



MOTOR PROTECTION & CONTROL TECHNOLOGY

Protection terms and definitions

Earth fault protection:

Earth fault protection is coarser than earth leakage protection and is detected at 10% of the running load of the motor. Currently, this feature is only available on the NewElec 320-327 M relays. The factory default trip time setting is 1s, however, it is possible to alter this time to 100ms if preferred. This must be stipulated at the time the order is placed.

In order to protect switchgear such as contactors from opening under a severe fault condition, the relay can be fitted with an extra changeover contact set which will be used by the protection relay to back trip the circuit breaker via a shunt mechanism ONLY on such faults. This feature does not make use of a separate core balance current transformer but relies instead on the measurement of spill current from the star point to earth of the sensing phase current transformers.

Earth leakage protection:

Some NewElec motor protection relays afford the user earth leakage protection with a sensitivity of 250mA. Where it is offered (refer NH; NI; NJ; NK and MA relays) the curve is instantaneous with a trip delay of 100ms. In the case of the MA relay, the sensing threshold is programmable up to 1A. The relays are designed for harmonic filtering therefore allaying fears of nuisance trips usually associated with large increases in rush currents and / or variable speed drives. Separate logic circuit conditions always ensure that the main circuit contactor is never opened under a fault condition rendering it likely to weld shut on opening.

To circumvent this possibility, some relays will not energise the main trip contact if the fault current exceeds 800% of motor full load setting while others will energise a separate dedicated earth leakage changeover contact to permit the interruption of the up stream circuit breaker through a shunt mechanism. NewElec also designs and manufactures dedicated products with only earth leakage protection which provide economical earth leakage protection solutions particularly aimed at variable speed drive applications. (Refer to the NewElec GA range of relays). The detection of earth leakage currents in all these instances is done by means of a core balance current transformer.

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Fail-safe:

Should the auxiliary power supply to the relay be interrupted, the relay will de-energise the main trip contact in order to disrupt the supply to the motor.

Initialisation of thermal memory:

The NewElec LA series motor protection relay when used without the optional NiCad backup battery, will on interruption of the auxiliary supply, reset the relay with a hot curve Class 5 setting, and will over a period of time, integrate back to the Class 15 cold curve.

Jam or running stall protection:

This feature inherent in the design of the NewElec NJ; NK; 320; MA and KC relays greatly minimises the risk of mechanical damage to the motor drive components as a result of running stall and excessive over torque conditions. This feature is activated upon the completion of the start sequence of the motor only. The aim of this protection feature is not so much to provide protection for the motor but as to provide a rapid disconnection of the supply to the motor in the eventuality of a locked rotor condition which could damage associated plant equipment. NewElec can also supply a dedicated relay that addresses this specific problem on its own (see OLR 8)

Locked rotor protection:

All NewElec relays protect motors against locked rotor conditions, which may occur on start-up or while running. The trip times will be a function of the difference between the remaining thermal capacity available to the motor and the thermal capacity already utilised at the time that the event occurs. Generally speaking, a time in the order of five to seven seconds can be expected.

During this period, and because the given motor will attempt to supply both the necessary power and torque, it is possible to incur mechanical breakdowns as a result of over torque. The motor will however be protected.

To circumvent possible mechanical breakdowns as a result of such incidents, some NewElec relays are fitted with a jam or running-stall protection feature. (Refer previous paragraph).

Overvoltage protection:

In the eventuality that the mains supply voltage is sensed to be greater than 115% of the rated supply voltage, a 10s trip delay will be initiated. Some relays in the NewElec range may permit the user more programming latitude both in respect to sensing threshold and trip delay.

Overload protection:

All NewElec relays provide accurate overload protection for both cyclic and sustained overloading conditions. Cooling time constants are differentiated for an overloaded motor, which is still running, and one whose supply has already been disconnected by the protection relay as a result of an overload. NewElec relays calculate remaining thermal motor capacity as a result of sustained or cyclic overloading patterns. Selectors and specifiers should be aware that some competing products in this field only react to sustained overloading conditions and do not incorporate thermal imagery and / or memory in their design.

Phase loss protection:

Otherwise known as single-phase protection, all NewElec relays are designed to disrupt the supply to the motor in the eventuality that a phase should be lost. The standard trip time is 5s and will be effective even on motors running with no load. This trip time has been altered to 1s on the MA, KA and KC range of relays.

