COMMITTENTE:

RFI RETE FERROVIARIA ITALIANA
GRUPPO FERROVIE DELLO STATO ITALIANE

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DIREZIONE PROGRAMMI INVESTIMENTI
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GRUPPO FERROVIE DELLO STATO ITALIANE

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PROGETTO ESECUTIVO

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RADDOPPIO DELLA TRATTA FERROVIARIA TERMOLI - LESINA
LOTTI 2 e 3 - RADDOPPIO TERMOLI - RIPALTA

INDAGINI GEOGNOSTICHE E PROVE IN SITU PREGRESSE – PROVE PRESSIOMETRICHE "MPT" – PROVE DILATOMETRICHE "DRT"

L'Appaltatore		I progettisti (il Direttore della progettazione)	
Ing. Gianguido Babini	A.A.D'AGOSTINO COSTRUZIONI GENERALI S.r.l. Il Direttore Tecnico (Ing. Gianguido Babini)	Ing. Massimo Facchini	Firmato digitalmente da: Facchini Massimo Firmato il 12/03/2024 17:05 Seriale Certificato: 2702585 Valido dal 01/09/2023 al 01/09/2026 InfoCamere Qualified Electronic Signature CA
Data **14/10/2022**	*firma*	*Data* **14/10/2022**	*firma*

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Rev.	Descrizione	Redatto	Data	Verificato	Data	Approvato	Data	Autorizzato/Data
A	Prima emissione	-	Ottobre 2022	Giovanni De Fazio	Ottobre 2022	Giuseppe Cerchiaro	Ottobre 2022	M. Facchini Ottobre 2022

Indagini geognostiche e prove in situ pregresse – prove pressiometriche “MPT” – prove dilatometriche “DRT”

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1. PREMESSA

Nel presente elaborato vengono riproposte le "*Indagini geognostiche e prove in situ pregresse – prove pressiometriche (MPT) – prove dilatometriche (DRT)*" relative all'Emissione Definitiva (LI0202D69SGGE0005005A) del progetto in oggetto. Per le indagini integrative eseguite nell'ambito dell'Emissione Esecutiva del suddetto progetto si rimanda all'elaborato "*Indagini geognostiche e prove in situ – Progetto Esecutivo*" identificato per mezzo della seguente codifica: **LI0B02EZZSGGE0005009A**.

COMMITTENTE:

RFI RETE FERROVIARIA ITALIANA
GRUPPO FERROVIE DELLO STATO ITALIANE

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ITALFERR
GRUPPO FERROVIE DELLO STATO ITALIANE

INFRASTRUTTURE FERROVIARIE STRATEGICHE DEFINITE DALLA LEGGE OBIETTIVO N. 443/01

U.O. GEOLOGIA, GESTIONE TERRE E BONIFICHE

PROGETTO DEFINITIVO

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RADDOPPIO DELLA TRATTA FERROVIARIA TERMOLI - LESINA
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Indagini geognostiche e prove in situ

SONDAGGI
Prove in foro

PROVE PRESSIOMETRICHE "MPT"
PROVE DILATOMETRICHE "DRT"

SCALA: -

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Rev.	Descrizione	Redatto	Data	Verificato	Data	Approvato	Data	Autorizzato Data
A	Emissione definitiva	C. Treviso	Settembre 2018	A. Pellegrino M. Sciarra	Settembre 2018	B.M. Bianchi	Settembre 2018	F. Marchese Settembre 2018

ITALFERR S.p.A.
Dott. Geologo Francesco MARCHESE
Resp. UO GEOLOGIA
Online Geologi Lazio n. 1755

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Tel. 0874/340003-16 **Fax**: 0874/340014
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web: **www.imosgeo.it**

PROVE PRESSIOMETRICHE SU TERRA PT E PROVE DILATOMETRICHE SU ROCCIA DRT

METODOLOGIA OPERATIVA

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1.0 PREMESSA

Le prove di deformabilita in sito (prove pressiometriche su terre o dilatometriche su roccia), consistono nel rilievo della pressione e della conseguente dilatazione o ricompressione delle pareti di un foro di sondaggio e sono eseguite per determinare i moduli di deformabilità (primo carico della curva sperimentale) e di elasticità (in ciclo di scarico – ricarico) dell' ammasso terroso o roccioso in esame.

Nel caso in cui, durante il corso della prova si riesce a raggiungere la plasticizzazione completa ovvero l'inizio delle deformazioni plastiche, è possibile definire una pressione di creep e una pressione limite corrispondente alla resistenza del materiale investigato.

2.0 PROVE DILATOMETRICHE DRT SU ROCCIA E PRESSIOMETRICHE MPT SU TERRA

Le prove pressiometriche su terra PT (Pressuremeter Test) o le prove dilatometriche su roccia DRT (Dilatometric Rock Test) si eseguono in fori di sondaggio calibrato, rispettivamente le prime (PT) in fori di diametro 66 mm mentre le seconde in fori di diametro variabile da 76 mm a 101 mm, e sono finalizzate principalmente alla determinazione della deformabilità dell'ammasso terroso o roccioso nelle condizioni di sito.

Il pressiometro è costituito da una sonda tricellulare in cui la cella centrale rappresenta la cella di misura e le celle superiori ed inferiori costituiscono delle camere di contropressione pneumatica che consentono nell'ambito di deformabilità dei terreni misurare l'espansione di una cavità cilindrica a basi piane, tuttavia tale strumento presenta dilatazioni parassite (cavi, sonda, instabilità delle contropressioni etc.) che costituiscono un errore strumentale solo parzialmente determinabile.

Il dilatometro da Roccia o Dilarock è invece caratterizzato da una monocamera cilindrica espandibile con misura della dilatazione di tipo elettronico posta direttamente sulla testa della sonda, pertanto, in questo strumento. la dilatazione parassita si limita alla variazione di spessore della guaina dilatometrica e determina un errore strumentale ampiamente inferiore a quello del pressiometro nonchè ad eccezione di rari casi (rocce durissime) di uno o più ordini inferiore alla grandezza da misurare.

Il pressiometro tricellulare, ideato per le terre, presenta delle forti limitazioni nell'uso in rocce tenere sia per quanto riguarda la precisione che l'accuratezza dei dati rilevati poiche :

- la dilatazione dei cavi è generalmente superiore di 10-100 volte rispetto alle deformazioni della roccia da misurare, piccole imprecisioni nella taratura alterano i risultati in modo sostanziale;
- la guaina più resistente di cui è dotata la sonda pressiometrica (guaina telata metallica) presenta una inerzia max di circa 4 bar e quando il peso della colonnina d'acqua supera tale resistenza, riempie la cella di misura, rendendo difficoltoso l'inserimento nella tasca di prova;
- la pressione differenziale applicata, dovrebbe consentire alle celle di guardia (gas) di mantenere piane le basi della cella di misura (acqua); va notato che il peso della colonnina di gas (considerato nullo) aumenta con l'incremento delle pressione e non risulta piu trascurabile oltre approssimativamente i 30 bars (i primi pressiometri di Louis Menard lavoravano a 25 bars);

Alla luce di queste considerazioni , la prova pressiometrica, non adrebbe mai prevista oltre i 50 metri di profondità ovvero oltre le medie pressioni superiori ai 25 – 30 bar e sostituita con la prova dilatometrica da roccia tenera (dilatometro volumetrico) : tale indicazione viene spesso ignorata da Progettisti e Direttori Lavori che pretendono l'esecuzione di prove pressiometriche oltre i limiti strumentali anzidetti.

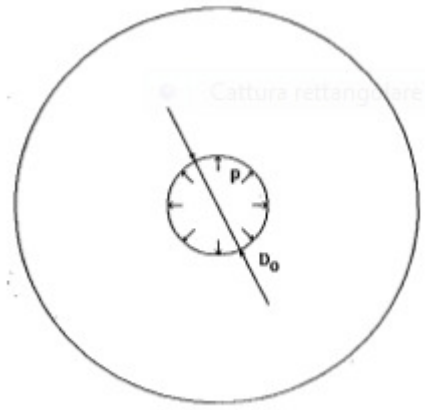
Secondo l'esperienza acquisita dallo scrivente durante il corso di oltre 12.000 prove di deformabilità, si consiglia :

1) per terreni molli o sciolti ovvero sotto falda utilizzare il pressiometro auto perforante

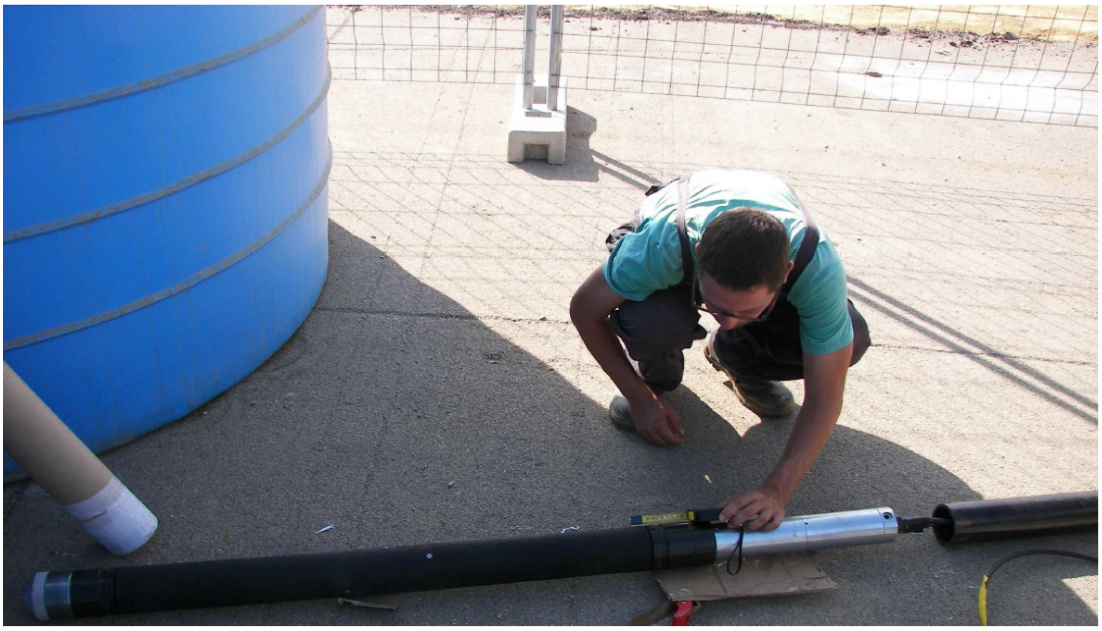
2) per terreni da consistenti a molto consistenti o sino a molto addensati utilizzare il pressiometro di Menard

1) per materiali complessi , terre dure, rocce tenere e rocce dure fratturate utilizzare il dilarock volumetrico tipo CSM

2) per rocce dure compatte e calcestruzzi si usa preferibilmente il dilarock a sensori radiali.



schema di piastra indefinita con foro circolare pressurizzato, schema interpretativo tradizionale delle prove dilatometriche



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Corpo sonda dilatometro da roccia diam 95 mm

PROVE PRESSIOMETRICHE PT (pressuremeter test) o DILATOMETRICHE SU ROCCIA DRT (dilatometric rock test)

La campagna di prove in sito è stata eseguita mediante l'impiego della seguente strumentazione (quella effettivamente utilizzata in neretto):

Dilatometro cilindrico volumetrico profondità sino 150 m : GEODV series tipo CSM (Colorado school of Mine) volumetrico da 200 bar dotato di lettura delle pressioni e deformazioni volumetriche in alta sensibilità (0,1 cmc /0,002 mm) in modo analogico/digitale, trasmissione delle pressione mediante cavi ad alta pressione, produzione 2005 e succ.

Dilatometro cilindrico volumetrico profondità sino 1000 m : VM01 tipo CSM (Colorado school of Mine) volumetrico da 200 bar dotato di lettura delle pressioni e deformazioni volumetriche in alta sensibilità (0,03 cmc /0,001 mm) in modo digitale a controllo remoto, trasmissione delle pressione mediante cavi ad alta pressione, produzione 2013.

Dilatometro cilindrico con sensori radiali : Roctest Telemac DMP-02/95 matricola 21F07 produzione 2007 con misura degli spostamenti radiali a mezzo n. 3 LVD disposti a 120 ° (sensibilità 1 μ , errore strumentale ± 5 μ) uno dall'altro e su piani diversi montati a guaina flessibile lunga 1 m, centralina ad acquisizione digitale dei dati dilaroc n. 28D03 e cavi ad alta pressione.

Centralina di misura pressiometro Apageo Segelm matricola 573 da 100 bar di lettura delle deformazioni in sensibilità elevata (1/50 cmc)

Sonda dilatometrica: monocellulare diam 95 mm, 90 mm , 70 mm e 63 mm

Sonda pressiometrica: tricellulare o monocellulare diametro 44mm, 60 mm, 74 mm, auto perforante 63 mm

Carotiere: tipo semplice o doppio corona a prismi di widia ad alta resistenza

Energizzatore: bombola di aria compressa/azoto compresso a 300 bar o pompa idraulica da 140 bar

2.2 PROCEDURE DI RIFERIMENTO Per la esecuzione delle prove dilatometriche/pressiometriche si è fatto riferimento ai seguenti standard operativi:

AFNOR NFP 94 – 110 - prove pressiometriche su terra

ASTM (D4719 - 87) – prove pressiometriche su terra

ISRM 1987 – (suggested method for determining deformability with flexible dilatometer with volume change measurements)

ISRM 1987 – (suggested method for determining deformability with flexible dilatometer with

radial displacemente change measurements)

2.3 MODALITÀ' OPERATIVE

La prova pressiometrica PT (o dilatometrica DRT) consiste nella immissione in foro di sondaggio di una sonda cilindrica tricellulare (PT) / monocellulare (DRT) dilatabile collegata ad un controllore pressione - volume posto in superficie e collegato al sistema di energizzazione rappresentato da una bombola di azoto a 200 bar.

La deformazione del tratto di terreno sottoposto a prova viene ottenuta immettendo un liquido in pressione all'interno della cella di misura posta nella zona mediana della sonda pressiometrica, ovvero di azoto nella camera dilatometrica; essa, durante la prova, si comporta come una cavità cilindrica in espansione la cui geometria è correttamente mantenuta dalle opportune pressioni applicate alle celle di guardia, poste superiormente ed inferiormente alla stessa cella di misura.

In tal modo si ottiene un tensore degli sforzi piano con sforzo principale orientato orizzontalmente, il cui valore, viene misurato in superficie mediante manometri di precisione a scale differenziate nonchè corretto in funzione delle inerzie proprie del sistema di espansione e della profondità dell'eventuale acqua presente nel foro all'atto della prova.

La rilevazione della deformazione del terreno viene eseguita direttamente in superficie mediante sistema volumometrico dotato di sensibilità normale (PT) od in alta precisione *(DRT)* ovvero da n. 3 sensori radiali di tipo *LVDT (DRT)* posti nel settore centrale della sonda; tale meccanismo si rende necessario in funzione delle diverse tipologie di prova (*prova su terreno* o *prova su roccia*), ed il valore ricavato viene successivamente depurato della dilatabilità propria dei tubi di immissione.

Applicando una serie di gradini di pressione, mantenuti costanti per determinati intervalli di tempo (*stress controlled*), e, rilevandone conseguentemente la deformazione, si ottiene una curva sforzo - deformazione in sito.

Durante il corso delle prove pressiometriche/dilatometriche effettuate si è proceduto ad eseguire uno (PT) o tre (DRT) cicli di scarico-ricarico a partire approssimativamente dal limite superiore del campo pseudoelastico (PT) ovvero nel tratto pseudoelastico (DRT), al fine di determinare il modulo di elasticità di Young dalla pendenza media del ciclo stesso ovvero dal tratto di ricarico (PT) o scarico (DRT).

Di particolare importanza per l'esecuzione di una corretta modalità di prova è l'esecuzione del foro che è avvenuta secondo tecnologie diversificate in funzione della litologia e sotto la diretta supervisione del tecnico strumentista: in tal modo è possibile effettuare prove pressiometriche/dilatometriche con estrema versatilità, dai terreni poco consistenti sino alle rocce compatte .

2.4 INTERPRETAZIONE TEORICO - SPERIMENTALE DEI RISULTATI

I principi teorici interpretativi sui quali si fonda l'analisi delle risultanze della prova dilatometrica sono riconducibili alla espansione di una cavità cilindrica secondo le seguenti assunzioni:

- mezzo omogeneo - ortotropo di dimensioni illimitate;
- espansione della cavità secondo simmetria assiale coincidente con l'asse del foro e deformazione piana;
- espansione di tipo quasi statico con incrementi e decrementi di pressione sufficientemente lenti da rendere trascurabili gli effetti delle forze di inerzia;
- comportamento del mezzo secondo una legge elasto - plastico lineare.

Gli elementi che influenzano una prova dilatometrica sono i seguenti:
volume di roccia interessato (effetto scala)
pressioni massime elevate (caso di rocce compatte)
intervallo di deformazione
possibilità di studio della anisotropia del litotipo (orientazione della fatturazione)
determinazione della deformabilità reale in sito mediante l'applicazione di opportune procedure operative (vedi cap. prec.)

I parametri ottenibili dall'analisi della curva dilatometrica sono i seguenti:

Po) PRESSIONE INIZIALE Po

La Pressione iniziale Po viene determinata in corrispondenza del limite inferiore del campo pseudoelastico (tratto subrettilineo di prima compressione della curva dilatometrica), può o meno corrispondere alla tensione totale tangenziale in sito , poiché a seguito del preforo il litotipo si trova in condizioni di trazione a comportamento più o meno elastico in funzione della intensità del disturbo arrecato dalla perforazione.

Em o Ep) MODULO PRESSIOMETRICO DI MENARD

Tale modulo è il modulo secante calcolato lungo tutto il campo pseudo elastico della curva pressiometrica compreso tra Po e Pf, e rappresenta il modulo di deformabilità di primo carico sino alla massima deformazione del terreno prima della insorgenza delle deformazioni di tipo plastico (punto Pf).

Tale modulo risulta sempre inferiore od uguale al modulo di elasticità di Young calcolato come segue:

E) MODULO DI ELASTICITA' Ey

Il modulo reversibile di elasticità o di Young è dato dalla relazione di Lamè applicata ad una cavità cilindrica in espansione:

$E = (1+\nu)\ \Phi\ P/d$

con:

- ν : coefficiente di Poisson del materiale (sovente uguale a 0,25 – 0,30);
- Φ : diametro del foro (mm);
- P : pressione (Mpa);
- D : deformazione diametrale (mm).

Il modulo è calcolato per ciascun ciclo nel tratto di scarico significativo nel seguente modo,

$E = (1+\nu)\ \Phi\ (Pimax - Pimin)/(dimax-dimin)$

con:

Pimax – Pimin : pressione massima e minima del tratto considerato;

dimax-dimin : deformazione massima e minima del tratto considerato;

Tali valori sono calcolati per interpolazione dai dati sperimentali mediante procedure statistico matematiche nel ciclo di scarico-ricarico.

T) MODULO DI DEFORMABILITA' INTERMEDIO Ti

Analogamente ad E viene calcolato sulla curva di prima ricompressione tra la pressione massima di un ciclo Pi (deformazione = xi) e la pressione massima raggiunta nel ciclo precedente Pi-1 (deformazione = xi-1) secondo la seguente relazione:

$Ti = (1+\nu)\ \Phi\ (P\ i - P\ i\text{-}1)/(x\ i - x\ i\text{-}1)$

EG) MODULO DI DEFORMABILITA' GLOBALE

Tale modulo corrisponde alla pendenza media dello sviluppo della curva sperimentale di prima ricompressione da Po, Do sino a Pf, Df (limiti del campo pseudoelastico investigato)

PL) PRESSIONE LIMITE Pl

corrisponde allo stato di equilibrio limite indifferente con deformazioni infinite, per convenzione al valore della pressione relativo ad una dilatazione della sonda pressiometrica uguale al raddoppio della cavità dopo l'inizio della fase pseudoelastica.

Da cui:

1 metodo - Pressione limite (Cassan 1978)

Pl = 1,7*(Pf-σho)+σho		COESIVI		
Pl = 1,5*(Pf-σho)+σho	Mpa	granulari	P'l/P'f =	1,70

2 metodo - Pressione limite (metodo per 1/V , Van Wambecke e D'Henricourt)

Pl (Vl) =	Kpa	Inverso del VL	1,14	CALCOLATA PER VIA GRAFICA

Con

Pf = pressione di fluage calcolata su curva sperimentale

σho = stima della tensione orizzontale in sito

P'l (Pressione limite netta) = Pl - Po (pressione iniziale campo pseudoelastico)

Con:

Vlim. = vo + (vo + Vo)

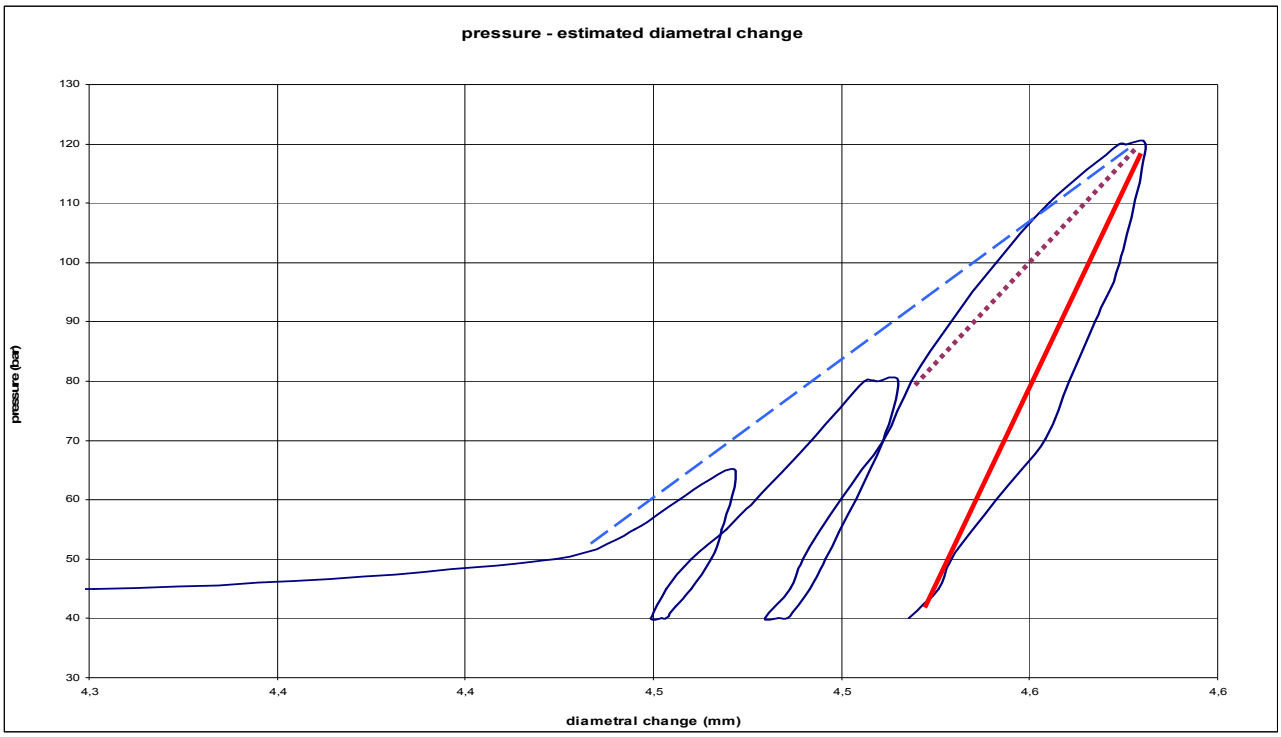
vo = volume di ricompressione iniziale

Vo = volume proprio della sonda a riposo

La determinazione della pressione limite è stata qui eseguita in funzione del grado di deformazione raggiunto in base alle seguenti metodiche:

-metodo dell'estrapolazione diretta dalla curva pressiometrica;

-metodo dell'estrapolazione dall'inverso del volume iniettato (V*an Wambecke e d'Henricourt, 1971*)



Esempio di prova dilatometrica profonda effettuata con dilatometro GeoAnalisi VM01

Rappresentazione dei moduli caratteristici

simbolo	*Modulo derivato da curva corretta*
----------	*EG modulo di deformabilita globale*
.....	*T3 modulo di deformabilità intermedio*
————	*E3=EY modulo di elasticità*

Coesione non drenata cu :

stima della resistenza al taglio non drenata di materiali coesivi od assimilati a comportamento geomeccanico coesivo, direttamente dalla curva pressiometrica o mediante correlazioni sperimentali, ampiamente diffuse, in funzione della pressione limite netta dei terreni compresi nell'ambito di grado di consistenza da basso ad elevato (*Amar & Jezequel,* 1972*; Cassan,* 1978, *Johnson* 1986);

Angolo di attrito efficace ϕ' + effetto coesione:

stima della resistenza al taglio drenata di materiali prettamente granulari od assimilati, derivante da correlazioni empiriche meno diffuse delle precedenti e sovente corrette in funzione

di comparazioni locali con prove geotecniche in sito od in laboratorio eventualmente disponibili, secondo la seguente:

phi' = (4*(Log2(P'l(Mpa)/0,25)+6))

(da *Centre D'etudes L. Menard , 1963* e da *Hughes et Alii, 1977*).

i valori così ottenuti, comprensivi dell'effetto della coesione c' laddove presente, vanno utilizzati come indicativi .

Un altro approccio per valutare la resistenza dei materiali investigati è invece quello di derivarli in termini di pressioni nette, direttamente dalla pressione di creep o fluage (pressione di incipiente rottura) desunti dalla curva pressiometrica/dilatometrica corretta, in tal caso si dovrà considerare l'effetto scala e la rispondenza del bulbo delle tensioni prodotto dallo strumento con quello teorico delle opere da progettare.

3.0 PIANIFICAZIONE DELLE INDAGINI PRESSIOMETRICHE/DILATOMETRICHE

Le prove pressiometriche PT e le prove dilatometriche DRT su roccia costituiscono prove puntuali (seppur interessano volumi di gran lunga piu significativi delle prove di laboratorio) rispetto ai bulbi di tensione indotti dalla grandissima maggioranza delle opere civili. pertanto per essere significative delle condizioni di ammasso terroso/roccioso devono essere pianificate in appositi fori di sondaggio a cadenza di una prova / 1.2 ml di perforazione sino ad un massimo di 1 prova / 5 ml di perforazione per bulbi di tensione particolarmente estesi (gallerie, dighe e grandi opere) .

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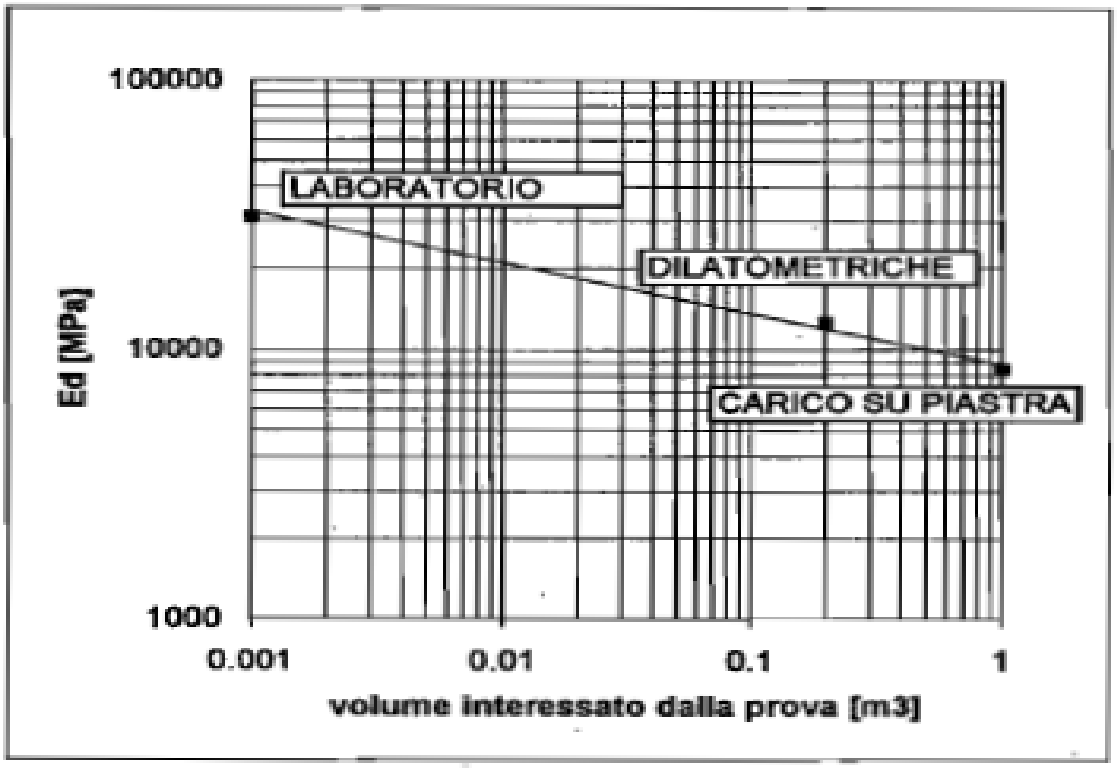

Effetto scala tra prove geomeccaniche per un litotipo fissile

Esecuzioni singole o in numero statisticamente poco significativo rispetto alle dimensioni volumetriche dell'ammasso da investigare possono essere fuorvianti delle caratteristiche geomeccaniche dello stesso, come raccomandato dalle norme americane (ISRM) e francesi (AFNOR)

(b) Within each drillhole, the tests may be spaced either at equal intervals or at specified locations in pre-selected geological formations or beds. Generally, a continuous log of deformability should be taken along the length of test hole pertinent to design. For example, a 1, 2 or 5 m test interval may be specified depending on test hole lengths and required resolution.

ISRM 1987 Working group on flexible dilatometers

ASTM (D4719 - 87) – prove pressiometriche su terra

ISRM 1987 – (suggested method for determining deformability with flexible dilatometer with volume change measurements)

ISRM 1987 – (suggested method for determining deformability with flexible dilatometer with radial displacemente change measurements)

AGI 1993 Determinazione della deformabilità di ammssi rocciosi mediante prove dilatometriche (R.Crivelli, P.Devin, S. Guido

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Sede: Via Monsignor Bologna, 18 - CAMPOBASSO
Stabilimento: C.da S.Maria delle Macchie - Vinchiaturo (CB)
Tel. 0874/340003-16 **Fax**: 0874/340014
P.IVA e Cod. Fiscale: 00717630701
web: www.imosgeo.it

S1 GALL BIS

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i.m.o.s. s.r.l.	**DILATOMETRIC ROCK TEST DRT**			mod DVT	rev. 2
	borehole	**S1GALL bis**	**probe depth m**	**5,5**	**code**	**1**
	Client:	**ITALFERR S.P.A.**	job	1714	v. accept.	1714SIT
	Project	RADDOPPIO TERMOLI-RIPALTA (Lotti 2 e 3)			report	**1714SIT 15 DRT**
		coordinates	EAST			
	site	CAMPOMARINO	NORTH		date	06.12.17	pag	1/3

DILATOMETRIC ROCK TEST WITH VOLUME CHANGE MEASUREMENTS - ISRM 1987

Borehole	**S1GALL bis**
test **1**	depth m 5,50
slope (degree) 90	core barrell
Device: CSM Type GEODV03 95 mm	
Orientation capteur C1=	Standard method: ISRM 1987
Probe diam 95 MM	Borehole diam 101 MM
Meteo	Temperatur e
lithotype	SABBIE LIMOSE DEBOLM. CEMENTATE ROSSASTRE
water table	POCKET PENETRO METER

Creep test P (Bars) =

Temps min	PBAR	MM
1		
2		
3		
4		
5		

PROBE SCHEME

rod adaptor
electronic device
double action piston
expandable cylinder

PROBE CALIBRATION

probe	GEODV03 CSM TYPE
membrane	CAUCCIU' ARMATO
measure cell height (cm)	
V0 cell volume at rest (cmc)	3457
lenght cable (mt)	100
Volume initial Vi (cmc)	349
diam calibration tube (cm)	10,1
tube calibration volume cmc	3806

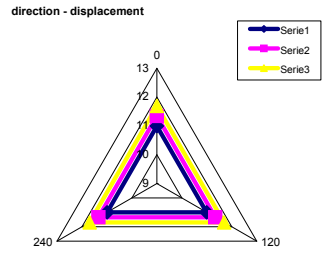
Calibration in air

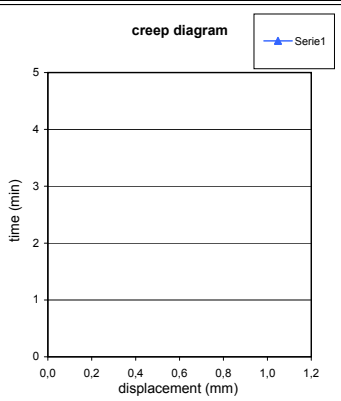
coeff *m*	0,0011	bar /cmc

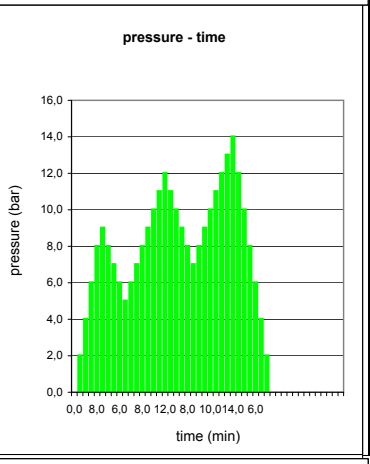
Confined calibration

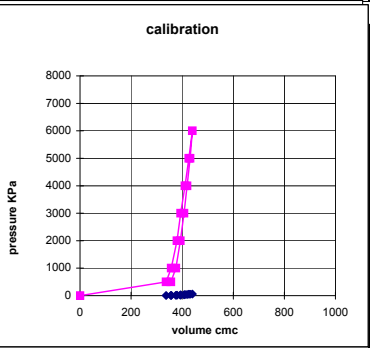
first load	1,45	cmc/bar
unload	1,11	cmc/bar

LITHOTYPE









time	P	Pcorr	Vol	ε c	1/V	diameter	Dil. Diam	Modulo
min	bar	Kpa	cmc	%	1000/cmc	(mm)	(mm)	MPa
0	0,0	0	0,0	-7,578	0,000	96,273	0,000	0,0
1	**2,0**	**187**	**590,2**	**0,000**	**1,694**	**104,168**	**7,894**	**3,1**
2	4,0	384	620,4	0,372	1,612	104,556	8,282	68,7
3	6,0	579	668,6	0,964	1,496	105,172	8,898	43,0
4	8,0	772	724,8	1,649	1,380	105,886	9,612	37,2
5	9,0	867	771,9	2,220	1,296	106,480	10,207	22,0
6	8,0	767	772,8	2,231	1,294	106,492	10,218	-1221,9
7	7,0	667	768,7	2,181	1,301	106,440	10,166	266,9
8	6,0	567	765,6	2,144	1,306	106,401	10,127	353,1
9	5,0	468	757,5	2,046	1,320	106,299	10,025	134,2
10	6,0	568	763,6	2,120	1,310	106,376	10,102	178,5
11	7,0	667	768,7	2,181	1,301	106,440	10,166	214,1
12	8,0	766	778,8	2,303	1,284	106,567	10,294	107,7
13	9,0	863	799,9	2,558	1,250	106,832	10,559	51,1
14	10,0	960	827,0	2,884	1,209	107,172	10,898	39,7
15	11,0	1057	860,1	3,280	1,163	107,585	11,311	32,5
16	12,0	1153	887,2	3,604	1,127	107,922	11,648	40,3
17	11,0	1054	885,1	3,579	1,130	107,896	18	536,7
18	10,0	954	884,0	3,566	1,131	107,882	11,609	1025,8
19	9,0	854	883,9	3,565	1,131	107,881	11,608	11388,1
20	8,0	754	881,8	3,540	1,134	107,855	11,581	536,3
21	7,0	655	869,7	3,395	1,150	107,704	11,431	91,8
22	8,0	755	874,8	3,456	1,143	107,768	11,494	219,5
23	9,0	854	882,9	3,553	1,133	107,869	11,595	137,9
24	10,0	952	897,0	3,721	1,115	108,044	11,770	78,9
25	11,0	1052	904,1	3,805	1,106	108,132	11,858	158,3
26	12,0	1149	926,2	4,068	1,080	108,405	12,132	50,1
27	13,0	1246	953,3	4,389	1,049	108,740	12,466	40,9
28	14,0	1342	987,4	4,792	1,013	109,159	12,886	32,4
29	12,0	1143	977,2	4,672	1,023	109,034	12,761	225,0
30	10,0	945	959,0	4,457	1,043	108,810	12,537	125,1
31	8,0	747	943,8	4,277	1,060	108,623	12,349	149,5
32	6,0	548	931,6	4,132	1,073	108,472	12,199	186,0
33	4,0	350	914,4	3,928	1,094	108,259	11,986	131,1
34	2,0	152	898,2	3,735	1,113	108,059	11,785	138,8

valori diametrali sono calcolati come valore medio della sonda cillindrica a espansione

FIELD LIMITS

	P	P corr	V corr	creep	1000/V	diameter	Dil. Diam	loop
min	2,0	187,5	590,2	0,0	1,7	104,2	7,9	primo
max	14,0	1342,0	987,4	4,8	1,0	109,2	12,886	carico
max	9,0	866,7	771,9	2,2	1,3	106,5	10,207	I
min	5,0	468,3	757,5	2,0	1,3	106,3	10,025	
max	12,0	1153,5	887,2	3,6	1,1	107,9	11,648	II
min	7,0	655,5	869,7	3,4	1,1	107,7	11,431	
max	14,0	1342,0	987,4	4,8	1,0	109,2	12,886	III
min	2,0	152,2	898,2	3,7	1,1	108,1	11,785	

