	99.01		99.02		99.80	
						
	Sockets	Relays	Sockets	Relays	Sockets	Relays
	90.20	60.12	90.02	60.12	94.54.1	55.32, 55.34
	90.21	60.13	90.03	60.13	94.82.3	55.32
	90.72	55.32	92.03	62.32, 62.33	94.84.3	55.32, 55.34
	94.73	55.33	94.02	55.32	94.92.3	55.32
	94.74	55.34	94.03	55.33	94.94.3	55.32, 55.34
	94.82	55.32	94.04	55.32, 55.34	95.55.3	40.51/52/61
	96.72	56.32	95.03	40.31		44.52, 44.62
	96.74	56.34	95.05	40.51/52/61	95.83.3	40.31
				44.52, 44.62	95.85.3	40.51/52/61
			95.55	40.51/52/61		44.52/62
				44.52, 44.62	95.93.3	40.31
			97.01	46.61	95.95.3	40.51/52/61
			97.02	46.52		44.52, 44.62
			97.51	46.61		
			97.52	46.52		

FUNCTION / OPERATING RANGE	CODE	CODE	CODE
Green LED + diode module (standard polarity)			
6 - 24 V DC 28 - 60 V DC 110 - 220 V DC	99.01.9.024.99 99.01.9.060.99 99.01.9.220.99	99.02.9.024.99 99.02.9.060.99 99.02.9.220.99	99.80.9.024.99 99.80.9.060.99 99.80.9.220.99
Green LED + diode module (non-standard polarity)			
6 - 24 V DC 28 - 60 V DC 110 - 220 V DC	99.01.9.024.79 99.01.9.060.79 99.01.9.220.79	99.02.9.024.79 99.02.9.060.79 99.02.9.220.79	
Green LED + Varistor			
6 - 24 V AC/DC 28 - 60 V AC/DC 110 - 240 V AC/DC	99.01.0.024.98 99.01.0.060.98 99.01.0.230.98	99.02.0.024.98 99.02.0.060.98 99.02.0.230.98	99.80.0.024.98 99.80.0.060.98 99.80.0.230.98
Green LED			
6 - 24 V AC/DC 28 - 60 V AC/DC 110 - 240 V AC/DC	99.01.0.024.59 99.01.0.060.59 99.01.0.230.59	99.02.0.024.59 99.02.0.060.59 99.02.0.230.59	99.80.0.024.59 99.80.0.060.59 99.80.0.230.59
Diode module (standard polarity)			
6 - 220 V DC	99.01.3.000.00	99.02.3.000.00	99.80.3.000.00
Diode module (non-standard polarity)			
6 - 220 V DC	99.01.2.000.00	99.02.2.000.00	99.80.2.000.00
RC module			
6 - 24 V AC/DC 28 - 60 V AC/DC 110 - 240 V AC/DC	99.01.0.024.09 99.01.0.060.09 99.01.0.230.09	99.02.0.024.09 99.02.0.060.09 99.02.0.230.09	99.80.0.024.09 99.80.0.060.09 99.80.0.230.09
Residual current bypass module			
110 - 240 V AC	99.01.8.230.07	99.02.8.230.07	99.80.8.230.07

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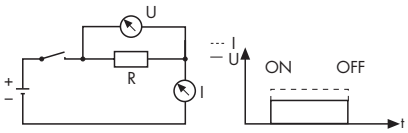
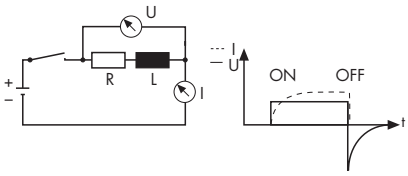
Voltage-current characteristic when switching a resistive load (fig. 1).



Voltage-current characteristic when switching a relay coil (fig. 2).



Switching Relay Coils.

