

Application note AN520

Task

Supervision for wire break and blown fuse

Description

Supervision of a motor for wire break and a blown fuse on one or more phases.

Unipower

For this task the Unipower HPL500 will be used.

Setup

HPL500 is set up for supervision with one max limit and one min limit. It is of no importance which limit is max and which is min, but in this document it is assumed that limit 1 is max and limit 2 is min.

Voltage Range must be set to the nominal voltage for the motor.

Current range should be selected so that the rated motor current is covered. This poses two scenarios:

- a) Current < 40A – i.e. the internal CT is sufficient
 - b) Current > 40A – i.e. an external N/5 CT is needed
- a) Simply select the current range needed to cover the rated motor current.
b) When using an external CT chose the smallest CT big enough to cover the rated motor current. Then select the current range in the table corresponding to the external CT.

Start timer (T_s) must be set large enough to filter out the start up current for the motor. If set too small, an alarm will occur at start up. If set too large, damage to equipment might occur if an alarm condition is present at start up. So please set T_s just large enough for the motor to be at nominal speed when T_s expires.

Limit 1 must be set as max limit (Parameter P01 = Hi).

Limit 2 must be set as min limit (Parameter P02 = Lo).

Set points could be set using the peak detectors; Leave the motor running at maximum acceptable load and read the max- and min-peak values. The set point for limit 1 (max) should be assigned a value appropriately above the max peak value and the set point for limit 2 (min) appropriately below the min peak value.

Response timers (Tr_1 and Tr_2) must be set according to the need for intervention due to overload. Typically values below 0.5 seconds are applicable for overload protection, but an exact value cannot be given here. Especially the response timer for limit 2 should not be set too short (Larger than 0.1s), since the measurement needs to drop below 5% before expiration.

Mode of operation

Wire break or a blown fuse may occur in one or more arbitrary phases;

If phase L1 or L2 is cut off a supply wire for the HPL500 is cut off and the unit will most likely shut down. This results in both relays disconnecting and an alarm condition is signalled. It may occur though, that the motor will generate the missing phase itself and thereby supply the HPL500 itself, since the HPL500 has a very small consumption. When the motor generates the missing phase itself, the current in the remaining phases will rise dramatically resulting in an excess of the max limit and the HPL500 will generate a max alarm and disconnect relay 1.

If the phase L3 is cut off the HPL500 will not measure anything and the min limit is exceeded – hereby generating a min alarm and a disconnection of relay 2.

In this way the HPL500 supervises for an arbitrary wire break or blown fuse. All that remains is to make sure no faulty alarms occur when stopping the motor deliberately; If no precautions are taken the HPL500 will generate a min alarm every time the motor is stopped. This may be prevented by connecting a break switch from the motor contactor between input S2 and gnd on the HPL500 (terminals 16 and 14) – see schematic below. A connection is hereby established between terminals 14 and 16 every time the motor contactor is off – and the motor is shut down. Now the S2 input on the HPL500 is active and the HPL500 will ignore any alarm condition – in this case a min alarm.

Connection

The schematic below shows how the HPL500 may be connected to solve the task. It is important that the input S2 (terminal 16) is connected in such a way that a connection to gnd (terminal 14) is established when the motor contactor has cut off the phases to the motor.

In the example the two output relays are connected in series to produce only one signal for alarm for both limits. If it is required to be able to distinguish between an overload (limit 1) and an under load (limit 2), the relays must be connected to separate inputs in the controller circuit.

