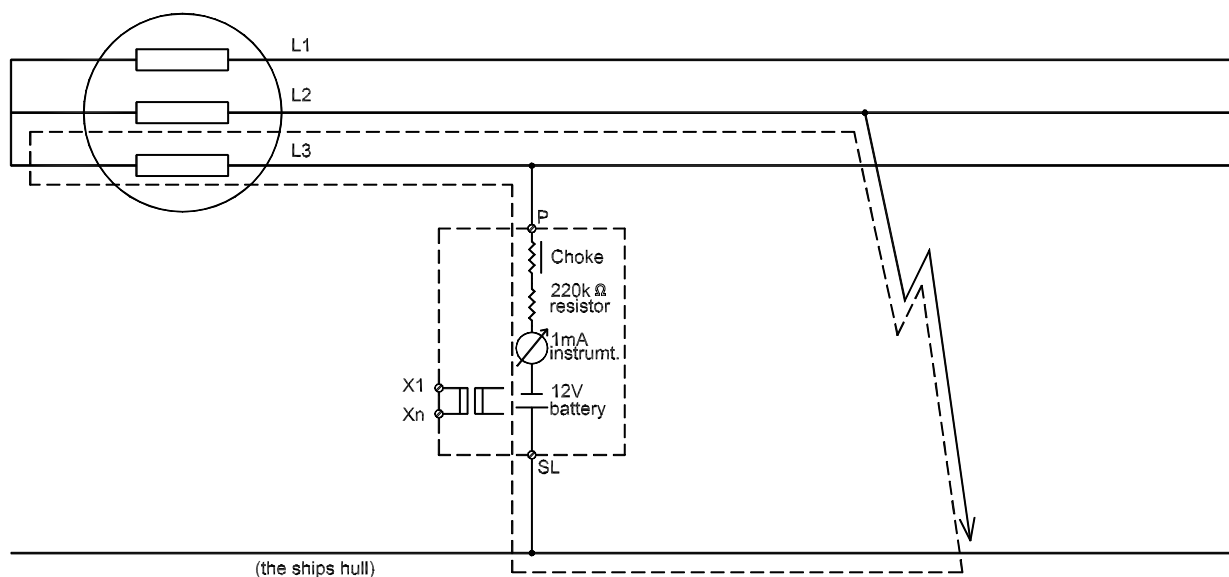


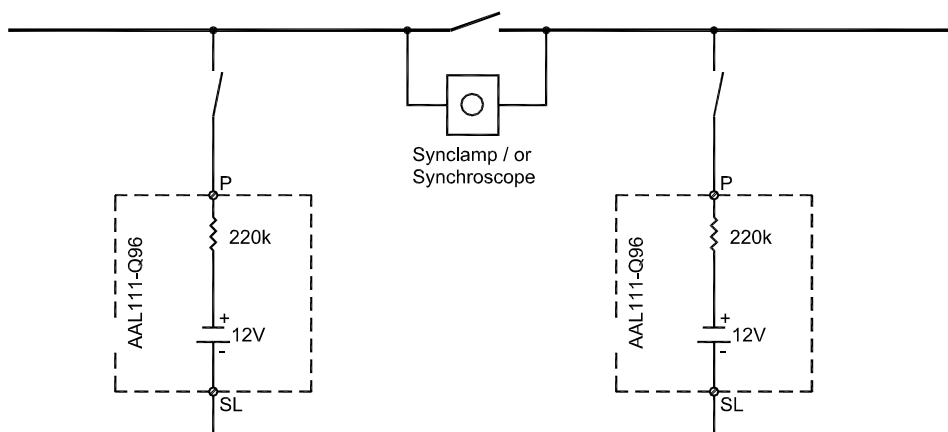
This application note gives guidelines for the AAL111-Q96 insulation monitor.

The example below illustrates the measuring method which is applied in the AAL111-Q96.



Drawing 1

As it appears from drawing 1, the measuring method is based on a simple ohmmeter circuit. When the auxiliary supply, which is galvanically separated from the measuring circuit, is connected, a stable 12V DC is generated internally. This 12V DC is applied as the measuring voltage of the ohmmeter. In series with this voltage a moving-coil instrument and a resistance with the same value as the value that can be read from the centre point of the AAL111-Q96 scale are mounted. Normally this value is chosen at 220k $\Omega$ , but can also be 22k $\Omega$ . The choke shown is mounted to prevent mains frequency from disturbing the measuring circuit. The broken line illustrates the flow path for a leakage from phase L2 to safe earth. From the diagram it appears that it is unimportant to which phase the AAL111-Q96 is connected, as the windings in the generator or the externally connected loads always secure that a DC flow path is established among phase L1, L2 and L3 for the measuring circuit.

