

# Poly phase static watthourmeters

## Pattern evaluation report

**Project number** : 800819  
**Test report number** : CVN-800819-02

**Applicant** : EMH Elektrizitätszähler GmbH & Co KG  
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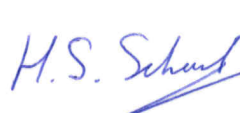
**Manufacturer** : EMH


**Type** : LZQJ-XC

**Test specifications** : - IEC 62052-11  
"Electricity metering equipment (AC) - General requirements, tests and test conditions - Part 11: Metering equipment"  
- IEC 62053-22  
"Electricity metering equipment (AC) - Particular requirements - Part 22: Static meters for active energy (classes 0,2 S and 0,5 S)"  
- EN 50470-1  
"Electricity metering equipment (a.c.) - General requirements, tests and test conditions - Part 1: Metering equipment (class indexes A, B and C)"  
- EN 50470-3  
"Electricity metering equipment (a.c.) - Particular requirements - Part 3: Static meters for active energy (class indexes A, B and C)"  
- PTB Prüfregeln Band 6 Teil B - Elektronische Zähler

**Testing period** : April 2008

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Tests	: The meters as specified in annex 2 were tested for compliance with the standards as specified on page 1 of this test report. The performed tests are stated in annex 1. If applicable specific test conditions are stated at each test.
Results	<p>See annex 1 of this test report. The meter fulfils the general requirements of the IEC 62052-11, and the requirements for class 0,2 S of the IEC 62053-22 for all performed tests.</p> <p>The meter fulfils the general requirements of the EN 50470-1 [2006], and the requirements for class C of the EN 50470-3 [2006] for all performed tests.</p>
Traceability	: The measurements have been executed using standards for which the traceability to (inter)national standards has been demonstrated towards the RvA.
Uncertainty	<p>: The reported uncertainty is based on a standard uncertainty multiplied by a coverage factor <math>k=2</math>, which provides a confidence level of approximately 95%.</p> <p>The total uncertainty of the measurements of the error of indication is 0,08% for power factor=1, and 0,13% for power factor=0,5 inductive or power factor=0,8 capacitive.</p> <p>The total uncertainty in the measurements of power is 0,02 W.</p>
Annexes	<p>: The complete test report consists of the following annexes:</p> <p>annex 1 : performed tests</p> <p>annex 2 : characteristics of the tested meters</p> <p>annex 3 : test data</p>
Remark	<p>: The measurements have been performed using a 3 phase 4 wire meter in a 3 wire configuration (neutral disconnected) and with auxillary power supply.</p> <p>The test data as presented in the annex 3 of this test report is performed under RvA accreditation with reference number L029, in which conformity to ISO/IEC 17025 has been demonstrated.</p> <p>The data as presented in the annexes 1 and 2 gives extra information.</p>



## Annex 1: Performed tests

In the following tables the performed tests are indicated with the accompanying results, as well as the page number of the appertaining annex where the results are presented.

### Particular requirements of the IEC 62053-22 / EN 50470-3:

article IEC 62053-22 / EN 50470-3	tests:	passed	not applicable	not performed	annex 3 page
8.1 / 8.1	error due to variation of current (at reference conditions)	√			1
8.1 / 8.1	error due to variation of current (single phase load)	√*			2
8.3 / 8.7.9	starting- and no-load condition	√			3
8.4 / 8.7.10	meter constant	√			4
8.2 / 8	variation of the error due to variation of the voltage			√	-
8.2 / 8	variation of the error due to variation of the frequency			√	-
8.2 / 8.5	reversed phase sequence			√	-
8.2 / 8.5	voltage unbalance			√	-
8.2 / 8.5	operation of accessories	√			5
8.2 / -	variation of the error due to variation of the temperature			√	-
8.2 / 8.5	variation of the error due to harmonics			√	-
8.2 / 8.5	continuous magnetic induction of external origin			√	-
8.2 / 8.5	magnetic induction of external origin (0,5 mT)			√	-
7.1 / 7.1	power consumption			√	-
7.2 / 8.6	variation of the error due to short-time overcurrents			√	-
7.3 / 8.5	variation of the error due to self-heating			√	-
7.4 / 7.2	AC voltage test			√	-

