Shared Learning

SL027/18 – Selection of Suitable Circuit Protection

Background

For a number of reasons the design process associated with the selection of circuit protective devices for signalling functional circuits needs to be refreshed.

This Shared Learning flags the need for signalling designers to make informed engineering decisions about protection based on a competent understanding of electrical theory.

The Signalling Design Handbook (SDH) Module B4 has been re-published as part of a wholesale SDH refresh and contains the following guidance:

Functional Circuits

Functional circuits cover signalling circuits up to circa 110V AC and 120V DC.

The new SDH is specific about prescribing the need to protect operatives from inadvertent shock for designed changes to installations containing supplies:

a) equal to or exceeding 25V AC or

b) equal to or exceeding 50V DC or

c) supplies capable of delivering 25A.

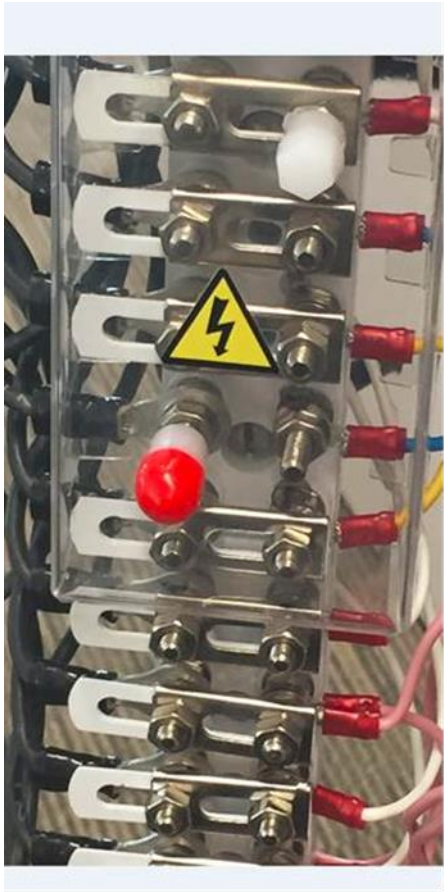
Note the revised thresholds.

Shrouds are available, specially manufactured to fit over open terminals and fuse carriers of the usual signalling variety (2BA et al).

Designs *SHOULD* specify their addition when prescribing changes since it makes clear to the installer the requirements for what is a very low cost improvement (*and thus not unreasonable to do*).

Functional Circuits

Note ‘should’ *(on the previous slide)* as it’s unusual to prescribe all the supporting component piece parts of an electrical installation in the design since these details are given elsewhere in supporting NR Standards such as BRS-SM 440 drawings or The Signalling Installation Handbook.



Shroud fitted to 2BA links

Miniature Circuit Breakers

The new SDH formally introduces the use of Miniature Circuit Breakers (MCBs) for protection with the advantages:

- by comparison to fuses: indestructible
- less likely to be replaced with incorrect substitutes *(unlike fuses!)*
- intentionally provide switching and isolation
- can provide double pole isolation.

Fuse & MCB Selection

Fuse and MCB selection MUST:

- Be appropriate for the form of supply, AC or DC – they are not necessarily interchangeable!!!!!
- Be appropriate for the type of load i.e. slow acting when surge or inrush will be experienced or fast acting to protect more delicate loads.
- Be sized to avoid ‘tiring’ where the load is close to the rating.
- Be able to (at least) protect the circuit wiring.
- Discriminate with the next protective device upstream *(but see next slide)* and thus minimise the number of circuits disconnected under a fault condition.

Design Process

The design process should follow a logical step-by-step approach:

1. Establish the steady state load.
2. Add a *suitable and sufficient* headroom and choose a protection rating being mindful of preferred values of fuse or MCB.
3. If the device is not rated for the short-term inrush or transient which the load exhibits then increase the rating accordingly.
4. Compare the ‘discrimination bands’ or lollipop diagrams for the devices and ensure, where discrimination is required (not always the case - engineering judgement needed here!), the intended compatibility is achieved upstream and downstream.
5. Check that all circuit components exceed the rating of the protective device.
6. Deal with unusual circumstances by thinking critically about them.

Design Process

7. Be specific about the chosen device e.g. 6A BS88 alone is not enough and should be qualified as appropriate – 6A BS88, type gG, size A2, 690V AC rated.