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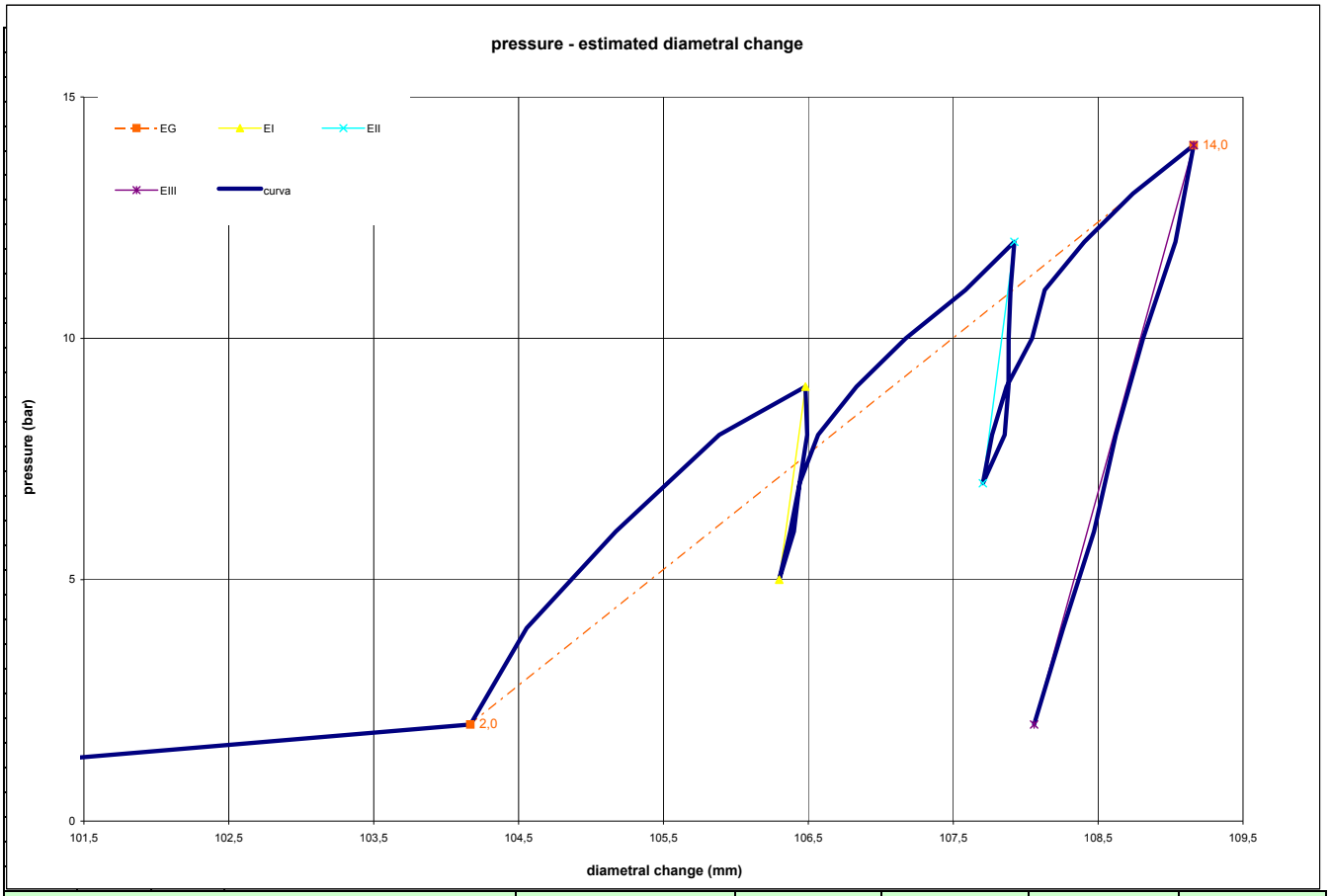
measured
dott. geol. M.Agostini

1714SIT15 CAMPOMARINO S1GALLbis mt 5,5 GEODV03 146 MPA REV2

Il Direttore del Laboratorio
Dott.Geol.Valerio Manzon

	DILATOMETRIC ROCK TEST DRT				mod DVT rev. 1
	borehole	S1GALL bis	probe depth m	5,5	code 1
	Client:	ITALFERR S.P.A.	job 1714	v. accept.	1714SIT
	Project	RADDOPPIO TERMOLI-RIPALTA (Lotti 2 e 3)		report	1714SIT 15 DRT
		coordinates	EAST		
	site	CAMPOMARINO	NORTH	data 06.12.17	pag 2/3

DILATOMETRIC ROCK TEST WITH VOLUME CHANGE MEASUREMENTS - ISRM 1987



DATA PROCESSING						SENSOR 1	SENSOR 2	SENSOR 3	SENSOR AVE
			ELASTICITY MODULUS Ei						
Legend:	DATA		loop	Pmax	Pmin	E1 (Mpa)	E2 (Mpa)	E3 (Mpa)	Eav (Mpa)
H = test depth	symbol	datum	1	9,00	5,00				297
W = water table depth	γnsoil	2,2	2	12,00	7,00				310
ν = Poisson ratio	W (ml)	5,5	3	14,00	2,00				146
vo = cell initial volume	ν	0,3	4						
do =cell initial diameter	vo (cmc)	3457	5						
Φ = borehole wall diameter	do (mm)	96,27	DEFORMATION MODULUS Ti						
Po = start pressure	σv (kPa)	121	loop	Pmax	Pmin	T1 (Mpa)	T2 (Mpa)	T3 (Mpa)	Tm (Mpa)
Pmax = max loop pressure (MPa)			1	9,00	2,00				40
Pmin = min loop pressure (MPa)			2	12,00	9,00				27
d max displacement at P max			3	14,00	12,00				21
d min displacement at P min			4						
σv vertical total stress estimated			5						
ε c = dR / Ro			GLOBAL DEFORMATION MODULUS EG						
ELASTICITY MODULUS Ei	ELASTICITY MODULUS Ey estimated			Pmax	Pmin	EG1 (Mpa)	EG2 (Mpa)	EG3 (Mpa)	EGm (Mpa)
Ei = (1+ ν) Φ Pax - Pmin	Ey= (EII+EIII)/2			14,00	2,00				31
dmax - dmin	Ey= EIII		DIAMETER			F	F	F	F
			beginning diameter (mm)						104,168
DEFORMATION MODULUS Ti			final diameter (mm)						109,159
Ti = (1+ ν) Φ Pi - Pi-1			range mm						4,992
Xi - Xi-1			DM loop minimun displacement			DILATOMETRIC AND GEOTECHNICAL ESTIMATED PARAMETERS			
	Pbar	C1	C2	C3	Cm	Po initial pressure (KPa)	187	**EG** (MPa)	**31**
GLOBAL DEFORMATION MODULUS EG	bar	0	120	240	0	Pf creep pressure (KPa)	1342	**E3** (MPa)	**146**
EG = (1+ ν) Φ Pmax - Po	9,0	10,997	10,997	10,997	10,207	PL limit pres. (KPa) Cassan >	2222	E/P'L	14,65
dmax - do						PL' net limit pres (KPa) >	2137	EG/Ey	0,21
note: RAGGIUNTI I LIMITI DI DEFORMAZIONE DELLO STRUMENTO						Ko lateral coeff at rest (KPa)	0,70	**cu** coesion (KPa) johnson	
						Pho lateral pressure (KPa)	85	**ϕ** friction angle (°) >	

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measured
dott. geol. M.Agostini

1714SIT15 CAMPOMARINO S1GALLbis mt 5,5 GEODV03 146 MPA REV2

Il Direttore del Laboratorio
Dott.Geol.Valerio Manzon

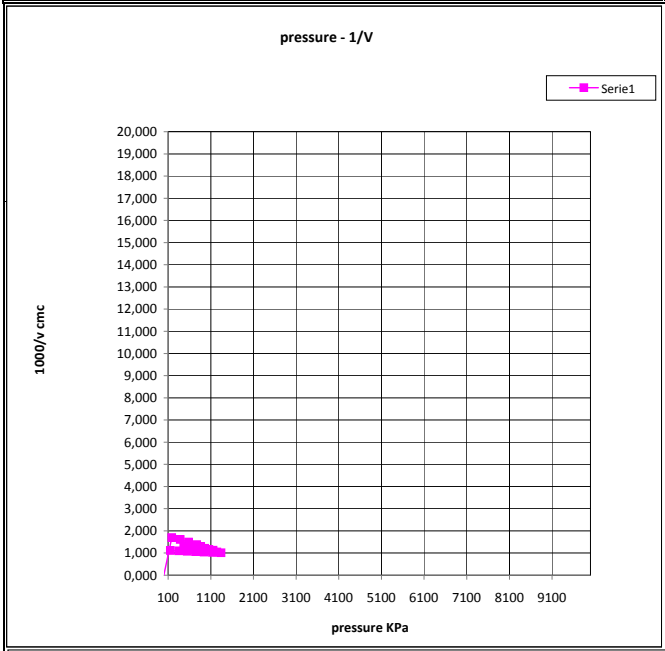
i.m.o.s. s.r.l.	DILATOMETRIC ROCK TEST DRT					mod DVT	rev. 1
	borehole	S1GALL bis	probe depth m	5,5		code	1
	Client:	ITALFERR S.P.A.			job 1714	v. accept.	1714SIT
	Project	RADDOPPIO TERMOLI-RIPALTA (Lotti 2 e 3)				report	1714SIT 15 DRT
		coordinates		EAST			
	site	CAMPOMARINO		NORTH		date 06.12.17	pag 3/3

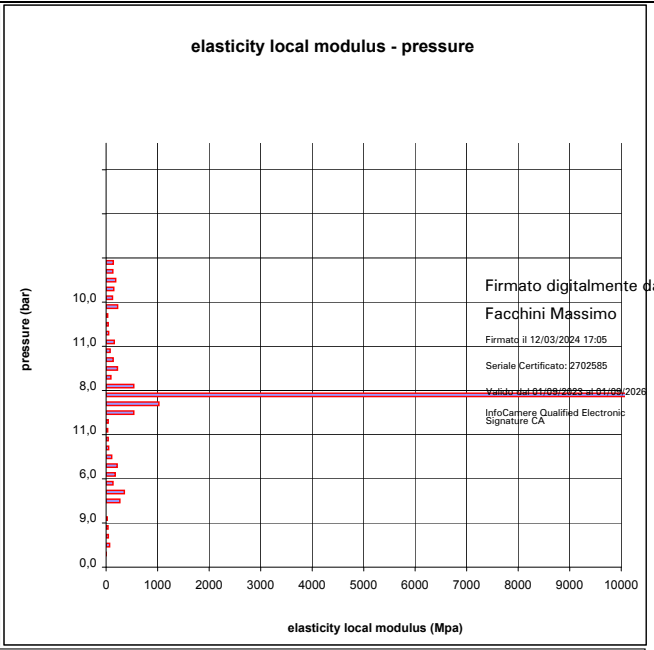
DILATOMETRIC ROCK TEST WITH VOLUME CHANGE MEASUREMENTS - ISRM 1987

PLACE

SECTION

da inserire





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measured
dott. geol. M.Agostini

Il Direttore del Laboratorio
Dott.Geol.Valerio Manzon

i.m.o.s. s.r.l.	**DILATOMETRIC ROCK TEST DRT**			mod DVT	rev. 2
borehole	**S1GALL bis**	probe depth m	**11,0**	code	**2**
Client:	**ITALFERR S.P.A.**	job	1714	v. accept.	1714SIT
Project	RADDOPPIO TERMOLI-RIPALTA (Lotti 2 e 3)	report	**1714SIT 16 DRT**		
coordinates		EAST			
site	CAMPOMARINO	NORTH	date 06.12.17	pag	1/3

DILATOMETRIC ROCK TEST WITH VOLUME CHANGE MEASUREMENTS - ISRM 1987

Borehole	**S1GALL bis**		
test	**2**	depth m	11,00
slope (degree)	90	core barrell	
Device:	CSM Type GEODV03 95 mm		
Orientation capteur	C1=	Standard method:	ISRM 1987
Probe diam	95 MM	Borehole diam	101 MM
Meteo		Temperatur e	
lithotype	SABBIE DEBOLM. LIMOSE ROSSASTRE MOLTO ADDENSATE		
water table		POCKET PENETRO METER	

Creep test P (Bars) =

Temps min	PBAR	MM
1		
2		
3		
4		
5		

PROBE SCHEME

rod adaptor
electronic device
double action piston
expandable cylinder

PROBE CALIBRATION

probe	GEODV03 CSM TYPE
membrane	CAUCCIU' ARMATO
measure cell height (cm)	
V0 cell volume at rest (cmc)	3457
lenght cable (mt)	50
Volume initial Vi (cmc)	349
diam calibration tube (cm)	10,1
tube calibration volume cmc	3806

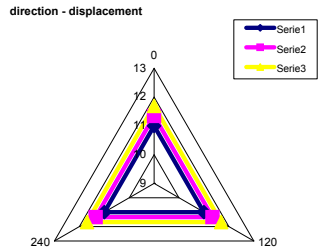
Calibration in air

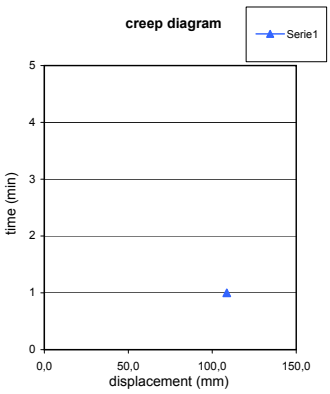
coeff *m*	0,0011	bar /cmc

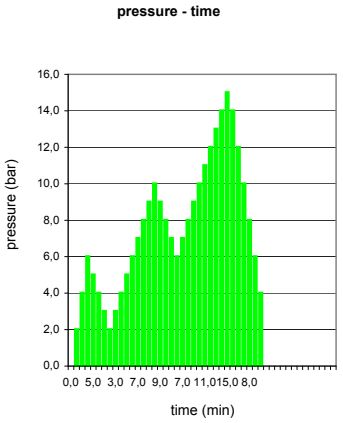
Confined calibration

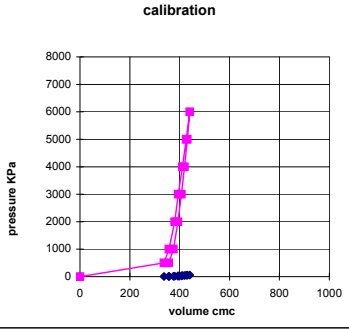
first load	1,45	cmc/bar
unload	1,11	cmc/bar

LITHOTYPE









time	P	Pcorr	Vol	ε c	1/V	diameter	Dil. Diam	Modulo
min	bar	Kpa	cmc	%	1000/cmc	(mm)	(mm)	MPa
0	0,0	0	0,0	-8,512	0,000	96,273	0,000	0,0
1	**2,0**	**233**	**673,2**	**0,000**	**1,485**	**105,230**	**8,957**	**3,4**
2	4,0	431	690,4	0,208	1,448	105,449	9,176	123,9
3	6,0	627	724,6	0,620	1,380	105,883	9,610	62,1
4	5,0	527	724,5	0,619	1,380	105,882	9,608	10969,9
5	4,0	428	720,4	0,570	1,388	105,830	9,556	263,9
6	3,0	328	716,3	0,520	1,396	105,778	9,505	263,6
7	2,0	228	714,2	0,495	1,400	105,751	9,478	515,6
8	3,0	328	717,3	0,532	1,394	105,791	9,517	348,8
9	4,0	428	720,4	0,570	1,388	105,830	9,556	349,1
10	5,0	527	728,5	0,667	1,373	105,932	9,659	133,0
11	6,0	625	739,6	0,801	1,352	106,073	9,799	96,9
12	7,0	722	765,7	1,114	1,306	106,402	10,129	40,7
13	8,0	820	786,8	1,366	1,271	106,668	10,394	50,9
14	9,0	919	797,9	1,498	1,253	106,807	10,534	98,3
15	10,0	1015	827,0	1,845	1,209	107,172	10,898	36,9
16	9,0	916	825,9	1,832	1,211	107,158	10,884	1012,0
17	8,0	816	821,8	1,783	1,217	107,107	18	270,3
18	7,0	717	815,7	1,710	1,226	107,030	10,757	181,0
19	6,0	617	808,6	1,626	1,237	106,941	10,668	155,1
20	7,0	717	814,7	1,698	1,227	107,018	10,744	180,7
21	8,0	816	821,8	1,783	1,217	107,107	10,833	155,3
22	9,0	915	826,9	1,844	1,209	107,170	10,897	217,0
23	10,0	1014	837,0	1,964	1,195	107,297	11,023	109,1
24	11,0	1112	858,1	2,214	1,165	107,560	11,286	51,8
25	12,0	1209	884,2	2,522	1,131	107,885	11,611	41,8
26	13,0	1305	914,3	2,877	1,094	108,258	11,985	36,3
27	14,0	1403	939,4	3,172	1,065	108,568	12,295	44,1
28	**15,0**	**1499**	**971,5**	**3,548**	**1,029**	**108,964**	**12,690**	**34,4**
29	14,0	1399	971,4	3,547	1,029	108,963	12,689	11617,6
30	12,0	1200	965,2	3,474	1,036	108,886	12,613	370,0
31	10,0	1001	955,0	3,355	1,047	108,761	12,487	223,9
32	8,0	802	944,8	3,235	1,058	108,635	12,362	223,4
33	6,0	604	924,6	2,998	1,082	108,386	12,112	111,8
34	4,0	407	898,4	2,690	1,113	108,061	11,788	85,4

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Facchini Massimo
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valori diametrali sono calcolati come valore medio della sonda cillindrica a espansione

FIELD LIMITS

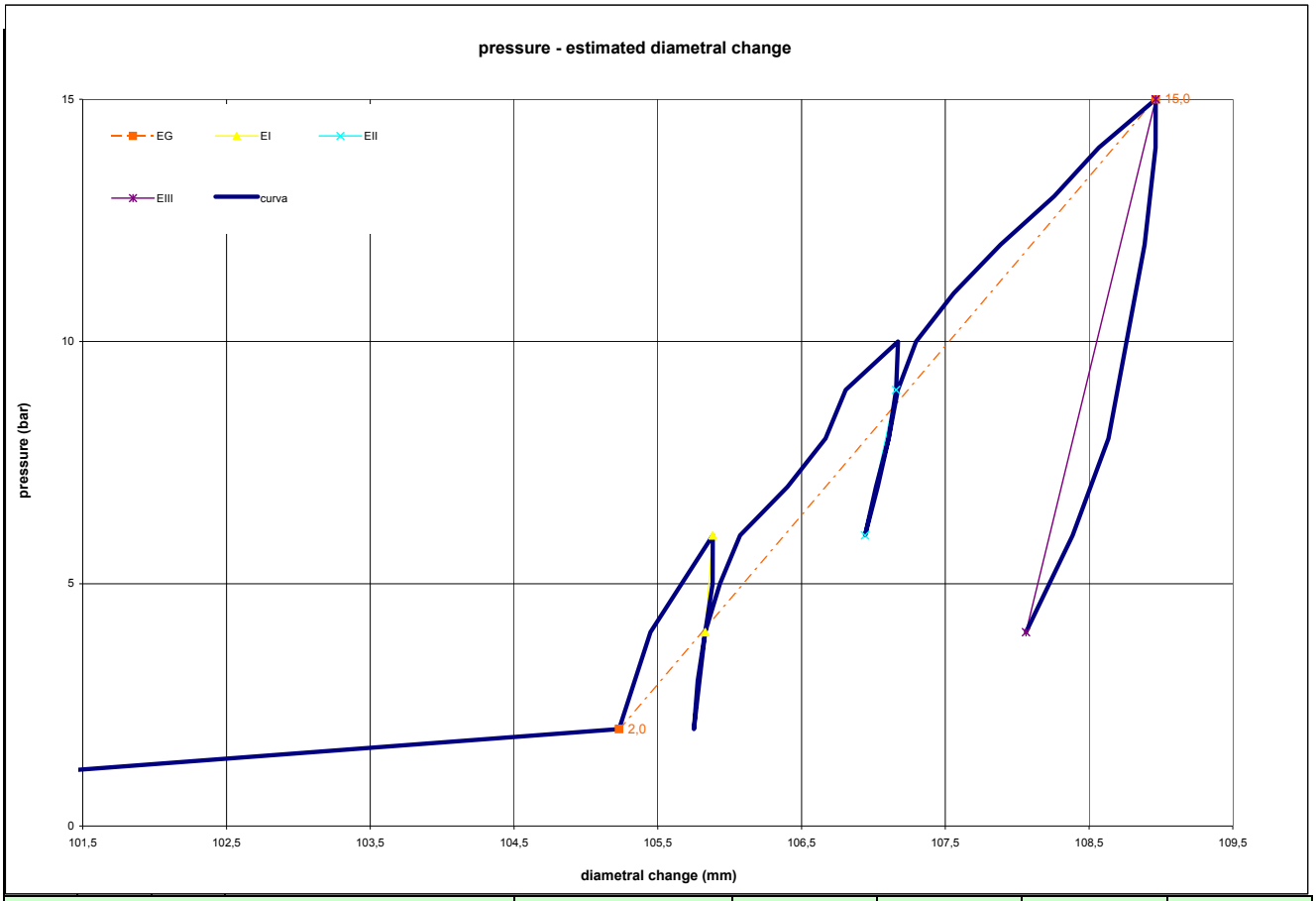
	P	P corr	V corr	creep	1000/V	diameter	Dil. Diam	loop
min	2,0	233,0	673,2	0,0	1,5	105,2	9,0	primo
max	15,0	1498,8	971,5	3,5	1,0	109,0	12,7	carico
max	6,0	627,1	724,6	0,6	1,4	105,9	9,6	I
min	4,0	427,6	720,4	0,6	1,4	105,8	9,6	
max	9,0	915,5	825,9	1,8	1,2	107,2	10,9	II
min	6,0	617,5	808,6	1,6	1,2	106,9	10,7	
max	15,0	1498,8	971,5	3,5	1,0	109,0	12,7	III
min	4,0	407,2	898,4	2,7	1,1	108,1	11,8	

measured
dott. geol. M.Agostini

Il Direttore del Laboratorio
Dott.Geol.Valerio Manzon

	DILATOMETRIC ROCK TEST DRT				mod DVT rev. 1
	borehole	S1GALL bis	probe depth m	11,0	code 2
	Client:	ITALFERR S.P.A.	job 1714	v. accept.	1714SIT
	Project	RADDOPPIO **TERMOLI-RIPALTA (Lotti 2 e 3)**		report	1714SIT 16 DRT
		coordinates	EAST		
	site	CAMPOMARINO	NORTH	date 06.12.17	pag 2/3

DILATOMETRIC ROCK TEST WITH VOLUME CHANGE MEASUREMENTS - ISRM 1987



DATA PROCESSING						SENSOR 1	SENSOR 2	SENSOR 3	SENSOR AVE
			ELASTICITY MODULUS Ei						
Legend:	DATA		loop	Pmax	Pmin	E1 (Mpa)	E2 (Mpa)	E3 (Mpa)	Eav (Mpa)
H = test depth	symbol	datum	1	6,00	4,00				513
W = water table depth	γnsoil	2,2	2	9,00	6,00				188
ν = Poisson ratio	W (ml)	11,0	3	15,00	4,00				165
vo = cell initial volume	ν	0,3	4						
do =cell initial diameter	vo (cmc)	3457	5						
Φ = borehole wall diameter	do (mm)	96,27	DEFORMATION MODULUS Ti						
Po = start pressure	σv (kPa)	242	loop	Pmax	Pmin	T1 (Mpa)	T2 (Mpa)	T3 (Mpa)	Tm (Mpa)
Pmax = max loop pressure (MPa)			1	6,00	2,00				83
Pmin = min loop pressure (MPa)			2	9,00	6,00				31
d max displacement at P max			3	15,00	9,00				44
d min displacement at P min			4						
σv vertical total stress estimated			5						
ε c = dR / Ro			GLOBAL DEFORMATION MODULUS EG						
ELASTICITY MODULUS Ei	ELASTICITY MODULUS Ey estimated			Pmax	Pmin	EG1 (Mpa)	EG2 (Mpa)	EG3 (Mpa)	EG Gm (Mpa)
Ei = (1+ ν) Φ Pax - Pmin	Ey= (EII+EIII)/2			15,00	2,00				46
dmax - dmin	Ey= EIII		DIAMETER			F	F	F	F
			beginning diameter (mm)						105,230
DEFORMATION MODULUS Ti			final diameter (mm)						108,964
Ti = (1+ ν) Φ Pi - Pi-1			range mm						3,734
Xi - Xi-1			DM loop minimun displacement			DILATOMETRIC AND GEOTECHNICAL ESTIMATED PARAMETERS			
	Pbar	C1	C2	C3	Cm	Po initial pressure (KPa)	233	**EG** (MPa)	**46**
GLOBAL DEFORMATION MODULUS EG	bar	0	120	240	0	Pf creep pressure (KPa)	1499	**E3** (MPa)	**165**
EG = (1+ ν) Φ Pmax - Po	6,0	10,997	10,997	10,997	9,610	PL limit pres. (KPa) Cassan >	2429	E/P'L	20,52
dmax - do						PL' net limit pres (KPa) >	2260	EG/Ey	0,28
note: RAGGIUNTI I LIMITI DI DEFORMAZIONE DELLO STRUMENTO						Ko lateral coeff at rest (KPa)	0,70	**cu** coesion (KPa) johnson	
						Pho lateral pressure (KPa)	169	**ϕ** friction angle (°) >	

Firmato digitalmente da: Facchini Massimo
Firmato il 12/03/2024 17:05
Seriale Certificato: 2702585
Valido dal 01/09/2023 al 01/09/2026
InfoCamere Qualified Electronic Signature CA

measured
dott. geol. M.Agostini

1714SIT16 CAMPOMARINO S1GALLbis mt 11,0 GEODV03 165 MPA REV2

Il Direttore del Laboratorio
Dott.Geol.Valerio Manzon

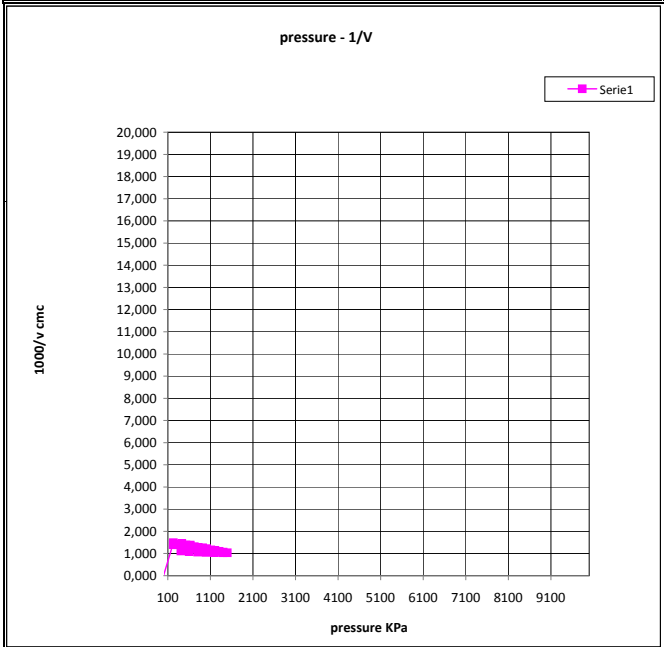
	DILATOMETRIC ROCK TEST DRT				mod DVT	rev. 1
	borehole	S1GALL bis	probe depth m	11,0	code	2
	Client:	ITALFERR S.P.A.	job	1714	v. accept.	1714SIT
	Project	RADDOPPIO TERMOLI-RIPALTA (Lotti 2 e 3)			report	1714SIT 16 DRT
		coordinates	EAST			
	site	CAMPOMARINO	NORTH		date	06.12.17 pag 3/3

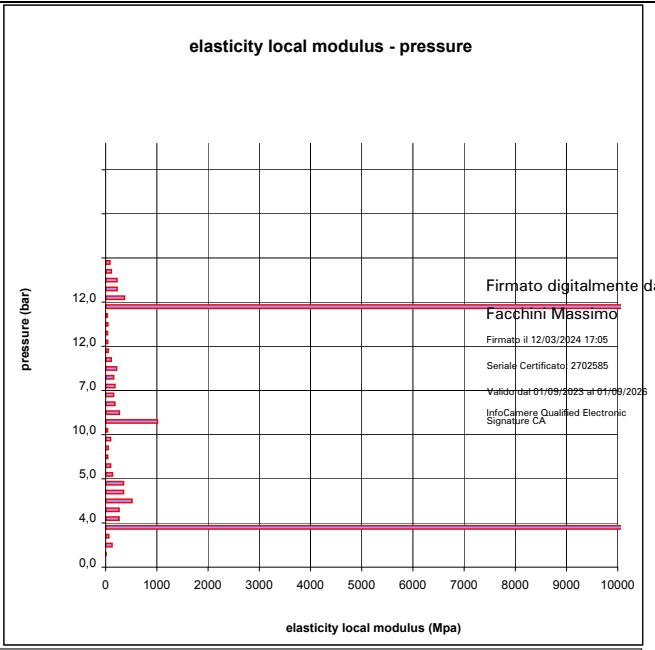
DILATOMETRIC ROCK TEST WITH VOLUME CHANGE MEASUREMENTS - ISRM 1987

PLACE

SECTION

da inserire





Firmato digitalmente da:
Facchini Massimo
Firmato il 12/03/2024 17:05
Seriale Certificato: 2702585
Valido dal 01/09/2023 al 01/09/2025
InfoCamere Qualified Electronic Signature CA

measured
dott. geol. M.Agostini

Il Direttore del Laboratorio
Dott.Geol.Valerio Manzon

Sede: Via Monsignor Bologna, 18 - CAMPOBASSO
Stabilimento: C.da S.Maria delle Macchie - Vinchiaturo (CB)
Tel. 0874/340003-16 **Fax**: 0874/340014
P.IVA e Cod. Fiscale: 00717630701
web: www.imosgeo.it

S1 GALL

Firmato digitalmente da:
Facchini Massimo
Firmato il 12/03/2024 17:05
Seriale Certificato: 2702585
Valido dal 01/09/2023 al 01/09/2026
InfoCamere Qualified Electronic Signature CA

i.m.o.s. s.r.l.	DILATOMETRIC ROCK TEST DRT				mod DVT rev. 1
	borehole S1GALL	probe depth m 30,0		code 1	
	Client: ITALFERR S.P.A.		job 1714	v. accept. 1714SIT	
	Project COLLEGAMENTO CAMPOMARINO-RIPALTA			report 1714SIT 01 DRT	
		coordinates	EAST		
	site CAMPOMARINO		NORTH	date 15.06.17	pag 1/3

DILATOMETRIC ROCK TEST WITH VOLUME CHANGE MEASUREMENTS - ISRM 1987

Borehole	S1GALL
test 1	depth m 30,00
slope (degree) 90	core barrell
Device: CSM Type GEODV03 95 mm	
Orientation capteur C1=	Standard method: ISRM 1987
Probe diam 95 MM	Borehole diam 101 MM
Meteo	Temperatur e
lithotype	SABBIA LIMOSA BEIGE DA ADDENSATA A DEB, CEMENTATA
water table	POCKET PENETRO METER

Creep test P (Bars) = 48,0

Temps min	PBAR	MM
1	48,0	110,727
2	48,0	110,744
3	48,0	110,750
4	48,0	110,756
5	48,0	110,762

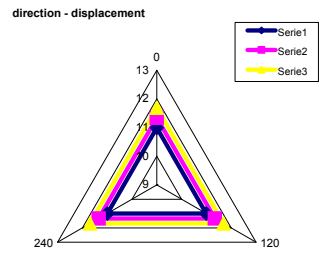
PROBE SCHEME

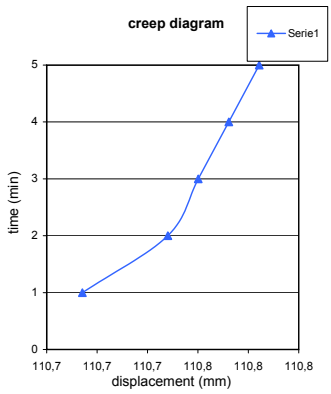
rod adaptor
electronic device
double action piston
expandable cylinder

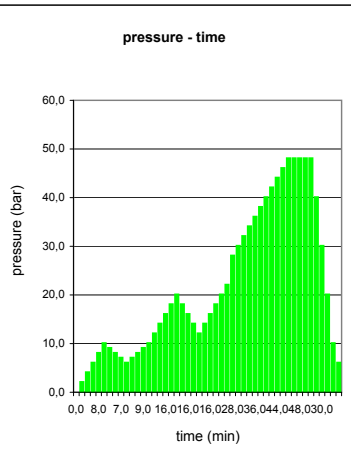
PROBE CALIBRATION

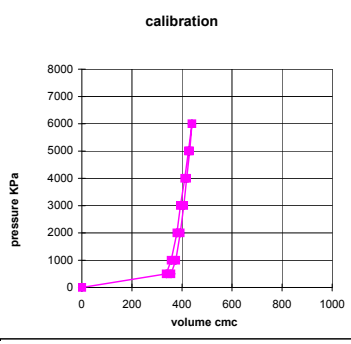
probe	GEODV03 CSM TYPE
membrane	CAUCCIU' ARMATO
measure cell height (cm)	
V0 cell volume at rest (cmc)	3457
lenght cable (mt)	50
Volume initial Vi (cmc)	349
diam calibration tube (cm)	10,1
tube calibration volume cmc	3806
Calibration in air	
coeff *m*	0,06 cmc/Kpa
Confined calibration	
first load	66 Kpa/cmc
unload	85 Kpa/cmc

LITHOTYPE









time	P	Pcorr	Vol	ε c	1/V	diameter	Dil. Diam	Modulo
min	bar	Kpa	cmc	%	1000/cmc	(mm)	(mm)	MPa
0	0,0	0	0,0	-7,636	0,000	96,273	0,000	0,0
1	**2,0**	**471**	**413,6**	**-2,267**	**2,418**	**101,870**	**5,597**	**10,4**
2	4,0	662	502,3	-1,154	1,991	103,030	6,757	21,1
3	6,0	855	551,9	-0,536	1,812	103,674	7,400	38,7
4	8,0	1049	595,3	0,000	1,680	104,233	7,959	45,0
5	10,0	1243	625,2	0,369	1,599	104,617	8,344	66,0
6	9,0	1145	628,0	0,403	1,592	104,653	8,379	-360,6
7	8,0	1047	621,3	0,320	1,610	104,567	8,293	148,2
8	7,0	950	611,7	0,203	1,635	104,445	8,171	104,3
9	6,0	853	591,9	-0,041	1,689	104,190	7,916	49,6
10	7,0	950	602,7	0,092	1,659	104,329	8,055	91,2
11	8,0	1047	612,6	0,213	1,632	104,455	8,182	100,8
12	9,0	1145	619,3	0,296	1,615	104,541	8,268	147,9
13	10,0	1243	628,2	0,406	1,592	104,656	8,382	111,5
14	12,0	1437	661,8	0,818	1,511	105,086	8,812	59,2
15	14,0	1631	685,5	1,107	1,459	105,387	9,113	85,0
16	16,0	1826	703,5	1,327	1,421	105,616	9,342	112,2
17	18,0	2021	721,7	1,548	1,386	105,846	18	112,0
18	20,0	2217	732,4	1,678	1,365	105,982	9,708	190,3
19	18,0	2021	731,2	1,663	1,368	105,966	9,693	1655,2
20	16,0	1825	724,1	1,577	1,381	105,877	9,604	290,7
21	14,0	1630	707,5	1,375	1,413	105,666	9,393	122,3
22	12,0	1435	688,8	1,148	1,452	105,429	9,156	108,6
23	14,0	1630	705,1	1,346	1,418	105,636	9,362	124,8
24	16,0	1825	718,5	1,509	1,392	105,806	9,533	151,4
25	18,0	2021	733,6	1,692	1,363	105,997	9,723	135,7
26	20,0	2216	738,4	1,751	1,354	106,058	9,784	424,0
27	22,0	2411	757,9	1,987	1,319	106,304	10,031	104,9
28	28,0	2997	801,6	2,514	1,248	106,853	10,580	142,2
29	30,0	3192	812,2	2,642	1,231	106,986	10,713	195,8
30	32,0	3388	822,8	2,770	1,215	107,120	10,846	196,3
31	**34,0**	**3582**	**846,5**	**3,053**	**1,181**	**107,415**	**11,142**	**88,3**
32	36,0	3777	874,0	3,382	1,144	107,758	11,485	76,2
33	38,0	3970	917,2	3,896	1,090	108,294	12,020	48,8
34	40,0	4164	948,6	4,269	1,054	108,682	12,409	67,8
35	42,0	4358	981,3	4,655	1,019	109,085	12,812	65,5
36	44,0	4552	1015,4	5,056	0,985	109,503	13,229	63,5
37	46,0	4745	1065,7	5,645	0,938	110,117	13,844	43,1
38	48,0	4938	1116,0	6,231	0,896	110,727	14,454	43,7
39	48,0	4938	1117,4	6,247	0,895	110,744	14,471	-0,7
40	48,0	4938	1117,9	6,253	0,895	110,750	14,477	-0,7
41	48,0	4938	1118,4	6,258	0,894	110,756	14,483	-0,7
42	48,0	4938	1118,9	6,264	0,894	110,762	14,489	-0,7
43	40,0	4156	1094,0	5,975	0,914	110,461	14,187	359,2
44	30,0	3177	1062,3	5,605	0,941	110,076	13,802	349,9
45	20,0	2201	985,6	4,705	1,015	109,127	12,853	142,5
46	10,0	1227	886,2	3,528	1,128	107,940	11,666	107,7
47	6,0	838	839,9	2,974	1,191	107,333	11,060	90,9

