

# **Manual Envi vane system**

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Rev A

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# Introduction

The Envi Vane System has two main units:

1. The above ground surface unit consisting of gear box with control box, engine and torque sensor. There is also a mounting bracket.
2. The In situ unit. This is a probe with memory measuring the torque on the vane which is mounted at the end of the probe. The torque sensor is positioned just a few centimeters above the vane. Three sizes of vanes are delivered with the system.

In addition you need a few cables. Depending on what type of installation it is cables required differ between installations. You also need a PC with Envi software installed. You also need an Envi logger system. The vane shear tests are recorded and the system keeps track of the depth. There is also an option to execute vane shear tests without a logger system but the operator must define each test depth in a pop up dialogue.

## Complete system



Control box & gear box



Vane probe



Vanes

*Three different sizes*

Rods, preferably Ø22 mm

*Chuck available also for 32mm rods*

## Mounting and starting the system

Start by mounting the system in the mounting bracket and tighten firmly. Connect the military type six pin contact in the control box and in the connection box. This contact carries both power to the vane system engine and the CAN bus. Verify that the small contact connecting the above ground torque transducer to the control box is connected. This contact should always be connected with the exception of when the system gets an overhaul.



Make sure the red switch is set 1 = ON and that the green switch is set to 0 = OFF. The black switch shall be set to position 1=AUTO. Turn the potentiometer (yello arrow) to around 10. This potentiometer regulates the rotation speed whne black switch is set to MANUAL. Starting at maximum speed will cause the engine protection to stop the system.

Ensure that the system gets power by starting rotation (green switch) and verifying that it turns. If rotation speed is set to AUTO you can hear a faint ticking sound if you position your ear on the control box. An alternative is to switch to MANUAL and increase the speed with the potentiometer. Then you can see that the chuck rotates and your hear a sound from the transmission. Remember to reset the speed potentiometer to 10 when done.

If no vane is mounted on the probe mount one that is suitable for the task ahead. Often the smallest one. Connect the probe to the system. Start the CPT application and connect the probe to the system. Start the sounding by pressing NEW in the application window and select METHOD = Vb

<b>IDENTIFIERINGAR</b>	<b>METOD</b>
Projekt-ID: testar	Vb
Sond. ID: 1111	
Plats: Allingsås	<b>UPPDRAGSGIVARE</b>
Företag: Environmental Mechanics AB	Företag:
Fällingenjör: Per	Kontaktperson:
Arbetsledare: Jörgen	
	<b>MILJÖFAKTORER</b>
<b>SONDFAKTORER</b>	Nivå Grundvatten: [ ] [cm]
CPT	Luftryck: [ ] [hPa]
A: 0.68 B: [ ]	Temperatur: [ ] [C]
Mode	Förbörningsdjup: 0 [cm]
<input type="checkbox"/> Kabel <input checked="" type="checkbox"/> Trådlös	<b>KOORDINATER</b>
	X: [ ] Y: [ ] Z: [ ]
	SPARA
	RENSA
	AVBRYT

The three parameters Project ID, Sounding ID and Method must be defined due to system requirements. The other parameters are optional. Press SAVE when you have filled in your data

When asked for what type of vane you are using select Nilcon with one tapered end and the size (diameter) of the vane.

**ANGE TYP AV VINGE**

Typ  
Nilcon, nedre ändan vinklad

Diameter  
55

Max tillåtet moment  
100

**OK**

Also set maximum allowed torque. This is the maximum torque that the above ground unit will experience. Not the torque at the vane. This is set in order to protect the above ground unit from damage. Default value is 100 Nm. Going higher than 300 Nm is not recommended. When defined press OK. You now get a pop up with information about how to proceed when reading zero values. The system will now read probe zero values. When that is done (a status window shows you this) a zero value pop up will appear. Close that dialogue and disconnect the probe.

**INFORMATION!**

Läsning av sondens nollor kommer att göras nu  
Låt sonden vara ansluten med kabeln tills nollläsningen genomförs

**OK**

Press OK to start the vane probe. A wait dialogue appears until zero value reading is done.

Det kan ta lite tid att starta sonden  
Vänligen vänta...

Aktivitet: Inleder sonden

When the probe has started and the zero values have been saved you get a new pop up saying that the probe is connected and what serial ID the probe has.

**MEDDELANDE**

Memovane med id: 0 är nu ansluten!  
Nollvärden:

**OK**

Close the pop up by pressing OK and disconnect the probe from the cable.

