AUXILIARY, TRIP & SUPERVISION RELAYS

While digital protection systems have replaced electromechanical relays in many applications and types of service, there are still many areas where the traditional relay reigns supreme and is likely to do so for years to come.

The effect of a fault on a power system is dependent on the speed with which the fault can be detected and isolated. Modern protection schemes incorporate ever increasing functionality through the application of digital techniques to protection relay technology. While this technology has already replaced many old designs such as induction disc overcurrent relays, the requirement for highly reliable auxiliary, tripping and supervision relays largely remains. This is particularly evident where compatibility to high voltage switchgear is required. Electro-mechanical multi-trip relays remain the preferred option for a wide range of functions such as:

- Interfacing signals from protection relays where the required number of contacts exceed the number of protective relay contacts;
- Circuit breaker tripping where the trip coil power requirements exceed the protective relay contacts capacity;
- Where secure system lockout is required;
- Auxiliary trips to start backup protection timers, start disturbance recorders and signal classical SCADA systems;
- Flagged follower relays for transformer oil & winding temperature alarm and trip, buchholz gas & surge;
- Monitor trip supply voltage, the trip circuit & coil integrity through continuous energisation of the relay coil ensuring failure is detected and alarmed;
- Intertripping of switchgear via pilot wires which may have an induced AC voltage. The pilot receive relay can be designed to discriminate between the induced AC voltage yet still provide a high speed trip from the DC trip signal.

ELECTRO-MECHANICAL RELAY BENEFITS

Despite the maturity of the technology, electro-mechanical relays provide an array of useful characteristics including:

- High levels of electrical isolation between input and output circuits;
- A huge range of resistance between switch-on/switch-off;
- Many independent isolated outputs may be associated with one input;
- Physical ruggedness. Most relays can withstand massive short term overloads across both actuating and switching components;
- Relays are largely immune to electrical, radio frequency and other forms of radiation;
- High burden versions immune to capacitor discharge currents;
- Actuating voltages and currents are relatively uncritical;
- The operation of the relay is largely self evident making fault finding simpler;
- Innumerable switching configurations are possible;
- High speed operation;
- High visibility mechanical flags and latches provide non volatile memory and reset capabilities without the need for auxiliary supplies;
- Relative compactness considering the number of contacts possible per signal input;
- Proven field reliability;
- May be designed to discriminate between AC & DC inputs.

ELECTRO-MECHANICAL RELAY PERFORMANCE

Relay operating speed is an important factor when designing a protection or control system. In broad terms the faster the operating speed the higher the relay cost and coil power required. The use of high speed trip relays are therefore usually limited to applications where system fault clearance times are critical.

STANDARD SPEED AUXILIARY RELAYS

Many types of flag, interposing and repeat relays have a less stringent requirement in regards to speed of operation. In these instances there is little point in specifying more expensive and higher burden high speed relays.

HIGH SPEED TRIP RELAYS

High speed operation is defined as contact closure having occurred within 10ms at the rated operating voltage. At the maximum rating of 125% the contacts must not bounce beyond the 10ms limit. To achieve these characteristics requires very careful design of the coil and contact stack.

COIL BURDEN

High burden relay coils are suitable for application in high security circuit breaker tripping circuits and in particular where the initiating contact may be remote from the relay. The high burden also provides immunity to capacitance discharge currents to avoid false tripping. As the relay operate coil will not be continuously rated at the high burden level an economising element must be automatically switched in by the relay. This typically occurs in 10-20ms but a delay of 50-100ms may be specified to ensure that other series elements will have sufficient time to operate.

CONTACT RATING

The DC breaking performance of an electro-mechanical relay for inductive DC loads is the critical factor when direct tripping of circuit breakers is required. To achieve reliable switching operation on a load of 5 amps at 125V DC inductive (L/R=40ms) will normally require the fitting of magnetic blowouts adjacent to the contact stacks.

CONTACT BOUNCE

Contact bounce can occur due to the kinetic energy of the moving contact particularly in high speed tripping relays. This energy can be reduced by keeping the mass of the moving contact to a minimum and through the addition of anti-bounce buffers to provide a damping wiping motion when the contacts meet.

CONTACT CLEANING

The design of the relay should be such that the contact surface is kept clean to avoid high resistance contacts. In the most common form of armature attracted relays the contact surface is domed such that when the contacts are driven to an overtravel position they actually wipe. The wiping action serves to clean the contacts and also provides a damping action to assist in reducing bounce.

CONTACT CONFIGURATION

Contact stacks are available in mixtures of normally open, normally closed and/or changeover. The contacts can be specified to be latching or non-latching.

