

WCM411 Calibration

September 2016



Basics

- every WCM411 sensor must be calibrated for one material
- calibration values for the material are stored in the sensor parameters
 - Vipunet software can calibrate many materials, but the sensor contains only parameters for one material

Calibration parameters: 4 & 6

- "Esc" Press "Esc"-button
- open Write "open" and press "Enter"
- >*conf* listing of all sensor parameters

1 coef_A: Scaling factor of the second signal

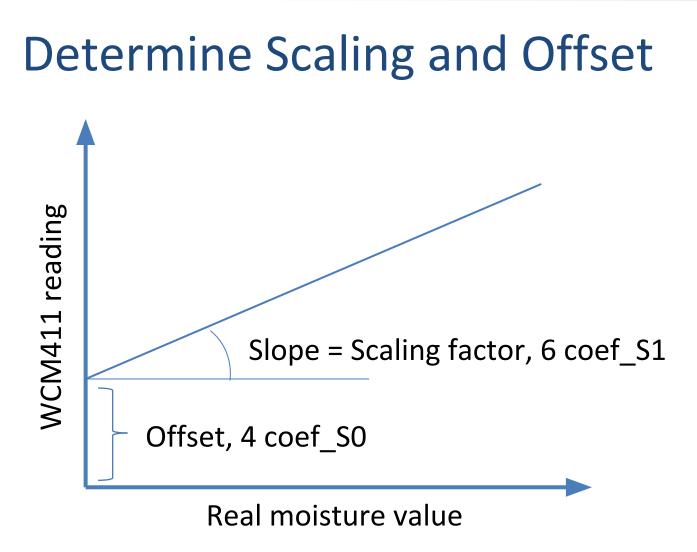
2 coef_B: Offset of the second signal

3 filter_len: Determines the sensor response time

- 4 coef_S0: Offset of moisture, look at Calibration
- 5 coef_S1: Not in use
- 6 coef_S2: Scaling of moisture, look at *Calibration*

••• •••







Changing parameter values

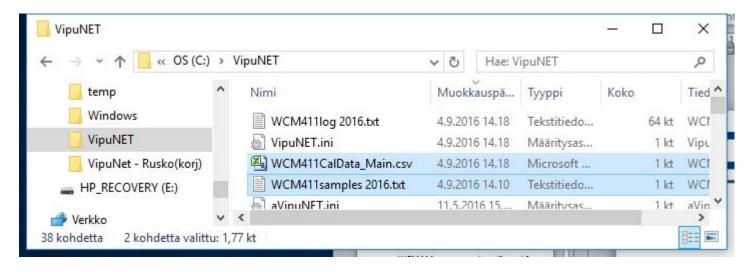
• Manually (not recommended)

"Esc"	Press "Esc"-button
open	Write "open" and press "Enter"
>conf	listing of all sensor parameters
>conf 4	-1.0 changes offset to -1.0 (% of moisture

By Vipunet calibration support
 – recommended

Vipunet

- Windows PC application, directory C:\Vipunet
- For a fresh start of calibration rename or save to another location the highlighted old calibration files:



