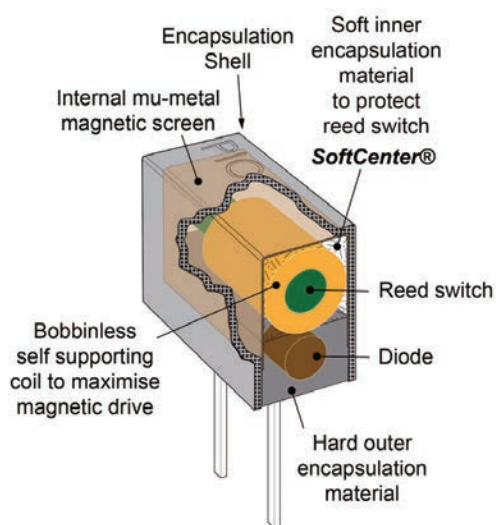


Reed Relays Product Catalog



The Leaders in Reed Relays

Instrument Grade Reed Switches

Outstanding Technical Support

SoftCenter® Technology

Innovative Product Range

Custom Designs



Manufacturing facilities in the UK and Czech Republic



Computer Aided Design

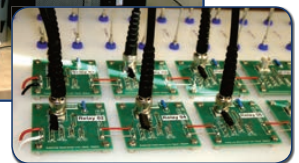
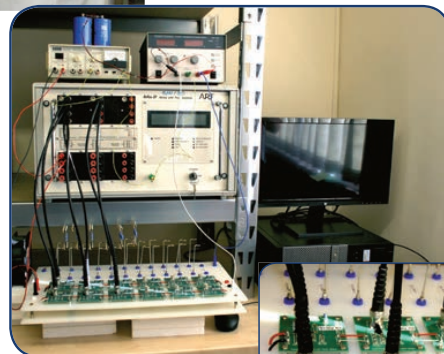
In-house designed and built Automation



In-house X-Ray facility



Formerless Coil Winding on fully automatic machinery



Life Testing to billions of operations

Pickering Electronics - A Brief History

Pickering Electronics are a British manufacturer of high quality Reed Relays predominantly used in Instrumentation and Test equipment. Pickering is a privately-owned company and currently employs approximately 150 people. Pickering have been designing Reed Relays since 1968 and today, Pickering's Single-in-Line (SIL/SIP) range is by far the most developed in the relay industry, with relays 25 percent the size of many of their competitors. Pickering Relays are available in Surface Mount, Single-in-Line (SIL/SIP) and Dual-in-Line (DIL/ DIP), with the option of dry or mercury wetted switches. These small relays are sold in high volumes to large ATE companies throughout the world.

Pickering relays have many advantages over the more usual 'Hard Moulded' construction. They are constructed using SoftCenter® technology which greatly reduces stress on the delicate glass reed switch capsule for maximum life and performance. Mu-metal magnetic screening allows high packing density without the risk of problems due to magnetic interaction between relays. The great majority of Pickering relays are also manufactured with self-supporting coils, thus avoiding the space required for these bobbins. In the case of the smaller relays types, this gives around 50 percent more room for the coil winding, allowing the use of less sensitive reed switches with their inherent advantages of higher operating and restoring forces. In some ranges, this technique allows Pickering to achieve extremely high coil resistance figures.

In 1980 Pickering moved to a purpose-built factory of 2200m² (22000 ft²) in Clacton-on-Sea, Essex, where all manufacturing took place until 2007, when Pickering opened a Czech manufacturing facility located on a site of 12500 ft².

Pickering are certified to ISO 9001-2000 and audited by the British Standards Institution. Pickering prides itself on the quality of its products therefore continuous inspection during the manufacturing process is carried out, and Reed Relays are 100 percent tested for all operating parameters.

Pickering Interfaces - Technology Partner

Pickering Interfaces is a sister company, who design and manufacture modular PXI/PCI/LXI switching systems for the Functional ATE market - pickeringtest.com. Pickering Interfaces are a large reed relay customer who work very closely with Pickering Electronics on leading edge reed relay designs, reliability testing, life testing, production engineering and QA issues. This close relationship greatly benefits both companies.

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Quick Reference Guide

Please click on one of the following frames to navigate to the page required.

NEW Series 120
Very High Density ATE/Instrumentation

1 Form A

- Highest packing density currently possible
- Plastic package** with internal mu-metal magnetic screen
- 3, 5 or 12V coils
- Switching up to 1A, 20W
- Dry ruthenium switches

1 Form A

Page 12

NEW Series 124
Very High Density ATE/Instrumentation

1 Form A

- The industry's smallest through-hole reed relay currently available
- Plastic package** with internal mu-metal magnetic screen
- 3 or 5V coils
- Switching up to 0.5A, 5W
- Dry ruthenium switches

1 Form A

Page 14

Series 117
Very High Density ATE/Instrumentation

1 Form A 0.26 nom (6.60)
0.27 max (6.86)
2 Form A 0.39 nom (9.90)
0.40 max (10.16)

Inches (mm)

Pin 1

- Very high packing density - requires a board area of only 0.15 x 0.27 inches
- Plastic package** with internal mu-metal magnetic screen
- 3 and 5V coils
- Dry ruthenium switches

1 Form A 2 Form A

Diodes are optional

Page 16

Series 116
Very High Density ATE/Instrumentation

1 Form A 0.26 nom (6.60)
2 Form A 0.39 max (9.9)

Inches (mm)

Pin 1

- Pin compatible, 10 Watts version of the Series 117 requires the same area of only 0.15 x 0.27 inches
- Plastic package** with internal mu-metal magnetic screen
- 3V, 5V or 12V coils
- Dry ruthenium switches

1 Form A 2 Form A

Diodes are optional

Page 18

Series 115
Very High Density ATE/Instrumentation

1 Form A 0.26 nom (6.60)
2 Form A 0.39 max (9.9)

Inches (mm)

Pin 1

- Plastic package** with internal mu-metal magnetic screen
- 3V, 5V or 12V coils
- Dry ruthenium switches

1 Form A 2 Form A

Diodes are optional

Page 20

Series 112
High Density ATE/Instrumentation

Inches (mm)

Pin 1 0.1 (2.54) pin spacing

- Plastic package** with internal mu-metal screen
- Requires a board area of only 0.15 x 0.4 inches
- 3V, 5V or 12V coils
- Dry ruthenium switches

1 Form A

Diodes are optional

Page 22

Series 110
High Density ATE/Instrumentation

Inches (mm)

Pin 1 0.1 (2.54) pin spacing

- Plastic package** with internal mu-metal screen
- Requires a board area of only 0.15 x 0.4 inches
- 3V, 5V or 12V coils
- Dry ruthenium switches

1 Form A

Diodes are optional

Page 24

Series 113
High Density ATE/Instrumentation

Inches (mm)

Pin 1

- Plastic package** with internal mu-metal screen
- Requires a board area of only 0.15 x 0.5 inches
- 3V, 5V or 12V coils
- Dry switches

1 Form A 2 Form A 1 Form C

Diodes are optional

Page 26

Series 111
High Density ATE/Instrumentation

Inches (mm)

Pin 1 0.1 (2.54) pin spacing

- (Mu-metal) or screened plastic package** (not illustrated)
- RF version available**
- Dry ruthenium switches
- 3V and 5V coils

1 Form A 1 Form A Co-axial

Diodes are optional

Page 28

Series 109
High Density ATE/Instrumentation

Inches (mm)

Pin 1

- (Mu-metal) or screened plastic package** (not illustrated)
- RF version available**
- 3V, 5V or 12V coils
- Dry ruthenium switches

1 Form A 2 Form A 1 Form B 1 Form A Co-axial

Diodes are optional

Page 30

Series 106
ATE/Instrumentation General Purpose

Inches (mm)

Pin 1

- Plastic package** with internal mu-metal screen
- 3V, 5V or 12V coils
- Dry switches

1 Form A 1 Form C

Diodes are optional

Page 32

Series 105
Instrumentation General Purpose

Inches (mm)

Pin 1

- Plastic package** with internal mu-metal screen
- 3V, 5V, 12V or 24V coils
- Wide range with dry or mercury wetted switches

1 Form A 2 Form A 1 Form B 1 Form C

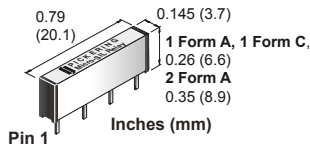
Diodes are optional

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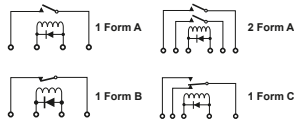
Quick Reference Guide

Series 108

ATE/Instrumentation
General Purpose



- **(Mu-metal package)**
- Requires a board area of only 0.15 x 0.8 inches
- 3V, 5V or 12V coils
- Dry switches

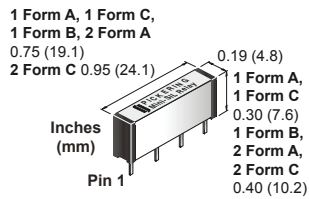


Diodes are optional

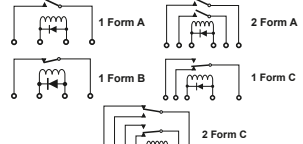
Page 36

Series 107

ATE/Instrumentation
General Purpose



- **(Mu-metal package)** 3V, 5V, 12V, 24V coils
- Wide range with dry or mercury wetted switches

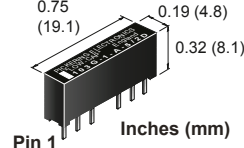


Diodes are optional

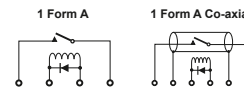
Page 38

Series 103

Low Capacitance
Wide Bandwidth



- **(Plastic package)** with optional magnetic screen
- 1 Form A - One fifth the normal capacitance level
- **(1 Form A Coaxial)** 3V, 5V or 12V coils

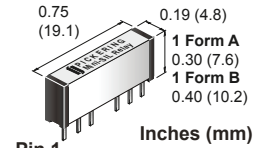


Diodes are optional

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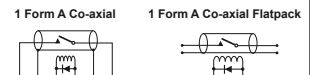
Series 102

Radio Frequency
Up to 3GHz



See also Series 103, 109 and 111

- **(Mu-metal)** Single-in-Line package or **(plastic flatpack)** (not illustrated)
- **50 Ohms characteristic impedance** - Up to 1.5GHz - SIL or 3GHz - flatpack 3V, 5V or 12V coils



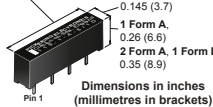
Diodes are optional

Page 42

Series 119

High Voltage - Up to 3kV

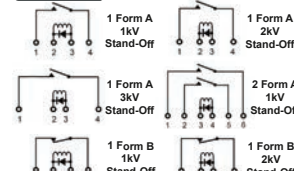
1 Form A, 1 Form B 1kV, 2kV 0.595 (15.1)
1 Form A 3kV, 2 Form A 0.79 (20.1)



Dimensions in inches (millimetres in brackets)

- Dry ruthenium switches, 3V, 5V or 12V coils
- 1 Form A. Standing off 1kV, switching up to 1kV.
- 1 Form A. Standing off 2kV, switching up to 1kV.
- 1 Form A. Standing off 3kV, switching up to 1kV.
- 1 Form B. Standing off 1kV, switching up to 1kV.
- 1 Form B. Standing off 2kV, switching up to 1kV.
- 2 Form A. Standing off 1kV, switching up to 1kV.

- **(Plastic package)** internal mu-metal magnetic screen

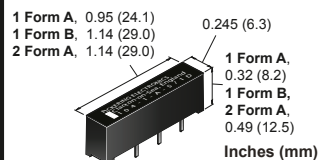


Diodes are optional

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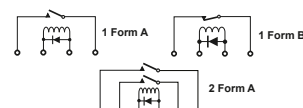
Series 104

High Voltage
Up to 3kV



- **(Plastic package)** with internal mu-metal screen

- 3V, 5V, 12V or 24V coils
- Dry or mercury wetted HV switches
- Ideal for cable test ATE

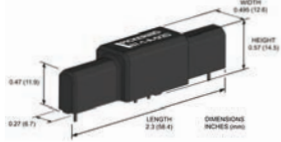


Diodes are optional

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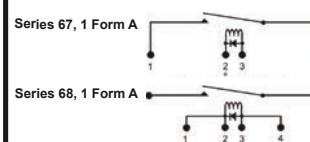
Series 67/68

High Voltage up to 10kV



- **(Plastic package)** with internal mu-metal screen
- Robust 50 Watts Tungsten contacts
- Series 67 has pcb pins for all connections. Series 68 has flying leads from the top face for the high voltage connections.
- 1 Form A. Standing off 5kV, switching up to 3.5kV.
- 1 Form A. Standing off 10kV, switching up to 7.5kV.

- 5V, 12V or 24V coils

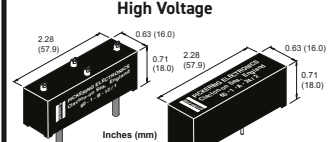


Diodes are optional

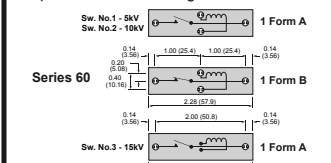
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Series 60/65

Chassis/PCB Mounting
High Voltage



- Up to 12.5 kV switching

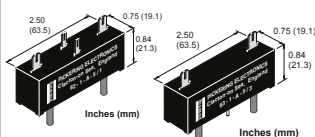


Diodes are optional

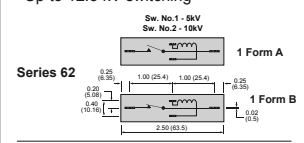
Page 50

Series 62/63

Chassis/PCB Mounting
High Voltage



- Up to 12.5 kV switching



Diodes are optional

Page 52

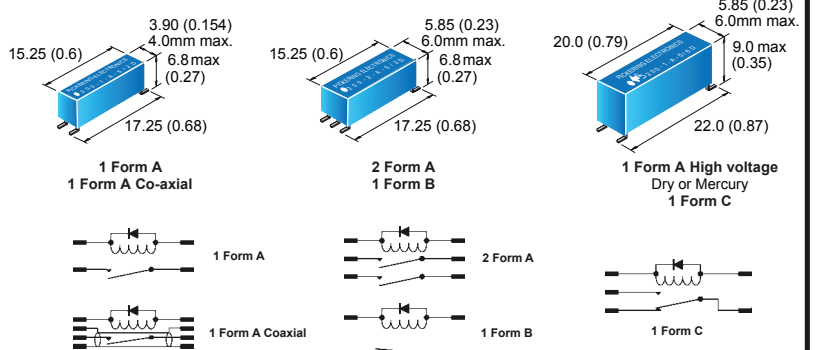
Series 200 - Surface Mount

High Density ATE/Instrumentation

- High Temperature **(plastic package)** with internal mu-metal magnetic screen
- Wide range of switching configurations - Dry or mercury wetted

- **(Coaxial version)** for high speed digital switching or R.F. to 6GHz

- 3V, 5V or 12V coils with optional diode



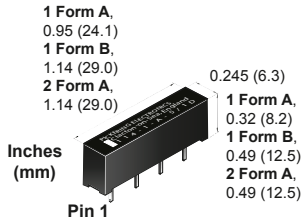
Diodes are optional

Page 54

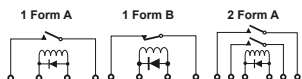
Quick Reference Guide

Series 114

High Power
Up to 40 Watts



- Plastic package with internal mu-metal screen
- 3V, 5V, 12V or 24V coils
- Will replace mercury wetted relays in many applications

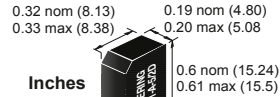


Diodes are optional

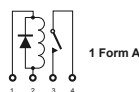
Page 56

Series 118

High Coil Resistance
ATE/Instrumentation



- 3 and 5V coils, 5V versions have a resistance of 22kΩ
- Requires a board area of 0.2 x 0.33 in
- Plastic package with internal mu-metal magnetic screen
- Dry ruthenium switches

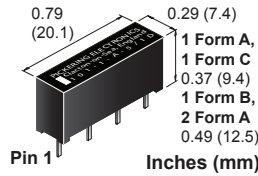


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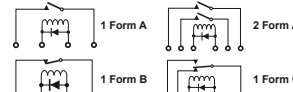
Page 58

Series 101

Direct Drive from
HC or HCT CMOS



- Plastic package with internal mu-metal screen
- 3V, 5V, 12V or 24V coils
5 volt coil is 1600 Ohms
- Wide range with dry or mercury wetted switches

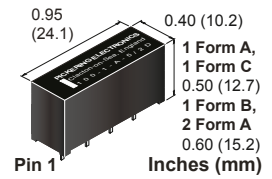


Diodes are optional

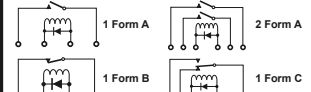
Page 60

Series 100

Direct Drive from CMOS
Low Thermal EMF



- Ideal for data acquisition or thermo-couple switching
- 3V, 5V, 12V or 24V coils
5 volt coil is 3300 Ohms
- Wide range with dry or mercury wetted switches

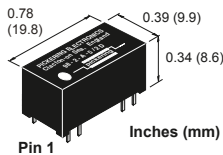


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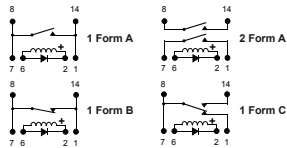
Page 62

Series 98

CMOS Drive DIL/DIP
Reed Relays



- Pin compatible with standard DIL/DIP relays
- 5V, 12V or 24V coils
- Wide range with dry or mercury wetted switches

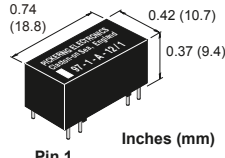


Diodes are optional

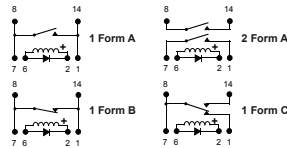
Page 64

Series 97

Dual-in-Line DIL/DIP
Reed Relays



- Plastic package with internal magnetic screen
- Wide range of switch configurations
- 5V, 12V or 24V coils with or without internal diode

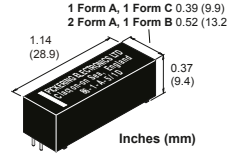


Diodes are optional

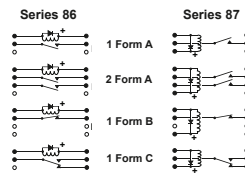
Page 66

Series 86/87

Dry and Mercury Wetted
High Sensitivity Reed Relays



- Plastic package with magnetic screen
- Wide range of switch configurations
- 5V, 12V or 24V coils

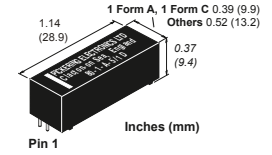


Diodes are optional

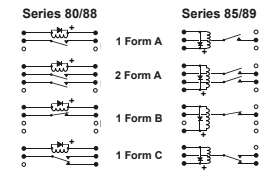
Page 68

Series 80/85/88/89

Dry and Mercury Wetted
General Purpose



- Plastic package with magnetic screen
- Wide range of switch configurations
- 5V, 12V or 24V coils



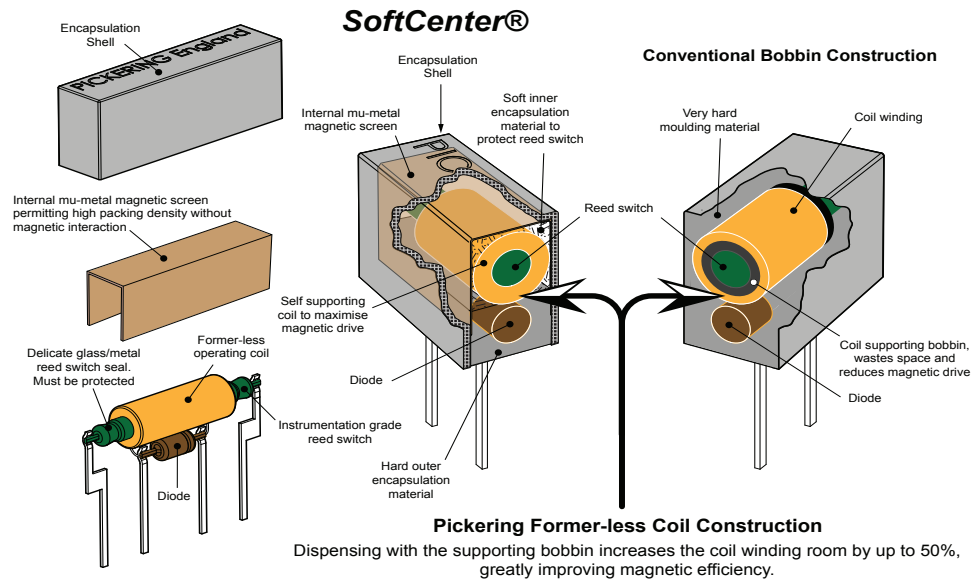
Other configurations also available
Diodes are optional

Page 70

SoftCenter® Technology

Pickering Reed Relays are encapsulated using a soft inner material to cushion the reed switch capsule. The very hard compounds used by most other manufacturers can cause stresses that can potentially damage the reed switch and degrade contact resistance stability and life expectation. Pickering relay **SoftCenter®** construction stops this.

Typical Pickering Construction using Former-less Coils and our **SoftCenter®** technology



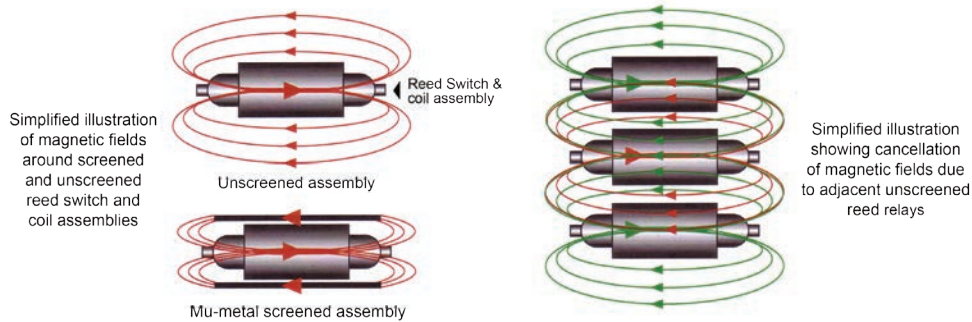
Former-less Coil Winding

All our Reed Relays are constructed using our **SoftCenter®** technology, which uses a soft inner material to reduce stresses on the reed switch. In addition, contact life and more reliable contact resistance are achieved by our use of Former-less coil winding. Our Former-less coils are manufactured using a fully automated process that provides consistent output quality and repeatability. So what is Former-less Coil Winding and what advantages does it give you? Looking at the above diagram you can see that former-less winding greatly increases the winding 'window', providing the following advantages:

- A much higher magnetic drive level and better magnetic coupling as the smaller diameter of the inner turns are more efficient (more turns per Ohm).
- The number of Ampere Turns (AT) is increased - Reed switches are usually rated in sensitivity by an Ampere Turn number, for example, an AT rating of 15AT is twice as sensitive as one with a 30AT. Because the 30AT switch needs more magnetic drive there is much more 'restoring force', which is the ability to open when the coil drive is turned off. This in turn extends the working life of the reed switch many times.

Magnetic Interaction

The switch contacts in a reed relay are operated by the magnetic field generated by the coil which is wound around the hermetically sealed switch capsule. When these relays are stacked close together, the field from adjacent relays will partially oppose the magnetic field from the relay alongside, reducing its sensitivity. This means that a higher coil voltage will be required to operate it. For very small relays, this increase could be as high as 40% which means that it may not be possible to operate the relay at its normal coil voltage. Look at the magnetic field illustrations below.



Our relays are fitted with a Mu-metal magnetic screen rather than one made of steel because of its high permeability and very low magnetic remanence. This screen concentrates the magnetic field, greatly improving the device's efficiency and reliability and allowing side by side stacking to maximize density. The high packing densities that can be achieved when using our reed relays is illustrated below on a PXI High Density Reed Relay Matrix Module from our sister company Pickering Interfaces.



***This module uses 360 Pickering Series 111P relays, plus 156 Pickering Series 117 relays.
A total of 516 Reed Relays.***

Magnetic screening is absolutely essential for reed relays mounted on a close pitch!

Technical Guide to Reed Relays

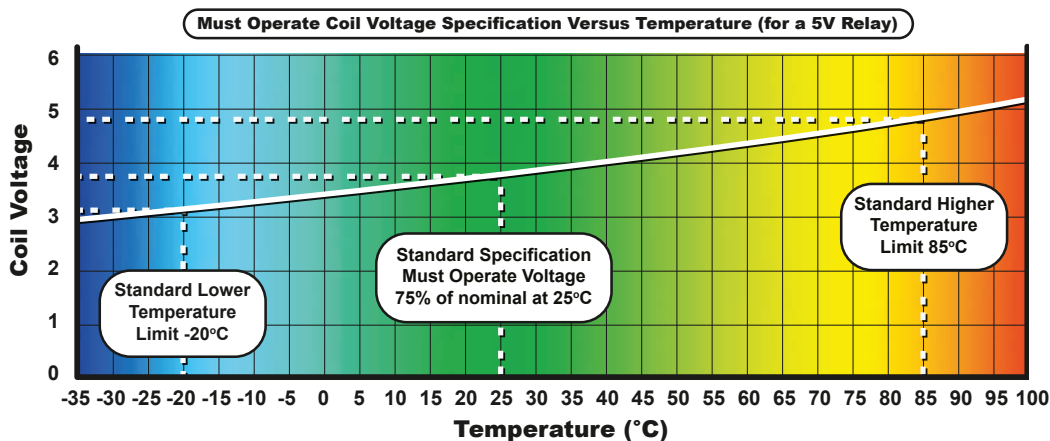
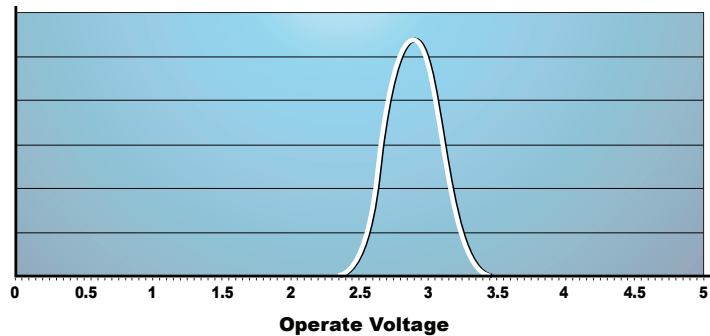
Temperature Effects

Reed Relays are sometimes considered a mundane component by design engineers and often little thought is given to their operating parameters. One of these parameters is operating temperature and failure to consider its effects can lead to the possibility of the relay not operating at high temperatures.

The relay's reed switch is operated by a magnetic field generated by a coil which is wound around it using copper wire. Copper has a positive coefficient of resistance of approximately 0.4% per °C and its resistance will increase with temperature at this rate. As the resistance increases, the current and therefore the level of magnetic field will fall.

The industry standard 'Must Operate Voltage' sometimes called the 'Pull-In Voltage' is 75% of nominal and usually quoted at 25°C. For a 5V relay this would be equal to 3.75V, although in practice it will be lower than this figure. The first graph shows the actual distribution of Operate Voltages for a batch of 1000 Pickering relays. In the second graph you can see how this operate voltage figure will change with temperature.

Distribution of Operate Voltage for a sample of 1000 Pickering 109P-1-A-5/2D Relays



Remember that there will also be a voltage drop in the relay driver that needs to be taken into account. It can be clearly seen that at higher temperatures it is possible that the relay will not operate at its nominal coil drive voltage. For Reed Relays other than those manufactured by Pickering, magnetic interaction with adjacent relays will also need to be considered.

Pickering are able to supply Reed Relays with an increased magnetic drive level to accommodate higher temperatures if requested and also have sensitive 3V coil versions in many ranges.

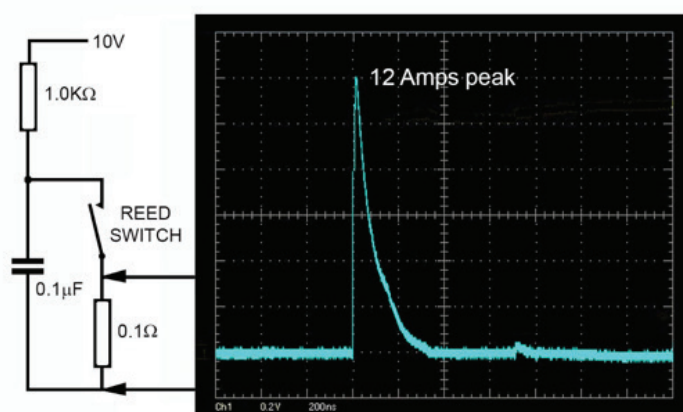
Contact Abuse

High current or high power inrushes are the most damaging and most frequent cause of contact damage. Reed Relays have specified maximum Current, Voltage and Power ratings. The Power figure is simply the product of the voltage across the open contacts before closure and the instantaneous current as they first make.

We at Pickering have lost count of the number of times that we have heard something like “I was only switching 5 volts at 50 milliamps onto this CMOS logic board” when the user has completely disregarded the current inrush into the liberal sprinkling of decoupling capacitors and several micro-Farads of reservoir capacitance on that board.