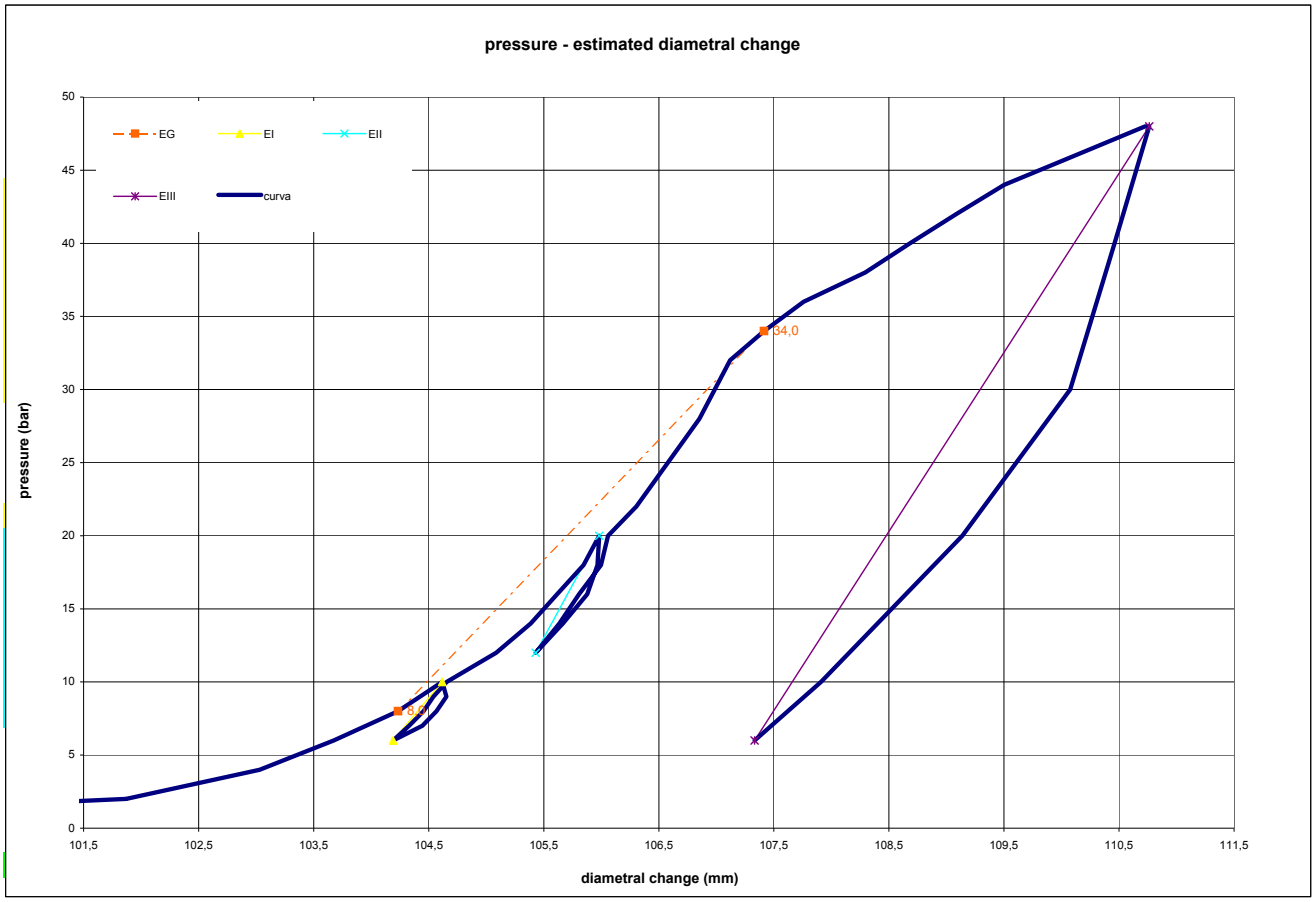
valori diametrali sono calcolati come valore medio della sonda cillindrica in espansione

FIELD LIMITS

	P	P corr	V corr	creep	1000/V	diameter	Dil. Diam	loop
min	8,0	1048,5	595,3	0,0	1,7	104,2	8,0	primo
max	34,0	3582,2	846,5	3,1	1,2	107,4	11,1	carico
max	10,0	1242,8	625,2	0,4	1,6	104,6	8,3	I
min	6,0	852,7	591,9	0,0	1,7	104,2	7,9	
max	20,0	2216,6	732,4	1,7	1,4	106,0	9,7	II
min	12,0	1435,0	688,8	1,1	1,5	105,4	9,2	
max	48,0	4938,3	1118,9	6,3	0,9	110,8	14,5	III
min	6,0	837,8	839,9	3,0	1,2	107,3	11,1	

i.m.o.s. s.r.l.	DILATOMETRIC ROCK TEST DRT				mod DVT rev. 1
	borehole	S1GALL	probe depth m	30,0	code 1
	Client:	ITALFERR S.P.A.	job 1714	v. accept.	1714SIT
	Project	COLLEGAMENTO CAMPOMARINO-RIPALTA		report	1714SIT 01 DRT
		coordinates	EAST		
	site	CAMPOMARINO	NORTH	date 15.06.17	pag 2/3

DILATOMETRIC ROCK TEST WITH VOLUME CHANGE MEASUREMENTS - ISRM 1987



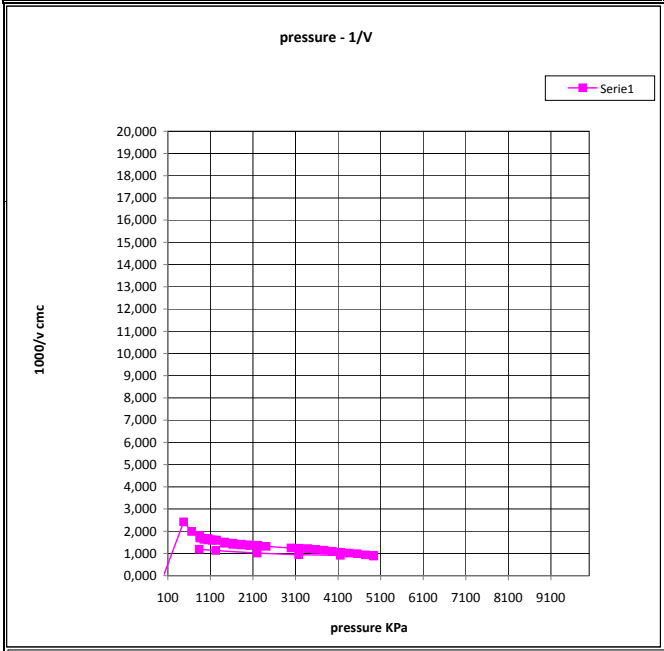
DATA PROCESSING						SENSOR 1	SENSOR 2	SENSOR 3	SENSOR AVE
			ELASTICITY MODULUS Ei						
Legend:	DATA		loop	Pmax	Pmin	E1 (Mpa)	E2 (Mpa)	E3 (Mpa)	Eav (Mpa)
H = test depth	symbol	datum	1	10,00	6,00				119
W = water table depth	γnsoil	2,5	2	20,00	12,00				184
ν = Poisson ratio	W (ml)	30,0	3	48,00	6,00				156
vo = cell initial volume	ν	0,25	4						
do =cell initial diameter	vo (cmc)	3457	5						
Φ = borehole wall diameter	do (mm)	96,27	DEFORMATION MODULUS Ti						
Po = start pressure	σv (kPa)	750	loop	Pmax	Pmin	T1 (Mpa)	T2 (Mpa)	T3 (Mpa)	Tm (Mpa)
Pmax = max loop pressure (MPa)			1	10,00	8,00				66
Pmin = min loop pressure (MPa)			2	20,00	10,00				93
d max displacement at P max			3	48,00	20,00				74
d min displacement at P min			4						
σv vertical total stress estimated			5						
ε c = dR / Ro			GLOBAL DEFORMATION MODULUS EG						
ELASTICITY MODULUS Ei	ELASTICITY MODULUS Ey estimated			Pmax	Pmin	EG1 (Mpa)	EG2 (Mpa)	EG3 (Mpa)	EG Ave (Mpa)
Ei = (1+ ν) Φ Pax - Pmin	Ey= (EII+EIII)/2			34,00	8,00				104
dmax - dmin	Ey= EIII		DIAMETER			F	F	F	F
			beginning diameter (mm)						104,233
DEFORMATION MODULUS Ti			final diameter (mm)						110,762
Ti = (1+ ν) Φ Pi - Pi-1			range mm						6,529
Xi - Xi-1			DM loop minimun displacement			DILATOMETRIC AND GEOTECHNICAL ESTIMATED PARAMETERS			
	Pbar	C1	C2	C3	Cm	Po initial pressure (KPa)	1049	**EG** (MPa)	**104**
GLOBAL DEFORMATION MODULUS EG	bar	0	120	240	0	Pf creep pressure (KPa)	3582	**E3** (MPa)	**156**
EG = (1+ ν) Φ Pmax - Po	10,0	10,997	10,997	10,997	8,344	PL limit pres. (KPa) Cassan >	5722	E/P'L	19,96
dmax - do						PL' net limit pres (KPa) >	5197	EG/Ey	0,67
note: MATERIALE ASSIMILATO A TERRENO COESIVO						Ko lateral coeff at rest (KPa)	0,70	**cu** coesion (KPa) johnson	**597**
						Pho lateral pressure (KPa)	525	**ϕ** friction angle (°) >	

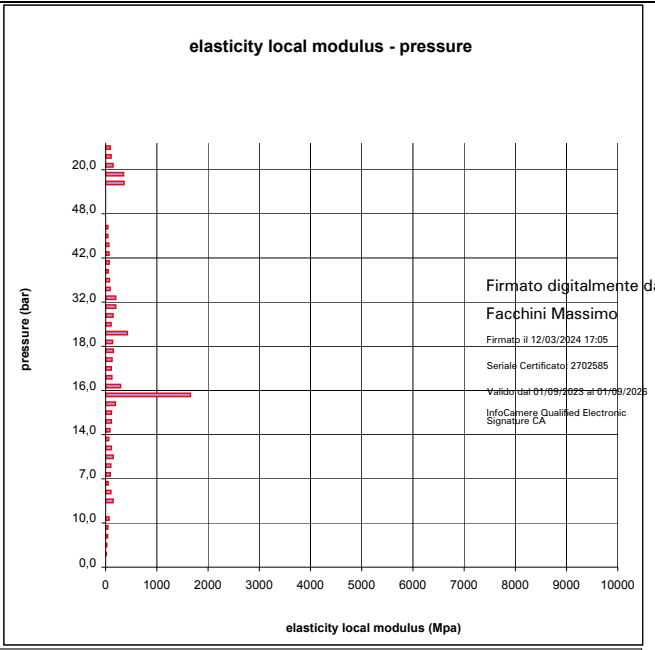
i.m.o.s. s.r.l.	DILATOMETRIC ROCK TEST DRT					mod DVT	rev. 1
	borehole	S1GALL	probe depth m	30,0		code	1
	Client:	ITALFERR S.P.A.			job	1714	v. accept. 1714SIT
	Project	COLLEGAMENTO CAMPOMARINO-RIPALTA				report	1714SIT 01 DRT
		coordinates		EAST			
	site	CAMPOMARINO		NORTH		date	15.06.17 pag 3/3

DILATOMETRIC ROCK TEST WITH VOLUME CHANGE MEASUREMENTS - ISRM 1987

PLACE

SECTION





i.m.o.s. s.r.l.	**DILATOMETRIC ROCK TEST DRT**				mod DVT rev. 1
	borehole	**S1GALL**	**probe depth m**	**40,1**	**code** **2**
	Client:	**ITALFERR S.P.A.**	job	1714	v. accept. 1714SIT
	Project	COLLEGAMENTO CAMPOMARINO-RIPALTA		report	**1714SIT 02 DRT**
		coordinates	EAST		
	site	CAMPOMARINO	NORTH	date	15.06.17 pag 1/3

DILATOMETRIC ROCK TEST WITH VOLUME CHANGE MEASUREMENTS - ISRM 1987

Borehole	**S1GALL**		
test	**2**	depth m	40,05
slope (degree)	90	core barrell	
Device:	CSM Type GEODV03 95 mm		
Orientation capteur	C1=	Standard method:	ISRM 1987
Probe diam	95 MM	Borehole diam	101 MM
Meteo		Temperatur e	
lithotype	Alternanza di strati sabbiosi e arenacei teneri giallo / beige		
water table		POCKET PENETRO METER	

Creep test P (Bars) =

Temps min	PBAR	MM
1		
2		
3		
4		
5		

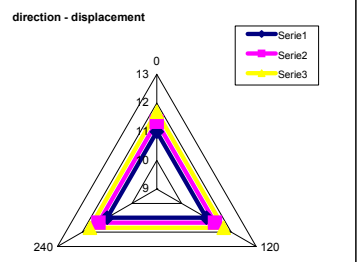
PROBE SCHEME

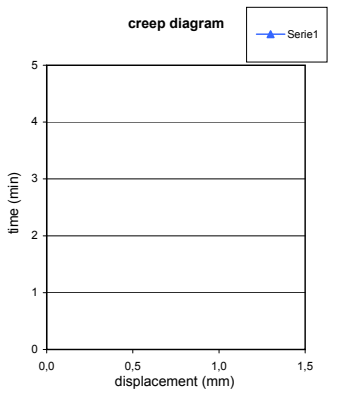
rod adaptor
electronic device
double action piston
expandable cylinder

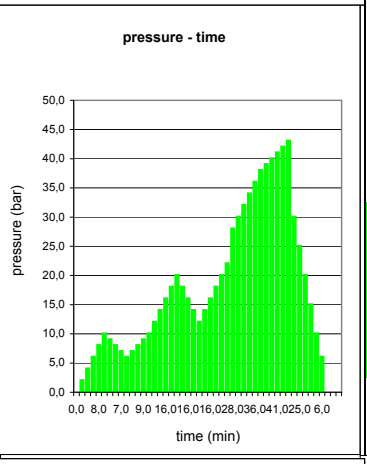
PROBE CALIBRATION

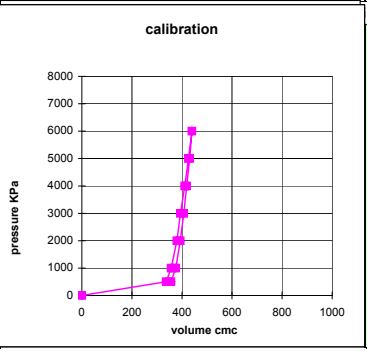
probe	GEODV03 CSM TYPE	
membrane	CAUCCIU' ARMATO	
measure cell height (cm)		
V0 cell volume at rest (cmc)	3457	
lenght cable (mt)	50	
Volume initial Vi (cmc)	349	
diam calibration tube (cm)	10,1	
tube calibration volume cmc	3806	
Calibration in air		
coeff *m*	0,06	cmc/Kpa
Confined calibration		
first load	66	Kpa/cmc
unload	85	Kpa/cmc

LITHOTYPE









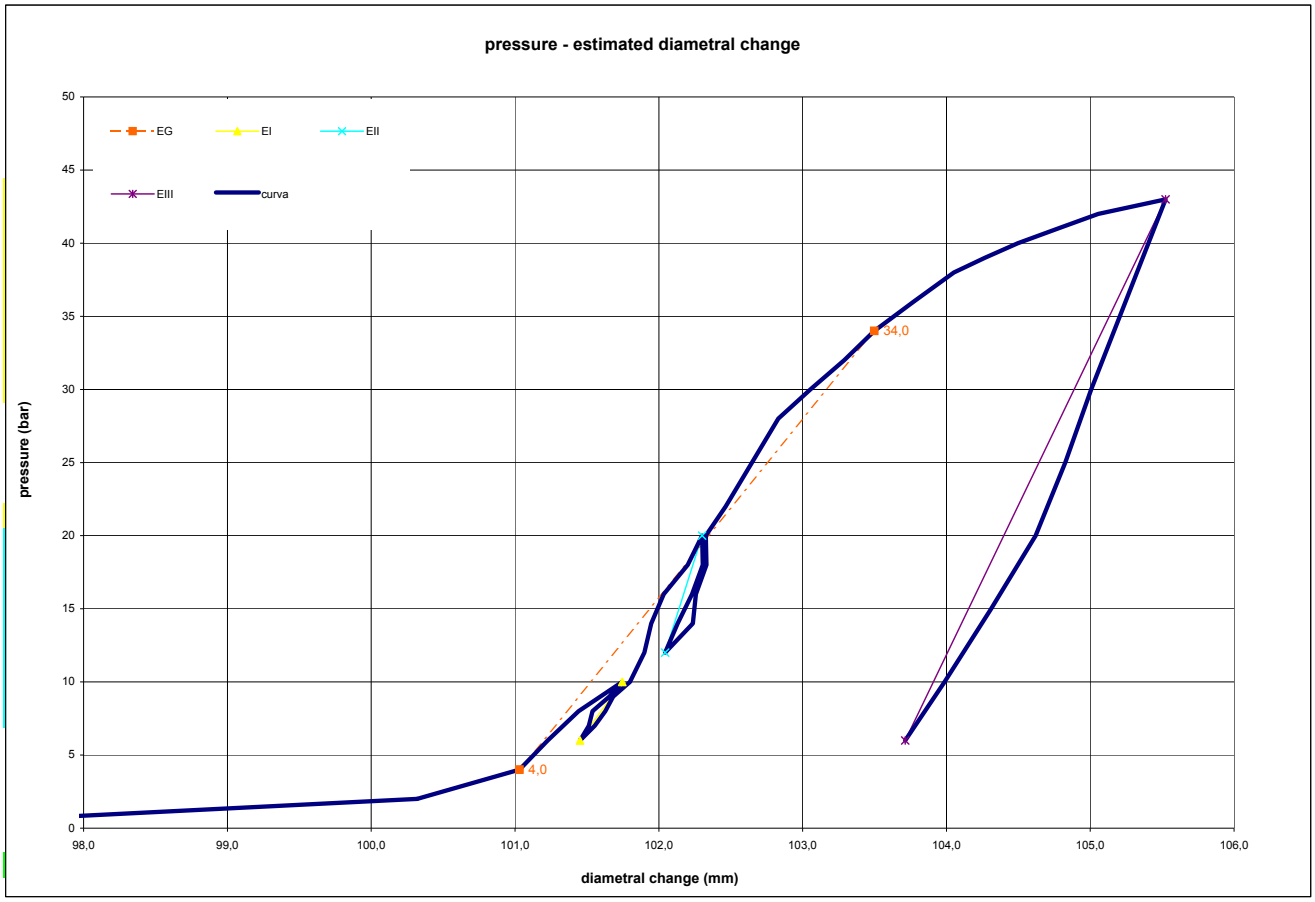
time	P	Pcorr	Vol	ε c	1/V	diameter	Dil. Diam	Modulo
min	bar	Kpa	cmc	%	1000/cmc	(mm)	(mm)	MPa
0	0,0	0	0,0	-4,710	0,000	96,273	0,000	0,0
1	2,0	579	296,6	-0,706	3,371	100,319	4,045	17,6
2	**4,0**	**772**	**350,2**	**0,000**	**2,856**	**101,032**	**4,758**	**34,0**
3	6,0	967	364,9	0,193	2,740	101,227	4,954	126,3
4	8,0	1162	381,2	0,406	2,624	101,442	5,169	115,0
5	10,0	1357	404,2	0,707	2,474	101,746	5,473	81,3
6	9,0	1259	397,4	0,618	2,516	101,656	5,383	138,1
7	8,0	1161	388,5	0,501	2,574	101,538	5,265	105,2
8	7,0	1064	386,5	0,476	2,587	101,513	5,240	490,2
9	6,0	966	381,9	0,416	2,618	101,452	5,179	203,2
10	7,0	1063	389,6	0,517	2,566	101,554	5,281	121,4
11	8,0	1161	395,3	0,590	2,530	101,628	5,355	167,3
12	9,0	1259	399,4	0,644	2,504	101,682	5,409	228,7
13	10,0	1356	408,2	0,759	2,450	101,799	5,525	106,7
14	12,0	1552	415,8	0,859	2,405	101,899	5,626	247,6
15	14,0	1748	419,5	0,906	2,384	101,947	5,674	521,2
16	16,0	1943	426,1	0,992	2,347	102,034	5,761	285,8
17	18,0	2139	438,8	1,157	2,279	102,200	18	150,2
18	20,0	2334	446,4	1,256	2,240	102,300	6,027	249,6
19	18,0	2138	446,8	1,260	2,238	102,305	6,032	-5315,5
20	16,0	1943	441,1	1,187	2,267	102,231	5,958	338,4
21	14,0	1747	433,5	1,088	2,307	102,131	5,858	249,3
22	12,0	1551	426,8	1,002	2,343	102,044	5,770	286,4
23	14,0	1746	441,5	1,192	2,265	102,236	5,962	129,7
24	16,0	1942	443,1	1,213	2,257	102,257	5,984	1164,8
25	18,0	2138	448,8	1,286	2,228	102,331	6,058	338,6
26	20,0	2334	448,4	1,282	2,230	102,327	6,053	-5318,3
27	22,0	2530	458,9	1,418	2,179	102,465	6,191	181,3
28	28,0	3116	487,0	1,780	2,054	102,831	6,557	205,7
29	30,0	3311	504,1	2,001	1,984	103,054	6,780	112,4
30	32,0	3506	522,2	2,235	1,915	103,289	7,016	106,7
31	**34,0**	**3701**	**538,4**	**2,442**	**1,857**	**103,499**	**7,225**	**120,5**
32	36,0	3896	559,5	2,712	1,787	103,772	7,499	92,3
33	38,0	4091	581,2	2,989	1,721	104,051	7,778	90,6
34	39,0	4188	598,0	3,203	1,672	104,268	7,994	58,4
35	40,0	4285	615,8	3,429	1,624	104,497	8,223	55,3
36	41,0	4381	637,6	3,706	1,568	104,776	8,503	45,3
37	42,0	4478	659,4	3,982	1,516	105,055	8,781	45,5
38	43,0	4574	696,3	4,446	1,436	105,524	9,250	26,9
39	30,0	3302	655,6	3,934	1,525	105,006	8,732	323,2
40	25,0	2813	641,5	3,755	1,559	104,826	8,552	356,2
41	20,0	2324	625,4	3,551	1,599	104,620	8,346	310,7
42	15,0	1835	601,3	3,245	1,663	104,310	8,037	206,4
43	10,0	1346	576,2	2,925	1,736	103,987	7,714	196,9
44	6,0	955	554,9	2,654	1,802	103,715	7,442	184,7

valori diametrali sono calcolati come valore medio della sonda cillindrica in espansione

FIELD LIMITS	P	P corr	V corr	creep	1000/V	diameter	Dil. Diam	loop
min	4,0	771,6	350,2	0,0	2,9	101,0	4,8	primo
max	34,0	3701,2	538,4	2,4	1,9	103,5	7,2	carico
max	10,0	1356,5	404,2	0,7	2,5	101,7	5,5	I
min	6,0	965,8	381,9	0,4	2,6	101,5	5,2	
max	20,0	2334,3	446,4	1,3	2,2	102,3	6,0	II
min	12,0	1551,2	426,8	1,0	2,3	102,0	5,8	
max	43,0	4574,0	696,3	4,4	1,4	105,5	9,3	III
min	6,0	955,4	554,9	2,7	1,8	103,7	7,4	

i.m.o.s. s.r.l.	DILATOMETRIC ROCK TEST DRT				mod DVT rev. 1
	borehole	S1GALL	probe depth m	40,1	code 2
	Client:	ITALFERR S.P.A.	job 1714	v. accept.	1714SIT
	Project	COLLEGAMENTO CAMPOMARINO-RIPALTA		report	1714SIT 02 DRT
		coordinates	EAST		
	site	CAMPOMARINO	NORTH	date 15.06.17	pag 2/3

DILATOMETRIC ROCK TEST WITH VOLUME CHANGE MEASUREMENTS - ISRM 1987



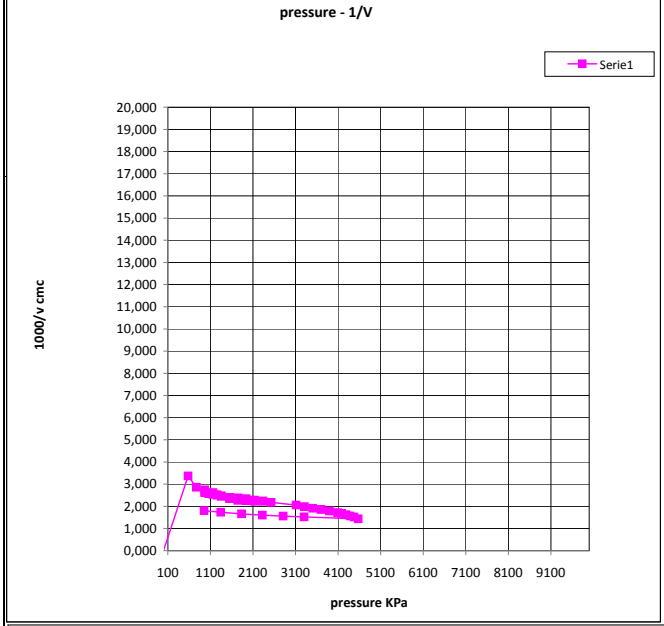
DATA PROCESSING						SENSOR 1	SENSOR 2	SENSOR 3	SENSOR AVE
			ELASTICITY MODULUS Ei						
Legend:	DATA		loop	Pmax	Pmin	E1 (Mpa)	E2 (Mpa)	E3 (Mpa)	Eav (Mpa)
H = test depth	symbol	datum	1	10,00	6,00				168
W = water table depth	γnsoil	2,5	2	20,00	12,00				385
ν = Poisson ratio	W (ml)	40,1	3	43,00	6,00				252
vo = cell initial volume	ν	0,25	4						
do =cell initial diameter	vo (cmc)	3457	5						
Φ = borehole wall diameter	do (mm)	96,27	DEFORMATION MODULUS Ti						
Po = start pressure	σv (kPa)	1001	loop	Pmax	Pmin	T1 (Mpa)	T2 (Mpa)	T3 (Mpa)	Tm (Mpa)
Pmax = max loop pressure (MPa)			1	10,00	4,00				103
Pmin = min loop pressure (MPa)			2	20,00	10,00				223
d max displacement at P max			3	43,00	20,00				38
d min displacement at P min			4						
σv vertical total stress estimated			5						
ε c = dR / Ro			GLOBAL DEFORMATION MODULUS EG						
ELASTICITY MODULUS Ei	ELASTICITY MODULUS Ey estimated			Pmax	Pmin	EG1 (Mpa)	EG2 (Mpa)	EG3 (Mpa)	EG Av (Mpa)
Ei = (1+ ν) Φ Pax - Pmin	Ey= (EII+EIII)/2			34,00	4,00				150
dmax - dmin	Ey= EIII		DIAMETER			F	F	F	F
			beginning diameter (mm)						101,032
DEFORMATION MODULUS Ti			final diameter (mm)						105,524
Ti = (1+ ν) Φ Pi - Pi-1			range mm						4,492
Xi - Xi-1			DM loop minimun displacement			DILATOMETRIC AND GEOTECHNICAL ESTIMATED PARAMETERS			
	Pbar	C1	C2	C3	Cm	Po initial pressure (KPa)	772	**EG** (MPa)	**150**
GLOBAL DEFORMATION MODULUS EG	bar	0	120	240	0	Pf creep pressure (KPa)	3701	**E3** (MPa)	**252**
EG = (1+ ν) Φ Pmax - Po	10,0	10,997	10,997	10,997	5,473	PL limit pres. (KPa) Cassan >	5801	E/P'L	29,40
dmax - do						PL' net limit pres (KPa) >	5101	EG/Ey	0,59
note: MATERIALE ASSIMILATO A TERRENO COESIVO						Ko lateral coeff at rest (KPa)	0,70	**cu** coesion (KPa) johnson	**605**
						Pho lateral pressure (KPa)	701	**ϕ** friction angle (°) >	

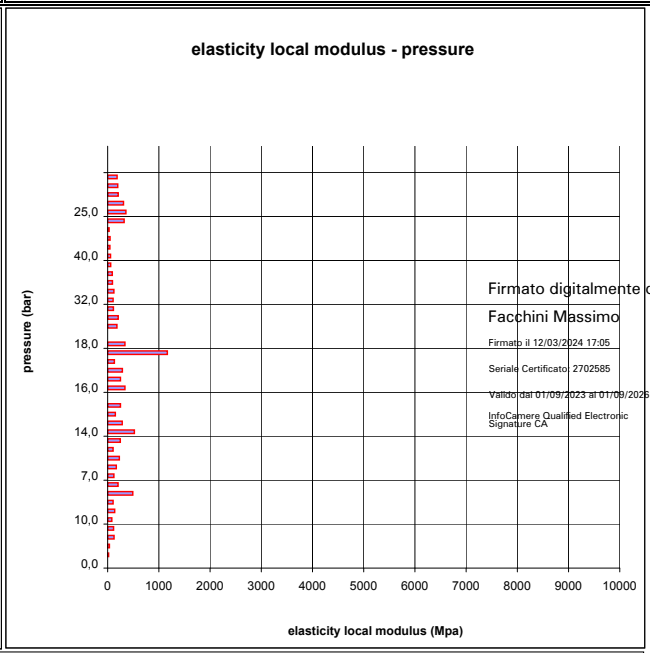
i.m.o.s. s.r.l.	DILATOMETRIC ROCK TEST DRT					mod DVT	rev. 1
	borehole	S1GALL	probe depth m	40,1		code	2
	Client:	ITALFERR S.P.A.			job	1714	v. accept. 1714SIT
	Project	COLLEGAMENTO CAMPOMARINO-RIPALTA				report	1714SIT 02 DRT
		coordinates		EAST			
	site	CAMPOMARINO		NORTH		date	15.06.17 pag 3/3

DILATOMETRIC ROCK TEST WITH VOLUME CHANGE MEASUREMENTS - ISRM 1987

PLACE

SECTION





i.m.o.s. s.r.l.	**DILATOMETRIC ROCK TEST DRT**			mod DVT	rev. 1
	borehole S1GALL	**probe depth m** 50,0		**code**	3
	Client: **ITALFERR S.P.A.**		job 1714	v. accept.	1714SIT
	Project COLLEGAMENTO CAMPOMARINO-RIPALTA			report	**1714SIT 03 DRT**
		coordinates	EAST		
	site CAMPOMARINO		NORTH	date 15.06.17	pag 1/3

DILATOMETRIC ROCK TEST WITH VOLUME CHANGE MEASUREMENTS - ISRM 1987

Borehole	**S1GALL**		
test	**3**	depth m	50,00
slope (degree)	90	core barrell	
Device:	CSM Type GEODV03 95 mm		
Orientation capteur	C1=	Standard method:	ISRM 1987
Probe diam	95 MM	Borehole diam	101 MM
Meteo		Temperatur e	
lithotype	sabbie fini limose argillose da addensate a deb.cementate		
water table		POCKET PENETRO METER	

Creep test P (Bars) =

Temps min	PBAR	MM
1		
2		
3		
4		
5		

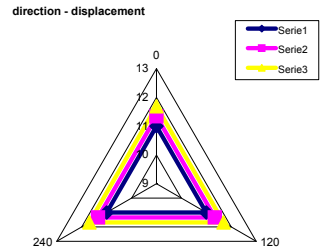
PROBE SCHEME

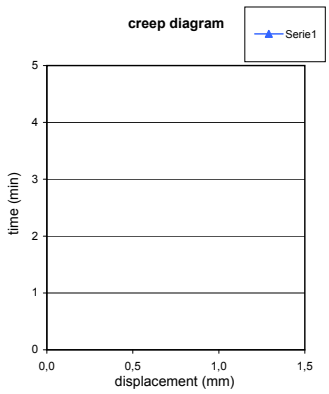
rod adaptor
electronic device
double action piston
expandable cylinder

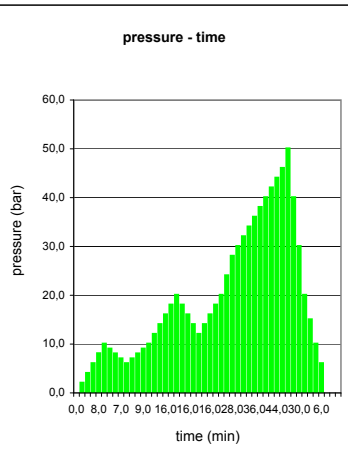
PROBE CALIBRATION

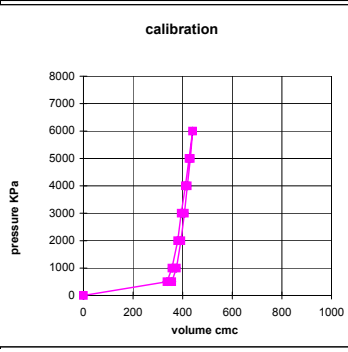
probe	GEODV03 CSM TYPE	
membrane	CAUCCIU' ARMATO	
measure cell height (cm)		
V0 cell volume at rest (cmc)	3457	
lenght cable (mt)	50	
Volume initial Vi (cmc)	349	
diam calibration tube (cm)	10,1	
tube calibration volume cmc	3806	
Calibration in air		
coeff *m*	0,06	cmc/Kpa
Confined calibration		
first load	66	Kpa/cmc
unload	85	Kpa/cmc

LITHOTYPE









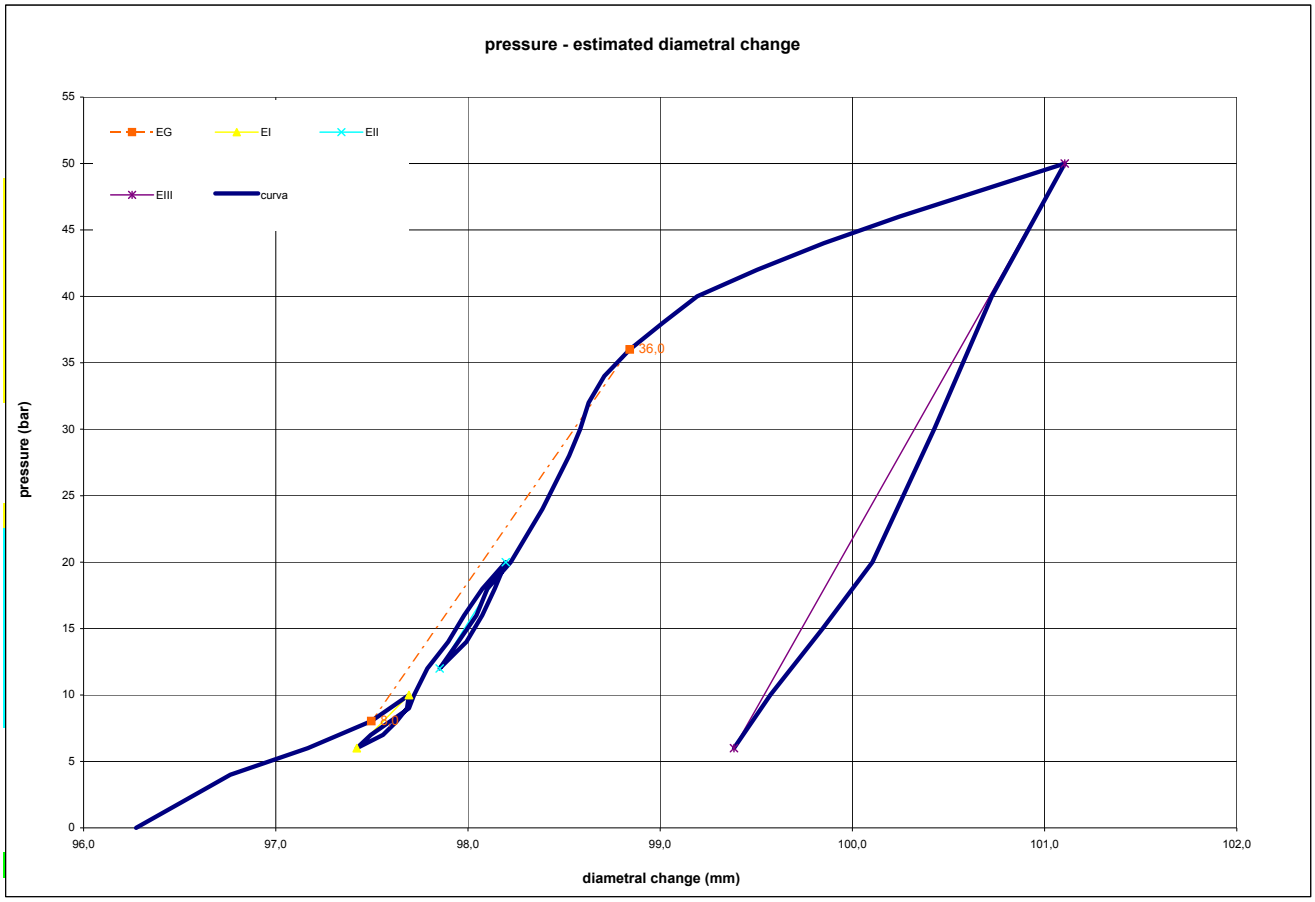
time	P	Pcorr	Vol	ε c	1/V	diameter	Dil. Diam	Modulo
min	bar	Kpa	cmc	%	1000/cmc	(mm)	(mm)	MPa
0	0,0	0	0,0	-1,255	0,000	96,273	0,000	0,0
1	**2,0**	**695**	**17,6**	**-1,003**	**56,689**	**96,519**	**0,245**	**341,4**
2	4,0	890	35,3	-0,752	28,345	96,763	0,490	96,3
3	6,0	1084	64,4	-0,339	15,523	97,166	0,893	58,5
4	8,0	1283	88,4	0,000	11,311	97,497	1,223	73,1
5	10,0	1474	102,7	0,201	9,737	97,693	1,420	118,9
6	9,0	1376	102,0	0,191	9,806	97,683	1,410	1211,0
7	8,0	1278	98,0	0,135	10,208	97,628	1,354	216,3
8	7,0	1181	92,8	0,062	10,771	97,558	1,284	169,5
9	6,0	1083	82,9	-0,077	12,060	97,421	1,148	87,0
10	7,0	1181	88,2	-0,002	11,333	97,494	1,221	162,7
11	8,0	1279	95,5	0,099	10,476	97,594	1,320	119,9
12	9,0	1376	102,7	0,201	9,739	97,693	1,419	120,2
13	10,0	1474	104,6	0,228	9,560	97,719	1,446	454,0
14	12,0	1670	109,6	0,299	9,121	97,788	1,515	346,1
15	14,0	1865	117,6	0,410	8,505	97,897	1,623	219,9
16	16,0	2061	123,6	0,495	8,089	97,980	1,706	289,8
17	18,0	2257	130,6	0,593	7,659	98,075	18	252,6
18	20,0	2452	139,5	0,718	7,168	98,197	1,923	196,4
19	18,0	2256	135,3	0,658	7,393	98,139	1,865	415,0
20	16,0	2061	130,5	0,592	7,662	98,074	1,801	370,7
21	14,0	1865	124,5	0,507	8,033	97,991	1,718	290,4
22	12,0	1669	114,3	0,365	8,746	97,853	1,579	172,3
23	14,0	1865	121,4	0,464	8,239	97,949	1,676	248,4
24	16,0	2061	128,3	0,561	7,793	98,044	1,770	252,4
25	18,0	2257	132,5	0,619	7,549	98,101	1,827	424,2
26	20,0	2452	141,4	0,744	7,072	98,223	1,949	196,5
27	24,0	2843	153,5	0,913	6,516	98,387	2,114	292,0
28	28,0	3235	163,7	1,056	6,110	98,526	2,252	347,6
29	30,0	3431	167,9	1,115	5,956	98,584	2,310	418,3
30	32,0	3627	171,1	1,160	5,843	98,628	2,354	548,1
31	34,0	3822	177,2	1,244	5,644	98,710	2,436	294,1
32	**36,0**	**4018**	**186,9**	**1,380**	**5,350**	**98,842**	**2,568**	**182,6**
33	38,0	4213	199,6	1,555	5,011	99,013	2,740	141,0
34	40,0	4408	212,8	1,739	4,699	99,192	2,919	135,1
35	42,0	4603	235,9	2,059	4,238	99,504	3,231	77,4
36	44,0	4798	261,7	2,414	3,821	99,851	3,577	70,0
37	46,0	4992	291,0	2,818	3,436	100,244	3,970	61,8
38	50,0	5380	355,7	3,701	2,811	101,105	4,832	56,7
39	40,0	4402	327,1	3,311	3,057	100,725	4,452	324,9
40	30,0	3423	304,6	3,004	3,283	100,425	4,152	410,4
41	20,0	2444	280,6	2,675	3,564	100,104	3,831	382,3
42	15,0	1955	261,3	2,409	3,827	99,846	3,572	236,1
43	10,0	1466	241,0	2,129	4,149	99,573	3,299	223,3
44	6,0	1075	227,0	1,936	4,405	99,384	3,111	258,5

valori diametrali sono calcolati come valore medio della sonda cillindrica in espansione