Differences in Samples files

WCM411samples 2016.txt – Muistio	<u>17</u>		Ű.	×
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016-09-03;13:39:10; WCM411; 100.000;0.000; Main; user;1.000;0.000; moisture; 3.34;3.34;3.34;3.27;3.26;3.26;3.26;3.26;3.27;3.27; comme	nt; !	Sample	1	1
016-09-03;13:43:37; WCM411; 100.000;0.000; Main; user;1.000;0.000; moisture; 3.76;3.76;3.76;3.76;3.63;3.76;3.90;3.76;3.75;3.75; comme	nt; 1	Sample	2	
016-09-03;13:55:12; WCM411; 100.000;0.000; Main; user;1.000;0.000; moisture; 5.63;5.57;5.57;5.57;5.44;5.44;5.44;5.44;5.44	nt;	Sample	3	
016-09-03;14:08:36; WCM411; 100.000;0.000; Main; user;1.000;0.000; moisture; 6.87;6.87;6.87;6.87;6.87;6.87;6.87	nt;	Sample	4	
016-09-03;14:21:51; WCM411; 100.000;0.000; Main; user;1.000;0.000; moisture; 7.66;7.80;7.76;7.66;7.42;7.66;7.71;7.71;7.71; comme	nt;	Sample	5	
016-09-03;14:42:45; WCM411; 100.000;0.000; Main; user;1.000;0.000; moisture; 6.45;6.74;6.99;6.99;6.99;6.99;6.74;7.02;7.02;7.02; comme	nt;	Sample	6	
	82	80		
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1	A	В	С	D	E	F	G	Н	1	J	K	L	M	N	0	Р	Q	R	S	т	U	V	W	X	
1	3.9.2016	13:39:10	WCM411	100	0	Main	user	1	0	moisture	3.34	3.34	3.34	3.27	3.26	3.26	3.26	3.26	3.27	3.27	comment	Sample	3	3.29	1
2	3.9.2016	13:43:37	WCM411	100	0	Main	user	1	0	moisture	3.76	3.76	3.76	3.76	3.63	3.76	3.9	3.76	3.75	3.75	comment	Sample	4	3.76	
3	3.9.2016	13:55:12	WCM411	100	0	Main	user	1	0	moisture	5.63	5.57	5.57	5.57	5.44	5.44	5.44	5.44	5.44	5.44	comment	Sample	5	5.5	
4	3.9.2016	14:08:36	WCM411	100	0	Main	user	1	0	moisture	6.87	6.87	6.87	6.87	6.87	6.87	6.3	6.3	5.77	6.3	comment	Sample	6	6.59	1
5	3.9.2016	14:21:51	WCM411	100	0	Main	user	1	0	moisture	7.66	7.8	7.76	7.76	7.66	7.42	7.66	7.71	7.71	7.71	comment	Sample	8	7.68	,
6	3.9.2016	14:42:45	WCM411	100	0	Main	user	1	0	moisture	6.45	6.74	6.99	6.99	6.99	6.99	6.74	7.02	7.02	7.02	comment	Sample	7	6.89	1
7																									
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9				L																					
02,41	E MCM	411CalData	Main /												1					100					•

VipuNET.ini

- Check Vipunet.ini
 - If you find lines like:
 - [WCM Scales]
 - = 56.20, -0.53
 - remove them, save the file and restart Vipunet
 - this avoids confusion about current calibration values

<u>Tiedosto Muokkaa Muotoile Näytä Ohje</u> [Lang] Lang=1 [Paths] LogPath=C:\VipuNET\data [Settings] Median=7 Low Signal=1 Noise limit=0 [Materials] Material=1 Material 4=Sand; 1; -1 Material 2=IA; 1; 3 Material 3=coarse; 1; 1 Material 1=Main; 1.0 ;0.0 [Port] Port=COM4 BaudRate=38400 [WCM Scales] = 100.00, 0.00	VipuN	IET.ini – Mu	istio -	- C	_ >	×
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Calibration

Three different procedures:

- 1. Calibrate in the lab
 - measure two samples, e.g. about 2 and 5 % by Vipunet Sample button, then CAL -button and finally Calibrate WCM –button
 - check offset at final sensor location
- 2. Calibrate during production
 - this procedure may take long time
- 3. Use table values for Scale (6 coef_S1)
 - determine offset (4 coef_S0) at final sensor location

Vipunet Sample Button

- When pressing Sample button, be sure that the reading, in this case 3.85, corresponds to your bake out sample
 - Hint: adjust "Min signal" to cause graphing to stop, while silo door is closed.
 - Setting "Noise limit" may do the same, when measuring over a belt feeder.

