## How to check an electricity meter using the Calmet C300B Calibrator



This Application manual describes the step-by-step method of electricity meter checking. The Calmet C300B Calibrator and the *Test System* function of the Calpro C300 software allows us to perform the following checks:

- error check,
- counting check,
- counter test.

The system for one-phase electricity meter testing consists of the following hardware:

- the C300B calibrator
- the photo head,
- the single position rack,
- wires,
- a PC or laptop.

We can see an example of such a system in Fig.1



Fig.1. The system for one-phase electricity meter checking

To build the test system perform the following steps:

- connect the U input of the electricity meter to the U1 voltage output of the C300B calibrator,
- connect the I input of the electricity meter to the I1 current output of the C300B calibrator,
- connect the photo head to the input of the C300B calibrator, marked as  $\square$  ,
- connect the computer to the RS232 input of the C300B calibrator,

The complete system is presented in Fig.2



Fig.2. An overview of the connections in the system for one-phase electricity meter checking

To check if the system works correctly, perform the following test:

- run the Calpro C300 software described in Calpro300 Basic user manual,
- set up the connection between the C300B Calibrator and the computer as described in *Calpro300 Basic* user manual,
- set up the nominal value for the electricity meter current and voltage and press the *Operate* button as in Fig.3,

til Calpro 300				_ @ X
File Yeni Options Help				
「日間間の同い	(A T			_
U Q 230 000 V 2000 I 1 Q 10.000 A 200 I 9 0.00	D         D2         D2         D1         D1 <thd1< th="">         D1         D1         D1<!--</td--><td>Standag</td><td>1</td><td>3+0+</td></thd1<>	Standag	1	3+0+
< u12 120,00 ° < u13 120,00 °	Ω 1.123 f 50,000 m 0 mm Δ 3 PHASE 4 WIRE	Operate		NT NO
Cather	Image: Control of the second secon		14	- 990
· · · · · · · · · · · · · · · · · · ·		Calpre 300 v. 1. 0. 20	SPN Connected: COH11, Fermiore: v.3.6.1.7	-

Fig.3 Main window of Calpro 300 PC Soft

- if the voltage and current circuits have been connected correctly, the disc of the electricity meter will rotate,
- press the button on the photo head to switch it on, see fig.2,
- if the photo head is set up correctly, the red LED (see fig. 2) will blink according to the rotating black spot on the electricity meter's disc. Otherwise, reposition the photo head until the red LED begins blinking,
- the system for electricity meter testing is ready to work.

To begin the electricity meter checking process, enter the basic information about the device and prepare the testing procedure. To do so, open the folders *Type* and *Procedure*, which are located in the folder *Electricity Meter* in the *Functional field* (see Fig. 4).



Fig.4. View of the Function field

Fig. 5 illustrates how to set the "Type" of electricity meter - enter information about the input parameters, accuracy class, meter constant, and the type of connection into the relevant fields.

Electricity meter name					
W626U 10(60)A			-		🔜 <u>*</u> %
Nominal parameters Ub - Base voltage 230.0 V 10	▼ A	- Imax - Max current	▼ A	f - Frequency -	▼ Hz
Class of accuracy	• %	Meter constant	_	⊙ pulse / kWh	C Wh / pulse
Reset time	Transformer				
Meter connection	Г ст Г үт	I'	A / V /	I"   U"	▼ A ▼ V
Comment					
					<b>*</b>

Fig.5 View of the Type window

The next step is to define the "Procedure" of testing by setting points of input parameters which will be used to test the electricity meter. The example of setting for one point is presented in Fig.6. Rules on filling out the fields are described in *Calpro300 TS user manual* 

