutte le attività che avranno bisogno del personale e della strumentazione del Servizio stesso, per l'anno seguente.

In particolare devono essere concordati:

- Il tipo degli impianti che devono essere realizzati in campagna, i lavori ed il periodo nel quale devono essere effettuati.

- Le misure topografiche, geotecniche ed idrologiche prevedendone la tipologia, il periodo e/o la cadenza dell'effettuazione.

Se l'intervento e' direttamente corrispondente al verificarsi di un determinato evento (p.e. precipitazioni notevoli) bisogna stabilire la soglia per effettuare l'intervento.

Per quanto riguarda la strumentazione fissa e la raccolta dei dati la cadenza sara' quella prevista dalle case costruttrici.

Durante l'anno eventuali collaborazioni non previste, possono essere comunque effettuate, se c'e' la disponibilita' di personale e di fondi e la strumentazione non e' utilizzata per altre attivita'.

Nel caso in cui e' disponibile l'apparecchiatura, ma non il personale del Servizio (per giustificati motivi) e la misura non puo' essere rinviata, il responsabile della ricerca ed i suoi collaboratori interni possono utilizzare l'apparecchiatura attenendosi alle procedure allegate.

Nel mese di gennaio di ciascun anno, il responsabile del Servizio compilara' un Rapporto interno nel quale verra' redatto:

- un consuntivo delle misure effettuate nell'anno precedente;

- un quadro delle misure da effettuare nell'anno in corso, specificandone le tipologie e le giornate uomo necessarie;

- l'elenco aggiornato delle apparecchiature disponibili, mettendo in evidenza le nuove acquisizioni;

- l'elenco dei Rapporti interni redatti negli ultimi tre anni, riguardanti l'attivita' del Servizio stesso.

Il Responsabile

Dionisio Caloiero

(Dionisio Caloiero)

Il Commissario

Marino Sorriso Valvo

(Marino Sorriso Valvo)

Rende 30-9-1997

CONSIGLIO NAZIONALE DELLE RICERCHE
ISTITUTO DI RICERCA PER LA
PROTEZIONE IDROGEOLOGICA
NELL'ITALIA MERIDIONALE ED INSULARE
il Direttore

Prot. 746

Rende, 2 nov. 99

Ai Ricercatori
Al Responsabile e agli afferenti al SIMC
Sede

Nei Progetti per il 2000 si trova personale afferente al SIMC o al altri servizi con mensilità impegnate in progetti di ricerca. Ciò non è una novità, ma è forse opportuno chiarire quanto segue, anche in considerazione per il 2000 è prevista una mole di lavoro molto rilevante:

1 - il personale che afferisce a uno o più servizi non ha tempo disponibile a sua discrezione, oltre gli impegni già presi in linea generale con i suddetti servizi. L'indicazione di impegno nelle varie ricerche è facoltativo e serve per dimensionare le attività previste dalle varie ricerche, ma non costituisce impegno esclusivo per il tecnico in questione.

2 - come definito ormai da tempo, il SIMC non ha una dotazione propria per le attività fatte per conto delle varie ricerche, salvo attività di interesse generale; pertanto, le spese per tale personale gravano sulle ricerche per le quali si opera.

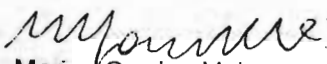
3 - come già stabilito, al fine di evitare disguidi ed ottimizzare le risorse, le attività vanno concordate con il Responsabile del SIMC; pertanto, invito tutti a fare riferimento a Caloiero per definire gli impegni di personale. Inoltre, è bene che all'inizio dell'anno i vari responsabili indichino, con la precisione possibile, l'impegno previsto.

4 - analogamente, il piano di utilizzo riguarderà anche le strumentazioni. Si precisa che, in prima istanza, la raccolta dei dati per mezzo di strumentazioni topografiche, idrauliche e inclinometriche impiegate per misure all'esterno, sono gestite dal SIMC, salvo la raccolta effettuata con strumentazioni acquisite ed utilizzate per specifiche ricerche. In questo caso, comunque, fatte salve le necessità delle ricerche specifiche l'apparecchiatura deve rimanere a disposizione di eventuali altri utilizzatori dell'Istituto. L'elaborazione dei dati è generalmente a cura degli interessati. Il SIMC può elaborare, tuttavia, alcuni tipi di dato, per i dettagli fare riferimento al Responsabile.

