



**Autologging Plate Load Tester
SL340**

Impact Test Equipment Ltd
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User Guide
User Guide
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SL340

Auto-logging, Wireless Plate Load Testing System with GPS Positioning

OPERATION MANUAL



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SECTION 1 : INTRODUCTION

1.1 GENERAL DESCRIPTION OF THE SYSTEM

Thank you for purchasing your PLATEMAN plate load testing system. The PLATEMAN is brings the standard Plate Load Test up to date at last, with benefits for both users and clients in terms of rapid testing, instant results and accurate measurements. The PLATEMAN is a battery powered, wireless, auto logging test system complete with reporting software.

Test results are viewed in real time as the test progresses and results can be viewed instantly on site. The operator simply enters the required load, the number of increments and cycles and presses the go button. The handheld rugged PDA then prompts the operator when to increase the load and when to hold and release it.

Load and displacement measurements are recorded using wireless load cell and digital displacement transducers and transmitted to the PDA in real time. The operator never has to enter the potentially dangerous area below the reaction load to take readings. After the test is completed, the data can be analysed and re-viewed instantly on site, including calculation of estimated CBR.

The system includes a lightweight, modular, adjustable height, reference beam, that the transducers and wireless connection module hang off. This is easily transportable around site speeding up the testing process.

Data is downloaded to a PC using the PLATEMAN PC software, which analyses data and produces detailed test reports, that can be printed out or transmitted electronically to the client.

1.2 TEST METHOD

The Plate Load test is designed to determine the vertical deformation and strength characteristics of soil by assessing the force and amount of penetration with time when a rigid plate is made to penetrate the soil.

The method may be used to evaluate the ultimate bearing capacity, the shear strength and deformation parameters of the soil beneath the plate without entailing the effects of sample disturbance.

Testing may be carried out at the ground surface, in pits or in trenches in accordance with BS1377: Part 9: 1990.

SECTION 2 : SYSTEM & HARDWARE

2.1 PLATEMAN SYSTEM COMPONENTS

Your PLATEMAN kit contains the following items :

- ◆ PLATEMAN test unit (Getac 532F Rugged PDA)
- ◆ PLATEMAN bluetooth wireless transducer acquisition, power supply and transmitter unit with calibration certificate
- ◆ AC & DC charger
- ◆ 250KN load cell with lead and calibration certificate
- ◆ 3No Displacement transducers with 50mm travel and calibration certificate. (Note – 100mm travel displacement gauges are also available)
- ◆ PLATEMAN Lightweight 3m demountable reference beam with adjustable legs, 3No adjustable transducer clamps and carry case. (Note – 500mm short beam extensions are also available)
- ◆ PLATEMAN Foam lined transport case
- ◆ PLATEMAN PDA carry pouch
- ◆ PLATEMAN Operation Manual
- ◆ PLATEMAN Software on datastick

The PLATEMAN is a lightweight portable plate load testing system, the main components of which are described in detail below:

PLATEMAN TEST UNIT



The PLATEMAN test unit is based on a Steatite rugged 532F PDA unit, which is the world's smallest rugged PDA, with the following main features:

- MIL-STD 810G and IP65 Compliance

- Microsoft Windows Mobile 6.5
- E-Compass and Altimeter
- 3M Pixels Auto-focus Camera
- VGA Display
- Transflective 3.5" TFT LCD
- Embedded High Sensitivity GPS Receiver
- Long Battery Life Provides All-day Power

A full technical spec is supplied on the GETAC datasheet in the appendix. The test unit is supplied pre-loaded with the PLATEMAN software for foundation testing.

Power requirements and charging

AC adapter (10W, 100-240VAC; 50 / 60 Hz)

Li-Ion smart battery (2400mAh) (up to 8 hours of battery life)

Charging time: Sleep mode, approx. 3.5 Hrs.