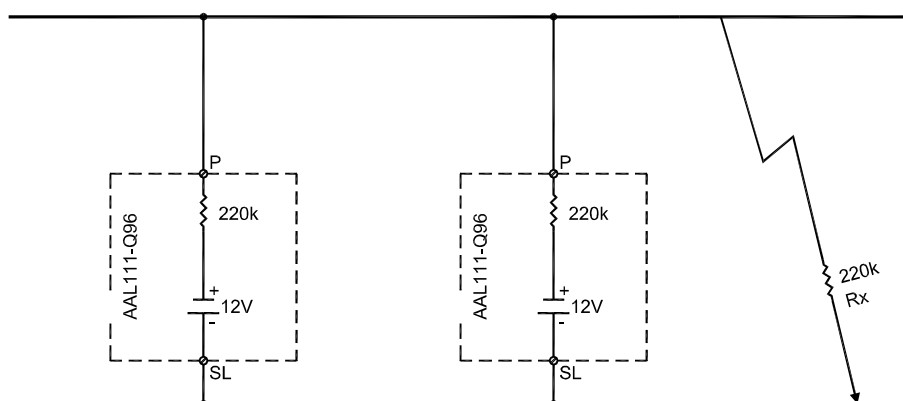


Drawing 2

Drawing 2 illustrates the situation where more AAL111-Q96 form part of the same installation. Because of the measuring principle, correct insulation measuring is only possible when one instrument at a time is connected. It means that when the circuit breaker is closed, an auxiliary contact on the circuit breaker must

disconnect "P" on the one AAL111-Q96. During synchronisation where a synchroniser is connected parallelly over the circuit breaker, errors in indication will arise as well. If the application (the installation) makes it difficult to disconnect "P" on the one AAL111-Q96 before the shown circuit breaker is closed, the result will be that the two shown AAL111-Q96 are parallelly connected in the synchronising period. The following errors in indication are now possible, dependent on the connection of the two AAL111-Q96.

The following examples are based on AAL111-Q96 with a measuring range of  $1\text{k}\Omega/\text{V}$  and  $220\text{k}\Omega$  on the centre of the scale.

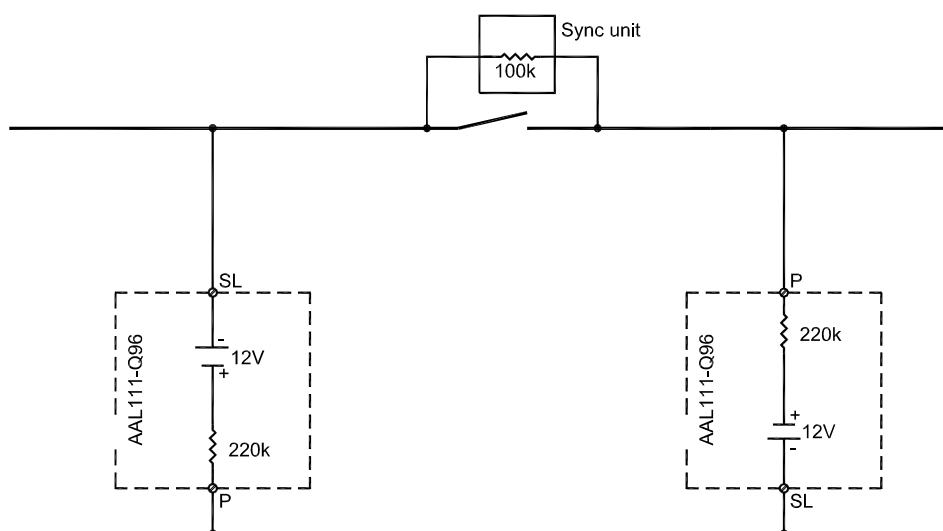


Indication 440k  
(2 x leakage resistor) on both units.

Correct indication on both units  
if  $R_x = \infty$  eller  $0\Omega$ .