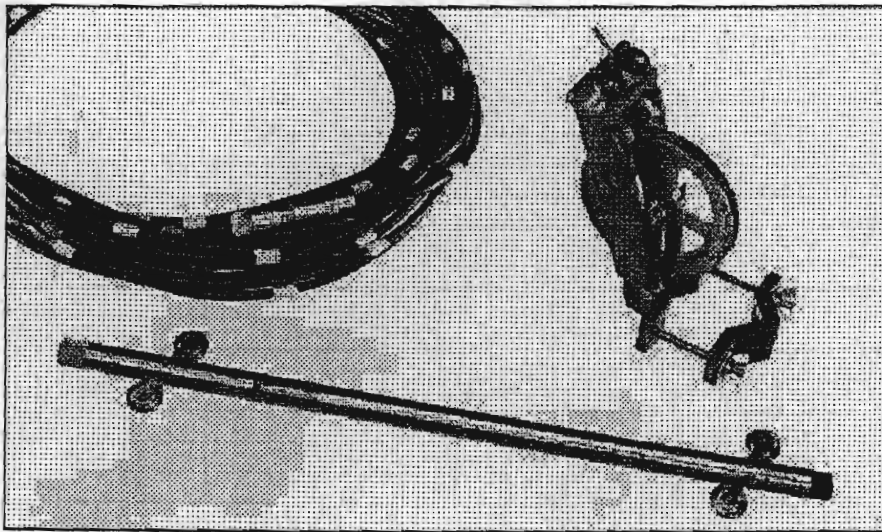
5 - il Responsabile del SIMC è tenuto a preparare uno schema con le richieste pervenute entro la fine dell'anno precedente quello di riferimento.

6 - Se il cumulo di tale impegno dovesse superare le disponibilità in mesi-uomo del SIMC, non appena saranno noti i programmi definitivi, si farà, a cura della Direzione, un'assegnazione alle varie ricerche.

7 - tutti sono tenuti al rispetto di questa procedura, pena l'esclusione dal computo delle risorse disponibili.


Marino Sorriso-Valvo

Digitilt® Inclinometer Probe



Digitilt Inclinometer Probe, Control Cable, and Pulley Assembly.

Applications

Digitilt inclinometers are used to monitor lateral movements in embankments and landslide areas, deflections of retaining walls and piles, and deformations of excavation walls, tunnels, and shafts.

Operation

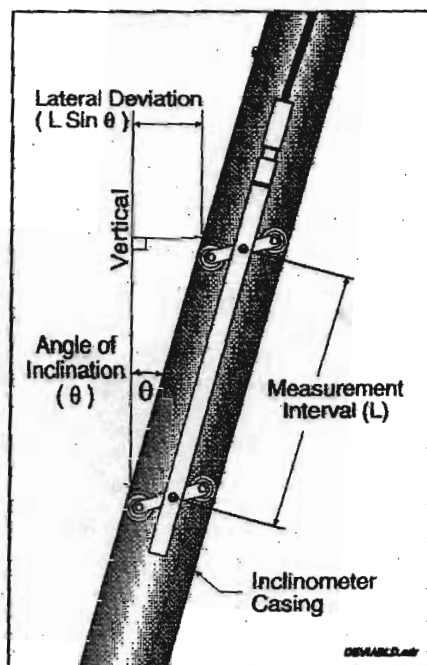
Inclinometer casing is typically installed in a near vertical borehole that passes through suspected zones of movement into stable ground. The Digitilt inclinometer probe, control cable, pulley assembly, and readout are used to survey the casing. The first survey establishes the initial profile of the casing. Subsequent surveys reveal changes in the profile if ground movement occurs.

During a survey, the probe is drawn upwards from the bottom of the casing to the top, halted in its travel at half-meter intervals for tilt measurements (two-foot intervals are used for English probes).

The inclination of the probe body is measured by two force-balanced servo-accelerometers. One accelerometer measures tilt in the plane of the inclinometer wheels, which track the longitudinal grooves of the casing. The other accelerometer measures tilt in the plane perpendicular to the wheels.

Inclination measurements are converted to lateral deviations. Changes in lateral deviation, determined by comparing data from current and initial surveys, indicate ground movements.

Plotting the cumulative changes at each measurement interval yields a high resolution displacement profile. Displacement profiles are useful for determining the magnitude, depth, direction, and rate of ground movement.



Angle of Inclination and Lateral Deviation

Advantages

Proven Performance: Digitilt inclinometer probes have earned a world-wide reputation for high precision, superior stability, and rugged construction.

Repeatable Tracking: The Digitilt probe is designed to travel hundreds of kilometers of inclinometer casing. To ensure consistent tracking in all types of casing, the probe is equipped with robust wheel carriages, sealed wheel bearings, and specially designed wheels.

Extended Installation Life: The compact size of the Digitilt probe allows it to pass through small radius curves, extending the useful life of the installation beyond that possible with most other inclinometer probes.