PLATEMAN TRANSDUCER ACQUISITION UNIT AND POWER SUPPLY



The PLATEMAN transducer unit is housed in a rugged aluminium and ABS plastic casing, designed to withstand the rigours of site use. It has the following main features:

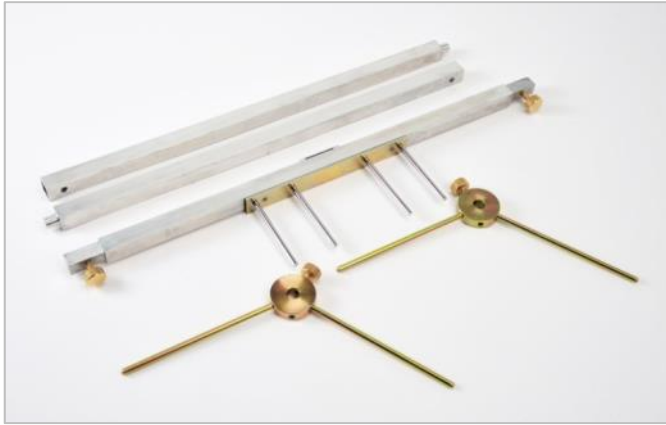
- High Sensitivity accelerometer
- Bluetooth wireless data transfer
- On-board signal memory
- Battery charge indicator
- Long life re-chargeable Li-Ion battery
- IP65 Compliance

Power requirements and charging

AC charger (8.4V DC Output, 10W, 100-240VAC Input)

Li-Ion battery, 2200mAh. (One month typical daily usage on full charge)

Charging time: approx. 2 Hrs.



PLATEMAN lightweight reference beam



PLATEMAN displacement transducers



PLATEMAN load cell

2.2 PLATEMAN OPERATING ENVIRONMENT

The PLATEMAN is designed to operate from -5° C (32F) to 50° C(104F). Both the Test and Transducer units are environmentally sealed and can be used in wet, dusty or humid atmospheres.

2.3 PLATEMAN SYSTEM SETTINGS

To set the time and date, follow the GETAC 532F operating instructions supplied with the system.

2.4 PLATEMAN PC SOFTWARE REQUIREMENTS AND INSTALLATION

The PC Reporting Programme is provided on a USB datastick with the system. The software should run on any PC running windows XP or later.

Programme Installation

The software is stand alone and license free. To install:

Copy all the files on the data stick to a directory on your PC.
The programme file is called PLT_Print2012.exe. Either run from this location or create a shortcut to this programme from your desktop by using

Right click on PLT_Print2012.exe > Send to...> desktop.

The procedure for transferring data files from the unit to a PC is given in Section 4 and full details of operation are given in Section 3.

SECTION 3 : CARRYING OUT A TEST

This section sets out the procedure for performing a plate load test using the PLATEMAN system in accordance with BS 1377: PART 9: 1990. Ensure that both the PLATEMAN test unit (PDA) and the PLATEMAN transducer unit (grey box) are both fully charged.

3.1 SETTING UP EQUIPMENT ON SITE

Prepare a test area by removing any loose material so that the area the plate will be seated on is level. For tests on granular material any hollows should be filled in with fine sand. Use the minimum amount of sand necessary to achieve a level area.

Position the reaction load jacking point directly over the position to be tested. Bed the plate on to the sand by applying downward pressure and a twisting motion. Gently remove the plate to ensure that there are no voids underneath.

Place the jack, and any spacers that are required, onto the centre of the plate. (Note: Extension sets supplied are only rated up to 12.5Tons).

Set up the PLATEMAN DATUM bar, as per the picture to the right. (Note shorter 500mm end pieces are available for use in confined situations)

You can adjust the height of the beam by using screwing the support legs into different holes in the end supports.

Position the datum so that the legs are 1.5x the plate diameter away from the plate and as far away from the reaction load as possible.



Attach the LDVT gauges to the datum bar using the clamps supplied, ensuring that all gauges are placed at equal distances from the plate edge, they should be equally spaced around the plate circumference.

Apply a small seating load to the plate, hold for 30 seconds and release. Place the load cell on top of the jack or spacer plates. Plug the LDVTs and Load Cell into the PLATEMAN data acquisition and transmission box.

3.2 PERFORMING A PLATE LOAD TEST

Turn the PLATEMAN transducer unit on by pressing the silver button on the side on. The blue light will flash continuously until it connects with the PLATEMAN test unit. And then it will turn solid blue.

Turn on the PLATEMAN test unit, both at the master on/off switch under the rubber seal, and the front panel on/off switch. Wait for the unit to boot up.