Do not rely on electronic current limiting of power supplies only, to protect relay contacts. Electronic current limiting takes a finite time to react and there are often decoupling capacitors on the output of a power supply. There is nothing better than resistive current limiting.

As well as inrushes due to charging capacitive loads, discharging capacitors can be an even greater issue as the current is often only limited by the resistance of the reed switch and PC tracks. Even capacitors charged to quite low voltages can cause current inrushes of tens of amps and although they may be for microseconds only, they can cause damage to small reed switches.



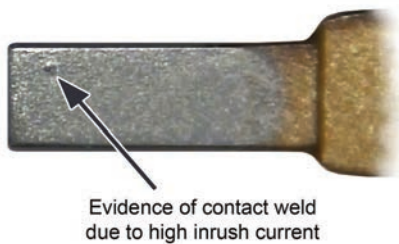
Typical current inrush when discharging a 0.1μF capacitor at 10 Volts through a Reed Switch and 0.1 Ohms resistor

As voltages increase for some applications, inrushes can become an even greater issue, for example when discharging cables after high voltage proof testing. The energy stored in a capacitance is equal to $\frac{1}{2} CV^2$ Joules so will increase with the square of voltage. Increasing from 10 volts to 1000 volts will increase the stored energy by 10,000 times.

If you have ever had a relay contact stick closed, only to free with a slight tap, or had a longer than expected release time, more than likely, it is caused by a micro-weld due to a current inrush.

'Hot' versus 'Cold' Switching

Reed Relays generally have a higher Carry Current rating than their 'hot' Switching Current rating. It is usually during 'hot' switching where contact damage occurs due to the resulting arc across the contacts as they open or close. A severe current overload will quickly melt the contact area causing the two surfaces to fuse together creating a hard weld as soon as the contact closes. Less severe current inrushes will cause a milder weld or gradually build up a 'pip' on one contact and erode a 'crater' on the other according to the direction of current flow. These can eventually lock together. Arcs can occur when contacts open, particularly when the load is inductive and Back EMFs from inductive loads should always be limited, usually by a simple diode in the case of DC loads or by a Snubber or Varistor in the case of AC loads.



One way to reduce or remove these issues is to 'Cold' switch. This is a common technique in Test Instrumentation, where the current or voltage stimulus is not applied to the switch until after the relay has been operated and contact bounce finished. In the same way, the stimulus is removed before the contact is opened. In this way there will be no arcing or switched current inrushes and the relay will achieve maximum life, often into billions of operations.



When calculating the delay time between switching on the relay coil and applying the current to the switch, it is important to consider the effects of high ambient temperature if this is likely to be encountered. The maximum operate time and bounce figures given on the data sheets are at a 25°C ambient level. At higher temperatures, the resistance of the coil winding will increase at a rate of 0.4 % per °C, this being the coefficient of resistance of the copper coil wire. There will therefore be a corresponding fall in coil current and the level of the magnetic field that is generated to operate the reed switch. This lower drive level will increase the operate time slightly. The timing figures on Pickering data sheets are normally quite conservative so this is unlikely to be an issue up to the normal ambient specification of 85°C. However, if there is any additional self-heating within the relay due to a high carry current and the switch resistance (I^2R Watts), it will be necessary to consider this and allow a little more time before turning on the current through the switch.

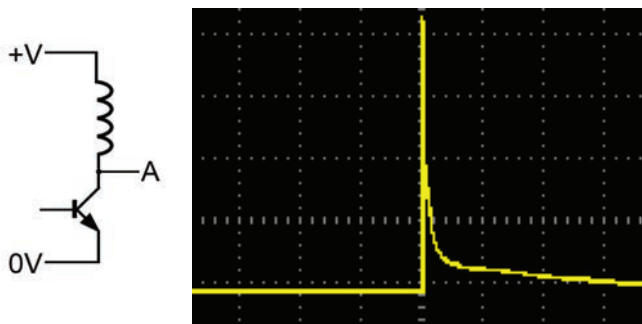
Please contact Pickering Application Engineers at techsales@pickeringrelay.com for further help if required.

Why place a diode across a relay coil?

In the majority of relay applications, a diode is connected across the relay coil, this could be either externally fitted or commonly integral within the relay. Some relay driver ICs may also include an internal diode so another will not be necessary.

A reed relay operating coil usually comprises of many hundreds or even thousands of turns of wire wound around a reed switch (effectively a ferro-magnetic core). This operating coil therefore forms an inductor. When a current flows through this coil, a magnetic field is generated which operates the reed switch. The problem arises when the current through this inductive coil is switched off. This will usually be performed by a semiconductor switch of some sort. The collapsing magnetic field will produce a substantial voltage transient in its effort to disperse the stored energy in the inductor and oppose the sudden change of current flow. This voltage transient can sometimes be equal to many hundreds of volts and is commonly referred to as a Back EMF. If not suppressed, this will be equal to $-L \times di/dt$ where L is the inductance of the coil in Henrys and di/dt is the rate of change of current. If the current is reduced quickly, di/dt will be a high figure, resulting in a high level of Back EMF. If the current is reduced slowly, di/dt will be smaller resulting in a lower Back EMF figure but a longer release delay time which may not be desirable.

The diagram below shows a common method of driving a relay coil using an open collector NPN driver transistor.

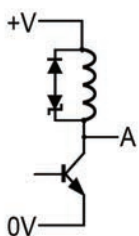
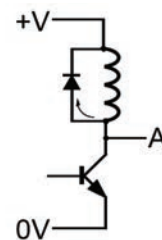


When the transistor is turned on, it will pull Point A to near 0 Volts turning on the relay. When the transistor is turned off, the stored energy in the inductor will generate a Back EMF pulse. This pulse will be of the opposite voltage polarity to that which was used to energize the coil. You will see from the oscilloscope display that there is a very large voltage spike which can be hundreds of volts more positive than the supply rail.

If not limited, this voltage spike can quite easily damage the semiconductor driver and interfere with the controlling electronics due to the electrical noise generated.

Limiting the Back EMF and the Effect on Release Time

The most usual method of limiting this Back EMF voltage to protect the driver, is by the use of a diode connected across the coil as shown in this circuit. When the driver output at A, rises above the coil supply voltage, the diode conducts and clamps the Back EMF voltage to the Forward Voltage figure of the diode ($V_f = 0.7$ Volts for a typical silicon diode) so the driver will only be subjected to the supply line voltage plus 0.7 Volts. Ideally, this diode should be inside the relay or very close to the coil terminals to avoid the risk of RFI as this current is carried along printed circuit tracks.



A consequence of using a simple diode in this way is to increase the opening or release time of the relay as the magnetic field will be retained until the energy is dissipated, limited by the coil resistance. The release time of a reed relay is quite fast so this is rarely an issue but in some instances, a faster release time is desired. Using the circuit shown with a Zener diode in series with a normal diode will achieve this by clamping the Back EMF to the Zener voltage plus 0.7 volts. As an example, a small reed relay might have a typical release time of around 120 microseconds with a simple diode clamp and this could fall to perhaps 50 microseconds if a 6.2 volt Zener is added in this way.

Pickering Series 120

Single Pole 4mm^2 ™ Reed Relays

Up to 1 Amp switching - Very high packing density

Stacking on 4mm x 4mm pitch

Features

- Highest packing density currently available
- 3, 5 or 12 Volt coils
- Switching up to 1 A, 20 W
- 1 Form A (SPST) Normally Open (NO) Energize to make
- Plastic package with internal mu-metal magnetic screen
- Highest quality instrumentation grade switches
- Insulation resistance greater than $10^{12} \Omega$
- 100% tested for dynamic contact resistance for guaranteed performance

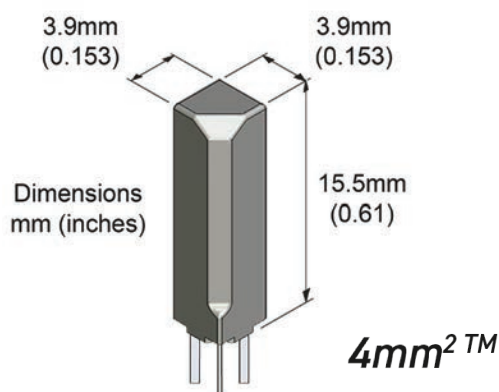
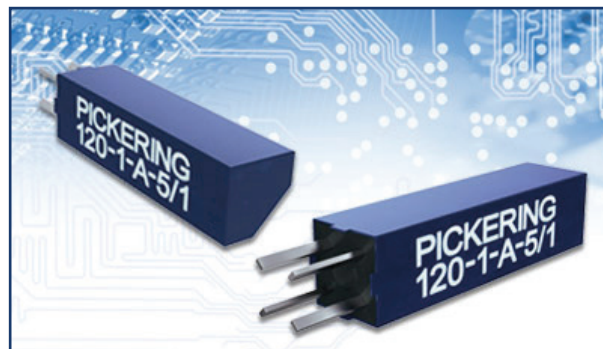
The Series 120 reed relay range takes up the minimum board area making them ideal for very high density applications such as A.T.E. switching matrices or multiplexers. Requiring a board area of only 4mm x 4mm, these relays allow the highest packing density currently available.

Two switch types are available, a general purpose sputtered ruthenium switch rated at 15 Watts, 1 Amp (3 volt version) or 20 Watts, 1 Amp (5 & 12 volt versions) and a low level sputtered ruthenium switch rated at 10 Watts, 0.5 Amps.

These are the same reed switches as used in many other long established Pickering ranges but are orientated vertically within the package, allowing this high density. The small size of the package does not allow an internal diode. Back EMF suppression diodes are included in many relay drivers but if they are not, and depending on your drive methods, these may have to be provided externally.

While socketing relays is not normally recommended due to the risk of affecting contact resistance integrity, it is appreciated that sockets may sometimes be desired for ease of servicing/replacement, in the case of a relay being damaged or reaching the end of its working life.

The device has pins on a 2mm square pitch. There are suitable connectors available from some manufacturers, both SMD and Through Hole, that will allow these relays to be stacked in either a row or in a matrix on a 4mm pitch.



A total of 528 Series 120 relays on Pickering Interfaces ultra-high-density PXI module illustrates the packing density of these extremely small Reed Relays.

Series 120 switch ratings - The contact ratings for each switch type are shown below:

Switch No	Switch form	Power rating	Max. switch current	Max. carry current	Max. switching volts	Life expectancy ops typical (see Note ¹ below)	Operate time inc bounce (max)	Release time	Special features
1	A	15 W (3 V Version) 20 W (5 & 12 V)	1.0 A	1.2 A	200	10E9	0.5 ms	0.2 ms	General purpose
2	A	10 W	0.5 A	1.2 A	200	10E9	0.5 ms	0.2 ms	Low level

Switch no.2 is particularly good for switching low currents and/or voltages. It is the ideal switch for A.T.E. systems where cold switching techniques are often used. Where higher power levels are involved, switch no.1 is more suitable.

Operating voltages

Coil voltage - nominal	Must operate voltage - maximum at 25°C	Must release voltage - minimum at 25°C
3 V	2.25 V	0.3 V
5 V	3.75 V	0.5 V
12 V	9.0 V	1.2 V

Coil data and type numbers

Device type	Type Number	Coil (V)	Coil resistance	Max. contact resistance (initial)	Insulation resistance (minimum)		Capacitance (typical) (see Note ^{2,3} below)	
					Switch to coil	Across switch	Closed switch to coil	Across open switch
1 Form A (energize to make) General Purpose Switch No. 1	120-1-A-3/1	3	200 Ω					
	120-1-A-5/1	5	300 Ω	0.12 Ω	10E12 Ω	10E12 Ω	2.9 pF	0.25 pF
	120-1-A-12/1	12	800 Ω					
1 Form A (energize to make) Low Level Switch No. 2	120-1-A-3/2	3	200 Ω					
	120-1-A-5/2	5	500 Ω	0.12 Ω	10E12 Ω	10E12 Ω	2.9 pF	0.25 pF
	120-1-A-12/2	12	800 Ω					

Environmental specification

Standard operating temperature range: -20 to +85 °C.

Note: The upper temperature limit can be extended to +125 °C if the coil drive voltage is increased to accommodate the resistance/temperature coefficient of the copper coil winding. This is approximately 0.4% per °C. This means that at 125 °C the coil drive voltage will need to be increased by approximately 40 x 0.4 = 16% to maintain the required magnetic drive level. Please contact sales@pickeringrelay.com for assistance if necessary.

Vibration: Maximum 20 G

Shock: Maximum 50 G

Note¹ Life expectancy

The life of a reed relay depends upon the switch load and end of life criteria. For example, for an 'end of life' contact resistance specification of 1 Ω, switching low loads (10 V at 10 mA resistive) or when 'cold' switching, typical life is approx 1 x 10⁹ ops. At the maximum load (resistive), typical life is 1 x 10⁷ ops. In the event of abusive conditions, e.g. high currents due to capacitive inrushes, this figure reduces considerably. Pickering will be pleased to perform life testing with any particular load condition.

Note² Switch to coil capacitance

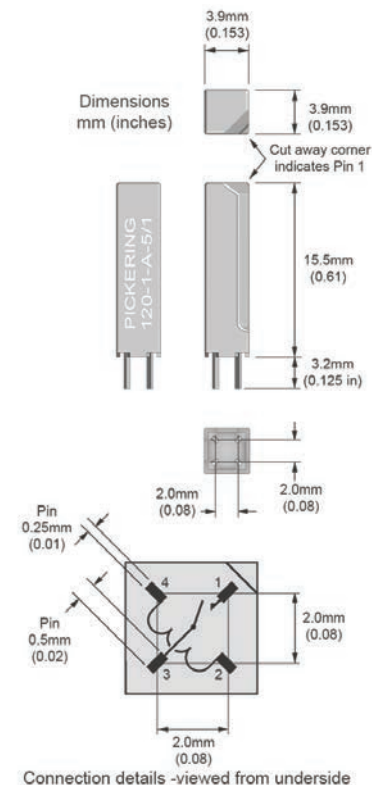
Due to the asymmetrical internal construction of the relay, the capacitance to the coil from one switch connection is approximately half the capacitance of the other switch connection, pin 1 is lower. In some applications this feature may be used to advantage for example, in a multiplexer where it is desirable to minimize the capacitance of the common connection to maximize bandwidth.

Note³ Capacitance across open switch

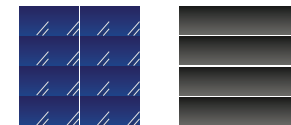
The capacitance across the open switch was measured with other connections guarded.

Pin Configuration and Dimensional Data

Dimensions in Millimeters (Inches in brackets)



Example of Packing Density - Actual Size



Pickering Electronics' Series 120

Industry standard reed relay of the same electrical specification.

The above full scale graphic illustrates sixteen new Series 120 Relays packed into an area of 1.6cm x 1.6cm, in comparison, only four of the industry standard reed relays can be fitted into the same area.

3D Models: Interactive models of the complete range of Pickering relay products can be downloaded from the web site.

Internal Mu-metal Magnetic Screen

The Series 120 relays are fitted with an internal mu-metal magnetic screen which permits side-by-side stacking on a 4mm pitch.

Order Code

120 - 1 - A - 5 / 2

Series _____
 Number of reeds _____
 Switch form _____
 Coil voltage _____
 Switch number (1 or 2 See table adjacent) _____

Help

If you need any technical advice or other help, for example, any special tests that you would like carried out, please do not hesitate to contact our Technical Sales Department. We will always be pleased to discuss Pickering relays with you. email: techsales@pickeringrelay.com

Please ask us for a FREE evaluation sample.



ISO9001 Manufacture of Reed Relays FM 29036



Pickering Series 124

Single Pole 4mm^2 ™ Reed Relays

0.5 Amp switching - Very high packing density

Stacking on 4mm x 4mm pitch

Features

- The industry's smallest through-hole reed relay currently available
- 3 or 5 Volt coils
- 5 Watts, 0.5 Amp switching
- 1 Form A (SPST) Normally Open (NO) Energize to make
- Very fast operate and release times making these relays ideal for high speed test systems
- Plastic package with internal mu-metal magnetic screen
- Ideal for A.T.E. switching matrices or multiplexers
- Highest quality instrumentation grade switches
- Insulation resistance greater than $10^{12} \Omega$
- 100% tested for dynamic contact resistance for guaranteed performance

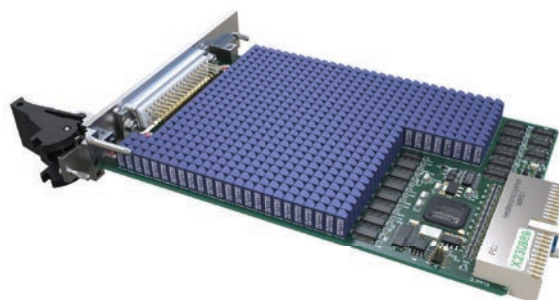
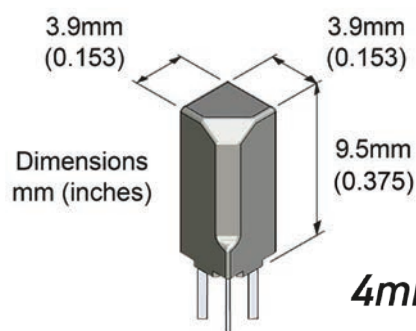
The Series 124 reed relay range is part of Pickering's new ultra-high density 4mm^2 product line, which take up the minimum board area of only 4mm x 4mm, allowing the highest packing density currently available.

The range features a sputtered ruthenium switch rated at 5 Watts, 0.5 Amps. These are the same reed switches as used in the long established Pickering Series 111, 111P and 117 but are orientated vertically within the package, allowing this high density. If a higher rating is required, please consider our Series 120 which are rated up to 1.0 Amp at 20 Watts but with a higher profile height.

The small size of the package does not allow an internal diode. Back EMF suppression diodes are included in many relay drivers but if they are not, and depending on your drive methods, these may have to be provided externally.

While socketing relays is not normally recommended due to the risk of affecting contact resistance integrity, it is appreciated that sockets may sometimes be desired for ease of servicing/replacement, in the case of a relay being damaged or reaching the end of its working life.

The device has pins on a 2mm square pitch. There are suitable connectors available from some manufacturers, both SMD and Through Hole, that will allow these relays to be stacked in either a row or in a matrix on a 4mm pitch.



A total of 606 Series 124 relays on an example ultra-high-density PXI module illustrates the packing density of these extremely small Reed Relays.

The reed switch in the Series 124 is suitable for low level or 'cold' switching. In accordance with Pickering convention, this switch is referred to as type number 2. There is no general purpose switch (type number 1) currently available in this series, but the type 2 is suitable for all applications if it is used within its specified ratings. This means that high inrush currents, particularly caused by capacitive loads must be avoided.

Series 124 switch ratings - The contact ratings for each switch type are shown below:

Switch No	Switch form	Power rating	Max. switch current	Max. carry current	Max. switching volts	Life expectancy ops typical (see Note ¹ below)	Operate time inc bounce (max)	Release time	Special features
2	A	5 W	0.5 A	0.5 A	170	10E8	0.2 ms	0.1 ms	All applications

Operating voltages

Coil voltage - nominal	Must operate voltage - maximum at 25°C	Must release voltage - minimum at 25°C
3 V	2.25 V	0.3 V
5 V	3.75 V	0.5 V

Coil data and type numbers

Device type	Type Number	Coil (V)	Coil resistance	Max. contact resistance (initial)	Insulation resistance (minimum)		Capacitance (typical) (see Note ^{2,3} below)	
					Switch to coil @ 1 kV DC	Across switch	Closed switch to coil	Across open switch
1 Form A (energize to make) Switch No. 2	124-1-A-3/2	3	75 Ω	0.15 Ω	10E12 Ω	10E12 Ω	1.6 pF	0.25 pF
	124-1-A-5/2	5	200 Ω					

Environmental specification

Standard operating temperature range: -20 to +85 °C.

Note: The upper temperature limit can be extended to +125 °C if the coil drive voltage is increased to accommodate the resistance/temperature coefficient of the copper coil winding. This is approximately 0.4% per °C. This means that at 125 °C the coil drive voltage will need to be increased by approximately 40 x 0.4 = 16% to maintain the required magnetic drive level. Please contact sales@pickeringrelay.com for assistance if necessary.

Vibration: Maximum 20 G

Shock: Maximum 50 G

Note¹ Life expectancy

The life of a reed relay depends upon the switch load and end of life criteria. For example, for an 'end of life' contact resistance specification of 1 Ω, switching low loads (10 V at 10 mA resistive) or when 'cold' switching, typical life is approx 2.5 x 10⁸ ops. At the maximum load (resistive), typical life is 1 x 10⁶ ops. In the event of abusive conditions, e.g. high currents due to capacitive inrushes, this figure reduces considerably. Pickering will be pleased to perform life testing with any particular load condition.

Note² Switch to coil capacitance

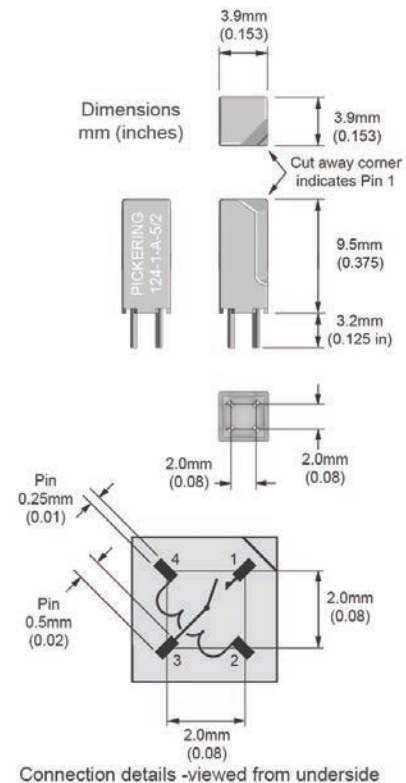
Due to the asymmetrical internal construction of the relay, the capacitance to the coil from one switch connection is approximately half the capacitance of the other switch connection, pin 1 is lower. In some applications this feature may be used to advantage for example, in a multiplexer where it is desirable to minimize the capacitance of the common connection to maximize bandwidth.

Note³ Capacitance across open switch

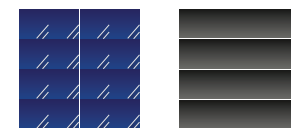
The capacitance across the open switch was measured with other connections guarded.

Pin Configuration and Dimensional Data

Dimensions in Millimeters (Inches in brackets)



Example of Packing Density - Actual Size



Pickering Electronics' Series 124

Industry standard reed relay

The above full scale graphic illustrates sixteen new Series 124 Relays packed into an area of 1.6cm x 1.6cm, in comparison, only four of the industry standard reed relays can be fitted into the same area.

3D Models: Interactive models of the complete range of Pickering relay products can be downloaded from the web site.

Internal Mu-metal Magnetic Screen

The Series 124 relays are fitted with an internal mu-metal magnetic screen which permits side-by-side stacking on a 4mm pitch.

Order Code

124 - 1 - A - 5 / 2

Series _____
Number of reeds _____
Switch form _____
Coil voltage _____
Switch number (1 or 2 See table adjacent) _____

Help

If you need any technical advice or other help, for example, any special tests that you would like carried out, please do not hesitate to contact our Technical Sales Department. We will always be pleased to discuss Pickering relays with you. email: techsales@pickeringrelay.com

Please ask us for a FREE evaluation sample.



ISO9001 Manufacture of Reed Relays FM 29036



Single-in-Line SIL/SIP Reed Relays

Very high packing density

1 Form A stacks on 0.15 x 0.27 inches pitch

Features

- **SoftCenter®** construction (see adjacent diagram)
- Highest quality instrumentation grade switches
- Plastic package with internal mu-metal magnetic screen
- They take up the minimum of board area, conserving board space
- Insulation resistance greater than $10^{12} \Omega$
- 3 or 5 Volt coils with or without internal diode
- 100% tested for dynamic contact resistance for guaranteed performance

The Pickering Series 117 is a range of Single-in-Line relays intended for very high density applications such as A.T.E. switching matrices or multiplexers.

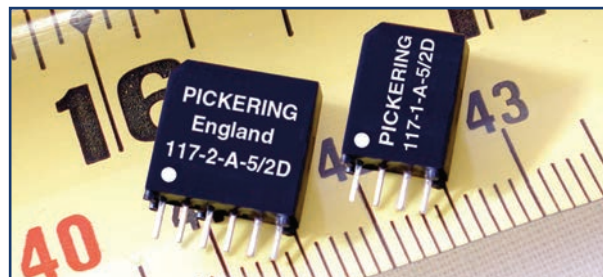
They are available with either 1 or 2 Form A (energize to make) switches.

Single switch versions require a board area of only 0.15 inches x 0.27 inches. This is one quarter of the board area of the industry standard 0.2 x 0.8 inches Single-in-Line package. The very small size of these relays often makes it possible to increase the functionality of existing designs without increasing the size of printed circuit boards.

The Series 117 switch rating of 5 Watts, 0.5 A is adequate for most instrumentation applications. If a higher rating is required, the Series 116, which is rated at 10 Watts, 0.5 A should be considered. The relay footprint and pin configurations of the Series 116 are identical but the case height increases slightly to 0.49 inches (12.5 mm).

The relays feature an internal mu-metal magnetic screen. Mu-metal has the advantage of a high permeability and low magnetic remanence and eliminates problems that would otherwise occur due to magnetic interaction. Interaction is usually measured as a percentage increase in the voltage required to operate a relay when additional relays, stacked each side, are themselves operated. An unscreened device mounted on this pitch would have an interaction figure of around 40 percent. Relays of this size without magnetic screening would therefore be totally unsuitable for applications where dense packing is required.

3 volt and 5 volt coils are available with an optional Back E.M.F suppression diode.



1 Form A 0.26 nom (6.60)
0.27 max (6.86)

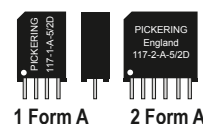
2 Form A 0.39 nom (9.90)
0.40 max (10.16)

0.145 nom (3.70)
0.15 max (3.81)

0.375 nom (9.52)
0.385 max (9.78)

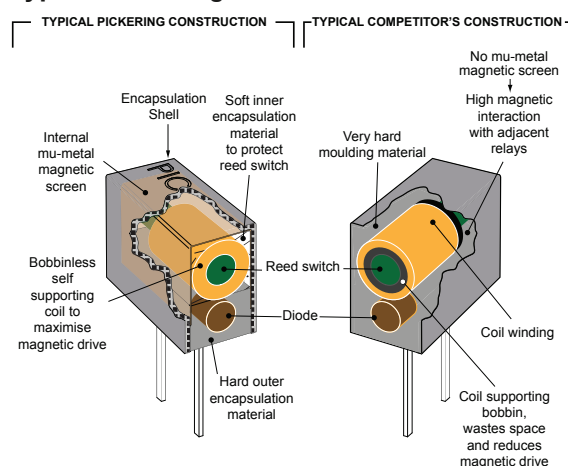
Inches (mm)

Pin 1



Actual size

Typical Pickering **SoftCenter®** Construction



The reed switch in the Series 117 is suitable for low level or 'cold' switching. In accordance with Pickering convention, this switch is referred to as type number 2. There is no general purpose switch (type number 1) currently available in this series, but the type 2 is suitable for all applications if it is used within its specified ratings. This means that high inrush currents, particularly caused by capacitive loads must be avoided.

Series 117 switch ratings - The contact ratings for each switch type are shown below:

Switch No	Switch form	Power rating	Max. switch current	Max. carry current	Max. switching volts	Life expectancy ops typical (see Note ¹ below)	Operate time inc bounce (max)	Release time	Special features
2	A	5 W	0.5 A	0.5 A	170	10E8	0.3 ms	0.15 ms	All applications

Operating voltages

Coil voltage - nominal	Must operate voltage - maximum at 25°C	Must release voltage - minimum at 25°C
3 V	2.25 V	0.3 V
5 V	3.75 V	0.5 V

Coil data and type numbers

Device type	Type Number	Coil (V)	Coil resistance	Max. contact resistance (initial)	Insulation resistance (minimum)		Capacitance (typical) (see Note ^{2,3} below)	
					Switch to coil	Across switch	Closed switch to coil	Across open switch
1 Form A (energize to make) Switch No. 2	117-1-A-3/2D 117-1-A-5/2D	3 5	200 Ω 400 Ω	0.12 Ω	10E12 Ω	10E12 Ω	2.0 pF	0.14 pF
2 Form A (energize to make) Switch No. 2	117-2-A-5/2D	5	250 Ω	0.12 Ω	10E12 Ω	10E12 Ω	2.0 pF	0.14 pF

When an internal diode is required, the suffix D is added to the part number as shown in the table.

Environmental specification

Standard operating temperature range: -20 to +85 °C.

Note: The upper temperature limit can be extended to +125 °C if the coil drive voltage is increased to accommodate the resistance/temperature coefficient of the copper coil winding. This is approximately 0.4% per °C. This means that at 125 °C the coil drive voltage will need to be increased by approximately $40 \times 0.4 = 16\%$ to maintain the required magnetic drive level. Please contact sales@pickeringrelay.com for assistance if necessary.

