



Application notes energy meters

Topic: current transformers

Pascal Hurni / December 2013

Current transformers technology / types



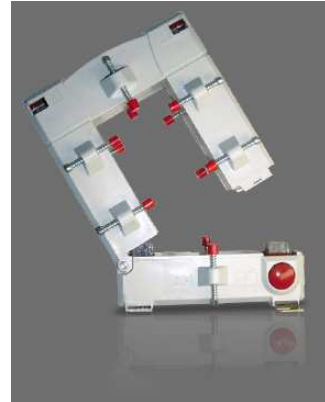
Current transformer

Advantages:

- Many manufacturers
- Low price
- Small, compact design
- Better accuracy classes (0.2/0.5/1/2)

Disadvantages :

- Removal / replacement, as installed fix



Split Core current transformer

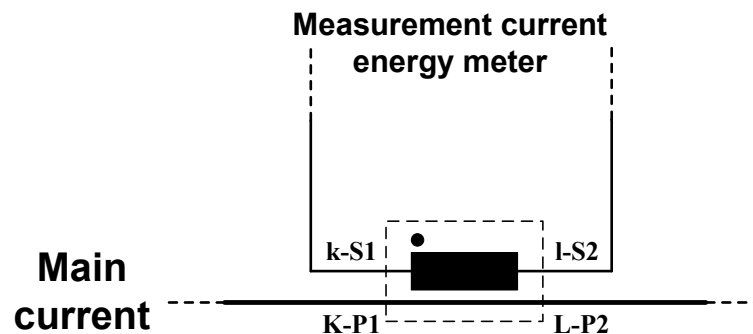
Advantages:

- Easy installation and removal
- Easy to retrofit

Disadvantages:

- High price
- Less accuracy classes (0.5/1/2)

Designation of the current transformer terminals



The terminals on the primary side (main current) are:

IN: K-P1 / OUT: L-P2

The secondary side (measuring current) has the markings:

IN: k-S1 / OUT: l-S2

CAUTION:

If the connections S1/S2 are inverted, the measured current is shifted by 180°.

Secondary currents / Distance to the meter

There are different ranges of CT's secondary currents.

5A current transformer:

The current transformer with 5A secondary current are very common in the market and are considered as standard. There are many different manufacturers.

1A current transformer:

The lower secondary current allows a more compact design. The price is lower due to the smaller use of material.

Important is the power of the current transformers, this is directly linked to the distance between current transformer and meter.

Calculation example:

Distance between current transformer and meter = 5m. The copper cable ($\rho=0,0172$) has a cross-section of $1,5\text{mm}^2$. (R_L = cable resistance / P_L = cable power)

For a 5A converter, the result would be:

$$R_L = \rho \cdot \frac{L}{s} = 0.0172 \frac{\Omega \cdot \text{mm}^2}{\text{m}} \cdot \frac{5\text{m} \cdot 2}{1.5\text{mm}^2} = \underline{0.12\Omega}$$

$$P_L = 0.12\Omega \cdot 5\text{A}^2 = \underline{2.86\text{VA}}$$

For a 1A converter, the result would be:

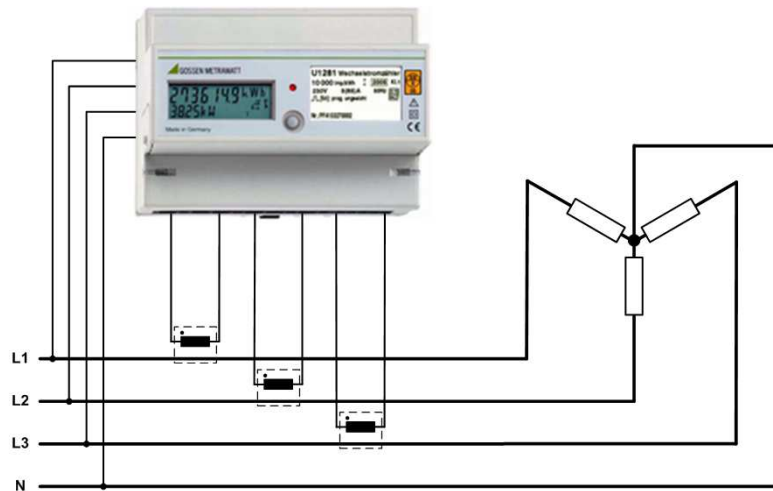
$$P_L = 0.12\Omega \cdot 1\text{A}^2 = \underline{0.12\text{VA}} \quad (\text{around 24 times smaller})$$