If you are using 3 transducers select PLT_3D and for 4 transducers select PLT_4D. Tap the programme icon only once to start.



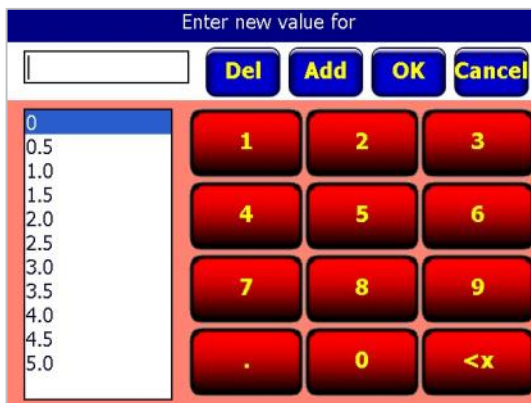
A screen shot will appear with reminders for unit and transducer calibrations



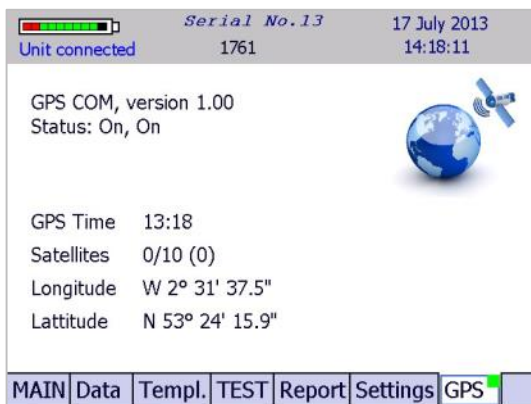
The MAIN Screen will appear. Use this to input site data, create new tests, open existing tests and save changes. A green horizontal bar will appear at the top left of the screen when connected to the PLATEMAN transducer unit.



The Keyboard screen will automatically appear when text boxes are touched



The Numeric keypad will automatically appear when numeric input is required



Click on the GPS tab to check for the GPS satellite status. When a GPS co-ordinate fix is obtained, the tab will show a green box, visible in all menus.



Click on the DATA tab and enter the test information, i.e. test ref, test material, location, reaction load, depth of test below ground, plate diameter and weather.

Serial No.13 17 July 2013
Unit connected 1439 14:16:54

Test No. TP24

Material TS41

Location 0.5 Ref 16

Type of React.Load 1.0 Motor

Depth 2.0

Plate Diam. 300

Weather

MAIN Data Templ. TEST Report Settings GPS

Depth, Plate Diameter and Weather have drop down lists for quick selection.

Enter new value for

Del Add OK Cancel

0

0.5

1.0

1.5

2.0

2.5

3.0

3.5

4.0

4.5

5.0

1 2 3

4 5 6

7 8 9

. 0 <x

You can edit the drop down list by clicking on the button to the right of the field.

Serial No.13 17 July 2013
Unit connected 1808 14:18:22

Max. Applied Pressure, kPa 450

Time step: 1 sec

Number of Increments 5

Number of Decrements 1

Number of Cycles 1

Ascending Step, kPa 90.0

Descending Step, kPa 450.0

Same Cycles

Custom Cycles

View

MAIN Data Templ. TEST Report Settings GPS

Click on the TEMPLATE tab to set up the test parameters, including the maximum applied pressure, pressure increments, number of increments, decrements, cycles and the time step.

Serial No.13 17 July 2013
Unit connected 1846 14:18:31

Time step: 1 sec

1 sec (10hrs max)

2 sec (20hrs max)

10 sec (100hrs max)

The template is loaded from file:

file name

View

MAIN Data Templ. TEST Report Settings GPS

Time steps of 1, 2 or 10 seconds can be selected.

Serial No.13 17 July 2013
Unit connected 1924 14:18:50

Max. Applied Pressure, kPa **450** Time step: 1 sec

Number of Increments **5** Ascending Step, kPa **90.0**

Number of Decrements **5** Descending Step, kPa **450.0**

Number of Cycles **10** ☒ Same Cycles ☐ Custom Cycles **View**

MAIN Data Templ. TEST Report Settings GPS

Up to 10 loading increments can be selected.