Vibration: Maximum 20 G **Shock:** Maximum 50 G

Note¹ Life expectancy

The life of a reed relay depends upon the switch load and end of life criteria. For example, for an 'end of life' contact resistance specification of 1 Ω, switching low loads (10 V at 10 mA resistive) or when 'cold' switching, typical life is approx 2.5×10^8 ops. At the maximum load (resistive), typical life is 1×10^6 ops. In the event of abusive conditions, e.g. high currents due to capacitive inrushes, this figure reduces considerably. Pickering will be pleased to perform life testing with any particular load condition.

Note² Switch to coil capacitance

Due to the asymmetrical internal construction of the relay, the capacitance to the coil from one switch connection is approximately half the capacitance of the other switch connection, for the 1 Form A versions pin 3 is lower. In some applications this feature may be used to advantage for example, in a multiplexer where it is desirable to minimize the capacitance of the common connection to maximize bandwidth.

Note³ Capacitance across open switch

The capacitance across the open switch was measured with other connections guarded.

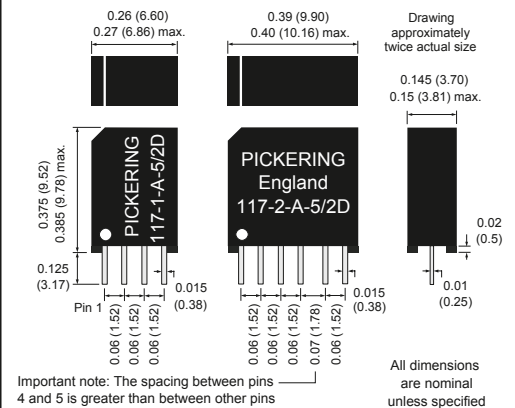
Example of Packing Density - Actual Size



In this small area of only 2.16 x 1.2 inches (5.48 x 3.05 cm), it is possible to construct an 8 x 8 matrix - 64, 1 Form A relays.

Pin Configuration and Dimensional Data

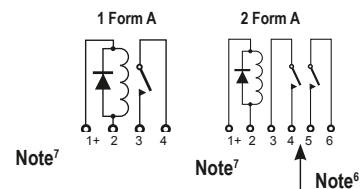
Dimensions in Inches (Millimeters in brackets)



Note⁴ View from below showing position of round pins

Note⁴: Pin 3 is round with an outer diameter of 0.016 (0.4).

Note⁵: Pins 4 and 5 are round with an outer diameter of 0.016 (0.4).



Note⁶: The spacing between pins 4 and 5 is greater than between other pins.

Note⁷: When an optional diode is fitted pin 1 is the positive connection.

3D Models: Interactive models of the complete range of Pickering relay products can be downloaded from the web site.

Internal Mu-metal Magnetic Screen

The Series 117 relays are fitted with an internal mu-metal magnetic screen which permits side-by-side stacking on 0.15 inches pitch.

Order Code

117 - 1 - A - 5 / 2 D

Series _____
 Number of reeds _____
 Switch form _____
 Coil voltage _____
 Switch number (Only Type 2 available) _____
 Diode if fitted (Omit if not required) _____

Help

If you need any technical advice or other help, for example, any special tests that you would like carried out, please do not hesitate to contact our Technical Sales Department. We will always be pleased to discuss Pickering relays with you. email: techsales@pickeringrelay.com

Please ask us for a FREE evaluation sample.



ISO9001 Manufacture of
Reed Relays FM 29036

Single-in-Line SIL/SIP Reed Relays

10 Watts switching - Very high packing density

1 Form A stacks on 0.15 x 0.27 inches pitch

Features

- **SoftCenter®** construction (see adjacent diagram)
- Highest quality instrumentation grade switches
- Plastic package with internal mu-metal magnetic screen
- They take up the minimum of board area, conserving board space
- Insulation resistance greater than $10^{12} \Omega$
- 3, 5 or 12 Volt coils with or without internal diode
- 100% tested for dynamic contact resistance for guaranteed performance

The Pickering Series 116 is a range of Single-in-Line relays intended for very high density applications such as A.T.E. switching matrices or multiplexers.

They have a switch rating of 10 Watts, 0.5 A and are pin compatible with the Pickering Series 117 which have a lower power rating of 5 Watts and a lower profile height of 0.38 inches (9.65 mm).

Switches have sputtered ruthenium contacts making them ideal for low level or "cold" switching applications.

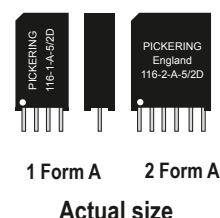
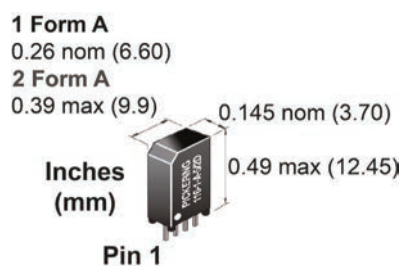
1 or 2 pole, Form A (energize to make) versions are available.

The single pole version uses the same switch and coil assembly as the Pickering Series 112.

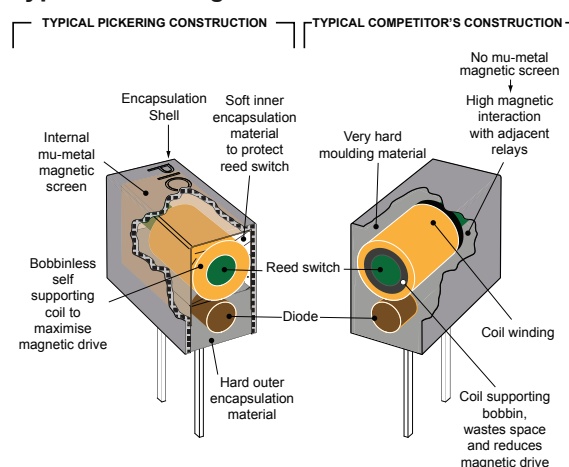
Single switch versions require a board area of only 0.15 inches x 0.27 inches. This is one quarter of the board area of the industry standard 0.2 x 0.8 inches Single-in-Line package. The very small size of these relays often makes it possible to increase the functionality of existing designs without increasing the size of printed circuit boards.

The relays feature an internal mu-metal magnetic screen. Mu-metal has the advantage of a high permeability and low magnetic remanence and eliminates problems that would otherwise occur due to magnetic interaction. Interaction is usually measured as a percentage increase in the voltage required to operate a relay when additional relays, stacked each side, are themselves operated. An unscreened device mounted on this pitch would have an interaction figure of around 40 percent. Relays of this size without magnetic screening would therefore be totally unsuitable for applications where dense packing is required.

3 volt, 5 volt or 12 volt coils are available. An internal Back E.M.F suppression diode is available as an option.



Typical Pickering **SoftCenter®** Construction



The reed switch in the Series 116 is suitable for low level or 'cold' switching. In accordance with Pickering convention, this switch is referred to as type number 2. There is no general purpose switch (type number 1) currently available in this series, but the type 2 is suitable for all applications if it is used within its specified ratings.

Series 116 switch ratings - The contact ratings for each switch type are shown below:

Switch No	Switch form	Power rating	Max. switch current	Max. carry current	Max. switching volts	Life expectancy ops typical (see Note ¹ below)	Operate time inc bounce (max)	Release time	Special features
2	A	10 W	0.5 A	0.5 A	200	10E8	0.5 ms	0.2 ms	All applications

Operating voltages

Coil voltage - nominal	Must operate voltage - maximum at 25°C	Must release voltage - minimum at 25°C
3 V	2.25 V	0.3 V
5 V	3.75 V	0.5 V
12 V	9.0 V	1.2 V

Coil data and type numbers

Device type	Type Number	Coil (V)	Coil resistance	Max. contact resistance (initial)	Insulation resistance (minimum)		Capacitance (typical) (see Note ^{2,3} below)	
					Switch to coil	Across switch	Closed switch to coil	Across open switch
1 Form A (energize to make) Switch No. 2	116-1-A-3/2D	3	250 Ω	0.12 Ω	10E12 Ω	10E12 Ω	2.1 pF	0.2 pF
	116-1-A-5/2D	5	500 Ω					
	116-1-A-12/2D	12	750 Ω					
2 Form A (energize to make) Switch No. 2	116-2-A-5/2D	5	375 Ω	0.12 Ω	10E12 Ω	10E12 Ω	2.1 pF	0.2 pF
	116-2-A-12/2D	12	750 Ω					

When an internal diode is required, the suffix D is added to the part number as shown in the table.

Environmental specification

Standard operating temperature range: -20 to +85 °C.

Note: The upper temperature limit can be extended to +125 °C if the coil drive voltage is increased to accommodate the resistance/temperature coefficient of the copper coil winding. This is approximately 0.4% per °C. This means that at 125 °C the coil drive voltage will need to be increased by approximately 40 x 0.4 = 16% to maintain the required magnetic drive level. Please contact sales@pickeringrelay.com for assistance if necessary.

Vibration: Maximum 20 G

Shock: Maximum 50 G

Note¹ Life expectancy

The life of a reed relay depends upon the switch load and end of life criteria. For example, for an 'end of life' contact resistance specification of 1 Ω, switching low loads (10 V at 10 mA resistive) or when 'cold' switching, typical life is approx 2.5 x 10⁸ ops. At the maximum load (resistive), typical life is 1 x 10⁶ ops. In the event of abusive conditions, e.g. high currents due to capacitive inrushes, this figure reduces considerably. Pickering will be pleased to perform life testing with any particular load condition.

Note² Switch to coil capacitance

Due to the asymmetrical internal construction of the relay, the capacitance to the coil from one switch connection is approximately half the capacitance of the other switch connection, pin 3 is lower. In some applications this feature may be used to advantage for example, in a multiplexer where it is desirable to minimize the capacitance of the common connection to maximize bandwidth.

Note³ Capacitance across open switch

The capacitance across the open switch was measured with other connections guarded.

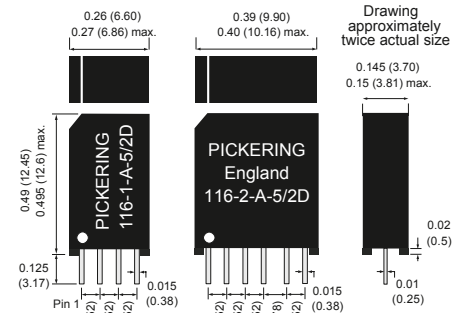
Example of Packing Density - Actual Size



In this small area of only 2.16 x 1.2 inches (5.48 x 3.05 cm), it is possible to construct an 8 x 8 matrix - 64, 1 Form A relays.

Pin Configuration and Dimensional Data

Dimensions in Inches (Millimeters in brackets)



Pickering Series 115

Single-in-Line SIL/SIP Reed Relays

10, 15 or 20 Watts switching - Very high packing density

1 Form A stacks on 0.15 x 0.27 inches pitch

Features

- **SoftCenter®** construction (see adjacent diagram)
- Highest quality instrumentation grade switches
- Plastic package with internal mu-metal magnetic screen
- They take up the minimum of board area, conserving board space
- Insulation resistance greater than $10^{12} \Omega$
- 3, 5 or 12 Volt coils with or without internal diode
- 100% tested for dynamic contact resistance for guaranteed performance

The Pickering Series 115 is a range of Single-in-Line relays intended for very high density applications such as A.T.E. switching matrices or multiplexers.

They are pin compatible with the Pickering Series 116 and 117 but have a slightly higher profile.

The reed switch/coil assemblies used in this series are the same as used in the long established and well proven, Series 109 and 109P.

Two switch types are available. Both types have sputtered ruthenium contacts for long life and high reliability.

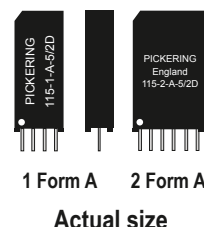
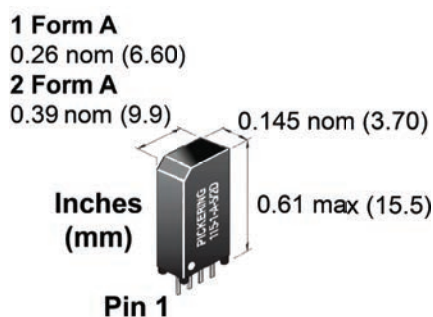
Switch type number 1 is better suited for general purpose applications. It has a layer of copper beneath the ruthenium to help dissipate the heat from the contact area. This gives an improved current inrush handling ability.

Switch type number 2 should be chosen for low level or 'cold' switching applications.

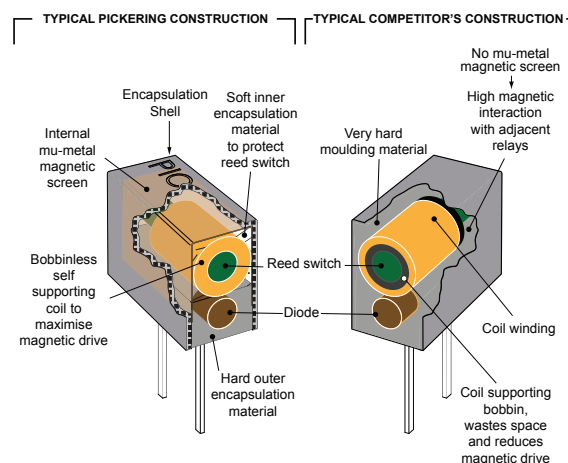
Single switch versions require a board area of only 0.15 inches x 0.27 inches. This is one quarter of the board area of the industry standard 0.2 x 0.8 inches Single-in-Line package. The very small size of these relays often makes it possible to increase the functionality of existing designs without increasing the size of printed circuit boards.

The relays feature an internal mu-metal magnetic screen. Mu-metal has the advantage of a high permeability and low magnetic remanence and eliminates problems that would otherwise occur due to magnetic interaction. Relays of this size without magnetic screening would be totally unsuitable for applications where dense packing is required.

3 volt, 5 volt or 12 volt coils are available. An internal Back E.M.F suppression diode is available as an option.



Typical Pickering SoftCenter® Construction



Series 115 switch ratings - The contact ratings for each switch type are shown below:

Switch No	Switch form	Power rating	Max. switch current	Max. carry current	Max. switching volts	Life expectancy ops typical (see Note ¹ below)	Operate time inc bounce (max)	Release time	Special features
1	A	15 W (3 V & 2 Form A) 20 W (5 V Versions) 20 W (12 V Versions)	1.0 A	1.2 A	200	10E9	0.5 ms	0.2 ms	General purpose
2	A	10 W	0.5 A	1.2 A	200	10E9	0.5 ms	0.2 ms	Low level

Switch no.2 is particularly good for switching low currents and/or voltages. It is the ideal switch for A.T.E. systems where cold switching techniques are often used. Where higher power levels are involved, switch no.1 is more suitable.

Operating voltages

Coil voltage - nominal	Must operate voltage - maximum at 25°C	Must release voltage - minimum at 25°C
3 V	2.25 V	0.3 V
5 V	3.75 V	0.5 V
12 V	9.0 V	1.2 V

Coil data and type numbers

Device type	Type Number	Coil (V)	Coil resistance	Max. contact resistance (initial)	Insulation resistance (minimum)		Capacitance (typical) (see Note ^{2,3} below)	
					Switch to coil	Across switch	Closed switch to coil	Across open switch
1 Form A (energize to make) General Purpose Switch No. 1	115-1-A-3/1D	3	250 Ω					
	115-1-A-5/1D	5	500 Ω	0.12 Ω	10E12 Ω	10E12 Ω	2.9 pF	0.14 pF
	115-1-A-12/1D	12	1000 Ω					
1 Form A (energize to make) Low Level Switch No. 2	115-1-A-3/2D	3	250 Ω					
	115-1-A-5/2D	5	500 Ω	0.12 Ω	10E12 Ω	10E12 Ω	2.9 pF	0.14 pF
	115-1-A-12/2D	12	1000 Ω					
2 Form A (energize to make) Low Level Switch No. 2	115-2-A-5/1D	5	250 Ω	0.12 Ω	10E12 Ω	10E12 Ω	2.9 pF	0.14 pF
	115-2-A-5/2D	5	350 Ω					

When an internal diode is required, the suffix D is added to the part number as shown in the table.

Environmental specification

Standard operating temperature range: -20 to +85 °C.	
Note: The upper temperature limit can be extended to +125 °C if the coil drive voltage is increased to accommodate the resistance/temperature coefficient of the copper coil winding. This is approximately 0.4% per °C. This means that at 125 °C the coil drive voltage will need to be increased by approximately $40 \times 0.4 = 16\%$ to maintain the required magnetic drive level. Please contact sales@pickeringrelay.com for assistance if necessary.	
Vibration: Maximum 20 G	Shock: Maximum 50 G

Note¹ Life expectancy
The life of a reed relay depends upon the switch load and end of life criteria. For example, for an 'end of life' contact resistance specification of 1 Ω, switching low loads (10 V at 10 mA resistive) or when 'cold' switching, typical life is approx 1 x 10⁹ ops. At the maximum load (resistive), typical life is 1 x 10⁷ ops. In the event of abusive conditions, e.g. high currents due to capacitive inrushes, this figure reduces considerably. Pickering will be pleased to perform life testing with any particular load condition.

Note² Switch to coil capacitance
Due to the asymmetrical internal construction of the relay, the capacitance to the coil from one switch connection is approximately half the capacitance of the other switch connection, pin 3 is lower. In some applications this feature may be used to advantage for example, in a multiplexer where it is desirable to minimize the capacitance of the common connection to maximize bandwidth.

Note³ Capacitance across open switch
The capacitance across the open switch was measured with other connections guarded.

Example of Packing Density - Actual Size

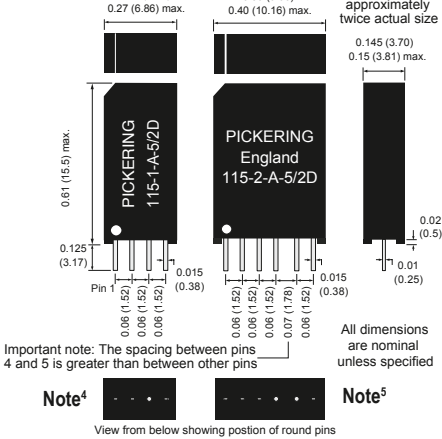


In this small area of only 2.16 x 1.2 inches (5.48 x 3.05 cm), it is possible to construct an 8 x 8 matrix - 64, 1 Form A relays.

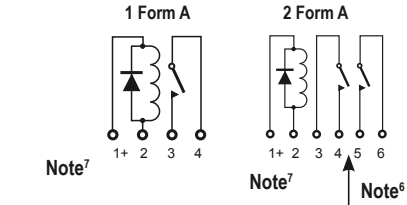


Pin Configuration and Dimensional Data

Dimensions in Inches (Millimeters in brackets)



Note⁴: Pin 3 is round with an outer diameter of 0.0175 (0.44).
Note⁵: Pins 4 and 5 are round with an outer diameter of 0.0175 (0.44).



Note⁶: The spacing between pins 4 and 5 is greater than between other pins.
Note⁷: When an optional diode is fitted pin 1 is the positive connection.

3D Models: Interactive models of the complete range of Pickering relay products can be downloaded from the web site.

Internal Mu-metal Magnetic Screen

The Series 115 relays are fitted with an internal mu-metal magnetic screen which permits side-by-side stacking on 0.15 inches pitch.

Order Code

115 - 1 - A - 5 / 2 D

Series _____
Number of reeds _____
Switch form _____
Coil voltage _____
Switch number (1 or 2 See table adjacent) _____
Diode if fitted (Omit if not required) _____

Help

If you need any technical advice or other help, for example, any special tests that you would like carried out, please do not hesitate to contact our Technical Sales Department. We will always be pleased to discuss Pickering relays with you. email: techsales@pickeringrelay.com

Please ask us for a FREE evaluation sample.

Single-in-Line SIL/SIP Reed Relays

10 Watts switching - Very high packing density

1 Form A stacks on 0.15 x 0.4 inches pitch

Features

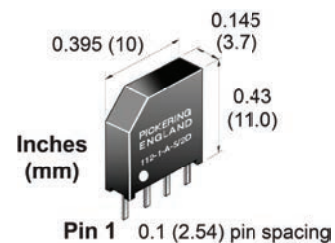
- **SoftCenter®** construction (see adjacent diagram)
- Highest quality instrumentation grade switches
- Ideal for high density card based systems and Automatic Test Equipment
- Plastic package with internal mu-metal magnetic screen
- They take up the minimum of board area, conserving board space
- Insulation resistance greater than $10^{12} \Omega$
- 3, 5 and 12 Volt coils with or without internal diode
- 5 Volt coils of 500 ohms may be driven directly from TTL logic
- 100% tested for dynamic contact resistance for guaranteed performance

The Pickering Series 112 is a range of magnetically screened single-in-line reed relays that require a board area of only 0.15 inches (3.8mm.) by 0.4 inches (10mm.) while retaining the 10 Watts, 0.5 Amps rating associated with larger relays. This small footprint is achieved by mounting the reed switch diagonally within the package.

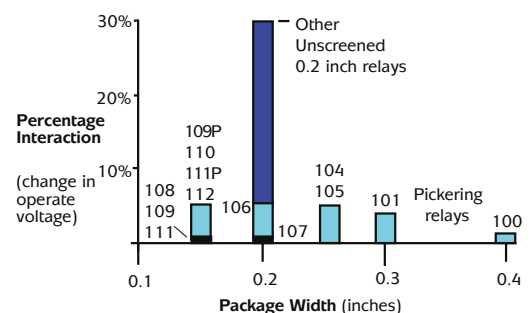
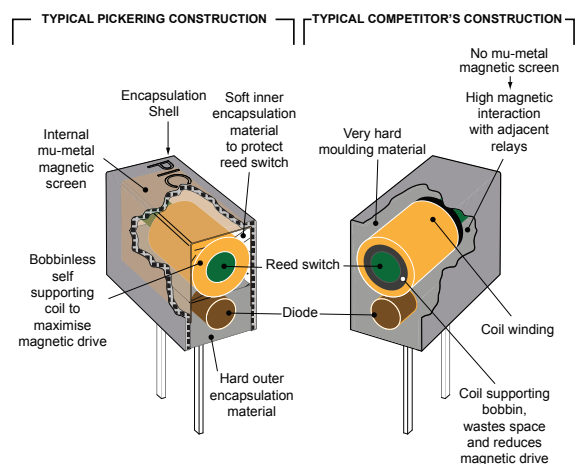
These relays require around one third the board area of the more usual 0.2 x 0.8 inch devices and the height of only 0.43 inches (11mm.) is suitable for high density card based systems such as VME, VXI, Compact PCI, and PXI. The high quality, sputtered ruthenium switch contacts also makes them ideal for Automatic Test Equipment.

The Series 112 is encapsulated in a plastic package using a very high resistivity resin to achieve an insulation resistance greater than 10^{12} ohms. The relay has an internal mumetal screen which totally eliminates the risk of magnetic interaction problems. An unscreened device mounted on this pitch would have an interaction figure of around 40 percent. Relays of this size without magnetic screening would therefore be totally unsuitable for applications where dense packing is required. Pickering Series 112 have a typical interaction figure of 5 percent.

3, 5 and 12 Volt coils are standard, with the option of an internal diode. 5 Volt coils have a resistance of 500 ohms and may be driven directly from TTL logic.



Typical Pickering SoftCenter® Construction



Key: ■ Unscreened ■ Internal mu-metal screen ■ Complete mu-metal can

Series 112 switch ratings - The contact ratings for each switch type are shown below:

Switch No	Switch form	Power rating	Max. switch current	Max. carry current	Max. switching volts	Life expectancy ops typical (see Note ¹ below)	Operate time inc bounce (max)	Release time	Special features
2	A	10 W	0.5 A	0.5 A	200	10E8	0.5 ms	0.2 ms	General purpose

Switch number 2 is suitable for low level or "cold" switching applications. It is also a good general purpose "hot" switch as long as the maximum switching current specification is observed. There is no Switch number 1 available in this range at present.

Operating voltages

Coil voltage - nominal	Must operate voltage - maximum at 25°C	Must release voltage - minimum at 25°C
3 V	2.25 V	0.3 V
5 V	3.75 V	0.5 V
12 V	9 V	1.2 V

Coil data and type numbers

Device type	Type Number	Coil (V)	Coil resistance	Max. contact resistance (initial)	Insulation resistance (minimum)		Capacitance (typical) (see Note ² below)	
					Switch to coil	Across switch	Closed switch to coil	Across open switch
1 Form A (energize to make) Switch No. 2	112-1-A-3/2D	3	250 Ω	0.12 Ω	10E12 Ω	10E12 Ω	1.5 pF	0.15 pF
	112-1-A-5/2D	5	500 Ω					
	112-1-A-12/2D	12	750 Ω					

When an internal diode is required, the suffix D is added to the part number as shown in the table.

Environmental specification

Standard operating temperature range: -20 to +85 °C.

Note: The upper temperature limit can be extended to +125 °C if the coil drive voltage is increased to accommodate the resistance/temperature coefficient of the copper coil winding. This is approximately 0.4% per °C. This means that at 125 °C the coil drive voltage will need to be increased by approximately 40 x 0.4 = 16% to maintain the required magnetic drive level. Please contact sales@pickeringrelay.com for assistance if necessary.

Vibration: Maximum 20 GShock: Maximum 50 G

Note¹ Life expectancy

The life of a reed relay depends upon the switch load and end of life criteria. For example, for an 'end of life' contact resistance specification of 1 Ω, switching low loads (10 V at 10 mA resistive) or when 'cold' switching, typical life is approx 2.5 x 10⁸ ops. At the maximum load (resistive), typical life is 1 x 10⁶ ops. In the event of abusive conditions, e.g. high currents due to capacitive inrushes, this figure reduces considerably. Pickering will be pleased to perform life testing with any particular load condition.

Note² Capacitance across open switch

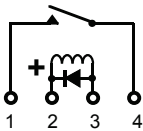
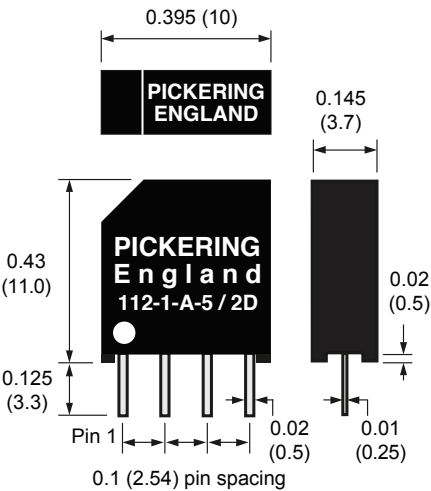
The capacitance across the open switch was measured with other connections guarded.

Internal Mu-metal Magnetic Screen

The Series 112 relays are fitted with an internal mu-metal magnetic screen which permits side-by-side stacking on 0.15 inches pitch.

Pin Configuration and Dimensional Data

Dimensions in Inches (Millimeters in brackets)



Schematic

1 Form A

Energize to make

Important: Where the optional internal diode is fitted, the correct coil polarity must be observed, as shown by the + symbol on the schematic.

3D Models: Interactive models of the complete range of Pickering relay products can be downloaded from the web site.

Order Code

112 - 1 - A - 5 / 2 D

Series _____

Number of reeds _____

Switch form _____

Coil voltage _____

Switch number (Only Type 2 available) _____

Diode if fitted (Omit if not required) _____

Help

If you need any technical advice or other help, for example, any special tests that you would like carried out, please do not hesitate to contact our Technical Sales Department. We will always be pleased to discuss Pickering relays with you. email: techsales@pickeringrelay.com

Please ask us for a FREE evaluation sample.



ISO9001 Manufacture of Reed Relays FM 29036

Pickering Series 110

SIL/SIP Reed Relays

20 Watts switching - Very high packing density

1 Form A stacks on 0.15 x 0.40 inches pitch

Features

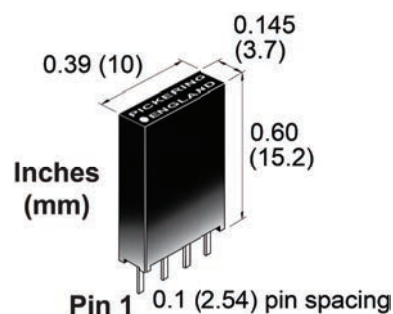
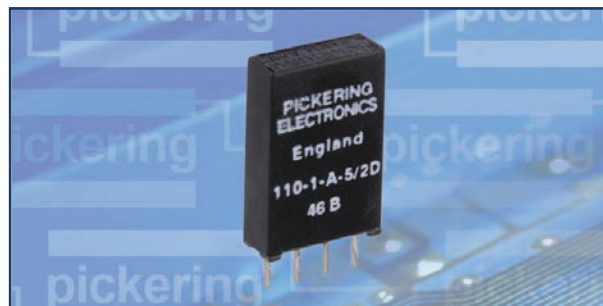
- **SoftCenter®** construction (see adjacent diagram)
- Highest quality instrumentation grade switches
- Plastic package with internal mu-metal magnetic screen
- They take up the minimum of board area, conserving board space
- Insulation resistance greater than $10^{12} \Omega$
- 3, 5 and 12 Volt coils with or without internal diode
- 5 Volt coils of 500 ohms may be driven directly from TTL logic
- 100% tested for dynamic contact resistance for guaranteed performance

The Pickering Series 110 V-SIL (vertical single-in-line) is a range of magnetically screened single-in-line reed relays that stack on 0.15 inches by 0.4 inches pitch. The switches in this range are mounted vertically within the package, this allows the use of the same switch types as would normally be found in relays requiring a very much larger board area. Two types of Form A (energize to make) switches are available, a general purpose version and a type suitable for low level or "cold" switching applications.