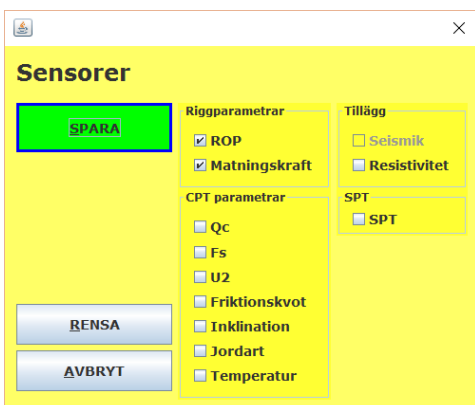
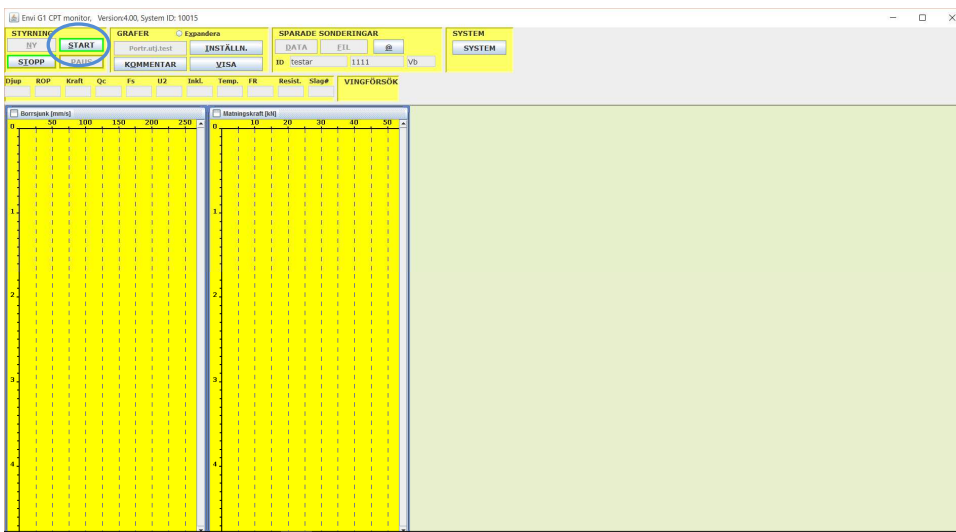
# Execute a Vane test

## Preparations

Connect the battery tube to the probe. First the black plastic tube and then the the steel tube which is threaded and firmly tightened. Hand power is often enough. Make sure the **red** switch on the vane system is in position ON, the **black** switch in position AUTO and the **green** switch in position OFF. Using the manual speed control during sounding is not recommended.

## Start

Add a rod to the probe and position the vane on ground surface. Clamp the rod to keep the probe steady. Press START in application window and start pushing the vane into the ground. When asked for what parameters to show select only ROP (Rate Of Penetration). Maybe also feed force if you have sensors for that. Then press SAVE. Next you will be prompted to specify start depth. If you have predrilled to some level you can lower the probe to that level instead of ground level before starting the sounding. If so specify you start depth in the dialogue. Otherwise just press SAVE and the system will use zero as ground level.

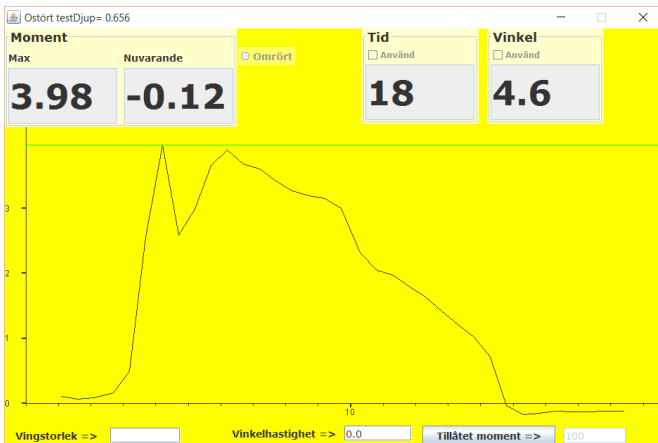


Start advancing the probe into the ground. Ensure that the system registers depth and ROP.