Serial No.13 17 July 2013
Unit connected 1972 14:19:02

Max. Applied Pressure, kPa **450** Time step: 1 sec

Number of Increments **5** Ascending Step, kPa **90.0**

Number of Decrements **1** Descending Step, kPa **450.0**

Number of Cycles **1** ☒ Same Cycles ☐ Custom Cycles **View**

MAIN Data Templ. TEST Report Settings GPS

UP to five unloading decrements can be selected.

Serial No.13 17 July 2013
Unit connected 2032 14:19:16

Max. Applied Pressure, kPa **450** Time step: 1 sec

Number of Increments **1** Ascending Step, kPa **90.0**

Number of Decrements **5** Descending Step, kPa **450.0**

Number of Cycles **1** ☒ Same Cycles ☐ Custom Cycles **View**

MAIN Data Templ. TEST Report Settings GPS

UP to 5 cycles can be selected.

Serial No.13 17 July 2013
Unit connected 2145 14:19:43

90.0	90.0
180	180
270	270
360	360
450	450
0.0	0.0

LOAD

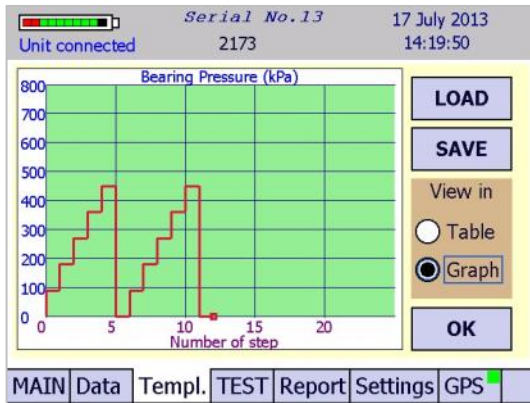
SAVE

View in ☒ Table ☐ Graph

OK

MAIN Data Templ. TEST Report Settings GPS

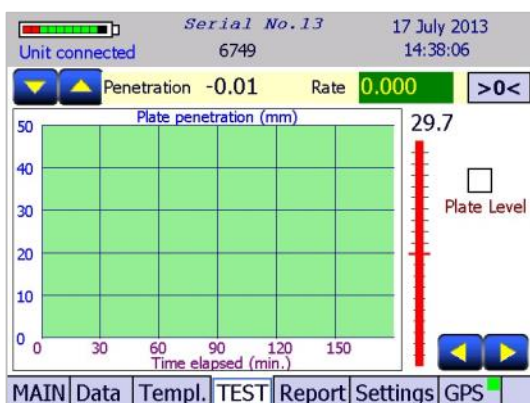
Once the template is entered, this can be viewed as a table....



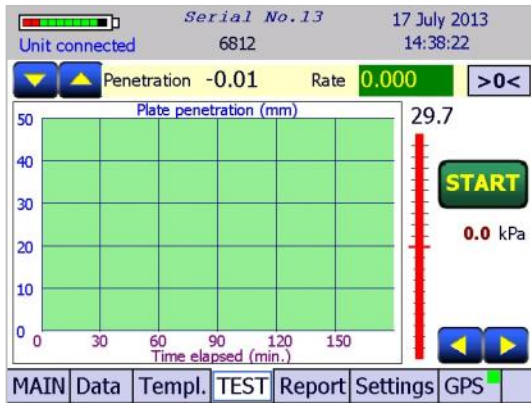
....or as a graph

If the cycles are not the same, custom cycles can be set using the 'Custom Cycles' button. Each cycle can be selected and edited.

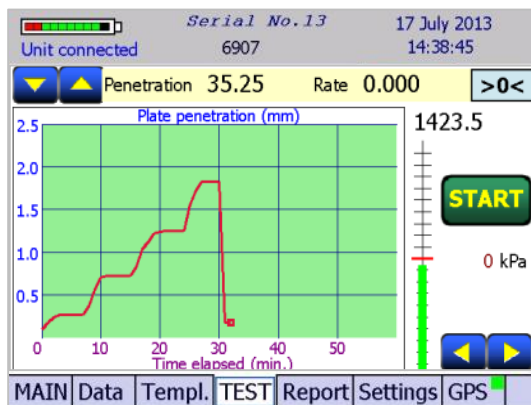
The template entered can be saved as a template file for use in future, or a previously stored template can be loaded.