Computerized Calibrations:

A custom designed, computerized calibration table performs thorough testing of each inclinometer probe and generates extremely accurate calibration data.

Reliable Control Cable: Digitilt control cable is durable and easy to handle, stays flexible in cold temperatures, resists chemicals and abrasion, and provides excellent dimensional stability. Flexible rubber depth marks are permanently vulcanized to the cable jacket. The marks cannot loosen and have no rigid edges that can damage the cable jacket and conductors.

Consistent Depth Control: The pulley assembly, a recommended accessory, helps the operator achieve uniform depth control. The one-way action of its cable clamp ensures consistent positioning of the probe.

Protective Case: The stainless steel carrying case included with the probe provides good protection during transport.

Digitilt Compatibility: The Digitilt family includes a wide range of readouts and computer software, horizontal and in-place inclinometers, tiltmeters, high quality inclinometer casing, and specialized accessories.

Digitilt Inclinometer Probes

	Metric Inclinometer Probe	English Inclinometer Probe
Order Number	50302510	50302500
Wheel Base	500 mm	24 in
Accelerometers	Two force balanced servo-accelerometers	Two force balanced servo-accelerometers
Measurement Range	$\pm 53^\circ$ from vertical	$\pm 35^\circ$ from vertical
Resolution	0.02 mm per 500 mm	0.0001 ft per 2 ft
Repeatability	$\pm 0.01\%$ FS	$\pm 0.01\%$ FS
Linearity	$\pm 0.02\%$ FS	$\pm 0.02\%$ FS
Sensitivity	1.000 ± 0.001	1.000 ± 0.001
Rotation Factor	± 0.0045	± 0.0045
System Accuracy	± 6 mm per 25 m	± 0.025 ft per 100 ft
Minimum Radius Curve	2.2 m for retrieval; 4.5 m for reading	10 ft for retrieval; 17.6 ft for reading
Temperature Range	-20 to +50 $^\circ\text{C}$	-4 to +122 $^\circ\text{F}$
Temperature Coefficient	0.005% FS per $^\circ\text{C}$ typical	0.003% FS per $^\circ\text{F}$ typical
Dimensions & Weight	25.4 mm $\varnothing$ x 653 mm long, 1.8 kg	1 in $\varnothing$ x 30 in long, 4 lb
Materials	Stainless steel	Stainless steel

Digitilt Control Cable

Metric Cable 50601010
English Cable 50601000
Connector for Readout 50301800
Connector for Probe 50303100

Digitilt control cable, which is used to control the depth of the inclinometer probe, also conducts power and signals between the probe and the readout.

Depth marks are vulcanized onto cable jacket. Steel core wire controls stretching. Binder layer eliminates slipping of cable jacket relative to core wire. Torsion braid counters cable torque. Neoprene cable jacket resists chemicals and abrasion and is flexible in cold temperatures. Cable should be stored on reels with a diameter of 8 inches or larger. Power reel diameter should be 16 inches or larger.

Cable is supplied in specified lengths with no splices or surface defects. Cable has a rated strength of 480 lb and a working strength of 120 lb. Metric cable is graduated with yellow 0.5-meter marks and red 1-meter marks. English cable is graduated with yellow 2-foot marks and red 10-foot marks.

Both connectors listed above are required. Connectors are factory attached to control cable.

Pulley Assembly

Small Pulley 51104604
 For use on 48 or 70 mm (1.9 or 2.75 in) casing.

Large Pulley 51104606
 For use on 70 or 85 mm (2.75 or 3.34 in) casing.

Pulley assembly clamps onto top of casing to help operator control depth of probe. Cable clamp serves as reference for depth marks. Removable pulley wheel facilitates insertion of probe into casing.

Readouts

Compatible readouts include the Digitilt Data-Mate and the Digitilt 09. See separate data sheets for features of each.

Dummy Probe

Metric Wheel Base 50304810
English Wheel Base 50304800
Nylon Line with Reel 50304900

Dummy probe is used to test for casing continuity, groove continuity, and obstructions or severe distortions of casing that could hinder retrieval of Digitilt probe and control cable. Dummy probe is stainless steel and has dimensions and wheels identical to those of Digitilt probe.

Portable reel has 61 meters (200 feet) of nylon line, which is used to lower and retrieve dummy probe.

Cable Reels

Plastic Storage Reel 56404100
Steel Storage Reel 50503000
Slip-Ring Reel, Small 50500105
Slip-Ring Reel, Large 50500110
Cover for Slip-Ring Reels 50500180

Plastic reel has 30 m (100 ft) capacity. Steel reel has 200 m (660 ft) capacity. Small slip-ring reel has 150 m (500 ft) capacity. Large slip-ring reel has 305 m (1000 ft) capacity. Slip-ring reels can be rotated with indicator connected. Jumper cable #50500152 is required to connect readout to reel.