Sample	Main	Moisture (%)	3.85
•			
- Moistu	re — Measured	- Signal 1 - Signal 2	- Material
95 +			
90			
85	-		
80		a a a a	
75			
70			
65			
60		x	
55			
50			
45			
40		x	
35			
30			
25			
20			
15			
10			
5			
0			
-2	-1.8 -1.6 -1	.4 -1.2 -1 -0.8	-0.6 -0.4 -0.2

Vipunet Settings Window

- "Min signal" 50 is used here to set on recording, while silo door is open.
- Observe CAL button!
- WCM411 installs a new firmware.
- for other details consult the User's Guide

Disconnect	18,64.	13.46,	13.04,	33.	181.8.	776.9 ^
		13.45,			100 100 100 100 T	
Comm Port Baud Rate	100	13.48,	315.545 AL5555	Secon	1100.00	
COM4 ~ 38400 ~	2000	13.45,	100 million (100 m		Sector and the sector	
	18.68,	13.47,	2.0	2.5	2.5	
Measurement parameters	18.65,	13.45,	13.11,	33,	182.7,	776.9
Median Noise limit	18.65,	13.46,	13.09,	33,	182.8,	776.9
7 0.00 0.70	18.66,	13.48,	13.05,	33,	183.6,	776.9
Min signal Max signal	18.68,	13.50,	13.02,	33,	183.2,	776.8
	18.67,	13.49,	13.03,	33,	183.8,	776.8
50 2001	18.69,	13.49,	13.09,	33,	184.7,	776.9
Material	18.66,	13.47,	13.08,	33,	184.9,	777.0
Main V #	28.53,	23.63,	6.27,	33,	117.8,	777.0
	99.10,	85.33,	4.33,	33,	118.0,	777.0
Scaling factor Offset	100.66,	87.36,	3.94,	33,	118.1,	776.8
1.000 0.000	100.41,	86.33,	4.40,	33,	116.3,	776.9
	105.04,	89.43,	4.89,	33,	116.3,	777.0
CAL WCM411	104.52,	88.98,	4.90,	33,	116.3,	777.1
	103.74,	88.35,	4.88,	33,	116.5,	777.0
	100.74,	85.88,	4.83,	33,	123.8,	776.9
	20.55,	15.53,	10.84,	33,	185.3,	776.8
	18.66,	13.47,	13.08,	33,	185.1,	776.8
	18.68,	13.48,	13.08,	33,	185.1,	776.8

Vipunet CAL Window

- Six samples of material "Main" with bake out (Lab %) values
- Calibration values in the sensor are 100.000 and 0.00, calibration result is:
 - 99.241 for 6 coef_S1 and
 - 0.34 for 4 coef_S0
- To calibrate press
 "Calibrate WCM" button

	Material	Date	Time	WCM %	Lab. %	Comment
	Main	2016-09-03	13:39:10	3.29	3.5	Sample 1
	Main	2016-09-03	13:43:37	3.76	4.3	Sample 2
	Main	2016-09-03	13:55:12	5.5	5.8	Sample 3
	Main	2016-09-03	14:08:36	6.59	6.4	Sample 4
	Main	2016-09-03	14:21:51	7.68	8.2	Sample 5
	Main	2016-09-03	14:42:45	6.89	7.3	Sample 6
Save data	<					
atest scaling factors: Calibration result : S2	99.241		8	/0 8 	noisture	line fit

Check your numbers!

• Prior to calibration check the samples file, that there are no accidental bad readings, which can change the average value of the sample.

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	WCM411CalDat	ta_Main.csv																						- 0	٤
Å	A	В	С	D	E	F	G	Н	1	J	K	L	M	N	0	P	Q	R	S	Т	U	V	W	X	
L	3.9.2016	13:39:10	WCM411	100	0	Main	user	1	0	moisture	3.34	3.34	3.34	3.27	3.26	3.26	3.26	3.26	3.27	3.27	comment	Sample	3	3.29	
2	3.9.2016	13:43:37	WCM411	100	0	Main	user	1	0	moisture	3.76	3.76	3.76	3.76	3.63	3.76	3.9	3.76	3.75	3.75	comment	Sample	4	3.76	
	3.9.2016	13:55:12	WCM411	100	0	Main	user	1	0	moisture	5.63	5.57	5.57	5.57	5.44	5.44	5.44	5.44	5.44	5.44	comment	Sample	5	5.5	
Ŗ	3.9.2016	14:08:36	WCM411	100	0	Main	user	1	0	moisture	6.87	6.87	6.87	6.87	6.87	6.87	6.3	6.3	5.77	6.3	comment	Sample	6	6.59	
5	3.9.2016	14:21:51	WCM411	100	0	Main	user	1	0	moisture	7.66	7.8	7.76	7.76	7.66	7.42	7.66	7.71	7.71	7.71	comment	Sample	8	7.68	
;	3.9.2016	14:42:45	WCM411	100	0	Main	user	1	0	moisture	6.45	6.74	6.99	6.99	6.99	6.99	6.74	7.02	7.02	7.02	comment	Sample	7	6.89	
1																									
3																									
0				L																					
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Table values for scaling factor S1