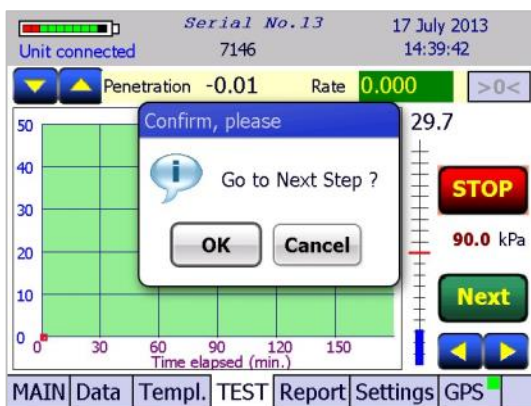
Once set up, to start a test, click on the TEST tab and press the >0< icon to zero the LVDT's and load cell. You are now ready to start the test. Click on the 'Plate Level' box (if the plate is level) and the **START** button will appear.



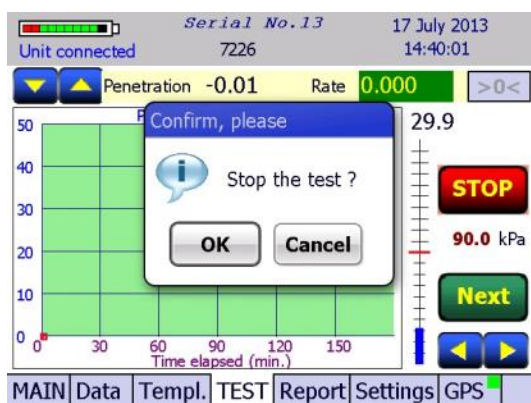
Click on the **START** button and the PLATEMAN will start recording data from the load cell and LVDT's. The PLATEMAN will now guide you through the template you have set up. A load indicator line is displayed, with the target line displayed in red and green. The operator should then maintain this load using the hydraulic pump. The line goes green when correct.



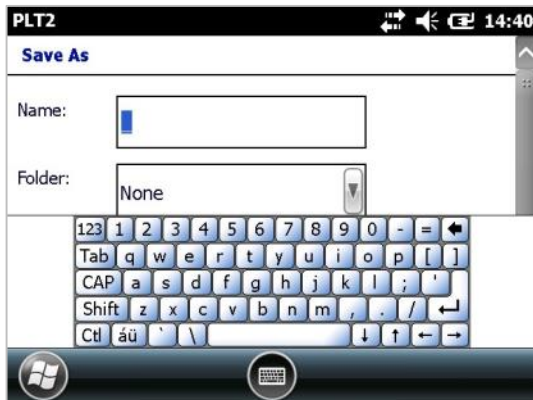
As test proceeds, the average plate penetration recorded by the LVDT's is displayed against time in real-time, as well as the plate load in kPa. When the rate of settlement is below the set level (see settings) the box around it will go green. If you have selected Auto Next in the Settings>Rate menu then it will automatically prompt you to apply the next load increment.



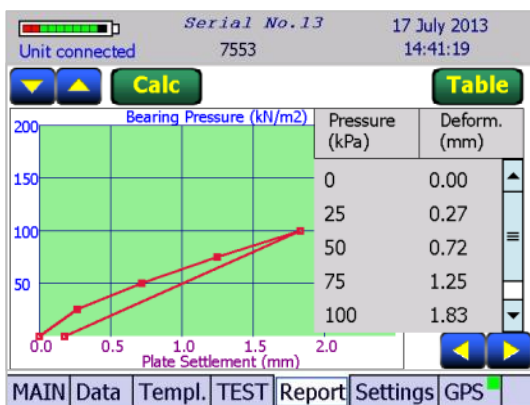
You can override the test at any time and press Next – this will give you a warning message.



Once the test is finished (or you wish to abort the test), click on the stop button.



You will now be given the option to save the test data file. Click on SAVE and enter the file name.



Once the test is complete you can select the REPORT tab to display bearing pressure against plate settlement. Selecting table in the REPORT screen displays a table of bearing pressure and plate settlement.



Selecting Calc in the REPORT screen displays further test information from calculation, including the k value and estimated CBR value.