Specification Notes

Wheel Base: The distance between the upper and lower wheels. The *gauge length* or *measurement interval*, used in the computation of lateral deviation, is typically the same as the wheel base, but can be varied according to survey requirements.

Measurement Range: The maximum range of the probe, when used with the Digitilt DataMate or the Digitilt 09 Indicator. *Full Scale (FS)* in the specifications is the output of the probe at 30° from vertical, not the measurement range.

Resolution: The smallest increment in lateral deviation that can be displayed as one digit on a Digitilt readout.

Repeatability: The difference between repeated readings taken at the same inclination, expressed as a percent of full scale. Includes hysteresis, in which inclination is approached from opposite directions.

Linearity: The maximum deviation of any reading from a best fit straight line based on sensitivity (-10° to $+10^\circ$). Expressed as a percent of full scale.

Sensitivity: The slope of a best fit straight line calculated from readings acquired between -10° and $+10^\circ$. The sensitivity value supplied on the probe calibration sheet can be applied to data to correct for differences between probes.

Rotation Factor: Rotation is the difference in alignment between the probe wheels and the accelerometer. The rotation factor supplied on the probe calibration sheet can be applied to data to correct for differences between probes. However, probes conforming to the ± 0.0045 specification, the maximum allowed in manufacturing, can be interchanged and will meet system accuracy specifications with no corrections applied. **Cross-Axis Sensitivity,** a related specification, is a maximum of $\pm 0.015\%$ FS per degree.

System Accuracy: An accuracy achievable in the field, expressed as lateral deviation over a given length of casing. The specification accommodates interchanged probes, but can be improved by applying rotation and sensitivity factors. The specification assumes Digitilt probe operating within original specifications, a straight borehole inclined within 3° of vertical, correctly installed Slope Indicator inclinometer casing, and proper reading techniques.

Minimum Radius Curve: The "retrieval" radius is the shortest radius curve through which the probe can be retrieved. The "reading" radius is the shortest radius curve through which the probe can pass and still obtain a valid reading. Test performed in 70 mm (2.75 inch) inclinometer casing with a 59 mm (2.32 in) I.D. with control cable connected to probe.

Dimensions: Wheel diameter is 32 mm (1.25 in). The control cable connector adds 92 mm (3.75 in) to length of probe body.

Products and specifications are subject to change without notice. For warranty information, please request "Terms of Sale."

Belotti SISTEMI

20068 PESCHIERA BORROMEO (MI)
 VIA F.LLI BANDIERA, 8
 TEL. (02) 55308223 - FAX (02) 55303155
 E-MAIL: belotti@mail3:telnetwork.it

SLOPE INDICATOR

Digitilt® DataMate

Records data from Digitilt inclinometer probes, tiltmeters, and spiral sensors

The Digitilt DataMate

The Digitilt DataMate records data from inclinometer probes, tiltmeters, and spiral sensors. It stores up to 40 complete inclinometer surveys and powers a Digitilt inclinometer probe for 16 hours.



Simple to operate, the compact DataMate runs 16 hours, stores up to 40 surveys, and can transfer data to a PC.

The DataMate is designed for hard use in difficult environments. Electronic components are rated for extended temperatures. Connector sockets are located on the face panel, away from contact with mud, water, or snow. The case is sealed against condensation and humidity. And the bright, backlit display is visible under all lighting conditions.

Overview of Operation

The Digitilt DataMate stores a list of inclinometer installations in memory. To begin a survey, the operator selects an installation from the list. The DataMate then displays the starting depth, and the operator positions the inclinometer probe accordingly.

The display shows the depth in meters or feet, the A-axis reading, and the B-axis reading. When both readings are stable and ready to record, the DataMate displays a graphic "ready" signal.

When the operator records the readings with the hand switch or the

keyboard, the DataMate beeps to confirm the recording and displays the next depth. The operator raises the probe to this depth, watches for the ready signal, and records the reading. These steps are repeated until the survey is done.

To correct a mistake, the operator scrolls through the data to any depth, repositions the probe, and continues the survey from that point.

Validating Data

The DataMate provides checksums and checksum statistics to help the operator validate the data set. First, the DataMate calculates the mean and standard deviation of checksums for the entire data set. If the results are within acceptable limits, the operator can assume the data set is good.

If there is some question, the DataMate can "zoom in" on groups of ten readings. The zoom feature makes it easy to isolate possible errors and is particularly useful for surveys of deep installations or poorly installed casing.

