

Capacitor bank- protection and control

The new VAMP 40 relay has many features making it ideal for capacitor bank protection applications

The new VAMP 40 feeder and motor protection relay has many applications in the electrical distribution and industrial markets. One of the applications is for capacitor, filter and reactor bank protection. The use and applications are described in this article.

Unbalance protection

The VAMP 40 relay has 5 current inputs as well as a single voltage input. Normally two of these inputs can be used for earth or residual current inputs. In double star unearthed capacitor bank applications, these inputs can be used for unbalanced current detection. The unbalance protection is measured with a dedicated current transformer between the star points of the banks as shown in the figure below. The unbalance current is not affected by system unbalance. However, due to capacitor manufacturing tolerances, some amount of natural unbalance current exists between the star points.

In the VAMP 40, this unbalance current is compensated so that the net current measured becomes zero. This compensation is triggered manually at commissioning. The phasors of the unbalance current and one phase current are recorded (the latter for

a polarising to zero measurement). As the initially existing unbalance current is compensated to zero in the VAMP 40 relay, the unbalance setting can be very sensitive. Should the unbalance current change due to failure in the bank, this functionality can be used to also locate the branch of the faulty element which would typically be a blown fuse.

Two current stages can be set for unbalance alarm and trip respectively. Following a blown fuse, a time setting would determine how long the unbalance condition has to prevail before it is determined to be a faulty fuse. After a fuse failure has been detected, new compensation is added automatically so that the unbalance current “seen” by the relay yet again becomes zero. A faulty element counter is also increased simultaneously. The user can set the number of tolerable faulty elements before a trip is initiated.

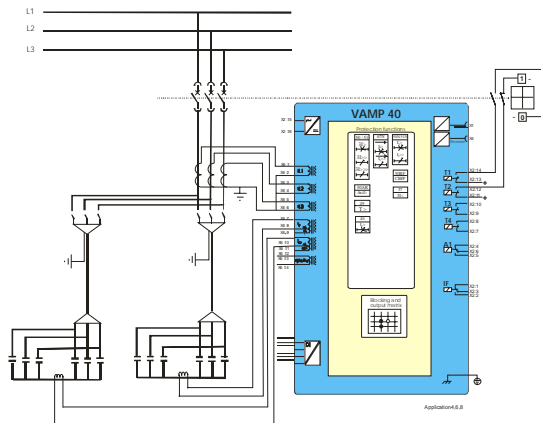


Figure 1. Capacitor bank- overcurrent , earthfault, overload and unbalance protection for an automatic bank(2 steps)

Five unbalance inputs

The shown application (Figure 1) also measures phase currents into the capacitor banks. However, the three phase inputs can also be used for unbalance detection, making it possible to have up to five unbalance inputs into a single VAMP 40 relay.

This is achieved with another novel feature of the VAMP 40 which contains up to eight programmable stages or virtual protection elements. This makes it possible to define additional protection elements of any available type within the relay, hence making it possible to have five unbalance current inputs rather than phase currents. Of course, without a phase current input there would not be any current polarisation.

Voltage protection and control

The VAMP 40 relay also has a single voltage input that could be

used for phase to phase voltage or phase to earth voltage. The latter is typically used for directional earth fault protection. In capacitor bank applications, the measurement of phase to phase voltage enables overvoltage or undervoltage protection as well as control of shunt capacitor banks. Similarly the measurement of phase to earth voltage can be used for unbalance voltage detection.

The (Figure 2) diagram demonstrates the use of the VAMP 260 for controlling capacitor switching. In such an application the VAMP 260 could be used to control reactive power compensation depending on the time of the day or to other measured criteria. Of course this control could be used in isolation or combined with voltage control to provide a very flexible shunt bank controller, be it a reactor or capacitor. With the aid of an RTD input, temperature measurements could also be used for protection and/or control applications.

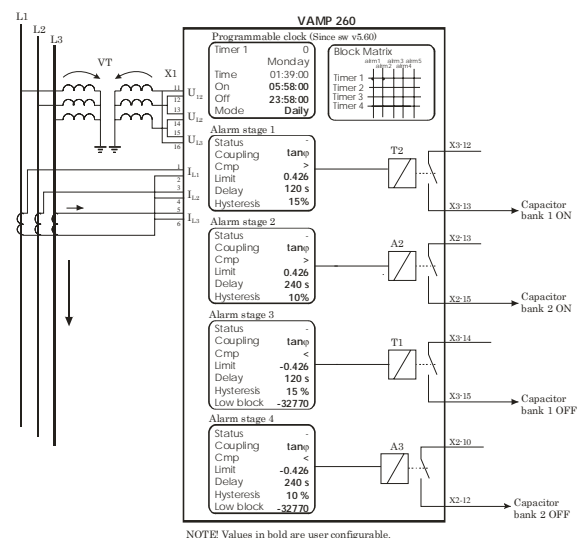


Figure 2. P.F controller application/ two-stage clock controlled power factor controller



Summary

The VAMP 40 relay has many more measured quantities and functionalities than the few described in this article. As VAMP places the highest priority on user-friendliness, all these functionalities are extremely easy to apply. It can be concluded that the VAMP 40 can be used on its own or in combination with the VAMP 260 to provide comprehensive capacitor bank protection and/or control.

VAMP Ltd
P.O.Box 810
FI-65101 VAASA
Finland

Visiting Address:
Vaasa Airport Park
Yrittäjänkatu 15
Vaasa, Finland

Tel: +358 20 753 3200
Fax: +358 20 753 3205
Email: vamp@vamp.fi
<http://www.vamp.fi>



ISO 9001:2000
certified company



We reserve the rights to product alterations without prior notice.
Copyright © Vamp Ltd. All trademarks are the property of their respective holders.