FIELD LIMITS	P	P corr	V corr	creep	1000/V	diameter	Dil. Diam	loop
min	8,0	1282,9	88,4	0,0	11,3	97,5	1,2	primo
max	36,0	4017,8	186,9	1,4	5,3	98,8	2,6	carico
max	10,0	1474,1	102,7	0,2	9,7	97,7	1,4	I
min	6,0	1083,2	82,9	-0,1	12,1	97,4	1,1	
max	20,0	2452,2	139,5	0,7	7,2	98,2	1,9	II
min	12,0	1669,5	114,3	0,4	8,7	97,9	1,6	
max	50,0	5380,1	355,7	3,7	2,8	101,1	4,8	III
min	6,0	1074,6	227,0	1,9	4,4	99,4	3,1	

i.m.o.s. s.r.l.	**DILATOMETRIC ROCK TEST DRT**				mod DVT rev. 1
	borehole	**S1GALL**	**probe depth m**	**50,0**	**code** **3**
	Client:	**ITALFERR S.P.A.**	job 1714	v. accept.	**1714SIT**
	Project	**COLLEGAMENTO CAMPOMARINO-RIPALTA**		report	**1714SIT 03 DRT**
		coordinates	EAST		
	site	CAMPOMARINO	NORTH	date 15.06.17	pag 2/3

DILATOMETRIC ROCK TEST WITH VOLUME CHANGE MEASUREMENTS - ISRM 1987



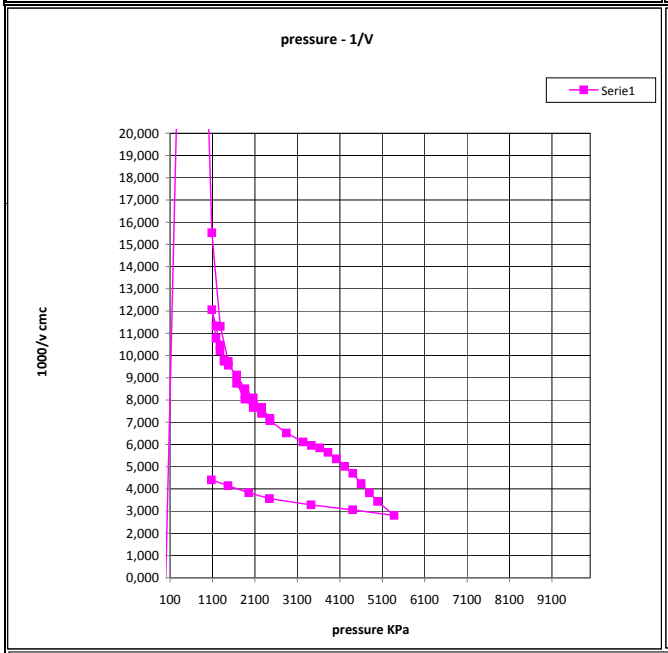
DATA PROCESSING						SENSOR 1	SENSOR 2	SENSOR 3	SENSOR AVE
			ELASTICITY MODULUS Ei						
Legend:	**DATA**		loop	Pmax	Pmin	E1 (Mpa)	E2 (Mpa)	E3 (Mpa)	Eav (Mpa)
H = test depth	symbol	datum	1	10,00	6,00				175
W = water table depth	γnsoil	2,5	2	20,00	12,00				277
ν = Poisson ratio	W (ml)	50,0	3	50,00	6,00				305
vo = cell initial volume	ν	0,25	4						
do =cell initial diameter	vo (cmc)	3457	5						
Φ = borehole wall diameter	do (mm)	96,27	DEFORMATION MODULUS Ti						
Po = start pressure	σv (kPa)	1250	loop	Pmax	Pmin	T1 (Mpa)	T2 (Mpa)	T3 (Mpa)	Tm (Mpa)
Pmax = max loop pressure (MPa)			1	10,00	8,04				119
Pmin = min loop pressure (MPa)			2	20,00	10,00				257
d max displacement at P max			3	50,00	20,00				120
d min displacement at P min			4						
σv vertical total stress estimated			5						
ε c = dR / Ro			GLOBAL DEFORMATION MODULUS EG						
ELASTICITY MODULUS Ei	ELASTICITY MODULUS Ey estimated			Pmax	Pmin	EG1 (Mpa)	EG2 (Mpa)	EG3 (Mpa)	EGAV (Mpa)
Ei = (1+ ν) Φ Pax - Pmin	Ey= (EII+EIII)/2			36,00	8,04				248
dmax - dmin	Ey= EIII		DIAMETER			F	F	F	F
			beginning diameter (mm)						97,497
DEFORMATION MODULUS Ti			final diameter (mm)						101,105
Ti = (1+ ν) Φ Pi - Pi-1			range mm						3,608
Xi - Xi-1			DM loop minimun displacement			DILATOMETRIC AND GEOTECHNICAL ESTIMATED PARAMETERS			
	Pbar	C1	C2	C3	Cm	Po initial pressure (KPa)	1283	**EG** (MPa)	**248**
GLOBAL DEFORMATION MODULUS EG	bar	0	120	240	0	Pf creep pressure (KPa)	4018	**E3** (MPa)	**305**
EG = (1+ ν) Φ Pmax - Po	10,0	10,997	10,997	10,997	1,420	PL limit pres. (KPa) Cassan >	6218	E/P'L	46,38
dmax - do						PL' net limit pres (KPa) >	5343	EG/Ey	0,81
note: MATERIALE ASSIMILATO A TERRENO COESIVO						Ko lateral coeff at rest (KPa)	0,70	**cu** coesion (KPa) johnson	**647**
						Pho lateral pressure (KPa)	875	**ϕ** friction angle (°) >	

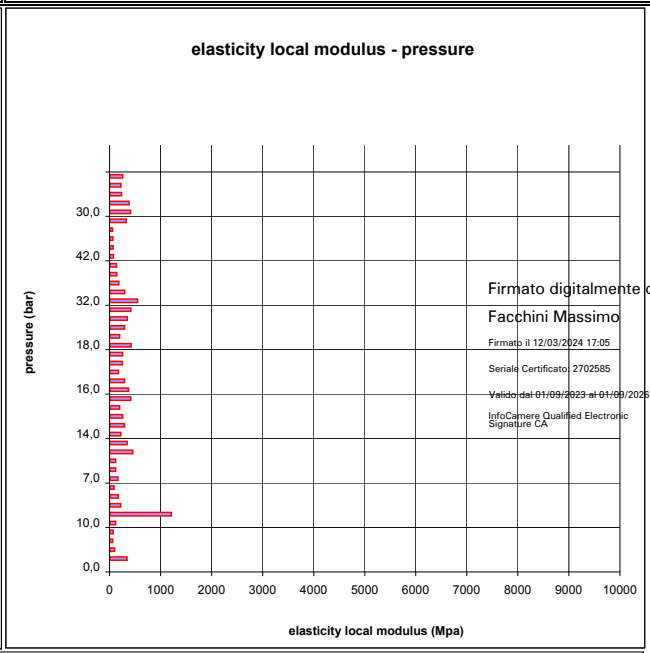
i.m.o.s. s.r.l.	DILATOMETRIC ROCK TEST DRT					mod DVT	rev. 1
	borehole	S1GALL	probe depth m	50,0		code	3
	Client:	ITALFERR S.P.A.			job 1714	v. accept.	1714SIT
	Project	COLLEGAMENTO CAMPOMARINO-RIPALTA				report	1714SIT 03 DRT
		coordinates		EAST			
	site	CAMPOMARINO		NORTH		date 15.06.17	pag 3/3

DILATOMETRIC ROCK TEST WITH VOLUME CHANGE MEASUREMENTS - ISRM 1987

PLACE

SECTION





Sede: Via Monsignor Bologna, 18 - CAMPOBASSO
Stabilimento: C.da S.Maria delle Macchie - Vinchiaturo (CB)
Tel. 0874/340003-16 **Fax**: 0874/340014
P.IVA e Cod. Fiscale: 00717630701
web: **www.imosgeo.it**

S2 GALL

Firmato digitalmente da:
Facchini Massimo
Firmato il 12/03/2024 17:05
Seriale Certificato: 2702585
Valido dal 01/09/2023 al 01/09/2026
InfoCamere Qualified Electronic Signature CA

i.m.o.s. s.r.l.	**DILATOMETRIC ROCK TEST DRT**			mod DVT	rev. 1
	borehole	**S2GALL**	**probe depth m**	**31,1**	**code**	**1**
	Client:	**ITALFERR S.P.A.**	job	1714	v. accept.	1714SIT
	Project	COLLEGAMENTO CAMPOMARINO-RIPALTA			report	**1714SIT**	**04**	**DRT**
		coordinates	EAST					
	site	CAMPOMARINO	NORTH		date	07.06.17	pag	1/3

DILATOMETRIC ROCK TEST WITH VOLUME CHANGE MEASUREMENTS - ISRM 1987

Borehole	**S2GALL**		
test	**1**	depth m	31,10
slope (degree)	90	core barrell	
Device:	CSM Type GEODV03 95 mm		
Orientation capteur	C1=	Standard method:	ISRM 1987
Probe diam	95 MM	Borehole diam	101 MM
Meteo		Temperatur e	
lithotype	sabbie medio fini con livelli conglomeratici		
water table		POCKET PENETRO METER	

Creep test P (Bars) = 35,0

Temps min	PBAR	MM
1	35,0	103,968
2	35,0	104,030
3	35,0	104,084
4	35,0	104,097
5	35,0	104,110

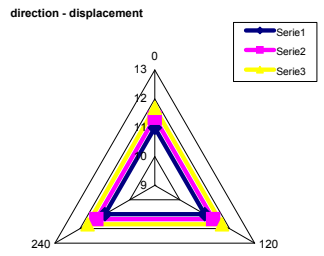
PROBE SCHEME

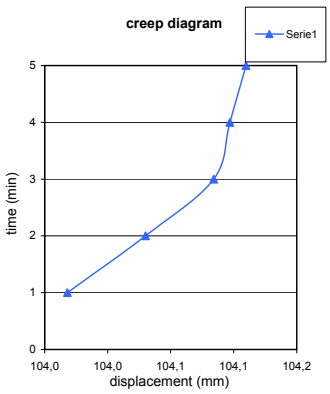
rod adaptor
electronic device
double action piston
expandable cylinder

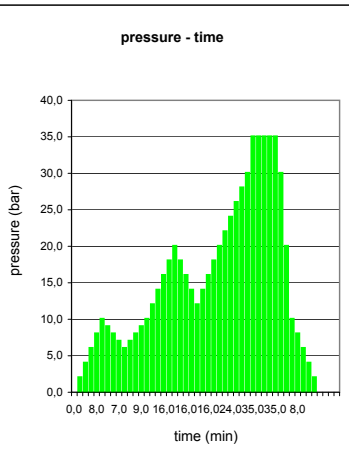
PROBE CALIBRATION

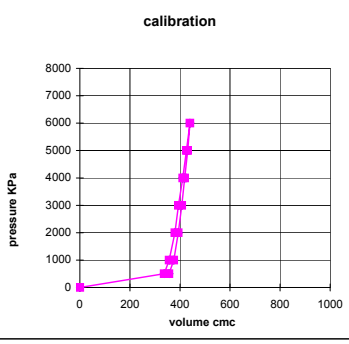
probe	GEODV03 CSM TYPE	
membrane	CAUCCIU' ARMATO	
measure cell height (cm)		
V0 cell volume at rest (cmc)	3457	
lenght cable (mt)	50	
Volume initial Vi (cmc)	349	
diam calibration tube (cm)	10,1	
tube calibration volume cmc	3806	
Calibration in air		
coeff *m*	0,06	cmc/Kpa
Confined calibration		
first load	66	Kpa/cmc
unload	85	Kpa/cmc

LITHOTYPE









time	P	Pcorr	Vol	ε c	1/V	diameter	Dil. Diam	Modulo
min	bar	Kpa	cmc	%	1000/cmc	(mm)	(mm)	MPa
0	0,0	0	0,0	-5,748	0,000	96,273	0,000	0,0
1	**2,0**	**488**	**323,6**	**-1,435**	**3,090**	**100,679**	**4,406**	**13,6**
2	4,0	681	376,3	-0,752	2,658	101,377	5,104	34,9
3	6,0	875	406,9	-0,356	2,457	101,782	5,508	61,0
4	8,0	1069	434,6	0,000	2,301	102,145	5,872	68,2
5	10,0	1264	446,6	0,155	2,239	102,303	6,030	158,1
6	9,0	1167	443,4	0,113	2,255	102,261	5,987	296,4
7	8,0	1069	441,6	0,090	2,265	102,237	5,964	524,5
8	7,0	971	441,7	0,092	2,264	102,239	5,966	-5308,8
9	6,0	873	438,9	0,056	2,278	102,202	5,929	338,1
10	7,0	971	441,7	0,092	2,264	102,239	5,966	338,1
11	8,0	1069	445,5	0,140	2,245	102,288	6,015	256,4
12	9,0	1166	449,4	0,190	2,225	102,340	6,066	243,5
13	10,0	1264	452,2	0,226	2,211	102,376	6,103	339,0
14	12,0	1460	456,8	0,286	2,189	102,437	6,164	412,6
15	14,0	1655	468,5	0,435	2,135	102,589	6,316	164,5
16	16,0	1851	477,1	0,545	2,096	102,702	6,429	222,4
17	18,0	2047	483,8	0,630	2,067	102,789	18	290,1
18	20,0	2242	493,4	0,753	2,027	102,915	6,641	200,0
19	18,0	2046	494,5	0,767	2,022	102,928	6,655	-1827,6
20	16,0	1850	492,1	0,737	2,032	102,898	6,624	826,9
21	14,0	1654	486,3	0,662	2,056	102,822	6,548	330,6
22	12,0	1459	478,1	0,558	2,091	102,716	6,442	236,6
23	14,0	1655	480,5	0,588	2,081	102,746	6,473	824,0
24	16,0	1850	486,8	0,669	2,054	102,829	6,555	304,1
25	18,0	2046	493,3	0,751	2,027	102,913	6,639	299,8
26	20,0	2242	500,2	0,840	1,999	103,003	6,730	278,7
27	22,0	2437	512,4	0,996	1,951	103,162	6,889	158,1
28	24,0	2632	522,7	1,126	1,913	103,295	7,022	189,7
29	26,0	2828	535,8	1,293	1,866	103,466	7,192	148,1
30	28,0	3023	547,5	1,440	1,827	103,616	7,343	167,8
31	30,0	3218	556,8	1,558	1,796	103,737	7,464	209,8
32	**35,0**	**3708**	**574,7**	**1,785**	**1,740**	**103,968**	**7,695**	**274,8**
33	35,0	3707	579,5	1,845	1,726	104,030	7,756	-0,6
34	35,0	3707	583,7	1,898	1,713	104,084	7,811	-0,6
35	35,0	3707	584,7	1,911	1,710	104,097	7,823	-0,6
36	35,0	3707	585,7	1,923	1,707	104,110	7,836	-0,6
37	30,0	3217	581,6	1,872	1,719	104,057	7,784	1207,1
38	20,0	2237	574,4	1,781	1,741	103,964	7,691	1372,9
39	10,0	1258	554,1	1,524	1,805	103,702	7,429	484,9
40	8,0	1063	545,4	1,414	1,834	103,589	7,316	224,1
41	6,0	867	534,8	1,280	1,870	103,453	7,179	185,3
42	4,0	672	522,6	1,125	1,914	103,294	7,020	159,0
43	2,0	477	507,6	0,935	1,970	103,100	6,826	129,7

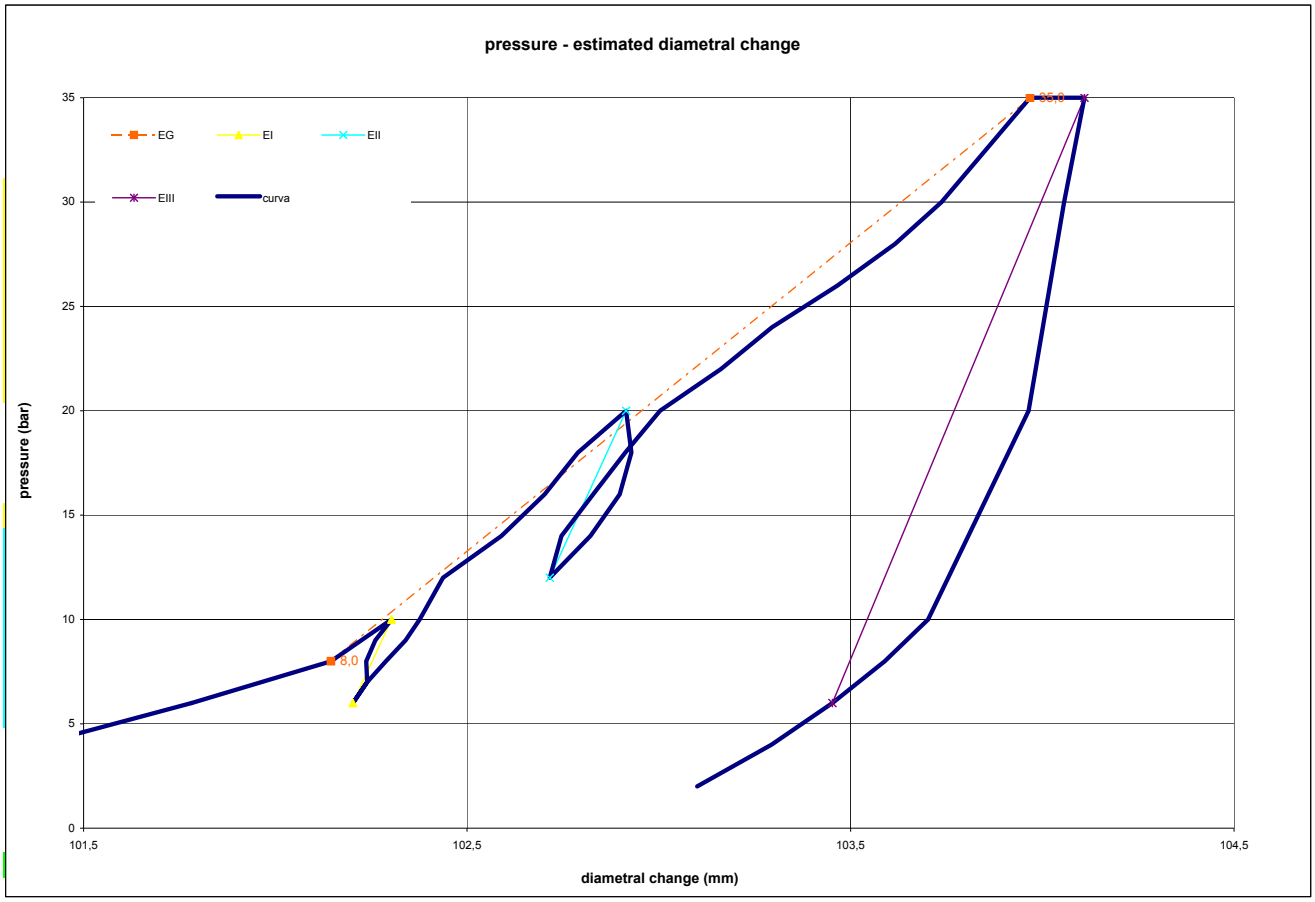
valori diametrali sono calcolati come valore medio della sonda cillindrica in espansione

FIELD LIMITS

	P	P corr	V corr	creep	1000/V	diameter	Dil. Diam	loop
min	8,0	1069,2	434,6	0,0	2,3	102,1	5,9	primo
max	35,0	3707,5	574,7	1,8	1,7	104,0	7,7	carico
max	10,0	1264,5	446,6	0,2	2,2	102,3	6,0	I
min	6,0	872,8	438,9	0,1	2,3	102,2	5,9	
max	20,0	2242,0	493,4	0,8	2,0	102,9	6,6	II
min	12,0	1458,7	478,1	0,6	2,1	102,7	6,4	
max	35,0	3706,9	585,7	1,9	1,7	104,1	7,8	III
min	6,0	867,1	534,8	1,3	1,9	103,5	7,2	

i.m.o.s. s.r.l.	**DILATOMETRIC ROCK TEST DRT**			mod DVT	rev. 1
	borehole	**S2GALL**	**probe depth m**	**31,1**	**code**	**1**
	Client:	**ITALFERR S.P.A.**	job	1714	v. accept.	**1714SIT**
	Project	**COLLEGAMENTO CAMPOMARINO-RIPALTA**			report	**1714SIT**	**04**	**DRT**
		coordinates	EAST					
	site	CAMPOMARINO	NORTH		date	07.06.17	pag	2/3

DILATOMETRIC ROCK TEST WITH VOLUME CHANGE MEASUREMENTS - ISRM 1987



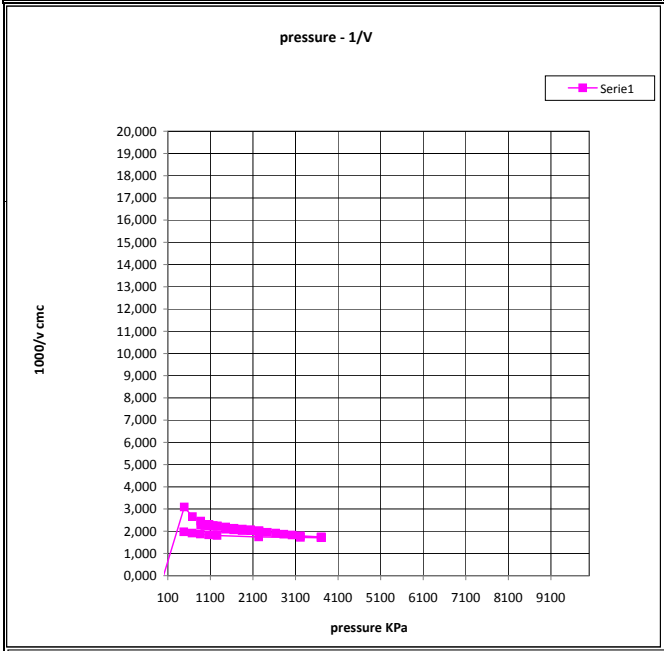
DATA PROCESSING						SENSOR 1	SENSOR 2	SENSOR 3	SENSOR AVE
			ELASTICITY MODULUS Ei						
Legend:	**DATA**		loop	Pmax	Pmin	E1 (Mpa)	E2 (Mpa)	E3 (Mpa)	Eav (Mpa)
H = test depth	symbol	datum	1	10,00	6,00				497
W = water table depth	γnsoil	2,5	2	20,00	12,00				503
ν = Poisson ratio	W (ml)	31,1	3	35,00	6,00				552
vo = cell initial volume	ν	0,25	4						
do =cell initial diameter	vo (cmc)	3457	5						
Φ = borehole wall diameter	do (mm)	96,27	DEFORMATION MODULUS Ti						
Po = start pressure	σv (kPa)	778	loop	Pmax	Pmin	T1 (Mpa)	T2 (Mpa)	T3 (Mpa)	Tm (Mpa)
Pmax = max loop pressure (MPa)			1	10,00	8,00				158
Pmin = min loop pressure (MPa)			2	20,00	10,00				204
d max displacement at P max			3	35,00	20,00				156
d min displacement at P min			4						
σv vertical total stress estimated			5						
ε c = dR / Ro			GLOBAL DEFORMATION MODULUS EG						
ELASTICITY MODULUS Ei	ELASTICITY MODULUS Ey estimated			Pmax	Pmin	EG1 (Mpa)	EG2 (Mpa)	EG3 (Mpa)	EG (Mpa)
Ei = (1+ ν) Φ Pax - Pmin	Ey= (EII+EIII)/2			35,00	8,00				185
dmax - dmin	Ey= EIII		DIAMETER			F	F	F	F
			beginning diameter (mm)						102,145
DEFORMATION MODULUS Ti			final diameter (mm)						104,110
Ti = (1+ ν) Φ Pi - Pi-1			range mm						1,965
Xi - Xi-1			DM loop minimun displacement			DILATOMETRIC AND GEOTECHNICAL ESTIMATED PARAMETERS			
	Pbar	C1	C2	C3	Cm	Po initial pressure (KPa)	1069	**EG** (MPa)	**185**
GLOBAL DEFORMATION MODULUS EG	bar	0	120	240	0	Pf creep pressure (KPa)	3708	**E3** (MPa)	**552**
EG = (1+ ν) Φ Pmax - Po	10,0	10,997	10,997	10,997	6,030	PL limit pres. (KPa) Cassan >	5922	E/P'L	34,37
dmax - do						PL' net limit pres (KPa) >	5378	EG/Ey	0,33
note: MATERIALE ASSIMILATO A TERRENO COESIVO						Ko lateral coeff at rest (KPa)	0,70	**cu** coesion (KPa) johnson	
						Pho lateral pressure (KPa)	544	**ϕ** friction angle (°) >	

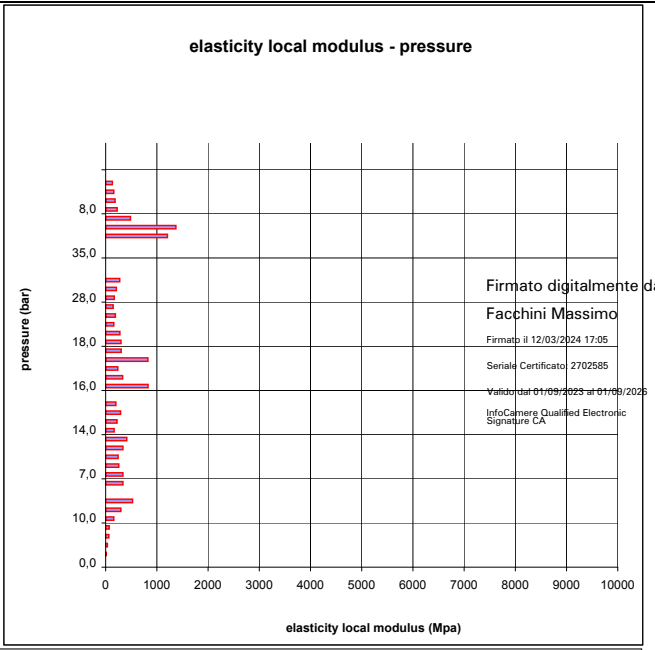
i.m.o.s. s.r.l.	DILATOMETRIC ROCK TEST DRT					mod DVT	rev. 1
	borehole	S2GALL	probe depth m	31,1		code	1
	Client:	ITALFERR S.P.A.			job	1714	v. accept. 1714SIT
	Project	COLLEGAMENTO CAMPOMARINO-RIPALTA			report	1714SIT	04 DRT
		coordinates		EAST			
	site	CAMPOMARINO		NORTH	date	07.06.17	pag 3/3

DILATOMETRIC ROCK TEST WITH VOLUME CHANGE MEASUREMENTS - ISRM 1987

PLACE

SECTION





i.m.o.s. s.r.l.	DILATOMETRIC ROCK TEST DRT				mod DVT rev. 1
borehole	S2GALL	probe depth m	39,3	code	2
Client:	ITALFERR S.P.A.	job	1714	v. accept.	1714SIT
Project	COLLEGAMENTO CAMPOMARINO-RIPALTA			report	1714SIT 05 DRT
	coordinates	EAST			
site	CAMPOMARINO	NORTH		date	08.06.17 pag 1/3

DILATOMETRIC ROCK TEST WITH VOLUME CHANGE MEASUREMENTS - ISRM 1987

Borehole	S2GALL		
test	2	depth m	39,30
slope (degree)	90	core barrell	
Device:	CSM Type GEODV03 95 mm		
Orientation capteur	C1=	Standard method:	ISRM 1987
Probe diam	95 MM	Borehole diam	101 MM
Meteo		Temperatur e	
lithotype	sabbie limose da moltoaddensate a deb. Cementate		
water table		POCKET PENETRO METER	

Creep test P (Bars) =

Temps min	PBAR	MM
1		
2		
3		
4		
5		

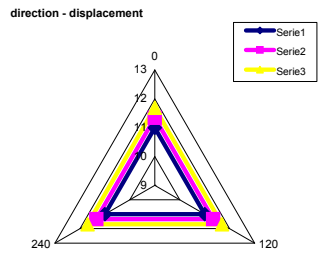
PROBE SCHEME

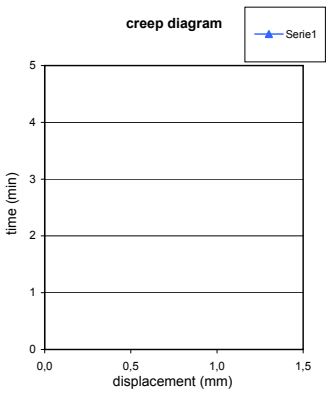
rod adaptor
electronic device
double action piston
expandable cylinder

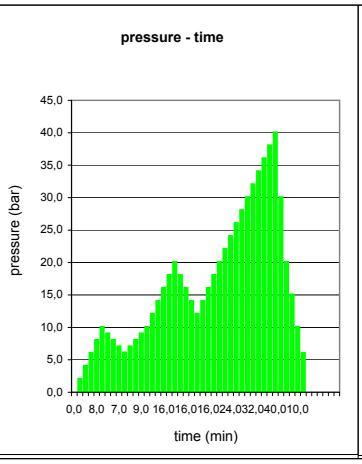
PROBE CALIBRATION

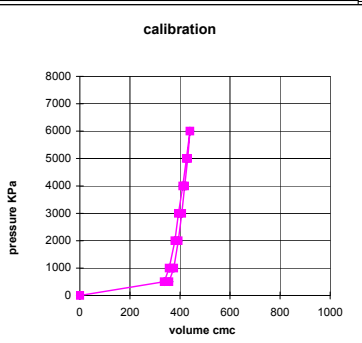
probe	GEODV03 CSM TYPE	
membrane	CAUCCIU' ARMATO	
measure cell height (cm)		
V0 cell volume at rest (cmc)	3457	
lenght cable (mt)	50	
Volume initial Vi (cmc)	349	
diam calibration tube (cm)	10,1	
tube calibration volume cmc	3806	
Calibration in air		
coeff *m*	0,06	cmc/Kpa
Confined calibration		
first load	66	Kpa/cmc
unload	85	Kpa/cmc

LITHOTYPE









time	P	Pcorr	Vol	ε c	1/V	diameter	Dil. Diam	Modulo
min	bar	Kpa	cmc	%	1000/cmc	(mm)	(mm)	MPa
0	0,0	0	0,0	-7,788	0,000	96,273	0,000	0,0
1	**2,0**	**553**	**608,6**	**0,000**	**1,643**	**104,405**	**8,131**	**8,5**
2	4,0	748	617,3	0,106	1,620	104,516	8,242	230,3
3	6,0	942	659,9	0,629	1,515	105,061	8,788	46,5
4	8,0	1136	681,6	0,893	1,467	105,337	9,063	92,9
5	10,0	1331	698,2	1,095	1,432	105,548	9,275	121,5
6	9,0	1234	694,4	1,049	1,440	105,500	9,226	265,8
7	8,0	1136	690,6	1,002	1,448	105,451	9,178	265,6
8	7,0	1038	685,7	0,944	1,458	105,390	9,117	210,1
9	6,1	947	677,8	0,847	1,475	105,289	9,016	118,7
10	7,0	1038	683,7	0,919	1,463	105,365	9,091	159,2
11	8,0	1136	693,6	1,039	1,442	105,489	9,216	102,8
12	9,0	1233	697,4	1,085	1,434	105,538	9,265	265,8
13	10,0	1331	709,2	1,229	1,410	105,688	9,415	85,6
14	12,0	1526	727,8	1,455	1,374	105,924	9,651	109,2
15	14,0	1720	749,5	1,717	1,334	106,198	9,924	94,4
16	16,0	1916	762,1	1,870	1,312	106,357	10,084	162,7
17	18,0	2111	782,8	2,119	1,278	106,617	18	99,8
18	20,0	2306	796,4	2,283	1,256	106,788	10,515	152,0
19	18,0	2110	790,8	2,215	1,265	106,717	10,444	368,8
20	16,0	1914	788,1	2,183	1,269	106,684	10,411	787,8
21	14,0	1719	775,5	2,031	1,290	106,525	10,252	163,7
22	12,0	1524	750,8	1,734	1,332	106,215	9,941	83,3
23	14,0	1720	762,5	1,874	1,312	106,362	10,088	176,8
24	16,0	1915	772,1	1,991	1,295	106,483	10,210	214,2
25	18,0	2110	789,8	2,203	1,266	106,705	10,431	117,1
26	20,0	2306	800,4	2,331	1,249	106,838	10,565	195,2
27	22,0	2501	809,0	2,435	1,236	106,947	10,673	241,1
28	24,0	2696	826,7	2,646	1,210	107,168	10,894	118,1
29	26,0	2891	841,3	2,822	1,189	107,351	11,077	143,0
30	28,0	3087	853,0	2,961	1,172	107,496	11,222	180,6
31	30,0	3282	870,6	3,171	1,149	107,716	11,442	119,4
32	**32,0**	**3476**	**893,2**	**3,441**	**1,120**	**107,997**	**11,724**	**93,3**
33	34,0	3671	909,9	3,638	1,099	108,203	11,930	127,7
34	36,0	3866	930,5	3,883	1,075	108,459	12,185	103,3
35	38,0	4061	960,2	4,233	1,041	108,825	12,551	72,1
36	40,0	4254	998,8	4,688	1,001	109,299	13,026	55,6
37	30,0	3276	962,6	4,262	1,039	108,855	12,581	299,8
38	20,0	2299	909,4	3,633	1,100	108,197	11,924	201,7
39	15,0	1811	877,3	3,251	1,140	107,799	11,526	165,4
40	10,0	1323	844,2	2,856	1,185	107,387	11,113	159,2
41	6,0	932	814,9	2,505	1,227	107,021	10,747	142,9

Firmato digitalmente da:
Facchini Massimo
Firmato il 12/03/2024 17:05
Seriale Certificato: 2702585
Valido dal 01/09/2023 al 01/09/2026
InfoCamere Qualified Electronic Signature CA

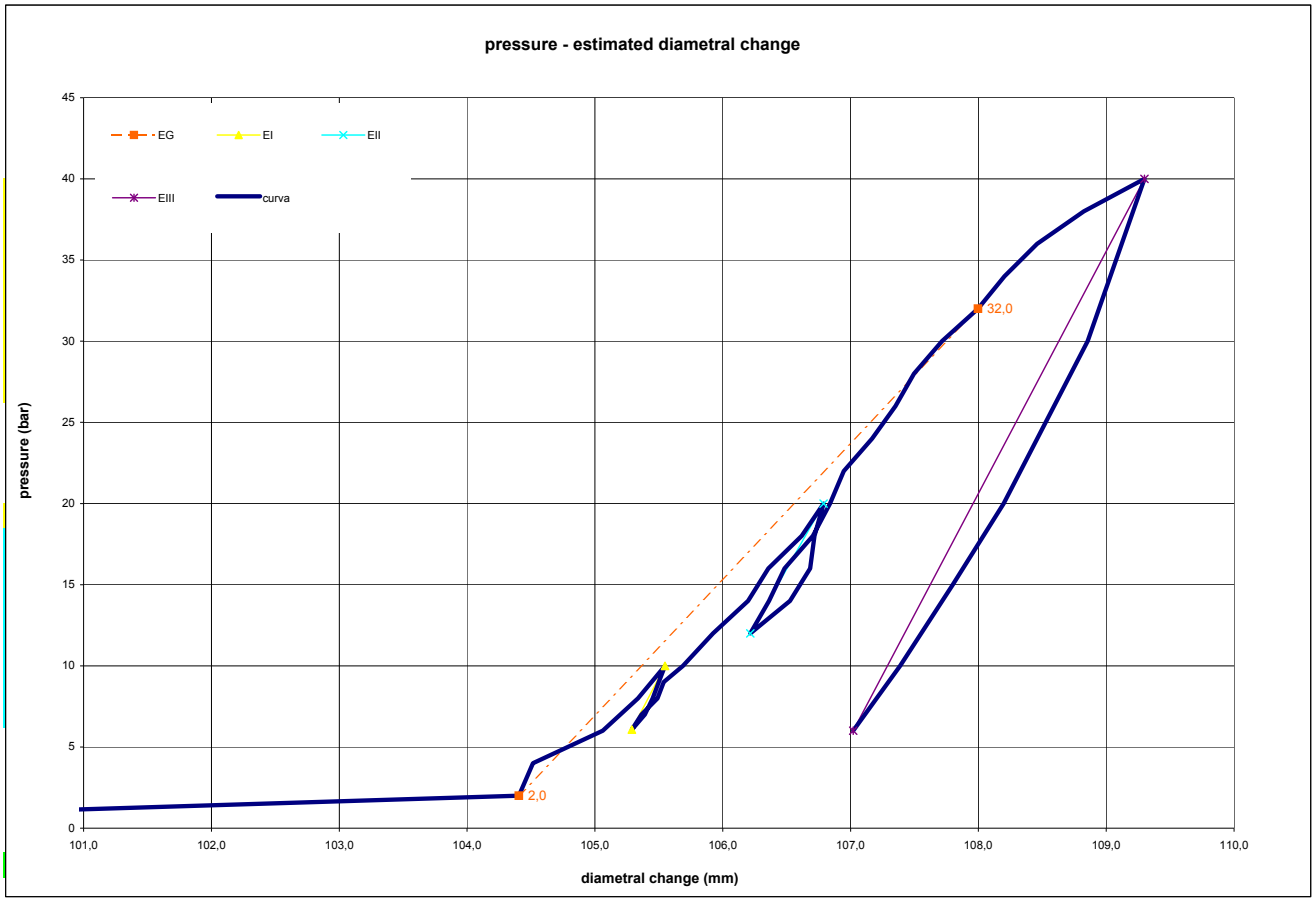
valori diametrali sono calcolati come valore medio della sonda cillindrica in espansione

