



INSTALLATION AND USER MANUAL POLARMOIST Water Content Monitoring System for aggregates

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Introduction

This document is the installation and user manual of Polarmoist Water Content Monitoring System. The probe is designed to measure moisture in coarse and fine aggregates on belt conveyors or flowing down out of bins. The probe sends infrared light and measures the amount of retro-reflected light. The measurement is based on absorption of infrared light while passing through a thin water layer on the surface of the aggregate being measured. The probe is of solid-state design and does not have moving nor wearing parts.

Although the probe is pre-calibrated in the factory, it is necessary to calibrate the probe after installation to correspond to the right aggregate and measuring environment. The probe shall be calibrated in the working environment by taking first two samples and adjusting the reading. When there will be calibration data over a broader range of moisture, the calibration can be redone. The probe measures surface moisture. Absorbed moisture is taken into calculations by burn-offs and calibration. Windows PC based VipuNET user interface supports calibration by registering all the reference measurements and by setting the calibration parameters of the probe.

VipuNET software collects the data messages from the probe and stores them on the computer with date and time. The program shows also the numeric moisture reading and represents it as a function of time on the screen as a graph. In addition, to support the probe calibration the program can be used for upgrading/updating the probe firmware or setting up all the parameters of the probe.

The probe system has different analog outputs available. Factory setup is 4...20 mA.



Delivery content

Polarmoist is suitable for stand-alone assembly or electrical cabinet assembly if needed. In the electrical cabinet assembly, Control room connection Box components are located in a batch plant electrical cabinet. See electrical diagrams for different set-ups at the end of this manual.

The following main components are included:

- Probe assembly
- Probe cables
- Probe connection box (X MOI 1)
- Control room connection box, including Power, Signal and USB connections (X MOI 2)
- VipuNET calibration and monitoring software
- Vipunet software and user manual can be downloaded from <u>https://polarmatic.studio.crasman.fi/bank/polarmoist</u>. Password is: aggregate

This delivery content **does not include** the following required components:

- Control PC
- Signal cable between Probe box and electrical cabinet. Cable type is screened data transmission cable, LiyCY twisted pairs 2x2x0,5 (2x2xAWG20). Max length 50 m.
- Compressed air plastic hose 8/6 mm, T-joints or flow adjustment device.



Note! The figures below shows an example of typical delivery content. However, single PC USB connection can have maximum of 7 probes connected. If more probes are required, more USB connections are required in the PC.



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Mechanical and electrical assembly

Probe assembly

The probe assembly includes the main components shown below. Probe and probe cover are delivered separately in order to avoid any damages during the delivery. Pneumatic hose shown in the figure is not included thus should be purchased separately. The probe assembly shall be assembled into protection tube as shown in the figure.

Compressed air is used to arrange a counter flow to prevent contamination of the probe window.



The probe is typically installed over a belt conveyor or under a sector gate at a distance of approx. 0.70–0.90 meters (25-35 in.) from the aggregate when measured from the top of the probe. The tube can be fixed with M8 mm bolts or similar to fixed structures like L bars. The figure below shows an example of the installation over a bin belt feeder.





Figure 1. Probe installed over a bin belt feeder.

The measuring beam is cone shaped and has a diameter of 10 cm [4 in.] at a distance of 1 m [40 in.]. The probe must only see the aggregate measured and no other targets under its beam. One can check the location of the measurement area by moving hand or white paper while following the signal output.



Note! The measurement must be taken from a moving sample, because a standing aggregate may be optically inhomogeneous causing unwanted offset of reading.



The protection tube visor shall be turned against possible flow of dust or stones released for example by operation of pneumatic valves. When using heated moist aggregates, the visor should be turned down to prevent moisture getting collected in the tube while the moisture is flowing upwards. In that case, the possible pneumatic shocks should be prevented with additional shields.

The probe placing is shown in the figure below. Recommended tilting angle is 60°, however it can be between 40° and 80°. For more details, see the figures below.





Figure 2. Probe position over aggregate flow



Probe connection box

Each Probe is connected to a probe connection Box (X MOI 1) with a probe cable. Up to four probes can be connected to each connection box. For the wiring, see wiring diagram at end of this manual. Connect the probe cable to probe with ready installed connector after completing mechanical assembly of the probe unit.

From the probe connection box, the signals are led to Control room Connection Box via intermediate cable. This cable is type **Screened data transmission cable, twisted pairs 2x2x0,5 (2x2xAWG20).**



Note! The intermediate cable between Probe connection Box and Control room control box is not included.



Note! Maximum length of the intermediate cable is 50 m (165 ft)

The connection Box should be located close to probes in a place where the box is in as dry and secured location as possible. The cable glands shall point downwards.



Figure 3. Probe connection box X MOI 1



Control room connection box

All the Probe connection Boxes are connected to Control Room Connection box (X MOI 2). The Control Room Connection Box is built in the factory for the correct amount of probes. Analog signal output to the batching automation systems is located here. Control PC is also connected here via USB connection. The Control room Connection Box should be located in the control room close to the PC on which the VipuNET software is installed. For the wiring, see wiring diagram at end of this manual.



