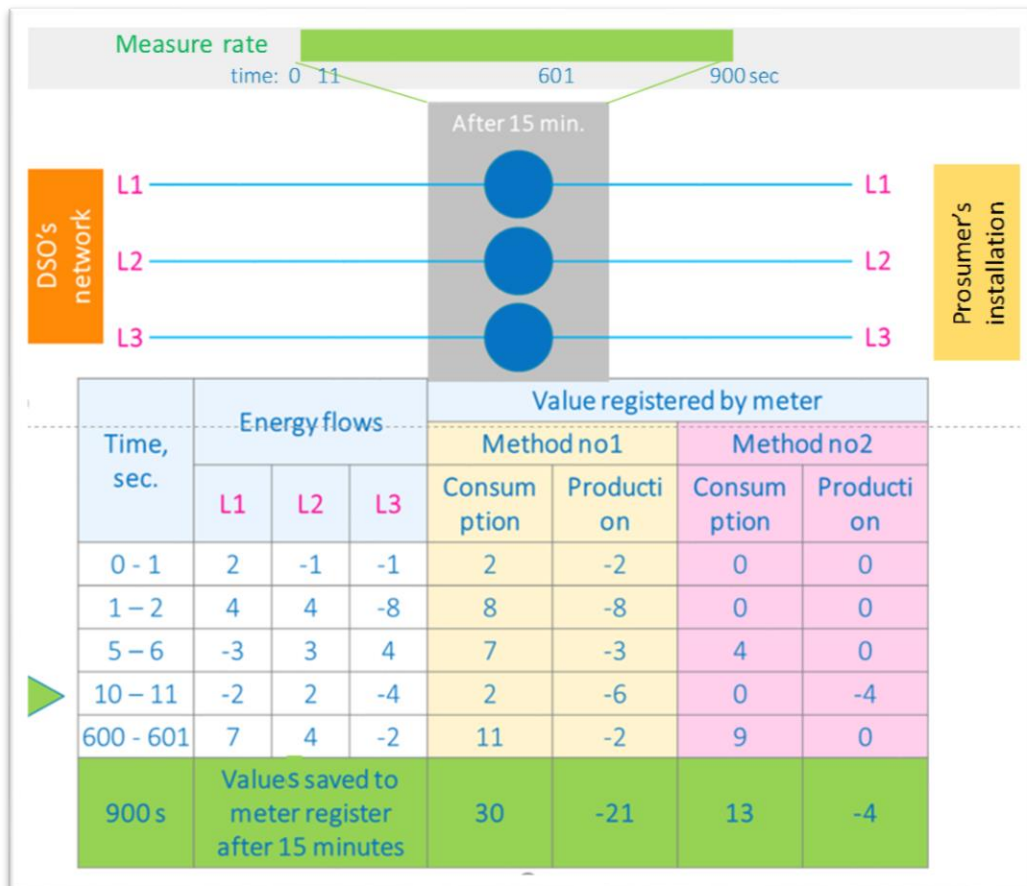| **Memo:** Smart meter reading methods	eblX	**E**uropean forum for energy **B**usiness **I**nformation e**X**change
Date: June 21th, 2017	**MDS**	(ebIX® working group for **M**aster **D**ata **S**tructuring and harmonisation in the European energy market)

Smart meter reading method

A smart electrical meter tracks the electrical energy flow over the different phase-lines multiple times before a read is set in the register. Usually the register intervals are 15 minutes or sometimes 1 hour, as the measure sample rate can be much higher. There are different ways to determine the read logged in the register of the meter.

Question

The question, raised by Poland, is: what type of method is used in each country for calculating the net registered energy flow per registering interval in a smart meter?
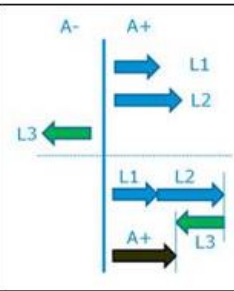
Example explanation of the prominent methods "vectorial" or "algebraic".