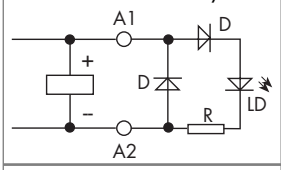
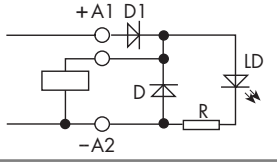
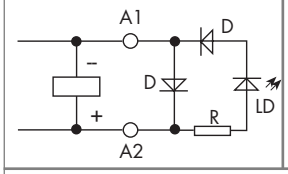
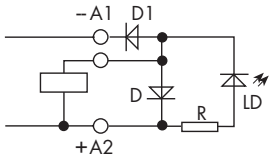
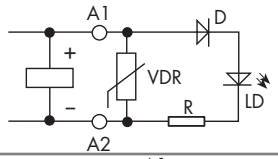
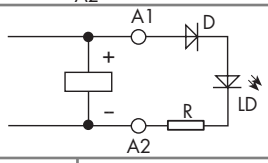
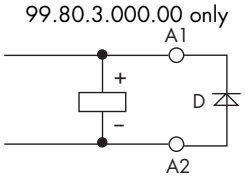
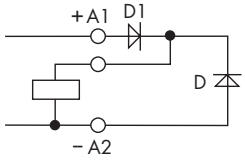
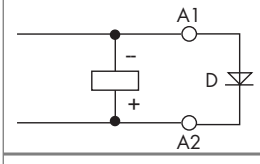
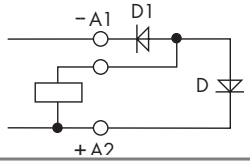
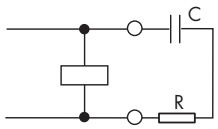
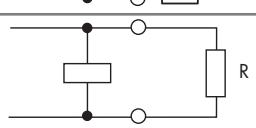
When switching a resistive load, the current follows the phase of the voltage directly (Fig 1).

When switching relay coils the current and voltage waveforms are different due to the inductive nature of the coil (Fig 2). A brief explanation of this mechanism is as follows.

On energisating the coil, the build up of the magnetic field gives rise to counter electromotive forces which in turn delay the rise in coil current. On de-energisation, the sudden interruption of the coil current causes a sudden collapse of the magnetic field, which in turn induces a high voltage of reverse polarity across the coil. This reverse polarity voltage peak can reach a value typically 15 times higher than the supply voltage, and as a consequence can disturb or destroy electronic devices.

To counteract this potentially damaging effect, relays coils can be suppressed with a Diode, a Varistor (voltage dependent resistor) or a RC (resistor/capacitor) module – dependent on the operating voltage. (See below for descriptions of the various Modules available.)

Whilst the above description is based on the working of a DC coil, the reverse polarity voltage peak on de-energisation applies similarly to AC coils. However, when energising AC coils there will also be a coil inrush current of 1.3 to 1.7 times the nominal coil current – dependent on coil size. If coils are fed via a transformer (and particularly if several are energised at the same time) then this may need to taken into account when calculating the VA rating of the transformer.

Diagrams		Functions
99.01.9.xxx.99 only 99.80.9.xxx.99 only 	99.02.9.xxx.99 only 	**Green LED + diode module (standard polarity)** Recovery diode modules + LED are used for DC only. The reverse voltage peaks of the coil are short circuited by the recovery diode (positive to terminal A1). The release time increases by an approximate factor of 3. If an increase of the release time is undesirable use a Varistor or RC module. The LED indicator lights up when the coil is energized.
99.01.9.xxx.79 only 	99.02.9.xxx.79 only 	**Green LED + diode module (non-standard polarity)** Recovery diode modules + LED are used for DC only. The reverse voltage peaks of the coil are short circuited by the recovery diode (positive to terminal A2). The release time increases by an approximate factor of 3. If an increase of the release time is undesirable use a Varistor or RC module. The LED indicator lights up when the coil is energized.
		**Green LED + Varistor** LED modules + Varistor are used for both AC and DC coils. The reverse voltage peaks of the relay coil are limited by the Varistor to approximately 2.5 times the nominal voltage of the supply. When using DC coils it is essential that positive is connected to terminal A1. The relay release time increases insignificantly.
		**Green LED** LED modules are used for AC and DC. The LED indicator lights up when the coil is energized. When using DC it is essential that positive is connected to terminal A1.
99.01.3.000.00 only 99.80.3.000.00 only 	99.02.3.000.00 only 	**Diode module (standard polarity)** Recovery diode modules are used for DC only. The reverse voltage peaks of the coil are short circuited by the recovery diode (positive to terminal A1). The release time increases by an approximate factor of 3. If an increase of the release time is undesirable use a Varistor or RC module.
99.01.2.000.00 only 99.80.2.000.00 only 	99.02.2.000.00 only 	**Diode module (non-standard polarity)** Recovery diode modules are used for DC only. The reverse voltage peaks of the coil are short circuited by the recovery diode (positive to terminal A2). The release time increases by an approximate factor of 3. If an increase of the release time is undesirable use a Varistor or RC module.
		**RC module** RC circuit modules are used for AC and DC coils. The reverse voltage peaks of the coil are limited by the RC module to approximately 2.5 times the nominal voltage of the supply. The relay release time increases insignificantly.
		**Residual current bypass module** Bypass modules are advisable if 110 or 230v AC relays show any tendency to fail to release. Failure to release can be caused by residual currents from AC proximity switches or inductive coupling caused through long parallel lying AC control lines.

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