Connection of energy meter with CT's

Connection variant:

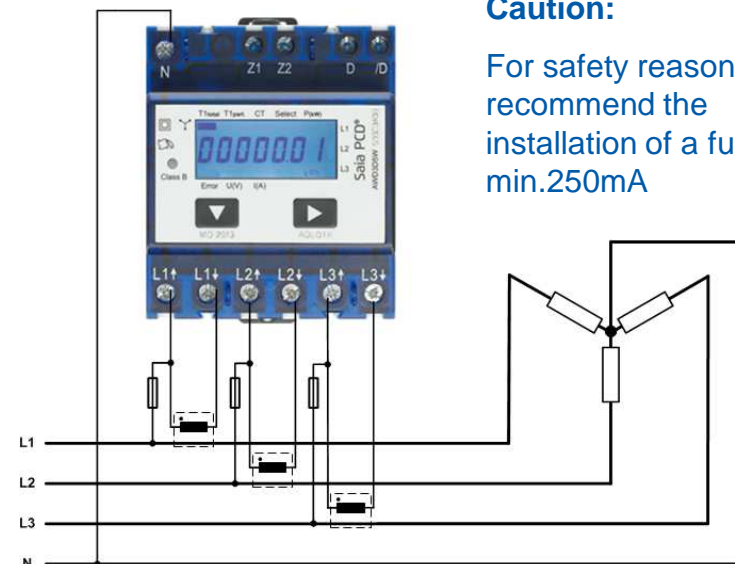
There are energy meters with combined inputs for current / voltage (phase). This facilitates the wiring of the devices because fewer connections need to be made.

Because of these combined inputs, mains voltage are on the secondary side of the transformer!



Connection variant with separate inputs

- The voltage and current inputs have separate terminals.
- No mains voltage on the secondary of the CT.
- Common on the market



Caution:

For safety reasons, we recommend the installation of a fuse. min.250mA

Connection variant with combined inputs

- The voltage and current inputs are together.
- Smaller design of the device, because fewer terminals needed.
- Saves time by wiring installation



Mains voltage on the CT secondary terminals!

Replacement of a meter with current transformer

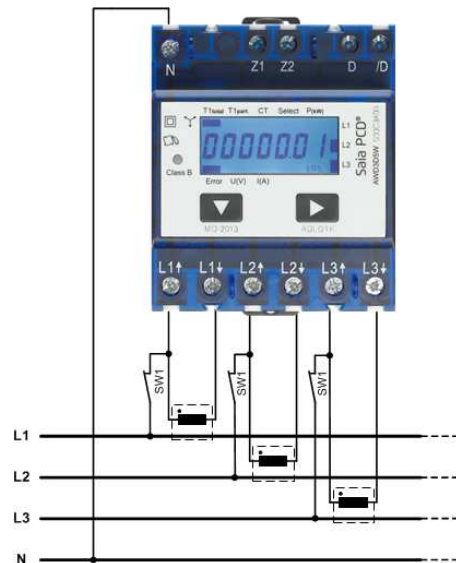
To replace an electricity meter that is operated with a split core current transformer, the system does not need to be stopped!