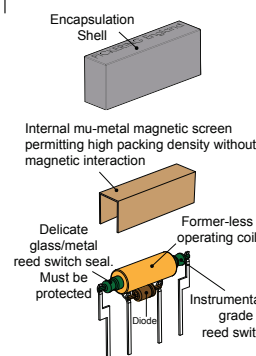
These relays require around one third the board area of the more usual 0.2 x 0.8 inch devices. These are your ideal choice for high density applications such as A.T.E. switching matrices or where very little board area is available. If a lower profile device is required, look at the Series 111 & 112.

The Series 110 is encapsulated in a plastic package using a very high resistivity resin. The relay has an internal mu-metal screen which totally eliminates the risk of magnetic interaction problems. An unscreened device mounted on this pitch would have an interaction figure of around 40 percent. Relays of this size without magnetic screening would therefore be totally unsuitable for applications where dense packing is required. Pickering Series 110 have a typical interaction figure of 5 percent.

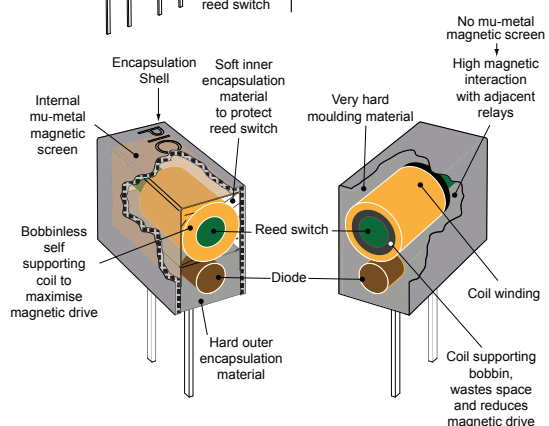
3, 5 and 12 Volt coils are standard, with the option of an internal diode. 5 Volt coils have a resistance of 500 ohms and may be driven directly from TTL logic.

Typical Pickering **SoftCenter®** Construction

TYPICAL PICKERING CONSTRUCTION



TYPICAL COMPETITOR'S CONSTRUCTION



Series 110 switch ratings - The contact ratings for each switch type are shown below:

Switch No	Switch form	Power rating	Max. switch current	Max. carry current	Max. switching volts	Life expectancy ops typical (see Note ¹ below)	Operate time inc bounce (max)	Release time	Special features
1	A	20 W	1.0 A	1.2 A	200	10E9	0.5 ms	0.2 ms	General purpose
2	A	10 W	0.5 A	1.2 A	200	10E9	0.5 ms	0.2 ms	Low level

Switch no. 2 is particularly good for switching low currents and/or voltages. It is the ideal switch for A.T.E. systems where cold switching techniques are often used. Where higher power levels are involved, switch no. 1 is more suitable.

Operating voltages

Coil voltage - nominal	Must operate voltage - maximum at 25°C	Must release voltage - minimum at 25°C
3 V	2.25 V	0.3 V
5 V	3.75 V	0.5 V
12 V	9 V	1.2 V

Coil data and type numbers

Device type	Type Number	Coil (V)	Coil resistance	Max. contact resistance (initial)	Insulation resistance (minimum)		Capacitance (typical) (see Note ² below)	
					Switch to coil	Across switch	Closed switch to coil	Across open switch
1 Form A (energize to make) General Purpose Switch No. 1	110-1-A-5/1D	5	500 Ω	0.15 Ω	10E12 Ω	10E12 Ω	3 pF	0.1 pF
	110-1-A-12/1D	12	1000 Ω					
1 Form A (energize to make) Low Level Switch No. 2	110-1-A-3/2D	3	250 Ω	0.15 Ω	10E12 Ω	10E12 Ω	3 pF	0.1 pF
	110-1-A-5/2D	5	500 Ω					
	110-1-A-12/2D	12	1000 Ω					

When an internal diode is required, the suffix D is added to the part number as shown in the table.

Environmental specification

Standard operating temperature range: -20 to +85 °C.	
Note: The upper temperature limit can be extended to +125 °C if the coil drive voltage is increased to accommodate the resistance/temperature coefficient of the copper coil winding. This is approximately 0.4% per °C. This means that at 125 °C the coil drive voltage will need to be increased by approximately $40 \times 0.4 = 16\%$ to maintain the required magnetic drive level. Please contact sales@pickeringrelay.com for assistance if necessary.	
Vibration: Maximum 20 G	Shock: Maximum 50 G

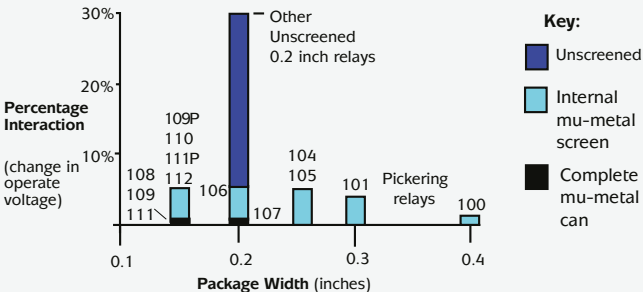
Note¹ Life expectancy
The life of a reed relay depends upon the switch load and end of life criteria. For example, for an 'end of life' contact resistance specification of 1 Ω, switching low loads (10 V at 10 mA resistive) or when 'cold' switching, typical life is approx 1 x 10⁹ ops. At the maximum load (resistive), typical life is 1 x 10⁷ ops. In the event of abusive conditions, e.g. high currents due to capacitive inrushes, this figure reduces considerably. Pickering will be pleased to perform life testing with any particular load condition.

Note² Capacitance across open switch
The capacitance across the open switch was measured with other connections guarded.

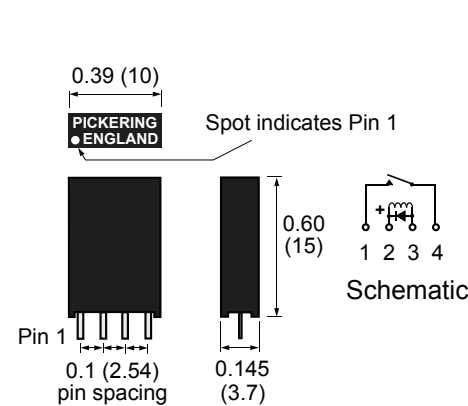
Internal Mu-metal Magnetic Screen

The Series 110 relays are fitted with an internal mu-metal magnetic screen which permits side-by-side stacking on 0.15 inches pitch.

Graph showing the effects of different types of Screening



Pin Configuration and Dimensional Data



Important: Where the optional internal diode is fitted, the correct coil polarity must be observed, as shown by the + symbol on the schematic.

3D Models: Interactive models of the complete range of Pickering relay products can be downloaded from the web site.

Order Code

110 - 1 - A - 5 / 2 D

Series _____
Number of reeds _____
Switch form _____
Coil voltage _____
Switch number (See table adjacent) _____
Diode if fitted (Omit if not required) _____

Help

If you need any technical advice or other help, for example, any special tests that you would like carried out, please do not hesitate to contact our Technical Sales Department. We will always be pleased to discuss Pickering relays with you. email: techsales@pickeringrelay.com

Please ask us for a FREE evaluation sample.

Single-in-Line SIL/SIP Reed Relays

Up to 10 Watts switching - Very high packing density

Stacks on 0.15 x 0.5 inches pitch

Features

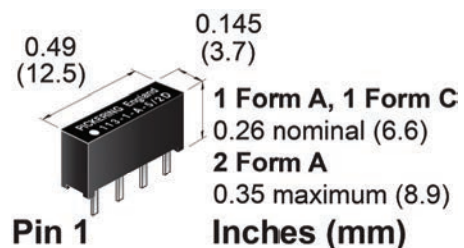
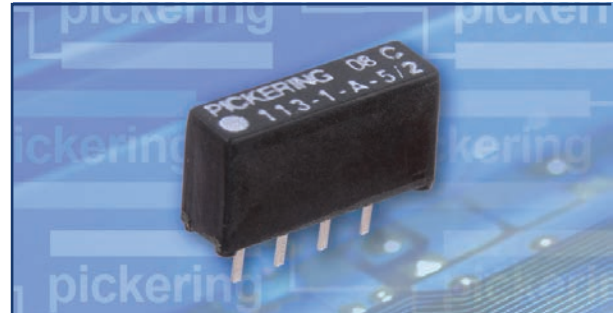
- **SoftCenter®** construction (see adjacent diagram)
- Highest quality instrumentation grade switches
- Form A versions have sputtered ruthenium contacts, ideal for Automatic Test Equipment
- Plastic package with internal mu-metal magnetic screen
- They take up very little area, conserving board space
- High insulation resistance - greater than 10^{12} ohms for Form A types and greater than 10^{10} ohms for Form C types
- 3, 5 and 12 Volt coils are standard, with or without internal diode
- 1 Form A, 5 volt version has a coil resistance of 500 ohms - drives directly from TTL logic
- 100% tested for dynamic contact resistance

The Pickering Series 113 is a range of magnetically screened single-in-line reed relays that require a board area of only 0.15 inches (3.8mm.) by 0.5 inches (12.7mm.) The Form A (energize to make) versions retain the 10 Watts, 0.5 Amps rating associated with larger relays. The changeover version has a 3 Watts rating.

These relays require less than half the board area of the more usual 0.2 x 0.8 inch devices and have a height of only 0.26 inches (6.6mm.) for the 1 Form A and 1 Form C types and 0.35 inches (8.9 mm.) for the 2 Form A type.

The Series 113 is encapsulated in a plastic package using a very high resistivity resin to achieve an insulation resistance greater than 10^{12} ohms for the Form A types. The relay has an internal mu-metal screen which totally eliminates the risk of magnetic interaction problems. An unscreened device mounted on this pitch would have an interaction figure of around 40 percent. Relays of this size without magnetic screening would therefore be totally unsuitable for applications where dense packing is required. Pickering Series 113 have a typical interaction figure of 5 percent.

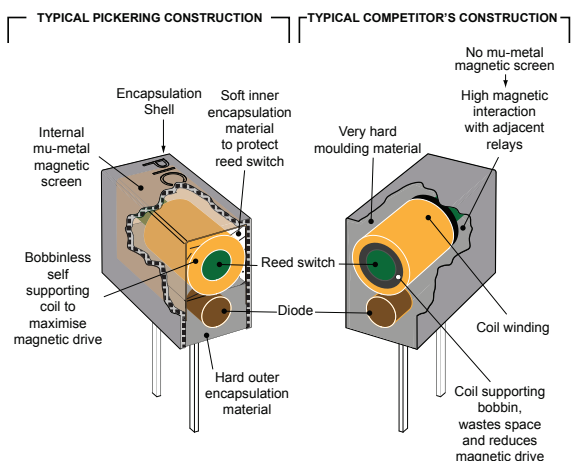
3, 5 and 12 Volt coils are standard, with the option of an internal diode. 1 Form A, 5 Volt coils have a resistance of 500 ohms and may be driven directly from TTL logic.



Switch Ratings - Dry switches

- 1 Form A (Energize to Make) relays.
10 Watts at 200V
- 2 Form A (Energize to Make) relays.
10 Watts at 200V
- 1 Form C (Change-over) relays.
3 Watts at 30V

Typical Pickering **SoftCenter®** Construction



Series 113 switch ratings

The contact ratings for each switch type are shown below:

Switch No	Switch form	Power rating	Max. switch current	Max. carry current	Max. switching volts	Life expectancy ops typical (see Note ¹ below)	Operate time inc bounce (max)	Release time	Special features
2	A	10 W	0.5 A	0.5 A	200	10E8	0.5 ms	0.2 ms	General purpose
3	C	3 W	0.1 A	0.1 A	30	10E8	1.0 ms	0.2 ms	Low level

Switch no. 2 is particularly good for switching low currents and/or voltages. It is the ideal switch for A.T.E. systems where cold switching techniques are often used. Where higher power levels are involved, switch no. 1 is more suitable.

Operating voltages

Coil voltage - nominal	Must operate voltage - maximum at 25°C	Must release voltage - minimum at 25°C
3 V	2.25 V	0.3 V
5 V	3.75 V	0.5 V
12 V	9 V	1.2 V

Coil data and type numbers

Device type	Type Number	Coil (V)	Coil resistance	Max. contact resistance (initial)	Insulation resistance (minimum)		Capacitance (typical) (see Note ² below)	
					Switch to coil	Across switch	Closed switch to coil	Across open switch
1 Form A (energize to make) Switch No. 2	113-1-A-3/2D	3	250 Ω	0.12 Ω	10E12 Ω	10E12 Ω	1.5 pF	0.15 pF
	113-1-A-5/2D	5	500 Ω					
	113-1-A-12/2D	12	650 Ω					
1 Form A (energize to make) Switch No. 2 (Special Pinout)	113SP-1-A-5/2D	5	500 Ω	0.12 Ω	10E12 Ω	10E12 Ω	1.5 pF	0.15 pF
	113SP-1-A-12/2D	12	650 Ω					
2 Form A (energize to make) Switch No. 2	113-2-A-5/2D	5	150 Ω	0.12 Ω	10E12 Ω	10E12 Ω	See Note ³	See Note ³
1 Form C (change-over) Switch No. 3	113-1-C-5/3D	5	150 Ω	0.25 Ω	10E12 Ω	10E10 Ω	See Note ³	See Note ³

When an internal diode is required, the suffix D is added to the part number as shown in the table

Environmental specification

Standard operating temperature range: -20 to +85 °C.

Note: The upper temperature limit can be extended to +125 °C if the coil drive voltage is increased to accommodate the resistance/temperature coefficient of the copper coil winding. This is approximately 0.4% per °C. This means that at 125 °C the coil drive voltage will need to be increased by approximately 40 x 0.4 = 16% to maintain the required magnetic drive level. Please contact sales@pickeringrelay.com for assistance if necessary.

Vibration: Maximum 20 G

Shock: Maximum 50 G

Note¹ Life expectancy

The life of a reed relay depends upon the switch load and end of life criteria. For example, for an 'end of life' contact resistance specification of 1 Ω, switching low loads (10 V at 10 mA resistive) or when 'cold' switching, typical life is approx 2.5 x 10⁸ ops. At the maximum load (resistive), typical life is 1 x 10⁶ ops. In the event of abusive conditions, e.g. high currents due to capacitive inrushes, this figure reduces considerably. Pickering will be pleased to perform life testing with any particular load condition.

Note² Capacitance across open switch

The capacitance across the open switch was measured with other connections guarded.

Note³ Capacitance values

The value will depend upon on the mode of connection/guarding of unused terminals. Please contact technical sales for details.

Internal Mu-metal Magnetic Screen

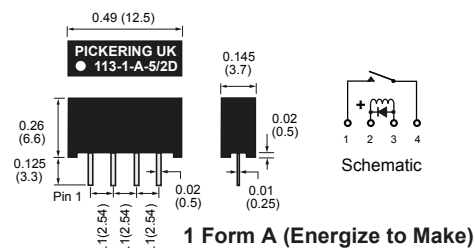
The Series 113 relays are fitted with an internal mu-metal magnetic screen which permits side-by-side stacking on 0.15 inches pitch.

Help

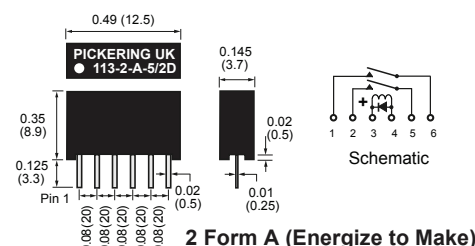
If you need any technical advice or other help, for example, any special tests that you would like carried out, please do not hesitate to contact our Technical Sales Department. We will always be pleased to discuss Pickering relays with you. email: techsales@pickeringrelay.com

Pin Configuration and Dimensional Data

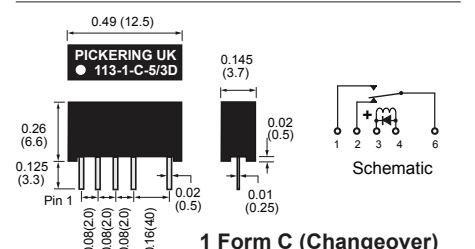
Dimensions in Inches (Millimeters in brackets)



1 Form A (Energize to Make)



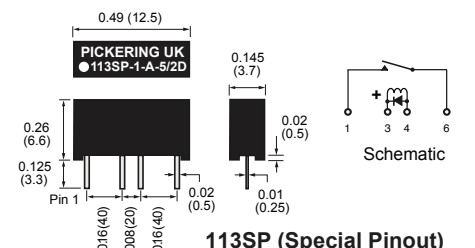
2 Form A (Energize to Make)



1 Form C (Changeover)

Special pin configuration for 1 Form A

The standard 1 Form A device has 4 pins on 0.1 inches (2.54mm) pitch (see drawing above). This configuration makes it pin compatible with the Pickering Series 110, 111 and 112. A special pin configuration is also available with a pinout compatible with that of the 2 Form A type (see drawing above). The switch terminals are pins 1&6, the coil is Pins 3&4 with pins 2&5 omitted, this version has the prefix 113SP. It is sometimes desirable to have a PCB that can be used for either 1 Form A or 2 Form A switching, this arrangement allows the use of a common board fitted with the appropriate relay.



113SP (Special Pinout)

Important: Where the optional internal diode is fitted, the correct coil polarity must be observed, as shown by the + symbol on the schematics above.

3D Models: Interactive models of the complete range of Pickering relay products can be downloaded from the web site.

Order Code

113 - 1 - A - 5 / 2 D

Series _____
Number of reeds _____
Switch form _____
Coil voltage _____
Switch number (See table adjacent) _____
Diode if fitted (Omit if not required) _____

Please ask us for a FREE evaluation sample.



ISO9001 Manufacture of
Reed Relays FM 29036



email: sales@pickeringrelay.com

pickeringrelay.com

Pico-SIL/SIP Reed Relays

Including coaxial types for up to 1.5GHz

Stacks on 0.15 x 0.40 inches pitch giving very high packing density

Features

- **SoftCenter®** construction (see adjacent diagram)
- Highest quality instrumentation grade switches
- Mu-metal magnetic screening
- Two package styles - Mu-metal package or Plastic package with internal mu-metal magnetic screen
- They take up the minimum of board area, conserving board space
- Insulation resistance greater than $10^{12} \Omega$
- 3 or 5 Volt coils with or without internal diode
- 100% tested for dynamic contact resistance for guaranteed performance

The Pickering Series 111 is a range of magnetically screened single-in-line reed relays that stack on 0.15 inches by 0.4 inches pitch. They have an identical footprint to the Series 110 and 112 but the height is reduced to only 0.26 inches (6.6mm). The switch rating of 5 Watts is adequate for most instrumentation applications. If a higher power rating is required, please look at our Series 110 or 112 which have a higher power rating and an identical pin-out. The range also includes the type 111RF, a 50 ohms coaxial device suitable for use up to 1.5GHz.

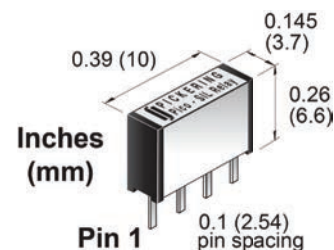
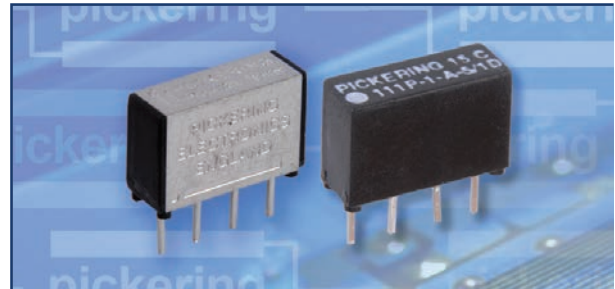
These relays require around one third the board area of the more usual 0.2 x 0.8 inch devices and are ideal for high density applications.

Two package styles are available:

The type 111 is encapsulated in a mu-metal can. The coaxial version, type 111RF, is also available in this package style.

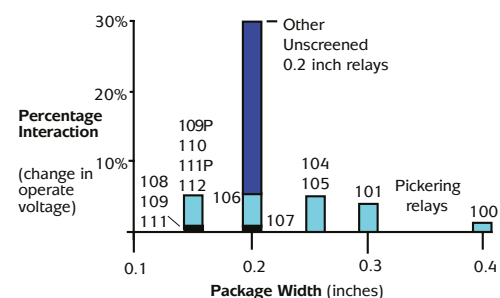
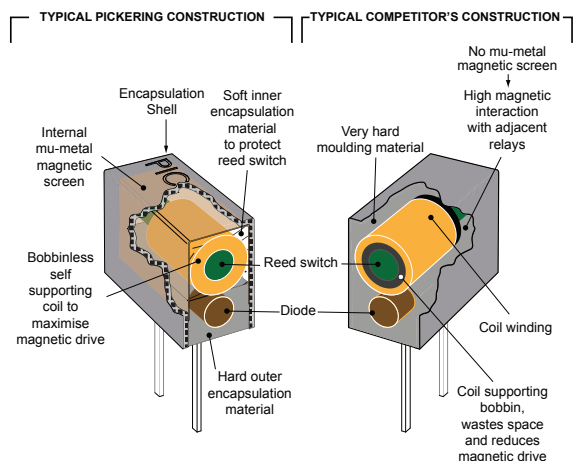
The type 111P is encapsulated in a plastic package and features an internal mu-metal screen. An internal diode is an option in both types.

Magnetic screening is essential to avoid magnetic interaction problems. Interaction is usually measured as a percentage increase in the voltage required to operate a relay when two additional relays, stacked one each side, are themselves operated. An unscreened device mounted on this pitch would have an interaction figure of around 40%. Relays of this size would therefore be totally unsuitable for applications where dense packing is required. Pickering Series 111 have an interaction figure of around 1 percent.



The plastic package features the same dimensions as the mu-metal version detailed above.

Typical Pickering **SoftCenter®** Construction



Key: ■ Unscreened ■ Internal mu-metal screen ■ Complete mu-metal can

Series 111 switch ratings - The contact ratings for each switch type are shown below:

Switch No	Switch form	Power rating	Max. switch current	Max. carry current	Max. switching volts	Life expectancy ops typical (see Note ¹ below)	Operate time inc bounce (max)	Release time	Special features
1	A	5 W	0.5 A	0.5 A	170	10E8	0.5 ms	0.2 ms	General purpose (Energise to make)

Operating voltages

Coil voltage - nominal	Must operate voltage - maximum at 25°C	Must release voltage - minimum at 25°C
3 V	2.25 V	0.3 V
5 V	3.75 V	0.5 V

Coil data and type numbers

Device type	Package Style	Type Number	Coil (V)	Coil resistance	Max. contact resistance (initial)	Insulation resistance (minimum)		Capacitance (typical) (see Note ² below)	
						Switch to coil	Across switch	Closed switch to coil	Across open switch
1 Form A Switch No. 1	Mu-metal	111-1-A-3/1D	3	200 Ω	0.15 Ω	10E12 Ω	10E12 Ω	1.5 pF	0.15 pF
		111-1-A-5/1D	5	500 Ω					
1 Form A Switch No. 1	Plastic with internal screen	111P-1-A-3/1D	3	200 Ω	0.15 Ω	10E12 Ω	10E12 Ω	1.5 pF	0.15 pF
		111P-1-A-5/1D	5	400 Ω					
1 Form A Switch No. 1 (Coaxial)	Mu-metal	111RF-1-A-5/1D	5	180 Ω	0.15 Ω	10E12 Ω	10E12 Ω	1.5 pF	0.15 pF

When an internal diode is required, the suffix D is added to the part number as shown in the table.

Environmental specification

Standard operating temperature range: -20 to +85 °C.	
Note: The upper temperature limit can be extended to +125 °C if the coil drive voltage is increased to accommodate the resistance/temperature coefficient of the copper coil winding. This is approximately 0.4% per °C. This means that at 125 °C the coil drive voltage will need to be increased by approximately $40 \times 0.4 = 16\%$ to maintain the required magnetic drive level. Please contact sales@pickeringrelay.com for assistance if necessary.	
Vibration: Maximum 20 G	Shock: Maximum 50 G

Note¹ Life expectancy

The life of a reed relay depends upon the switch load and end of life criteria. For example, for an 'end of life' contact resistance specification of 1 Ω, switching low loads (10 V at 10 mA resistive) or when 'cold' switching, typical life is approx 2.5 x 10⁸ ops. At the maximum load (resistive), typical life is 1 x 10⁸ ops. In the event of abusive conditions, e.g. high currents due to capacitive inrushes, this figure reduces considerably. Pickering will be pleased to perform life testing with any particular load condition.

Note² Capacitance across open switch

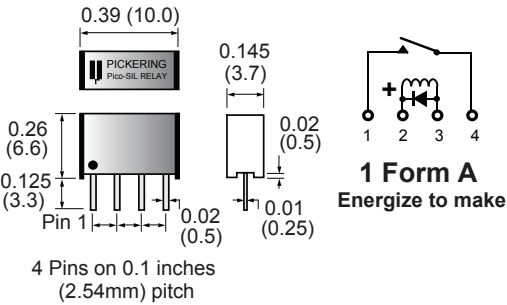
The capacitance across the open switch was measured with other connections guarded.

Pin Configuration and Dimensional Data

Dimensions in Inches (Millimeters in brackets)

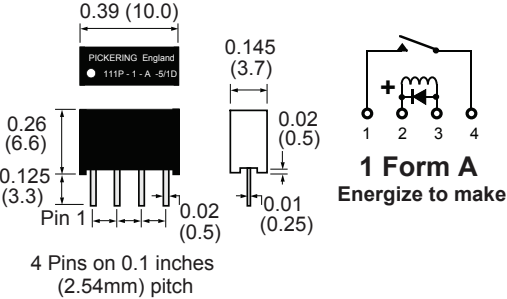
Type 111

Mu-metal package



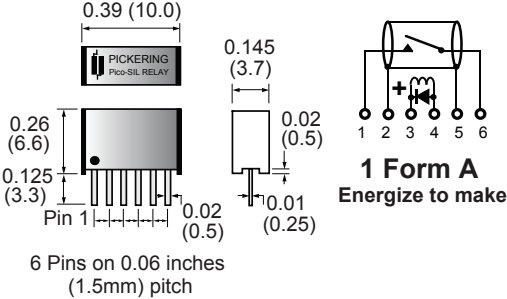
Type 111P

Plastic package with internal mu-metal screen



Type 111RF

Mu-metal package



Important: Where the optional internal diode is fitted, the correct coil polarity must be observed, as shown by the + symbol on the schematics.

3D Models: Interactive models of the complete range of Pickering relay products can be downloaded from the web site.

Order Code

111 - 1 - A - 5 / 1 D

Series _____
Number of reeds _____
Switch form _____
Coil voltage _____
Switch number (Only Type 1 available) _____
Diode if fitted (Omit if not required) _____

Help

If you need any technical advice or other help, for example, any special tests that you would like carried out, please do not hesitate to contact our Technical Sales Department. We will always be pleased to discuss Pickering relays with you. email: techsales@pickeringrelay.com

Please ask us for a FREE evaluation sample.



ISO9001 Manufacture of Reed Relays FM 29036



email: sales@pickeringrelay.com

pickeringrelay.com

Micro-SIL[®] SIL/SIP Reed Relays

Including coaxial types

Up to 20 Watts switching - Very high packing density

Features

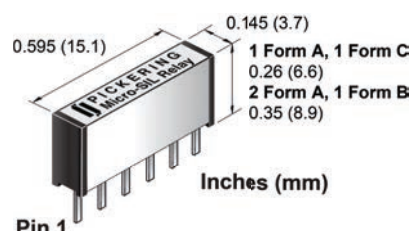
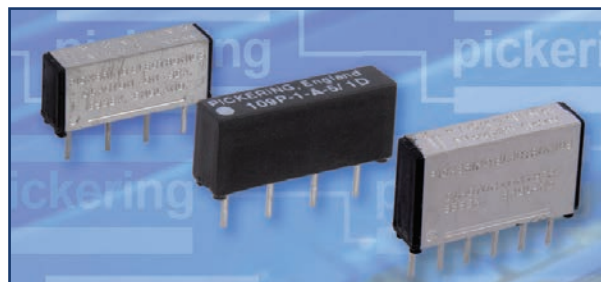
- **SoftCenter[®]** construction (see adjacent diagram)
- Highest quality instrumentation grade switches
- 1 Form A and 2 Form A (energise to make)
- 1 Form B (energise to break)
- 1 Form C (changeover)
- 1 Form A Coaxial 50 Ohms impedance (energise to make)
- 1 Form A Coaxial 75 Ohms impedance (energise to make)
- Insulation resistance greater than $10^{12} \Omega$
- 3, 5 and 12 Volt coils with or without internal diode

The mu-metal packaged Series 109 and 109RF, and the plastic packaged Series 109P, are magnetically screened single-in-line reed relays that stack on 0.15 inches x 0.6 inches pitch. The adjacent column gives further details of the device types available.