Figure 4. Control room Connection Box for four probes

Changing the output signal type

The output signal can be selected to match the input required by the batch plant control system. A signal conditioner is located inside the Control room connection box. Signal conditioner is used for providing galvanic isolation between field circuits and control circuits. This ensures reliable function of the measured moisture signal. Factory setting is 4...20 mA signal, but the signal type can be changed. The signal corresponds to moisture reading 0...16%. The following probe analog signals are available by configuring DIP switches:



Output	Dip position (S)					
	1	2	3	4	5	6
0 mA 20 mA					х	
4 mA 20 mA						
0 V 10 V	х	х			х	
2 V 10 V	х	х				



Compressed air

Compressed air is recommended to be used to provide a counter flow to prevent contamination of the probe window. Each probe assembly has a connector for compressed air. For example, polyurethane compressed air tube diameter of 8 mm (5/16 in.) can be used. The system shall have airflow control device to set the flow to approx. 1-2 l/s.



Note! Compressed air tubing, connectors and air flow control are not included in delivery





VipuNET software

VipuNET software is provided for setting automatically calibration parameters to the moisture probe. The software is also used for registering the calibration and reference values, to follow the measured moisture numerically and graphically and for saving the collected data with date and time. The program runs in Windows PCs with Windows 7 or newer.

Installing

To install VipuNET:

- 1. The software is delivered in VipuNet.zip format
- 2. Unzip the Vipunet.zip to a desired directory for example on desktop
- 3. Start the installation by clicking on Setup.exe
- 4. The setup file may need .NET Framework support files from Microsoft. If you do not have an Internet connection, the support files can be installed with a separate installer program.
- 5. VipuNET starts at the end of the installation and asks for material name (give name of the aggregate measured by this probe)
- 6. There is a notice for setting of the serial port. Press OK button.
- 7. VipuNET main page opens.

VipuNET 2.0	X	VipuTerm 💌
Material Name	OK Cancel	Select a Port in Settings
8-16		ОК



VipuNET 2.0

- 8. VipuNET is now installed and a startup icon is created to desktop
- 9. VipuNET folder "C:\VipuNET" is created
- 10. If you have more than one probe, close VipuNET at this point. Otherwise, you may move on to the next chapter.



Multiple probe assembly

If VipuNET software is used for more than one probe connected to the same computer, then a new subfolder for example C:\VipuNet\WCM2probe2 must be created for each additional probe, in which the name of the folder starts with the letters WCM and the rest differs from each other. This folder contains the corresponding files as the main folder (ie. c:\VipuNET) for the first probe.

Example: You have two probes. In this case you need to create one additional folder under C:VipuNet (for example WCMprobe2 in this case). The VipuNET software reads the amount of folders on start-up and based on the amount, the software identifies that there is one additional probe and two in total.



After completing this, two main windows are opened each time when opening VipuNET. One window can be seen and the rest are minimized on Windows taskbar. VipuNET writes the information of each probe into separate folders and files.

