

3 APPLICATION NOTES – TESTING SPECIFIC DEVICES

This chapter gives details of how to test many common types of protection device using the 50A-3PH.

3.1 Three Phase Over Current Relays

The configuration shown in figure 3.1 is suitable for testing over-current relays, and will measure the time delay between the time when the “on” pushbutton is pressed and the time the relay trips.

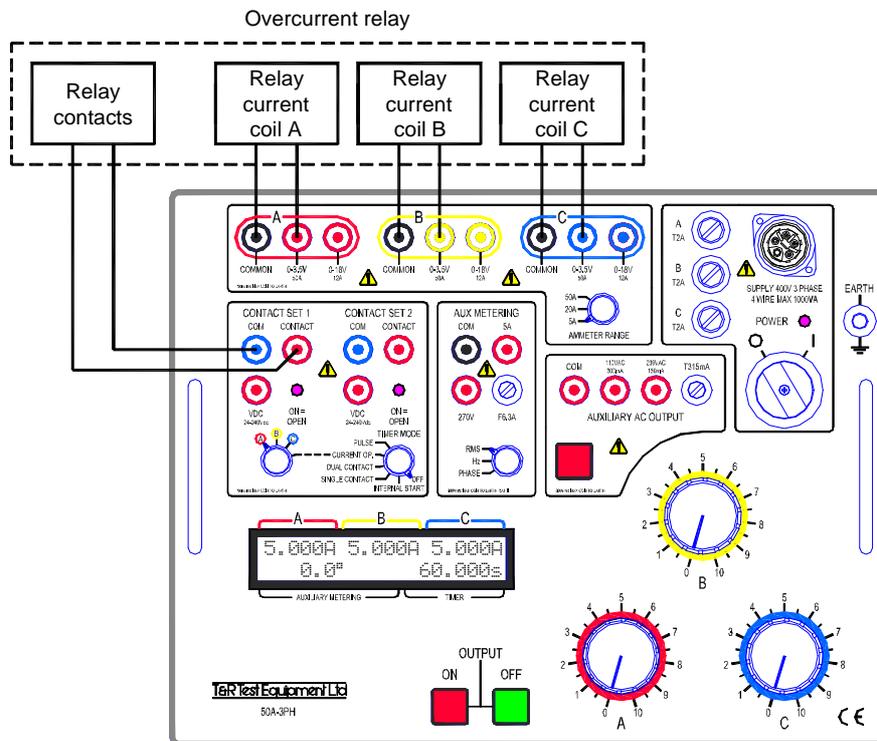


Figure 3.1 Connections for testing over-current relays

3.1.1 Connections

Ensure that the output is switched off and that the relay is isolated before making any connections.

Connect the relay contacts to contact set 1.

Connect the relay current coils to the 3.5V outputs, selecting suitable leads from the lead set depending on the current to be injected. If the desired current is unobtainable during testing, it may be necessary to connect the relay coils to the higher voltage tap on the 50A-3PH.

3.1.2 Test procedure

Set the output controls to zero (anti-clockwise) and the timer mode to “off”.

Select the desired ammeter range.

Press the “output on” pushbutton and increase the desired test current for each phase.

Switch the output off using the “output off” pushbutton.

Select “internal start” timer mode, and switch the output on. The unit now resets and starts the timer and starts injecting current into the relay. When the relay’s contacts change state, the timer will stop and the output will be switched off automatically.

3.2 Timing of Auto-Reset/Reclosing Devices

Auto-reclosing devices require that the timer is started when power is removed from the device, and the timer stops when the contacts change state. This may be achieved using the single contact timer mode.