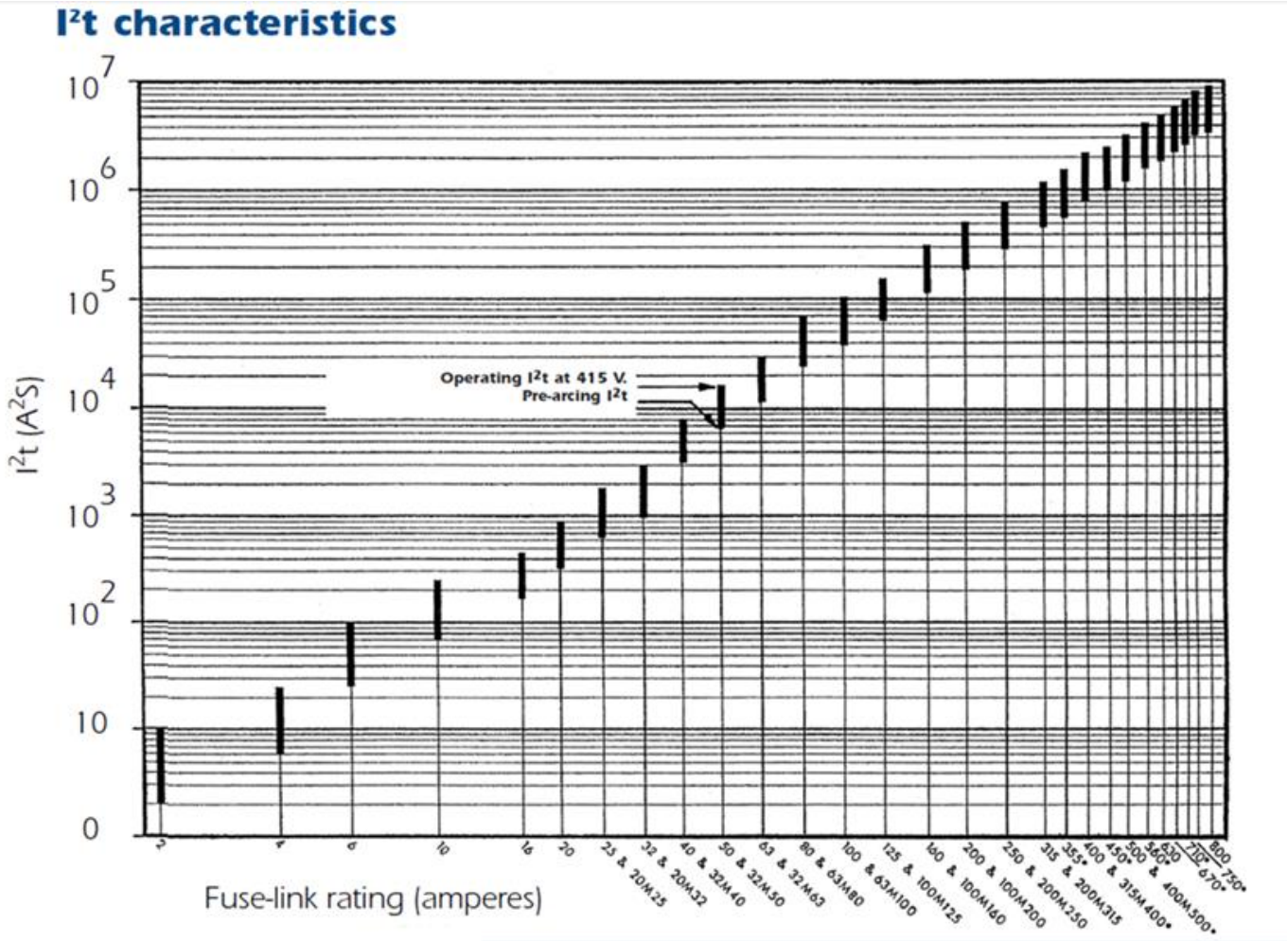
   Quoting a manufacturers part number will often simplify this e.g.

   TIA6 = 6A BS88, type gG, size A2, 690V AC rated

   Littelfuse 326 = DEF-STAN 59-96 Pt1, ceramic, size 0, time lag

Fuses and MCBs can be intermixed subject to sensible selection of the current rating and speed of trip criteria.

Design Process



TYPICAL Lollipop Diagram *(this one for BS88 fuses)*

Further Information

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