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Phase rotation protection:

Unless otherwise stipulated, phase rotation protection is achieved by phase voltage measurement so that it is unnecessary to actually start the motor to establish that it may turn the wrong way. It should be pointed out that irrespective of the method used in detecting phase rotation incompatibility, phase rotation problems can still be encountered if incorrect phase connections are terminated down-stream from the detection device. This shortcoming will be applicable regardless of which type or brand is installed for such protection.

Phase unbalance protection:

It is inherent in the design of all NewElec motor protection relays to disrupt the supply to the motor should the phase currents become unbalanced. The design of our relays ensures that this happens even if the motor is running at no load. The standard factory trip time setting default is 5s. In the case of the NewElec 320; 330 and M series the current unbalance-sensing threshold between phases is user selectable. Other relay designs offer fixed sensing thresholds ranging from 20 to 30% between phases.

Pre-loading of thermal curve:

As per IEC 255-8 protection, a relay with full thermal memory must take into account the actual load level that the motor had been operating at preceding the overcurrent condition. This is to ensure that the motor windings are protected from hot and cold operating conditions allowing full utilisation of the motor thermal capacity. If a motor has been standing for a 5 to 10 hour period, the thermal capacity available will be that specified for the cold curve class, but if that same motor has been operating at 90% load for 1 hour without any overcurrent conditions, the thermal capacity available will be that specified for the hot curve class. The adjustment of the thermal curve class in this condition is known as pre-loading and allows capacity to be utilised when it is available but does not allow the overloading of the motor.

Relay healthy:

An LED display indicator confirming that there is supply power to the relay and that the relay has passed an internal self-diagnostic. The relay is ready for use.

Restart contact:

A dedicated changeover contact designed for inclusion in the usual starting circuit of a motor.

Restart timer:

This is used in conjunction with the underload protection device as featured in some NewElec relays. It enables the user to select a time delay after which the motor protection relay will restart the given motor. Should the motor current consumption again be below a desirable level, the process will be repeated until such time as the motor draws an appropriate load.

Short circuit protection:

Short circuit faults will be detected by the NewElec 320-327 M relays. The detection threshold is 11 times motor full load setting with a factory preset trip time of 1s. However it is possible to alter this time to 100ms if preferred. This must be stipulated at the time the order is placed. In order to protect switchgear such as contactors from opening under a severe fault condition, the relay can be fitted with an extra changeover contact set which will be used by the protection relay to back trip the circuit breaker via a shunt mechanism ONLY on such faults. The NewElec 100 M series enables the user to set short circuit detection thresholds ranging from 7,5 to 12 times motor full load currents.

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Thermal lock out period:

After an overload trip, the entire thermal capacity of the motor has been utilised. Automatic (if selectable feature on model is used) or manual reset modes will only be tolerated by the relay when the motor has regained a minimum of 33% thermal capacity.

Thermal Memory:

All NewElec relays are designed to calculate motor thermal capacity utilisation as well as remaining thermal capacity at all times. NewElec relays do not permit an operator to restart a motor that has just recently been disconnected from the main supply as a result of an overload trip. Similarly, where a relay is fitted with a user-selectable auto reset facility, it must be emphasised that such an auto reset is only applicable to an overload condition AND always subjected to a cooling off stage FIRST, before the motor may be re-started.

Underload or undercurrent protection:

A condition where a given motor is running below a user-selected load threshold signalling either a total drop in load, a mechanical fracture of sorts or loss of efficiency. In some instances such a condition could cause the collapse of a motor especially where such a motor benefits from the cooling action of the medium it is pumping. NewElec offers this feature in the K and MA ranges only but also has an independent undercurrent relay for this unique purpose. The condition must exist for at least 15s. NewElec can also supply a dedicated product specifically aimed at addressing the needs of such applications (see UCR 80).

Undervoltage protection:

In the eventuality that the mains supply voltage is sensed to be less than 90% of the rated supply voltage, a 10s trip delay will be initiated. Some relays in the NewElec range may permit the user more programming latitude, both in respect of sensing threshold and trip delay.

Voltage phase symmetry protection:

In the eventuality that the phase voltages become unbalanced by more than 110%, a 10s trip delay will be initiated. Some NewElec relays may permit the user more programming versatility both in respect of sensing threshold and trip delay.

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