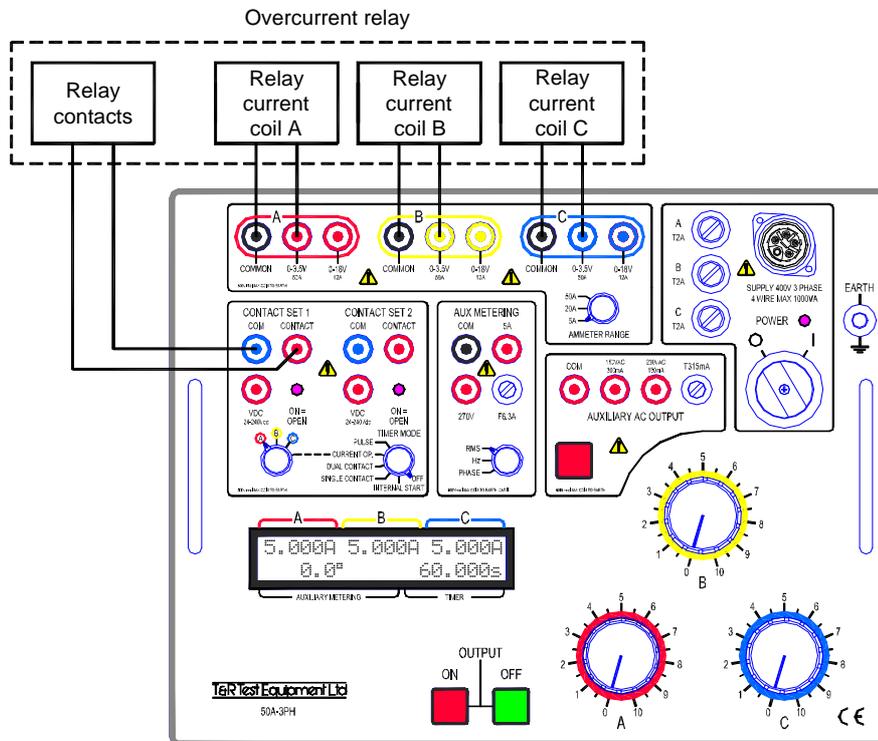


Figure 3.2 Connections for testing auto-reclose devices

3.2.1 Connections

Ensure that the outputs are switched off and that the relay is isolated before making any connections.

Connect the relay contacts to contact set 1.

Connect the main outputs as shown in figure 3.4, selecting the most appropriate output taps for the relay under test.

3.2.2 Test procedure

Set the main output controls to zero (anti-clockwise) and the timer mode to “off”.

Switch on the main output, and increase the currents for each phase to the desired level.

Switch off the main output.

Switch the timer to “single contact” mode, and reset the relay.

Switch the main output on. The output will be switched off and the timer will start when the relay trips. The timer will stop when the relay auto-recloses.

3.3 Timing Circuit Breakers

Testing CBE's MCB's and other devices with no auxiliary contacts is possible using the current operated timer mode on the 50A-3PH. This mode starts the timer when the output current on the selected phase exceeds 10% of the selected current range, and stops the timer when the current on the selected phase falls below 10% of range. The phase on which to start and stop the timer is selected using the phase select switch.

