NHP

TECHNICAL NEWS

Issue 1

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Quarterly Technical Newsletter of Australia's leading supplier of low-voltage motor control and switchgear.

IN THIS ISSUE

WELCOME TO THE INAUGURAL EDITION OF NHP TECHNICAL NEWS!

We welcome you to this the first edition of the NHP Technical News. Three to four publications will be produced annually, providing a wide range of application and design criteria for the motor control and distribution fields.

The details provided in this, and future issues, is actively supported by our numerous Principals, and also our extensive field and technical personnel throughout Australia.

FEATURE ARTICLES

As a lead up to the forthcoming feature articles we will begin with a fundamental application study which we trust will bring about a more knowledgeable approach to motor starters for their ultimate application, rather than a somewhat 'hypothetical' approach to what may work.

YOUR INPUT

Your input on the articles published is most welcome, and we look forward to receiving details of any special or interesting application problems.

We will endeavour to present articles in a non-promotional manner - that is, on their technical and/or application basis only, however, reference will be made from time to time to product types or features for clarification purposes.

This first issue covers some basic application studies in voltage drop/interruptions, with some simple, yet effective means of overcoming these problems.

'WE LOOK FORWARD TO HEARING FROM YOU'

Motor control equipment

2

Contactor control circuits and power supplies

POWER SUPPLIES

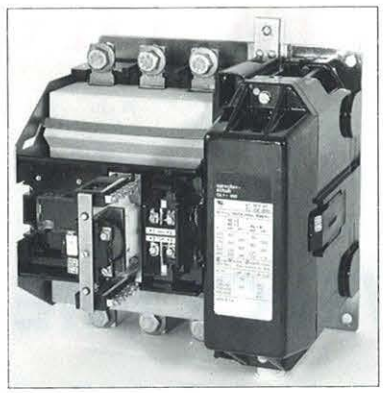
Momentary loss of voltage in power supplies can lead to a number of problems, not the least of which could be an interruption of a production process or essential supplies in hospitals, buildings, etc.

Often the supply loss is of a short duration; perhaps just a few cycles. The effect on computers and similar apparatus is well known, and solutions such as the use of a UPS (Uninterruptable Power Supply) are readily employed.

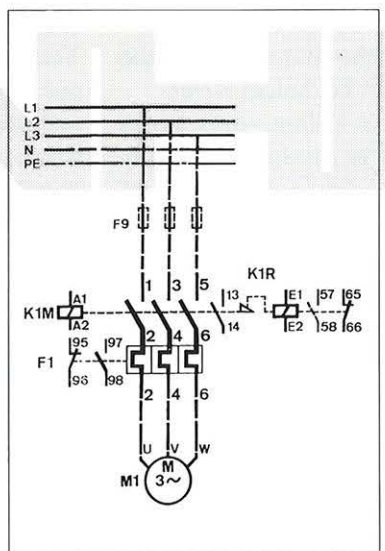
However, temporary loss of voltage in contactor and motor control circuits can also result in operational difficulties, and such situations are discussed further :-

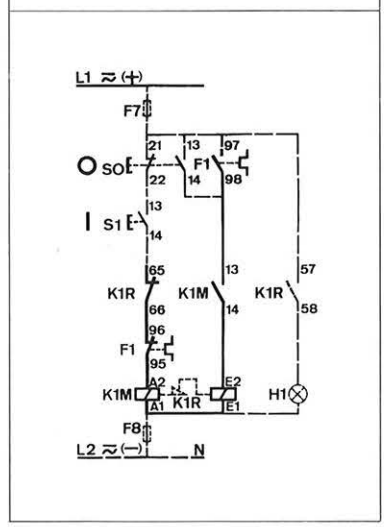
LOSS OF VOLTAGE

The loss of voltage may not be complete as it may only occur in one phase, dip to, say, 50 per cent of normal (brown-out); or alternatively all three phases may dip simultaneously due to the starting of large loads elsewhere in the system. In such cases it is possible to offer some solutions to the most common causes. ■



Typical contactor with mechanical latch





Latched contactors circuit diagrams

Latched contactors

The addition of a latching device to standard contactors allows the contactor to remain closed for extended periods of time without the need for coil power. This may be advantageous in situations where there is a possibility of short supply failures. Such failures are frequently encountered on networks, particularly when HV overhead lines are struck by lightning, causing temporary opening and re-closing of the HV protection devices.

POWER DISTRIBUTION

In other applications the contactor may be used for power distribution switching, such as for automatic lighting or general power reticulation. In these cases temporary loss of only one phase (which could be the control phase), does not necessarily mean that services on the other phases should be disconnected.

The advantage when using a latched contactor is that part of the lighting or distribution network can continue to function.

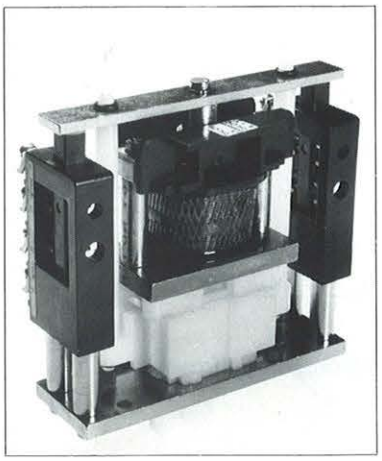
With motor starting contactors, a short supply dip or interruption may not necessitate the contactor disconnecting the load. Of course, this would depend on the application, and care must be taken to ensure that the contactor can be released when required.

