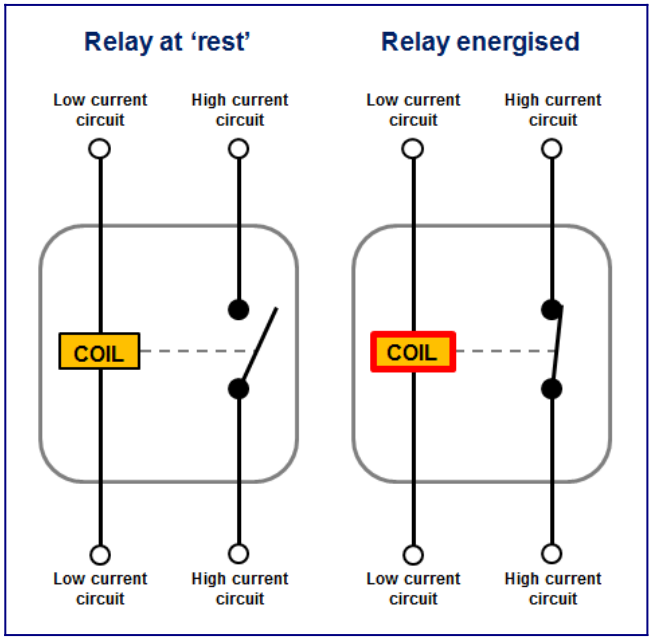
Rear tailgate - https://bjsoffroad.com/tailgate-window-motor-relay-kits/

https://www.youtube.com/watch?v=vbYzUweBwmQ

https://www.youtube.com/watch?v=Avo_35OUCPM&t=343s



Relay terminology

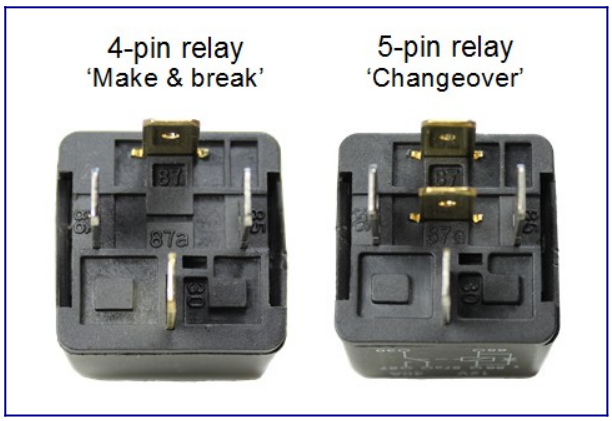
The ISO mini relay we have looked at above has 4 pins (or terminals) on the body and is referred to as a ***make & break*** relay because there is one high current circuit and a contact that is either open or closed depending upon whether the relay is at rest or energised. If the contact is broken with the relay at rest then the relay is referred to as **Normally Open** (NO) and if the contact is closed with the relay at rest then the relay is referred to as **Normally Closed** (NC). Normally Open relays are the more common type.

ISO mini relays with two circuits, one of which is closed when the relay is at rest and the other which is closed when the relay is energised, have 5 pins on the body and are referred to as ***changeover*** relays. These have two contacts connected to a common terminal.

Make & break relays are also known as Single Pole Single Throw (SPST) and changeover relays as Single Pole Double Throw (SPDT). This is based on standard switch terminology. There are other contact configurations discussed below but make & break and changeover relays are the most commonly used.

Terminal numbering convention

The terminal numberings found on a relay body are taken from **DIN 72552** which is a German automotive industry standard that has been widely adopted and allocates a numeric code to various types of electrical terminals found in vehicles. The terminals on the outside of a 4 or 5 pin mini relay are marked with numbers as shown below:



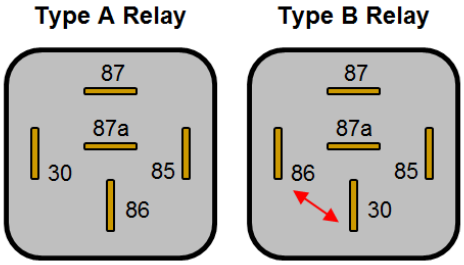
Terminal/Pin number	Connection
85	Coil
86	Coil
87	Normally Open (NO)
87a	Normally Closed (NC) - not present on 4 pin relays
30	Common connection to NO & NC terminals

According to DIN 72552 the coil should be fed with +12V to terminal 86 and grounded via terminal 85, however in practice it makes no difference which way around they are wired, unless you are using a relay with an integrated diode (see more info on diodes below).