	W626U 10(60)	A							-	6		*					
est	point																
	Point name	100%Ib cos=0	5L (Error test)														
		100.0	~ [s		la le	тр	J v L	l all									
	01%061	100.0	% [5]	•	]%₀  ⊃		_ % /	All			2						
	I [%Ib]	100.0 💌	% 51	гв 💌	]% S	тв	· % 🔽	All	<b>f</b> 50	I.O 💌	Hz 🗆 S	ynch					
		0.5 💌		5 🔻		.5		All	പെ	23 💌	1						
	sin O										1	-					
	U12	120.0	<sup>0</sup> U31  -1	20.0 💌		Waveform	4										
est	type		Test m	ethod		T	est duration -		1	-Output cor	nstant						
÷	Frror test	G Me	@ Im	nulses	10		Cycles	3		Г. С.							
	Littor cosc	*S 18001	~	paisos	10												
~		C	C			- 10		-									
C	Counting	C Max	C Tin	ne	j	_ s (	Time [hh:	mm:ss] 00:	00:00	50 power	<u> </u>						
0	Counting Counter test	C Max		ne ror limit	2.0	s (	Time [hh:: Energy	mm:ss] 00:1	00:00	S0 power	pu	ılse/kWh					
0	Counting Counter test	C Max	C Tin	ne or limit	2.0	s ( •%	) Time [hh:1	mm:ss] 00:1	00:00	S0 power	pu	ilse/kWh					
0	Counting Counter test Point N	C Max	C Tin Err	ne ror limit U2 [%Ub]	2.0 U3 [%Ub]	s ( • %	Time [hh: Energy I2 [%Ib]	mm:ss] 00:1	φ1	S0 power C φ2	φ <b>3</b>	lse/k₩h					
0 0 10	Counting Counter test Point N No load 80%Un	C Max	C Tin Err U1 [%Ub] 80	ne ror limit U2 [%Ub] STB	2.0 U3 [%Ub] STB	s ( % ( 11 [%Ib] STB	Time [hh: Energy I2 [%Ib] STB	mm:ss] 00: [kWh] 13 [%Ib] STB	φ1 0.0°	50 power C Φ2 0.0 °	φ <b>3</b> 0.0 °	ilse/kWh ≹12 [ª 120,1					
C Jo 1 2	Counting Counter test Point N No load 80%Un No load 115%Ur	C Max Name (Counting)	C Tin Err U1 [%Ub] 80 115	ne for limit U2 [%Ub] STB STB	2.0 U3 [%Ub] STB STB	s ( % ( 11 [%Ib] STB STB	Time [hh: Energy I2 [%Ib] STB STB	mm:ss] 00: [kWh] [3 [%Ib] STB STB	φ1 0.0 ° 0.0 °	50 power C Φ2 0.0 ° 0.0 °	φ <b>3</b> 0.0 ° 0.0 °	lise/kWh					
C Jo 1 2 3	Counting Counter test Point N No load 80%Un No load 115%Ur Starting conditio	C Max Jame (Counting) n (Counting) on (Counting)	U1 [%Ub] 80 115 100.0	or limit U2 (%Ub) STB STB STB STB	2.0 2.0 3 [%Ub] 5TB 5TB 5TB 5TB	s ( % ( 11 [%Ib] STB STB 0.4	Time [hh: Energy I2 [%Ib] STB STB STB STB	mm:ss] 00:1 [kWh] [ 13 [%Ib] STB STB STB STB	φ1 0.0° 0.0° 0.0°	50 power C 0.0 ° 0.0 ° 0.0 °	<b>43</b> 0.0 ° 0.0 °	Ise/kWh					
C C lo 1 2 3 4	Counting Counter test Point N No load 80%Un No load 115%Ur Starting conditio Meter constant	C Max Jame (Counting) n (Counting) (Counter te	U1 [%Ub] 80 115 100.0 100.0	or limit U2 (%Ub) STB STB STB STB STB	2.0 2.0 5TB 5TB 5TB 5TB 5TB 5TB	s ( % ( 11 [%Ib] STB STB 0.4 600	Time [hh: Energy I2 [%Ib] STB STB STB STB STB	I3 [%Ib] STB STB STB STB STB STB	φ1 0.0° 0.0° 0.0° 0.0° 0.0°	50 power C 0.0 ° 0.0 ° 0.0 ° 0.0 °	φ3 0.0° 0.0° 0.0° 0.0°	lise/kWh \$12 [° 120,1 120,1 120,1 120,1					