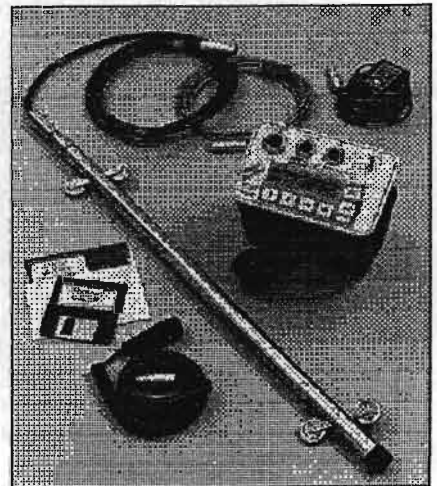


Convenient hand switch reduces fatigue and keeps the DataMate clear of work area.

Questionable readings can be verified and corrected. When the operator repositions the probe in the casing, the DataMate displays "live" and recorded readings side by side for comparison. The operator can then overwrite the recorded reading with the live reading, if appropriate.

Retrieving Data

To transfer data from the DataMate to a PC, the operator runs the DataMate Manager program (DMM), which retrieves the data and stores it in a database for quick access. The DMM program also imports data files from previous Slope Indicator formats, from spreadsheets, and from G-TILT.®



Digitilt DataMate, Digitilt inclinometer probe, and DataMate Manager software for the PC.

Processing Data

While the DataMate can calculate deviation and displacement for the top or bottom of the installation, more comprehensive processing must be performed on a computer.

DigiPro for Windows is a program designed specifically for this purpose. DigiPro processes inclinometer data and generates high resolution graphs. It also allows the user to interactively apply corrections for casing spiral, casing orientation, and sensor errors.

DigiPro for Windows is easy to learn and use, ensures that calculations are performed accurately, eliminates repetitive work, and dramatically reduces the time required to process data.

DataMate Specifications

General Description: Portable inclinometer readout for recording readings from vertical and horizontal inclinometer probes, spiral sensors, and tiltmeters. Reads both metric and English sensors.

Menu-Selected Functions:

- ☐ **Record:** Displays depths and readings, automatically advances to next depth after readings are recorded.
- ☐ **Manual Read:** For reading tiltmeters or testing the inclinometer probe or spiral sensor.
- ☐ **Validate:** Calculates checksum statistics.
- ☐ **Correct:** Allows user to verify and overwrite stored reading with live reading.
- ☐ **Compare:** Calculates cumulative deviation or displacement.
- ☐ **Print:** Outputs ASCII data in tabular format to serial printer or to computer.
- ☐ **Comm:** Enters communications mode allowing PC to transfer data to and from DataMate.
- ☐ **Utilities:** Sets time and date; disables beeper and key click sounds; adjusts display for best visibility; checks memory usage, battery voltage, temperature, and relative humidity inside DataMate.

Survey Types: Standard two-pass survey for biaxial inclinometer probes. Two or four-pass survey for spiral sensors.

Maximum Survey Depth: 500 m or 2000 ft.

Reading Intervals: Minimum metric interval is 0.5 m; minimum English interval is 1 ft.

Installation Parameters: Stores a list of 40 installations. Different installation lists are easily transferred to DataMate using DMM.

Data Capacity: 10,000 data points distributed in a maximum of 40 data sets. In a standard two-pass survey, the DataMate records four data points at each depth (A0, A180, B0, B180). Thus 10,000 data points would be the data from 2,500 depths, the equivalent of surveying 1,250 m of casing at half-meter intervals or 5,000 feet of casing at 2-foot intervals.

Operating Time: 16 hours @ 20°C (68°F) with inclinometer probe powered. Backup battery keeps data secure for six months if main battery is discharged.

Temperature Rating: -20 to 50°C (-4 to 122°F).

Data Transfers: Data transferred to PC via direction cable connection with RS232 serial port. Transfers managed by DMM program.

Display: 20 x 2 backlit LCD with adjustable contrast and extended-temperature specs.

Battery: Rechargeable, 6 volt, 6 Ah, gelled electrolyte, lead-acid battery. 16 hour charge time for 80% of capacity with included AC charger. 3 volt, lithium cell backup battery.

Case: Splashproof, non-submersible, aluminum case with plastic shell. Connectors are waterproof when capped or in use.

Dimensions: 127 x 178 x 178 mm (5 x 7 x 7 inch).

Weight: 3 kg (6.5 lb).

DMM Software Specifications

General Description: Computer software supplied with the DigiTilt DataMate. DMM is used to transfer data between DataMate and PC. DMM also creates the project database, imports and exports data, and provides easy to use database maintenance tools.

The Windows 95/NT version of DMM, which should be available in Spring, 1998, is described below.