2 VipuNET 0-8				UpuNET 8-16				x
TECONER	N	Noisture (%)	0.65	TECONER	R N	Noisture	4.95	5
Sample	0-8			Sample	8-16			
Moisture Messue 9 Moisture Messue 7 Moisture Messue 6 5 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4	ed — Signal 1 —	Signal 2 - Ma		Moisture — Meas 9 8 7 6 5 8 7 6 6 7 8 7 6 6 7 7 6 6 7 7 7 7 7 7 7	red — Signal 1 —	Signal 2 — Mat		
2 1 -10 -9 -8 -2017-07-1 Max 10 VipuTerm - a serial port termina	-7 -6 7 Time 10	-5 4	-3 -2 -1 0 Settings	A serial port termin	17 -7 -6 17 Time 10	-5 4	-3 -2 -1 See	0 ings
Disconnect Comm Port Baud Rate COM5 v 38400 v	33.80, 29 33.83, 29 33.87, 29 33.88, 29	.19, 0.99, .18, 0.85, .15, 0.85, .17, 0.94,	29, 257.8, 707.0, 29, 257.6, 707.0, 29, 257.5, 707.0, 29, 256.5, 707.0,	Disconnect Comm Port Baud Rate	33.93, 20 33.93, 20 33.93, 20 33.93, 20 33.90, 20	.83, 4.95, .83, 4.95, .83, 4.95, .82, 4.94,	38, 254.3, 973.9, 38, 254.3, 973.9, 37, 255.2, 973.9, 37, 254.3, 973.8,	
Measurement parameters Median Noise limit 4 0.00 0.00 Min signal Max signal 1 2001	33.86, 29 33.88, 29 33.86, 29 33.82, 29 33.80, 29 33.90, 29 33.96, 29	1.17, 0.94, 1.10, 0.94, 1.19, 0.90, 2.20, 0.86, 2.20, 0.79, 1.16, 0.79, 1.13, 0.96,	29, 257.4, 707.0, 29, 257.2, 707.0, 29, 256.3, 707.1, 29, 256.4, 707.0, 29, 258.0, 707.0, 29, 256.1, 707.0, 29, 257.1, 707.1,	Measurement parameters Medan Noise limit 4 0.00 ÷ Min signal Nassignal 1 2001	33.92, 20 33.94, 20 33.92, 20 33.91, 20 33.94, 20 33.97, 20 33.97, 20	.82, 4.95, .83, 4.96, .84, 4.96, .80, 4.96, .83, 4.96, .85, 4.96, .80, 4.96	38, 254.0, 973.8, 38, 254.9, 973.8, 38, 253.9, 973.9, 36, 254.5, 973.8, 38, 254.5, 973.8, 38, 254.2, 973.8, 38, 255.2, 973.8,	
Material # 0.8 • # Scaling factor Offset 0.000	33.88, 29 33.88, 29 33.90, 29 33.88, 29 33.90, 29 33.88, 29	1.15, 0.98, 1.12, 0.98, 1.15, 0.99, 1.16, 0.99, 1.14, 0.99, 1.21, 0.95,	29, 256.8, 707.0, 29, 257.7, 707.0, 29, 257.4, 707.0, 29, 256.4, 707.0, 29, 255.5, 706.9, 29, 257.3, 707.1,	Material 8-16 • ## Scaling factor Offset 1.000 0.00	33.93, 20 33.92, 20 33.96, 20 33.94, 20 33.93, 20 33.93, 20	.81, 4.98, .81, 4.98, .84, 4.97, .84, 4.97, .81, 4.97, .82, 4.97,	38, 253.8, 973.7, 38, 254.0, 973.8, 36, 255.2, 973.6, 38, 253.8, 973.9, 38, 254.3, 973.6, 38, 255.0, 973.8,	
CAL WCM411	33.84, 29 33.84, 29 33.88, 29 33.82, 29 33.85, 29 33.85, 29 33.81, 29	.21, 0.87, .16, 0.87, .24, 0.81, .25, 0.81, .23, 0.79, .23, 0.73,	29, 257.0, 707.0, 29, 257.3, 707.1, 29, 257.9, 707.1, 29, 257.5, 707.1, 29, 256.5, 707.0, 29, 257.0, 707.0, +	CAL WCM411	33.94, 20 33.95, 20 33.96, 20 33.98, 20 33.96, 20	.83, 4.97, .84, 4.95, .86, 4.95, .85, 4.95, .85, 4.93,	38, 255.3, 973.8, 38, 254.5, 973.8, 38, 254.2, 973.8, 38, 254.2, 973.8, 38, 254.2, 973.8, 37, 255.1, 973.8,	
Data Folder	C:\VipuNET\data			Data Folder	C:\VIPUNET\WCMSE	NSOR2\data		



Basic set-up

Before you start, some initial settings must be set. This can be done on the settings page, which can be opened from the main page by pressing "settings" button.

🕮 VipuNET 8-16				x
TECOI	NER 8-16	Moisture (%)		•
Moisture	Measured 2017-07-17	Signal 1 — Signal 2 –	— Material	
Max 10	Time	10 • min	Settin	gs

Connecting probes to VipuNET

On the settings page, select correct "Comm port". Set Baud rate to 38400. Press "Connect". When the probe is working, you can see data flow lines as shown in the figure below. Repeat these for each probe if you have multiple probes. Now all probes are connected.

VipuTerm - a serial port terminal						
Disconnect	71.73,	44.21,	4.63,	35,	257.0,	986. ^
	71.76,	44.26,	4.72,	35,	258.4,	986.
Comm Port Baud Rate	71.88,	44.20,	4.76,	35,	257.3,	986.
COM4 - 38400 -	71.88,	43.96,	4.86,	35,	257.4,	986.
	71.79,	43.95,	5.09,	35,	259.7,	986.
Measurement parameters	71.68,	43.99,	5.09,	35,	256.5,	986.
Median Noise limit	71.80,	44.12,	4.97,	35,	256.6,	986.
25 0 0 10 0 41	72.03,	44.42,	4.90,	35,	257.7,	986.
	72.69,	45.12,	4.72,	35,	257.9,	986.
	73.72,	46.17,	4.41,	35,	257.8,	986.
40 2001	74.85,	47.22,	3.98,	35,	259.6,	986.
Astorial	75.81,	48.08,	3.63,	35,	260.4,	986. =
	76.81,	48.73,	3.37,	35,	256.8,	986.
8-16 •	77.58,	49.11,	3.37,	35,	257.8,	986.
Scaling factor Uffset	78.02,	49.28,	3.47,	35,	257.3,	986.
1.000 0.000	78.07,	49.09,	3.57,	35,	258.4,	986.
CAL WCM411			_			-
Data Folder	C:\VIPUNET\W	CMProbe2\dat	a			

Each probe has its own separate data folder. Folder path is shown on the bottom of the settings page. Check that all probes have different data folders.



Median value setting

Median value setting is the amount of readings taken from the aggregate to calculate moisture. The median value setting is a moving value. After taking a new reading, the reading is counted in and the oldest reading is counted out. Mathematically, median is the middle value of a group.

Median value setting is done according to the characteristics of the current probe assembly and use profile of conveyors and bin gates. The system takes approx. two readings per second. This value should be set according to the measurement time available ie. actual dosing phase time of dosing your aggregate. You should set it so that your smallest batch will have at least as many readings as the median value. It should be set to be long enough but not too long so that the aggregate movement stops before measurement stops.