0 1 2 3 4 5	Counting Counter test No load 80%Un No load 115%Ur Starting conditio Meter constant o Operate 60%Ut	C Max Jame (Counting) n (Counting) (Counter te o 10%Ib (Er	U1 [%Ub] 80 115 100.0 100.0 60	uz (%Ub) STB STB STB STB STB STB STB	2.0 2.0 STB STB STB STB STB STB STB	s ( • % ( 11 [%Ib] STB STB 0.4 600 10.0	Time [hh: Energy I2 [%Ib] STB STB STB STB STB STB	I3 [%Ib] I3 [%Ib] STB STB STB STB STB STB	φ1 0.0° 0.0° 0.0° 0.0° 0.0° 0.0°	50 power C 0.0 ° 0.0 ° 0.0 ° 0.0 ° 0.0 °	φ3 0.0° 0.0° 0.0° 0.0° 0.0°	Ise/kWh \$12 [ª 120,0 120,0 120,0 120,0 120,0					
C Jo 1 2 3 4 5 6	Counting Counter test Point N No load 80%Un No load 115%Uf Starting conditio Meter constant Operate 60%Ut 10%Ib cos=1 (E	C Max lame (Counting) in (Counting) (Counting) (Counter te in 10%Ib (Er Error test)	C Tin Err U1 [%Ub] 80 115 100.0 100.0 60 100.0	uz (%Ub) STB STB STB STB STB STB STB STB STB	2.0 2.0 STB STB STB STB STB STB STB STB STB	s ( % ( 11 [%Ib] STB STB 0.4 600 10.0 10.0	Time [hh: Energy I2 [%Ib] STB STB STB STB STB STB STB	I3 [%Ib] I3 [%Ib] STB STB STB STB STB STB STB STB	φ1 0.0° 0.0° 0.0° 0.0° 0.0° 0.0° 0.0°	50 power C 0.0° 0.0° 0.0° 0.0° 0.0° 0.0° 0.0°	<b>φ3</b> 0.0° 0.0° 0.0° 0.0° 0.0° 0.0°	se/kWh 120.0 120.0 120.0 120.0 120.0 120.0 120.0					
C Io 1 2 3 4 5 5 7	Countring Counter test No load 80%Un No load 115%Ur Starting conditio Meter constant Operate 60%Ub 10%Ib cos=1 (f 100%Ib cos=1 (f	C Max Jame (Counting) n (Counting) n (Counter te o 10%Ib (Er Error test) (Error test)	U1 [%Ub] 80 115 100.0 100.0 60 100.0 100.0	or limit U2 (%Ub) STB STB STB STB STB STB STB STB	2.0 (%Ub) STB STB STB STB STB STB STB STB	s ( % % ( 11 [%1b] STB STB 0.4 600 10.0 10.0 10.0 100.0	Time [hh:: Energy I2 [%Ib] STB STB STB STB STB STB STB STB	I 3 [%1b] I 3 [%1b] STB STB STB STB STB STB STB STB	φ1 0.0° 0.0° 0.0° 0.0° 0.0° 0.0° 0.0°	50 power C 0.0 ° 0.0 ° 0.0 ° 0.0 ° 0.0 ° 0.0 °	<b>#</b> <b>9</b> <b>9</b> <b>9</b> <b>9</b> <b>9</b> <b>9</b> <b>1</b> <b>1</b> <b>1</b> <b>1</b> <b>1</b> <b>1</b> <b>1</b> <b>1</b>	Ise/kWh \$12 [° 120.0 120.0 120.0 120.0 120.0 120.0 120.0 120.0					
C lo 1 2 3 4 5 5 7 3	Counting Counter test No load 80%Un No load 115%Ur Starting conditio Meter constant I Operate 60%UU 10%Ib cos=1 (E 100%Ib cos=1 (	C Max Aame (Counting) n (Counting) n (Counting) (Counting) (Counting) (Counting) (Counting) (Counting) (Counting) Store (Counting) (Counti	C Tin Err U1 [%Ub] 80 115 100.0 100.0 60 100.0 100.0 100.0	ne or limit U2 (%Ub) STB STB STB STB STB STB STB STB	2.0 2.0 STB STB STB STB STB STB STB STB STB STB	s ( % % ( 11 [%1b] STB STB 0.4 600 10.0 10.0 100.0 100.0	Time [hhit Energy 12 [%1b] STB STB STB STB STB STB STB STB STB	III (%Ib) STB STB STB STB STB STB STB STB STB STB	#1           0.0 °	50 power C 0.0 ° 0.0 ° 0.0 ° 0.0 ° 0.0 ° 0.0 ° 0.0 ° 0.0 ° 0.0 ° 0.0 °	<b>9</b> <b>9</b> <b>9</b> <b>9</b> <b>9</b> <b>9</b> <b>9</b> <b>9</b> <b>9</b> <b>9</b>	Ise/KWh \$12 [* 120.0 120.0 120.0 120.0 120.0 120.0 120.0 120.0 120.0 120.0					