These relays require little more than half the board area of the more usual 0.2 x 0.8 inch devices, this allows around 80 percent more relays onto your board. These are the ideal choice for high density applications such as A.T.E. switching matrices or where very little board area is available.

Mu-metal, due to its high permeability and low magnetic remanence is used to provide magnetic screening. This eliminates problems that would otherwise occur due to magnetic interaction. Interaction is usually measured as a percentage increase in the voltage required to operate a relay when two additional relays, stacked one each side, are themselves operated. An unscreened device mounted on this pitch would have an interaction figure of around 40 percent. Relays of this size without magnetic screening would therefore be totally unsuitable for applications where dense packing is required. Pickering Series 109 and 109RF have a typical interaction figure of 1 percent. Series 109P and 109PH have a typical figure of 3 percent.

Two types of Form A (energise to make) switches are available, a general purpose switch (switch no.1) and a vacuum sputtered ruthenium switch (switch no.2) which is ideal for low level or "cold" switching applications. 5 volt coils normally have a resistance of 500 ohms and 12 volt coils are 1000 ohms. A sensitive single pole 5 volt device with a 1000 ohms coil is also available. Internal back E.M.F. clamping diodes are an option for all types. The small size of these relays often makes it possible to increase the functionality of existing designs without increasing the size of printed circuit boards.



Device Types

Series 109 1 Form A, 2 Form A, 1 Form B, 1 Form C

Similar in construction to the Pickering Series 107 and Series 108. These patented devices are encapsulated in mu-metal cans using very high resistivity resins.

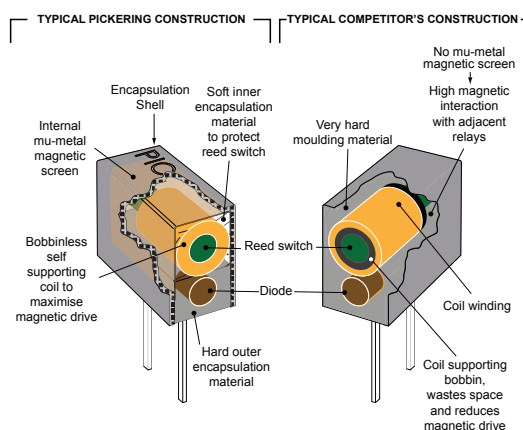
Series 109RF Coaxial 1 Form A

Coaxial relays in mu-metal cans. They are available with a characteristic impedance of either 50 or 75 ohms. For R.F. up to 2GHz, telecoms, video or high speed digital switching up to 500 Mbits/sec.

Series 109P 1 Form A

The electrical specification and dimensions are identical to the 1 Form A Series 109. They are encapsulated using the same resins within a plastic package which features an internal mumetal magnetic screen.

Typical Pickering SoftCenter[®] Construction



Series 109 switch ratings - The contact ratings for each switch type are shown below:

Switch No	Switch form	Power rating	Max. switch current	Max. carry current	Max. switching volts	Life expectancy ops typical (see Note ¹ below)	Operate time inc bounce (max)	Release time	Special features
1	A	15 W (5L Version) 20 W (Other)	1.0 A	1.2 A	200	10E9	0.5 ms	0.2 ms	General purpose
2	A or B	10 W	0.5 A	1.2 A	200	10E9	0.5 ms	0.2 ms	Low level
3	C	3 W	0.1 A	0.1 A	30	10E7	0.75 ms	0.5 ms	Change over

Switch no.2 is particularly good for switching low currents and/or voltages. It is the ideal switch for A.T.E. systems where cold switching techniques are often used. Where higher power levels are involved, switch no.1 is more suitable.

Operating voltages

Coil voltage - nominal	Must operate voltage - maximum at 25°C	Must release voltage - minimum at 25°C
3 V	2.25 V	0.3 V
5 V	3.75 V	0.5 V
12 V	9 V	1.2 V

Coil data and type numbers

Device type	Package Style	Type Number	Coil (V)	Coil resistance	Max. contact resistance (initial)	Insulation resistance (minimum)		Capacitance (typical) (see Note ² below)	
						Switch to coil	Across switch	Closed switch to coil	Across open switch
1 Form A General Purpose Switch No. 1	1	109-1-A-5/1D 109-1-A-5L/1D 109-1-A-12/1D	5 5 12	500 Ω 1000 Ω 1000 Ω	0.15 Ω	10E12 Ω	10E12 Ω	2.5 pF	0.1 pF
1 Form A Low Level Switch No. 2	1	109-1-A-3/2D 109-1-A-5/2D 109-1-A-5L/2D 109-1-A-12/2D	3 5 5 12	330 Ω 500 Ω 1000 Ω 1000 Ω	0.12 Ω	10E12 Ω	10E12 Ω	2.5 pF	0.1 pF
1 Form B Low Level Switch No. 2	2	109-1-B-5/2D	5	750 Ω	0.12 Ω	10E12 Ω	10E12 Ω	2.5 pF	0.1 pF
1 Form C (change-over) Switch No. 3	5	109-1-C-3/3D 109-1-C-5/3D	3 5	100 Ω 150 Ω	0.25 Ω	10E12 Ω	10E11 Ω	See Note ³	See Note ³
2 Form A Switch No. 2	3	109-2-A-3/2D 109-2-A-5/2D 109-2-A-12/2D	3 5 12	200 Ω 375 Ω 750 Ω	0.14 Ω	10E12 Ω	10E12 Ω	See Note ³	See Note ³
50 Ω Coaxial Switch No. 1	4	109RF50-1-A-5/1D 109RF50-1-A-12/1D	5 12	375 Ω 600 Ω	0.15 Ω	10E12 Ω	10E12 Ω	2.5 pF	0.1 pF
50 Ω Coaxial Switch No. 2	4	109RF50-1-A-3/2D 109RF50-1-A-5/2D 109RF50-1-A-12/2D	3 5 12	200 Ω 375 Ω 600 Ω	0.12 Ω	10E12 Ω	10E12 Ω	2.5 pF	0.1 pF
75 Ω Coaxial Switch No. 1	4	109RF75-1-A-5/1D 109RF75-1-A-12/1D	5 12	375 Ω 600 Ω	0.15 Ω	10E12 Ω	10E12 Ω	2.5 pF	0.1 pF
75 Ω Coaxial Switch No. 2	4	109RF75-1-A-5/2D 109RF75-1-A-12/2D	5 12	375 Ω 600 Ω	0.12 Ω	10E12 Ω	10E12 Ω	2.5 pF	0.1 pF
1 Form A Switch No. 1	6	109P-1-A-5/1D 109P-1-A-5L/1D 109P-1-A-12/1D	5 5 12	500 Ω 1000 Ω 1000 Ω	0.15 Ω	10E12 Ω	10E12 Ω	2.5 pF	0.1 pF
1 Form A Switch No. 2	6	109P-1-A-3/2D 109P-1-A-5/2D 109P-1-A-5L/2D 109P-1-A-12/2D	3 5 5 12	250 Ω 500 Ω 1000 Ω 1000 Ω	0.12 Ω	10E12 Ω	10E12 Ω	2.5 pF	0.1 pF

When an internal diode is required, the suffix D is added to the part number as shown in the table.

Environmental specification

Standard operating temperature range: -20 to +85 °C. Note: The upper temperature limit can be extended to +125 °C if the coil drive voltage is increased to accommodate the resistance/temperature coefficient of the copper coil winding. This is approximately 0.4% per °C. This means that at 125 °C the coil drive voltage will need to be increased by approximately 40 x 0.4 =16% to maintain the required magnetic drive level. Please contact sales@pickeringrelay.com for assistance.	Vibration: Maximum 20 G Shock: Maximum 50 G
--	--

Note¹ Life expectancy

The life of a reed relay depends upon the switch load and end of life criteria. For example, for an 'end of life' contact resistance specification of 1 Ω, switching low loads (10 V at 10 mA resistive) or when 'cold' switching, typical life is approx 1 x 10⁹ ops. At the maximum load (resistive), typical life is 1 x 10⁷ ops. In the event of abusive conditions, e.g. high currents due to capacitive inrushes, this figure reduces considerably. Pickering will be pleased to perform life testing with any particular load condition.

Note² Capacitance across open switch

The capacitance across the open switch was measured with other connections guarded.

Note³ Capacitance values

The value will depend upon on the mode of connection/guarding of unused terminals. Please contact technical sales for details.

Help

If you need any technical advice or other help, for example, any special tests that you would like carried out, please do not hesitate to contact our Technical Sales Department. We will always be pleased to discuss Pickering relays with you. email: techsales@pickeringrelay.com

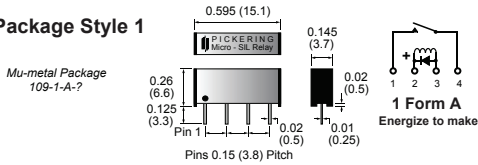


ISO9001 Manufacture of Reed Relays FM 29036

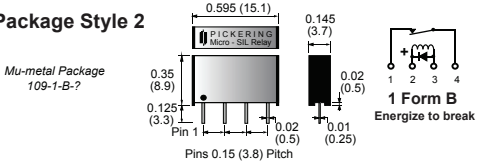
Pin Configuration and Dimensional Data

Dimensions in Inches (Millimeters in brackets)

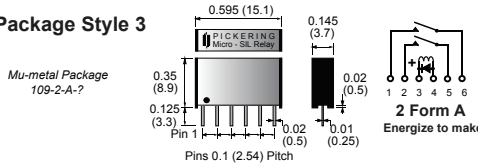
Package Style 1



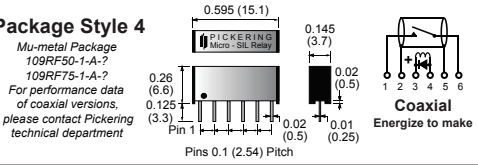
Package Style 2



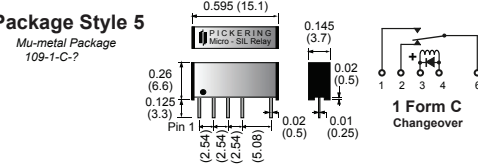
Package Style 3



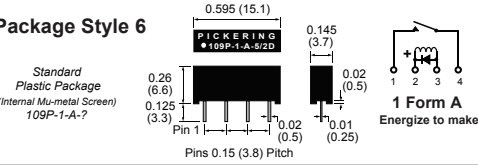
Package Style 4



Package Style 5



Package Style 6



Important: Where the optional internal diode is fitted or for all Form B types, the correct coil polarity must be observed, as shown by the + symbol on the schematics.

3D Models: Interactive models of the complete range of Pickering relay products can be downloaded from the web site.

Order Code

109 RF 50 - 1 - A - 5 L / 2 D

Series _____
RF (Omit if RF not required) _____
RF Impedance 50Ω or 75Ω (Omit if not RF) _____
Number of reeds _____
Switch form _____
Coil voltage _____
'L' - Special 1000Ω, 5V coil _____
(Form A Types only. Not RF - Omit 'L' if not required) _____
Switch number (1, 2 or 3 See table adjacent) _____
Diode if fitted (Omit if not required) _____

Alternative pin configurations

Alternative pin configurations are available, for example, 1 Form A relays with pins on 0.1 inches (2.54mm) pitch to enable insertion into standard SIL sockets. Please contact our technical sales office for further information.

Please ask us for a FREE evaluation sample.



email: sales@pickeringrelay.com

pickeringrelay.com

Single-in-Line SIL/SIP Reed Relays

1 Form A (energise to make), 20 Watts at 200V

1 Form C (change-over), 3 Watts at 200V

Features

- **SoftCenter®** construction (see adjacent diagram)
- Highest quality instrumentation grade switches
- Internal mu-metal magnetic screen
- Insulation resistance greater than $10^{12} \Omega$ for Form A devices
- Dry switches available in both 1 Form A and 1 Form C configurations
- 3, 5 and 12 Volt coils with or without internal diode
- 5 Volt coils are 500 ohms and may be driven directly from TTL logic
- 100% tested for dynamic contact resistance for guaranteed performance

The Series 106 is a range of Single-In-Line reed relays intended for stacking on 0.2 inches pitch. Their small size, superb contact resistance stability and ultra high insulation resistance, make these relays an ideal choice for Automatic Test Equipment. They have an internal mu-metal screen to eliminate problems that would otherwise be experienced due to magnetic interaction. While the screening is not quite as efficient as the complete mu-metal can of the Series 107, 108 or 109, it is more than adequate for most applications (see explanation below).

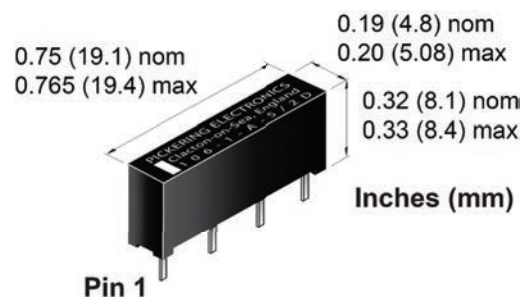
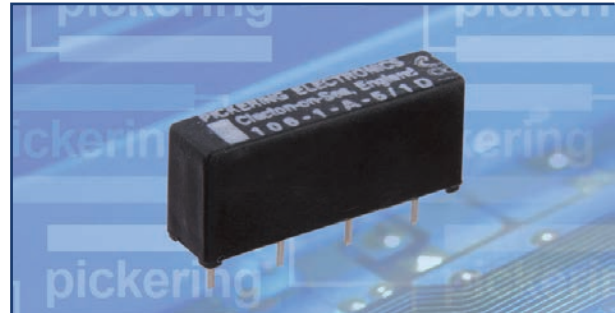
If even greater packing density is required, smaller devices are available in other Pickering SIL ranges.

Magnetic Interaction - An explanation

Magnetic interaction between relays is normally expressed as a percentage increase in the voltage required to operate the relay, due to the extraneous fields from adjacent relay coils.

An unscreened SIL relay of this size would have an interaction figure of around 30 percent, i.e. the voltage required to operate it will increase by this amount when relays alongside are operated also. It may prove impossible to use such a relay at its nominal coil voltage in high density applications.

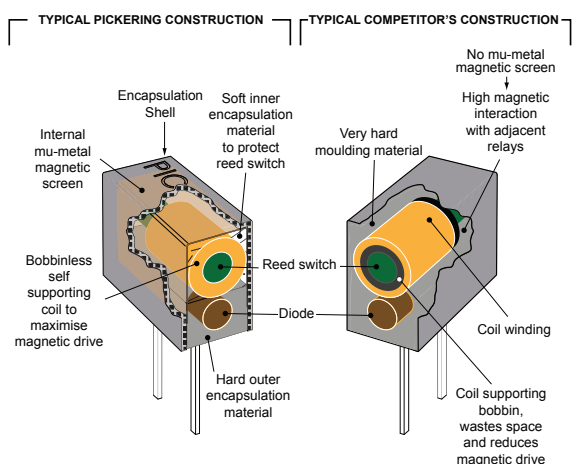
A Pickering Series 106 reed relay has an interaction figure of approximately 5 percent.



Switch Ratings

- 1 Form A (Energize to Make) relays.
Up to 1 Amp switching at 20 Watts
- 1 Form C (Change-over) relays.
3 Watts at 200 Volts

Typical Pickering **SoftCenter®** Construction



Series 106 switch ratings - The contact ratings for each switch type are shown below:

Switch No	Switch form	Power rating	Max. switch current	Max. carry current	Max. switching volts	Life expectancy ops typical (see Note ¹ below)	Operate time inc bounce (max)	Release time	Special features
1	A	20 W	1.0 A	1.2 A	200	10E9	0.5 ms	0.2 ms	General purpose
2	A	10 W	0.5 A	1.2 A	200	10E9	0.5 ms	0.2 ms	Low level
3	C	3 W	0.25 A	1.2 A	200	10E7	1.0 ms	0.5 ms	Change over

Switch no.2 is particularly good for switching low currents and/or voltages. It is the ideal switch for A.T.E. systems where cold switching techniques are often used. Where higher power levels are involved, switch no.1 is more suitable.

Operating voltages

Coil voltage - nominal	Must operate voltage - maximum at 25°C	Must release voltage - minimum at 25°C
3 V	2.25 V	0.3 V
5 V	3.75 V	0.5 V
12 V	9 V	1.2 V

Coil data and type numbers

Device type	Type Number	Coil (V)	Coil resistance	Max. contact resistance (initial)	Insulation resistance (minimum)		Capacitance (typical) (see Note ² below)	
					Switch to coil	Across switch	Closed switch to coil	Across open switch
1 Form A (energize to make) General Purpose Switch No. 1	106-1-A-5/1D	5	500 Ω	0.15 Ω	10E12 Ω	10E12 Ω	2.5 pF	0.1 pF
	106-1-A-12/1D	12	1000 Ω					
1 Form A (energize to make) Low Level Switch No. 2	106-1-A-3/2D	3	500 Ω	0.12 Ω	10E12 Ω	10E12 Ω	2.5 pF	0.1 pF
	106-1-A-5/2D	5	500 Ω					
	106-1-A-12/2D	12	1000 Ω					
1 Form C (change-over) Switch No. 3	106-1-C-5/3D	5	500 Ω	0.20 Ω	10E12 Ω	10E10 Ω	See Note ³	See Note ³
	106-1-C-12/3D	12	1000 Ω					

When an internal diode is required, the suffix D is added to the part number as shown in the table.

Environmental specification

Standard operating temperature range: -20 to +85 °C.

Note: The upper temperature limit can be extended to +125 °C if the coil drive voltage is increased to accommodate the resistance/temperature coefficient of the copper coil winding. This is approximately 0.4% per °C. This means that at 125 °C the coil drive voltage will need to be increased by approximately 40 x 0.4 = 16% to maintain the required magnetic drive level. Please contact sales@pickeringrelay.com for assistance if necessary.

Vibration: Maximum 20 GShock: Maximum 50 G

Note¹ Life expectancy

The life of a reed relay depends upon the switch load and end of life criteria. For example, for an 'end of life' contact resistance specification of 1 Ω, switching low loads (10 V at 10 mA resistive) or when 'cold' switching, typical life is approx 1 x 10⁹ ops. At the maximum load (resistive), typical life is 1 x 10⁷ ops. In the event of abusive conditions, e.g. high currents due to capacitive inrushes, this figure reduces considerably. Pickering will be pleased to perform life testing with any particular load condition.

Note² Capacitance across open switch

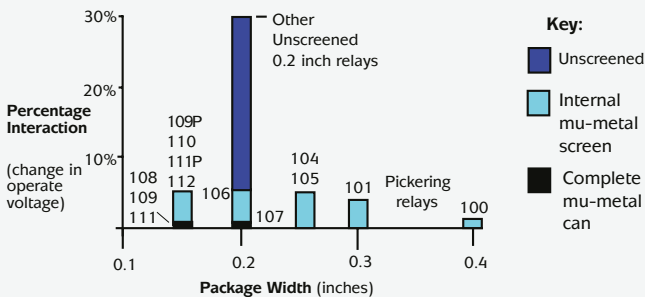
The capacitance across the open switch was measured with other connections guarded.

Note³ Capacitance values

The value will depend upon on the mode of connection/guarding of unused terminals. Please contact technical sales for details.

Internal Mu-metal Magnetic Screen

The Series 106 relays are fitted with an internal mu-metal magnetic screen which permits side-by-side stacking on 0.2 inches pitch.



Pin Configuration and Dimensional Data

Dimensions in Inches (Millimeters in brackets)

1 Form A (Energize to make)

0.75 (19.1) nominal
0.765 (19.4) maximum

0.32 (8.1) nominal
0.33 (8.4) maximum

Pin 1

0.20 (5.08) 0.20 (5.08) 0.20 (5.08)

0.02 (0.508)

0.19 (4.8) nom. 0.20 (5.08) max.

0.125 (3.175)

0.01 (0.254)

1 Form C (Changeover)

0.75 (19.1) nominal
0.765 (19.4) maximum

0.32 (8.1) nominal
0.33 (8.4) maximum

Pin 1

0.10 (2.54)

0.20 (5.08) 0.20 (5.08)

0.02 (0.508)

0.19 (4.8) nom. 0.20 (5.08) max.

0.125 (3.175)

0.01 (0.254)

Important: Where the optional internal diode is fitted, the correct coil polarity must be observed, as shown by the + symbol on the schematics.

3D Models: Interactive models of the complete range of Pickering relay products can be downloaded from the web site.

Mercury Relays

With the exception of the position insensitive type, mercury relays should be mounted vertically with pin 1 uppermost.

Order Code

106 - 1 - A - 5 / 2 D

Series _____

Number of reeds _____

Switch form _____

Coil voltage _____

Switch number (See table adjacent) _____

Diode if fitted (Omit if not required) _____

Help

If you need any technical advice or other help, for example, any special tests that you would like carried out, please do not hesitate to contact our Technical Sales Department. We will always be pleased to discuss Pickering relays with you. email: techsales@pickeringrelay.com

Please ask us for a FREE evaluation sample.

Single-in-Line SIL/SIP Reed Relays

Up to 20 Watts switching for Dry Reed Relays

Up to 50 Watts switching for Mercury Reed Relays

Features

- **SoftCenter®** construction (see adjacent diagram)
- Highest quality instrumentation grade switches
- Encapsulated in a Plastic package with internal mu-metal magnetic screen
- Wide range of switch configurations -
1 Form A, 1 Form B, 2 Form A, 1 Form C
- Two pole relay requires the same board area as the single pole type
- Dry and mercury wetted switches are available with the same pin configuration and footprint. (see "A useful tip" below)
- Insulation resistance greater than $10^{12} \Omega$ for dry Form A devices
- 3, 5, 12 and 24 Volt coils with or without internal diode
- 100% tested for dynamic contact resistance for guaranteed performance

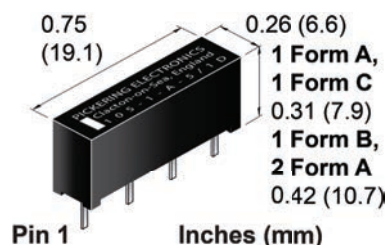
The Series 105 is a range of Single-in Line reed relays, available with a wide variety of switching configurations and switch types, including mercury wetted versions. They feature internal mu-metal magnetic screens which allow high packing density without the risk of magnetic interaction problems.

The Pickering Series 100, 101, 103, 106, 107 and 108 all have the same pin locations as the Series 105. If a reduced coil power is desired, please consider our Series 100 and 101 which may be driven directly from CMOS logic. If a higher packing density is required, smaller devices are available in other Pickering SIL ranges.

In addition to the relays shown on this brochure, many other special types are manufactured to meet customers specific requirements. Please contact our technical sales department for further information or samples.

A useful tip

If there is a chance that you might want to use mercury wetted relays instead of dry relays at a later date, for example to increase switch ratings, lay out the PCB initially as though for the mercury wetted type with pin 1 uppermost. This allows uprating later without PCB changes. The mercury versions in the Series 105 have identical pin configurations to the dry types.



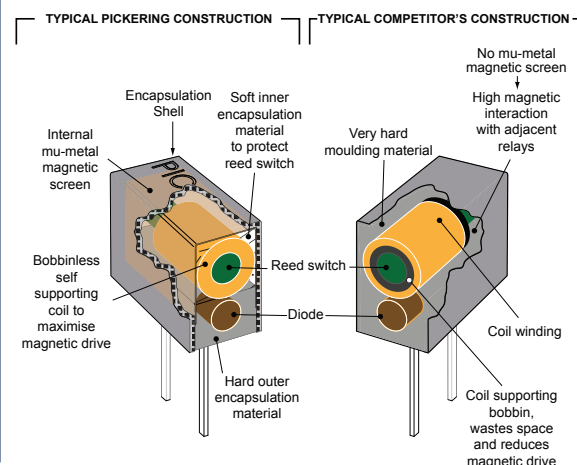
Switch Ratings - Dry switches

- Single or Double pole Form A (Energize to Make) relays. Up to 1 Amp switching at 20 Watts
- Single pole Form B (Energize to Break) relays. Up to 1 Amp switching at 20 Watts
- Single pole Form C (Change-over) relays. 0.25 Amps switching at 3 Watts

Switch Ratings - Mercury Wetted Switches

- Single or Double pole Form A (Energize to Make) relays. 2 Amp switching at 50 Watts
- Single pole, Non Position Sensitive, Form A (Energize to Make) relays. 2 Amp switching at 50 Watts

Typical Pickering **SoftCenter®** Construction



Series 105 switch ratings - The contact ratings for each switch type are shown below:

Switch No	Switch form	Power rating	Max. switch current	Max. carry current	Max. switching volts	Life expectancy ops typical (see Note ¹ below)	Operate time inc bounce (max)	Release time	Special features
1	A or B	15 W (5 V Versions) 20 W (12 & 24 V)	1.0 A	1.2 A	200	10E9	0.5 ms	0.2 ms	General purpose
2	A	10 W	0.5 A	1.2 A	200	10E9	0.5 ms	0.2 ms	Low level
3	C	3 W	0.25 A	1.2 A	200	10E7	1.0 ms	0.5 ms	Change over
4	A	10 W	0.5 A	1.2 A	400	10E7	0.75 ms	0.5 ms	500V stand-off

Switch no.2 is particularly good for switching low currents and/or voltages. It is the ideal switch for A.T.E. systems where cold switching techniques are often used. Where higher power levels are involved, switch no.1 is more suitable.

Dry Relay - Coil data and type numbers

Device type	Type Number	Coil (V)	Coil resistance	Max. contact resistance (initial)	Insulation resistance (minimum)		Capacitance (typical) (see Note ² below)		
					Switch to coil	Across switch	Closed switch to coil	Across open switch	
1 Form A (energize to make) General Purpose Switch No. 1	105-1-A-5/1D	5	500 Ω						
	105-1-A-12/1D	12	1000 Ω	0.15 Ω	10E12 Ω	10E12 Ω	2.5 pF	0.1 pF	
	105-1-A-24/1D	24	3000 Ω						
1 Form A (energize to make) Low Level Switch No. 2	105-1-A-3/2D	3	500 Ω						
	105-1-A-5/2D	5	500 Ω	0.12 Ω	10E12 Ω	10E12 Ω	2.5 pF	0.1 pF	
	105-1-A-12/2D	12	1000 Ω						
1 Form A (energize to make) High Voltage Switch No. 4	105-1-A-5/4D	5	500 Ω						
	105-1-A-12/4D	12	1000 Ω	0.15 Ω	10E12 Ω	10E12 Ω	2.5 pF	0.15 pF	
	105-1-A-24/4D	24	3000 Ω						
1 Form C (change-over) Switch No. 3	105-1-C-5/3D	5	500 Ω						
	105-1-C-12/3D	12	1000 Ω	0.20 Ω	10E12 Ω	10E10 Ω	See Note ³	See Note ³	
	105-1-C-24/3D	24	3000 Ω						
1 Form B (energize to break) General Purpose Switch No. 1	105-1-B-5/1D	5	1000 Ω						
	105-1-B-12/1D	12	3000 Ω	0.15 Ω	10E12 Ω	10E12 Ω	2.5 pF	0.1 pF	
	105-1-B-24/1D	24	3000 Ω						
2 Form A (energize to make) General Purpose Switch No. 1	105-2-A-5/1D	5	500 Ω						
	105-2-A-12/1D	12	1000 Ω	0.17 Ω	10E12 Ω	10E12 Ω	See Note ³	See Note ³	
	105-2-A-24/1D	24	3000 Ω						
2 Form A (energize to make) Low Level Switch No. 2	105-2-A-5/2D	5	500 Ω						
	105-2-A-12/2D	12	1000 Ω	0.15 Ω	10E12 Ω	10E12 Ω	See Note ³	See Note ³	
	105-2-A-24/2D	24	3000 Ω						

When an internal diode is required, the suffix D is added to the part number as shown in the table.

Mercury Reed: Series 105 switch ratings - The contact ratings for each switch type are shown below:

Switch No	Switch form	Power rating	Max. switch current	Max. carry current	Max. switching volts	Life expectancy ops typical (see Note ¹ below)	Operate time (max)	Release time	Special features
6	A	50 W	2 A	3 A	500	10E8	1.5 ms	1.0 ms	Standard Mercury
8	A	50 W	2 A	2 A	350	10E8	1.5 ms	1.0 ms	Position Insensitive

Mercury Relay: Coil data and type numbers

Device type	Type Number	Coil (V)	Coil resistance	Max. contact resistance (initial)	Insulation resistance (minimum)		Capacitance (typical) (see Note ² below)		
					Switch to coil	Across switch	Closed switch to coil	Across open switch	
1 Form A (energize to make) Switch No. 6	105-1-A-5/6D	5	140 Ω						
	105-1-A-12/6D	12	500 Ω	0.075 Ω	10E12 Ω	10E11 Ω	4 pF	0.1 pF	
	105-1-A-24/6D	24	1500 Ω						
1 Form A (energize to make) Position Insensitive Switch No. 8	105-1-A-5/8D	5	140 Ω						
	105-1-A-12/8D	12	500 Ω	0.100 Ω	10E12 Ω	10E11 Ω	4 pF	0.1 pF	
	105-1-A-24/8D	24	1500 Ω						
2 Form A (energize to make) Switch No. 6	105-2-A-5/6D	5	100 Ω						
	105-2-A-12/6D	12	375 Ω	0.100 Ω	10E12 Ω	10E11 Ω	See Note ³	See Note ³	
	105-2-A-24/6D	24	1000 Ω						

When an internal diode is required, the suffix D is added to the part number as shown in the table.