### General requirements of the IEC 62052-11 / EN 50470-1:

article IEC 62052-11 / EN 50470-1	tests:	passed	not applicable	not performed	annex 3 page
7.3.2 / 7.3	impulse voltage test			√	-
7.4 / -	earth fault		√		-
7.5.2 / 7.4.5	immunity to electrostatic discharges			√	-
7.5.3 / 7.4.6	immunity to electromagnetic RF-fields			√	-
7.5.4 / 7.4.7	fast transient bursts			√	-
7.5.5 / 7.4.8	immunity to conducted disturbances			√	-
7.5.6 / 7.4.9	surge immunity			√	-
7.5.7 / 7.4.10	damped oscillatory waves immunity			√	-
7.5.8 / 7.4.13	radio interference suppression			√	-
7.1.2 / 7.4.4	influence of supply voltage			√	-
7.2 / 7.2	influence of heating			√	-
6.3.1, 6.3.2, 6.3.3	dry heat test, cold test and damp heat, cyclic test			√	-
6.3.4	solar radiation		√		-
5.2.2.2, 5.2.2.3	shock and vibration tests			√	-
5.2.2.1	spring hammer test			√	-
5.9	protection against dust and water			√	-
5.8	test of resistance to heat and fire			√	-

Extra requirements for the EN 50470-3:

article EN 50470-3	tests:	passed	not applicable	not performed	annex 3 page
8.1	accuracy tests at reference conditions			√	-
8.2	repeatability			√	-
8.3	variation of the error due to variation of the voltage			√	-
8.3	variation of the error due to variation of the frequency			√	-
8.3	variation of the error due to variation of the temperature			√	-
8.4	maximum permissible error			√	-
8.5	earth fault		√		-

Remark: The measurements are performed at a reference temperature of  $23 \pm 2$  °C, unless an other temperature is stated.

The measurements have been performed using a 3 phase 4 wire meter in a 3 wire configuration (neutral disconnected) and with auxillary power supply.

\* The single phase load test has only been performed as described in PTB Prüfregein Teil 6 B.6.3.



## Annex 2: Characteristics of the tested watthour meters

Sample number	Model**	Serial number	Year of fabrication	$I_n$ [A]	$I_{max}$ [A]	$U_{ref}^*$ [V]	Frequency [Hz]	Meter constant [imp./kWh]
4.	LZQJ-XC	801810	2008	1	6	3x57,7/100	50	40.000
5.	LZQJ-XC	801811	2008	1	6	3x57,7/100	50	40.000

Software version: 2.05      Checksum: 51F9CA2E  
Hardware version: Main board: 9AY0202P  
PSU board: 9AY0302P  
Input/output board: 9AY0402P  
Display board: CG046-3004 C00  
Sensor board: 9AY0502P

Remarks: The results as mentioned in this test report relate only to the meters which are tested.

\* The meters have been tested in a 3 wire configuration with disconnected neutral.

\*\* Type: S5A3-B0-6MB-LC-080026-E50/Q

The above mentioned characteristics were stated on the watthour meters under test and are required by the IEC documents.

However, according to the Annex MI-003 of the MID and the EN 50470 documents, other parameters are used to define the meter characteristics. Therefore in addition the following characteristics are used during the investigation:

- $I_{tr}$  :  $0,05 * I_n$
- $I_{min}$  :  $0,2 * I_{tr}$     ( =  $0,01 * I_n$  )
- $I_{st}$  :  $0,02 * I_{tr}$     ( =  $0,001 * I_n$  )

Several tests are performed to show compliance with both the IEC documents and EN 50470 documents, as indicated in Annex 1. For those tests mainly the terminology as indicated in the IEC documents is used. The above mentioned values for  $I_{tr}$ ,  $I_{min}$  and  $I_{st}$  can be used for a cross reference between the two different kind of terminologies.



## Annex 3: Test data

### Test: Error due to variation of the current (at reference conditions)

The error of the meters is measured under reference conditions at different values of the current and power factor.