Fig.6 View of the Procedure window

After setting the type of electricity meter and the points of testing in the procedure, it is possible to run Auto Test as presented in Fig.7. Select the type of meter from the "Electricity meter name" field and the desired procedure from the "Procedure name" Next, select all the valid test points from the ones defined in the Procedure from the "Test points" field. As a result, we get ratio error ( $\epsilon$ ).



Fig.7 View of the Auto test window

The results of the electricity meter testing are presented in the form of a table and/or diagram. An example of the results being presented in table and diagram form can be seen in Fig.8

Erro	r test Count	ing	Count	ter test	l																	
No	Date	Ti	ime	U1 [V]	I1 [A]	f [Hz]	Phi	i1	$\triangle$	Limit [%]	8 [9	6] Es	[%]	OK								
1	2013-03-19	14:2	25:07	138.00	0 1.00000	50.000	0	.00 •	1	2.000	1.55	57 1	0.025	~								
2	2013-03-19	14:4	46:07	138.00	0 1.00000	50.000	0	.00 °	1	2.000	1.67	70 1	0.000	~								
з	2013-03-19	14:4	49:41	230.00	0 1.00000	50.000	0	.00 °	1	2.000	0.56	37 1	0.000	~								
4	2013-03-19	14:5	51:46	230.00	0 10.0000	50.000	0	.00 °	1	2.000	0.38	33 1	0.000	~								
5	2013-03-19	14:5	52:09	230.00	0 10.0000	50.000	Cos 0	.50 L	1	2.000	0.71	18 1	0.000	~								
6	2013-03-19	14:5	53:46	230.00	0 60.000	50.000	0	.00 °	1	2.000	-0.73	35 1	0.000	~				_				
1	8	Erro	or test	Counti	ng Counte	r test																
		No		Point	t name	[	Date	Tin	ïme	U1 [V]	I1 [A]	f[	Hz]	Phi1	N	Limit N	OK					
		1	No lo	ad 80%l	Jn (Counting	) 2013	-03-19 13:1		8:10	184.000	0.0000	00 50	.000	0.00 °	• 0	1 (Max)	~					
		2	No lo	ad 115%	Un (Countin	g) 2010	3-03-19	13:2	8:23	264.500	0.0000	00 50	.000	0.00 °	0	1 (Max)	~					
		з	Start	ing cond	ition (Countir	ng) 2010	3-03-19	14:5	9:36	230.000	0.0400	00 50	.000	0.00 °	2	2 (Min)	~					
		62		Error	test   Counti	ng Count	er test											-				
				No	Poin	t name		Date		Time	U1 [V]	I1 [A]	f [Hz	:] Ph	i1	E1		E2	E	Limit [%]	8 [%]	OK
				1	Meter constar	nt (Counter	test) 2	2013-03	-19	14:08:48	230.000	60.000	50.00	0.0	0 •	865.2000 KV	Wh 8	66.2000 K/Vh	1.001577 KWh	2.000	-0.159	~