Project DataBase: Inclinometer data is stored in a Microsoft Access® compatible database. The user typically creates a new database for each project.

Import Capabilities: Imports legacy data from all of Slope Indicator's previous formats, including the project databases created by DMM for DOS. Also imports GTILT® data.

Maintenance Functions: Allows user to edit any field, move installations from one project to another, move data from one installation to another, browse data, and archive data.

Advanced Functions: Generates expanded spiral datasets from spiral data, generates settlement datasets from settlement data.

Transfer Function: Transfers data between PC and DataMate via direct cable connection.

Report Capabilities: Prints selected datasets and validation statistics.

System Requirements: DMM for Windows requires a Pentium®-class computer with Windows® 95 or NT, 16 megabytes of RAM and 10 megabytes of disk space, and a mouse or similar pointing device. The program does not run on Windows 3.x or DOS.

DigiPro Software (Optional)

General Description: DigiPro is computer software designed to process and graph inclinometer data. DigiPro complements the DigiTilt DataMate and DMM program, but is purchased separately.

Graph Types: Graph types include cumulative and incremental displacements, cumulative and incremental deviations, displacement vs time, and checksums and difference checksums. The total number of datasets per graph is limited only by memory and legibility requirements.

Reports: When you save a graph, DigiPro automatically creates a report so you can reuse scales, labels, legends, title block, and other settings. To process new datasets, you just click on the report. DigiPro automatically retrieves your settings, finds the new data and displays an updated graph.

Templates: DigiPro's templates are preformatted graphs of various types. You click on the template that you want. DigiPro displays graphs for the A and B axes side by side, ready to modify, print, or save as a report.

Slope Indicator Company
A Boart Longyear Group Company

Belotti
SISTEMI

BELOTTI

20068 Peschiera Borromeo (MI)

Via F.lli Bandiera, 8

Tel.: 02.55.30.82.23 - Fax.: 02.55.30.31.55

E-mail: belotti.sistemi@iol.it

Web Site: www.belotti-online.it

Templates also provide a way for your organization to standardize the format and presentation of inclinometer reports.

Listings: When you print a report, you can choose to print a listing of the most recent dataset. You can also print a listing of the plotted data points.

Error Correction: Corrections can be applied for misoriented casing and spiraled casing (spiral correction requires data acquired with a spiral sensor) and for differences between probes or changes in the performance of a probe using zero shift, rotation, and sensitivity corrections.

Data Units: You can choose millimeters, meters, inches, or feet for displacements and deviations. DigiPro can convert English-unit data to metric and vice versa.

Depth Units: You can choose depths or elevations and meters or feet for depth unit labels. DigiPro will automatically convert units as required.

System Requirements: DMM for Windows requires a Pentium®-class computer with Windows® 95 or NT, 16 megabytes of RAM and 15 megabytes of disk space. Display should have a resolution of 800 x 600 or higher, and a mouse or similar pointing device is required. The program does not run on Windows 3.x or DOS.

Ordering Information

DigiTilt DataMate 50310900
Includes hand switch, manual, battery charger, and interface cable for PC. Please specify voltage (100, 115, 220, or 240) and frequency (50 or 60 Hz) for charger. Includes DMM software. Does not include DigiPro software.

DigiPro for Windows CD . 50310000
DigiPro for Windows 3.5 . 50310035
Optional software for processing and graphing inclinometer data. Distributed on CD or 3.5 inch disks. A 30-day trial version is available. See DigiPro datasheet for details.

Registered trademarks are: DigiTilt - Slope Indicator; Windows 95, NT, and Access - Microsoft; Pentium - Intel; GTILT - Mitre Software; PC-SLIN - GeoSlope.

Products and specifications are subject to change without notice. For warranty information, please request "Terms of Sale."

 **SLOPE
INDICATOR**

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DigiPro for Windows

Software for Processing and Graphing Inclinometer Data

For Windows® 95/NT

DigiPro runs on Windows 95 and NT and is compatible with NT and Novell networks.

Efficient

Easy to Learn and Use: Click to choose a graph. Click to tweak the graph. Click to print. It's that easy.

Eliminates Repetitive Work: When you save the graph, DigiPro creates a report so you can reuse scales, labels, legends, and other settings.

Saves Time: Just click on the report to process new datasets. DigiPro automatically retrieves your settings, finds the new data, and displays an updated graph. And when you print, DigiPro includes a listing of the new data on a separate page.

Powerful

Automatic Conversions: DigiPro can produce metric-unit reports from English-unit data. DigiPro can also convert depths to elevations.

Visual Data Validation: DigiPro can generate checksum graphs for easy validation of data.