Example: Aggregate feeding from bin to conveyor takes about 4 seconds. What should the median value setting be?



The system takes two readings per second. Ideal median value setting in this case is 8.

We recommend to set the median value so that the fine dosing is not interfering the moisture value. This is done by using as long median value setting as possible, when a single value does not have significant influence on the median.



Note! Median value should be set as close as possible but not over to maximum time available.

Min signal setting

Min signal is set to stop measurement with small signals. This is useful for example with bin sector gates. Since without an aggregate flow, the signals are typically very small and there is no reason to measure. When the flow starts, the signal grows, and when it is bigger than the Min signal, the measurement is initiated.

The Exact value of Min signal depends on the probe assembly and on the aggregate that is measured. Typical value is between 40 and 50. The first number on the data flow is the Min signal. Check first what is the signal level when aggregate is not flowing. Then check what is the signal level when aggregate is flowing. Set the Min signal level so that probe is taking readings only when aggregate is flowing. This will help you when calibrating the probes.

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🖄 VipuTerm - a	a serial port terminal						X
Disconne	ect	57.40,	35.99,	3.92,	35,	283.4,	996. ^
Comm Port	Baud Rate	57.38,	35.99,	3.92,	35,	283.4, 283.5,	996.
	30400 +	57.38,	35.99,	3.92,	35,	283.5,	996.
Median	Noise limit	57.37,	35.98,	3.91,	35,	283.4,	996.
4 💭 Min signal	Max signal	57.38, 57.38,	35.98, 35.98,	3.92, 3.92,	35, 35,	283.4, 283.4,	996.
40	2001	57.38, 57.37,	35.98, 35.98,	3.92, 3.92,	35, 35,	283.4, 283.4,	996. 995.
8-16	▼ <u>#</u>	57.37, 57.37,	35.98, 35.98,	3.92, 3.92,	35, 35,	283.4, 283.4,	995. 995.
1.000	0.000	57.36, 57.36,	35.97, 35.97,	3.92, 3.92,	35,	283.4, 283.4,	995. ≡
CAL	WCM411	57.35,	35.97,	3.92,	35,	283.4,	995
Data	a Folder	C:\VIPUNET\W	CMSENSOR2\c	lata			



Note! Min signal level setting is not mandatory setting, but can be used to control moisture measurement on and off.

Noise limit setting

When nothing is happening ie. aggregates are not moving, noise level is very low. Noise level starts to grow when aggregates are moving on conveyor. By this setting the system can recognize the moving aggregates and it starts to measure only when noise level is increasing. If this setting is 0.00, the measurement is on at all times except when min signal level prohibits it. The window on the right side of the Noise limit setting shows the current noise level. This can be set to a right value by checking the noise levels when the aggregates are moving and when it is not moving. Note that the probe is measuring all the time, but when noise limit is under setting, the values are ignored.

🖉 VipuTerm - a serial port termina	1						
Disconnect	50.93,	31.43,	4.70,	38, 272.0,	962.5,	0.0,	549.8, ^
	50.79,	31.14,	4.78,	38, 267.5,	962.6,	0.0,	549.9,
Comm Port Baud Rate	50.88,	31.03,	5.01,	38, 269.3,	962.6,	0.0,	549.8,
COM4 ~ 38400 ~	51.24,	30.99,	5.26,	38, 268.7,	962.6,	0.0,	549.8,
	52.04,	31.10,	5.67,	38, 273.2,	962.5,	0.0,	549.8,
Measurement parameters	52.96,	31.56,	6.25,	38, 268.5,	962.5,	0.0,	549.8,
Median Noise limit	54.65,	32.45,	6.38,	38, 273.0,	962.6,	0.0,	549.8,
10 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	56.93,	33.36,	6.57,	38, 272.3,	962.5,	0.0,	549.8,
Min signal	58.74,	33.80,	7.20,	38, 273.7,	962.5,	0.0,	549.8,
	59.70,	34.13,	8.06,	38, 273.7,	962.6,	0.0,	549.8,
40 2001	60.13,	34.37,	8.38,	38, 269.7,	962.5,	0.0,	549.8,
Metorial	59.88,	34.34,	8.38,	38, 275.3,	962.5,	0.0,	549.8,
	59.24,	34.13,	8.25,	38, 273.2,	962.5,	0.0,	549.8,
8-16 • 11	58.74,	34.30,	8.01,	38, 272.2,	962.6,	0.0,	549.8,
Scaling factor Offset	59.13,	35.14,	7.37,	38, 273.0,	962.6,	0.0,	549.8,
1.000 0.000	57.25,	34.11,	6.52,	38, 272.5,	962.5,	0.0,	549.8,
	55.48,	33.98,	6.40,	38, 271.7,	962.5,	0.0,	549.8,
CAL WCM411	54.93,	33.84,	5.05,	38, 271.0,	962.5,	0.0,	549.8,
	54.40,	33.55,	4.78,	38, 267.0,	962.4,	0.0,	549.8,
	53.62,	33.32,	4.72,	38, 267.0,	962.4,	0.0,	549.8
	53.23,	32.98,	4.51,	38, 266.9,	962.4,	0.0,	549.8.
	52.92,	32.60,	4.51,	38, 271.4,	962.3,	0.0,	549.7
	52.56,	32.26,	4.78,	38, 269.5,	962.5,	0.0,	549.8
							· •
Data Felder	C-VIPUNET/W	MSENSOR2	data				
Data Folder			0000				.::



Note! Noise limit setting is not a mandatory setting, but can be used to control moisture measurement output signal being on or off.