The exchange can be done according to the following procedure:

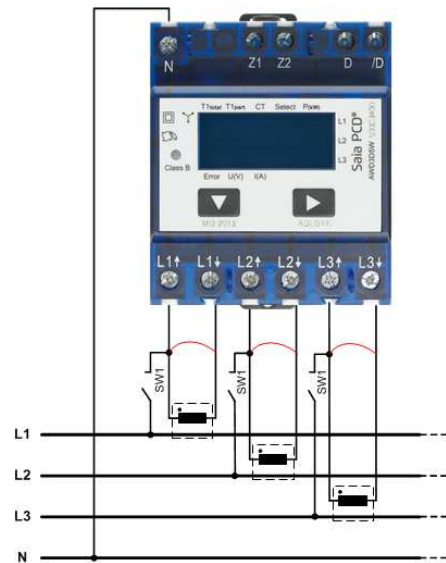


The manipulation with mains voltage may be made only by qualified personnel.

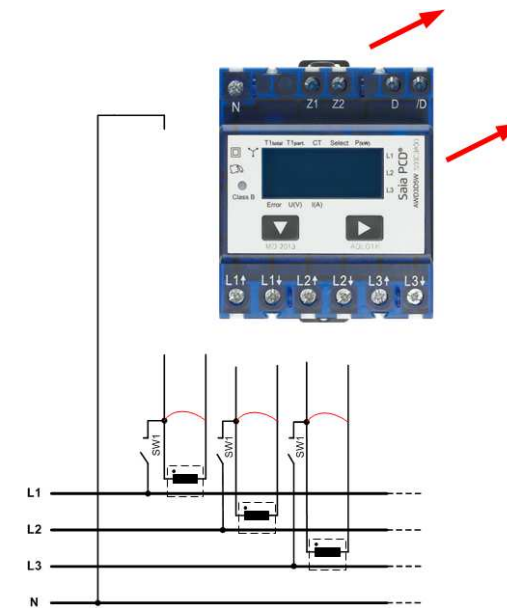
A wire can be used as bridge. For safety reasons a current transformer with two screws per terminal should be used.



- 1) Normal operation:
 - For the installation, switches (SW1) should be foreseen to switch off the mains.



- 2) Switch off the mains voltage
 - Open SW1, the meter is not powered anymore.
 - Bypass the secondary of the CT with a bridge.



- 3) Exchange of the energy meter.
 - After the exchange, remove bridges, and close switch (SW1) .

Important points for current transformers

When is earthing of a CT necessary?

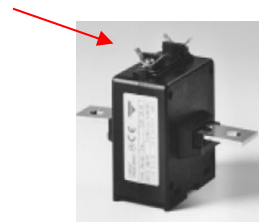
The earthing for the CT's is widely used and in the habit of many people because in past the CT's were made of metal and an earthing was important and necessary. Modern CT's normally have a plastic housing and it's not necessary to make an earthing in **low voltage** systems.

The SBC energy meters are tested by TÜV. The test rapport can be found here:

<http://www.sbc-support.com/en/product-index/axx-energy-meters/general/>

Contact protection

The current transformer must be designed to avoid a contact with the metal parts. A lot of energy meters have no separate current and voltage inputs. Therefore an earthing of the CT would cause a short circuit between phase and ground!