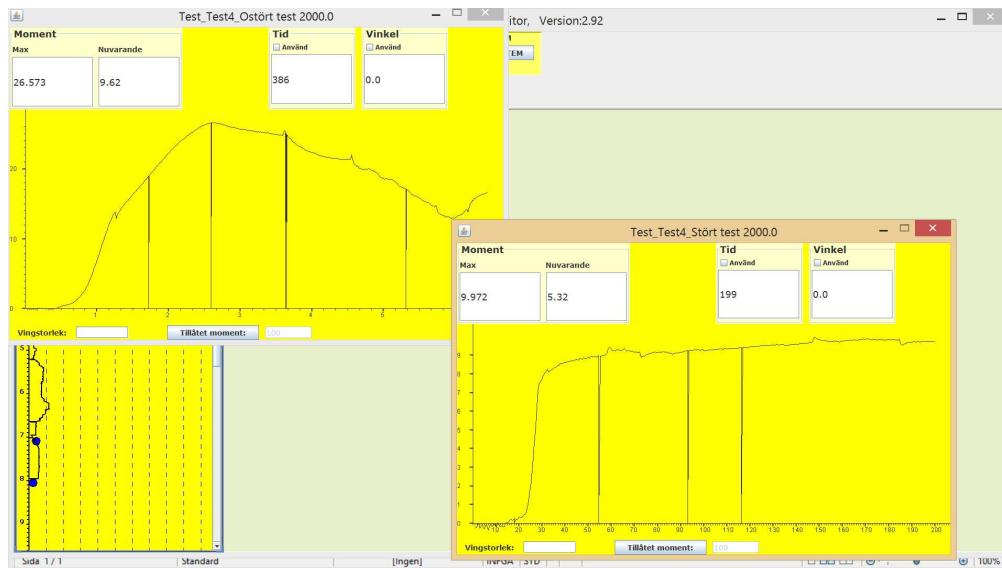
## Sounding

Keep advancing the probe until you reach the desired depth for the first test. Lock the chuck by lifting the fastening ring up and turning it counter clockwise. Use some force to lock the chuck on the rods. When the chuck is locked set the green switch to ON to start the rotation. Verify that the chuck stays locked and does not slip on the rod. If the chuck slips help it lock by turning the fastening ring counter clockwise and holding it for a while until the chuck clamps as it is supposed to.

A pop up window showing the torque measured by the above ground unit pops up. The first test is registered as undisturbed test. If you do more tests on the same level they are registered as disturbed tests. If you execute more than one disturbed test on the same level the system will select and use the disturbed test with the lowest torque for calculation of sensitivity. For information purpose the angle that the gear box has turned is also shown. The angular speed for the system is typically somewhere between 6-10 degrees per minute.



The pop up torque windows are positioned on top of the application window. When you advance the probe downwards again the open pop up window will close. You can view it again by clicking the blue circle in the ROP graph



Example with two test on the same level. One disturbed and one undisturbed

When you see that the torque measured above ground surface gets lower you have a failure in the ground and shear strength can be determined. You stop the test by shifting the green switch to OFF. When you are satisfied with tests on current level you proceed by advancing the probe deeper into the ground. The application starts registering depth and ROP again. A blue circle is plotted in the ROP graph at the level where you executed the test to show where the test was done.

The above is repeated for all test levels.

## Terminating the test

When you have done tests on all levels required you terminate the test by pressing the STOP button in the application.

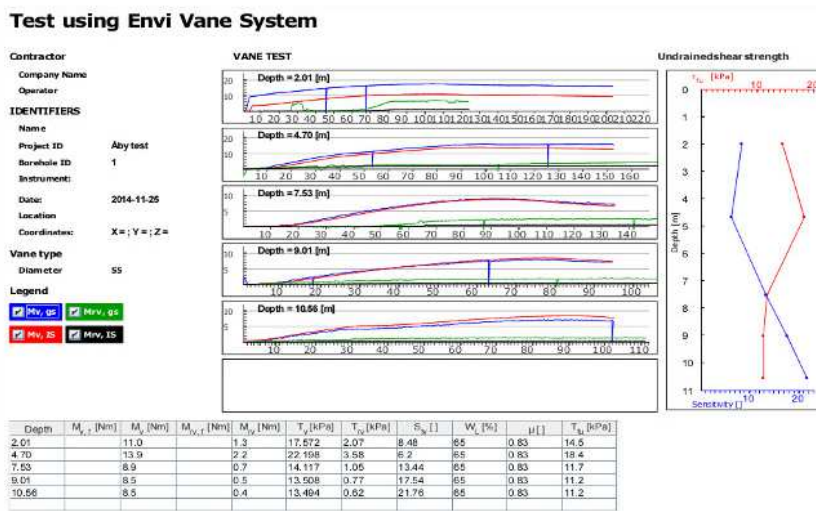
Then follow the instructions on screen. Once the probe is retracted to ground surface you remove the battery tube and reconnect the probe to the system. Confirm with OK in the dialogue that you have connected the probe and are ready for data download.



The system will show when data has been downloaded. Any errors will be shown in pop up windows.

## Create files

To create files press the FILE button in the application window. The system currently supports only SGF type format. The system will then create an SGF file with shear strength and sensitivity data. The system will also create a report with all data plotted (see below). The first page shows the six first levels and then coming levels will be plotted in additional pages. The graph showing shear strength and sensitivity is depicted to the far right in the report. This is plotted only on first page and contains plots for all levels (also levels plotted on trailing pages).



You can select what graphs you want to plot by selecting or deselecting the four check boxes:

Mv, gs = Torque undisturbed test, ground surface

Mrv, gs = Torque disturbed test, ground surface

Mv, IS = Torque undisturbed test, In Situ

Mrv, IS = Torque disturbed test, In Situ

If the torque determined by the system is wrong the system may have selected torque from a value that is a distortion of some sort. To fix this you click in the graph close to the position where you determine maximum torque. Then the system will chose this torque and update the table and plots accordingly

You can also change the liquid limit factor by clicking in that cell in the table. When you have changed the value the correction factor  $\mu$  will be updated and the undrained shear strength will be updated and plot and table corrected accordingly.

When you are satisfied you can plot the report by pressing the PRINT button in the lower right corner of the report page. The system will then save a JPG showing the report.

If you want to have torque raw data saved to work with plotting graphs yourself you can also create Excel compatible files for the tests. To do this open SETTINGS in the application window and then press File&Email button to get another pop up window. There you select Create Vane Raw Data File.