Setting parameters to the probe

When using mA signal, "median", "Noise limit" and "Min signal" parameters must be set to the probe <u>manually</u> to match the ones that are used in VipuNET. When calibrating the probe, these parameters are not set when pressing "Cal" button.



Note! Before making any settings on the probe do them and test them first at VipuNET

Probe settings are done in command mode. Command mode is initiated from the settings page, by:

- click data stream
- press "Esc" button (display turns to green) and
- immediately type "open"
- press "Enter" from keyboard.

Note that you need to be fast while doing this, since there is only limited time when commands are accepted. The display should look as shown below. When connection to the probe is opened, the display shows "OPENED". Note that connection will close shortly if no commands are given. To re-open the connection, repeat the same steps as described above.

VipuTerm - a serial port terminal				VipuTerm - a serial port terminal				
Disconnect Comm Port Baud Rate	50.65, 31.59, 50.89, 31.79, 50.97, 31.85,	4.17, 4.11, 4.11,	36, 285.2, 979. * 36, 285.8, 979. 36, 295.0, 979.	Disconnect Comm Port Baud Rate	52.59, 52.07, 52.26,	32.70, 32.43, 32.53,	4.33, 4.26, 4.27,	36, 281.4, 979. A 36, 282.4, 979. 36, 289.1, 979.
Measurement parameters Median Noise limit	50.93, 31.83, 50.97, 31.54, 50.95, 31.67, 51.06, 31.68,	4.09, 4.09, 4.34, 4.44,	36, 283.8, 979. 36, 289.9, 979. 36, 292.9, 979. 36, 285.9, 979.	Measurement parameters Median Noise limit	52.27, 52.05, 52.39, 52.14,	32.45, 32.37, 32.36, 32.16,	4.27, 4.31, 4.40, 4.65,	36, 290.6, 979. 36, 287.3, 979. 36, 290.5, 979. 36, 286.0, 979.
4 0.00 ⊕ 0.07 Min signal Max signal 40 2001	51.10, 31.48, 51.57, 31.51, 51.48, 31.53, 51.16, 31.48,	4.44, 4.78, 5.06, 5.06,	36, 294.7, 979. 36, 290.3, 979. 36, 284.5, 979. 36, 287.6, 979.	4 0.00 0.14 Min signal Max signal 40 2001	51.99, 52.10, 51.97, 52.08,	32.09, 32.36, 32.10, 32.13,	4.69, 4.69, 4.66, 4.66,	36, 296.8, 979. 36, 295.0, 979. 36, 292.9, 979. 36, 296.0, 979. 36, 296.0, 979.
Material 8-16 # Scaling factor Offset 1.000 0.000	51.55, 31.61, 51.73, 31.93, 51.89, 31.92, 51.80, 31.88, 52.14, 32.02,	4.91, 4.84, 4.84, 4.81, 4.84,	36, 285.2, 979. 36, 284.9, 979. 36, 289.8, 979. 36, 288.3, 979. 36, 295.2, 979. ■	Material 8-16 v # Scaling factor Offset 1.000 0.000	51.79, 51.71, 51.25, 50.75,	31.99, 32.22, 31.91, 31.49,	4.66, 4.64, 4.26, 4.26,	36, 283.9, 979. 36, 293.9, 979. 36, 296.4, 979. 36, 294.4, 979.
CAL WCM411 Data Folder	C:\VIPUNET\WCMSENSOR	2\data		CAL WCM411 Data Folder	C:\VIPUNET\W	CMSENSOR2\d	ata	, il

🖄 VipuTerm - a	serial port termina	r		1. A. 196					- 0	×
Disconne Comm Pot Cold Medasuremen Medan 4 4 60 8:16 Scaling factor 1.000 CAL:	Act Baud Flate 3840 3840 w nt parameters Noise Int 000 0 0 0 0 0 0 0 0 0 0 0	51.76, 51.89, 51.56, 51.45, 51.45, 51.45, 51.45, 51.45, 51.45, 51.45, 51.26, 50.27, 50.27, 50.27, \$0.27, \$0.27, \$0.28, ↓	31.85, 31.74, 31.52, 31.67, 31.25, 31.09, 31.09, 31.09, 30.71,	4.83, 4.83, 5.12, 5.12, 4.82, 4.77, 4.77, 4.77, 5.06,	37, 37, 37, 37, 37, 37, 37, 37, 37, 37,	266.9, 269.9, 268.8, 270.6, 264.3, 267.0, 268.8, 269.2, 269.2, 269.2, 269.2, 269.2, 269.2, 269.2, 269.3, 270.8,	968.5, 968.5, 968.5, 968.4, 968.4, 968.4, 968.4, 968.4, 968.3, 968.3,	0.0, 0.0, 0.0, 0.0, 0.0, 0.0, 0.0, 0.0,	554.5, 554.6, 554.6, 554.6, 554.6, 554.6, 554.6, 554.6, 554.6,	
Data	Folder	C:\VIPUNET\W	CMSENSOR2\c	iata						