SUMMARY

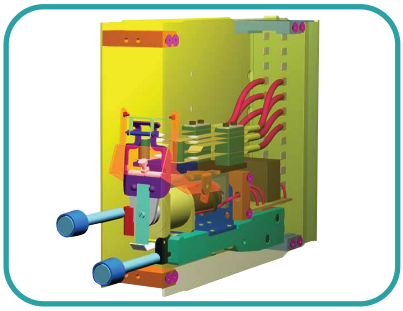
There remains a strong argument for the retention of electro-mechanical relays to provide auxiliary, tripping and supervision functions in modern protection relay schemes. The key benefits offered by mixing technologies within the one system include:

- Lower total system cost achieved through the selecting of the appropriate relay technology for a particular task;
- Increased system security by reducing the likelihood of multiple device failure due to a common fault mechanism;
- Compatibility with existing equipment for system refurbishment and upgrades;
- Compact high performance electro-mechanical relays can directly trip HV circuit breakers with high trip coil ratings;
- Electro-mechanical relays still provide a low risk fast track option for design engineers.

For further information please contact Relay Monitoring Systems:
www.rmspl.com.au

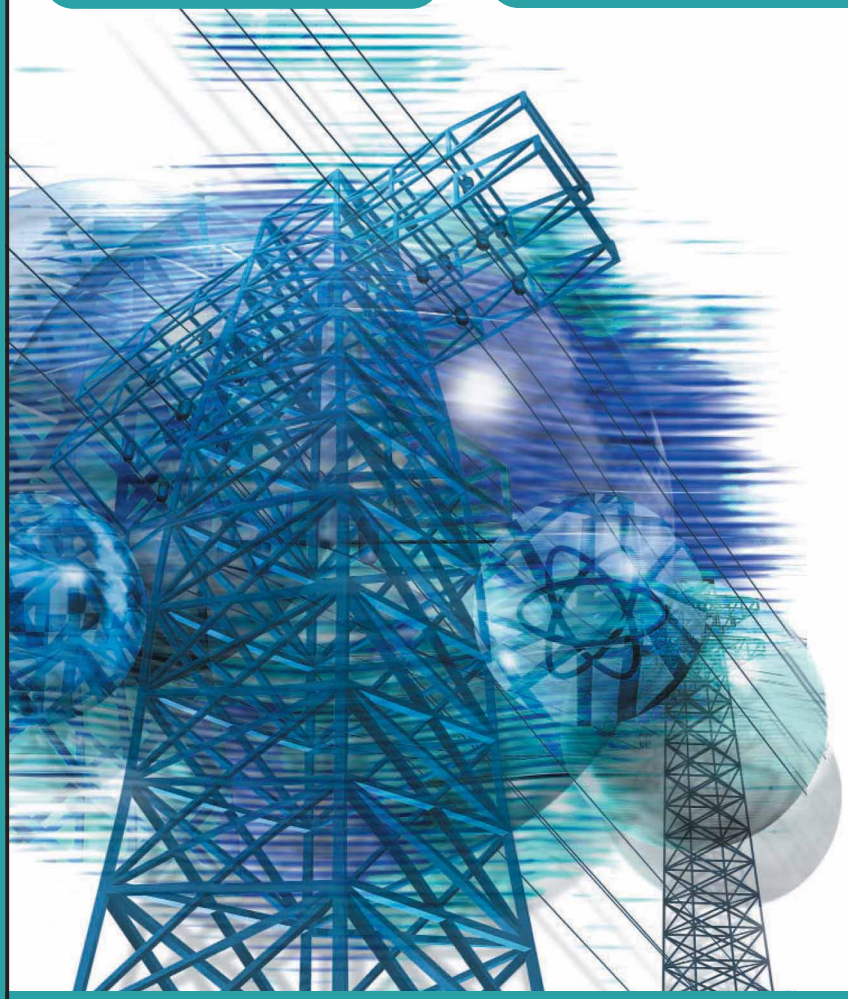
Auxiliary, Trip & Supervision

RMS 6RM QUAD
4 Element Flag Relay



RMS 2HSM
High Speed Trip Relay

SMITT D
DIN Rail Plug-in Relay



- 6R MATRIX range of auxiliary, trip and supervision relays
- Models equivalent to MVAA, MVAJ, MVAX
- 2HSM series of high speed trip relays, (<10ms) with up to 20 heavy duty contacts in any combination
- 6RM series of auxiliary flag relays, instantaneous or slug time delayed in 1,2,3,4 element versions
- 1TM series of trip circuit supervision relays, including supply supervision and trip circuit supervision with CB open or closed
- SMITT D Plug-in relay with 4 C/O contacts
- SMITT D-I Plug-in current operated relay with 2 C/O contacts
- SMITT B-D Plug-in bistable relay with 3 C/O & 1 N/C contacts
- SMITT KDN Plug-in mechanically latching relay with 8 C/O contacts

leading the way in auxiliary relay solutions

Relay Monitoring Systems Pty Ltd
6 Anzed Court Mulgrave Victoria 3170
Telephone: 61-3-9561 0266
Facsimile: 61-3-9561 0277
Email: gavin.ogorman@rmspl.com.au
Web Site: www.rmspl.com.au