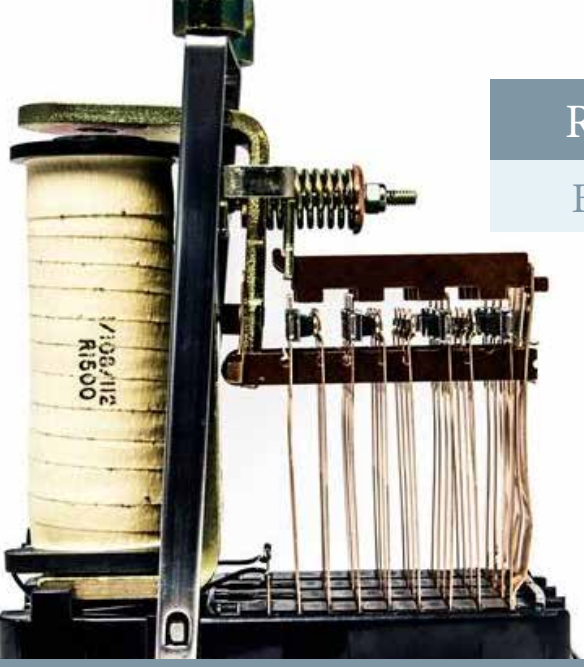
SIEMENS



Relay Solutions

BR 930 SERIES

Siemens.com/mobility

Q Style Relays - General Information

Style Q-Relays are based on a series of designs for 'miniature' plug-in relays developed by a committee of the Institution of Railway Signalling Engineers (IRSE)

Overview

These relays offer considerable size and cost savings when compared with the previous large plug-in and shelf types. Careful attention to detail design culminated in the production of a safe, dependable and efficient relay, within a standardised, minimum space envelope.

A method of safety interlocking was evolved such that only those units compatible with the plugboard could be mounted. More information on inter-locking may be found in succeeding pages.

British Rail (now Network Rail) subsequently approved the IRSE designs and published them as a series of B.R. Specifications, starting with B.R.930.

This specified the requirements for a basic dc, neutral, tractive-armature relay; subsequent releases covered varieties such as ac immune and biased types.

A diverse range of relays to B.R. Specifications is currently available and these may be used with confidence for general signalling applications.

All Q-Relays conform to B.R. 930 in general and many comply with related B.R. specifications.

Siemens also produce a large number of Q-Relays for which no specific B.R. Spec. applies (e.g. non-standard contact arrangements, voltages etc). Although Siemens produces probably the most extensive range of BR 930 series relays on the market, enquiries for units not listed in the catalogue are always welcomed.

Millions of B.R. 930 series Manufactured Q-Relays are in service world-wide, providing high-reliability control of railway signals and associated

Description

EMC COMPLIANCE

Style Q-Relays comply with the relevant emission requirements of EN 55014. It is considered that these relays have inherent immunity to in-service electro-magnetic disturbance.
A Technical Certificate for EU Directive on EMC (89/336/EEC) has been obtained.

INSECT PROOFING

In tropical countries, ingress of ants and other small insects into the relay enclosure can sometimes cause trouble. Siemens has evolved a method of sealing susceptible Q relays with a high performance flame retardant encapsulation resin based on urethane technology using a polybutadiene based material. The resin retains flexibility at temperatures between -60°C and +120°C, has excellent electrical properties and low moisture sensitivity.

PACKAGING

Q-Relays are normally packed in a carton holding ten relays; the same container is used for quantities of four to nine relays. Quantities less than four are packed individually in cardboard boxes, as are all train-carried relays. Each container has a bar-coded label affixed to the outside, stating details of the packaged relay(s) and the quantity therein.

RELAY TYPES

Style Q units comprise three main categories:

- Single Relays
- Twin Relays
- Miscellaneous relay units

Single relays
Single Relays are the most common type and Siemens offers a large variety to suit many railway signalling application.

Twin relays
Twin relays offer space and cost advantages when less contacts (eight maximum each relay) are required. Both relays are normally identical in form and function. They fit within a single relay case but due to space constraints the variety of twin relays is limited.

Relay units
Relay units are normally used in conjunction with relays in signalling circuits and consist of components such as transformer/rectifiers, timers, resistor units etc.

MOUNTING

The relay must be mounted so that its coil is horizontal along its length.

RELAY CONSTRUCTION

Common Features
All relays and relay units (apart from train carried relay which use white polyester material) use a robust glass-filled phenolic thermoset base moulding on which are located the various parts of the relay.

Most relays feature a transparent polycarbonate cover, held in place by an internal support strap which, in turn, is secured by fasteners that also hold the unit carrying handle to the cover. Nylon sealing plugs conceal the handle fixing nuts, deterring unauthorized entry and providing tamper evidence. A self-adhesive polyester label attached to the front of the cover carries information pertinent to the relay.

Safety-interlocking with the plugboard is accomplished by the use of pins fitted into holes in the rear of the base moulding and retained by a plate whose fixing screws are protected by tamper-evident seals. Five pins are normally used and their configuration may be governed by a numerical B.R. Pin Codes, other code series using-extra pin position such as S or X.

See Plugboard section for layout and identification of interlocking holes.

Single Relays
Various contact arrangements may be built-up to give a maximum of 4 contact pairs in each of 2 or 4 stack slots in the base moulding and these (contacts) may be Front (NO) or Back (NC), as required. The two outer stacks (A and D) each allow for coil connections to be made. Certain relays (such as sensitive, high percentage release types) require the use of a large heelpiece. In these cases no contacts can be fitted in positions 7 and 8.

Correct contact separation and insulation is normally achieved by the use of polycarbonate spacer blocks. Phenolic spacers are specified for contactor and thermal timer relays. Each stack assembly is secured by a torqued screw featuring a security head.