Before setting new values, you should check what are the current values set to the probe. To do that, *type: conf*

Press "Enter"

List of the current configuration opens. The parameters that need to be changed to match the parameters in VipuNET are as follows:

Median value setting = parameter # 20, Median Len Min signal = parameter #21, Signal Min Noise Limit = parameter # 23, Noise Min

VipuTerm - a serial port termina		
Disconnect	conf	~
Comm Port Baud Rate	1 coef_A 1.480	
COM4 ~ 38400 ~	3 filter_len 3.000	
Measurement parameters	4 coef_S0 0.300 5 coef_S1 0.000	
Median Noise limit	6 coef_S2 97.009	
4	7 coef_D 0.000 8 coef_S1DAC 161.580	
40 2001	9 coef_SODAC 662.983	
Material	11 data count 100.000	
8-16 The second	12 STISELLI 0.000 13 I laser 1000.00	
1.000 0.000	14 dirt sc 0.000 15 V1 clean 0.000	
CAL WCM411	16 V2 clean 0.000	
CAL WORKIN	17 T Clean 0.000 18 TS SC1 1.300	
	19 TS SC0 0.000 20 Median Len 4.000	
	21 Signal Min 0.000	=
	22 Signal Max 1000.00 23 Noise Min 0.000	
	<u>.</u>	
Data Folder	C:\VIPUNET\WCMSENSOR2\data	.:

Example of changing "Median setting" parameter # 20 value from current 4 to new 10: Type: conf 20 10

Press "Enter"

VipuTerm - a serial port terminal			VipuTerm - a serial port terminal	
Disconnect	1 coef_A 1.480		Disconnect	1 conf 3 1 480
Comm Port Baud Rate	3 filter len 3.000		Comm Port Baud Rate	2 coef B 0.000
COM4 - 38400 -	4 coef_50 0.300		COM4 * 38400 *	3 filter_len 3.000
	5 coef_S1 0.000			4 coef_S0 0.300
Measurement parameters	6 coef_S2 97.009		Measurement parameters	5 coef_S1 0.000
Median Noise limit	7 coef_D 0.000		Median Noise limit	6 coef_S2 97.009
4 💠 0.00 💠 0.06	8 coet_SIDAC 161.580		4 🗢 0.00 🗢 0.09	/ coef_D 0.000
Min signal Max signal	9 COEL_SUDAC 662.983		Min signal Max signal	0 COEL_SIDAC 161.500
40 2001	11 data count 100.000		40 2001	10 samp count 30.000
	12 offset L1 0.000		Matarial	11 data count 100.000
Material	13 I laser 1000.00			12 offset L1 0.000
8-16 • #	14 dirt sc 0.000		Seeles fastes Offert	13 I laser 1000.00
Scaling factor Offset	15 V1 clean 0.000		1 000 0 000	14 dirt sc 0.000
1.000 0.000	16 V2 clean 0.000	'	1.000 0.000	15 V1 clean 0.000
	17 T clean 0.000		CAL WCMAIL	16 V2 clean 0.000
UCAL WCM411	18 TS SC1 1.300		CAL WOMAIT	1/ T clean 0.000
\sim	19 TS SC0 0.000			10 15 501 1.300
	20 Median Ben 4.000			20 Median Len 10,000
	22 Signal Max 1000.00			21 Signal Min 0.000
	20 NOTE NOT 0,000			22 Signal Max 1000.00
	>conf 20 10			23 Noise Min 0.000
Data Folder	C:\VIPUNET\WCMSENSOR2\data		Data Estidas	C////DLINET/W/CMSENSOR2/ data
			Data Folder	C:\VIPUNET\WCM5ENSOK2\data

Command mode closes automatically or it can be closed by typing: close



Language settings

Language is changed in configuration settings file: C:\VipuNET\VipuNET.ini

🧾 VipuNET - Notepad	_	×	(
<u>F</u> ile <u>E</u> dit F <u>o</u> rmat <u>V</u> iew <u>H</u> elp			
<pre>[Lang] Lang=1 [Paths] LogPath=C:\VipuNET\data [Settings] Median=4 [Materials] Material=1 Material 1=; 1.0 ;0.0</pre>			< >
<		≥	

Language can be selected by changing *Lang* variable. The following language options are available.

Language	[Lang]
Windows language	Lang=-1
Finnish	Lang=0
English	Lang=1
Swedish	Lang=2
German	Lang=3
Russian	Lang=4
French	Lang=5



Calibration procedure

Each probe has been pre-set in the factory. However, each probe must be calibrated for the aggregate that it is intended to be used for. The calibration of the probes is as follows:

- 1. Check that the probe is mounted as described above
- 2. Use the VipuNET software for calibration
 - a. If not open, Start VipuNET(s) and check that probe(s) is measuring. New data lines are shown in settings page and moisture curve is drawn in start page.