Time, sec.	Energy flows			Value registered by meter			
				Method no1		Method no2	
	L1	L2	L3	Consumption	Production	Consumption	Production
0 - 1	2	-1	-1	2	-2	0	0
1 – 2	4	4	-8	8	-8	0	0
5 – 6	-3	3	4	7	-3	4	0
10 – 11	-2	2	-4	2	-6	0	-4
600 - 601	7	4	-2	11	-2	9	0
900 s	Values saved to meter register after 15 minutes			30	-21	13	-4

Energy being consumed is marked as "+"
Energy being produced is marked as "-"

Method no1 – algebraic method
Method no2 – vectorial method

Response from ebIX® member countries

Country	Comment	Method 1 algebraic	Method 2 vectorial
Denmark	In Denmark, both principles are used today, almost equally divided on the two types of meters (the principles are not regulated in legislations or regulations). But after introducing grid tariffs based on actually metered values (earlier always hourly or yearly net-settled), the prosumers complained to the regulator demanding uniform settlement. And now the authorities are considering to change the legislations – most likely stating that method 2, the vectorial method, has to be used.	✓	✓
Germany	Germany uses method 1, the algebraic method.	✓	
Norway	According to Hafslund's experts, method 2 (vectorial method, see figure), is used in the company. It's unclear if other methods are used in Norway. 		
Poland	In Poland, in the prosumers smart meter is programmed with method no. 1, the algebraic method.	✓	
Slovenia	Slovenia have some Iskra smart meters with vectorial method and there were problems when they measure prosumers quantities. Could be used just for Consumption or Production, but not for Combined. Now Slovenia puts in the technical requirements for all new three phase meters the **algebraic method** regardless if it is customer, producer or prosumer.	✓	✓
Sweden	Vattenfall has the vectorial metering in all meters today.		✓
The Netherlands	The Netherlands use the vectorial method in their smart meters to determine the quarterly values.		✓

The methods explained theoretical

Some explanation for understanding of methods in theoretical perspective.

The direction of the energy is dependent on the magnitude and direction of that in the different phases.

Vectorial method

In the vectorial method the meter calculates the net real energy flow from the measurements of the flows per phase (line) by vectorial summing the phased energy flows.

In this method, the net energy flow will be placed in only one quadrant being the net vector.

The diagram shows the energy vectors of the phase lines L plotted on the active (A) and reactive (R) axes,
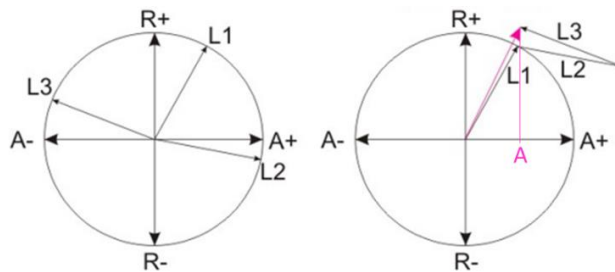
Algebraic or arithmetic method

In the algebraic or arithmetic method, each direction and magnitude of each phase line is kept separately. The register can be filled with the sum or with the different values for the phases. Energy is registered for each quadrant separately.
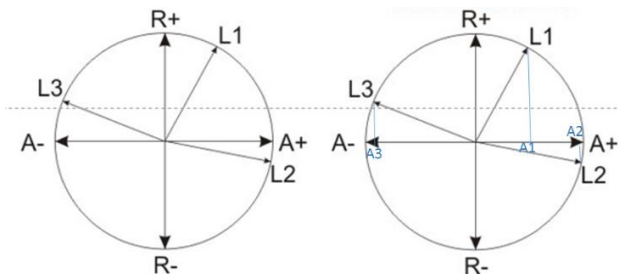
Absolute method

In this case where the absolute values of the energy of the different phase lines are summed |L1| + |L2| + |L3|. Vectors from the quadrants 2 and 3 are effectively transposed to quadrant 4 resp. 1.
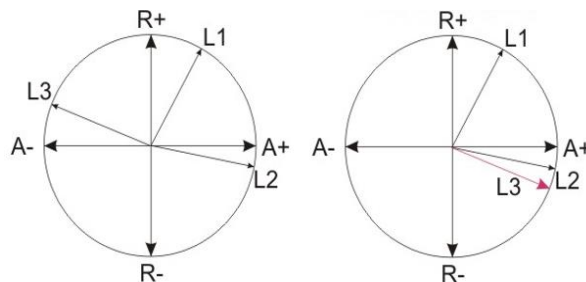
The meter must record all quantities according to the Type Of Metering Point. Here is an example, based on the examples above, with the corresponding OBIS codes:

Consumption: A+ (OBIS; 1.0.1.8.0) = (A1+)+(A2+);

Production: A- (OBIS; 1.0.2.8.0) = (A3-).