3.3 OTHER SETTINGS

Serial No. 13 17 July 2013
Unit connected 3754 14:26:08

Options

Correction factor formula

☐ HD25/94 : $F=0.00124D+0.0848$

☒ IAN : $F=0.001209D+0.079$

Save

Use of Max deflection

Extrapolate to 1.25mm

Plate Tilt Warning ☐ Enabled

Max allowable difference 10.0 mm

MAIN Data Templ. TEST Report Settings GPS

SETTINGS screen: Selecting **Opt** enables you to select the correction factors to use and the method of extrapolating to 1.25mm. You can also enable a plate tilting warning message and max allowable difference between gauges which will trigger the warning. You can then save the values used as default.

Serial No. 13 17 July 2013
Unit connected 3923 14:26:49

Loadcell

Coefficient 1.712 mV/V Set 15/07/13

Cur. Force (kN) 2.10 >0<

0.00	5.00	10.00	15.00	20.00	25.00
0.00	5.00	10.00	15.00	20.00	25.00

Calc Reset

MAIN Data Templ. TEST Report Settings GPS

SETTINGS screen: selecting **Cell** enters the load cell page. The coefficient is calculated or can be entered. The top table shows reference load, which is input. The bottom table shows PLT measurement, which is stored when clicked. Pressing Calc works out a new coefficient. SET permanently stores to memory. Up to 6 points can be used, but for load cells 2 is usually enough.

Serial No. 13 17 July 2013
Unit connected 3971 14:27:00

Displacement transducers

	Serial No.	Data (mm)	Set 0	Calibration Date
DT1	13B00252	-0.01	>0<	15/07/13
DT2	13B00253	-0.02	>0<	15/07/13
DT3	13B00254	-0.01	>0<	15/07/13

Set as Default Add from File

MAIN Data Templ. TEST Report Settings GPS

SETTINGS screen: selecting **DT** displays displacement transducer calibration info. You can select the order of LVDT's and add calibration data for additional gauges here.

SETTINGS screen: selecting **Rate** displays settlement limit and averaging time to use. You can also select the Auto Next button to automatically prompt and start the next load increment.

SETTINGS screen: selecting **Cal** enters displacement transducer calibration routine. The top table shows reference load, which is input. The bottom table shows PLT measurement, which is stored when clicked. Pressing Calc works out a new coefficient. Up to 10 points can be used, but for 2 is usually enough if linear.

After the test is complete, return to the MAIN menu and select SAVE to store the data to you preferred location. You have the option at this point to store the data straight away in ASCII format for use in your own software or MS Excel. Simply press and hold the SAVE button until a new menu appears with storage instructions. Please note, if you store directly in ASCII and not PLT format, we cannot view in the PC PLATEMAN software.

SECTION 4 : FILE OPERATIONS

4.1 REVIEWING DATA FILES

To view a stored data file, enter the MAIN menu, and select OPEN. Select the file you wish to view and you can review test and report data.

4.2 DELETING DATA FILES

Files can be selected and deleted directly from the PDA using the **File Explorer** option, in the PDA unit Windows menu, or remotely using Windows Mobile Device Centre, which should start automatically when the PDA unit is connected to your PC.

4.3 TRANSFERING DATA TO A PC

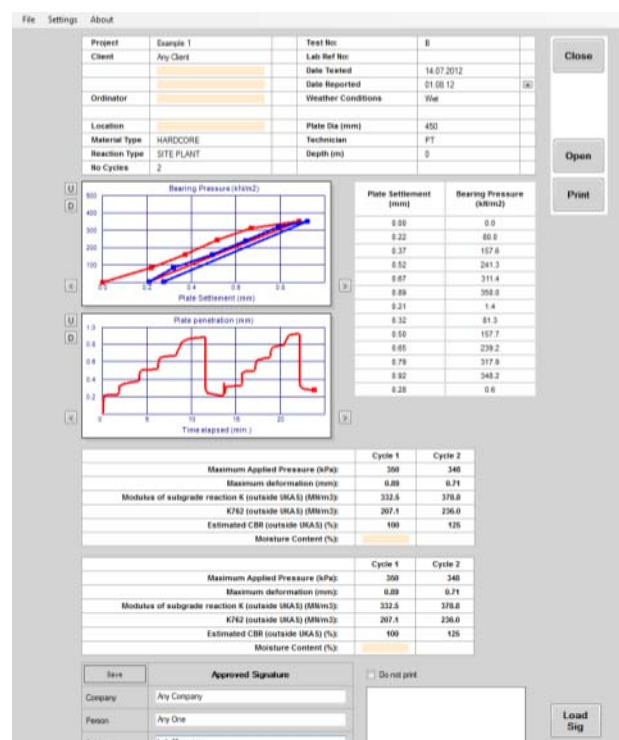
Data can be transferred from the PLATEMAN to your PC using Windows Mobile Device Centre, which should start automatically when the PDA unit is connected to your PC. Within the file management settings you can select and transfer data files to your PC for analysis using the PC PLATEMAN software. If you have problems connecting , you may need to temporarily disable you PC firewall.