FIELD LIMITS

	P	P corr	V corr	creep	1000/V	diameter	Dil. Diam	loop
min	2,0	552,5	608,6	0,0	1,6	104,4	8,1	primo
max	32,0	3476,3	893,2	3,4	1,1	108,0	11,7	carico
max	10,0	1331,4	698,2	1,1	1,4	105,5	9,3	I
min	6,1	947,4	677,8	0,8	1,5	105,3	9,0	
max	20,0	2305,8	796,4	2,3	1,3	106,8	10,5	II
min	12,0	1524,3	750,8	1,7	1,3	106,2	9,9	
max	40,0	4254,2	998,8	4,7	1,0	109,3	13,0	III
min	6,0	932,3	814,9	2,5	1,2	107,0	10,7	

i.m.o.s. s.r.l.	**DILATOMETRIC ROCK TEST DRT**				mod DVT rev. 1
	borehole	**S2GALL**	**probe depth m**	**39,3**	**code** **2**
	Client:	**ITALFERR S.P.A.**	job 1714	v. accept.	**1714SIT**
	Project	**COLLEGAMENTO CAMPOMARINO-RIPALTA**		report	**1714SIT 05 DRT**
		coordinates	EAST		
	site	CAMPOMARINO	NORTH	date 08.06.17	pag 2/3

DILATOMETRIC ROCK TEST WITH VOLUME CHANGE MEASUREMENTS - ISRM 1987



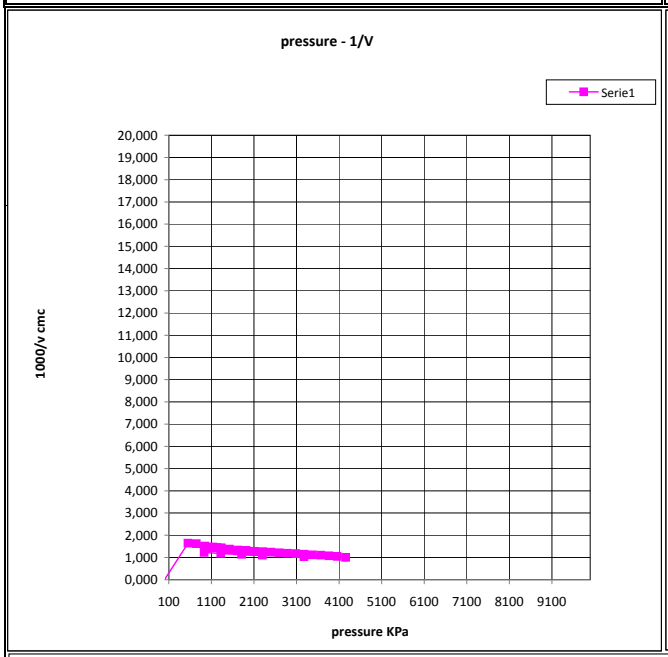
DATA PROCESSING						SENSOR 1	SENSOR 2	SENSOR 3	SENSOR AVE
			ELASTICITY MODULUS Ei						
Legend:	**DATA**		loop	Pmax	Pmin	E1 (Mpa)	E2 (Mpa)	E3 (Mpa)	Eav (Mpa)
H = test depth	symbol	datum	1	10,00	6,07				194
W = water table depth	γnsoil	2,5	2	20,00	12,00				178
ν = Poisson ratio	W (ml)	39,3	3	40,00	6,00				190
vo = cell initial volume	ν	0,25	4						
do =cell initial diameter	vo (cmc)	3457	5						
Φ = borehole wall diameter	do (mm)	96,27	DEFORMATION MODULUS Ti						
Po = start pressure	σv (kPa)	983	loop	Pmax	Pmin	T1 (Mpa)	T2 (Mpa)	T3 (Mpa)	Tm (Mpa)
Pmax = max loop pressure (MPa)			1	10,00	2,00				89
Pmin = min loop pressure (MPa)			2	20,00	10,00				103
d max displacement at P max			3	40,00	20,00				106
d min displacement at P min			4						
σv vertical total stress estimated			5						
ε c = dR / Ro			GLOBAL DEFORMATION MODULUS EG						
ELASTICITY MODULUS Ei	ELASTICITY MODULUS Ey estimated			Pmax	Pmin	EG1 (Mpa)	EG2 (Mpa)	EG3 (Mpa)	EG Av (Mpa)
Ei = (1+ ν) Φ Pax - Pmin	Ey= (EII+EIII)/2			32,00	2,00				106
dmax - dmin	Ey= EIII		DIAMETER			F	F	F	F
			beginning diameter (mm)						104,405
DEFORMATION MODULUS Ti			final diameter (mm)						109,299
Ti = (1+ ν) Φ Pi - Pi-1			range mm						4,895
Xi - Xi-1			DM loop minimun displacement			DILATOMETRIC AND GEOTECHNICAL ESTIMATED PARAMETERS			
	Pbar	C1	C2	C3	Cm	Po initial pressure (KPa)	553	**EG** (MPa)	**106**
GLOBAL DEFORMATION MODULUS EG	bar	0	120	240	0	Pf creep pressure (KPa)	3476	**E3** (MPa)	**190**
EG = (1+ ν) Φ Pmax - Po	10,0	10,997	10,997	10,997	9,275	PL limit pres. (KPa) Cassan >	5428	E/P'L	22,41
dmax - do						PL' net limit pres (KPa) >	4741	EG/Ey	0,56
note: MATERIALE ASSIMILATO A TERRENO COESIVO						Ko lateral coeff at rest (KPa)	0,70	**cu** coesion (KPa) johnson	**568**
						Pho lateral pressure (KPa)	688	ϕ friction angle (°) >	

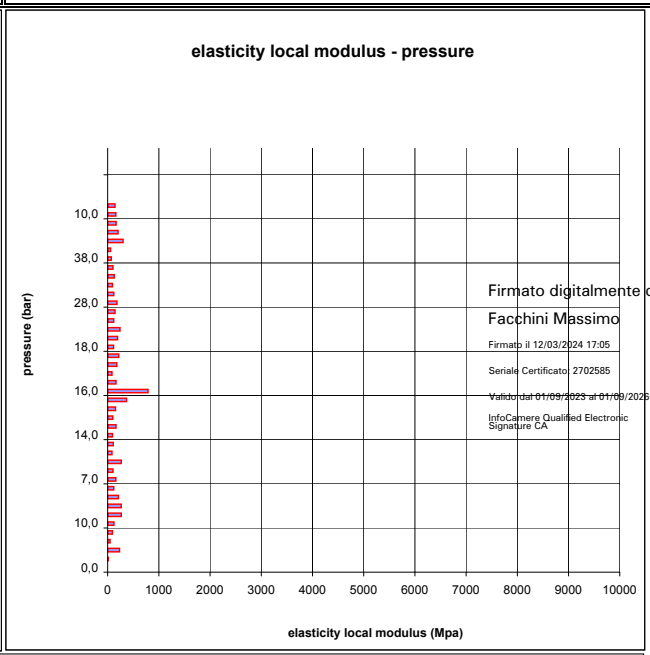
i.m.o.s. s.r.l.	DILATOMETRIC ROCK TEST DRT					mod DVT	rev. 1
	borehole	S2GALL	probe depth m	39,3		code	2
	Client:	ITALFERR S.P.A.			job	1714	v. accept. 1714SIT
	Project	COLLEGAMENTO CAMPOMARINO-RIPALTA			report	1714SIT	05 DRT
		coordinates		EAST			
	site	CAMPOMARINO		NORTH	date	08.06.17	pag 3/3

DILATOMETRIC ROCK TEST WITH VOLUME CHANGE MEASUREMENTS - ISRM 1987

PLACE

SECTION





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i.m.o.s. s.r.l.	**DILATOMETRIC ROCK TEST DRT**			mod DVT rev. 1
	borehole S2GALL	**probe depth m** 50,5		**code** 3
	Client: **ITALFERR S.P.A.**		job 1714	v. accept. 1714SIT
	Project COLLEGAMENTO CAMPOMARINO-RIPALTA			report **1714SIT 06 DRT**
	coordinates		EAST	
	site CAMPOMARINO		NORTH	date 08.06.17 pag 1/3

DILATOMETRIC ROCK TEST WITH VOLUME CHANGE MEASUREMENTS - ISRM 1987

Borehole	**S2GALL**		
test **3**	depth m 50,50		
slope (degree) 90	core barrell		
Device: CSM Type GEODV03 95 mm			
Orientation capteur C1=	Standard method: ISRM 1987		
Probe diam 95 MM	Borehole diam 101 MM		
Meteo	Temperature		
lithotype	sabbie e limi sabbiosi da addensate a deb.cementate		
water table	POCKET PENETRO METER		

Creep test P (Bars) = 30,0

Temps min	PBAR	MM
1	30,0	106,502
2	30,0	106,552
3	30,0	106,565
4	30,0	106,590
5	30,0	106,615

PROBE SCHEME

rod adaptor
electronic device
double action piston
expandable cylinder

PROBE CALIBRATION

probe	GEODV03 CSM TYPE
membrane	CAUCCIU' ARMATO
measure cell height (cm)	
V0 cell volume at rest (cmc)	3457
lenght cable (mt)	50
Volume initial Vi (cmc)	349
diam calibration tube (cm)	10,1
tube calibration volume cmc	3806

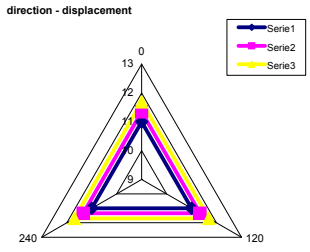
Calibration in air

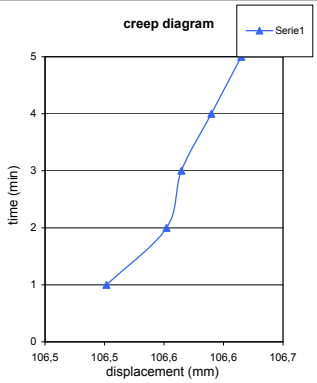
coeff *m* 0,06 cmc/Kpa

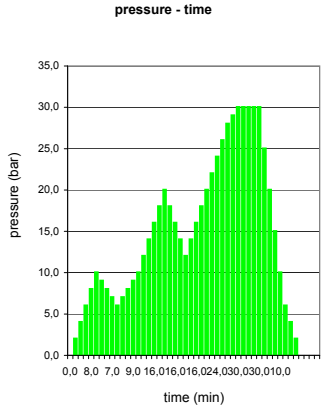
Confined calibration

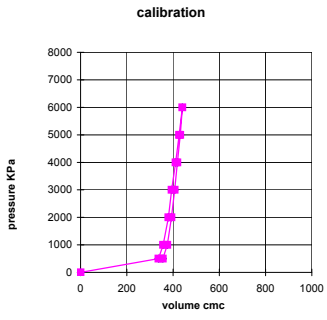
first load 66 Kpa/cmc
unload 85 Kpa/cmc

LITHOTYPE









time	P	Pcorr	Vol	εc	1/V	diameter	Dil. Diam	Modulo
min	bar	Kpa	cmc	%	1000/cmc	(mm)	(mm)	MPa
0	0,0	0	0,0	-8,048	0,000	96,273	0,000	0,0
1	**2,0**	**663**	**631,6**	**0,000**	**1,583**	**104,700**	**8,426**	**9,9**
2	4,0	859	640,3	0,106	1,562	104,810	8,537	231,6
3	6,0	1054	649,9	0,223	1,539	104,933	8,660	208,0
4	8,0	1249	665,6	0,414	1,502	105,133	8,860	128,3
5	10,0	1445	675,2	0,531	1,481	105,256	8,982	209,2
6	9,0	1347	674,4	0,521	1,483	105,245	8,972	1234,3
7	8,0	1249	675,1	0,530	1,481	105,254	8,981	-1489,7
8	7,0	1151	672,1	0,494	1,488	105,217	8,943	346,1
9	6,0	1053	667,9	0,443	1,497	105,163	8,890	239,1
10	7,0	1151	670,4	0,473	1,492	105,195	8,922	400,7
11	8,0	1249	672,2	0,494	1,488	105,217	8,944	587,6
12	9,0	1347	674,5	0,523	1,483	105,247	8,973	435,7
13	10,0	1445	677,2	0,556	1,477	105,281	9,008	371,8
14	12,0	1640	681,8	0,612	1,467	105,340	9,067	436,4
15	14,0	1836	689,5	0,705	1,450	105,438	9,164	265,2
16	16,0	2032	697,1	0,798	1,434	105,535	9,261	265,6
17	18,0	2227	706,8	0,914	1,415	105,657	18	210,8
18	20,0	2423	714,5	1,008	1,400	105,755	9,482	263,3
19	18,0	2227	709,8	0,951	1,409	105,695	9,422	430,5
20	16,0	2031	709,3	0,945	1,410	105,690	9,416	4640,9
21	14,0	1835	705,3	0,896	1,418	105,638	9,365	504,6
22	12,0	1639	697,7	0,805	1,433	105,543	9,269	269,7
23	14,0	1835	701,8	0,854	1,425	105,594	9,320	503,7
24	16,0	2031	704,6	0,888	1,419	105,630	9,356	717,4
25	18,0	2227	711,7	0,974	1,405	105,719	9,446	289,4
26	20,0	2423	715,4	1,019	1,398	105,767	9,493	546,0
27	22,0	2618	723,0	1,112	1,383	105,863	9,590	267,3
28	24,0	2814	730,7	1,204	1,369	105,960	9,687	267,8
29	**26,0**	**3009**	**738,3**	**1,296**	**1,354**	**106,057**	**9,783**	**268,3**
30	28,0	3204	757,0	1,521	1,321	106,292	10,019	109,9
31	29,0	3302	764,8	1,615	1,308	106,391	10,117	131,6
32	30,0	3399	773,6	1,721	1,293	106,502	10,228	116,8
33	30,0	3399	777,6	1,769	1,286	106,552	10,279	-0,6
34	30,0	3399	778,6	1,781	1,284	106,565	10,291	-0,6
35	30,0	3399	780,6	1,805	1,281	106,590	10,316	-0,6
36	30,0	3399	782,6	1,829	1,278	106,615	10,341	-0,6
37	25,0	2909	781,5	1,816	1,280	106,601	10,328	4721,7
38	20,0	2419	770,4	1,683	1,298	106,461	10,188	466,7
39	15,0	1930	757,7	1,530	1,320	106,301	10,028	406,6
40	10,0	1441	741,5	1,335	1,349	106,097	9,823	317,6
41	6,0	1050	722,3	1,103	1,384	105,854	9,581	213,5
42	4,0	854	714,8	1,012	1,399	105,759	9,485	270,8
43	2,0	659	701,3	0,849	1,426	105,588	9,315	151,3

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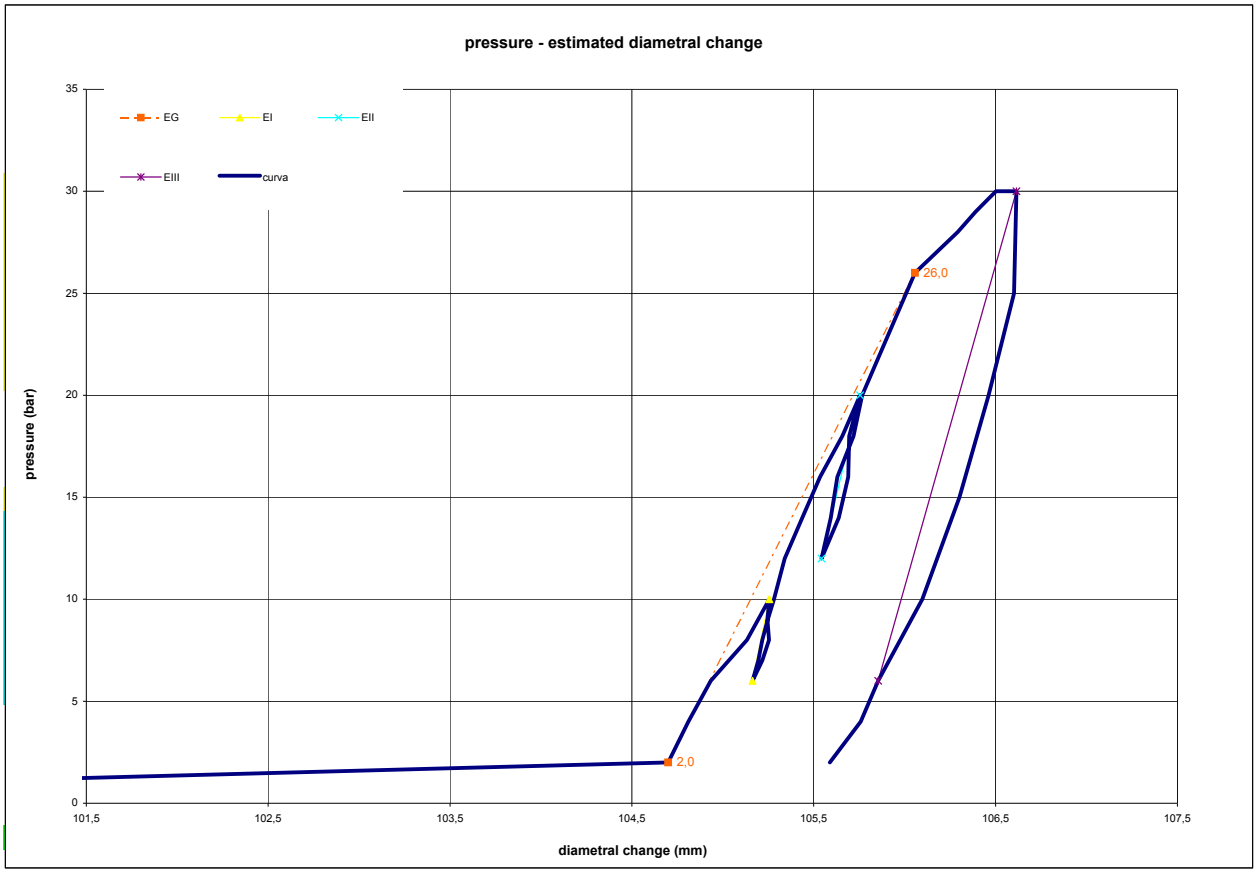
valori diametrali sono calcolati come valore medio della sonda cillindrica in espansione

FIELD LIMITS

	P	P corr	V corr	creep	1000/V	diameter	Dil. Diam	loop
min	2,0	663,2	631,6	0,0	1,6	104,7	8,4	primo
max	26,0	3009,5	738,3	1,3	1,4	106,1	9,8	carico
max	10,0	1444,8	675,2	0,5	1,5	105,3	9,0	I
min	6,0	1053,1	667,9	0,4	1,5	105,2	8,9	
max	20,0	2422,7	714,5	1,0	1,4	105,8	9,5	II
min	12,0	1639,5	697,7	0,8	1,4	105,5	9,3	
max	30,0	3398,9	782,6	1,8	1,3	106,6	10,3	III
min	6,0	1049,8	722,3	1,1	1,4	105,9	9,6	

i.m.o.s. s.r.l.	DILATOMETRIC ROCK TEST DRT				mod DVT rev. 1
	borehole	S2GALL	probe depth m	50,5	code 3
	Client:	ITALFERR S.P.A.	job 1714	v. accept.	1714SIT
	Project	COLLEGAMENTO CAMPOMARINO-RIPALTA		report	1714SIT 06 DRT
		coordinates	EAST		
	site	CAMPOMARINO	NORTH	date 08.06.17	pag 2/3

DILATOMETRIC ROCK TEST WITH VOLUME CHANGE MEASUREMENTS - ISRM 1987



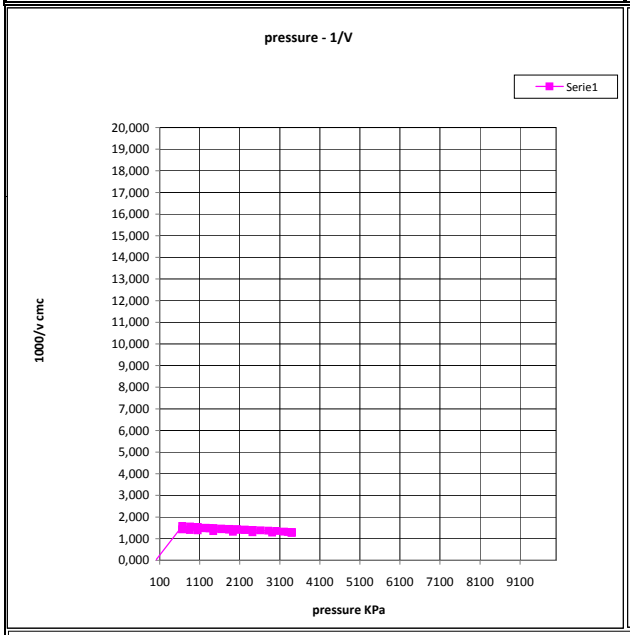
DATA PROCESSING						SENSOR 1	SENSOR 2	SENSOR 3	SENSOR AVE
			ELASTICITY MODULUS Ei						
Legend:	DATA		loop	Pmax	Pmin	E1 (Mpa)	E2 (Mpa)	E3 (Mpa)	Eav (Mpa)
H = test depth	symbol	datum	1	10,00	6,00				553
W = water table depth	γnsoil	2,5	2	20,00	12,00				482
ν = Poisson ratio	W (ml)	50,5	3	30,00	6,00				404
vo = cell initial volume	ν	0,25	4						
do =cell initial diameter	vo (cmc)	3457	5						
Φ = borehole wall diameter	do (mm)	96,27	DEFORMATION MODULUS Ti						
Po = start pressure	σv (kPa)	1263	loop	Pmax	Pmin	T1 (Mpa)	T2 (Mpa)	T3 (Mpa)	Tm (Mpa)
Pmax = max loop pressure (MPa)			1	10,00	2,00				184
Pmin = min loop pressure (MPa)			2	20,00	10,00				256
d max displacement at P max			3	30,00	20,00				149
d min displacement at P min			4						
σv vertical total stress estimated			5						
ε c = dR / Ro			GLOBAL DEFORMATION MODULUS EG						
ELASTICITY MODULUS Ei	ELASTICITY MODULUS Ey estimated			Pmax	Pmin	EG1 (Mpa)	EG2 (Mpa)	EG3 (Mpa)	EG (Mpa)
Ei = (1+ ν) Φ Pax - Pmin	Ey= (EII+EIII)/2			26,00	2,00				226
dmax - dmin	Ey= EIII		DIAMETER			F	F	F	F
			beginning diameter (mm)						104,700
DEFORMATION MODULUS Ti			final diameter (mm)						106,615
Ti = (1+ ν) Φ Pi - Pi-1			range mm						1,915
Xi - Xi-1			DM loop minimun displacement			DILATOMETRIC AND GEOTECHNICAL ESTIMATED PARAMETERS			
	Pbar	C1	C2	C3	Cm	Po initial pressure (KPa)	663	**EG** (MPa)	**226**
GLOBAL DEFORMATION MODULUS EG	bar	0	120	240	0	Pf creep pressure (KPa)	3009	**E3** (MPa)	**404**
EG = (1+ ν) Φ Pmax - Po	10,0	10,997	10,997	10,997	8,982	PL limit pres. (KPa) Cassan >	4497	E/P'L	62,62
dmax - do						PL' net limit pres (KPa) >	3614	EG/Ey	0,56
note: MATERIALE ASSIMILATO A TERRENO COESIVO						Ko lateral coeff at rest (KPa)	0,70	**cu** coesion (KPa) johnson	**475**
						Pho lateral pressure (KPa)	884	**ϕ** friction angle (°) >	

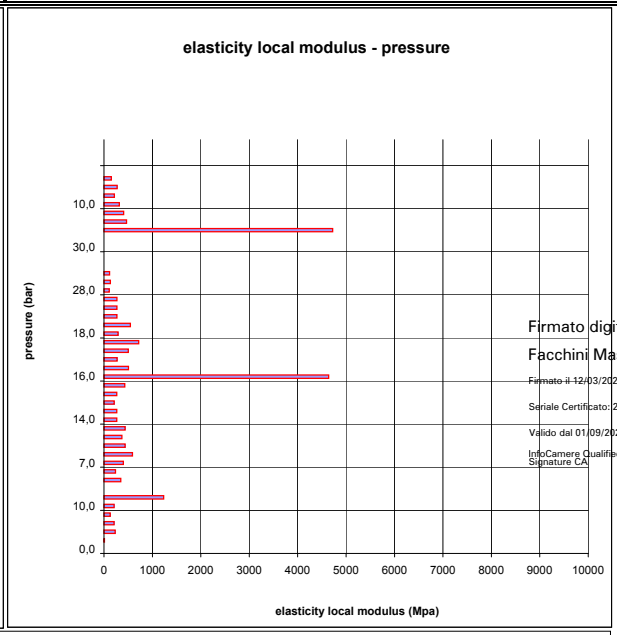
	DILATOMETRIC ROCK TEST DRT					mod DVT	rev. 1
	borehole	S2GALL	probe depth m	50,5		code	3
Client:	ITALFERR S.P.A.			job	1714	v. accept.	1714SIT
Project	COLLEGAMENTO CAMPOMARINO-RIPALTA					report	1714SIT 06 DRT
		coordinates		EAST			
site	CAMPOMARINO			NORTH		date	08.06.17 pag 3/3

DILATOMETRIC ROCK TEST WITH VOLUME CHANGE MEASUREMENTS - ISRM 1987

PLACE

SECTION





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InfoCamere Qualified Electronic Signature CA

Sede: Via Monsignor Bologna, 18 - CAMPOBASSO
Stabilimento: C.da S.Maria delle Macchie - Vinchiaturo (CB)
Tel. 0874/340003-16 **Fax**: 0874/340014
P.IVA e Cod. Fiscale: 00717630701
web: www.imosgeo.it

S2 GALL BIS

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PRESSUREMETER TEST					mod MPT	rev 2.0
BOREHOLE	S2GALL bis	DEPTH m	13,3	TEST CODE MPT		1
CLIENT	ITALFERR S.P.A.	JOB N.	1714	TYPE	SIT	
PROJECT	RADDOPPIO TERMOLI-RIPALTA (Lotti 2 e 3)	REPORT	1714SIT 13			
OBJECT						
COORDINATES						
SITE	Campomarino	DATE	05.12.17	PAGE	1/3	

weather _____ test depth 13,30 m

hydrostatic level (m) > _____ us _____ KPa display by surface (m) 1,00 SPT (m) _____ n/15cm

γn nat.grav assumed 2,20 t/mc Pressuremeter: APAGEO SEGELM

σV assumed 293 kPa test pocket carotaggio 66 mm probe: TE60

soil brief description ARGILLA AVANA CON LIVELLI SABBIOSI

geological unit

test in according with AFNOR NFP 94 - 110

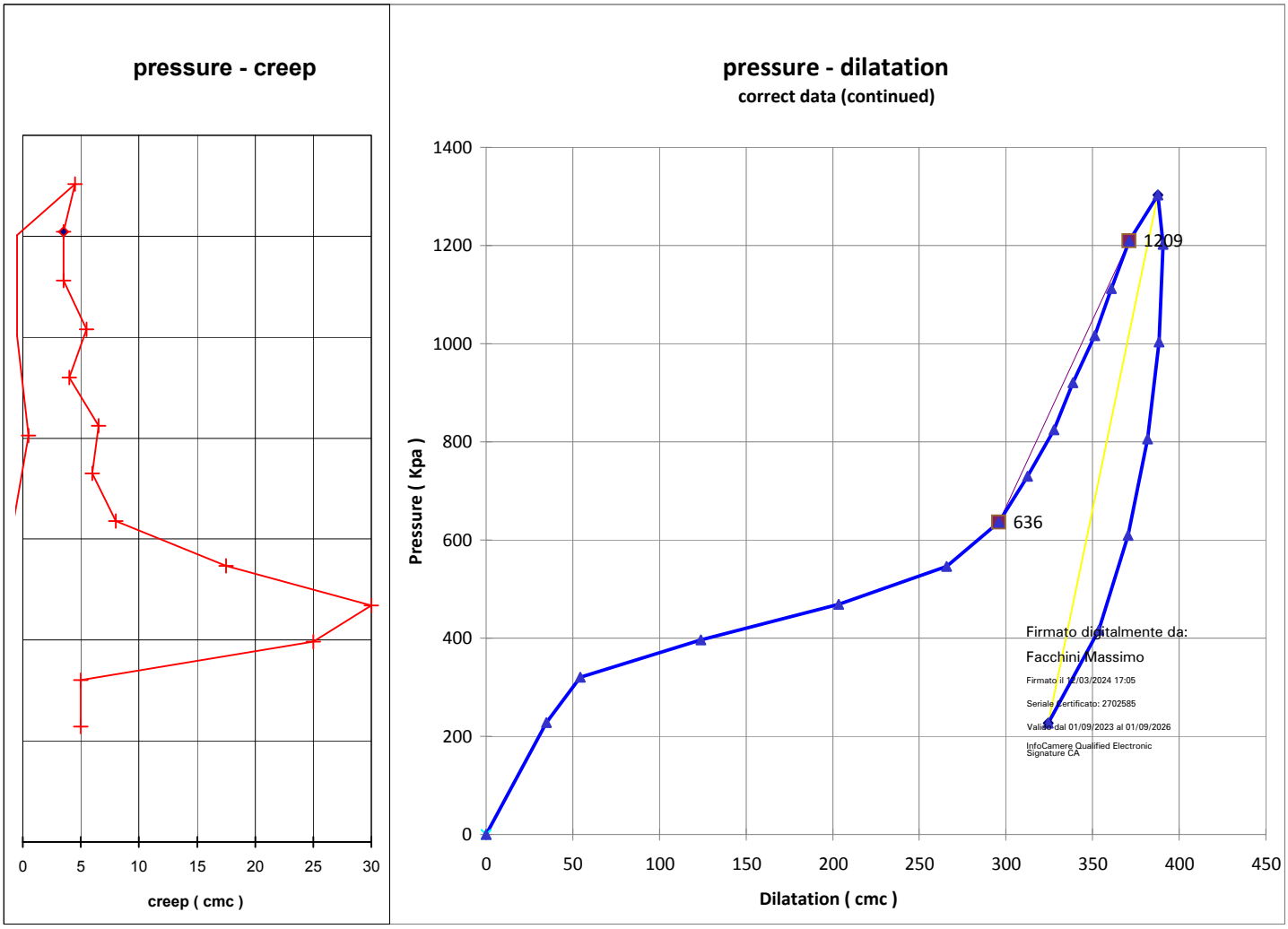
pressuremeter modulus **Em** **17,3** MPa

assumed elasticity modulus **Ey** **25,9** MPa

Em/P*L 10,15

assumed cu **196** kPa

Assumed friction angle by Menard °



Sperimentatore
dott.geol.M.Agostini

Direttore Laboratorio
dott.geol. Valerio Manzon

PRESSUREMETER TEST					mod MPT	rev 1.0
BOREHOLE	S2GALL bis	DEPTH m	13,3	TEST CODE MPT		1
CLIENT	ITALFERR S.P.A.		JOB N.	1714	TYPE	SIT
PROJECT	RADDOPPIO TERMOLI-RIPALTA (Lotti 2 e 3)		REPORT	1714	13	MPT
OBJECT						
COORDINATES						
SITE	Campomarino	DATE	05.12.17	PAGE	2/3	

DATA PROCESSING

PRESSUREMETER CURVE LIMITS

	FIRST LOAD	LOOP 1	LOOP 2
initial pressure P1 (kPa)	636	1303	
initial volume pressure V1 (kPa)	296	388	
initial creep vol C1 (cmc)	8		
final pressure P2 (kPa)	1209	227	
final volume V2 (kPa)	371	324	
fin creep (cmc)/ unload Eu (Mpa)	4	**39,6**	

PHYSIC PROPERTIES

VP probe volume at rest	523	cmc
VL probe limit volume	1115	cmc
V0 initial volume	296	cmc
1/VL	0,90	10^{-3} cmc
ν poisson index	0,33	
α sp reologic experimental coeff.	0,44	
α reologic theoric coefficient	**0,67**	

SYSTEM CORRECTION

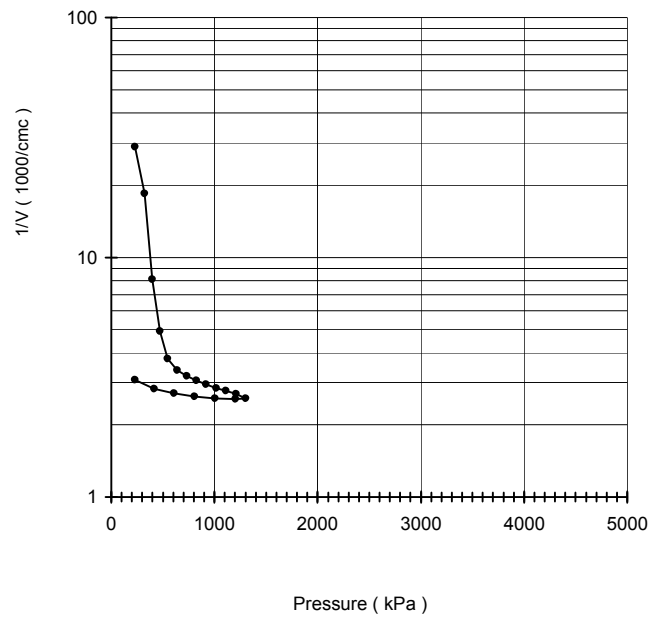
inertia cover	
kPa/cmc	0,35
syst. Dilatation	
cmc/Mpa	3,62

PRESSUREMETER PARAMETERS

Ko lateral coeff at rest assumed	**0,70**	
Pho estim. Horiz pres at rest	205	kPa
P0 measured initial pressure	636	kPa
Em pressuremeter modulus	**17,3**	MPa
Ey min elasticity mod. measured in unload	**39,6**	MPa
Ey elasticity mod. assumed by C. reologic	**25,9**	MPa
Pc creep pressure	1209	kPa
P*c net creep pressure	1004	kPa
PL limit pressure by Cassan	1912	kPa
PL limit pressure by Van Vambecke	2671	kPa
PL assumed limit pressure	1912	kPa
P*L assumed net limit pressure	1707	kPa
Em/P*L **10,15**	Ey/P*L 23,22	

GEOTECHNICAL PARAMETERS

Assumed CU by Amar et Jezequel	**196**	kPa
Assumed friction angle by Menard		°



DATA

n°	Pressure bars	Vr 30" cmc	Vr 60" cmc	P corr. kPa	V corr. cmc	creep cmc	Modulus MPa
1	0,0	0	0	0	0	0	
2	*1,0*	*30*	*35*	*228*	*35*	*5*	*9,5*
3	2,0	50	55	321	54	5	7,1
4	3,0	100	125	397	124	25	1,8
5	4,0	175	205	469	204	30	1,7
6	5,0	250	268	547	266	18	2,5
7	**6,0**	**290**	**298**	**636**	**296**	**8**	**6,3**
8	7,0	309	315	730	312	6	12,4
9	8,0	324	331	825	328	7	14,0
10	9,0	338	342	921	339	4	19,6
11	10,0	350	355	1016	351	6	17,4
12	11,0	362	365	1113	361	4	23,4
13	**12,0**	**372**	**376**	**1209**	**371**	**4**	**22,5**
14	13,0	388	393	1303	388	5	13,6
15	12,0	396	395	1202	391	-1	-85,5
16	10,0	393	392	1003	388	-1	212,2
17	8,0	384	385	806	382	1	70,4
18	6,0	374	373	610	370	-1	41,5
19	4,0	356	355	416	354	-1	27,2
20	2,0	329	325	227	324	-4	14,8
21							
22							
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35							

Firmato digitalmente da: Facchini Massimo
Firmato il 12/03/2024 17:05
Seriale Certificato: 2782585
Valido dal 01/09/2023 al 01/09/2026
InfoCamere Qualified Electronic Signature CA

FORO LARGO

Sperimentatore
dott.geol.M.Agostini

Direttore Laboratorio
dott.geol. Valerio Manzon

PRESSUREMETER TEST					mod MPT	rev 1.0
BOREHOLE	S2GALL bis	DEPTH m	13,3	TEST CODE MPT		1
CLIENT	ITALFERR S.P.A.	JOB N.	1714	TYPE	SIT	
PROJECT	RADDOPPIO TERMOLI-RIPALTA (Lotti 2 e 3)	REPORT	1714	13	MPT	
OBJECT						
COORDINATES						
SITE	Campomarino	DATE	05.12.17	PAGE	3/3	