Note¹ Life expectancy

The life of a reed relay depends upon the switch load and end of life criteria. For example, for an 'end of life' contact resistance specification of 1 Ω, switching low loads (10 V at 10 mA resistive) or when 'cold' switching, typical life is approx 1 x 10⁹ ops. At the maximum load (resistive), typical life is 1 x 10⁷ ops. In the event of abusive conditions, e.g. high currents due to capacitive inrushes, this figure reduces considerably. Pickering will be pleased to perform life testing with any particular load condition.

Note² Capacitance across open switch

The capacitance across the open switch was measured with other connections guarded.

Note³ Capacitance values

The value will depend upon on the mode of connection/guarding of unused terminals. Please contact technical sales for details.

Pin Configuration and Dimensional Data
Dimensions in Inches (Millimeters in brackets)

1 Form A
(Energize to make)

1 Form C
(Changeover)

1 Form B
(Energize to break)

2 Form A
(Energize to make)

Important: Where the optional internal diode is fitted or for all Form B types, the correct coil polarity must be observed, as shown by the + symbol on the schematics.

3D Models: Interactive models of the complete range of Pickering relay products can be downloaded from the web site.

Mercury Relays

With the exception of the position insensitive type, mercury relays should be mounted vertically with pin 1 uppermost.

Internal Mu-metal Magnetic Screen

The Series 105 relays are fitted with an internal mu-metal magnetic screen which permits side-by-side stacking.

Order Code

105 - 1 - A - 5 / 2 D

Series _____

Number of reeds _____

Switch form _____

Coil voltage _____

Switch number (See table adjacent) _____

Diode if fitted (Omit if not required) _____

Help

If you need any technical advice or other help, for example, any special tests that you would like carried out, please do not hesitate to contact our Technical Sales Department. We will always be pleased to discuss Pickering relays with you. email: techsales@pickeringrelay.com

Please ask us for a FREE evaluation sample.

ISO9001 Manufacture of
Reed Relays FM 29036

Micro-SIL[®] SIL/SIP Reed Relays

20 Watts at 200V - 1 Form A and 2 Form A (energise to make)

3 Watts at 200V - 1 Form C (change-over)

Features

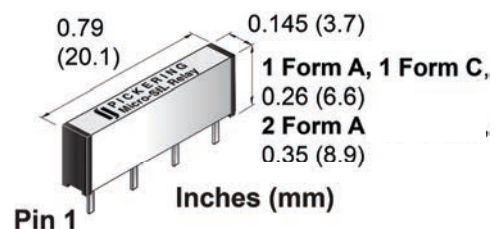
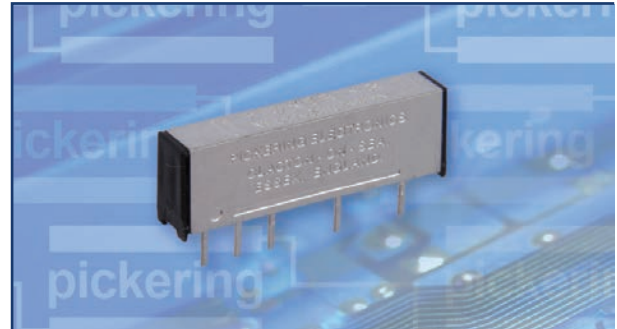
- **SoftCenter[®]** construction (see adjacent diagram)
- Highest quality instrumentation grade switches
- Encapsulated in mu-metal can
- Insulation resistance greater than $10^{12} \Omega$ for Form A devices
- Dry switches available in 1 Form A, 2 Form A and 1 Form C configurations. 2 Form A types require the same board area as 1 Form A
- 3, 5 and 12 Volt coils with or without internal diode
- 5 Volt coils are 500 ohms and may be driven directly from TTL logic
- 100% tested for dynamic contact resistance for guaranteed performance

The Pickering Series 108 is a range of magnetically screened single-in-line reed relays that stack on 0.15 inches (3.8mm) pitch, resulting in a 25 percent saving in board space over 0.2 inch (5.08mm) wide relays. This means that it is possible to pack 33 percent more relays into the same board area.

Their small size, superb contact resistance stability and ultra high insulation resistance, greater than 10^{12} ohms for Form A devices, make these relays a popular choice for high quality instrumentation.

The device is encapsulated in a mu-metal can using a very high resistivity resin. Mu-metal is used rather than steel because of both its very high permeability and its low magnetic remanence. This construction totally eliminates the risk of magnetic interaction problems. Magnetic interaction is usually measured as a percentage increase in the voltage required to operate a relay when two additional relays, stacked one each side, are themselves operated. An unscreened device mounted on this pitch would have an interaction figure of around 40 percent, it would therefore be totally unsuitable for applications where relays are to be packed densely. Pickering Series 108 have a typical interaction figure of only 1 percent.

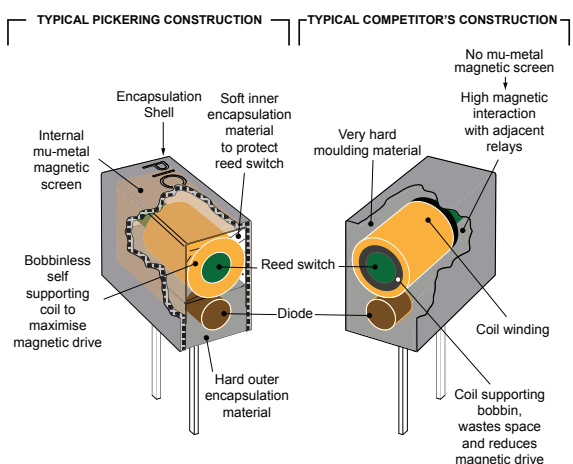
Dry switches are available in 1 or 2 Form A (energise to make) and 1 Form C (change-over) configurations. 3, 5 and 12 Volt coils are available, 5 Volt coils have a resistance of 500 Ohms and may therefore be driven directly from TTL logic.



Switch Ratings - Dry switches

- Single or Double pole Form A (Energize to Make) relays. Up to 1 Amp switching at 20 Watts
- Single pole Form C (Change-over) relays. 0.25 Amps switching at 3 Watts

Typical Pickering **SoftCenter[®]** Construction



Series 108 switch ratings

- The contact ratings for each switch type are shown below:

Switch No	Switch form	Power rating	Max. switch current	Max. carry current	Max. switching volts	Life expectancy ops typical (see Note ¹ below)	Operate time inc bounce (max)	Release time	Special features
1	A	15 W (5 V Versions) 20 W (12 V Versions)	1.0 A	1.2 A	200	10E9	0.5 ms	0.2 ms	General purpose
2	A	10 W	0.5 A	1.2 A	200	10E9	0.5 ms	0.2 ms	Low level
3	C	3 W	0.25 A	1.2 A	200	10E7	1.0 ms	0.5 ms	Change over

Switch no.2 is particularly good for switching low currents and/or voltages. It is the ideal switch for A.T.E. systems where cold switching techniques are often used. Where higher power levels are involved, switch no.1 is more suitable.

Operating voltages

Coil voltage - nominal	Must operate voltage - maximum at 25°C	Must release voltage - minimum at 25°C
3 V	2.25 V	0.3 V
5 V	3.75 V	0.5 V
12 V	9 V	1.2 V

Coil data and type numbers

Device type	Type Number	Coil (V)	Coil resistance	Max. contact resistance (initial)	Insulation resistance (minimum)		Capacitance (typical) (see Note ² below)	
					Switch to coil	Across switch	Closed switch to coil	Across open switch
1 Form A (energize to make) General Purpose Switch No. 1	108-1-A-5/1D	5	500 Ω	0.15 Ω	10E12 Ω	10E12 Ω	2.5 pF	0.15 pF
	108-1-A-12/1D	12	1000 Ω					
1 Form A (energize to make) Low Level Switch No. 2	108-1-A-3/2D	3	330 Ω	0.12 Ω	10E12 Ω	10E12 Ω	2.5 pF	0.15 pF
	108-1-A-5/2D	5	500 Ω					
1 Form C (change-over) Switch No. 3	108-1-C-5/3D	5	500 Ω	0.20 Ω	10E12 Ω	10E10 Ω	See Note ³	See Note ³
	108-1-C-12/3D	12	1000 Ω					
2 Form A (energize to make) General Purpose Switch No. 1	108-2-A-5/1D	5	375 Ω	0.17 Ω	10E12 Ω	10E12 Ω	See Note ³	See Note ³
	108-2-A-12/1D	12	1000 Ω					
2 Form A (energize to make) Low Level Switch No. 2	108-2-A-5/2D	5	375 Ω	0.15 Ω	10E12 Ω	10E12 Ω	See Note ³	See Note ³
	108-2-A-12/2D	12	1000 Ω					

When an internal diode is required, the suffix D is added to the part number as shown in the table.

Environmental specification

Standard operating temperature range: -20 to +85 °C.

Note: The upper temperature limit can be extended to +125 °C if the coil drive voltage is increased to accommodate the resistance/temperature coefficient of the copper coil winding. This is approximately 0.4% per °C. This means that at 125 °C the coil drive voltage will need to be increased by approximately $40 \times 0.4 = 16\%$ to maintain the required magnetic drive level. Please contact sales@pickeringrelay.com for assistance if necessary.

Vibration: Maximum 20 G

Shock: Maximum 50 G

Note¹ Life expectancy

The life of a reed relay depends upon the switch load and end of life criteria. For example, for an 'end of life' contact resistance specification of 1 Ω, switching low loads (10 V at 10 mA resistive) or when 'cold' switching, typical life is approx 1×10^9 ops. At the maximum load (resistive), typical life is 1×10^7 ops. In the event of abusive conditions, e.g. high currents due to capacitive inrushes, this figure reduces considerably. Pickering will be pleased to perform life testing with any particular load condition.

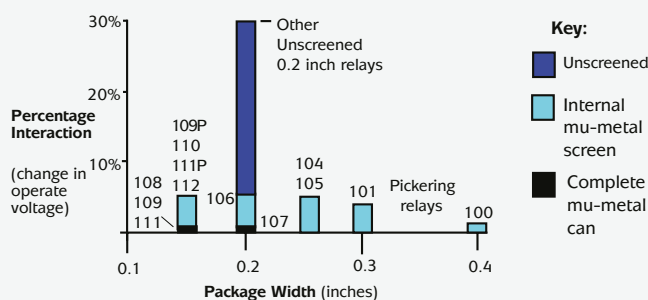
Note² Capacitance across open switch

The capacitance across the open switch was measured with other connections guarded.

Note³ Capacitance values

The value will depend upon on the mode of connection/guarding of unused terminals. Please contact technical sales for details.

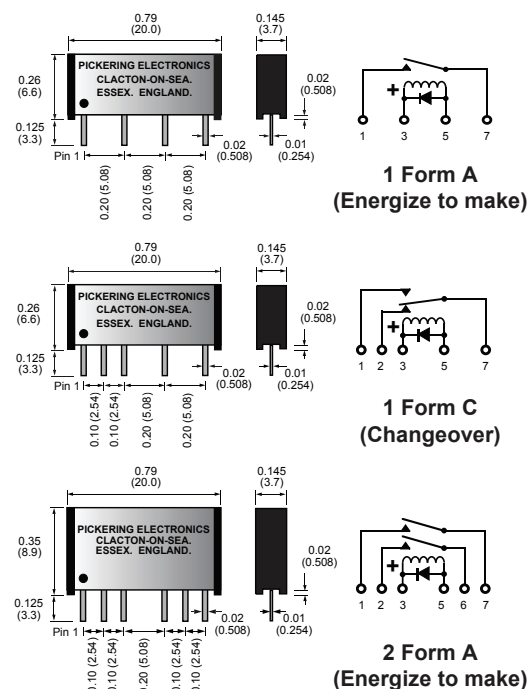
Graph showing the effects of different types of Screening



ISO9001 Manufacture of
Reed Relays FM 29036

Pin Configuration and Dimensional Data

Dimensions in Inches (Millimeters in brackets)



Important: Where the optional internal diode is fitted, the correct coil polarity must be observed, as shown by the + symbol on the schematics.

3D Models: Interactive models of the complete range of Pickering relay products can be downloaded from the web site.

Order Code

108 - 1 - A - 5 / 2 D

Series _____
Number of reeds _____
Switch form _____
Coil voltage _____
Switch number (See table adjacent) _____
Diode if fitted (Omit if not required) _____

Help

If you need any technical advice or other help, for example, any special tests that you would like carried out, please do not hesitate to contact our Technical Sales Department. We will always be pleased to discuss Pickering relays with you. email: techsales@pickeringrelay.com

Please ask us for a FREE evaluation sample.

Mini-SIL[®] SIL/SIP Reed Relays

Up to 20 Watts switching

Stacking on 0.2 inches pitch

Features

- **SoftCenter[®]** construction (see adjacent diagram)
- Highest quality instrumentation grade switches
- Encapsulated in patented mu-metal can
- Insulation resistance greater than $10^{12} \Omega$ for Form A devices
- Dry and mercury wetted switches available
- Wide range of switch configurations - 1 Form A, 1 Form B, 2 Form A, 1 Form C, and 2 Form C, see adjacent column
- For R.F. or high speed digital applications, 50 ohms coaxial devices are available in the same package style, see Series 102M
- 3, 5, 12 or 24 Volt coils with or without internal diode
- 100% tested for dynamic contact resistance for guaranteed performance

The Series 107 Mini-SIL range of reed relays are intended for stacking on 0.2 inches (5.08mm) pitch. Their small size, superb contact resistance stability and ultra high insulation resistance, make these relays an ideal choice for high quality instrumentation.

The mu-metal case ensures virtually total magnetic screening, see explanation below.

Both dry and mercury wetted switches are available in a wide range of configurations, see adjacent column.

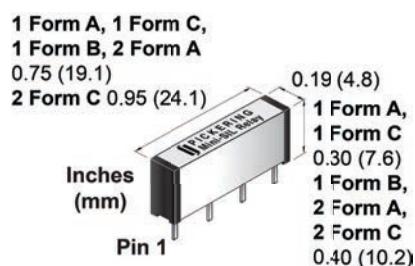
If even greater packing density is required, smaller devices are available in other Pickering SIL ranges (except for two pole changeover types).

Magnetic Interaction - An explanation

Magnetic interaction between relays is normally expressed as a percentage increase in the voltage required to operate the relay, due to the extraneous fields from adjacent relay coils.

An unscreened SIL relay of this size would have an interaction figure of around 30 percent, i.e. the voltage required to operate it will increase by this amount when relays alongside are operated also. It may prove impossible to use such a relay at its nominal coil voltage in high density applications.

A Pickering Series 107 reed relay has an interaction figure of approximately 1 percent.



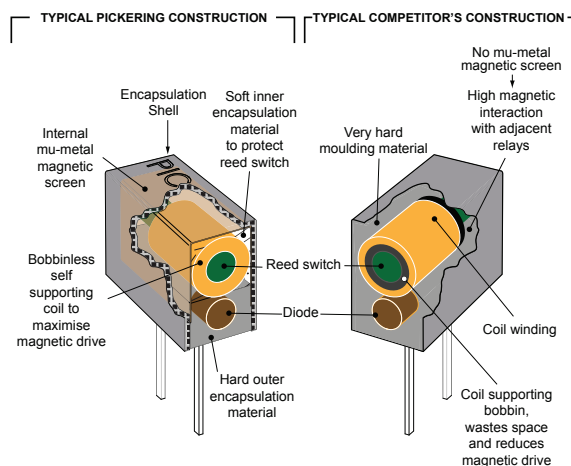
Switch Ratings - Dry switches

- Single or Double pole Form A (Energize to Make) relays. Up to 1 Amp switching at 20 Watts
- Single pole Form B (Energize to Break) relays. Up to 1 Amp switching at 20 Watts
- Single or Double pole Form C (Change-over) relays. 0.25 Amps switching at 3 Watts

Switch Ratings - Mercury Wetted Switches

- Single or Double pole Form A (Energize to Make) relays. 2 Amp switching at 50 Watts
- Single pole, Non Position Sensitive, Form A (Energize to Make) relays. 2 Amp switching at 50 Watts

Typical Pickering **SoftCenter[®]** Construction



Series 107 switch ratings - The contact ratings for each switch type are shown below:

Switch No	Switch form	Power rating	Max. switch current	Max. carry current	Max. switching volts	Life expectancy ops typical (see Note ¹ below)	Operate time inc bounce (max)	Release time	Special features
1	A or B	15 W (5 V Versions) 20 W (12 & 24 V)	1.0 A	1.2 A	200	10E9	0.5 ms	0.2 ms	General purpose
2	A	10 W	0.5 A	1.2 A	200	10E9	0.5 ms	0.2 ms	Low level
3	C	3 W	0.25 A	1.2 A	200	10E7	1.0 ms	0.5 ms	Change over
4	A	10 W	0.5 A	1.2 A	400	10E7	0.75 ms	0.25 ms	500V stand-off

Switch no.2 is particularly good for switching low currents and/or voltages. It is the ideal switch for A.T.E. systems where cold switching techniques are often used. Where higher power levels are involved, switch no.1 is more suitable.

Coil data and type numbers

Device type	Type Number	Coil (V)	Coil resistance	Max. contact resistance (initial)	Insulation resistance (minimum)		Capacitance (typical) (see Note ² below)	
					Switch to coil	Across switch	Closed switch to coil	Across open switch
1 Form A (energize to make) General Purpose Switch No. 1	107-1-A-5/1D	5	500 Ω	0.15 Ω	10E12 Ω	10E12 Ω	2.5 pF	0.2 pF
	107-1-A-12/1D	12	1000 Ω					
	107-1-A-24/1D	24	3000 Ω					
1 Form A (energize to make) Low Level Switch No. 2	107-1-A-3/2D	3	500 Ω	0.12 Ω	10E12 Ω	10E12 Ω	2.5 pF	0.2 pF
	107-1-A-5/2D	5	500 Ω					
	107-1-A-12/2D	12	1000 Ω					
1 Form A (energize to make) High Voltage Switch No. 4	107-1-A-3/4D	3	500 Ω	0.15 Ω	10E12 Ω	10E12 Ω	2.5 pF	0.2 pF
	107-1-A-12/4D	12	1000 Ω					
	107-1-A-24/4D	24	3000 Ω					
1 Form C (change-over) Switch No. 3	107-1-C-3/3D	3	500 Ω	0.20 Ω	10E12 Ω	10E10 Ω	See Note ³	See Note ³
	107-1-C-12/3D	12	1000 Ω					
	107-1-C-24/3D	24	3000 Ω					
1 Form B (energize to break) General Purpose Switch No. 1	107-1-B-5/1D	5	1000 Ω	0.15 Ω	10E12 Ω	10E12 Ω	2.5 pF	0.2 pF
	107-1-B-12/1D	12	3000 Ω					
	107-1-B-24/1D	24	3000 Ω					
2 Form A (energize to make) General Purpose Switch No. 1	107-2-A-5/1D	5	500 Ω	0.17 Ω	10E12 Ω	10E12 Ω	See Note ³	See Note ³
	107-2-A-12/1D	12	1000 Ω					
	107-2-A-24/1D	24	3000 Ω					
2 Form A (energize to make) Low Level Switch No. 2	107-2-A-5/2D	5	500 Ω	0.15 Ω	10E12 Ω	10E12 Ω	See Note ³	See Note ³
	107-2-A-12/2D	12	1000 Ω					
	107-2-A-24/2D	24	3000 Ω					
2 Form C (change-over) Switch No. 3	107-2-C-3/3D	3	200 Ω	0.22 Ω	10E12 Ω	10E12 Ω	See Note ³	See Note ³
	107-2-C-5/3D	5	375 Ω					
	107-2-C-12/3D	12	1000 Ω					
	107-2-C-24/3D	24	2700 Ω					

When an internal diode is required, the suffix D is added to the part number as shown in the table.

Mercury Reed: Series 107 switch ratings - The contact ratings for each switch type are shown below:

Switch No	Switch form	Power rating	Max. switch current	Max. carry current	Max. switching volts	Life expectancy ops typical (see Note ¹ below)	Operate time (max)	Release time	Special features
6	A	50 W	2 A	3 A	500	10E8	2.0 ms	1.25 ms	Standard Mercury
8	A	50 W	2 A	2 A	350	10E8	2.0 ms	1.25 ms	Position Insensitive

Mercury Relay: Coil data and type numbers

Device type	Type Number	Coil (V)	Coil resistance	Max. contact resistance (initial)	Insulation resistance (minimum)		Capacitance (typical) (see Note ² below)	
					Switch to coil	Across switch	Closed switch to coil	Across open switch
1 Form A (energize to make) Switch No. 6	107-1-A-5/6D	5	140 Ω	0.075 Ω	10E12 Ω	10E11 Ω	5 pF	0.1 pF
	107-1-A-12/6D	12	500 Ω					
	107-1-A-24/6D	24	1500 Ω					
1 Form A (energize to make) Position Insensitive Switch No. 8	107-1-A-5/8D	5	140 Ω	0.100 Ω	10E12 Ω	10E11 Ω	5 pF	0.1 pF
	107-1-A-12/8D	12	500 Ω					
	107-1-A-24/8D	24	1500 Ω					
2 Form A (energize to make) Switch No. 6	107-2-A-5/6D	5	100 Ω	0.100 Ω	10E12 Ω	10E11 Ω	See Note ³	See Note ³
	107-2-A-12/6D	12	375 Ω					
	107-2-A-24/6D	24	1000 Ω					

When an internal diode is required, the suffix D is added to the part number as shown in the table.

Note¹ Life expectancy

The life of a reed relay depends upon the switch load and end of life criteria. For example, for an 'end of life' contact resistance specification of 1 Ω, switching low loads (10 V at 10 mA resistive) or when 'cold' switching, typical life is approx 1 x 10⁹ ops. At the maximum load (resistive), typical life is 1 x 10⁷ ops. In the event of abusive conditions, e.g. high currents due to capacitive inrushes, this figure reduces considerably. Pickering will be pleased to perform life testing with any particular load condition.

Note² Capacitance across open switch

The capacitance across the open switch was measured with other connections guarded.

Note³ Capacitance values

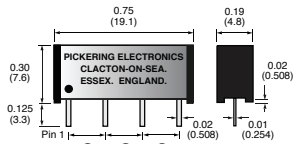
The value will depend upon on the mode of connection/guarding of unused terminals. Please contact technical sales for details.



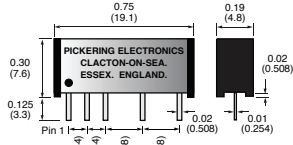
ISO9001 Manufacture of
Reed Relays FM 29036

Pin Configuration and Dimensional Data

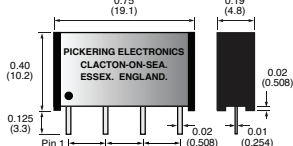
Dimensions in Inches (Millimeters in brackets)



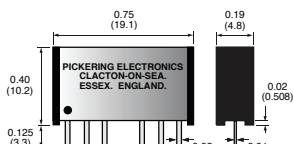
1 Form A
(Energize to make)



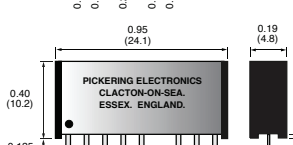
1 Form C
(Changeover)



1 Form B
(Energize to break)



2 Form A
(Energize to make)



2 Form C
(Changeover)

Important: Where the optional internal diode is fitted or for all Form B types, the correct coil polarity must be observed, as shown by the + symbol on the schematics.

3D Models: Interactive models of the complete range of Pickering relay products can be downloaded from the web site.

Mercury Relays

With the exception of the position insensitive type, mercury relays should be mounted vertically with pin 1 uppermost.

Order Code

107 - 1 - A - 5 / 2 D

Series _____

Number of reeds _____

Switch form _____

Coil voltage _____

Switch number (See table adjacent) _____

Diode if fitted (Omit if not required) _____

Help

If you need any technical advice or other help, for example, any special tests that you would like carried out, please do not hesitate to contact our Technical Sales Department. We will always be pleased to discuss Pickering relays with you. email: techsales@pickeringrelay.com

Please ask us for a FREE evaluation sample.



email: sales@pickeringrelay.com

pickeringrelay.com

Low Capacitance SIL/SIP Reed Relays

Up to 15 Watts switching

Stacking on 0.2 inches pitch

Features

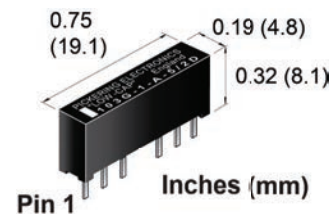
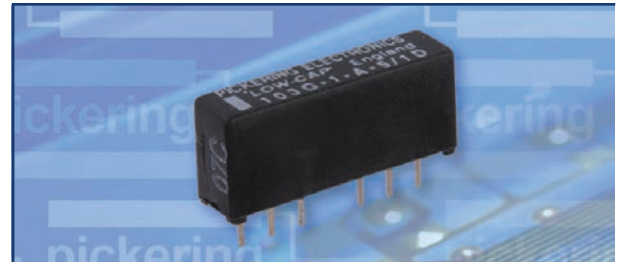
- **SoftCenter®** construction (see adjacent diagram)
- Highest quality instrumentation grade switches
- Inter-terminal capacitances are a fraction of that for standard SIL relays
- Pin compatible with standard 0.2 inch SIL relays
- Optional internal mu-metal magnetic screen
- Optional internal coaxial electrostatic screen
- Insulation resistance greater than $10^{12} \Omega$
- 100% tested for dynamic contact resistance for guaranteed performance

The Pickering Series 103 is a range of Single-in-Line reed relays intended for such applications as wide bandwidth A.T.E. switching matrices, attenuator switching or any other applications where exceptionally low levels of inter-terminal capacitances are required, for example, when carrying fast rise time pulses. A version with an internal co-axial electrostatic screen is available which is ideal for applications where capacitively coupled noise from switch to coil connections is undesirable. The co-axial device has a characteristic impedance of 50 ohms and is also suitable for RF applications, HF performance is similar to the Series 102M.

The range consists of two basic types, the first achieves ultra low capacitance levels of typically 0.1pf from each switch connection to the coil and typically 0.08pf across the open switch contacts, by virtue of an internal coaxial electrostatic screen or guard connection. Where it is not possible to drive a guard, the second type has inherently low capacitance figures of typically 0.4pf from each switch connection to the coil and typically 0.1pf across the open switch contacts. These figures for the unguarded version are around one quarter of those for standard SIL devices. An internal mu-metal magnetic screen is an option in both of these types.

The Series 103 may be stacked on 0.2 inches pitch and is pin compatible with all other 0.2 inch SIL relays. They are encapsulated in a plastic package using a very high resistivity resins.

Two types of Form A (energize to make) switches are available, a general purpose switch (switch no.1) and a vacuum sputtered ruthenium switch (switch no.2) which is ideal for very low level or "cold" switching applications.



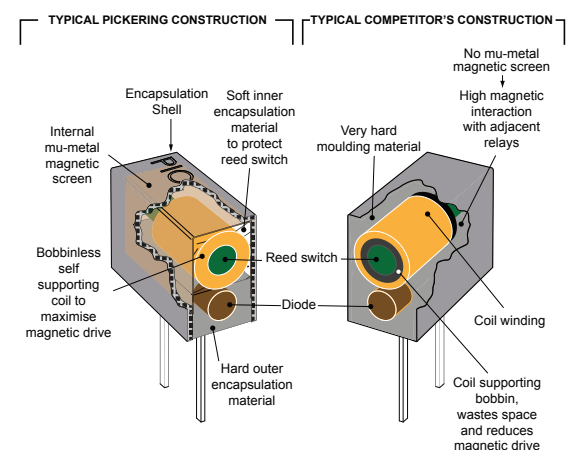
Switch Ratings

- 1 Form A (energize to make), 15 watts at 1 Amp
- 1 Form A (co-axial), up to 15 watts at 1 Amp.
50 ohms characteristic impedance makes this device suitable for RF applications also

Optional magnetic screening

In high density applications when more than one relay may be operated at any time, for example, ATE switching matrices, it is usually necessary to use a relay that includes internal mu-metal magnetic screening to reduce the effects of extraneous fields from adjacent devices. The addition of this screen however does have the effect of slightly increasing the capacitance figures of the relay, as illustrated in the tables over.

Typical Pickering SoftCenter® Construction



Dry Reed Series 103 switch ratings

The contact ratings for each switch type are shown below:

Switch No	Switch form	Power rating	Max. switch current	Max. carry current	Max. switching volts	Life expectancy ops typical (see Note ¹ below)	Operate time inc bounce (max)	Release time	Special features
1	A	15 W	1.0 A	1.2 A	200	10E9	0.5 ms	0.2 ms	General purpose
2	A	10 W	0.5 A	1.2 A	200	10E9	0.5 ms	0.2 ms	Low level

Switch no.2 is particularly good for switching low currents and/or voltages. It is the ideal switch for A.T.E. systems where cold switching techniques are often used. Where higher power levels are involved, switch no.1 is more suitable.