SECTION 5 : USING THE PC PLATEMAN SOFTWARE

5.1 OPENING DATA FILES

Once you have transferred your data files from the PDA to your PC (See Section 4), you can use the PLATEMAN PC software to view data, add your company details and print out reports. You can also export the data as ASCII for use in your own Excel worksheets if you prefer.

Click on OPEN or File > Open to locate and open the PLT data file you wish to view.



You can alter site information if required and set up and load an Approved Signature.

5.2 VIEW SETTINGS

Your company logo and if applicable your company UKAS logo can be imported and printed at the top of the table of results, by selecting SETTINGS > LOGO IMAGE. We recommend you use JPEG images as these resize with better clarity. You can elect to not print either if required using the check box. Use the LOAD buttons to locate the images and SET AS DEFAULT to save.

Your company details can be entered for reports, by selecting SETTINGS > COMPANY'S DETAILS. Use the SET AS DEFAULT button to save.

The Test Standards testing is carried out in accordance with together with remarks can be entered for reports, by selecting SETTINGS > STANDARDS USED. Use the SET AS DEFAULT button to save.

The Calculation parameters used can be set using SETTINGS > CALCULATIONS. This enables you to use either HD25/94 or IAN correction factor formula and also chose max value or extrapolation for determining the applied pressure/1.25mm displacement slope.

Calculation parameters

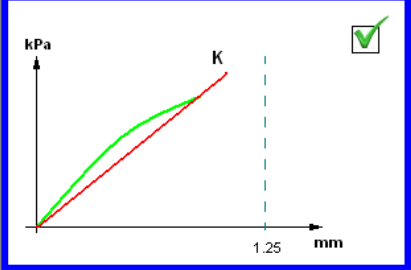
Correction factor formula

☒ **HD25/94 : $F=0.00124D+0.0848$**

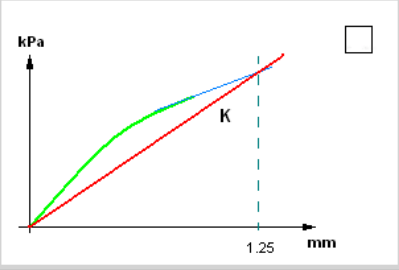
☐ IAN : $F=0.001209D+0.079$

Applied pressure / 1.25mm Displacement slope determination, if below 1.25mm:

Use max values point



Extrapolation to 1.25mm point

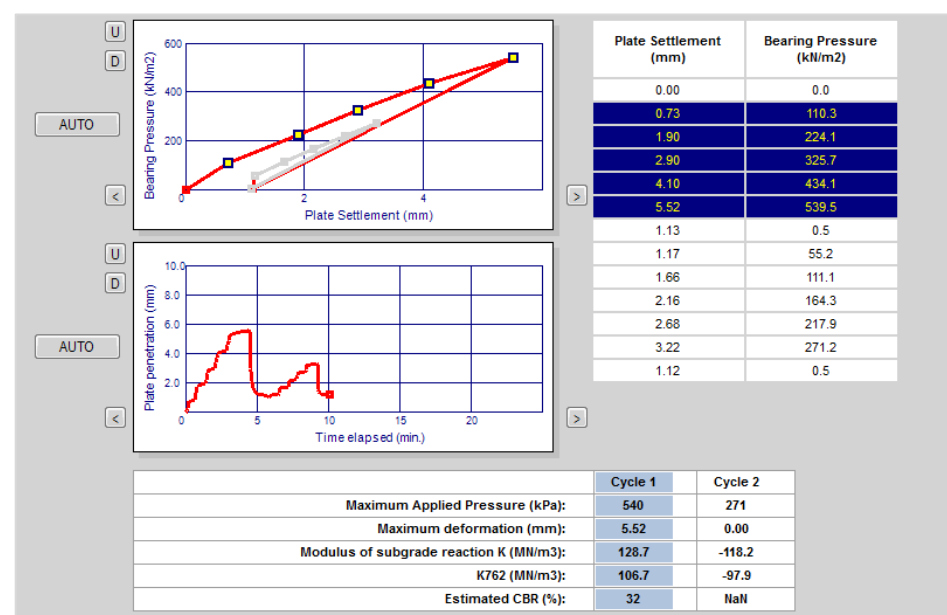


Set As Default

Load Default

Close

If more than one cycle is carried out, subsequent cycles appear in different colours. If you click on the cycle table (see below), the values used are identified and can be selected or deselected if incorrect.



5.3 PRINTING REPORT FILES

To print the test report, click on PRINT and select the printer you will be using. A full test report will be printed.

Testconsult Limited
Ruby House, 40A Hardwick Grange, Warrington, Cheshire
WA14 4RF
Tel: 01925 286880 Fax: 01925 286881

LABORATORY TEST REPORT
DETERMINATION OF PLATE BEARING CAPACITY

Project	Example 1	Test No:	5
Client	Any Client	Lab Ref No:	
		Date Tested	14.07.2012
		Date Reported	01.08.12
Ordinator		Weather Condition	Wet

Location		Plate Dia (mm)	450
Material Type	HARDCORE	Technician	PT
Reaction Type	SITE PLANT	Depth (m)	0
No Cycles	2		

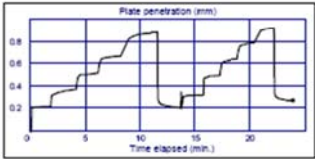
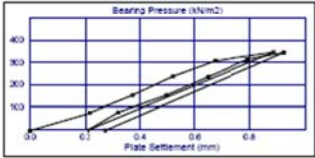


Plate Settlement (mm)	Bearing Pressure (kN/m2)
0.00	0.0
0.22	80.0
0.37	157.6
0.52	241.3
0.67	311.4
0.89	350.0
0.21	1.4
0.32	81.3
0.50	157.7
0.65	239.2
0.79	317.9
0.92	348.2
0.25	0.6

	Cycle 1	Cycle 2
Maximum Applied Pressure (kPa):	350	348
Maximum deformation (mm):	0.89	0.71
Modulus of subgrade reaction K (outside UKAS) (MN/m3):	332.5	378.8
K762 (outside UKAS) (MN/m3):	297.1	236.0
Estimated CBR (outside UKAS) (%):	100	125
Moisture Content (%):		

Plate Load - Tested in accordance with BS 1377 - Part 9 Cl. 4.1 : 1990
Moisture Content - Tested in accordance with BS 1377 - Part 2 : 1990, oven drying method
Opinions and interpolations expressed herein are outside the scope of UKAS accreditation

SECTION 6 : CALIBRATION OF PLATEMAN AND TRANSDUCERS

The PLATEMAN test unit and transducer unit are calibrated prior to shipment, and certificates are provided with each. Transducers can be recalibrated against reference equipment within the Settings Menu of the PDA.

Calibrations can also be carried out using equipment traceable back to national standards. We recommend that the unit and transducers are re-calibrated annually to ensure continuing compliance.

SECTION 7 : CARE AND MAINTENANCE

The PLATEMAN test unit and transducer units are designed to operate on site in a harsh environment. Nonetheless they do both contain electronics so they should be treated with respect, and not subjected to severe shocks, drops or temperatures.

The enclosures are best cleaned with a damp cloth and soapy water. We do not recommend using solvents to clean the units.

There are no operator serviceable parts inside either the PLATEMAN test unit or transducer units, which have been sealed against moisture. Opening the unit will invalidate any warranty which is given with the PLATEMAN, so in the event of malfunction we recommend that the unit is returned to the manufacturer for repair.