



Grid Solutions
a GE and Alstom joint venture

PROTECTION PRODUCT SOLUTIONS

MiCOM P14x Agile

Fully-Numerical high-impedance busbar protection

High impedance relays protecting power system busbars are a favoured practice in many utilities. Simplicity and continuity with tried and trusted practices are key. Grid Solutions' P14x series offers the perfect solution in a modern, numerical device.



CUSTOMER BENEFITS

- Sensitive high impedance bus protection
- Detection of open circuit CTs or buswires
- Operation tuned to fundamental frequency
- Fully-numerical relay with digital fault recording
- Graphical programmable logic to customize automation schemes
- Communications include IEC 61850 edition 2, and a range of serial protocols
- IEC 62439 PRP and HSR communications redundancy available
- IEEE1588 and IRIG-B for accurate time synchronising

Fast, simple and reliable busbar protection: Numerical single-box solution with full scheme supervision

Power system busbars are a key node in the delivery of energy to consumers. In many cases, outage of a busbar would constrain the ability to dispatch power efficiently, and in some cases it would cause direct disruption of supply to consumers. It is therefore essential to provide fast and discriminative protection which will initiate precise isolation of the faulted bus section in the event of an internal fault, but will remain stable and secure in the event of an external fault. High impedance protection schemes are the solution of choice for many utilities.

The MiCOM P14x Agile (MiCOM P141, P142, P143, P145 Agile) offers the perfect solution for high impedance busbar protection, drawing on many years of experience with MCAG34 and MFAC34 electromechanical schemes. In addition, to detect any potentially-dangerous open circuit scenario for current transformers or scheme buswires, sensitive overvoltage supervision is now provided, mimicking the safety feature offered in Grid Solutions' MVTP predecessor. The choice is simple: if a utility prefers a traditional solution – use MCAG or MFAC, if a utility prefers a full numerical solution – use Grid Solutions' P14x.

Delivering on a numerical relay platform offers the advantages of digital fault recording, measurements, cybersecurity and communications according to the latest substation standards. In addition, marshalling of trip commands to the correct circuit breakers connected to a faulted bus zone is achieved dynamically, adapting to the switching status of disconnectors, with inbuilt PSL (programmable scheme logic).

High impedance schemes necessitate cross-site and interbay connection of current transformer (CT) circuits. Typically, the disconnector and circuit breaker status indications will be connected by hardwiring in the same troughs, conduits and ducts as for the CTs. To avoid spurious pickup of the binary inputs which monitor the status – due to cross-talk between the wiring – it is essential that they offer the same immunity as historical hinged-armature relays. Grid Solutions' P14x binary inputs offer programmable pickup thresholds, AC rejection, and compliance with the mandatory ESI 48-4 EB2 standard, to achieve this objective.



Single box solution: high impedance busbar protection with integrated buswire supervision

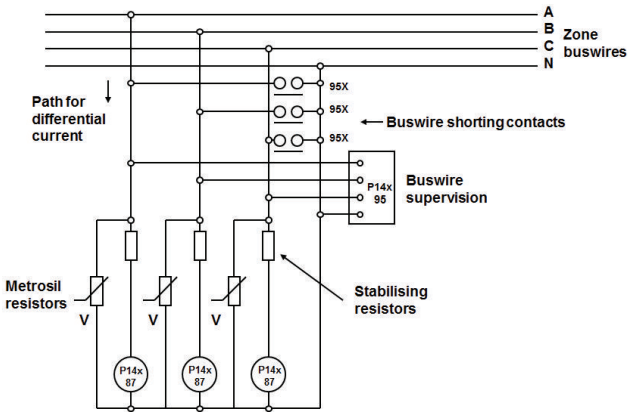


Figure 1: Typical high-impedance protection scheme

High impedance busbar protection is an alternative to biased differential bus protection. In the latter case, stability for external faults is achieved by a percentage bias slope. Conversely, in high impedance schemes the stability is achieved by virtue of a deliberate high impedance (a resistor) being added into the spill current path of the CT secondary circuit. This ensures that the differential current due to any saturated CT is minimized to a level which does not cause protection zone operation.

Should a CT become open-circuited in the scheme, this poses a fire and personnel safety risk in the substation. Depending on the level of load current flowing, zone elements may also be at risk of spurious pickup. Additionally, due to the high impedance in the scheme, the secondary circuit components may experience a prolonged overvoltage, for which they may not be thermally-rated. Supervision, to detect such scenarios, is essential.

In a traditional solution, Grid Solutions' MVTP relay is added, to detect open circuit scenarios by sensitive overvoltage detection. The P14x scheme now offers the advantage that in a numerical scheme, this function is integrated in the same device as for the zone differential element, to minimise the space occupied in relay panels, optimize cost and engineering time, and offer faster commissioning. The relaying for the zone is in one box.

Within Grid Solutions' P40 Agile range, the P14x series offers the perfect solution for high impedance busbar protection.

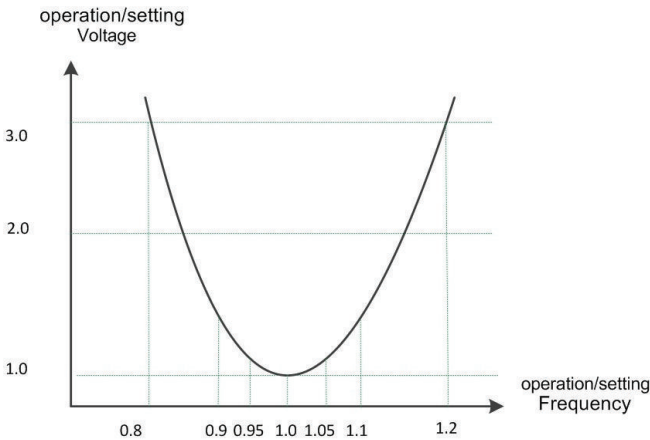


Figure 2: Sensitive overvoltage characteristic for buswire supervision

DEVICE TRACK RECORD

Market leader in high impedance busbar protection, with over 14,000 MCAG34 and over 12,000 MFAC34 units delivered

Market leader in buswire supervision, with over 13,000 MVTP units delivered

P14x series introduced in 1999. Worldwide application, with over 125,000 units delivered

Addition of IEC 61850 protocol in 2006

Switchable PRP/HSR and IEC61850 Edition 2 introduced in 2015

Buswire supervision feature launched in Grid Solutions' P14x in 2015

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