CT without contact protection

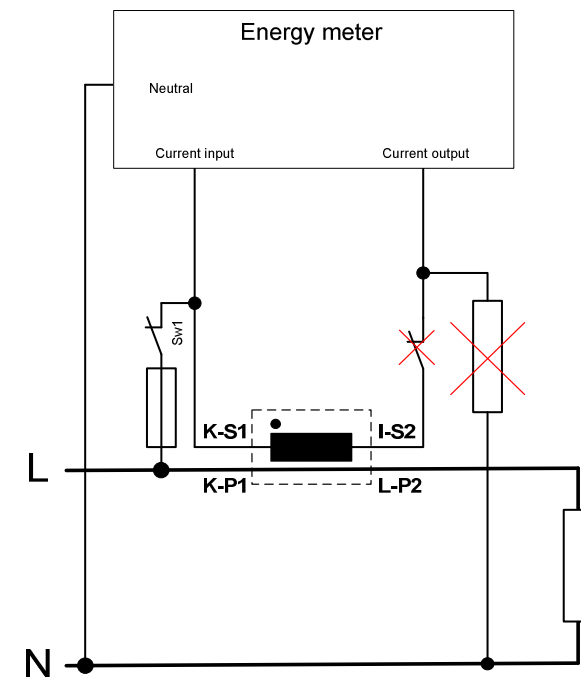


CT with contact protection

No manipulation on the output of the CT!!!

On the measurement output of the CT no tampering of the measured signal is allowed.

- No load
- No interruption (e.g. switches)
- The distance between the current transformer and the meter must be kept as short as possible

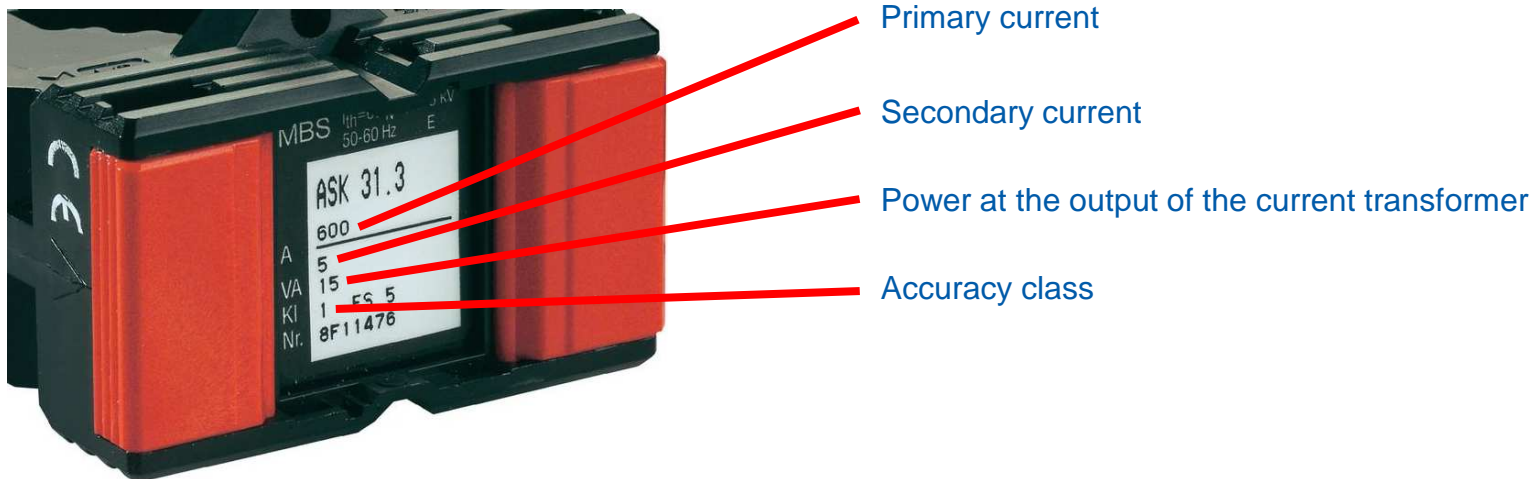


MID measurement / Nameplate of a CT

Important points to note:

- If the measured values are used for billing purposes, the energy meters must be MID approved.
- The accuracy of current transformers are regulated nationally.
- The national certification label must be affixed on the current transformer.

Nameplate of a current transformer



Some manufacturers of current transformers



MBS Sulzbach AG
Eisbachstraße 51
74429 Sulzbach–Laufen
Germany
www.mbs-ag.com



CIRCUTOR S.A.
Vial Sant Jordi s/n
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