Example 1

Example 1. If both AAL111-Q96 are connected to auxiliary supply and "SL" from both AAL111-Q96 are connected to safe earth and "P" from both units are connected to mains (bus bar), a possible leakage will be indicated (measured) on both units as 2 x the actual value in  $\Omega$ . E.g. a leakage of  $220\text{k}\Omega$  will be indicated (measured) as a leakage of  $440\text{k}\Omega$ . Please note that if there is no leakage, both units will correctly indicate "infinite". Also, if there is a short circuit, this state will be correctly indicated as  $0\Omega$  on both units.



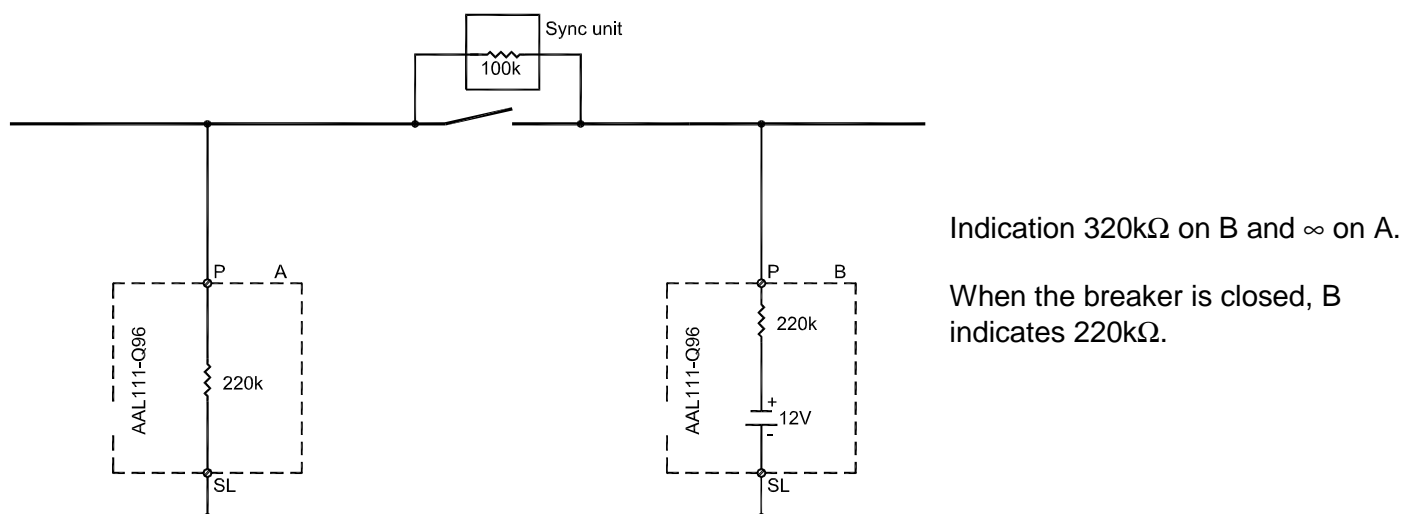
Indication  $50\text{k}\Omega$  on both units.

When the breaker is closed,  
both units indicate  $0\Omega$  (short circuit).

Example 2

Example 2. If "SL" and "P" are exchanged on the one AAL111-Q96 compared to the other AAL111-Q96 so that the measuring voltage of 12V DC is reverse polarised on the one unit compared to the other unit, the leakage will be indicated (measured) as 0.5 x the impedance in the connected synchronising unit. E.g. if the impedance in the synchronising unit is  $100\text{k}\Omega$ , AAL111-Q96 will indicate (measure)  $50\text{k}\Omega$ . This state is

only possible if "SL" and "P" wrongly have been exchanged on the one unit compared to the other unit. Please note that if only one unit is connected, no errors will be observed at the exchange of "SL" and "P".



## Example 3

Example 3. If only one of the two AAL111-Q96 is connected to the auxiliary supply, the unit will measure a leakage of 220kΩ (identical with the built-in series resistance) + the impedance in the connected synchronising equipment.

If it is not possible to disconnect "P" to the one AAL111-Q96 before the synchronising unit is connected, example one is the only acceptable alternative. Firstly, example one does not cause a failure alarm as a possible leakage is registered as the double of the leakage and a catastrophic leakage which arises during the synchronisation will in any case be registered. When the circuit breaker is closed, the one AAL111-Q96 is disconnected by an auxiliary contact on the circuit breaker and the measuring is now correct.

Regarding connection of the auxiliary supply, it is unimportant if the AAL111-Q96 is connected to the mains (bus bar) which is monitored by the unit or if the auxiliary supply is coming from another mains or is coming from a 24V battery.