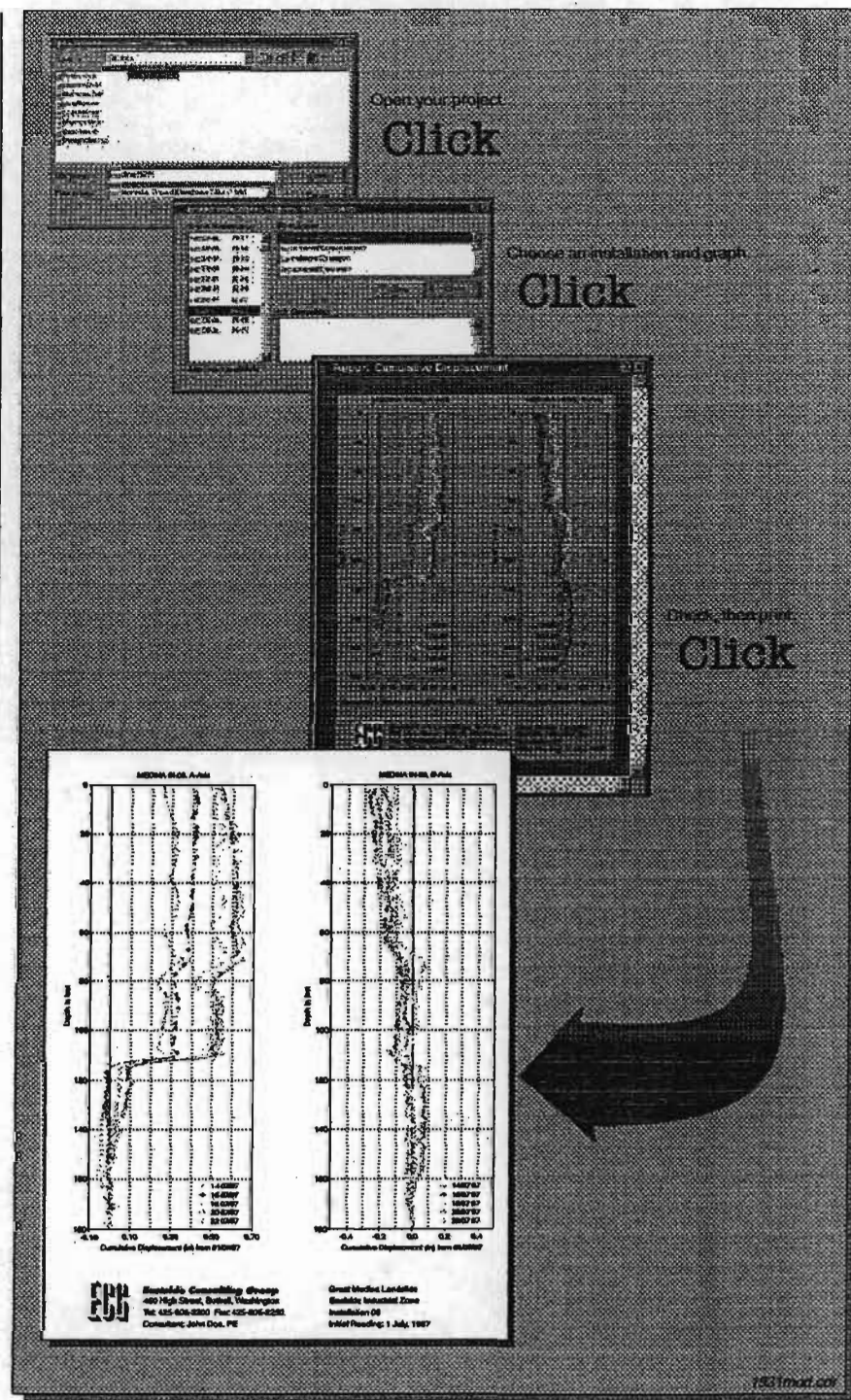
Interactive Corrections: DigiPro lets you determine correction values interactively. You can see the effect of corrections as you apply them.

Capable

Graphs: DigiPro can generate high resolution graphs of displacement, deviation, and time-displacement.* DigiPro also generates checksum and difference checksum graphs for data validation.

Listings: DigiPro can print a listing of the most recent dataset, the data points plotted in the graph, and a summary of report properties.

Advanced Corrections: DigiPro supports corrections for casing spiral, casing orientation, sensor rotation, sensor sensitivity, and sensor offset.



*Time-displacement graph will be supported in a free maintenance release scheduled for February 1998. Download this and other updates at www.slopeindicator.com

General Description

DigiPro for Windows is computer software designed to process and graph inclinometer data.