Tip: *you can use a changeover relay in place of a make & break relay by just leaving either the NO or NC terminal disconnected (depending on whether you want the circuit to be made or broken when you energise the relay).*

Terminal layouts

The automotive ISO mini relays we have been looking at above are typically available in two types of pin layout designated Type A and Type B layouts. These layouts are shown on the two 5-pin relays below (pin 87a not present on 4 pin relays):



You will notice that on the Type B layout pins 86 and 30 are swapped over compared with the Type A layout. The Type B layout is arguably easier to work with as the connected terminals are in-line, making the wiring easier to visualise. If you need to replace a relay make sure you use one with the same terminal layout as it is easy to overlook if you're not aware of the difference.

Terminal sizes

The terminal widths used on 4 and 5 pin relays are almost always 6.3mm wide, however some more specialist relays can have terminal widths of 2.8mm, 4.8mm and 9.5mm. The 9.5mm wide terminals tend to be used for higher power applications (such as for starter motor solenoid activation) and the smaller terminals tend to be used for electronics signalling where only very low currents are required. All widths will be compatible with the standard female blade crimp terminals of the corresponding sizes.

Relay body markings

Relays can look very similar from the outside so they normally have the circuit schematic, voltage rating, current rating and terminal numbers marked on the body to identify them.

- **Circuit schematic**

  This shows the basic internal circuits (including any diodes, resistors etc.) and terminal layout to assist wiring.

- **Voltage rating**

  The operating voltage of the coil and high current circuits. Typically 12V for passenger vehicles and small craft but also available in 6V for older vehicles and 24V for commercial applications (both auto and marine).

- **Current rating**

  This is the current carrying capacity of the high current circuit(s) and is normally between 25A and 40A, however it is sometimes shown as a dual rating on changeover relays e.g. 30/40A. In the case of dual ratings the normally closed circuit is the lower of the two, so 30A/40A, NC/NO for the example given. The current draw of the coil is not normally shown but is typically 150-200 mA with a corresponding coil resistance of around 80-60 Ω.

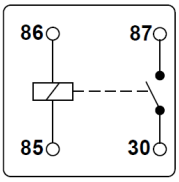
  Tip: *Knowing the coil resistance is useful when testing the relay for a fault with a multi-meter. A very high resistance or open circuit reading can indicate a damaged coil.*

- **Terminal numbering**

  The numbers 85, 86, 30, 87 & 87a (or other numbers for different relay configurations) are normally moulded into the plastic next to each pin and also shown on the circuit schematic.

Relay configurations and types

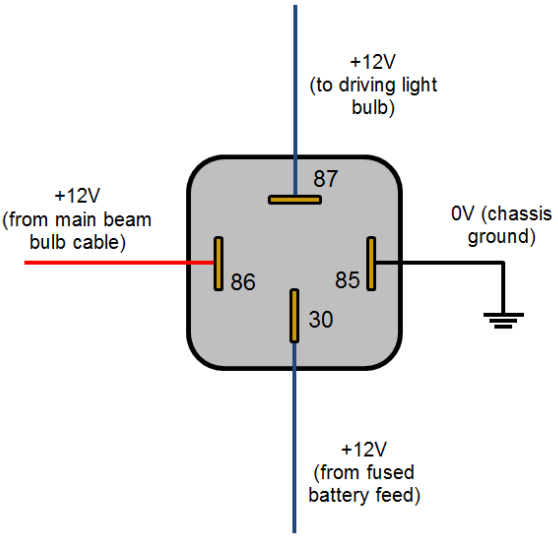
In addition to the basic make & break and changeover configurations above, ISO relays are available in a number of other common configurations which are described in the table below:

Configuration	Circuit schematic *	Description
Make & break relay		The most simple form of relay. The circuit between terminals 30 and 87 is made on energisation of the relay and broken on de-energisation, known as NO (or vice-versa for a NC relay).

The following diagrams show some common relay wiring schemes that use 4 pin ISO mini relays.

1. Adding driving lights that come on with the headlight main beam

This simple circuit uses the power feed to the headlight main beam bulb as the trigger to energise a relay. The high current circuit in this relay feeds power to the driving light bulb, so every time headlight main beam is selected, the coil is energised and the driving lights operate. **Note:** It is important that the new power feed to the driving lights is fused appropriately (see our Knowledge Centre fusing guide)



Terminal 86 - Connect to the +12v cable feeding power to the headlight main beam bulb (achieved by making a splice in the original loom).

Terminal 85 - Connect to a suitable earthing point on the vehicle chassis.

Terminal 30 - Connect to a +12V feed from the battery.

Terminal 87 - Connect to the +12V terminal of the driving light bulb or driving light loom.

Tip: *It is a good idea to use a separate relay for the left and right hand driving lights and have them switched independently from the left and right hand main beams. This way, if a relay on one side fails the driving light on the other side will still work.*