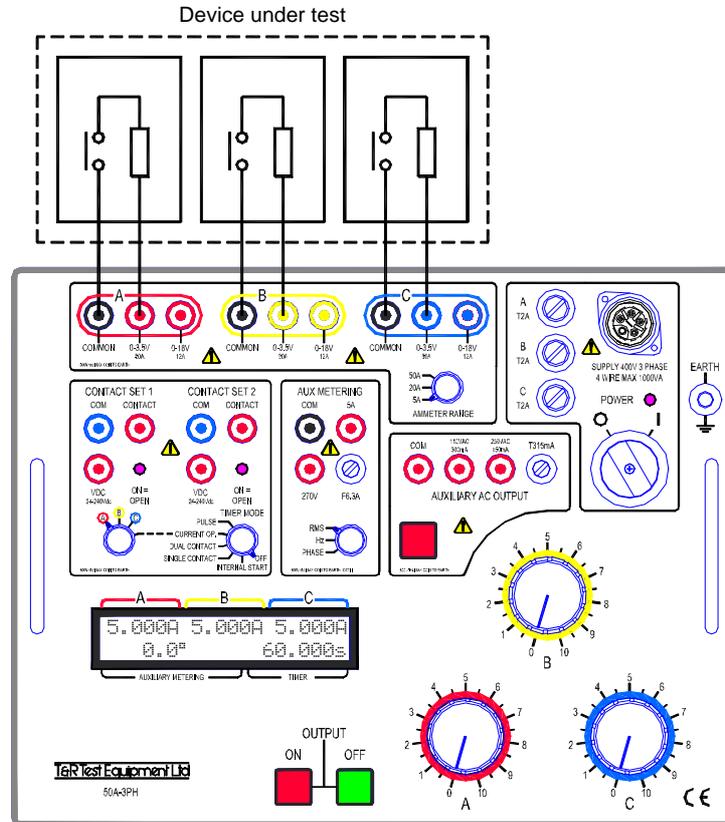


Figure 3.3 Connections for testing circuit breakers

3.3.1 Connections

Ensure that the outputs are switched off and that the device under test is isolated before making any connections.

Connect the main outputs as shown in figure 3.4, selecting the most appropriate tap for the device under test. For circuit breakers and other current trips, this will almost always be the 0-3.5V output.

Set the ammeter switch to the most suitable range.

Set the phase select switch to trigger the timer on the desired phase.

3.3.2 Test procedure

Set the output controls to zero (anti-clockwise) and the timer mode to “off”.

Switch on the main output, and increase the outputs to the desired level.

Switch off the main output.

Switch the timer to “current operated” mode, and reset the breaker if it has tripped.

Switch the main output on. The timer will start when current starts flowing in the device under test, and will stop when the device trips.

3.3.3 *Devices with short trip times*

When testing devices with short trip times (such as thermal circuit breakers at high over-current factors), setting the current may cause the breaker to trip. In such circumstances, set the current using pulse mode. In this mode, current will be injected for 600ms and the current logged every time the “output on” button is pressed.

3.4 Directional relays (in conjunction with DVS3 voltage source)

Directional relays may be tested using the 50A-3PH in conjunction with a suitable voltage source (such as the T&R DVS3). This procedure will detail the test procedure using the DVS3, but may be adapted to other voltage sources.