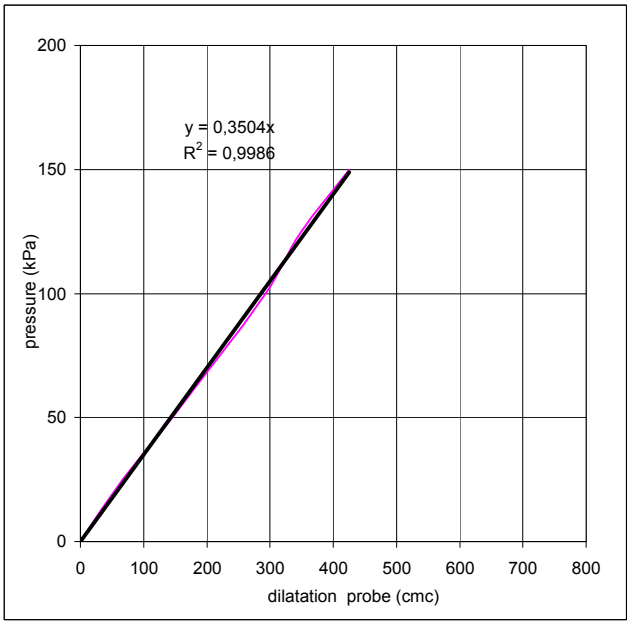
PLACE

SOIL TYPE

CALIBRATION IN AIR

membrane SI cover TELATA MORBIDA kPa/cmc 0,35

Height measure cell (cm) 21,00 VP in. probe vol (cmc) 523

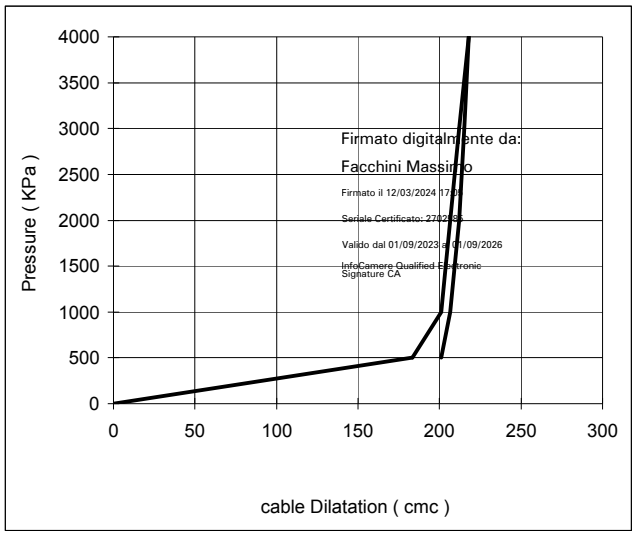


CONFINED CALIBRATION

Lenght cable 50 ϕ confined diameter (cm) 6,6

Vi (cmc) 195 Coeff. 5,62 cmc/Mpa first load

tube volume cmc 718 Coeff. 3,62 cmc/Mpa unload



Sperimentatore
dott.geol.M.Agostini

Direttore Laboratorio
dott.geol. Valerio Manzon

PRESSUREMETER TEST					mod MPT	rev 2.0
BOREHOLE	S2GALL bis	DEPTH m	23,0	TEST CODE MPT		2
CLIENT	ITALFERR S.P.A.	JOB N.	1714	TYPE	SIT	
PROJECT	RADDOPPIO TERMOLI-RIPALTA (Lotti 2 e 3)	REPORT	1714SIT 14		MPT	
OBJECT						
COORDINATES						
SITE	Campomarino	DATE	05.12.17	PAGE	1/3	

weather _____ test depth 23,00 m

hydrostatic level (m) > _____ us _____ KPa display by surface (m) 1,00 SPT (m) _____ n/15cm

γn nat.grav assumed 2,20 t/mc Pressuremeter: APAGEO SEGELM

σV assumed 506 kPa test pocket carotaggio 66 mm probe: TE60

soil brief description ARGILLA LIMOSA GRIGIA CON RARI LIVELLETTI SABBIOSI

geological unit _____

test in according with AFNOR NFP 94 - 110

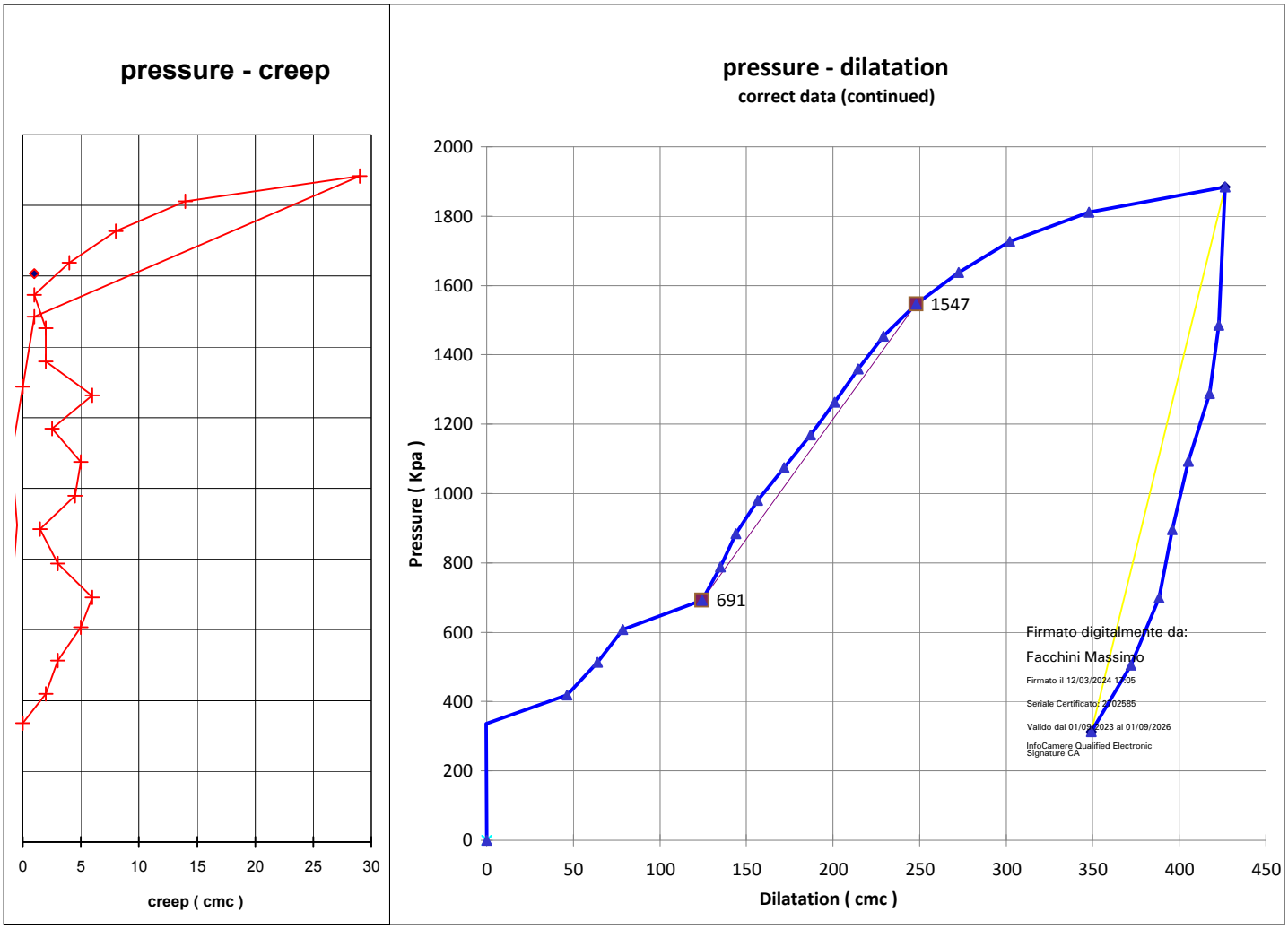
pressuremeter modulus **Em** **13,0** MPa

assumed elasticity modulus **Ey** **19,5** MPa

Em/P*L 7,66

assumed cu **195** kPa

Assumed friction angle by Menard °



Sperimentatore
dott.geol.M.Agostini

Direttore Laboratorio
dott.geol. Valerio Manzon

PRESSUREMETER TEST					mod MPT	rev 1.0
BOREHOLE	S2GALL bis	DEPTH m	23,0	TEST CODE MPT		2
CLIENT	ITALFERR S.P.A.	JOB N.	1714	TYPE	SIT	
PROJECT	RADDOPPIO TERMOLI-RIPALTA (Lotti 2 e 3)	REPORT	1714	14	MPT	
OBJECT						
COORDINATES						
SITE	Campomarino	DATE	05.12.17	PAGE	2/3	

DATA PROCESSING

PRESSUREMETER CURVE LIMITS

	FIRST LOAD	LOOP 1	LOOP 2
initial pressure P1 (kPa)	691	1884	
initial volume pressure V1 (kPa)	124	426	
initial creep vol C1 (cmc)	6		
final pressure P2 (kPa)	1547	313	
final volume V2 (kPa)	248	349	
fin creep (cmc)/ unload Eu (Mpa)	1	**49,3**	

PHYSIC PROPERTIES

VP probe volume at rest	523	cmc
VL probe limit volume	772	cmc
V0 initial volume	124	cmc
1/VL	1,30	10^{-3} cmc
ν poisson index	0,33	
α sp reologic experimental coeff.	0,26	
α reologic theoric coefficient	**0,67**	

SYSTEM CORRECTION

inertia cover	
kPa/cmc	0,35
syst. Dilatation	
cmc/Mpa	3,62

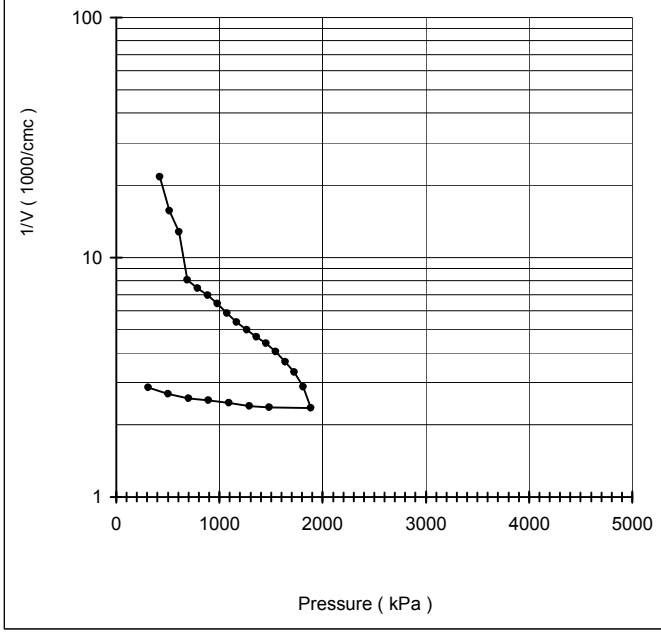
MPa

PRESSUREMETER PARAMETERS

Ko lateral coeff at rest assumed	**0,70**	
Pho estim. Horiz pres at rest	354	kPa
P0 measured initial pressure	691	kPa
Em pressuremeter modulus	**13,0**	MPa
Ey min elasticity mod. measured in unload	**49,3**	MPa
Ey elasticity mod. assumed by C. reologic	**19,5**	MPa
Pc creep pressure	1607	kPa
P*c net creep pressure	1253	kPa
PL limit pressure by Cassan	2484	kPa
PL limit pressure by Van Vambecke	2057	kPa
PL assumed limit pressure	2057	kPa
P*L assumed net limit pressure	1703	kPa
Em/P*L **7,66**	Ey/P*L 28,96	

GEOTECHNICAL PARAMETERS

Assumed CU by Amar et Jezequel	**195**	kPa
Assumed friction angle by Menard		°



DATA

n°	Pressure bars	Vr 30" cmc	Vr 60" cmc	P corr. kPa	V corr. cmc	creep cmc	Modulus MPa
1	0,0	0	0	0	0	0	
2	1,0	0	0	335	0	0	-1288,7
3	2,0	45	47	419	46	2	2,6
4	3,0	62	65	513	64	3	8,2
5	4,0	75	80	607	79	5	10,2
6	**5,0**	**120**	**126**	**691**	**124**	**6**	**3,1**
7	6,0	134	137	787	135	3	15,7
8	7,0	145	147	884	144	2	18,6
9	8,0	155	160	980	157	5	13,5
10	9,0	170	175	1074	172	5	11,4
11	10,0	188	191	1169	187	3	11,7
12	11,0	199	205	1264	201	6	12,8
13	12,0	217	219	1359	215	2	13,6
14	13,0	232	234	1454	229	2	12,8
15	**14,0**	**252**	**253**	**1547**	**248**	**1**	**10,1**
16	15,0	274	278	1638	273	4	7,7
17	16,0	300	308	1728	302	8	6,5
18	17,0	340	354	1812	348	14	4,1
19	18,0	404	433	1884	426	29	2,2
20	14,0	427	428	1486	423	1	282,7
21	12,0	422	422	1288	418	0	94,1
22	10,0	410	409	1092	405	-1	39,6
23	8,0	400	399	896	396	-1	52,1
24	6,0	392	391	699	388	-1	61,7
25	4,0	375	374	505	372	-2	28,6
26	2,0	353	350	313	349	-3	19,8
27							
28							
29							
30							
31							
32							
33							
34							
35							

tratto iniziale della curva pressiometrica disturbato da perforazione

Sperimentatore
dott.geol.M.Agostini

Direttore Laboratorio
dott.geol. Valerio Manzon

PRESSUREMETER TEST					mod MPT	rev 1.0
BOREHOLE	S2GALL bis	DEPTH m	23,0	TEST CODE MPT		2
CLIENT	ITALFERR S.P.A.	JOB N.	1714	TYPE	SIT	
PROJEC	RADDOPPIO TERMOLI-RIPALTA (Lotti 2 e 3)	REPORT	1714	14	MPT	
OBJECT						
COORDINATES						
SITE	Campomarino	DATE	05.12.17	PAGE	3/3	

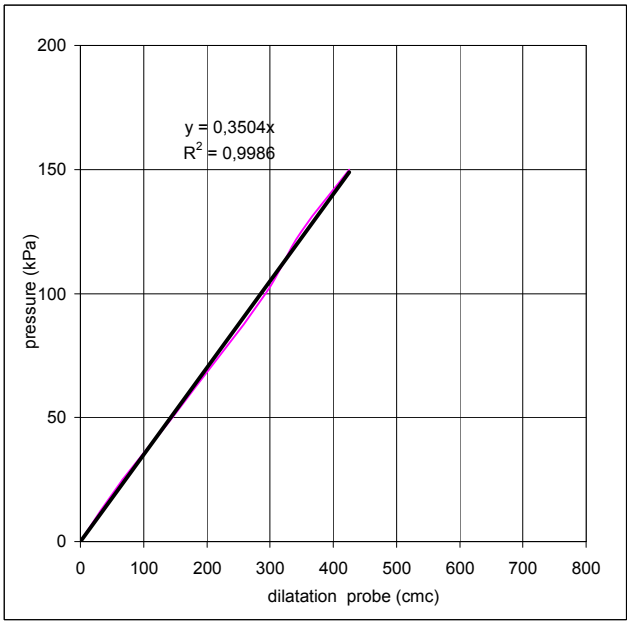
PLACE

SOIL TYPE

CALIBRATION IN AIR

membrane SI cover TELATA MORBIDA kPa/cmc 0,35

Height measure cell (cm) 21,00 VP in. probe vol (cmc) 523

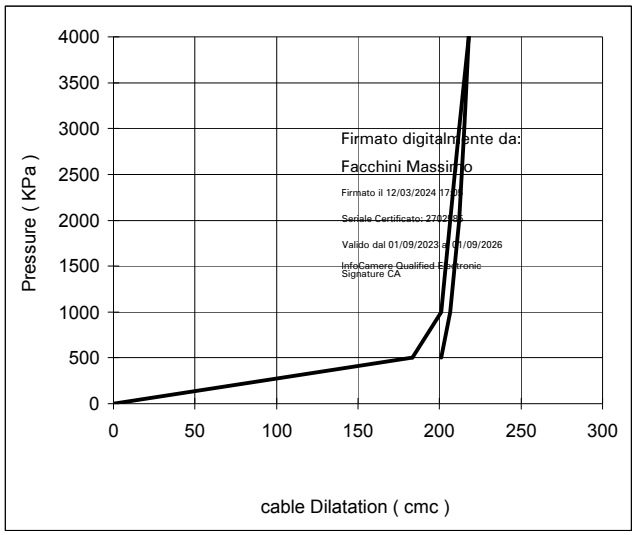


CONFINED CALIBRATION

Lenght cable 50 ϕ confined diameter (cm) 6,6

Vi (cmc) 195 Coeff. 5,62 cmc/Mpa first load

tube volume cmc 718 Coeff. 3,62 cmc/Mpa unload



Sperimentatore
dott.geol.M.Agostini

Direttore Laboratorio
dott.geol. Valerio Manzon

Sede: Via Monsignor Bologna, 18 - CAMPOBASSO
Stabilimento: C.da S.Maria delle Macchie - Vinchiaturo (CB)
Tel. 0874/340003-16 **Fax**: 0874/340014
P.IVA e Cod. Fiscale: 00717630701
web: www.imosgeo.it

S3 GALL

Firmato digitalmente da:
Facchini Massimo
Firmato il 12/03/2024 17:05
Seriale Certificato: 2702585
Valido dal 01/09/2023 al 01/09/2026
InfoCamere Qualified Electronic Signature CA

PRESSUREMETER TEST					mod MPT	rev 2.0
BOREHOLE	**S3GALL**	**DEPTH m**	**20,0**	**TEST CODE MPT**		**1**
CLIENT	**ITALFERR S.P.A.**	JOB N.	1714	TYPE		SIT
PROJECT	LOTTO CAMPOMARINO-RIPALTA	REPORT	1714SIT	**7**		MPT
OBJECT						
COORDINATES						
SITE	Campomarino	DATE	17.05.17	PAGE		1/3

weather _____ test depth 20,00 m

hydrostatic level (m) > _____ us _____ KPa display by surface (m) 1,00 SPT (m) _____ n/15cm

γn nat.grav assumed 2,20 t/mc Pressuremeter: APAGEO SEGELM

σV assumed 440 kPa test pocket carotaggio 66 mm probe: TE60

soil brief description argilla limosa grigia molto consistente

geological unit

test in according with AFNOR NFP 94 - 110

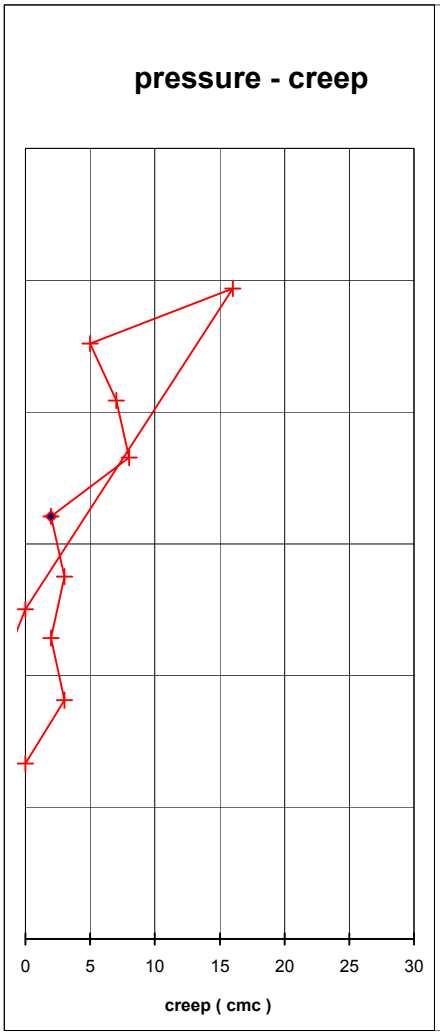
pressuremeter modulus **Em** **13,5** MPa

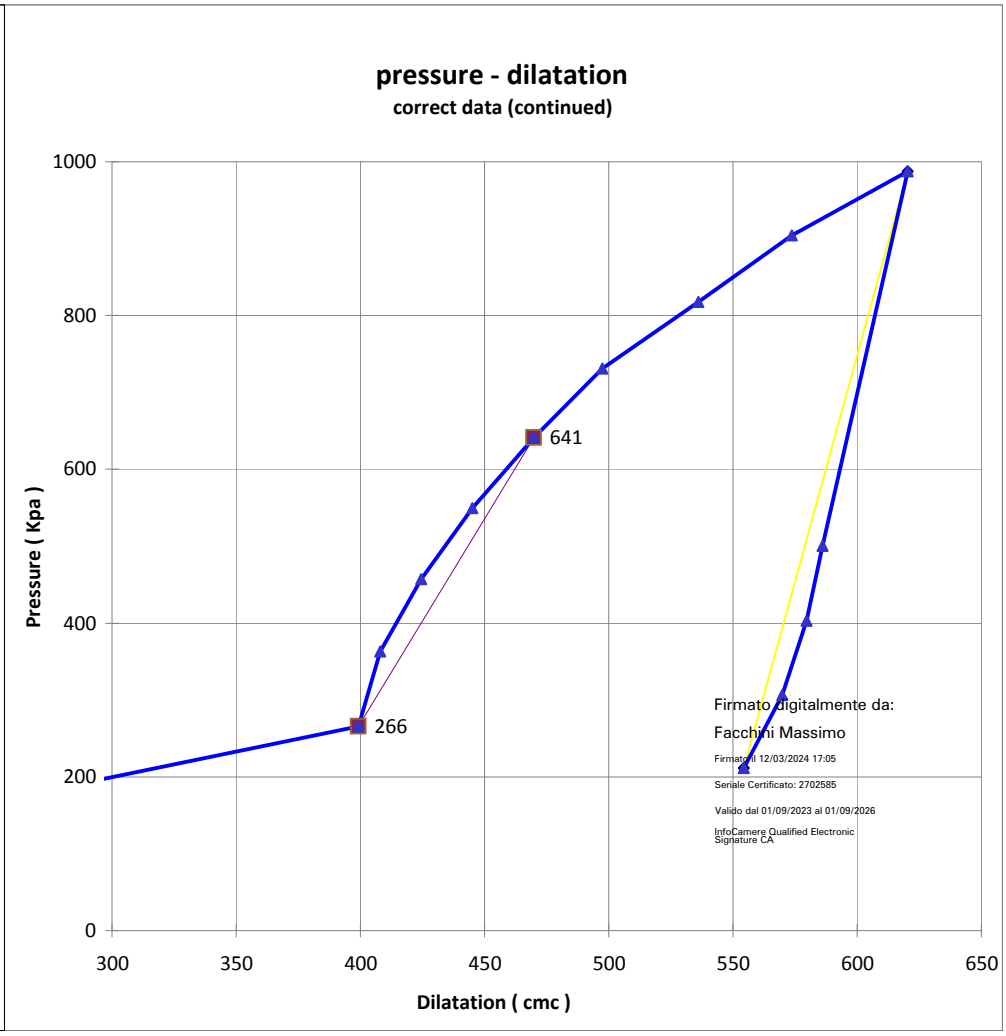
assumed elasticity modulus **Ey** **20,2** MPa

Em/P*L 23,92

Assumed CU (johnson, 1986) **112** kPa

Assumed friction angle by Menard °





PRESSUREMETER TEST					mod MPT	rev 1.0
BOREHOLE	S3GALL	DEPTH m	20,0		TEST CODE MPT	1
CLIENT	ITALFERR S.P.A.		JOB N.	1714	TYPE	SIT
PROJECT	LOTTO CAMPOMARINO-RIPALTA		REPORT	1714	7	MPT
OBJECT						
COORDINATES						
SITE	Campomarino	DATE	17.05.17		PAGE	2/3

DATA PROCESSING

PRESSUREMETER CURVE LIMITS

	FIRST LOAD	LOOP 1	LOOP 2
initial pressure P1 (kPa)	266	988	
initial volume pressure V1 (kPa)	399	620	
initial creep vol C1 (cmc)	0		
final pressure P2 (kPa)	641	212	
final volume V2 (kPa)	470	554	
fin creep (cmc)/ unload Eu (Mpa)	2	**34,7**	

PHYSIC PROPERTIES

VP probe volume at rest	523	cmc	
VL probe limit volume	1322	cmc	
V0 initial volume	399	cmc	
1/VL	0,76	10^{-3} cmc	
ν poisson index	0,33		
α sp reologic experimental coeff.	0,39		
α reologic theoric coefficient	**0,67**		

SYSTEM CORRECTIOI

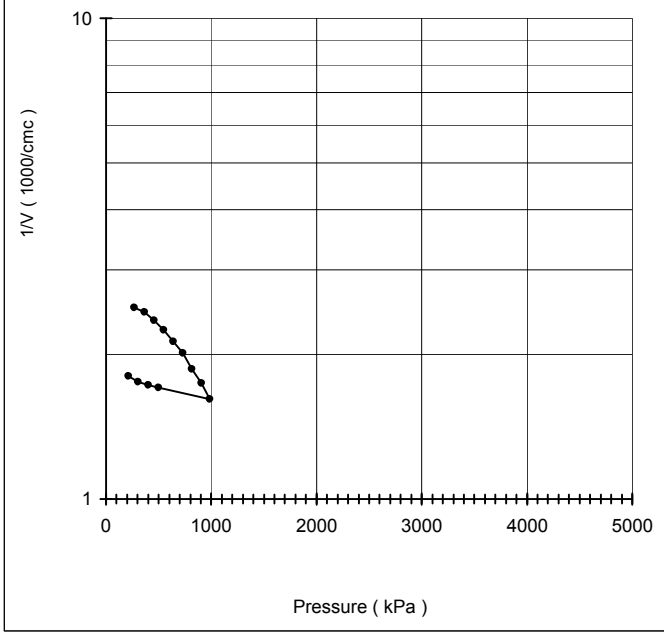
inertia cover		
kPa/cmc	0,35	
syst. Dilatation		
cmc/Mpa	3,62	
		MPa

PRESSUREMETER PARAMETERS

Ko lateral coeff at rest assumed	**0,70**	
Pho estim. Horiz pres at rest	308	kPa
P0 measured initial pressure	266	kPa
Em pressuremeter modulus	**13,5**	MPa
Ey min elasticity mod. measured in unload	**34,7**	MPa
Ey elasticity mod. assumed by C. reologic	**20,2**	MPa
Pc creep pressure	641	kPa
P*c net creep pressure	333	kPa
PL limit pressure by Cassan	874	kPa
PL limit pressure by Van Vambecke	1578	kPa
PL assumed limit pressure	874	kPa
P*L assumed net limit pressure	566	kPa
Em/P*L **23,92**	Ey/P*L 61,28	

GEOTECHNICAL PARAMETERS

Assumed CU (johnson, 1986)	**112**	kPa
Assumed friction angle by Menard		°



DATA

n°	Pressure bars	Vr 30" cmc	Vr 60" cmc	P corr. kPa	V corr. cmc	creep cmc	Modulus MPa
1	0,0	0	0	0	0	0	
2	**2,0**	**400**	**400**	**266**	**399**	**0**	**1,3**
3	3,0	406	409	363	408	3	27,6
4	4,0	424	426	457	425	2	14,1
5	5,0	444	447	550	445	3	11,4
6	**6,0**	**470**	**472**	**641**	**470**	**2**	**9,7**
7	7,0	492	500	731	497	8	8,7
8	8,0	532	539	817	536	7	6,2
9	9,0	572	577	904	574	5	6,6
10	10,0	608	624	988	620	16	5,3
11	5,0	588	588	500	586	0	42,7
12	4,0	583	581	403	580	-2	43,2
13	3,0	572	571	306	570	-1	29,2
14	2,0	556	555	212	554	-1	17,4
15							
16							
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35							

Firmato digitalmente da:
Facchini Massimo
Firmato il 12/03/2024 17:05
Seriale Certificato: 2782585
Valido dal 01/09/2023 al 01/09/2026
InfoCamere Qualified Electronic Signature CA

MATERIALE ASSIMILATO A TERRENO COESIVO

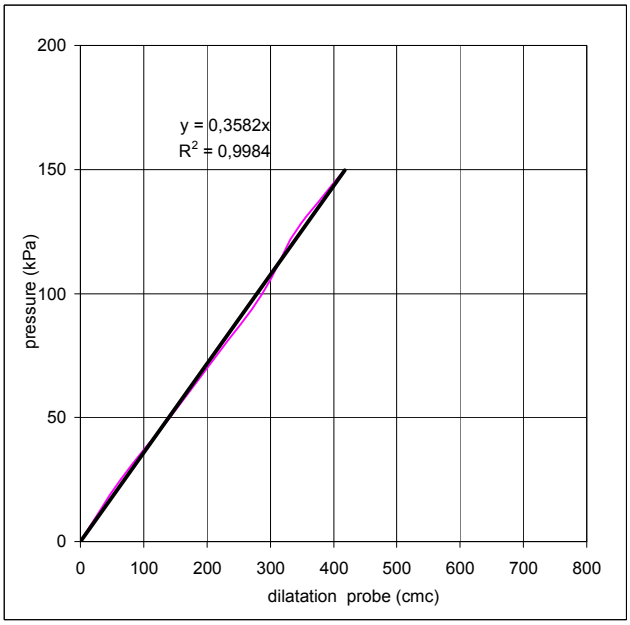
	PRESSUREMETER TEST				mod MPT	rev 1.0
	BOREHOLE	**S3GALL**	**DEPTH m**	**20,0**	**TEST CODE MPT**	**1**
	CLIENT	**ITALFERR S.P.A.**	JOB N.	1714	TYPE	SIT
	PROJECT	LOTTO CAMPOMARINO-RIPALTA	REPORT	1714	7	MPT
	OBJECT					
	COORDINATES					
	SITE	Campomarino	DATE	17.05.17	PAGE	3/3

PLACE

CALIBRATION IN AIR

membrane SI cover TELATA MORBIDA kPa/cmc 0,35

Height measure cell (cm) 21,00 VP in. probe vol (cmc) 523



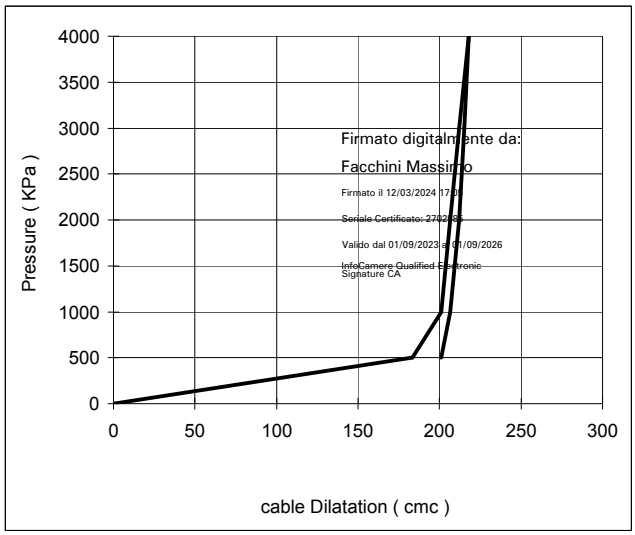
SOIL TYPE

CONFINED CALIBRATION

Lenght cable 50 ϕ confined diameter (cm) 6,6

Vi (cmc) 195 Coeff. 5,62 cmc/Mpa first load

tube volume cmc 718 Coeff. 3,62 cmc/Mpa unload



PRESSUREMETER TEST					mod MPT	rev 2.0
BOREHOLE	S3GALL	DEPTH m	25,2	TEST CODE MPT		1
CLIENT	ITALFERR S.P.A.	JOB N.	1714	TYPE	SIT	
PROJECT	LOTTO CAMPOMARINO-RIPALTA	REPORT	1714SIT	8	MPT	
OBJECT						
COORDINATES						
SITE	Campomarino	DATE	17.05.17	PAGE	1/3	

weather _____ test depth 25,20 m

hydrostatic level (m) > _____ us _____ KPa display by surface (m) 1,00 SPT (m) _____ n/15cm

γn nat.grav assumed 2,20 t/mc Pressuremeter: APAGEO SEGELM

σV assumed 554 kPa test pocket carotaggio 66 mm probe: TE60

soil brief description argilla limosa molto consistente

geological unit

test in according with AFNOR NFP 94 - 110

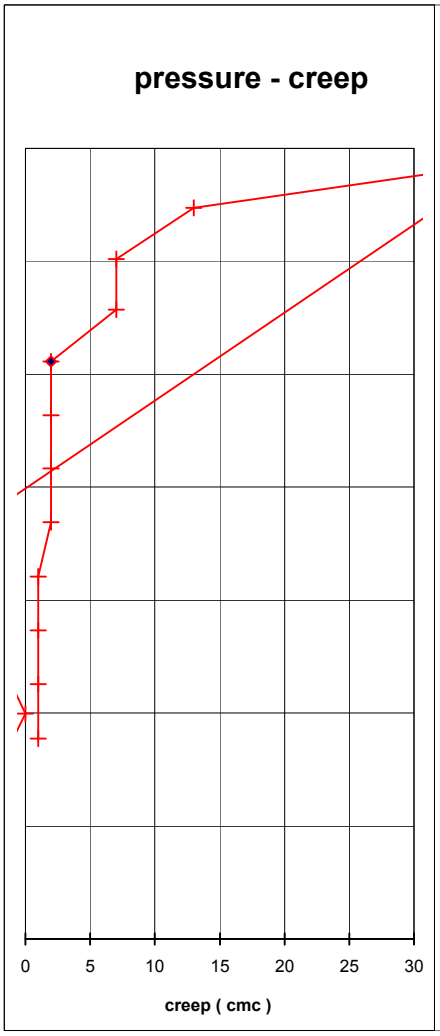
pressuremeter modulus **Em** **11,1** MPa

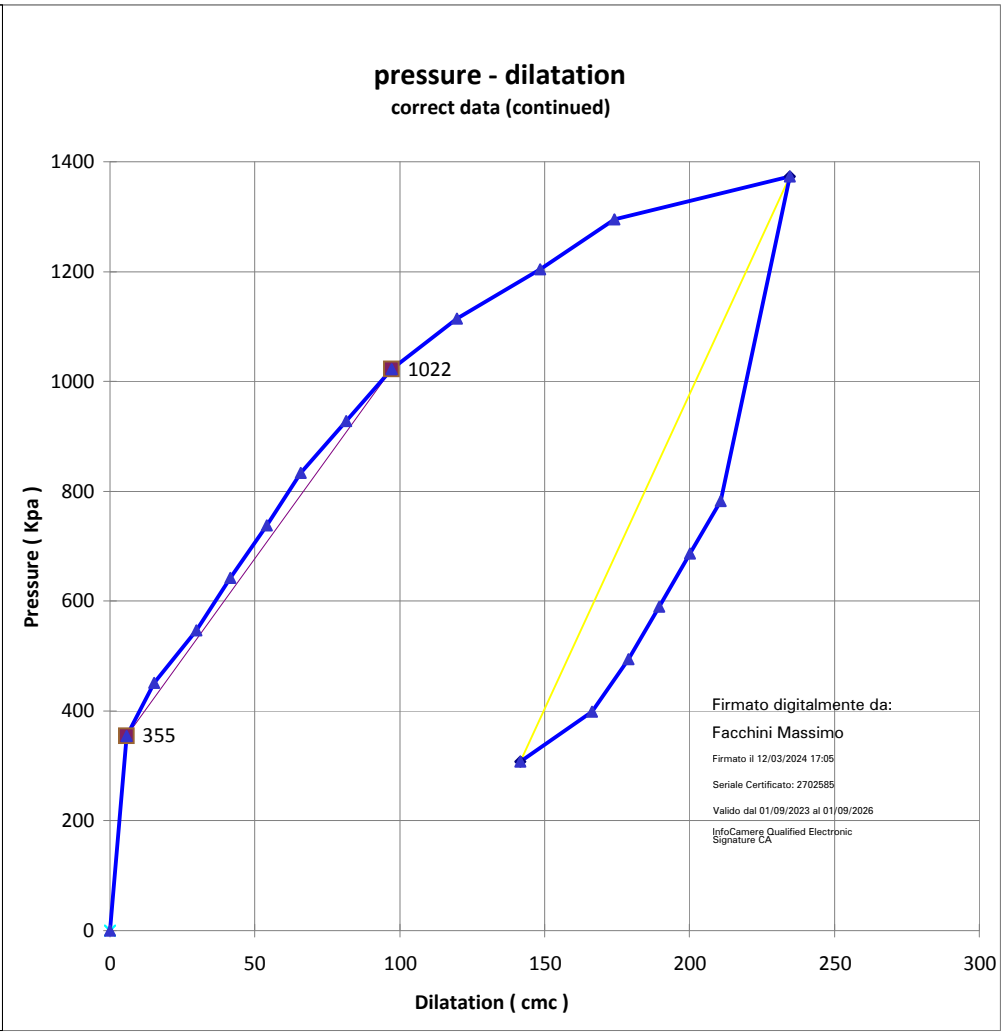
assumed elasticity modulus **Ey** **16,6** MPa

Em/P*L 10,34

assumed cu **133** kPa

Assumed friction angle by Menard °





PRESSUREMETER TEST					mod MPT	rev 1.0
BOREHOLE	S3GALL	DEPTH m	25,2	TEST CODE MPT		1
CLIENT	ITALFERR S.P.A.		JOB N.	1714	TYPE	SIT
PROJECT	LOTTO CAMPOMARINO-RIPALTA		REPORT	1714	8	MPT
OBJECT						
COORDINATES						
SITE	Campomarino	DATE	17.05.17		PAGE	2/3

DATA PROCESSING

PRESSUREMETER CURVE LIMITS

	FIRST LOAD	LOOP 1	LOOP 2
initial pressure P1 (kPa)	355	1373	
initial volume pressure V1 (kPa)	6	235	
initial creep vol C1 (cmc)	1		
final pressure P2 (kPa)	1022	307	
final volume V2 (kPa)	97	142	
fin creep (cmc)/ unload Eu (Mpa)	2	**21,7**	

PHYSIC PROPERTIES

VP probe volume at rest	523	cmc	
VL probe limit volume	534	cmc	
V0 initial volume	6	cmc	
1/VL	1,87	10^{-3} cmc	
ν poisson index	0,33		
α sp reologic experimental coeff.	0,51		
α reologic theoric coefficient	**0,67**		

SYSTEM CORRECTIOI

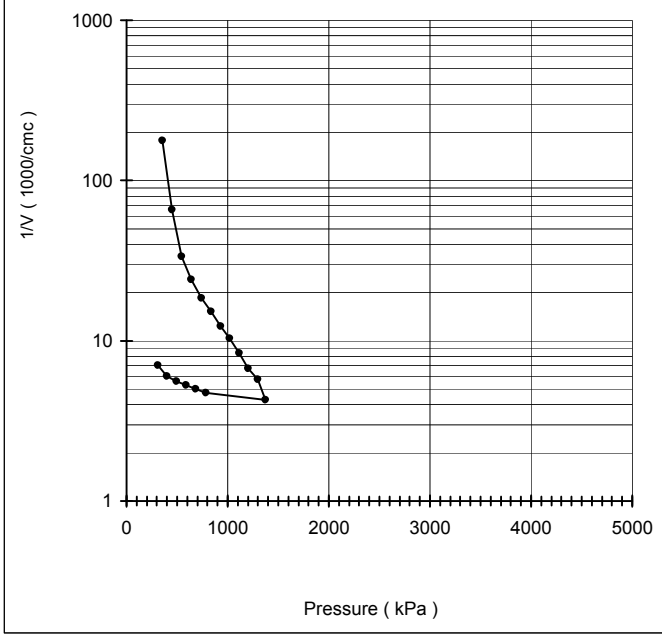
inertia cover	
kPa/cmc	0,35
syst. Dilatation	
cmc/Mpa	3,62
MPa	