Note! There must be one VipuNET open for each separate probe.

- b. take 1-3 shovels of aggregate and close them tightly into a bucket and mix well manually
- c. If you have set your Min signal setting correctly you can first take physical samples and after that you can press "sample" button to take corresponding sample to VipuNET. When Min signal setting is correct VipuNET measures only when aggregate flows.



Note! When using Min signal setting method to calibrate, make sure that measurements shown in VipuNET are the ones that you have taken the physical samples.

If you are not sure or Min signal setting is not set correctly, you need to press the "Sample" button on VipuNET main page window at the same time when taking the last physical sample.



d. The system verifies that you are actually taking a sample. Press "Yes" and give name to the sample.

Sample	
	Comment
Did You just take a sample? (8-16)	Comment the sample, please (8-16) OK Cancel
Yes No	Sample 5 per cent 8-16

Repeat this at least two times so that your samples have minimum of 2% moisture difference.



e. do your burn-off and record the results on VipuNET. To register your results, open Calibration table. Press "CAL" button on settings page.

VipuTerm - a serial port terminal					x
Disconnect Comm Port Baud Rate COM4	33.93, 33.93, 33.93, 33.90, 33.94, 33.94, 33.94, 33.94, 33.94, 33.97, 33.93, 33.93, 33.93, 33.94, 33.94, 33.94, 33.94, 33.94, 33.95, 33.96,	20.83, 20.83, 20.83, 20.82, 20.84, 20.80, 20.80, 20.80, 20.80, 20.81, 20.81, 20.84, 20.84, 20.84, 20.84, 20.83, 20.83, 20.83, 20.83, 20.83, 20.85, 20.85,	4.95, 4.95, 4.95, 4.96, 4.96, 4.96, 4.96, 4.96, 4.96, 4.96, 4.98, 4.98, 4.97, 4.97, 4.97, 4.97, 4.97, 4.97, 4.95, 4.95, 4.95, 4.95, 4.93,	38, 254.3, 973.9, 38, 254.3, 973.9, 37, 255.2, 973.9, 37, 254.3, 973.8, 38, 254.0, 973.8, 38, 254.9, 973.8, 38, 254.9, 973.8, 38, 254.5, 973.8, 38, 254.5, 973.8, 38, 254.2, 973.7, 38, 254.2, 973.7, 38, 255.2, 973.8, 38, 255.2, 973.8, 38, 255.4, 973.8, 38, 255.4, 973.8, 38, 255.2, 973.8, 38, 255.3, 973.8, 38, 255.3, 973.8, 38, 255.3, 973.8, 38, 255.2, 973.8, 38, 254.2, 973.8, 39, 255.1, 973.8, 37, 255.1, 973.8,	
Data Folder	C:\VIPUNET\W	CMSENSOR2\	data		

f. Place your calibration data on the correct line to "Lab%" column. In the end you should have nice linear curve and "Relevancy, R2" reading as close to 1 as possible. The system shows relevancy in red if it is not accurate enough. You can untick unwanted results to make the curve more accurate. Press "Save data" when you are satisfied with curve. "Save data" button disappears when there is no new data and appears again when new calibration samples are taken.

	Material	Date	Time	WCM %	Lah %	Comment		Material	Date	Time	WCM %	Lab %	Comment
	1 9.1C	2017-07-17	12-57-27	2.97	42	Sample 4 per cent 9.		8.16	2017-07-17	12:57:37	3.97	42	Sample 4 per cent
	8.16	2017-07-17	12:58:25	6.89	71	Sample 7% 8-16		8-16	2017-07-17	12:58:25	6.89	71	Sample 7% 8-16
	8-16	2017-07-17	13:00:20	6.04	6	Sample 6 per cent 8-		8-16	2017-07-17	13:00:20	6.04	6	Sample 6 per cer
	8-16	2017-07-17	13:02:31	5.75	5	Sample 5,5 per cent {		8-16	2017-07-17	13:02:31	5.75	5	Sample 5,5 per o
Save data test scaling factors: alibration result : S2	100.000 100.00 Relevan	n 0.00 S0 -0.09 cy, R2 0.87	WCH %	9 8 7 6 5 4 3 2	moisture	line fit	Latest scaling factors: Calibration result : S2	 100.000 97.009 Relevant Calib S2.97.0 	0.00 S0 0.30 cy, R2 0.99	WCM %	9 8 7 6 5 4 3	moisture	line fit

g. once you have the points that are at least 2% apart on the line and it looks good to you, you can press calibrate WCM, which then sends the data into the probe. Once the probe has been calibrated, calibration values are shown at the bottom of the calibration window.



Note! You should first see a nice linear curve on VipuNET and then press calibrate WCM. If one or more points are off chart (i.e. something went wrong in burn-off), you can simply untick that line and it will be removed from the curve and thus not effect the calibration of the probe

h. Once you are happy with what you see as moisture reading on VipuNET, you can connect it to your control system. You can still keep the VipuNET open to double check the values. You can also update the values at any point by using the same method as shown above.



Note! The Polarmoist reading is a surface moisture or total moisture reading and typically in your batch plant control system you would input an absorbed moisture value per aggregate, which the system then deducts from the total moisture value. This must be kept in mind when comparing these two.