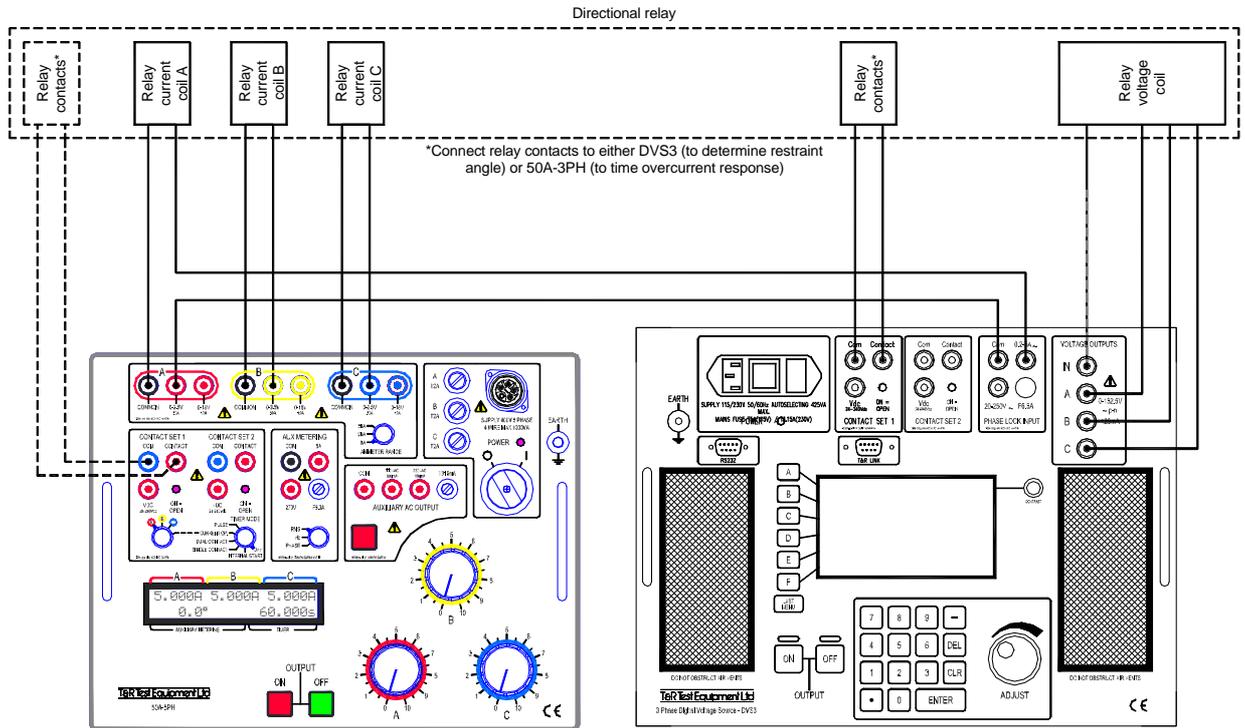


Figure 3.4 Connections for directional overcurrent relay

3.4.1 Connections

Ensure that the outputs are switched off and that the device under test is isolated before making any connections.

Connect the main outputs to the relay current coils as shown in figure 3.5, selecting the most appropriate tap for the device under test. The output of phase A is looped into the DVS3 phase lock input to allow the DVS3 to phase lock to the current output of the 50A-3PH.

Connect the output from the DVS3 to the relay voltage coils.

Set the ammeter switch to the 5A range, and the phase select switch to phase A.

Phase A of the DVS3 may be connected to the auxiliary input of the 50A-3PH as a double-check on the phase angle if required (not shown in figure 3.4 for clarity – refer to figure 2.6 for connections).

Connect the relay contacts to contacts set 1 on the DVS3.

3.4.2 Test procedure – restraint angle

Set the output controls to zero (anti-clockwise) and the timer mode to “off”.

Switch on the main output, and increase the output current for each phase to the setting current of the relay.

Select “Phase lock” mode on the DVS3, and select the lock source as “External lock”. Set the DVS3 to the desired output voltage, and switch the DVS3 output on.

When phase A on the DVS3 is set to zero, the voltage from the DVS3 will be in phase with the current from the 50A-3PH. The phase angle between the current and voltage may now be altered using the phase control on the DVS3. The contacts on the relay will now change state (indicated on the DVS3 screen) as the voltage phase is rotated through the restraint angle of the relay.

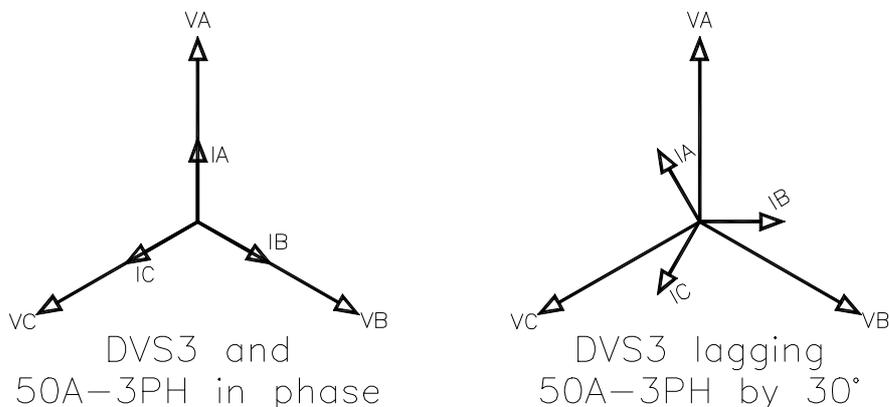


Figure 3.5 50A-3PH and DVS3 output phasors

3.4.3 Test procedure – overcurrent timing

Ensure that the outputs are switched off and that the device under test is isolated before making any connections.