PRESSUREMETER PARAMETERS

Ko lateral coeff at rest assumed	**0,70**	
Pho estim. Horiz pres at rest	388	kPa
P0 measured initial pressure	355	kPa
Em pressuremeter modulus	**11,1**	MPa
Ey min elasticity mod. measured in unload	**21,7**	MPa
Ey elasticity mod. assumed by C. reologic	**16,6**	MPa
Pc creep pressure	1022	kPa
P*c net creep pressure	634	kPa
PL limit pressure by Cassan	1466	kPa
PL limit pressure by Van Vambecke	1512	kPa
PL assumed limit pressure	1466	kPa
P*L assumed net limit pressure	1078	kPa
Em/P*L **10,34**	Ey/P*L 20,12	

GEOTECHNICAL PARAMETERS

Assumed CU by Amar et Jezequel	**133**	kPa
Assumed friction angle by Menard		°



DATA

n°	Pressure bars	Vr 30" cmc	Vr 60" cmc	P corr. kPa	V corr. cmc	creep cmc	Modulus MPa
1	0,0	0	0	0	0	0	
2	**1,0**	**5**	**6**	**355**	**6**	**1**	**88,1**
3	2,0	15	16	451	15	1	14,2
4	3,0	30	31	546	30	1	9,4
5	4,0	42	43	642	42	1	12,2
6	5,0	54	56	737	54	2	11,5
7	6,0	66	68	833	66	2	12,8
8	7,0	82	84	928	81	2	9,6
9	**8,0**	**98**	**100**	**1022**	**97**	**2**	**9,8**
10	9,0	116	123	1114	120	7	6,8
11	10,0	145	152	1204	148	7	5,5
12	11,0	165	178	1295	174	13	6,5
13	12,0	202	239	1373	235	37	2,5
14	6,0	214	213	782	211	-1	49,2
15	5,0	203	202	686	200	-1	17,5
16	4,0	192	191	590	190	-1	17,3
17	3,0	182	180	494	179	-2	17,0
18	2,0	167	167	399	166	0	14,0
19	1,0	144	142	307	142	-2	6,7
20							
21							
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Firmato digitalmente da: Facchini Massimo
Firmato il 12/03/2024 17:05
Seriale Certificato: 2782585
Valido dal 01/09/2023 al 01/09/2026
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MATERIALE ASSIMILATO A TERRENO COESIVO

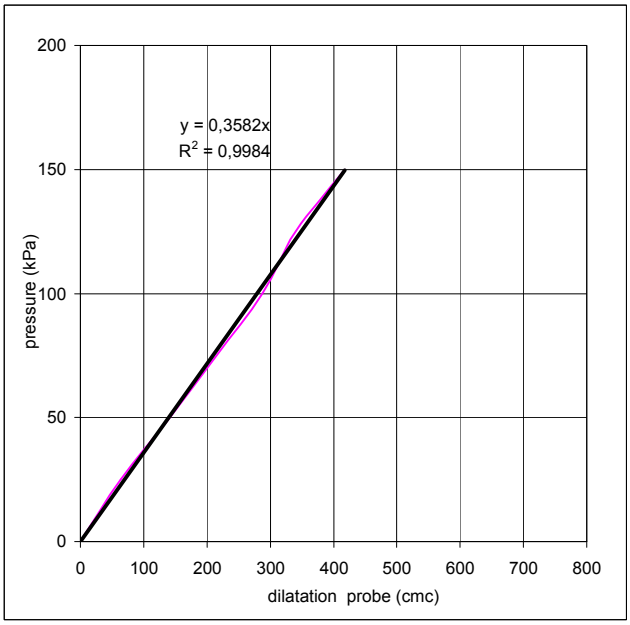
	PRESSUREMETER TEST				mod MPT	rev 1.0
BOREHOLE	**S3GALL**	**DEPTH m**	**25,2**		**TEST CODE MPT**	**1**
CLIENT	**ITALFERR S.P.A.**		JOB N.	1714	TYPE	SIT
PROJECT	LOTTO CAMPOMARINO-RIPALTA		REPORT	1714	8	MPT
OBJECT						
COORDINATES						
SITE	Campomarino	DATE	17.05.17		PAGE	3/3

PLACE

CALIBRATION IN AIR

membrane SI cover TELATA MORBIDA kPa/cmc 0,35

Height measure cell (cm) 21,00 VP in. probe vol (cmc) 523



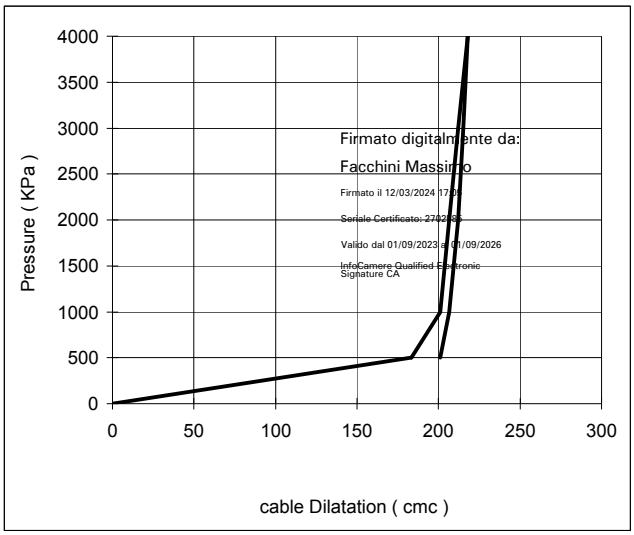
SOIL TYPE

CONFINED CALIBRATION

Lenght cable 50 ϕ confined diameter (cm) 6,6

Vi (cmc) 195 Coeff. 5,62 cmc/Mpa first load

tube volume cmc 718 Coeff. 3,62 cmc/Mpa unload



i.m.o.s. s.r.l.	DILATOMETRIC ROCK TEST DRT			mod DVT rev. 1
	borehole S3GALL	probe depth m 33,6		code 3
	Client: ITALFERR S.P.A.		job 1714	v. accept. 1714SIT
	Project COLLEGAMENTO CAMPOMARINO-RIPALTA			report 1714SIT 09 DRT
		coordinates	EAST	
	site CAMPOMARINO		NORTH	date 18.05.17 pag 1/3

DILATOMETER TEST WITH VOLUME CHANGE MEASUREMENTS - ISRM 1987

Borehole	S3GALL
test 3	depth m 33,60
slope (degree) 90	core barrell
Device: CSM Type VM01 95 mm	
Orientation capteur C1=	Standard method: ISRM 1987
Probe diam 90 MM	Borehole diam 101 MM
Meteo	Temperature
lithotype	SABBIA LIMOSA DA MOLTO ADDENSATA A DEB. CEMENTATA
water table	RQD

Creep test P (Bars) = 34,0

Temps min	PBAR	CMC
2	34,0	424,3
4	34,0	426,8
6	34,0	429,6
8	34,0	431,5
10	34,0	432,9

PROBE SCHEME

rod adaptor

electronic device

double action piston

expandable cylinder

PROBE CALIBRATION

probe	telata 85 mm
membrane	no
V0 cell volume at rest (cmc)	3856
lenght cable (mt)	100
Volume initial Vi (cmc)	150
diam calibration tube (cm)	10,10
tube calibration volume cmc	4006

Calibration in air

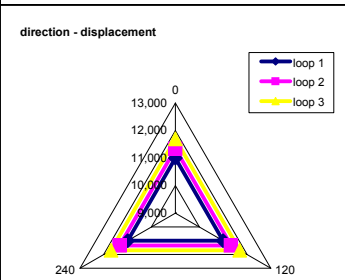
coeff *m* 0,10 cmc/Kpa

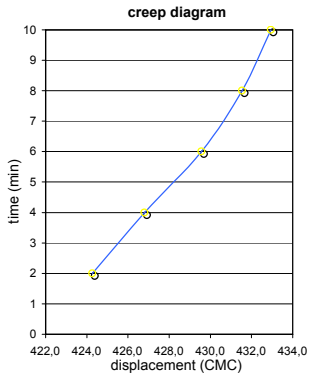
Confined calibration

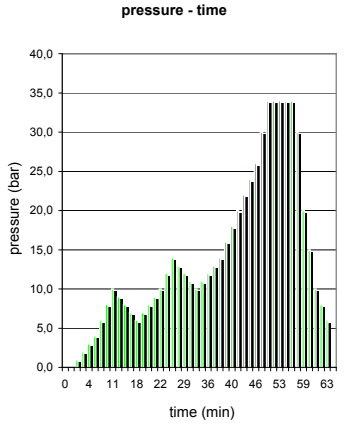
first load 3,00 cmc/Mpa

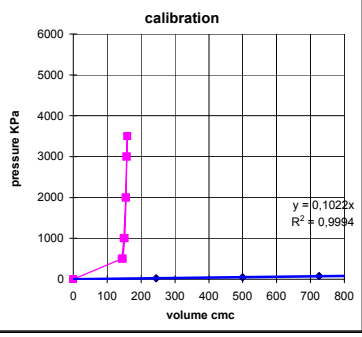
unload 2,14 cmc/Mpa

LITHOTYPE









time	test data							
	P	P corr	Volume	ε c	1/V	diameter	Dil. Diam	Modulo
min	bar	Kpa	cmc	%	1000/cmc	(mm)	(mm)	MPa
0	0,0	0	0,00	-2,840	#DIV/0!	99,104	0,000	
1	0,0	0	0,00	-2,840	#DIV/0!	99,104	0,000	
2	1,0	90	77,79	-1,865	12,856	100,098	0,995	11
3	2,0	186	99,41	-1,595	10,059	100,373	1,269	44
4	3,0	283	117,92	-1,366	8,481	100,607	1,504	52
5	4,0	377	153,18	-0,929	6,528	101,053	1,949	27
9	**6,0**	**566**	**228,71**	**0,000**	**4,372**	**102,000**	**2,897**	**25**
10	8,0	759	262,19	0,409	3,814	102,417	3,314	59
11	10,0	953	280,06	0,626	3,571	102,639	3,536	112
12	9,0	855	277,47	0,595	3,604	102,607	3,504	391
13	8,0	757	274,89	0,564	3,638	102,575	3,471	391
17	7,0	659	274,40	0,558	3,644	102,569	3,465	2085
18	6,0	561	271,11	0,518	3,688	102,528	3,425	307
19	7,0	660	271,90	0,527	3,678	102,538	3,434	1287
20	8,0	757	275,89	0,576	3,625	102,587	3,484	253
21	9,0	855	278,07	0,602	3,596	102,615	3,511	463
22	10,0	953	282,46	0,656	3,540	102,669	3,565	230
23	12,0	1147	299,63	0,864	3,337	102,882	3,778	117
27	14,0	1341	322,50	1,141	3,101	103,164	4,061	88
28	13,0	1243	320,51	1,117	3,120	103,140	4,036	515
29	12,0	1145	319,03	1,099	3,135	103,122	4,018	688
30	11,0	1048	315,64	1,058	3,168	103,080	3,976	301
31	10,0	950	311,96	1,014	3,206	103,034	3,931	276
32	11,0	1048	313,14	1,028	3,193	103,049	3,945	861
36	12,0	1146	316,26	1,066	3,162	103,087	3,984	327
37	13,0	1238	320,23	1,114	3,123	103,136	4,033	244
38	14,0	1341	324,85	1,170	3,078	103,193	4,090	232
39	16,0	1536	336,17	1,307	2,975	103,333	4,230	180
40	18,0	1731	343,74	1,398	2,909	103,426	4,323	271
41	20,0	1927	353,77	1,519	2,827	103,550	4,446	205
42	22,0	2122	362,29	1,622	2,760	103,655	4,551	241
44	24,0	2317	374,37	1,767	2,671	103,803	4,699	170
46	26,0	2512	384,02	1,883	2,604	103,921	4,818	214
47	30,0	2903	403,85	2,121	2,476	104,164	5,060	209
49	**34,0**	**3293**	**424,27**	**2,366**	**2,357**	**104,413**	**5,310**	**204**
51	34,0	3293	426,80	2,396	2,343	104,444	5,340	-1
53	34,0	3292	429,58	2,429	2,328	104,478	5,374	-1
55	34,0	3292	431,54	2,453	2,317	104,502	5,398	-1
57	34,0	3292	432,95	2,469	2,310	104,519	5,415	-1
58	30,0	2900	432,24	2,461	2,314	104,510	5,407	5985
59	20,0	1920	415,95	2,266	2,404	104,312	5,208	643
60	15,0	1431	403,76	2,120	2,477	104,163	5,059	428
61	10,0	942	385,99	1,907	2,591	103,945	4,842	292
62	8,0	748	370,94	1,726	2,696	103,761	4,657	137
63	6,0	553	359,01	1,582	2,785	103,614	4,511	173

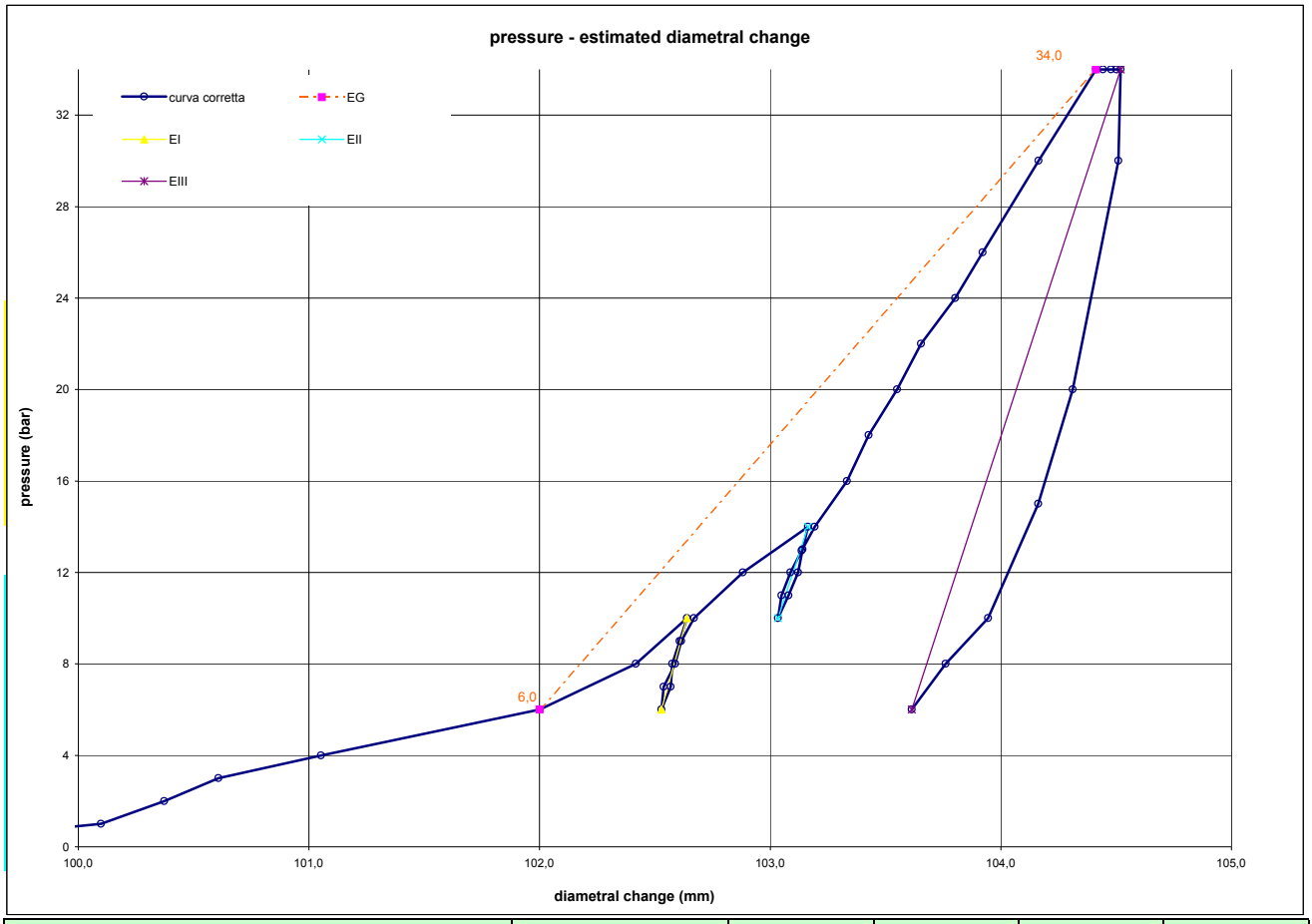
i valori diametrali sono calcolati come valore medio della sonda cillindrica in espansione

FIELD LIMITS

	P	P corr	V corr	creep	1000/V	diameter	Dil. Diam	loop
min	6,0	565,7	228,7	0,0	4,4	102,0	2,9	first load
max	34,0	3293,0	424,3	2,4	2,4	104,4	5,3	first load
max	10,0	953,0	280,1	0,6	3,6	102,6	3,5	I
min	6,0	561,5	271,1	0,5	3,7	102,5	3,4	I
max	14,0	1341,2	322,5	1,1	3,1	103,2	4,1	II
min	10,0	949,8	312,0	1,0	3,2	103,0	3,9	II
max	34,0	3292,1	432,9	2,5	2,3	104,5	5,4	III
min	6,0	552,7	359,0	1,6	2,8	103,6	4,5	III

i.m.o.s. s.r.l.	DILATOMETRIC ROCK TEST DRT				mod DVT rev. 1
borehole	S3GALL	probe depth m	33,6	code	3
Client:	ITALFERR S.P.A.	job	1714	v. accept.	1714SIT
Project	COLLEGAMENTO CAMPOMARINO-RIPALTA			report	1714SIT 09 DRT
	coordinates	EAST			
site	CAMPOMARINO	NORTH		date	18.05.17 pag 2/3

DILATOMETER TEST WITH VOLUME CHANGE MEASUREMENTS - ISRM 1987



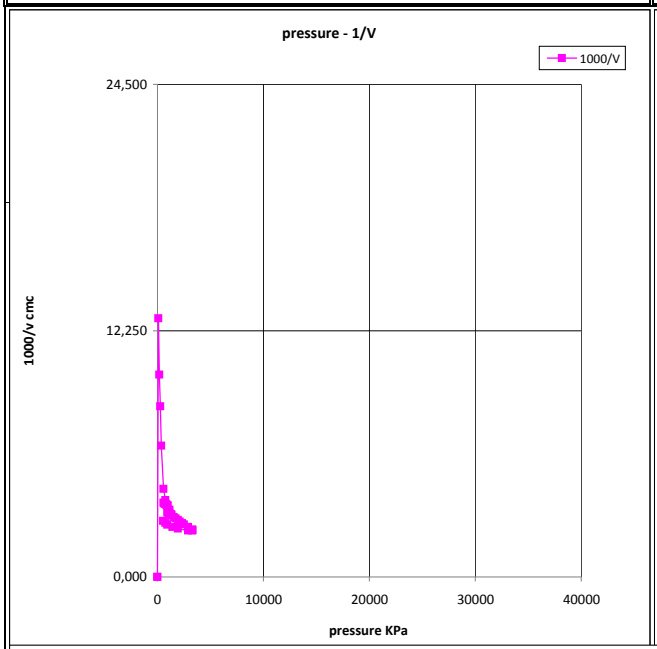
DATA PROCESSING						SENSOR 1	SENSOR 2	SENSOR 3	SENSOR AVE
			ELASTICITY MODULUS Ei						
Legend:	DATA		loop	Pmax	Pmin	E1 (Mpa)	E2 (Mpa)	E3 (Mpa)	Eav (Mpa)
H = test depth	symbol	datum	1	10,00	6,00				450
W = water table depth	γnsoil	2,5	2	14,00	10,00				383
ν = Poisson ratio	W (ml)	0,0	3	34,00	6,00				386
vo = cell initial volume	ν	0,25	4						
do =cell initial diameter	vo (cmc)	3856	5						
Φ = borehole wall diameter	do (mm)	99,10	DEFORMATION MODULUS Ti						
Po = start pressure	σv (kPa)	840	loop	Pmax	Pmin	T1 (Mpa)	T2 (Mpa)	T3 (Mpa)	Tm (Mpa)
Pmax = max loop pressure (MPa)			1	10,00	6,00				77
Pmin = min loop pressure (MPa)			2	14,00	10,00				94
d max displacement at P max			3	34,00	14,00				164
d min displacement at P min			4						
σv vertical total stress estimated			5						
ε c = dR / Ro			GLOBAL DEFORMATION MODULUS EG						
ELASTICITY MODULUS Ei	ELASTICITY MODULUS Ey estimated			Pmax	Pmin	EG1 (Mpa)	EG2 (Mpa)	EG3 (Mpa)	EGm (Mpa)
Ei = (1+ ν) Φ Pax - Pmin	Ey= (EII+EIII)/2			34,00	6,00				144
dmax - dmin	Ey= EIII		DIAMETER			F	F	F	F
			beginning diameter (mm)						102,000
DEFORMATION MODULUS Ti			final diameter (mm)						104,519
Ti = (1+ ν) Φ Pi - Pi-1			range mm						2,519
Xi - Xi-1			DM loop minimun displacement			DILATOMETRIC AND GEOTECHNICAL ESTIMATED PARAMETERS			
	Pbar	C1	C2	C3	Cm	Po initial pressure (KPa)	566	**EG** (MPa)	**144**
GLOBAL DEFORMATION MODULUS EG	bar	0	120	240	0	Pf creep pressure (KPa)	3293	**E3** (MPa)	**386**
EG = (1+ ν) Φ Pmax - Po	10,0	10,997	10,997	10,997	3,536	PL limit pressure (KPa) Cassan	5186	E/P'L	31,34
dmax - do	14,0	11,342	11,342	11,342	4,061	PL' net limit pres (KPa) >	4598	EG/Ey	0,37
note:MATERIALE ASSIMILATO A TERRENO COESIVO	34,0	11,692	11,692	11,692	5,415	Ko lateral coeff at rest (KPa)	0,70	**cu** coesion (KPa) johnson	**544**
						Pho lateral pressure (KPa)	588	ϕ friction angle (°) >	

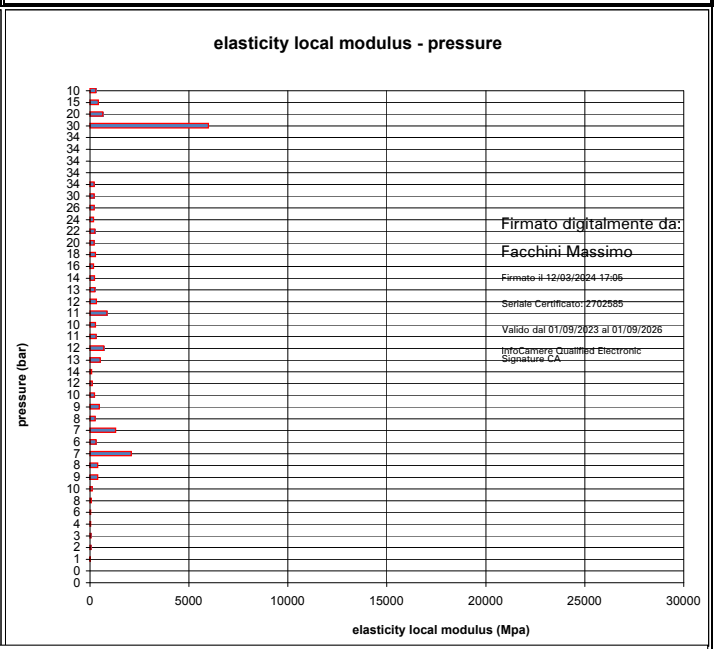
i.m.o.s. s.r.l.	DILATOMETRIC ROCK TEST DRT					mod DVT	rev. 1
	borehole	S3GALL	probe depth m	33,6		code	3
	Client:	ITALFERR S.P.A.		job	1714	v. accept.	1714SIT
	Project	COLLEGAMENTO CAMPOMARINO-RIPALTA				report	1714SIT 09 DRT
			coordinates	EAST			
	site	CAMPOMARINO		NORTH		date	18.05.17 pag 3/3

DILATOMETER TEST WITH VOLUME CHANGE MEASUREMENTS - ISRM 1987

PLACE

BOX





Firmato digitalmente da:
Facchini Massimo
Firmato il 12/03/2024 17:05
Seriale Certificato: 2702585
Valido dal 01/09/2023 al 01/09/2026
InfoCamere Qualified Electronic Signature CA

Sede: Via Monsignor Bologna, 18 - CAMPOBASSO
Stabilimento: C.da S.Maria delle Macchie - Vinchiaturo (CB)
Tel. 0874/340003-16 **Fax**: 0874/340014
P.IVA e Cod. Fiscale: 00717630701
web: **www.imosgeo.it**

S4 GALL

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InfoCamere Qualified Electronic Signature CA

PRESSUREMETER TEST					mod MPT	rev 2.0
BOREHOLE	S4GALL	DEPTH m	20,5	TEST CODE MPT		1
CLIENT	ITALFERR S.P.A.	JOB N.	1714	TYPE		SIT
PROJECT	LOTTO CAMPOMARINO-RIPALTA	REPORT	1714SIT	10		MPT
OBJECT						
COORDINATES						
SITE	Campomarino	DATE	15.05.17	PAGE		1/3

weather

test depth 20,50 m

hydrostatic level (m) > us KPa display by surface (m) 1,00 SPT (m) n/15cm

γn nat.grav assumed 2,20 t/mc Pressuremeter: APAGEO SEGELM

σV assumed 451 kPa test pocket carotaggio 66 mm probe: TE60

soil brief description sabbia deb.limose o limose

geological unit

test in according with AFNOR NFP 94 - 110

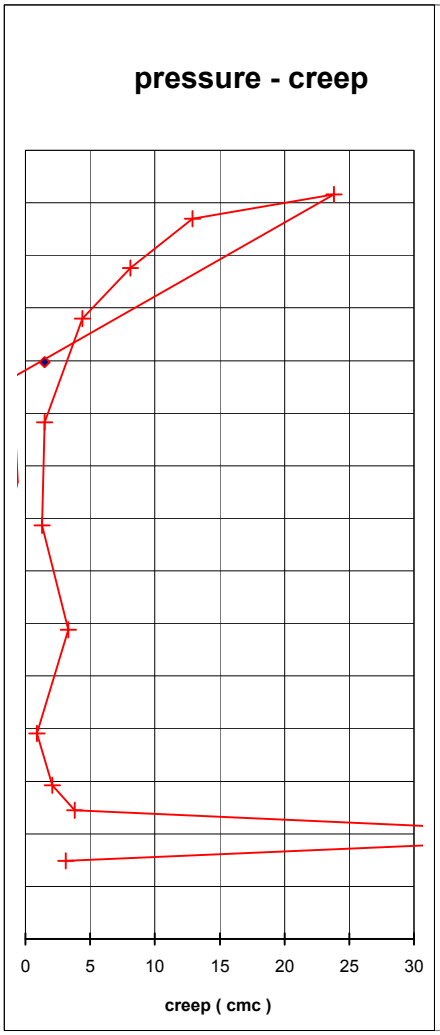
pressuremeter modulus **Em** **46,1** MPa

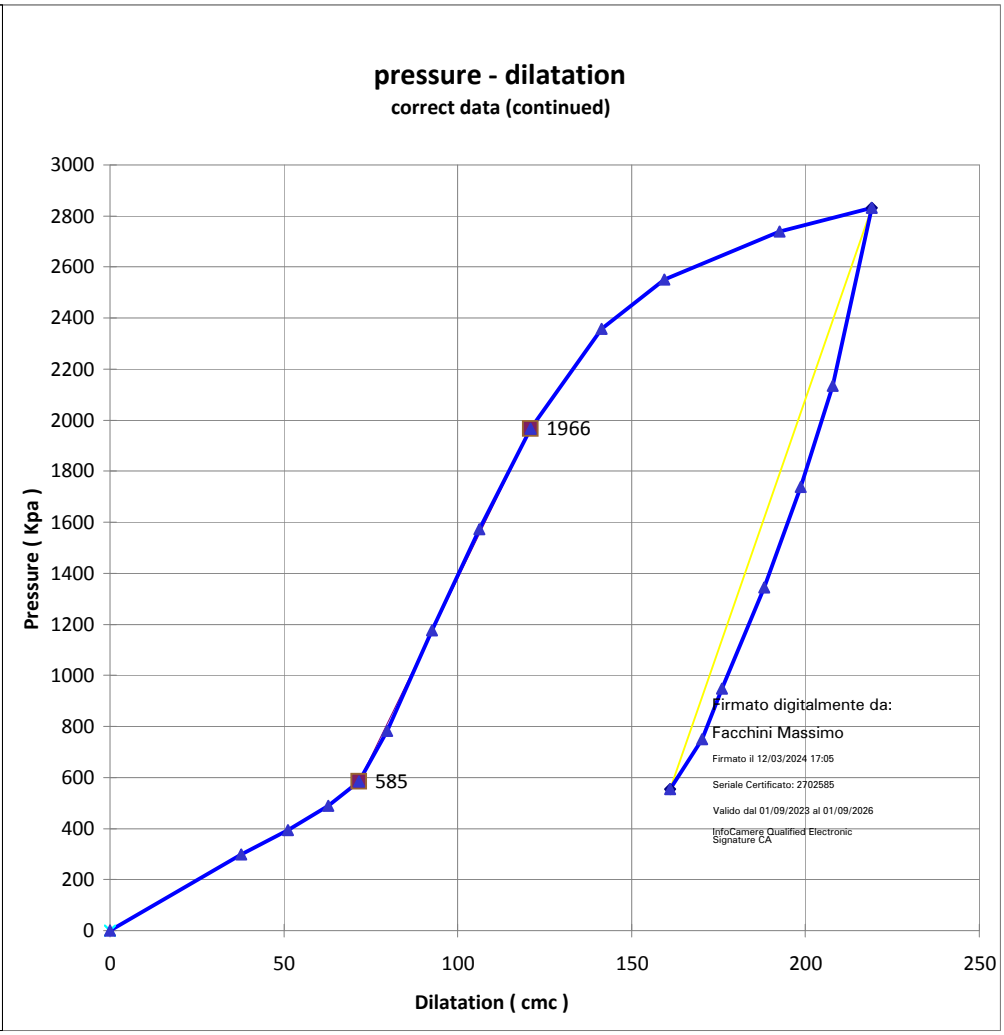
assumed elasticity modulus **Ey** **68,8** MPa

Em/P*L 14,86

assumed cu **335** kPa

Assumed friction angle by Menard °





PRESSUREMETER TEST					mod MPT	rev 1.0
BOREHOLE	S4GALL	DEPTH m	20,5	TEST CODE MPT		1
CLIENT	ITALFERR S.P.A.		JOB N.	1714	TYPE	SIT
PROJECT	LOTTO CAMPOMARINO-RIPALTA		REPORT	1714	10	MPT
OBJECT						
COORDINATES						
SITE	Campomarino	DATE	15.05.17		PAGE	2/3

DATA PROCESSING

PRESSUREMETER CURVE LIMITS

	FIRST LOAD	LOOP 1	LOOP 2
initial pressure P1 (kPa)	585	2831	
initial volume pressure V1 (kPa)	72	219	
initial creep vol C1 (cmc)	2		
final pressure P2 (kPa)	1966	554	
final volume V2 (kPa)	121	161	
fin creep (cmc)/ unload Eu (Mpa)	2	**74,5**	

PHYSIC PROPERTIES

VP probe volume at rest	523	cmc	
VL probe limit volume	666	cmc	
V0 initial volume	72	cmc	
1/VL	1,50	10^{-3} cmc	
ν poisson index	0,33		
α sp reologic experimental coeff.	0,62		
α reologic theoric coefficient	**0,67**		

SYSTEM CORRECTIOI

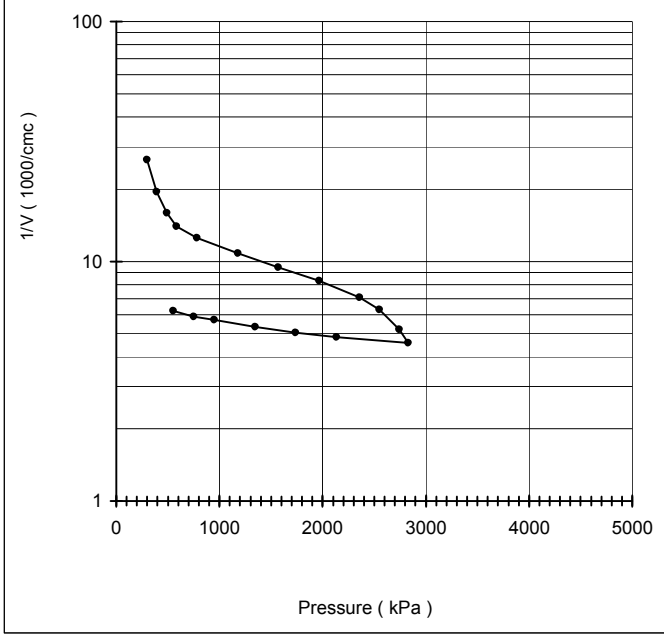
inertia cover	
kPa/cmc	0,35
syst. Dilatation	
cmc/Mpa	3,62
MPa	

PRESSUREMETER PARAMETERS

Ko lateral coeff at rest assumed	**0,70**	
Pho estim. Horiz pres at rest	316	kPa
P0 measured initial pressure	585	kPa
Em pressuremeter modulus	**46,1**	MPa
Ey min elasticity mod. measured in unload	**74,5**	MPa
Ey elasticity mod. assumed by C. reologic	**68,8**	MPa
Pc creep pressure	2193	kPa
P*c net creep pressure	1877	kPa
PL limit pressure by Cassan	3507	kPa
PL limit pressure by Van Vambecke	3421	kPa
PL assumed limit pressure	3421	kPa
P*L assumed net limit pressure	3105	kPa
Em/P*L **14,86**	Ey/P*L 23,99	

GEOTECHNICAL PARAMETERS

Assumed CU by Amar et Jezequel	**335**	kPa
Assumed friction angle by Menard		°



DATA

n°	Pressure bars	Vr 30" cmc	Vr 60" cmc	P corr. kPa	V corr. cmc	creep cmc	Modulus MPa
1	0,0	0	0	0	0	0	
2	1,0	35	38	298	38	3	11,4
3	2,0	4	52	393	51	48	10,7
4	3,0	60	64	489	63	4	12,8
5	**4,0**	**71**	**73**	**585**	**72**	**2**	**17,0**
6	6,0	81	82	782	80	1	38,8
7	10,0	93	96	1177	93	3	49,4
8	14,0	110	111	1572	106	1	48,2
9	**18,0**	**126**	**128**	**1966**	**121**	**2**	**45,3**
10	22,0	145	149	2359	141	4	33,4
11	24,0	160	168	2552	159	8	19,3
12	26,0	189	202	2740	192	13	10,6
13	27,0	205	229	2831	219	24	6,6
14	20,0	216	215	2136	208	-1	120,9
15	16,0	205	204	1739	199	-1	83,7
16	12,0	195	193	1344	188	-3	72,2
17	8,0	180	179	948	176	-1	60,5
18	6,0	175	173	751	170	-3	65,7
19	4,0	166	163	554	161	-4	38,8
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Firmato digitalmente da:
Facchini Massimo
Firmato il 12/03/2024 17:05
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InfoCamere Qualified Electronic Signature CA

MATERIALE ASSIMILATO A TERRENO COESIVO

	PRESSUREMETER TEST				mod MPT	rev 1.0
BOREHOLE	**S4GALL**	**DEPTH m**	**20,5**		**TEST CODE MPT**	**1**
CLIENT	**ITALFERR S.P.A.**		JOB N.	1714	TYPE	SIT
PROJECT	LOTTO CAMPOMARINO-RIPALTA		REPORT	1714	10	MPT
OBJECT						
COORDINATES						
SITE	Campomarino	DATE	15.05.17		PAGE	3/3

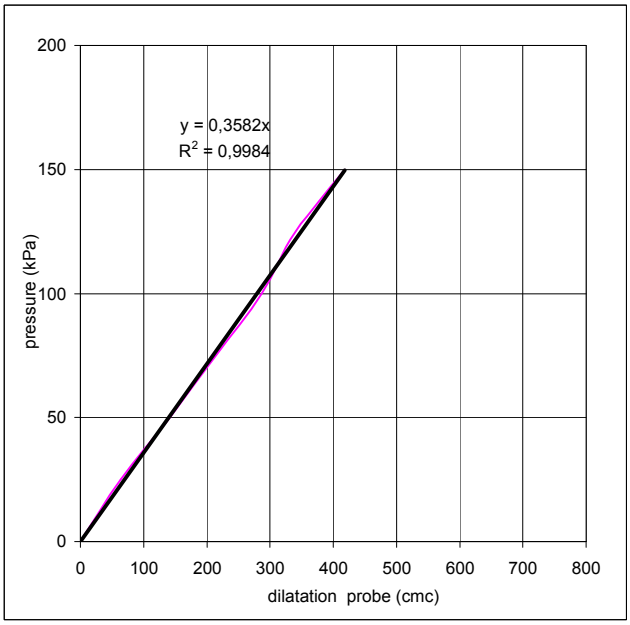
PLACE

SOIL TYPE

CALIBRATION IN AIR

membrane SI cover TELATA MORBIDA kPa/cmc 0,35

Height measure cell (cm) 21,00 VP in. probe vol (cmc) 523

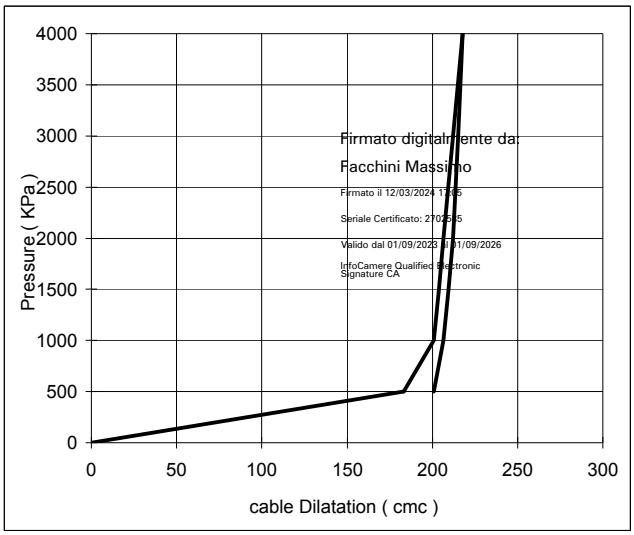


CONFINED CALIBRATION

Lenght cable 50 ϕ confined diameter (cm) 6,6

Vi (cmc) 195 Coeff. 5,62 cmc/Mpa first load

tube volume cmc 718 Coeff. 3,62 cmc/Mpa unload



i.m.o.s. s.r.l.	DILATOMETRIC ROCK TEST DRT				mod DVT rev. 1
	borehole	S4GALL	probe depth m 25,6	code	2
	Client:	ITALFERR S.P.A.	job 1714	v. accept.	1714SIT
	Project	COLLEGAMENTO CAMPOMARINO-RIPALTA		report	1714SIT 11 DRT
		coordinates	EAST		
	site	CAMPOMARINO	NORTH	date 16.05.17	pag 1/3