Aggregate	S1 (Scaling)	Comment
Fine (Filler)	100	0-2 mm
Intermediate	50	0-8 mm
Coarse	25	8-16 mm
Very coarse	12.5	16-32 mm

- Use these scaling factors, if you cannot calibrate initially and check only the offset with one sample.
- When getting more samples, continue calibration.



Bake Out Samples

- Take sample aggregate from different parts of a batch measured by WCM411, mix them thoroughly and determine moisture by bake out.
- Use a microwave oven with low power not to overheat aggregate
 - No need to exceed water boiling point!

Water Absorption of Coarse Aggregates

http://www.engineeringcivil.com/water-absorption-of-aggregates.html

WATER ABSORPTION

This test helps to determine the water absorption of coarse aggregates as per IS: 2386 (Part III) – 1963. For this test a sample not less than 2000g should be used. The apparatus used for this test are :-

Wire basket – perforated, electroplated or plastic coated with wire hangers for suspending it from the balance, Water-tight container for suspending the basket, Dry soft absorbent cloth – 75cm x 45cm (2 nos.), Shallow tray of minimum 650 sq.cm area, Air-tight container of a capacity similar to the basket and Oven.

Procedure to determine water absorption of Aggregates.

i) The sample should be thoroughly washed to remove finer particles and dust, drained and then placed in the wire basket and immersed in distilled water at a temperature between 22 and 32°C.

ii) After immersion, the entrapped air should be removed by lifting the basket and allowing it to drop 25 times in 25 seconds. The basket and sample should remain immersed for a period of $24 + \frac{1}{2}$ hrs afterwards.

iii) The basket and aggregates should then be removed from the water, allowed to drain for a few minutes, after which the aggregates should be gently emptied from the basket on to one of the dry clothes and gently surface-dried with the clothe, transferring it to a second dry cloth when the first would remove no further moisture. The aggregates should be spread on the second cloth and exposed to the atmosphere away from direct sunlight till it appears to be completely surface-dry. The aggregates should be weighed (Weight 'A').

iv) The aggregates should then be placed in an oven at a temperature of 100 to 110°C for 24hrs. It should then be removed from the oven, cooled and weighed (Weight 'B').

Formula used is Water absorption = $[(A - B)/B] \times 100\%$.

Two such tests should be done and the individual and mean results should be reported. A sample proforma for the record of the test is

S.No.	Determination No.	1	U	Ш
1	Weight of saturated surface-dried sample in g (A)	2409	2380	2491
2	Weight of oven-dried sample in g (B)	2404	2375	2486
3	Water absorption = $\frac{A - B}{B} \times 100\%$	$\frac{5}{2404} \times 100 = 0.208\%$	5 2375 × 100 = 0.210%	$\frac{5}{2486} \times 100 = 0.201\%$
	Average value	di	0.206% www.eng	ineeringcivil.com

WATER ABSORPTION OF COARSE AGGREGATES

Note: The figures given in the above table are for illustration purpose only.

Taking Laboratory Samples

- Put your sample on a rotating plate, use Sample button
 - avoid surface drying, be fast
 - thick enough layer of sample aggregate not to see though
 - first sample near 2 % moisture level
 - second sample near 5 %
 - determine the slope, i.e. scaling factor by Vipunet
- Final offset check with a production sample!