Operating voltages

Coil voltage - nominal	Must operate voltage - maximum at 25°C	Must release voltage - minimum at 25°C
3 V	2.25 V	0.3 V
5 V	3.75 V	0.5 V
12V	9 V	1.2 V

Dry Relays - Data and type numbers

Config	Switch		Type Number	Coil (V)	Coil resistance	Max. contact resistance (initial)	Insulation resistance (minimum)		Capacitance (typical) (see Note ² below)	
	Form	Type					Switch to coil	Across switch	Closed switch to coil	Across open switch
No Magnetic screen or Guard screen	A	1	103-1-A-5/1D	5	150 Ω	0.15 Ω	10E12 Ω	10E12 Ω	0.4 pF	0.13 pF
	A	2	103-1-A-5/2D	5	150 Ω	0.12 Ω				
Magnetic screen only	A	1	103M-1-A-5/1D	5	150 Ω	0.15 Ω	10E12 Ω	10E12 Ω	0.45 pF	0.13 pF
	A	2	103M-1-A-5/2D	5	150 Ω	0.12 Ω				
Guard screen only	A	2	103G-1-A-3/2D	3	300 Ω	0.12 Ω	10E12 Ω	10E12 Ω	0.1 pF	0.08 pF
	A	1	103G-1-A-5/1D	5	500 Ω	0.15 Ω				
	A	2	103G-1-A-5/2D	5	500 Ω	0.12 Ω				
	A	1	103G-1-A-12/1D	12	1000 Ω	0.15 Ω				
Guard screen and Magnetic screen	A	2	103GM-1-A-3/2D	3	300 Ω	0.12 Ω	10E12 Ω	10E12 Ω	0.2 pF	0.08 pF
	A	1	103GM-1-A-5/1D	5	500 Ω	0.15 Ω				
	A	2	103GM-1-A-5/2D	5	500 Ω	0.12 Ω				
	A	1	103GM-1-A-12/1D	12	1000 Ω	0.15 Ω				
	A	2	103GM-1-A-12/2D	12	1000 Ω	0.12 Ω				0.08 pF
	A	2	103GM-1-A-12/2D	12	1000 Ω	0.12 Ω				

When an internal diode is required, the suffix D is added to the part number as shown in the table.

Environmental specification

Standard operating temperature range: -20 to +85 °C.

Note: The upper temperature limit can be extended to +125 °C if the coil drive voltage is increased to accommodate the resistance/temperature coefficient of the copper coil winding. This is approximately 0.4% per °C. This means that at 125 °C the coil drive voltage will need to be increased by approximately $40 \times 0.4 = 16\%$ to maintain the required magnetic drive level. Please contact sales@pickeringrelay.com for assistance.

Vibration: Maximum 20 G

Shock: Maximum 50 G

Note¹ Life expectancy

The life of a reed relay depends upon the switch load and end of life criteria. For example, for an 'end of life' contact resistance specification of 1 Ω, switching low loads (10 V at 10 mA resistive) or when 'cold' switching, typical life is approx 1×10^9 ops. At the maximum load (resistive), typical life is 1×10^7 ops. In the event of abusive conditions, e.g. high currents due to capacitive inrushes, this figure reduces considerably. Pickering will be pleased to perform life testing with any particular load condition.

Note² Capacitance across open switch

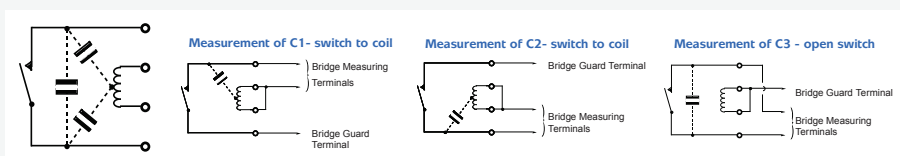
The capacitance across the open switch was measured with other connections guarded.

Note³ Capacitance values

The value will depend upon on the mode of connection/guarding of unused terminals. Please contact technical sales for details.

Simplified equivalent circuits

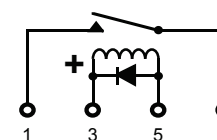
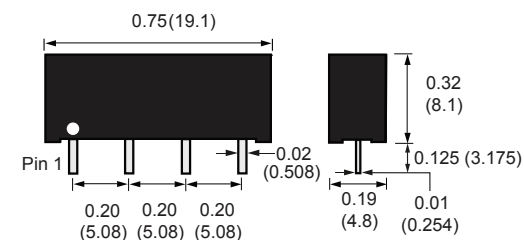
It is convenient to consider the internal capacitances as a delta network as in the circuit diagram alongside. C1 is the capacitance between one end of the switch and the coil, C2 is the capacitance between the other end of the switch and the coil. These two figures will be approximately equal. C3 is the capacitance across the open switch. When measuring the values of any one of these capacitances, it is necessary to "guard" the unused relay connections to avoid the parallel effects of the other capacitances, connection details when performing these measurements on a capacitance bridge are shown below. Relays with an internal electrostatic screen have the screen terminals guarded in all cases.



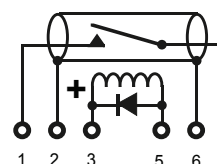
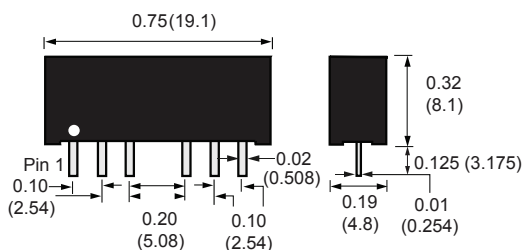
ISO9001 Manufacture of
Reed Relays FM 29036

Pin Configuration and Dimensional Data

Dimensions in Inches (Millimeters in brackets)



**1 Form A
(Energize to make)
103 and 103M**



1 Form A (Co-axial)

Important: Where the optional internal diode is fitted, the correct coil polarity must be observed, as shown by the + symbol on the schematics.

3D Models: Interactive models of the complete range of Pickering relay products can be downloaded from the web site.

Internal Mu-metal Magnetic Screen

The Series 103 relays are fitted with an optional internal mu-metal magnetic screen which permits side-by-side stacking on 0.2 inches pitch.

Order Code

103 G M - 1 - A - 5 / 2 D

Series _____
Guard (omit if not required) _____
Mag. screen (omit if not required) _____
Number of reeds _____
Switch form _____
Coil voltage _____
Switch number (See table adjacent) _____
Diode if fitted (Omit if not required) _____

Help

If you need any technical advice or other help, for example, any special tests that you would like carried out, please do not hesitate to contact our Technical Sales Department. We will always be pleased to discuss Pickering relays with you. email: techsales@pickeringrelay.com

Please ask us for a FREE evaluation sample.

Pickering Series 102

Subminiature Coaxial SIL/SIP Reed Relays for RF and High Speed Digital

Up to 20 Watts switching

Features

- **SoftCenter®** construction (see adjacent diagram)
- Highest quality instrumentation grade switches
- Form A (energize to make) or Form B (energize to break) configurations
- Up to 20 Watts switching capability
- Insulation resistance greater than $10^{12} \Omega$
- 3, 5 and 12 Volt coils with or without internal diode
- 100% tested for dynamic contact resistance for guaranteed performance

The Series 102 is a range of subminiature coaxial reed relays for high frequency applications up to 3 GHz, performance characteristics will be found on reverse of this sheet. Two package types are available, both displaying outstanding RF performance in terms of low insertion loss, good isolation and excellent VSWR characteristics in 50 ohms systems. These relays have good coil drive levels making them ideal for portable applications or where space is at a premium. If an even smaller RF relay is required, look at the Series 109RF or 111 RF.

102M (Mu-metal) Package.

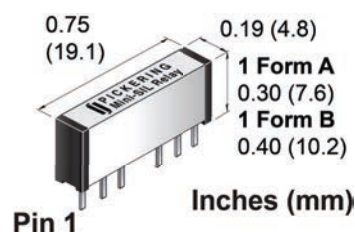
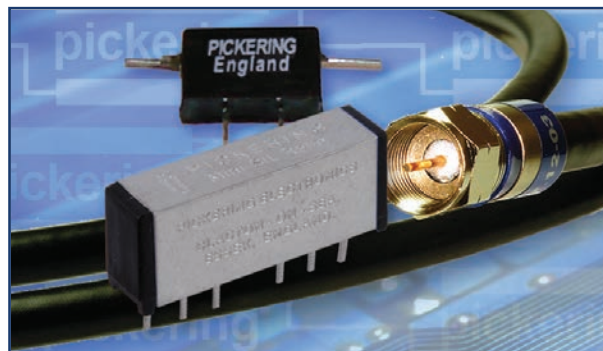
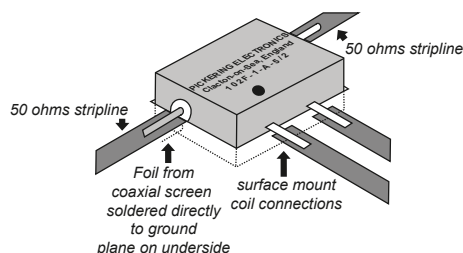
This device, constructed in the popular Single-In-Line format, features a mu-metal case allowing dense packaging without magnetic interaction problems. It has six pins for conventional PCB mounting. With careful printed circuit board layout this configuration will perform well up to 1.5GHz, it is easy to use and will meet most requirements.

102F (Flatpack) package.

The 102F package dispenses with the leadframe connections to the switch and screen. These terminations are instead brought out axially from the ends of the device where they are soldered directly to the stripline. This technique allows very accurate matching to the 50 ohms line and gives an excellent VSWR right up to 3 GHz.

Mounting method:

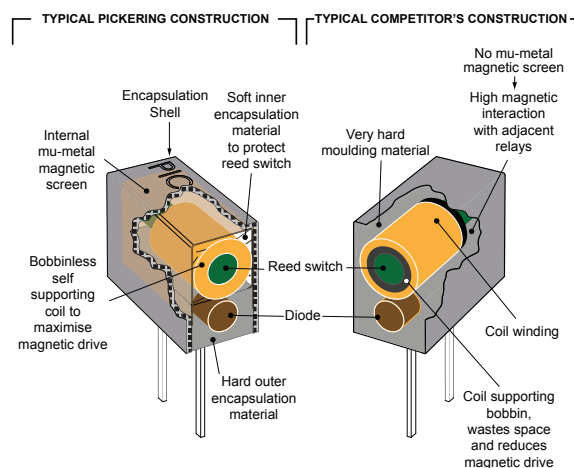
A small rectangular hole is punched into the printed circuit board or notched into the board edge to accommodate the package. The switch leads are then soldered directly to the 50 ohms stripline, the tin plated copper foil from the screen is soldered directly to the ground plane on the reverse side of the P.C.B. The coil connections are soldered directly to their tracks in the same way.



Switch Ratings

- **1 Form A coaxial** (energize to make), 10 watts at 200V - Switch No.1
- **1 Form A coaxial** (energize to make), 20 watts at 200V - Switch No.2
- **1 Form B coaxial** (energize to break), 10 watts at 200V - Switch No.1
- **1 Form B coaxial** (energize to break), 20 watts at 200V - Switch No.2

Typical Pickering SoftCenter® Construction



Series 102 switch ratings - The contact ratings for each switch type are shown below:

Switch No	Switch form	Power rating	Max. switch current	Max. carry current	Max. switching volts	Life expectancy ops typical (see Note ¹ below)	Operate time inc bounce (max)	Release time
1	A or B	10 W	0.5 A	1.2 A	200	10E8	0.5 ms	0.2 ms
2	A or B	20 W	1 A	1.2 A	200	10E8	0.5 ms	0.2 ms

102M (mu-metal) Data and type numbers

Device type	Type Number	Coil (V)	Coil resistance	Max. contact resistance (initial)	Insulation resistance (minimum)		Capacitance (typical) (see Note ² below)	
					Switch to coil	Across switch	Closed switch to coil	Across open switch
1 Form A (energize to make) General Purpose Switch No. 1 (10 Watts)	102M-1-A-3/1D	3	300 Ω	0.15 Ω	10E12 Ω	10E12 Ω	See Note ³	0.1 pF
	102M-1-A-5/1D	5	500 Ω					
	102M-1-A-12/1D	12	1000 Ω					
1 Form A (energize to make) Higher Power Dry Reed Switch No. 2 (20 Watts)	102M-1-A-5/2D	5	375 Ω	0.15 Ω	10E12 Ω	10E12 Ω	See Note ³	0.1 pF
	102M-1-A-12/2D	12	1000 Ω					
1 Form B (energize to break) General Purpose Switch No. 1 (10 Watts)	102M-1-B-5/1D	5	1000 Ω	0.15 Ω	10E12 Ω	10E12 Ω	See Note ³	0.1 pF
	102M-1-B-12/1D	12	1500 Ω					
1 Form B (energize to break) Higher Power Dry Reed Switch No. 2 (20 Watts)	102M-1-B-5/2D	5	1000 Ω	0.15 Ω	10E12 Ω	10E12 Ω	See Note ³	0.1 pF
	102M-1-B-12/2D	12	1500 Ω					

When an internal diode is required, the suffix D is added to the part number as shown in the table.

102F (flatpack) Data and type numbers

Device type	Type Number	Coil (V)	Coil resistance	Max. contact resistance (initial)	Insulation resistance (minimum)		Capacitance (typical) (see Note ² below)	
					Switch to coil	Across switch	Closed switch to coil	Across open switch
1 Form A (energize to make) General Purpose Switch No. 1 (10 Watts)	102F-1-A-3/1D	3	300 Ω	0.10 Ω	10E12 Ω	10E12 Ω	See Note ³	0.1 pF
	102F-1-A-5/1D	5	500 Ω					
	102F-1-A-12/1D	12	1000 Ω					
1 Form A (energize to make) Higher Power Dry Reed Switch No. 2 (20 Watts)	102F-1-A-5/2D	5	375 Ω	0.10 Ω	10E12 Ω	10E12 Ω	See Note ³	0.1 pF
	102F-1-A-12/2D	12	1000 Ω					

When an internal diode is required, the suffix D is added to the part number as shown in the table.

Note¹ Life expectancy

The life of a reed relay depends upon the switch load and end of life criteria. For example, for an 'end of life' contact resistance specification of 1 Ω, switching low loads (10 V at 10 mA resistive) or when 'cold' switching, typical life is approx 1 x 10⁹ ops. At the maximum load (resistive), typical life is 1 x 10⁷ ops. In the event of abusive conditions, e.g. high currents due to capacitive inrushes, this figure reduces considerably. Pickering will be pleased to perform life testing with any particular load condition.

Note² Capacitance across open switch

The capacitance across the open switch was measured with other connections guarded.

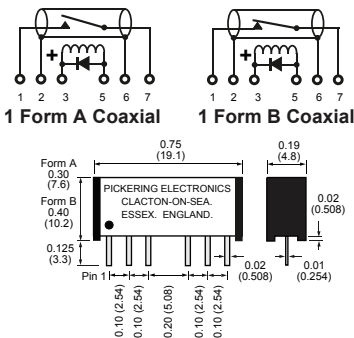
Note³ Capacitance values

The value will depend upon on the mode of connection/guarding of unused terminals. Please contact technical sales for details.

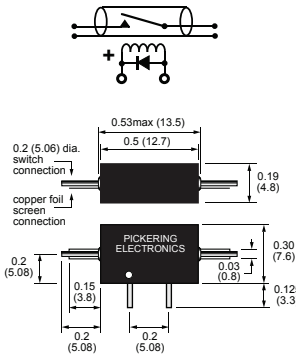
Pin Configuration and Dimensional Data

Dimensions in Inches (Millimeters in brackets)

102M Package

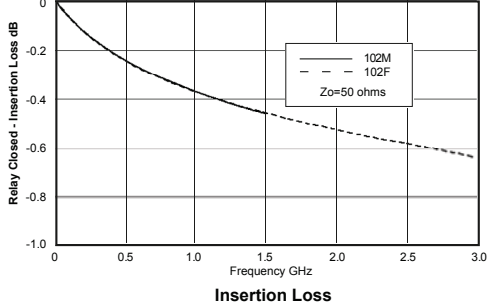
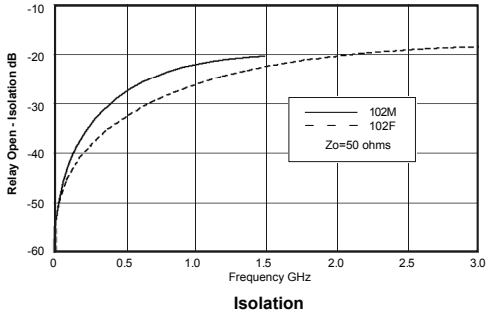
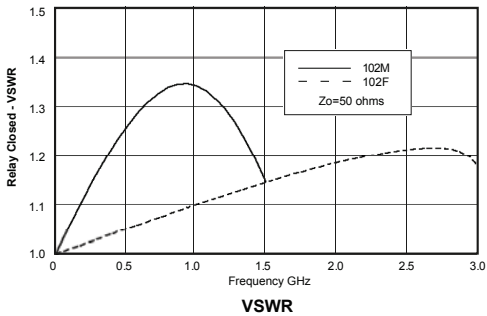


102F Package



Suggested PCB cut-out
0.55 (14) x 0.35 (8.9)

Typical Performance Characteristics



3D Models: Interactive models of the complete range of Pickering relay products can be downloaded from the web site.

Also available - Low capacitance reed relays

If your high frequency application does not require coaxial relays, Pickering also manufacture devices featuring very low levels of capacitance between the switch and coil, see our Series 103. These are especially useful for such applications as the switching of ranges and attenuators in computer controlled instrumentation. Contact our sales office for further details.

Order Code

102 M - 1 - A - 5 / 2 D

Series _____

Package Type (M or F) _____

Number of reeds _____

Switch form _____

Coil voltage _____

Switch number (1 or 2 See table adjacent) _____

Diode if fitted (Omit if not required) _____

Help

If you need any technical advice or other help, for example, any special tests that you would like carried out, please do not hesitate to contact our Technical Sales Department. We will always be pleased to discuss Pickering relays with you. email: techsales@pickeringrelay.com

Please ask us for a FREE evaluation sample.



High Voltage Micro-SIL Single-in-Line SIL/SIP Reed Relays

Up to 3kV Stand-off

Features

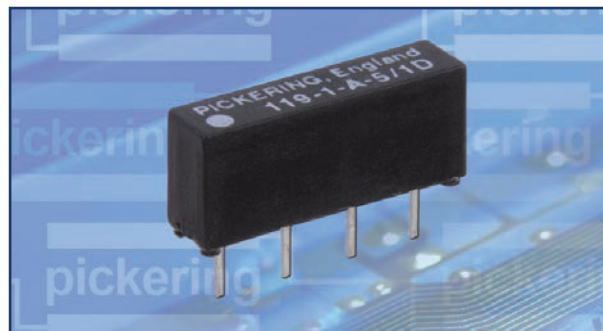
- **SoftCenter®** construction (see adjacent diagram)
- Highest quality instrumentation grade switches
- Small size
- Internal mu-metal magnetic screen
- One or two switches in a single package
- 1 Form A or 2 Form A (energize to make) or 1 Form B (energize to break) configurations
- 3, 5 and 12 Volt coils are standard, with or without internal diode
- 100% tested for dynamic contact resistance
- Ideal for Cable Testers, Mixed signal testers or other applications where High Voltage capability is required.

The Pickering Series 119 is a new range of very small Single-in-Line Reed Relays intended for voltages very much higher than standard small SIL relays. The vacuumed, sputtered ruthenium reed switches have a superb low level performance also, which makes them an ideal choice where a wide range of signals are involved.

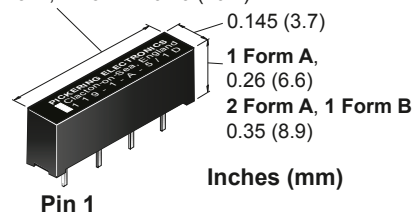
The range is based on the long established Series 109P style of plastic package with an internal mu-metal magnetic screen which allows high packing density and are made using Pickering's **SoftCenter®** construction.

Six versions are available, all with either 3, 5 or 12 volt operating coils. The 1 Form A, 1kV version has a package and pin configuration compatible with the standard 109P type, i.e. 4 pins on 0.15 inches (3.8mm) pitch. The other types have package lengths and pin configurations appropriate for their voltage ratings and the user will need to arrange suitable clearance distances around the parts.

Form A types can be mounted side by side, but a 1cm space should be left between the Form B type and other relays, as the magnetic field from the internal biasing magnet could slightly affect the sensitivity of the relay alongside.



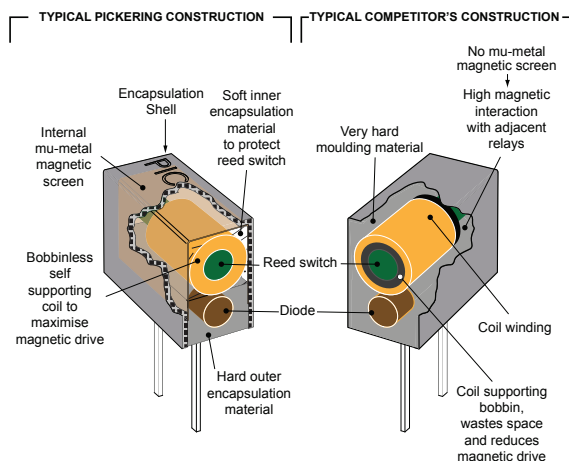
1 Form A, 1 Form B 1kV, 2kV 0.595 (15.1)
1 Form A 3kV, 2 Form A 0.79 (20.1)



Switch Ratings - Dry switches

- **1 Form A (energize to make)**
Stand-off 1kV, switching up to 1kV.
Stand-off 2kV, switching up to 1kV.
Stand-off 3kV, switching up to 1kV.
- **1 Form B (energize to break)**
Stand-off 1kV, switching up to 1kV.
Stand-off 2kV, switching up to 1kV.
- **2 Form A (energize to make)**
Stand-off 1kV, switching up to 1kV.

Typical Pickering **SoftCenter®** Construction



Series 119 switch ratings - The contact ratings for each switch type are shown below:

Switch No	Switch form	Power rating	Max. switch current	Max. carry current	Max. switching volts (see Note ¹)	Max. stand-off volts	Life expectancy ops typical (see Note ² below)	Operate time inc bounce (max)	Release time	Special features
1	A or B	10 W	0.7 A	1.25 A	1000	1000	10E8	0.5 ms	0.2 ms	High voltage
2	A or B	10 W	0.7 A	1.25 A	1000	2000	10E8	0.5 ms	0.2 ms	High voltage
3	A	10 W	0.7 A	1.25 A	1000	3000	10E8	0.5 ms	0.2 ms	High voltage

Operating voltages

Coil voltage - nominal	Must operate voltage - maximum at 25°C	Must release voltage - minimum at 25°C
3 V	2.25 V	0.3 V
5 V	3.75 V	0.5 V
12 V	9 V	1.2 V

Coil data and type numbers

Device type	Type Number	Coil (V)	Coil resistance	Max. contact resistance (initial)	Insulation resistance (minimum)		Capacitance (typical) (see Note ³ below)	
					Switch to coil	Across switch	Closed switch to coil	Across open switch
1 Form A (energize to make) Switch No. 1 (1kV)	119-1-A-3/1D	3	100 Ω	0.17 Ω	10E12 Ω	10E12 Ω	2.5 pF	0.1 pF
	119-1-A-5/1D	5	250 Ω					
	119-1-A-12/1D	12	750 Ω					
1 Form A (energize to make) Switch No. 2 (2kV)	119-1-A-3/2D	3	75 Ω	0.17 Ω	10E12 Ω	10E12 Ω	2.5 pF	0.1 pF
	119-1-A-5/2D	5	200 Ω					
	119-1-A-12/2D	12	500 Ω					
1 Form A (energize to make) Switch No. 3 (3kV)	119-1-A-3/3D	3	50 Ω	0.17 Ω	10E12 Ω	10E12 Ω	2.0 pF	0.1 pF
	119-1-A-5/3D	5	125 Ω					
	119-1-A-12/3D	12	400 Ω					
2 Form A (energize to make) Switch No. 1 (1kV)	119-2-A-3/1D	3	50 Ω	0.17 Ω	10E12 Ω	10E12 Ω	2.5 pF	0.1 pF
	119-2-A-5/1D	5	100 Ω					
	119-2-A-12/1D	12	400 Ω					
1 Form B (energize to break) Switch No. 1 (1kV)	119-1-B-3/1D	3	50 Ω	0.17 Ω	10E12 Ω	10E12 Ω	2.5 pF	0.1 pF
	119-1-B-5/1D	5	100 Ω					
	119-1-B-12/1D	12	400 Ω					
1 Form B (energize to break) Switch No. 2 (2kV)	119-1-B-3/2D	3	50 Ω	0.17 Ω	10E12 Ω	10E12 Ω	2.5 pF	0.1 pF
	119-1-B-5/2D	5	100 Ω					
	119-1-B-12/2D	12	400 Ω					

When an internal diode is required, the suffix D is added to the part number as shown in the table.

Environmental specification

Standard operating temperature range: -20 to +85 °C.	
Note: The upper temperature limit can be extended to +125 °C if the coil drive voltage is increased to accommodate the resistance/temperature coefficient of the copper coil winding. This is approximately 0.4% per °C. This means that at 125 °C the coil drive voltage will need to be increased by approximately $40 \times 0.4 = 16\%$ to maintain the required magnetic drive level. Please contact sales@pickeringrelay.com for assistance if necessary.	
Vibration: Maximum 20 G	Shock: Maximum 50 G

Note¹ Switching Voltage

This high voltage rating is for RESISTIVE loads only. At these high voltages, even stray capacitance can generate very high current pulses, which can damage the contact plating causing welding of the reed switch. If there is capacitance in circuit, provision should be made to limit the surge, to within the current and power ratings of the relay.

Note² Life expectancy

The life of a reed relay depends upon the switch load and end of life criteria. For example, for an 'end of life' contact resistance specification of 1 Ω, switching low loads (10 V at 10 mA resistive) or when 'cold' switching, typical life is approx 1 x 10⁸ ops. At the maximum load (resistive), typical life is 1 x 10⁷ ops. In the event of abusive conditions, e.g. high currents due to capacitive inrushes, this figure reduces considerably. Pickering will be pleased to perform life testing with any particular load condition.

Note³ Capacitance across open switch

This is measured with all other component leads connected to the guard terminal of the measuring bridge.

Help

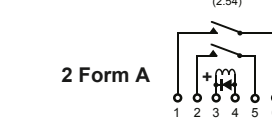
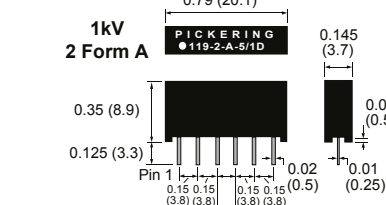
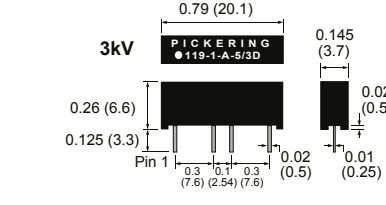
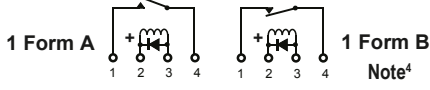
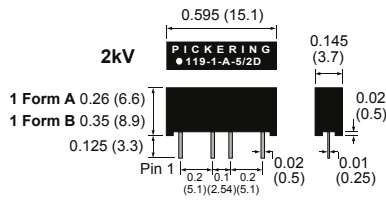
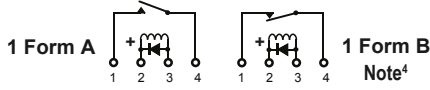
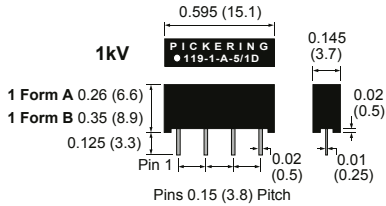
If you need any technical advice or other help, for example, any special tests that you would like carried out, please do not hesitate to contact our Technical Sales Department. We will always be pleased to discuss Pickering relays with you. email: techsales@pickeringrelay.com



ISO9001 Manufacture of Reed Relays FM 29036

Pin Configuration and Dimensional Data

Dimensions in Inches (Millimeters in brackets)



Important: Where the optional internal diode is fitted or for all Form B types, the correct coil polarity must be observed, as shown by the + symbol on the schematics.

Note⁴: A 1cm space should be left between Form B types and other relays, as the magnetic field from the internal biasing magnet could slightly affect the sensitivity of the relay alongside.

3D Models: Interactive models of the complete range of Pickering relay products can be downloaded from the web site.

Order Code

119 - 1 - A - 5 / 1 D

Series _____
Number of reeds _____
Switch form _____
Coil voltage _____
Switch number (See table adjacent) _____
Diode if fitted (Omit if not required) _____

Please ask us for a FREE evaluation sample.

High Voltage SIL/SIP Reed Relays

Up to 3 kilovolts Stand-off

Stacking on 0.25 inches pitch

Features

- Small size
- Internal mu-metal magnetic screen
- One or two switches in a single package
- Form A (energise to make) or Form B (energise to break) configurations
- Dry and mercury wetted switches available
- 3, 5, 12 and 24 Volt coils with or without internal diode
- 100% tested for dynamic contact resistance for guaranteed performance

The Series 104 is a range of Single-In-Line reed relays intended for voltages that are beyond the capabilities of conventional SIL reed relays.