How to do the burn-off

First weigh the sample. This is the Start weight. Be extra careful that all the aggregate stays in weighing loop. Use for example a clean new paintbrush to remove all the aggregate from the mixing shovel. Dry the sample totally dry in microwave or other oven. Mix the sample to make sure that it stays homogeneous. Repeat drying and weigh until the weight is not changing. This is the End weight. Note also that some scales are sensitive to high temperatures. Use insulation between the sample and the scale. The moisture percent is calculated with the following formula.

 $Moisture \% = \frac{Start \ weight \ (wet) - End \ weight \ (dry)}{End \ weight \ (dry)}$

Repeat the described steps with two to three samples per moisture percent. Calculate the average value of these samples and use that as a moisture percent value in VipuNET.

 $Average\ moisture\ \% = \frac{Sample\ 1\ \% + Sample\ 2\ \% + \cdots + Sample\ n\ \%}{Number\ of\ samples\ (n)}$



Note! Weight of the container used must not be part of the calculations. Scale must be set to zero with the container.



Troubleshooting

Error code	Fault	Possible reason	Action
Err1	No output data from	No / Loose connections of the	Ensure that all the
	probe	power supply	connections are
	or		connected and wires are
	data flow too slow		connected as per
			instructions
		No / Loose probe signal cabling	Ensure that all the
		from probe to the connection boxes	connections are
			connected and wires are
			connected as per
			instructions.
		COM and Baud rate settings are not	Check settings, see
		correct	chapter: Basic set-up
		USB ports are not connected	Check in the Windows
			Devices & Printers that
			there are USB ports for
			each probe available.
		VipuNET is not working properly	Re-start VipuNET
		Too much light for the probe to	The reading in the 5th
		measure right	column on the message
			line must be well under
			2000 at the time of
			batching aggregate.
			Higher readings saturate
			the probe. Provide
			shade around the probe
			measurement cone to
			avoid sunlight disturbing
			measurement
		Too long intermediate cabling	Length of the cabling
			shall not exceed 50 m.
			To check functionality,
			check all the
			connections first. After
			that, connect probe
			directly to PC to verify
			probe functionality.
		Faulty probe	First, connect probe
			directly to computer to
			check functionality.
			Contact supplier
	Output with	The baud rate is different in	Reset the baud rate
	improper characters	VipuNET software and the probe	setting



Moisture value -200	Probe is measuring but the median amount of samples is less than median value setting	Wait for a while so that the amount of samples is more than median.
Improper moisture values like -1000	Calibration points are too close to each other.	Redo calibration with minimum of 2 % moisture difference. See chapter: Calibration procedure.
	VipuNET is writing data from different probes to one file.	Create separate folders for each additional probe. If you have 4 probes, create 3 files starting with initials WCM. See chapter: Multiple probe assembly.



Drawings for stand alone assembly









υI ⊃ ¥ ш ш Т ω C \geq ۵ ۲ S Z 0 37 **NRO** 20 21 22 23 24 25 26 27 28 29 30 31 32 33 34 35 36 MORK ОМ ELEC POSITION \times ELEC DRAW 1 PAGE 1/2 OTALITY COMPUTER VIPUNET SOFTWARE J /27.4.2017 CONTROLLER READY CABLE Approved 8 OTIS MP8 MOISTURE MEASUREMENT 84M W EXTRA JUNCTION BOX FOR PROBES 5...X READY CABLE CALIBRATION BUS 2 OTIS MP PROBES 5-8 POLARMOIST OPTICAL MOISTURE MEASUREMENT SYSTEM MOISTURE MEASUREMENT ZdW M USB READY CABLE 9 07IS MP6 NOISTURE MEASUREMENT M Wb9 BOX X MOI 1 JUNCTION 1 READY CABLE MP5 s otis SAM W MOISTURE MEASUREMENT READY CABLE TWISTED PAIR (8x2xAWG20) t ons MP4 MOISTURE MEASUREMENT 19 ≯dW M DIAGRAM CONVERTER 18 READY CABLE ε ohis MP3 CABLE 17 RS232/USB 1-4 MOISTURE MEASUREMENT M Mb2 HUB PROBES USB 11 12 13 14 15 16 -LiYCY (TP) 8x2x0.5 READY CABLE z onis POWER SUPPLY +24VDC MP2 CABLE EXAMPLE polarmatic M WbS TNEMERUSAEM ENTRIN BOX B&M_PLANT CONTROL SYSTEM X MOI 1 JUNCTION 1 PLC ANALOG NPUT READY CABLE L OTIS ЧЫ SILO LIOW X M LdW M TNEMERUSAEM ENTRINM =CONTROL ROOM =AGGREGATE =FIELD m \Box ш Ω Ŷ S 4 c Т ш \leq C BEA - BEA way without Polarmatics prior written consent. nometron. No part of this material may be copied, reproduced, republished, or distributed in any E BEA B BEA Copyright 1982 Polarmatic Oy. All rights reserved. This material is Polarmatics confidential Ο ΒΕΛ A REV

Drawings for electrical cabinet assembly