OPERATION OF THE LATCH

The latching device can be fitted to contactors, as shown in the illustrations. The contactor coil, K1M, is energised momentarily to close the contacts. Once closed, the contacts remain in this position held by the latching mechanism. The latch incorporates a release coil, K1R, which needs to be energised momentarily in order to release the contactor.

If necessary, the latch coil can be energised from a separate source or DC supply voltage.

Because latch coils are not intended to be permanently energised, the circuit should be arranged in such a way that voltage is removed from the latch coil as soon as the contactor is released. ■



Mechanical latch

Contactors with delayed drop-out

Some contactor ranges utilise a DC controlled magnet system fed via a rectifier, and can therefore be used with both AC and DC control supplies.
A closer look at the internal control system of these contactors reveals a twin coil arrangement. By utilising the stored energy of the coils, and additional components, the contactor can be arranged so as to give different drop-out delays.

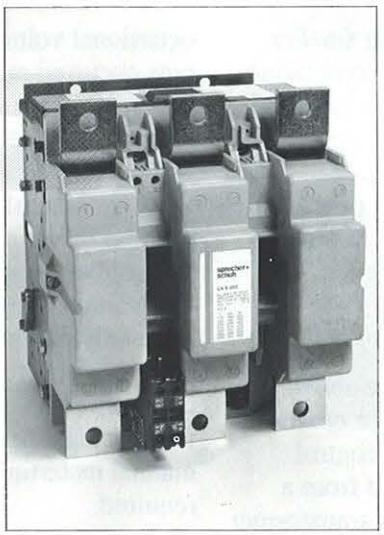
The standard contactors are delivered with the drop-out delay set to 150-200ms. By making simple wiring changes inside the control module the delay can be increased to between 0.5 and 1 second. Alternatively, breaking the supply directly in the coil supply (DC side) will result in a release time of approximately 20ms (M1 + M2).

DELAYED RELEASE FEATURE

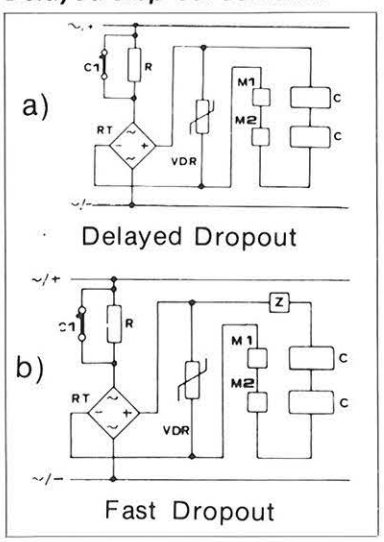
The delayed release feature is of particular benefit in areas with weak supply networks. With short supply dips, or momentary loss of voltage, the contacts will remain closed.

This feature will also prevent contactor 'chatter', and, as a result, the reliability of the main contacts are not jeopardised. In addition, because the contactor stays closed during short power dips it will not be necessary to manually restart the switched load (usually a motor), therefore reducing the possibility of production down-time.

From an operational point, the delayed drop-out feature also prevents 'pumping' and uncertain operation, particularly when controlled via series devices such as pressure switches and thermostats. ■



Delayed drop-out contactor



Circuit diagram - typical delayed drop-out contactor

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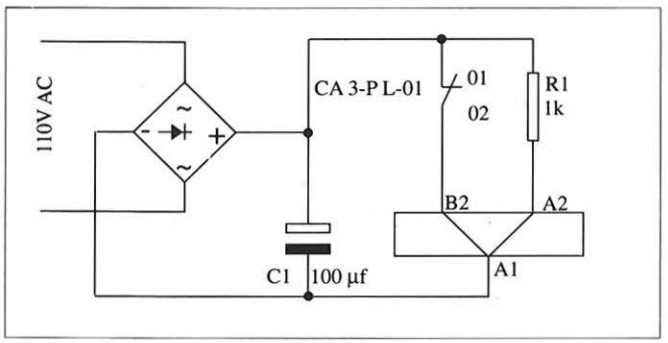

Typical delayed drop-out circuit

Customising delayed drop-out control

When using smaller contactors the coil cannot provide sufficient stored energy to give any appreciable delay. However, it is possible to use additional components to provide the required delay drop-out facility.

In the example above, contactors were controlled by a 110 volt control supply derived from a control circuit transformer common to many drives in a motor control centre. The nature of the supply reticulation was that occasional voltage drop-outs occurred at irregular intervals. This resulted in contactors de-energising, necessitating the need for manual restarting of those drives controlled by pushbutton stations. The voltage drop-outs were only of a short duration, yet production downtime was unacceptable because manual restarting was required.

For those important drives affected, the contactors were fitted with standard 110 volt DC coils which incorporate a pull in and hold winding. Utilising the existing 110 volt AC supply, each contactor circuit was fitted with a bridge rectifier, capacitor and resistor.

The addition of a rectifier and electrolytic capacitor raised the DC voltage to approximately 165 volts, requiring the addition of a resistor R1 to limit voltage on the hold winding to 110 volt DC. Using the components shown, the contactor will hold in for a time duration of approximately 0.5 seconds.

This was sufficient time to alleviate unwanted interruptions to the process caused by other dips. For longer voltage drop-outs the motor drives had run down sufficiently low to necessitate restarting in any case.

The values shown apply to Sprecher + Schuh contactors CA3-37 to CA3-72 (18.5-37kW). ■

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