Fig.8 Examples of presented results

g format										×											
General header info				Select approp	riate	print logo file															
Logo	PrintLogo.b	mp		Default settin	igs is "	PrintLogo.bm	p' file into "	Print" dir	ectory.												
I✓ Header	PrintHeader	.txt	<u> </u>	Default settin	iriate igs is '	Print neader. PrintHeader.	nie. txť file into	"Print" d	rectory	6											
Administration data																					
🔽 Admin					-					_	DRV D										
Error test results —					-						"Calmet"	'Sp. z o.	0. 0.	IIIIOA	vacyjno	wurt	Zeniowe				
🔽 Table					- (	C A		16			ul. Kukul	cza 18									
( All				Entre anteine	1	- a		AC			Email: m	eiona G ail@calr	net.com	ιpl							
C Points	J		[1-6]	e.g 1,3,5-12	-																
	_				Cust	omer info:			-										Site info:	10000000	_
🔽 Diagram	Y axis Ep	silon	<b>•</b>	Select X and			Name: Address:		Porze	i SA eczkowa 1	5									Name: Address:	Akaciowa 1
	X axis No	,	•	Delectricity			Phone:		068 3	22 14 22										Phone:	
							Email:		bok@	genea.pl										Email:	
Vector	Point 2		•	Select numb			Commen	t:													
					Meter	r info:															
Counting results					maa		E lectricit	y meter n	am///626	6U 10(60)	A										
🔽 Table							Meter con	nstant:	375.0	) pulse / k	Mh										
(€ All							Meter co	nnection	Direc	t											
C Points			[1-3]	Enter points e.g 1.3.5-12					000000												
					Error	test results :	W626U 10(0	58)A.rem			_	_	_	_							
Vector	Point 2		-	Select numb	No	Date	Time	U1 [∀]	н [А]	f [Hz]	Phi	1	(%)		8 %][	€s [%]	OK				
Counter test results					1	2013-03-19	14:25:07	138.000	1.0000	50.00	0 0.	.00 * 10	2.00	0 1	.557 0	0.025	1				
✓ Table					2	2013-03-19	14:46:07	138.000	1.0000	50.00	0 0.	.00 • 1	2.00	0 1	.670	0.000	1				
(• All					3	2013-03-19	14:49:41	230.000	1.0000	50.00	0 0.	.00 • 1	2.00	0 0	0.567 (	0.000	×				
C Points	[		[1-1]	Enter points	4	2013-03-19	14:51:46	230.000	10.000	50.00	0 0.	.00 *	2.00	0 0	0.383 (	0.000	×				
				6.g 1,0,0-12	5	2013-03-19	14:52:09	230.000	10.000	50.00	0 C os 0	.50 L	2.00	0 0	0.718	0.000	*				
Vector	Point 1		•	Select numb	6	2013-03-19	14:53:46	230.000	60.00	50.00	0 0.	.00 *	2.00	0 -0	0.735 (	0.000	*				
(initiality)	and the second sec																				
		_			Coun	ting results :	W626U 10(6	i0)A.rem		Time	114				DEIA		Limit H	01			
			ОК	Cancel	NU	Point	name	Da	e	nne	[V]	[A]	[H	z]	Plili	"		UN			
		_			1	No load 80%	Un (Count	201 3-0	3-19 1	3:18:10	184.000	0.0000	00 50	.000	0.00 *	0	1 (Max)	1			
					2	No load 1159	&Un (Coun	2013-0	13-19 1	3:28:23	264.500	0.0000	00 50	.000	0.00 *	0	1 (Max)	~			
					3	Starting cond	fition (	201 3-0	13-19 1	4:59:36	230.000	0.0400	00 50	.000	0.00 *	2	2 (Min)	-			
					<u> </u>			1							100						

The results can be printed out according to printer parameters settings as seen in Fig.9.

Fig.9 View of the Printing format window and an example printout