

POWER QUALITY MEASUREMENT CAPABILITIES OF “SMART” ENERGY METERS

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Abstract – Power quality measurement integrated in energy meters are presented as a potential benefit by some manufacturers. The Norwegian regulator has considered making minimum requirements for energy meters to include registration of interruptions. SINTEF Energy Research has performed tests on energy meters with power quality measurement capabilities (see Table 1). These tests include the ability to detect interruptions, supply voltage variations, voltage dips, among others. Inside these abilities, the “smart” meters were tested on:

- Accuracy of voltage measurement
- Registrations of supply voltage variations
- Registrations of interruptions
- Lowest functional voltage
- Registrations of voltage dips

The tests were performed by applying a controlled single-phase voltage signal to the energy meters by using a voltage generator. A Class A power quality measurement instrument (according to IEC standard 6100-4-30) was connected in parallel with the energy meter in order to verify the signal provided by the voltage generator and results given by the energy meters.

Table 1: Meter description

	Meter				
	A1	B1	B2	C1	D1
Category ¹	1	1	2	1	1
Phases	3	3	3	1	3
Voltage measurement	Yes	Yes	Yes	Yes	No
Current measurement	Yes	Yes	Yes	Yes	No
Frequency measurement	No	Yes	Yes	Yes	No
Unbalance measurement	No	No	Yes	No	No
Registration of interruptions	Yes	Yes	Yes	Yes	Yes
Predefined event registration	Yes	Yes	Yes	No	No
Programmable events	No	No	Yes	No	No

The measurement results from the different energy meters were obtained through software provided by the meter manufacturers. Table 1 presents the functionalities available in

each meter’s software. It is thus possible that other functionality could be obtained through software changes or updates.

Results presented in this paper show large differences in capabilities for power quality measurement of ‘smart’ energy meters (see Table 2).

Table 2: Test results

	A1	B1	B2	C1	D1
Measurement acc. voltage [% of $U_{Nominal}$]	0.43	0.30	0.10	0.50	N/A
Lowest functional voltage [% of $U_{Nominal}$]	48 ²	34	14 ²	28	24
Resolution time stamp	1 sec	1 min	1 sec	1 min	1 sec
Duration of event reported	Yes	No	Yes	No	Yes
Minimum voltage reported	Yes	No	No	No	No

The results also show that the power quality measurements are not according to international standards for such measurements like EN50160, IEC 61000-4-30 and others.

1 - Category 1 = Household, Category 2 = Commercial

2 - Time dependent