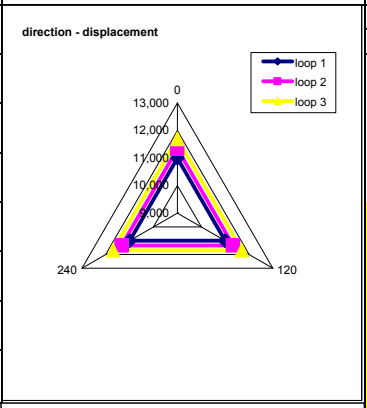
DILATOMETER TEST WITH VOLUME CHANGE MEASUREMENTS - ISRM 1987

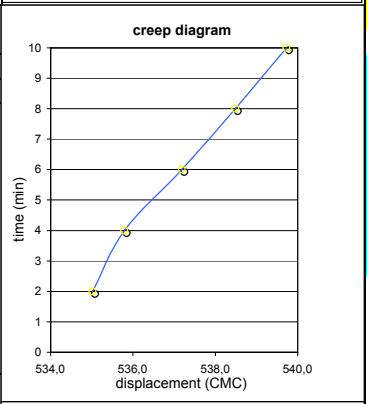
Borehole	S4GALL
test 2	depth m 25,60
slope (degree) 90	core barrell
Device: CSM Type VM01 95 mm	
Orientation capteur C1=	Standard method: ISRM 1987
Probe diam 90 MM	Borehole diam 101 MM
Meteo	Temperature
lithotype	ALTERNANZE DI SABBIA LIMOSA E LIVELLI ARGILLOSI. DA ADDENSATA A DEB.CEMENTATA
water table	RQD

Creep test P (Bars) =

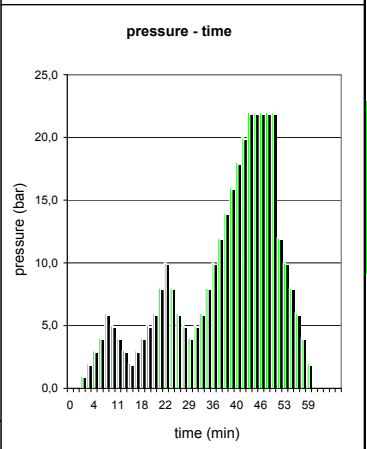
Temps min	PBAR	CMC
2	22,0	535,0
4	22,0	535,8
6	22,0	537,2
8	22,0	538,5
10	22,0	539,7

LITHOTYPE





PROBE SCHEME



PROBE CALIBRATION

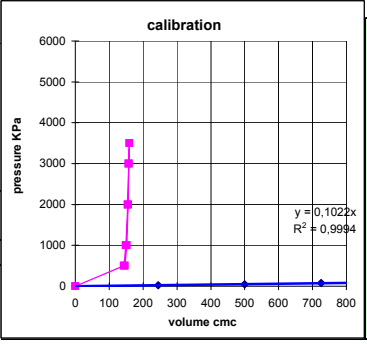
probe	telata 85 mm
membrane	no
V0 cell volume at rest (cmc)	3856
lenght cable (mt)	100
Volume initial Vi (cmc)	150
diam calibration tube (cm)	10,10
tube calibration volume cmc	4006

Calibration in air

coeff *m*	0,10	cmc/Kpa

Confined calibration

first load	3,00	cmc/Mpa
unload	2,14	cmc/Mpa



time	test data							
	P	P corr	Volume	ε c	1/V	diameter	Dil. Diam	Modulo
min	bar	Kpa	cmc	%	1000/cmc	(mm)	(mm)	MPa
0	0,0	0	0,00	-2,754	#DIV/0!	99,104	0,000	
1	0,0	0	0,00	-2,754	#DIV/0!	99,104	0,000	
2	1,0	86	124,59	-1,196	8,027	100,692	1,588	7
3	2,0	181	155,57	-0,812	6,428	101,083	1,979	31
4	3,0	274	207,16	-0,177	4,827	101,731	2,627	18
5	**4,0**	**370**	**221,54**	**0,000**	**4,514**	**101,911**	**2,807**	**68**
9	6,0	563	257,21	0,436	3,888	102,355	3,252	55
10	5,0	466	246,93	0,311	4,050	102,227	3,124	97
11	4,0	368	240,74	0,235	4,154	102,150	3,047	162
12	3,0	271	231,89	0,127	4,312	102,040	2,936	112
13	2,0	175	212,07	-0,116	4,715	101,792	2,689	49
17	3,0	272	224,66	0,038	4,451	101,950	2,846	78
18	4,0	369	231,33	0,120	4,323	102,033	2,929	149
19	5,0	466	248,93	0,335	4,017	102,252	3,149	56
20	6,0	562	263,61	0,515	3,793	102,435	3,331	68
21	8,0	756	291,09	0,849	3,435	102,776	3,672	73
22	10,0	947	336,06	1,394	2,976	103,332	4,228	44
23	8,0	753	316,09	1,153	3,164	103,085	3,982	102
27	6,0	559	298,11	0,934	3,354	102,863	3,759	113
28	5,0	462	288,09	0,813	3,471	102,739	3,635	101
29	4,0	365	272,14	0,619	3,675	102,541	3,437	63
30	5,0	462	283,03	0,751	3,533	102,676	3,573	92
31	6,0	559	295,01	0,897	3,390	102,825	3,721	84
32	8,0	753	320,49	1,206	3,120	103,140	4,036	79
36	10,0	947	341,26	1,457	2,930	103,396	4,292	98
37	12,0	1141	362,33	1,712	2,760	103,655	4,551	97
38	14,0	1335	383,40	1,965	2,608	103,914	4,810	97
39	16,0	1528	411,81	2,306	2,428	104,261	5,158	72
40	**18,0**	**1723**	**432,97**	**2,560**	**2,310**	**104,519**	**5,416**	**98**
41	20,0	1914	477,97	3,096	2,092	105,066	5,963	46
42	22,0	2105	535,01	3,773	1,869	105,755	6,652	36
44	22,0	2105	535,79	3,782	1,866	105,765	6,661	-1
46	22,0	2104	537,19	3,798	1,862	105,781	6,678	-1
47	22,0	2104	538,49	3,814	1,857	105,797	6,693	-1
49	22,0	2104	539,73	3,828	1,853	105,812	6,708	-1
51	12,0	1126	509,01	3,465	1,965	105,442	6,338	349
53	10,0	932	491,53	3,258	2,034	105,230	6,127	121
55	8,0	738	467,44	2,971	2,139	104,938	5,835	87
57	6,0	544	450,30	2,767	2,221	104,730	5,627	122
58	4,0	350	427,67	2,496	2,338	104,455	5,351	92
59	2,0	159	369,17	1,794	2,709	103,739	4,635	35

Firmato digitalmente da: Facchini Massimo
Firmato il 12/03/2024 17:05
Seriale Certificato: 2702585
Valido dal 01/09/2023 al 01/09/2026
InfoCamere Qualified Electronic Signature CA

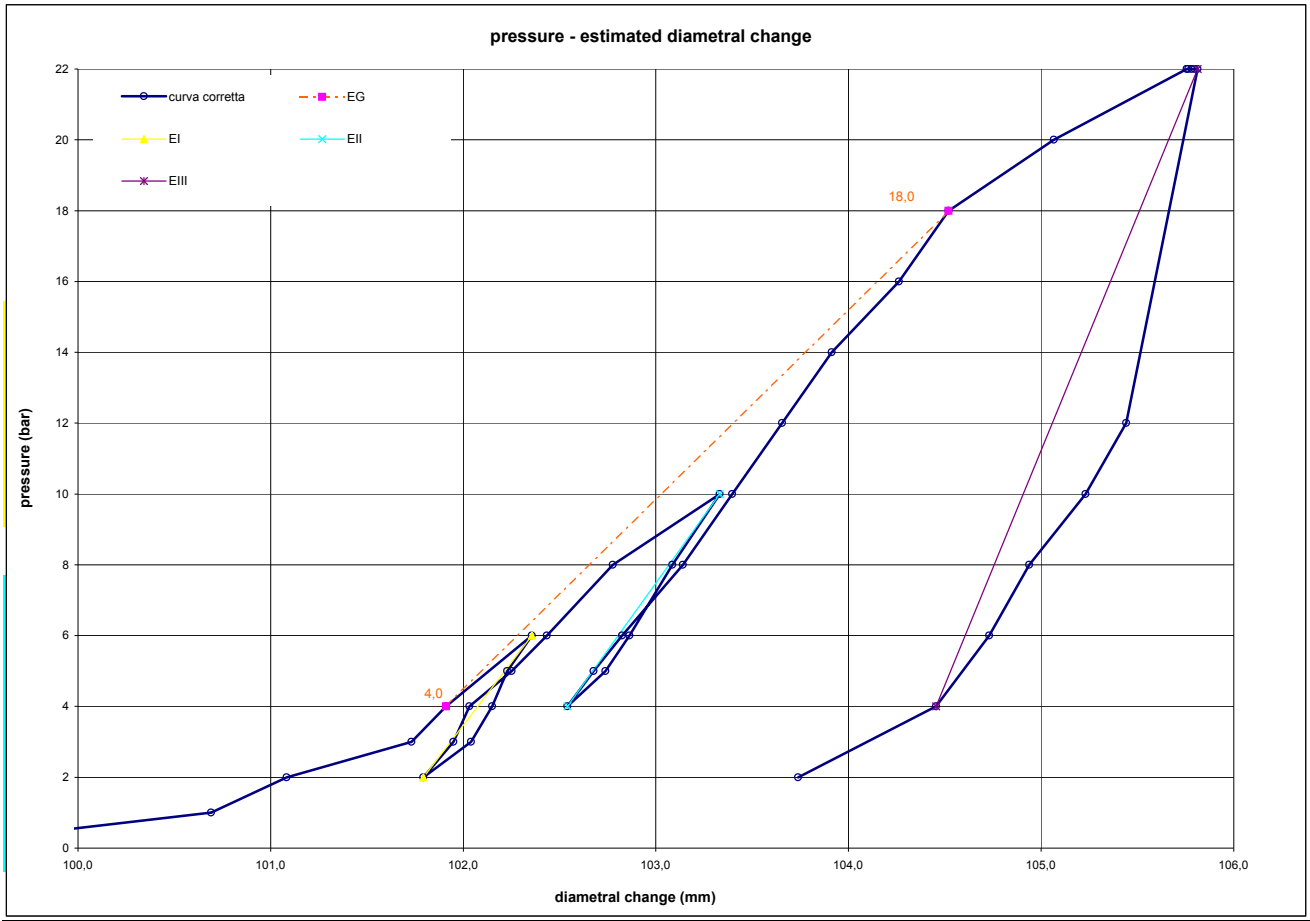
i valori diametrali sono calcolati come valore medio della sonda cillindrica in espansione

FIELD LIMITS

	P	P corr	V corr	creep	1000/V	diameter	Dil. Diam	loop
min	4,0	370,2	221,5	0,0	4,5	101,9	2,8	first load
max	18,0	1722,5	433,0	2,6	2,3	104,5	5,4	first load
max	6,0	562,9	257,2	0,4	3,9	102,4	3,3	I
min	2,0	175,0	212,1	-0,1	4,7	101,8	2,7	I
max	10,0	947,4	336,1	1,4	3,0	103,3	4,2	II
min	4,0	365,2	272,1	0,6	3,7	102,5	3,4	II
max	22,0	2104,2	539,7	3,8	1,9	105,8	6,7	III
min	4,0	349,6	427,7	2,5	2,3	104,5	5,4	III

	DILATOMETRIC ROCK TEST DRT			mod DVT	rev. 1
	borehole	**S4GALL**	**probe depth m**	**25,6**	**code**	**2**
	Client:	**ITALFERR S.P.A.**	job	1714	v. accept.	**1714SIT**
	Project	**COLLEGAMENTO CAMPOMARINO-RIPALTA**		report	**1714SIT**	**11**	**DRT**
		coordinates	EAST			
	site	CAMPOMARINO	NORTH	date	16.05.17	pag	2/3

DILATOMETER TEST WITH VOLUME CHANGE MEASUREMENTS - ISRM 1987



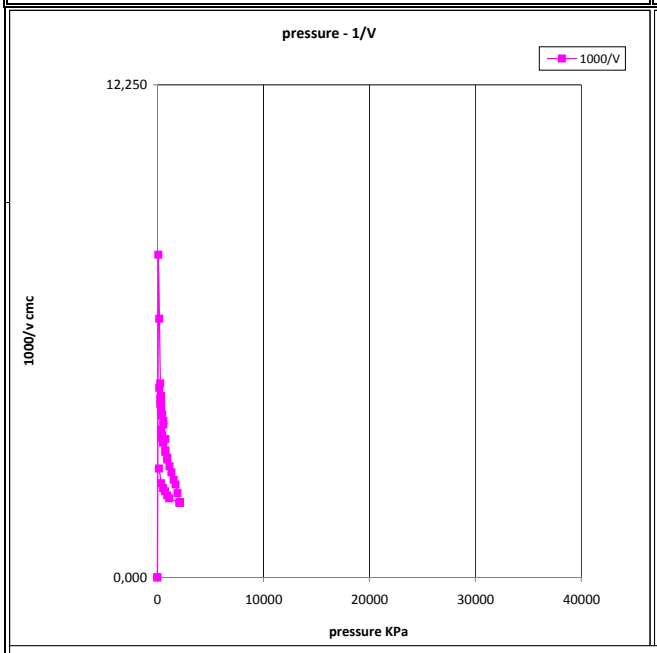
DATA PROCESSING						SENSOR 1	SENSOR 2	SENSOR 3	SENSOR AVE
			ELASTICITY MODULUS Ei						
Legend:	**DATA**		loop	Pmax	Pmin	E1 (Mpa)	E2 (Mpa)	E3 (Mpa)	Eav (Mpa)
H = test depth	symbol	datum	1	6,00	2,00				88
W = water table depth	γnsoil	2,5	2	10,00	4,00				94
ν = Poisson ratio	W (ml)	0,0	3	22,00	4,00				165
vo = cell initial volume	ν	0,25	4						
do =cell initial diameter	vo (cmc)	3856	5						
Φ = borehole wall diameter	do (mm)	99,10	DEFORMATION MODULUS Ti						
Po = start pressure	σv (kPa)	640	loop	Pmax	Pmin	T1 (Mpa)	T2 (Mpa)	T3 (Mpa)	TM (Mpa)
Pmax = max loop pressure (MPa)			1	6,00	4,00				55
Pmin = min loop pressure (MPa)			2	10,00	6,00				50
d max displacement at P max			3	22,00	10,00				59
d min displacement at P min			4						
σv vertical total stress estimated			5						
ε c = dR / Ro			GLOBAL DEFORMATION MODULUS EG						
ELASTICITY MODULUS Ei	ELASTICITY MODULUS Ey estimated			Pmax	Pmin	EG1 (Mpa)	EG2 (Mpa)	EG3 (Mpa)	EGm (Mpa)
Ei = (1+ ν) Φ Pax - Pmin	Ey= (EII+EIII)/2			18,00	4,00				66
dmax - dmin	Ey= EIII		DIAMETER			F	F	F	F
			beginning diameter (mm)						101,911
DEFORMATION MODULUS Ti			final diameter (mm)						105,812
Ti = (1+ ν) Φ Pi - Pi-1			range mm						3,901
Xi - Xi-1			DM loop minimun displacement			DILATOMETRIC AND GEOTECHNICAL ESTIMATED PARAMETERS			
			Pbar	C1	C2	C3	Cm	Po initial pressure (KPa)	370	**EG**(MPa)	**66**
GLOBAL DEFORMATION MODULUS EG			bar	0	120	240	0	Pf creep pressure (KPa)	1723	**E3** (MPa)	**165**
EG = (1+ ν) Φ Pmax - Po			6,0	10,997	10,997	10,997	3,252	PL limit pressure (KPa) Cassan	2615	E/P'L	30,48
dmax - do			10,0	11,342	11,342	11,342	4,228	PL' net limit pres (KPa) >	2167	EG/Ey	0,40
note:MATERIALE ASSIMILATO A TERRENO COESIVO			22,0	11,692	11,692	11,692	6,708	Ko lateral coeff at rest (KPa)	0,70	**cu** coesion (KPa) johnson	**286**
								Pho lateral pressure (KPa)	448	ϕ friction angle (°) >	

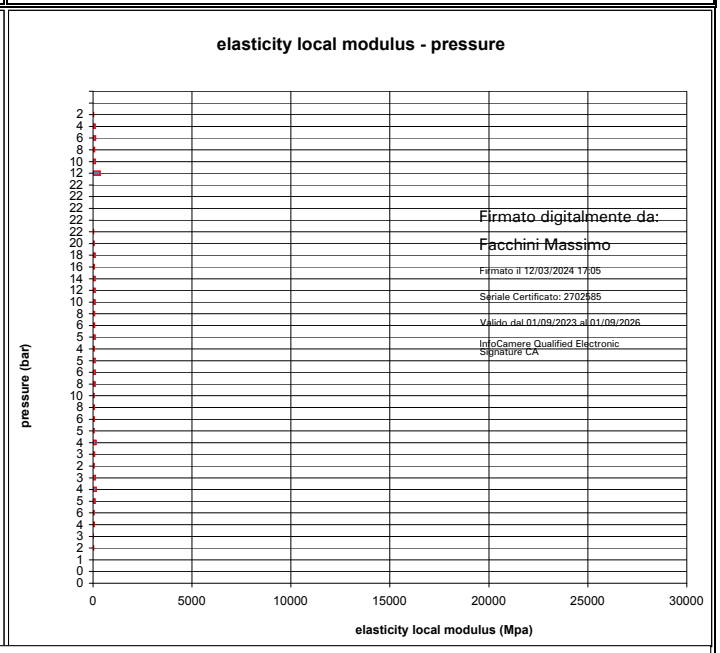
	DILATOMETRIC ROCK TEST DRT					mod DVT	rev. 1
	borehole	S4GALL	probe depth m	25,6		code	2
	Client:	ITALFERR S.P.A.		job	1714	v. accept.	1714SIT
	Project	COLLEGAMENTO CAMPOMARINO-RIPALTA			report	1714SIT	11 DRT
		coordinates		EAST			
	site	CAMPOMARINO		NORTH	date	16.05.17	pag 3/3

DILATOMETER TEST WITH VOLUME CHANGE MEASUREMENTS - ISRM 1987

PLACE

BOX





i.m.o.s. s.r.l.	**DILATOMETRIC ROCK TEST DRT**			mod DVT rev. 1
	borehole S4GALL	**probe depth m** 35,2		**code** 3
	Client: **ITALFERR S.P.A.**		job 1714	v. accept. 1714SIT
	Project COLLEGAMENTO CAMPOMARINO-RIPALTA			report **1714SIT 12 DRT**
		coordinates	EAST	
	site CAMPOMARINO		NORTH	date 16.05.17 pag 1/3

DILATOMETER TEST WITH VOLUME CHANGE MEASUREMENTS - ISRM 1987

Borehole	**S4GALL**
test **3**	depth m 35,20
slope (degree) 90	core barrell
Device: CSM Type VM01 95 mm	
Orientation capteur C1=	Standard method: ISRM 1987
Probe diam 90 MM	Borehole diam 101 MM
Meteo	Temperature
lithotype	SABBIA FINE LIMOSA DA MOLTO ADDENSATA A DEB. CEMENTATA
water table	RQD

Creep test P (Bars) = 24,0

Temps min	PBAR	CMC
2	24,0	107,4
4	24,0	107,4
6	24,0	107,5
8	24,0	107,5
10	24,0	107,5

PROBE SCHEME

rod adaptor

electronic device

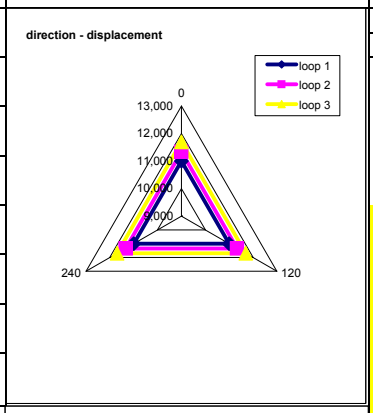
double action piston

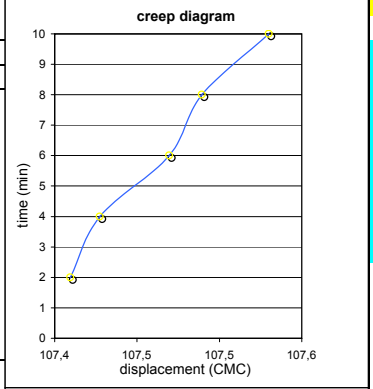
expandable cylinder

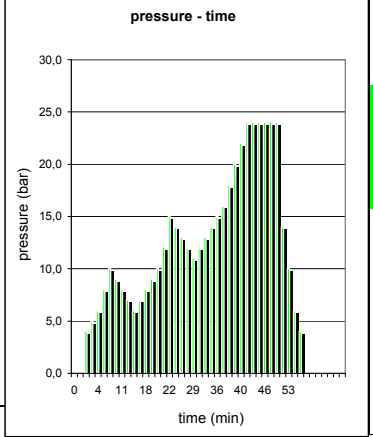
PROBE CALIBRATION

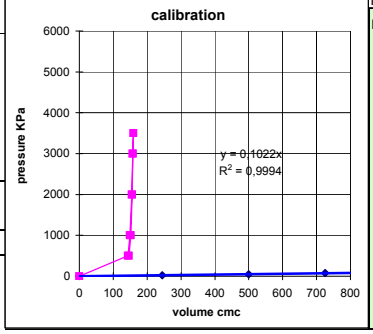
probe	telata 85 mm	
membrane	no	
V0 cell volume at rest (cmc)		3856
lenght cable (mt)		100
Volume initial Vi (cmc)		150
diam calibration tube (cm)		10,10
tube calibration volume cmc		4006
Calibration in air		
coeff *m*	0,10	cmc/Kpa
Confined calibration		
first load	3,00	cmc/Mpa
unload	2,14	cmc/Mpa

LITHOTYPE









time	test data							
	P	P corr	Volume	ε c	1/V	diameter	Dil. Diam	Modulo
min	bar	Kpa	cmc	%	1000/cmc	(mm)	(mm)	MPa
0	0,0	0	0,00	-5,077	#DIV/0!	99,104	0,000	
1	0,0	0	0,00	-5,077	#DIV/0!	99,104	0,000	
2	4,0	364	284,94	-1,632	3,509	102,700	3,596	13
3	5,0	455	358,03	-0,768	2,793	103,602	4,499	13
4	**6,0**	**546**	**423,51**	**0,000**	**2,361**	**104,404**	**5,300**	**15**
5	8,0	739	455,69	0,375	2,194	104,796	5,692	64
9	10,0	933	479,62	0,653	2,085	105,086	5,982	88
10	9,0	835	475,27	0,603	2,104	105,033	5,930	244
11	8,0	738	469,09	0,531	2,132	104,958	5,855	171
12	7,0	640	464,60	0,479	2,152	104,904	5,800	235
13	6,0	543	453,81	0,353	2,204	104,773	5,669	97
17	7,0	641	460,60	0,432	2,171	104,855	5,752	155
18	8,0	738	466,19	0,497	2,145	104,923	5,820	189
19	9,0	835	475,27	0,603	2,104	105,033	5,930	116
20	10,0	932	486,66	0,735	2,055	105,171	6,068	92
21	12,1	1131	512,42	1,033	1,952	105,483	6,379	84
22	15,0	1416	550,19	1,469	1,818	105,938	6,834	83
23	14,0	1319	548,10	1,445	1,824	105,913	6,809	517
27	13,0	1221	542,51	1,381	1,843	105,846	6,742	192
28	12,0	1124	531,63	1,255	1,881	105,714	6,611	98
29	11,0	1027	521,49	1,138	1,918	105,592	6,489	105
30	12,0	1125	525,83	1,188	1,902	105,645	6,541	247
31	13,0	1222	533,71	1,279	1,874	105,740	6,636	135
32	14,0	1319	545,20	1,412	1,834	105,878	6,774	93
36	15,0	1416	558,29	1,562	1,791	106,035	6,932	82
37	16,0	1512	574,37	1,747	1,741	106,228	7,125	66
38	18,0	1706	601,11	2,054	1,664	106,548	7,445	80
39	20,0	1899	629,20	2,375	1,589	106,883	7,780	77
40	22,0	2093	655,01	2,669	1,527	107,190	8,087	84
41	**24,0**	**2287**	**673,46**	**2,879**	**1,485**	**107,409**	**8,306**	**119**
42	24,0	2287	673,46	2,879	1,485	107,409	8,306	#DIV/0!
44	24,0	2287	674,97	2,896	1,482	107,427	8,324	-1
46	24,0	2287	678,53	2,936	1,474	107,470	8,366	-1
47	24,0	2286	680,20	2,955	1,470	107,489	8,386	-1
49	24,0	2286	683,63	2,994	1,463	107,530	8,426	-1
51	14,0	1307	664,06	2,772	1,506	107,298	8,194	566
53	10,0	917	640,83	2,507	1,560	107,022	7,918	189
55	6,0	527	612,32	2,182	1,633	106,682	7,579	153
57	4,0	335	578,09	1,790	1,730	106,273	7,169	63

Firmato digitalmente da:
Facchini Massimo
Firmato il 12/03/2024 17:05
Seriale Certificato: 2702585
Valido dal 01/09/2023 al 01/09/2026
InfoCamere Qualified Electronic Signature CA

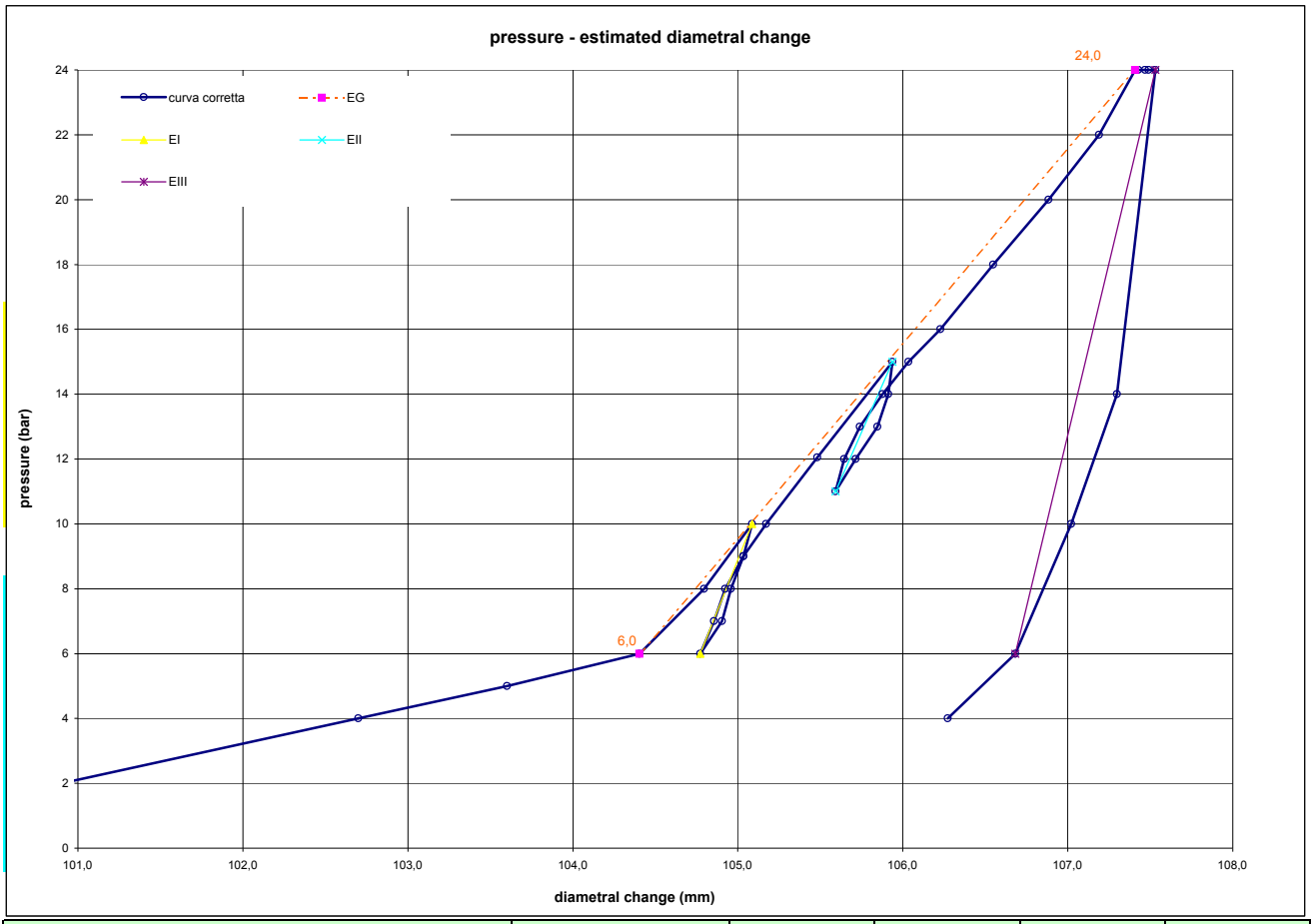
i valori diametrali sono calcolati come valore medio della sonda cillindrica in espansione

FIELD LIMITS

	P	P corr	V corr	creep	1000/V	diameter	Dil. Diam	loop
min	6,0	546,2	423,5	0,0	2,4	104,4	5,3	first load
max	24,0	2287,1	673,5	2,9	1,5	107,4	8,3	first load
max	10,0	933,0	479,6	0,7	2,1	105,1	6,0	I
min	6,0	543,2	453,8	0,4	2,2	104,8	5,7	I
max	15,0	1416,5	550,2	1,5	1,8	105,9	6,8	II
min	11,0	1027,0	521,5	1,1	1,9	105,6	6,5	II
max	24,0	2286,0	683,6	3,0	1,5	107,5	8,4	III
min	6,0	527,4	612,3	2,2	1,6	106,7	7,6	III

	DILATOMETRIC ROCK TEST DRT				mod DVT rev. 1
	borehole	S4GALL	probe depth m 35,2		code 3
	Client:	ITALFERR S.P.A.	job 1714	v. accept.	1714SIT
	Project	COLLEGAMENTO CAMPOMARINO-RIPALTA		report	1714SIT 12 DRT
		coordinates	EAST		
	site	CAMPOMARINO	NORTH	date 16.05.17	pag 2/3

DILATOMETER TEST WITH VOLUME CHANGE MEASUREMENTS - ISRM 1987



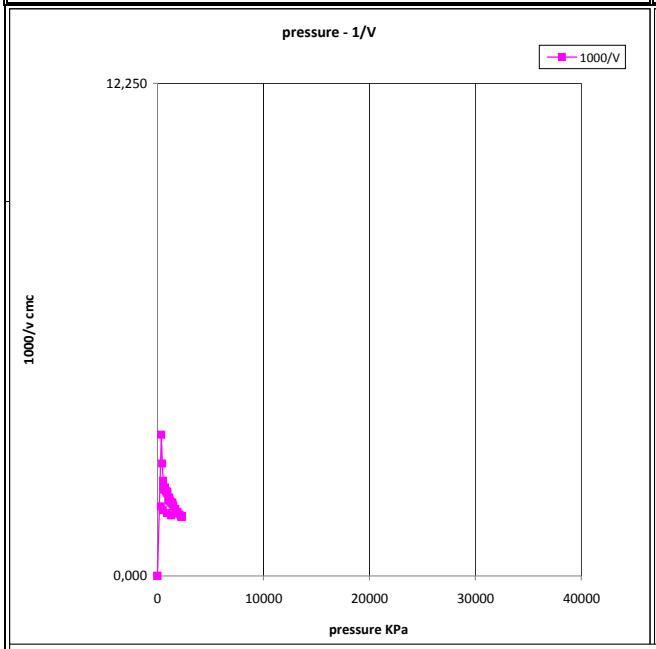
DATA PROCESSING						SENSOR 1	SENSOR 2	SENSOR 3	SENSOR AVE
			ELASTICITY MODULUS Ei						
Legend:	DATA		loop	Pmax	Pmin	E1 (Mpa)	E2 (Mpa)	E3 (Mpa)	Eav (Mpa)
H = test depth	symbol	datum	1	10,00	6,00				162
W = water table depth	γnsoil	2,5	2	15,00	11,00				147
ν = Poisson ratio	W (ml)	0,0	3	24,00	6,00				271
vo = cell initial volume	ν	0,25	4						
do =cell initial diameter	vo (cmc)	3856	5						
Φ = borehole wall diameter	do (mm)	99,10	DEFORMATION MODULUS Ti						
Po = start pressure	σv (kPa)	880	loop	Pmax	Pmin	T1 (Mpa)	T2 (Mpa)	T3 (Mpa)	Tm (Mpa)
Pmax = max loop pressure (MPa)			1	10,00	6,00				74
Pmin = min loop pressure (MPa)			2	15,00	10,00				74
d max displacement at P max			3	24,00	15,00				71
d min displacement at P min			4						
σv vertical total stress estimated			5						
ε c = dR / Ro			GLOBAL DEFORMATION MODULUS EG						
ELASTICITY MODULUS Ei	ELASTICITY MODULUS Ey estimated			Pmax	Pmin	EG1 (Mpa)	EG2 (Mpa)	EG3 (Mpa)	EGm (Mpa)
Ei = (1+ ν) Φ Pax - Pmin	Ey= (EII+EIII)/2			24,00	6,00				76
dmax - dmin	Ey= EIII		DIAMETER			F	F	F	F
			beginning diameter (mm)						104,404
DEFORMATION MODULUS Ti			final diameter (mm)						107,530
Ti = (1+ ν) Φ Pi - Pi-1			range mm						3,126
Xi - Xi-1			DM loop minimun displacement			DILATOMETRIC AND GEOTECHNICAL ESTIMATED PARAMETERS			
	Pbar	C1	C2	C3	Cm	Po initial pressure (KPa)	546	**EG** (MPa)	**76**
GLOBAL DEFORMATION MODULUS EG	bar	0	120	240	0	Pf creep pressure (KPa)	2287	**E3** (MPa)	**271**
EG = (1+ ν) Φ Pmax - Po	10,0	10,997	10,997	10,997	5,982	PL limit pressure (KPa) Cassan	3457	E/P'L	26,61
dmax - do	15,0	11,342	11,342	11,342	6,834	PL' net limit pres (KPa) >	2841	EG/Ey	0,28
note:MATERIALE ASSIMILATO A TERRENO COESIVO	24,0	11,692	11,692	11,692	8,426	Ko lateral coeff at rest (KPa)	0,70	**cu** coesion (KPa) johnson	**371**
						Pho lateral pressure (KPa)	616	ϕ friction angle (°) >	

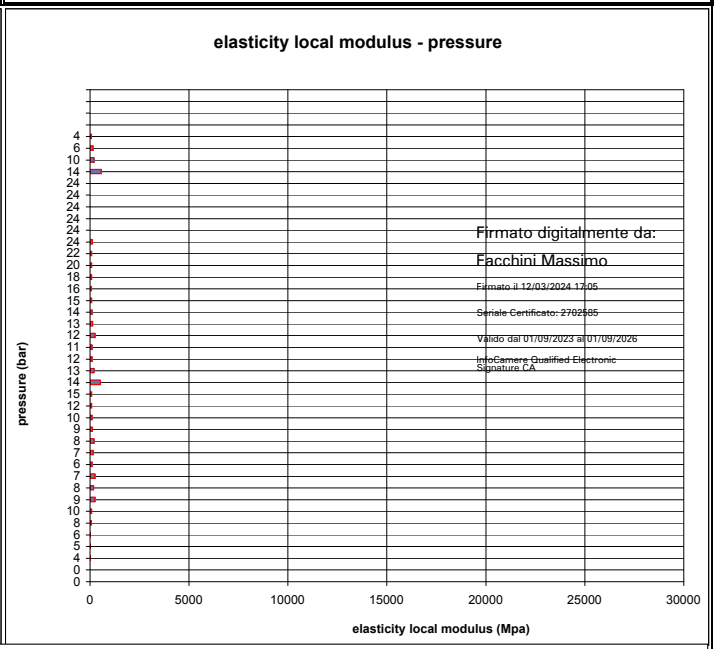
i.m.o.s. s.r.l.	DILATOMETRIC ROCK TEST DRT					mod DVT	rev. 1
	borehole	S4GALL	probe depth m	35,2		code	3
	Client:	ITALFERR S.P.A.			job	1714	v. accept. 1714SIT
	Project	COLLEGAMENTO CAMPOMARINO-RIPALTA				report	1714SIT 12 DRT
		coordinates		EAST			
	site	CAMPOMARINO		NORTH		date	16.05.17 pag 3/3

DILATOMETER TEST WITH VOLUME CHANGE MEASUREMENTS - ISRM 1987

PLACE

BOX





INTERRUZIONE PROVA PER DEFORMAZIONE ANOMALA