Productivity Features

Reports: When you save a graph, DigiPro automatically creates a report so you can reuse scales, labels, legends, and other settings. To process new datasets, you just click on the report. DigiPro automatically retrieves your settings, finds the new data and displays an updated graph. In addition to the standard reports, you can create any number of specialized reports. For example, you could create a report that isolates a particular shear zone. Then, whenever you wanted an update on the shear zone, you would simply click on the report, with no other steps or manipulations required.

Snapshots: DigiPro lets you save any instance of a report as a "snapshot" to provide a record of events. Snapshots are also useful for experimenting with correction factors.

Templates: DigiPro's graph templates provide instant graphs. Just choose the type of graph you want (there is one template for each type of graph), and DigiPro displays it. Templates also help you produce standardized, professional looking reports. You can customize your own templates with your company name, address, and logo, so that your reports will have a consistent format and style.

Listings: When you print a report, you can choose to print a listing of the most recent data, too. You can also print a listing of the plotted data points.

Extensive On-Line Help: Pop-up help is supplied for every setting, every field, and every operation, and help topics can be searched and printed. A printed manual and quick start guide are also provided.

Technical Features

Dataset Selection: The total number of datasets per graph is limited only by memory and legibility requirements. You can mark one dataset as the initial, and you can control the number of most recent datasets that are auto-selected for the graph. You can mark other datasets as permanently selected or permanently excluded from the graph (unmarked datasets are also excluded).

Data Units: You can choose millimeters, meters, inches, or feet for displacements and deviations. DigiPro can convert English-unit data to metric and vice versa. DigiPro sets scales automatically

or you can specify values for full scale left and full scale right.

Depth Units: You can choose meters or feet for depth unit labels. DigiPro will automatically convert units as required. DigiPro can convert depths to elevations and lets you reference depths and elevations to ground level (rather than to the top of the casing or pulley assembly). You can also toggle an auto-depth adjustment that ensures data is plotted at the top or bottom of an interval. DigiPro sets scales automatically or you can specify the depths or elevations of interest.

Graph Type: Graph types include cumulative and incremental displacements, cumulative and incremental deviations, time-displacement*, and checksums and difference checksums. You can specify A-axis or B-axis and top or bottom reference. Each report holds two graphs, and you can specify different types of graphs in the same report.

Error Correction: You can correct for misoriented casing and spiraled casing (spiral correction requires data acquired with a spiral sensor). You can also correct for differences between probes or changes in the performance of a probe using zero shift, rotation, and sensitivity corrections.

Layout and Formatting

Page Layout: Paper size, paper orientation, margins, graph size and placement have default settings that can be changed for individual reports. The layout of the default templates provides two graphs on the page with a title block at the bottom. Layout adjusts automatically for different paper sizes.

Graph Labels: Labels are supplied automatically or you can enter your own. You can change fonts and font sizes. Dataset identifiers can be toggled between date-only and date-and-time. The dataset legend can be placed in any corner of the graph.

Title Block and Logo: The title block provides two columns of four lines each to enter information about the graph. You can change fonts and font sizes for the text. You can also include your company name and logo. The logo must be a bit-map (.bmp) file.

Data Compatibility

Project Database: DigiPro works with data stored in Slope Indicator's "project database" format, which is used by the Digitilt DataMate and created by the DMM (DataMate Manager) program. Project databases, may be stored on individual computers or on a network file server.

Import Utility: The DigiPro Utilities program provides a way to import data from spreadsheets, GTILT, and all previous Slope Indicator formats. It also allows manual entry of data and provides a routine to import in-place inclinometer data. The import utility checks all imported data and lets you edit borehole identifiers, dataset identifiers, and other parameters before storing the data in a project database.

System Requirements

DigiPro for Windows requires a Pentium® class computer with Windows® 95 or NT, 16 MB of RAM, and 15 MB of disk space. The program does not run on Windows 3.x or DOS. A display resolution of 800 x 600 or higher is recommended, and a mouse or similar pointing device is required. DigiPro prints on any printer supported by Windows 95. Data can be stored on a network file server, but DigiPro itself must be installed on client computers (individual work stations).

Ordering Information

DigiPro for Windows CD..... 50310000

DigiPro for Windows 3.5" Disk. 50310035

DigiPro for Windows is available on CD or 3.5" disks. A printed manual is included. The program is copy protected, but can be installed and used immediately for 30 days. The user must then contact Slope Indicator by fax, phone, or e-mail to obtain an unlocking code that permits continued use of the program.

Registered trademarks are Digitilt-Slope Indicator, Windows 95 and NT-Microsoft, Pentium-Intel, and GTILT-Mitre Software.

*Time-displacement graph will be supported in a free maintenance release scheduled for February 1998. Download this and other updates at www.slopeindicator.com

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