Results: Balanced load:

I [%] of $I_n$	Error [%] import					
	Sample nr. 4			Sample nr. 5		
	$\cos(\phi)=1$	$\cos(\phi)=0,5$ ind.	$\cos(\phi)=0,8$ cap.	$\cos(\phi)=1$	$\cos(\phi)=0,5$ ind.	$\cos(\phi)=0,8$ cap.
1	+ 0,0			+ 0,0		
2	+ 0,0	+ 0,1	+ 0,0	+ 0,0	+ 0,0	- 0,0
5	+ 0,0	+ 0,0	+ 0,0	+ 0,0	+ 0,0	+ 0,0
10	+ 0,0	+ 0,0	+ 0,0	+ 0,0	+ 0,0	+ 0,0
20	+ 0,0	+ 0,0	+ 0,0	+ 0,0	+ 0,0	+ 0,0
50	+ 0,0	+ 0,0	+ 0,0	+ 0,0	+ 0,0	+ 0,0
100	+ 0,0	+ 0,0	+ 0,0	+ 0,0	+ 0,0	+ 0,0
0,5. $I_{max}$	+ 0,0	+ 0,1	+ 0,0	+ 0,0	+ 0,0	+ 0,0
$I_{max}$	+ 0,0	+ 0,0	+ 0,0	+ 0,0	+ 0,0	+ 0,0

I [%] of $I_n$	Error [%] export					
	Sample nr. 4			Sample nr. 5		
	$\cos(\phi)=1$	$\cos(\phi)=0,5$ ind.	$\cos(\phi)=0,8$ cap.	$\cos(\phi)=1$	$\cos(\phi)=0,5$ ind.	$\cos(\phi)=0,8$ cap.
1	+ 0,0			+ 0,0		
2	+ 0,0	+ 0,0	- 0,0	+ 0,0	+ 0,1	+ 0,0
5	+ 0,0	+ 0,0	+ 0,0	+ 0,0	+ 0,0	+ 0,0
10	+ 0,0	+ 0,0	+ 0,0	+ 0,0	+ 0,0	+ 0,0
20	+ 0,0	+ 0,0	+ 0,0	+ 0,0	+ 0,0	+ 0,0
50	+ 0,0	+ 0,0	+ 0,0	+ 0,0	+ 0,0	+ 0,0
100	+ 0,0	+ 0,0	+ 0,0	+ 0,0	+ 0,0	+ 0,0
0,5. $I_{max}$	+ 0,0	+ 0,0	+ 0,0	+ 0,0	+ 0,0	+ 0,0
$I_{max}$	+ 0,0	+ 0,0	+ 0,0	+ 0,0	+ 0,0	+ 0,0

Remark: Before the measurements were started, the voltage was connected for at least one hour and a current of  $0,1 \cdot I_n$  was running through the meters.



Single phase load:

Sample nr. 4				
I [%] of I <sub>n</sub>				
R	S	T	cos(f)	Error[%]
5	5	0	1	-0,14

Remark: The single phase load test has only been performed as described in PTB Prüfregeln Teil 6 B.6.3.



Test: Starting and no-load condition

The starting and no-load condition is checked at reference conditions.

Results:

Sample nr. 4	
No-load condition with no current and a tension of 80% and 115% of the reference voltage	√
Registration checked at % of $I_b$	0,1 %
Registration checked at % of $I_b$ with export energy	0,1 %

Sample nr. 5	
No-load condition with no current and a tension of 80% and 115% of the reference voltage	√
Registration checked at % of $I_b$	0,1 %
Registration checked at % of $I_b$ with export energy	0,1 %

The meter is functional within 5 s after the rated voltage is applied to the meter terminals:

yes





**Test:** Meter constant

The meter constant is checked with the value stated on the nameplate.

Results: The test is performed with: Sample nr. 4  
Sample nr. 5  
The meter constant as stated on the nameplate complies with the measured values of the test output.



**Test: Operation of accessories**

The influence of the operation of accessories is determined at 1% of the nominal current and  $\cos(\phi)=1$ .

Results:

Sample nr. 4		
error without auxiliary voltage [%]		+ 0,01
auxiliary voltage	error [%]	variation [%]
48 V, phase R	+ 0,01	+ 0,00
48 V, phase S	+ 0,00	- 0,01
48 V, phase T	+ 0,02	+ 0,01
275 V, phase R	+ 0,02	+ 0,01
275 V, phase S	+ 0,01	+ 0,00
275 V, phase T	+ 0,01	+ 0,00

Definition: Variation = (Error with operation of accessories) - (Error without operation of accessories)