Disconnect the relay contacts from the DVS3 and connect to contact set 1 on the 50A-3PH (see figure 3.5).

Disconnect the 50A-3PH phase A from the DVS3 (this may be left connected if the test current will not exceed 5A).

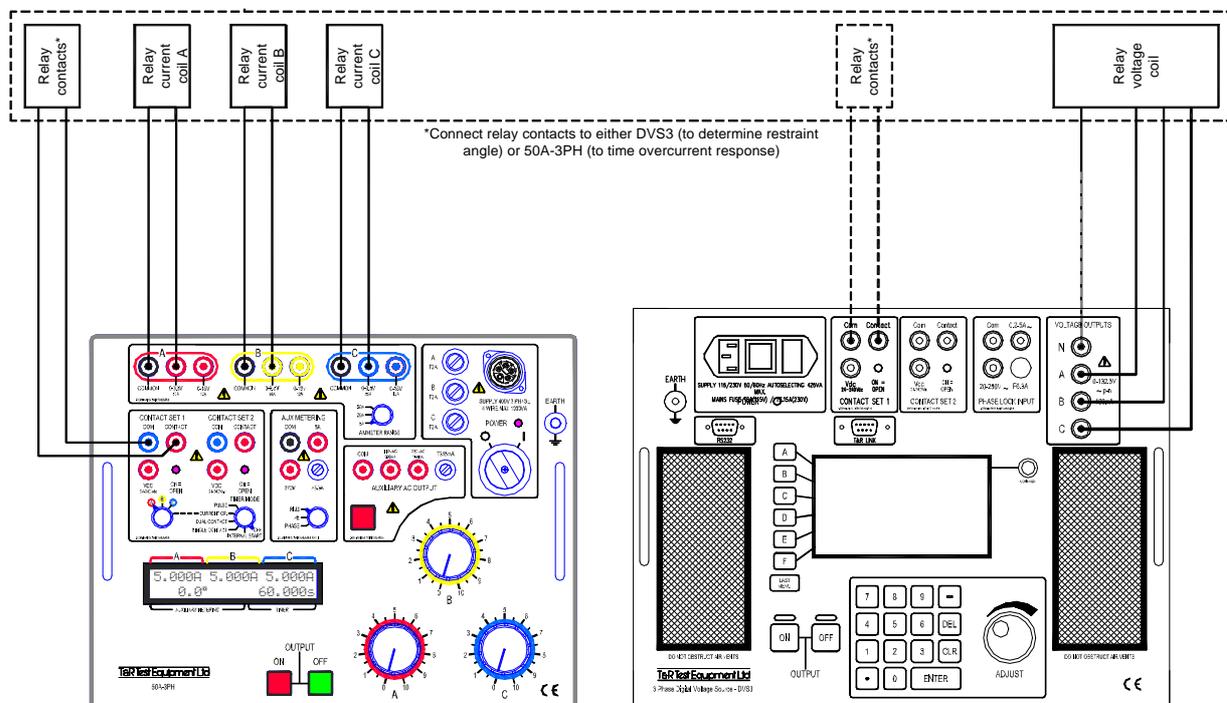


Figure 3.5 Connections for current injection into directional overcurrent relay

Set the DVS3 to mains lock and set the phase angle so that the relay is not in restraint.

Set the 50A-3PH timer mode to “off”

Press the 50A-3PH “output on” pushbutton and increase the desired test current for each phase.

Switch the output off using the “output off” pushbutton.

Select “internal start” timer mode, and switch the output on. The unit now resets and starts the timer and starts injecting current into the relay. When the relay’s contacts change state, the timer will stop and the output will be switched off automatically.