The magnet assembly (in its simplest form) consists of a cylindrical core, heelpiece and armature. The core and L-shaped heelpiece locate in the base moulding and are secured by the core retaining nut. The armature pivots on the (slightly angled) front end of the heel-piece and is constrained by a pivot plate. Armature return torque is provided by an adjustable helical spring, Front contact pressure and gravity. A small phosphor-bronze residual pin, riveted to the armature, prevents 'sticking' on release.

The relay coil is usually wound on a bobbin which slides over the core, although some relays use a coil wound directly onto the core, with press-on end cheeks providing constraint. Depending on the type of relay, additional items such as slugs and shunts may also be fitted over the core.

Contact springs are phosphor bronze and have specially shaped ends which extend through the relay base such that they make electrical contact with the plugboard connectors when the relay is plugged in. The springs are low rate to minimise changes in contact pressure due to wear over long periods of time.

Contact tips are normally of the non-weld type and thus suitable for safety-critical applications. Fixed contacts have silver impregnated graphite (SIG) tips carried in small clips; both tip and clip are soldered to the spring. Moving contacts have silver (SIL) tips, riveted and soldered. The contact pair is commonly referred to as SIG-SIL.

Heavy duty contacts (usually SIG-SIL) are suitable for high currents but require the use of ganged wiring and connectors.

Relays with weld-resistant 'Elkonite' (ELK-ELK) contact pairs are available where currents up to twice those allowed for SIG-SIL contacts must be switched.

Note: Elkonite contacts are silver/cadmium oxide.

Silver/palladium (SIL/PALL-SIL/PALL) contact pairs are occasionally used for non-critical low voltage, low current applications.

Silver-to-silver (SIL-SIL) contact pairs are available on some relays for special purposes.

When a relay is viewed in its normal fitted position (coil beneath the contact stacks) the following statements are valid:

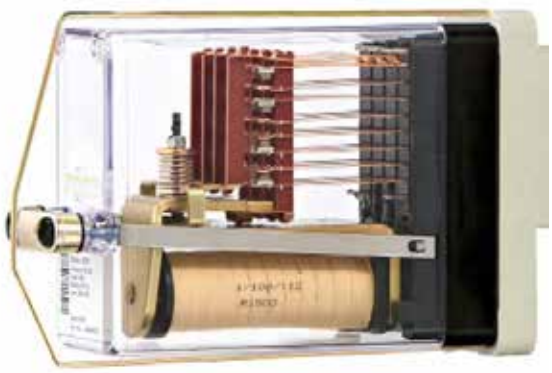
- Back contact pairs have the fixed contact below the moving contact.
- Front contact pairs have the fixed contact above the moving contact.

Moving contacts are operated by armature movement via synthetic resin bonded fabric (SRBF) operating arms. Castellated SRBF adjustment cards support the fixed contacts in their correct positions. Each card (one per stack) is held at one end by a support spring, which also guides an operating arm; the other end slots into a steel support bracket mounted above the pivot plate and riveted with it to the heelpiece. Both spring and bracket may be manipulated to achieve correct operational performance.

Twin Relays
These are similar in construction to single relays but have two coil and armature assemblies attached to a single heelpiece. Each independent armature can operate up to eight contacts in two adjacent stacks. Constructional details are otherwise as described for single relays.

Relay Units
A wide variety of devices assisting relay control functions are able to be mounted within the Q-Relay enclosure These may be simple, such as a single adjustable power resistor (QR14)` or more complicated unit containing 4 miniature relays (QR15).

In all cases, electrical wires are terminated at coil-type connectors, located and built-up in the same way as normal, switching contact stacks.



Representation of Relay, Plugboard and Retaining clip
(Clip Part No. J4136/1)

TEMPERATURE RANGE

The relays are designed to function within the temperature range of –20°C to +60°C.

Note: Prolonged exposure to ambient temperatures above +55°C with high humidity will shorten the life of the relay.

Reliability Figures
Mean Time Between Failures (MTBF): 2.56 x 10^6 hours.
Mean Time Between Wrong Side Failures (MTBWSF): 6.89 x 10^9 hours.

The calculated MTBF value quoted is derived from the geometric mean of three figures taken from in-service experience on London Victoria Line, Hong Kong and Singapore.

The calculated MTBWSF value quoted is derived from the geometric mean of three figures from the following data:

a) BR 'Statis' Reports,
b) Data provided by BR Technical Investigation Centre for London Underground Limited,
c) Metro Services experience at various locations.

The Q relay family of 'vital' relays are commensurate to SIL 4.

CONTACT RATINGS

Standard Safety Contacts (Sig-Sil)
Continuous current : 4 A dc.
Switching current: 12 V dc 24 W lamp load or 3 x BR.930 relays rated at 3 W each.

Note: The Q-Relay contact switching capability greatly exceeds this minimum BR. spec. load requirement; details of other loads are available on request.

Switching (DC) Resistive: 25 VA, 125 V max*
Switch (DC) Inductive: 9 VA, 125 V max*

Note: 1 * These Ratings may be doubled for AC.

Note: 2 Although 125 V DC maximum is quoted, it is advisable to restrict the voltage to 70 V DC, with 2 contacts connected in series for higher voltages.

Note: 3 Contact ratings may be exceeded at the cost of reduced contact life.

Note: 4 The above switching data is based on 1 million cycles.

Heavy Duty Contacts (Sig-Sil)
Continuous Rating: 7 A carrying.
Switching Current: 2 A @ 110 V dc Inductive.

Elkonite Weld-Resistant Contacts
Continuous Rating: 6 A dc.
Switching Current: 4 x 24 V dc, 36 W lamp load.

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