They are ideal for such applications as transformer or cable testing or any other automatic test equipment where high voltages are involved.

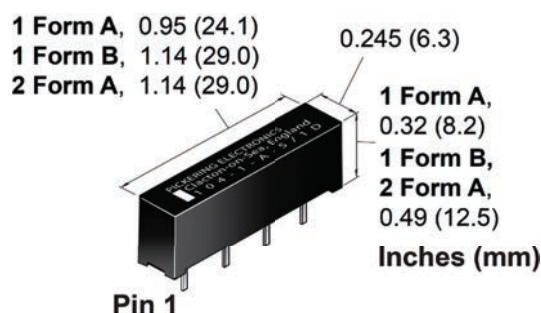
Where mains voltages are switched, for example to control and isolate S.C.R. or triac gates, they are an ideal choice.

One or two Form A (energise to make) or one Form B (energise to break) configurations are available.

The range features an internal mu-metal screen to eliminate problems that would otherwise be experienced due to magnetic interaction when they are closely stacked.

Three types of dry switches are available, capable of standing-off 1, 1.5 or 3kV d.c. The 3kV version has an increased clearance between the switch and coil pins to accommodate the higher voltage. Even higher voltage ratings are available to special order, please contact our sales office for further information.

Mercury wetted devices are also available for applications where bounce free switching is required. These are rated at 1500 volts d.c. stand-off, 500 volts d.c. switching at up to 50 watts.



Switch Ratings - Dry switches

- **1 or 2 Form A (energise to make)**
1000 Volts d.c. stand-off
500 Volts d.c. switching at 10 Watts
- **1 or 2 Form A (energise to make)**
1500 Volts d.c. stand-off
1000 Volts d.c. switching at 10 Watts
- **1 Form A (energise to make)**
3000 Volts d.c. stand-off
1000 Volts d.c. switching at 25 Watts
- **1 Form B (energise to break)**
1000 Volts d.c. stand-off
500 Volts d.c. switching at 10 Watts
- **1 Form B (energise to break)**
1500 Volts d.c. stand-off
1000 Volts d.c. switching at 10 Watts

Switch Ratings - Mercury switches

- **1 or 2 Form A (energise to make)**
1500 Volts d.c. stand-off
500 Volts d.c. switching at 50 Watts

Series 104 switch ratings - The contact ratings for each switch type are shown below:

Switch No	Switch form	Power rating	Max. switch current	Max. carry current	Max. switching volts	Max. stand-off volts	Life expectancy ops typical (see Note ¹ below)	Operate time inc bounce (max)	Release time
1	A or B	10 W	0.50 A	1.0 A	500	1000	10E8	1.0 ms	0.3 ms
2	A or B	10 W	0.50 A	1.0 A	1000	1500	10E8	1.0 ms	0.3 ms
3	A	25 W	1.00 A	1.5 A	1000	3000	10E8	1.0 ms	0.3 ms

Coil data and type numbers

Device type	Type Number	Coil (V)	Coil resistance	Max. contact resistance (initial)	Insulation resistance (minimum)		Capacitance (typical) (see Note ² below)	
					Switch to coil	Across switch	Closed switch to coil	Across open switch
1 Form A (energize to make) Switch No. 1 (1kV)	104-1-A-5/1D	5	375 Ω	0.15 Ω	10E12 Ω	10E12 Ω	2.5 pF	0.1 pF
	104-1-A-12/1D	12	1000 Ω					
	104-1-A-24/1D	24	3000 Ω					
1 Form A (energize to make) Switch No. 2 (1.5kV)	104-1-A-5/2D	5	375 Ω	0.15 Ω	10E12 Ω	10E12 Ω	2.5 pF	0.1 pF
	104-1-A-12/2D	12	1000 Ω					
	104-1-A-24/2D	24	3000 Ω					
1 Form A (energize to make) Switch No. 3 (3.0kV)	104-1-A-5/3D	5	220 Ω	0.15 Ω	10E12 Ω	10E12 Ω	2.5 pF	0.1 pF
	104-1-A-12/3D	12	500 Ω					
	104-1-A-24/3D	24	3000 Ω					
1 Form B (energize to break) Switch No. 1 (1kV)	104-1-B-5/1D	5	750 Ω	0.20 Ω	10E12 Ω	10E12 Ω	2.5 pF	0.1 pF
	104-1-B-12/1D	12	2000 Ω					
	104-1-B-24/1D	24	3000 Ω					
1 Form B (energize to break) Switch No. 2 (1.5kV)	104-1-B-5/2D	5	750 Ω	0.20 Ω	10E12 Ω	10E12 Ω	2.5 pF	0.1 pF
	104-1-B-12/2D	12	2000 Ω					
	104-1-B-24/2D	24	3000 Ω					
2 Form A (energize to make) Switch No. 1 (1kV)	104-2-A-5/1D	5	250 Ω	0.20 Ω	10E12 Ω	10E12 Ω	See Note ³	See Note ³
	104-2-A-12/1D	12	750 Ω					
	104-2-A-24/1D	24	2000 Ω					
2 Form A (energize to make) Switch No. 2 (1.5kV)	104-2-A-5/2D	5	250 Ω	0.20 Ω	10E12 Ω	10E12 Ω	See Note ³	See Note ³
	104-2-A-12/2D	12	750 Ω					
	104-2-A-24/2D	24	2000 Ω					

When an internal diode is required, the suffix D is added to the part number as shown in the table.

Mercury Reed: Series 104 switch ratings - The contact ratings for each switch type are shown below:

Switch No	Switch form	Power rating	Max. switch current	Max. carry current	Max. switching volts	Max. stand-off volts	Life expectancy ops typical (see Note ¹ below)	Operate time (max)	Release time
6	A	50 W	2.00 A	3.00 A	500	1500	10E8	1.5 ms	1.0 ms

Mercury Relay: Coil data and type numbers

Device type	Type Number	Coil (V)	Coil resistance	Max. contact resistance (initial)	Insulation resistance (minimum)		Capacitance (typical) (see Note ² below)	
					Switch to coil	Across switch	Closed switch to coil	Across open switch
1 Form A (energize to make) Switch No. 6 (1.5kV)	104-1-A-5/6D	5	100 Ω	0.12 Ω	10E12 Ω	10E11 Ω	3 pF	0.1 pF
	104-1-A-12/6D	12	500 Ω					
	104-1-A-24/6D	24	1500 Ω					
2 Form A (energize to make) Switch No. 6 (1.5kV)	104-2-A-5/6D	5	50 Ω	0.15 Ω	10E12 Ω	10E11 Ω	See Note ³	See Note ³
	104-2-A-12/6D	12	275 Ω					
	104-2-A-24/6D	24	1000 Ω					

When an internal diode is required, the suffix D is added to the part number as shown in the table.

Note¹ Life expectancy

The life of a reed relay depends upon the switch load and end of life criteria. For example, for an 'end of life' contact resistance specification of 1 Ω, switching low loads (10 V at 10 mA resistive) or when 'cold' switching, typical life is approx 1 x 10⁸ ops. At the maximum load (resistive), typical life is 1 x 10⁷ ops. In the event of abusive conditions, e.g. high currents due to capacitive inrushes, this figure reduces considerably. Pickering will be pleased to perform life testing with any particular load condition.

Note² Capacitance across open switch

The capacitance across the open switch was measured with other connections guarded.

Note³ Capacitance values

The value will depend upon on the mode of connection/guarding of unused terminals. Please contact technical sales for details.

Mercury Relays

Mercury relays should be mounted vertically with pin 1 uppermost. Pin 1 is marked with a bar on the top face of the relay.

Internal Mu-metal Magnetic Screen

The Series 104 relays are fitted with an internal mu-metal magnetic screen which permits side-by-side stacking.

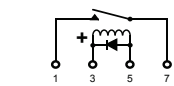
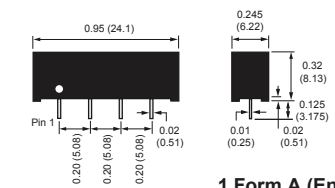


ISO9001 Manufacture of
Reed Relays FM 29036



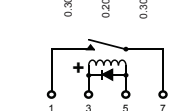
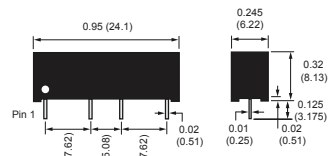
Pin Configuration and Dimensional Data

Dimensions in Inches (Millimeters in brackets)



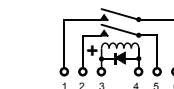
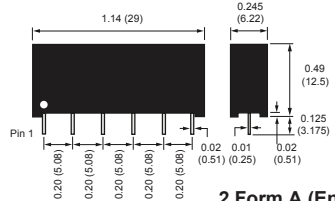
1 Form A (Energize to make)

Switch No. 1 (1 kV stand-off)
Switch No. 2 (1.5 kV stand-off)
Switch No. 6 (Mercury Wetted)



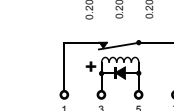
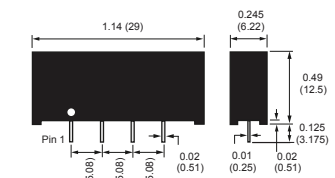
1 Form A (Energize to make)

Switch No. 3 (3 kV stand-off)



2 Form A (Energize to make)

Switch No. 1 (1 kV stand-off)
Switch No. 2 (1.5 kV stand-off)
Switch No. 6 (Mercury Wetted)



1 Form B (Energize to break)

Switch No. 1 (1 kV stand-off)
Switch No. 2 (1.5 kV stand-off)

Important: Where the optional internal diode is fitted or for all Form B types, the correct coil polarity must be observed, as shown by the + symbol on the schematics.

3D Models: Interactive models of the complete range of Pickering relay products can be downloaded from the web site.

Order Code

104 - 1 - A - 5 / 2 D

Series _____
Number of reeds _____
Switch form _____
Coil voltage _____
Switch number (See table adjacent) _____
Diode if fitted (Omit if not required) _____

Help

If you need any technical advice or other help, for example, any special tests that you would like carried out, please do not hesitate to contact our Technical Sales Department. We will always be pleased to discuss Pickering relays with you. email: techsales@pickeringrelay.com

Please ask us for a FREE evaluation sample.



email: sales@pickeringrelay.com

pickeringrelay.com

Pickering Series 67, 68

High Voltage Dry Reed Relays

for up to 10kV

Features

- **SoftCenter®** construction
- Option of PCB or flying lead switch connections
- Small size
- Up to 10 kV stand-off, 7.5 kV switching
- Long life
- Fully encapsulated

Series 67 - PCB connections to switch and coil

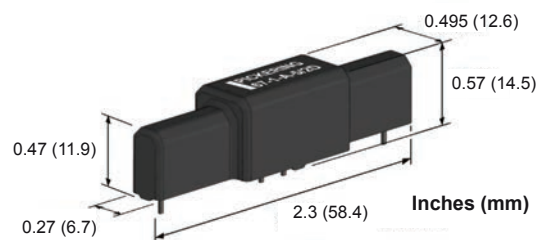
Series 68 - PCB connections to coil and flying leads to the switch which keeps the high voltage away from the PCB

The Series 67 and 68 ranges of high voltage reed relays have similar specifications to the established Series 60/65 and 62/63 but are constructed using a leadframe in a Single-in-Line format and feature former-less coils which enables a smaller package than is usual for this type of device.

The unusual package style allows some interesting stacking possibilities (see adjacent photo) when used to construct high density multiplexers or matrices. The parts feature an internal mu-metal magnetic screen.

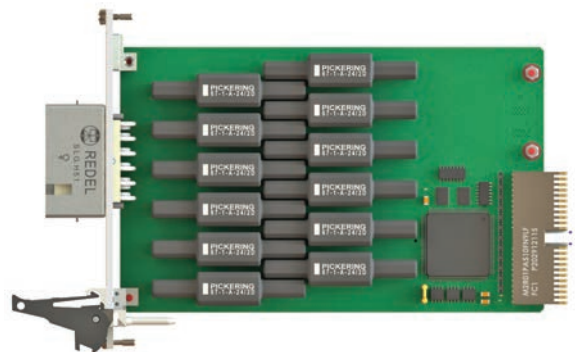
They are available for up to 10kV stand-off, 7.5kV switching at 50 Watts maximum. The tungsten plated contacts ensure a long and reliable life.

5, 12, and 24 volt coils are available as standard. Other voltages can be supplied to special order as can variations in the lead length of the Series 68 type.



Switch Ratings

- **1 Form A (energize to make)** Switch Number 1, 5kV stand-off. 3.5kV switching at up to 50 Watts
- **1 Form A (energize to make)** Switch Number 2, 10kV stand-off. 7.5kV switching at up to 50 Watts



Our Series 67 relays mounted on a 3U PXI 12-Way High Voltage Multiplexer Module, illustrates interesting stacking possibilities.

Series 67, 68 switch ratings - The contact ratings for each switch type are shown below:

Switch No	Switch form	Power rating	Max. switch current	Max. carry current	Max. switching volts	Max stand-off voltage	Life expectancy ops typical (see Note ² below)	Operate time inc bounce (max)	Release time
1	A	50 W	3 A	3 A	3500 (Note ¹)	5000	10E7	3 ms	2 ms
2	A	50 W	3 A	3 A	7500 (Note ¹)	10000	10E7	3 ms	2 ms

Operating voltages

Coil voltage - nominal	Must operate voltage - maximum at 25°C	Must release voltage - minimum at 25°C
5 V	3.75 V	0.5 V
12 V	9 V	1.2 V
24 V	18 V	2.4 V

Series 67 Coil data and type numbers

Device type	Type Number	Coil (V)	Coil resistance	Max. contact resistance (initial)	Insulation resistance (minimum)		Capacitance (typical) (see Note ³ below)	
					Switch to coil	Across switch	Closed switch to coil	Across open switch
1 Form A (energize to make) Switch No. 1	67-1-A-5/1D	5	40 Ω	0.12 Ω	10E12 Ω	10E12 Ω	3 pF	0.15 pF
	67-1-A-12/1D	12	150 Ω					
	67-1-A-24/1D	24	600 Ω					
1 Form A (energize to make) Switch No. 2	67-1-A-5/2D	5	40 Ω	0.12 Ω	10E12 Ω	10E12 Ω	3 pF	0.15 pF
	67-1-A-12/2D	12	150 Ω					
	67-1-A-24/2D	24	600 Ω					

When an internal diode is required, the suffix D is added to the part number as shown in the table.

Series 68 Coil data and type numbers

Device type	Type Number	Coil (V)	Coil resistance	Max. contact resistance (initial)	Insulation resistance (minimum)		Capacitance (typical) (see Note ³ below)	
					Switch to coil	Across switch	Closed switch to coil	Across open switch
1 Form A (energize to make) Switch No. 1	68-1-A-5/1D	5	40 Ω	0.12 Ω	10E12 Ω	10E12 Ω	3 pF	0.15 pF
	68-1-A-12/1D	12	150 Ω					
	68-1-A-24/1D	24	600 Ω					
1 Form A (energize to make) Switch No. 2	68-1-A-5/2D	5	40 Ω	0.12 Ω	10E12 Ω	10E12 Ω	3 pF	0.15 pF
	68-1-A-12/2D	12	150 Ω					
	68-1-A-24/2D	24	600 Ω					

When an internal diode is required, the suffix D is added to the part number as shown in the table.

Environmental specification

Standard operating temperature range: -20 to +85 °C.	
Note: The upper temperature limit can be extended to +125 °C if the coil drive voltage is increased to accommodate the resistance/temperature coefficient of the copper coil winding. This is approximately 0.4% per °C. This means that at 125 °C the coil drive voltage will need to be increased by approximately $40 \times 0.4 = 16\%$ to maintain the required magnetic drive level. Please contact sales@pickeringrelay.com for assistance if necessary.	
Vibration: Maximum 20 G	Shock: Maximum 50 G

Note¹ Switching Voltage

This high voltage rating is for RESISTIVE loads only. At these high voltages, circuit capacitance can generate very high current pulses which can damage the contact plating. If there is capacitance in circuit, provision should be made to limit the surge to within the current and power ratings of the relay. The product of open circuit switch voltage and instantaneous current at the point of switch-on should not exceed the 50 Watts power rating of the contact. Exceeding this level will reduce the operational life of the relay.

Note² Life expectancy

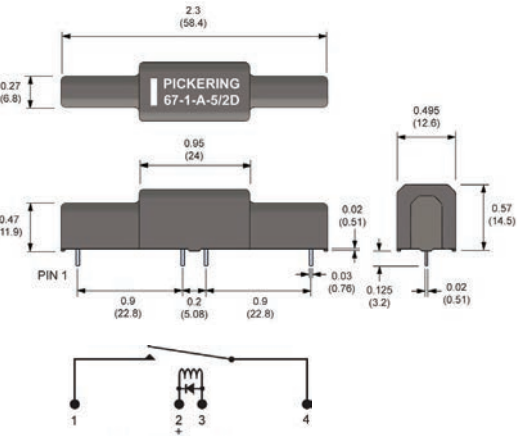
The life of a reed relay depends upon the switch load and end of life criteria. For example, for an 'end of life' contact resistance specification of 1 Ω, switching low loads (10 V at 10 mA resistive) or when 'cold' switching, typical life is approx 10 x 10⁶ ops. At the maximum load (resistive), typical life is 1 x 10⁶ ops. In the event of abusive conditions, e.g. high currents due to capacitive inrushes, this figure reduces considerably. Pickering will be pleased to perform life testing with any particular load condition.

Note³ Capacitance across open switch

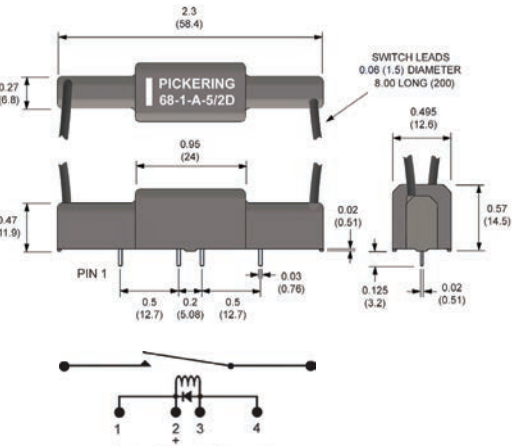
This is measured with the coil connected to the guard terminal of the measuring bridge.

Pin Configuration and Dimensional Data
Dimensions in Inches (Millimeters in brackets)

Series 67



Series 68



Important: Where the optional internal diode is fitted, the correct coil polarity must be observed, as shown by the + symbol on the schematics.

3D Models: Interactive models of the complete range of Pickering relay products can be downloaded from the web site.

Order Code

67 - 1 - A - 5 / 2 D

Series _____

Number of reeds _____

Switch form _____

Coil voltage _____

Switch number (See table adjacent) _____

Diode if fitted (Omit if not required) _____

Help

If you need any technical advice or other help, for example, any special tests that you would like carried out, please do not hesitate to contact our Technical Sales Department. We will always be pleased to discuss Pickering relays with you. email: techsales@pickeringrelay.com

Please ask us for a FREE evaluation sample.



ISO9001 Manufacture of
Reed Relays FM 29036

Pickering Series 60, 65

High Voltage Dry Reed Relays

for up to 15kV

Features

- **SoftCenter®** construction
- Up to 15 kV stand-off
- Up to 12.5 kV switching
- Small size
- Easy mounting
- Long life
- Fully encapsulated

Series 60 - Chassis mounting with solder connections on the top face

Series 65 - Printed circuit mounting

The Series 60 and 65 ranges of high voltage reed relays have been manufactured for many years and remain popular due to their small size and ease of use.

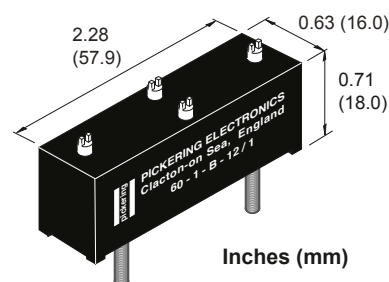
They are available for up to 15kV stand-off, 12.5kV switching at 50 Watts maximum. Tungsten plated contacts ensure a long and reliable life.

Both Form A (energize to make) and Form B (energize to break) configurations are available and it is usually possible to achieve a Form C (change-over) function by using a Form A and a Form B type together.

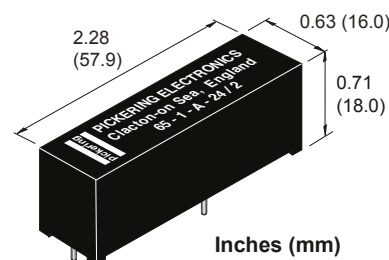
Form B types are magnetically biased and should not be mounted directly onto ferrous metal chassis or less than 1.5 inches (38mm) away from other relays as the coil operating voltage characteristics will be altered due to magnetic interaction. The coils of Form B relays are polarity sensitive, the positive connection is identified by a red spot.

Form A types can be mounted on ferrous chassis but a space of 1 inch (25mm) should be allowed between adjacent relays. 5, 12, and 24 volt coils are available as standard other voltages can be supplied to special order, please contact our sales office.

If similar relays with "push-on" connectors are preferred, please look at our Series 62 and Series 63.



Series 60



Series 65

Switch Ratings

- **1 Form A (energize to make)** Switch Number 1
5kV stand-off. 3.5kV switching at up to 50 Watts
- **1 Form A (energize to make)** Switch Number 2
10kV stand-off. 7.5kV switching at up to 50 Watts
- **1 Form A (energize to make)** Switch Number 3
15kV stand-off. 12.5kV switching at up to 50 Watts
- **1 Form B (energize to break)** Switch Number 1
5kV stand-off. 3.5kV switching at up to 50 Watts
- **1 Form B (energize to break)** Switch Number 2
10kV stand-off. 7.5kV switching at up to 50 Watts

Series 60, 65 switch ratings - The contact ratings for each switch type are shown below:

Switch No	Switch form	Power rating	Max. switch current	Max. carry current	Max. switching volts	Max. stand-off volts	Life expectancy ops typical (see Note ² below)	Operate time inc bounce (max)	Release time
1	A or B	50 W	3 A (Note ¹)	3 A	3500	5000	10E7	3 ms	2 ms
2	A or B	50 W	3 A (Note ¹)	3 A	7500	10000	10E7	3 ms	2 ms
3	A	50 W	3 A (Note ¹)	3 A	12500	15000	10E7	3 ms	2 ms

Operating voltages

Coil voltage - nominal	Must operate voltage - maximum at 25°C	Must release voltage - minimum at 25°C
5 V	3.75 V	0.5 V
12 V	9 V	1.2 V
24 V	18 V	2.4 V

Series 60 Coil data and type numbers

Device type	Type Number	Coil (V)	Coil resistance	Max. contact resistance (initial)	Insulation resistance (minimum)		Capacitance (typical) (see Note ³ below)	
					Switch to coil	Across switch	Closed switch to coil	Across open switch
1 Form A (energize to make) Switch No. 1 (5kV Stand-Off)	60-1-A-5/1	5	35 Ω	0.12 Ω	10E12 Ω	10E12 Ω	3 pF	0.15 pF
	60-1-A-12/1	12	150 Ω					
	60-1-A-24/1	24	500 Ω					
1 Form A (energize to make) Switch No. 2 (10kV Stand-Off)	60-1-A-5/2	5	35 Ω	0.12 Ω	10E12 Ω	10E12 Ω	3 pF	0.15 pF
	60-1-A-12/2	12	150 Ω					
	60-1-A-24/2	24	500 Ω					
1 Form A (energize to make) Switch No. 3 (15kV Stand-Off)	60-1-A-5/3	5	20 Ω	0.12 Ω	10E12 Ω	10E12 Ω	3 pF	0.15 pF
	60-1-A-12/3	12	50 Ω					
	60-1-A-24/3	24	200 Ω					
1 Form B (energize to break) Switch No. 1 (5kV Stand-Off)	60-1-B-5/1	5	35 Ω	0.12 Ω	10E12 Ω	10E12 Ω	3 pF	0.15 pF
	60-1-B-12/1	12	150 Ω					
	60-1-B-24/1	24	500 Ω					
1 Form B (energize to break) Switch No. 2 (10kV Stand-Off)	60-1-B-5/2	5	35 Ω	0.12 Ω	10E12 Ω	10E12 Ω	3 pF	0.15 pF
	60-1-B-12/2	12	150 Ω					
	60-1-B-24/2	24	500 Ω					

Series 65 Coil data and type numbers

Device type	Type Number	Coil (V)	Coil resistance	Max. contact resistance (initial)	Insulation resistance (minimum)		Capacitance (typical) (see Note ³ below)	
					Switch to coil	Across switch	Closed switch to coil	Across open switch
1 Form A (energize to make) Switch No. 1 (5kV Stand-Off)	65-1-A-5/1	5	35 Ω	0.12 Ω	10E12 Ω	10E12 Ω	3 pF	0.15 pF
	65-1-A-12/1	12	150 Ω					
	65-1-A-24/1	24	500 Ω					
1 Form A (energize to make) Switch No. 2 (10kV Stand-Off)	65-1-A-5/2	5	35 Ω	0.12 Ω	10E12 Ω	10E12 Ω	3 pF	0.15 pF
	65-1-A-12/2	12	150 Ω					
	65-1-A-24/2	24	500 Ω					
1 Form B (energize to break) Switch No. 1 (5kV Stand-Off)	65-1-B-5/1	5	35 Ω	0.12 Ω	10E12 Ω	10E12 Ω	3 pF	0.15 pF
	65-1-B-12/1	12	150 Ω					
	65-1-B-24/1	24	500 Ω					
1 Form B (energize to break) Switch No. 2 (10kV Stand-Off)	65-1-B-5/2	5	35 Ω	0.12 Ω	10E12 Ω	10E12 Ω	3 pF	0.15 pF
	65-1-B-12/2	12	150 Ω					
	65-1-B-24/2	24	500 Ω					

Environmental specification

Standard operating temperature range: -20 to +85 °C.	
Note: The upper temperature limit can be extended to +125 °C if the coil drive voltage is increased to accommodate the resistance/temperature coefficient of the copper coil winding. This is approximately 0.4% per °C. This means that at 125 °C the coil drive voltage will need to be increased by approximately $40 \times 0.4 = 16\%$ to maintain the required magnetic drive level. Please contact sales@pickeringrelay.com for assistance if necessary.	
Vibration: Maximum 20 G	Shock: Maximum 50 G

Note¹ Important - Current Rating

This is the maximum current rating at 50 Watts. If, for example, you wish to switch 5000 volts, the maximum current will be 10mA. Multiply your instantaneous switching current by the voltage to be switched, to ensure that you do not exceed this 50 Watts rating. Capacitive inrush currents can sometimes be high due to the voltages involved, if possible insert a series resistance into the circuit to limit this. Contact our Technical Department for assistance if required.

Note² Life expectancy

The life of a reed relay depends upon the switch load and end of life criteria. For example, for an 'end of life' contact resistance specification of 1 Ω, switching low loads (10 V at 10 mA resistive) or when 'cold' switching, typical life is approx 10 x 10⁶ ops. At the maximum load (resistive), typical life is 1 x 10⁶ ops. In the event of abusive conditions, e.g. high currents due to capacitive inrushes, this figure reduces considerably. Pickering will be pleased to perform life testing with any particular load condition.

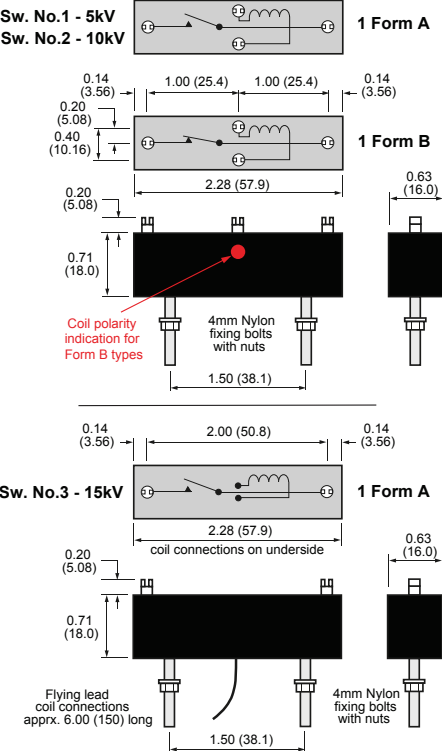
Note³ Capacitance across open switch

The capacitance across the open switch was measured with other connections guarded.

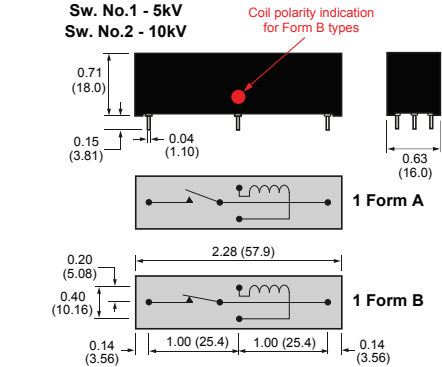
Pin Configuration and Dimensional Data

Dimensions in Inches (Millimeters in brackets)

Series 60 Chassis mounting



Series 65 PCB mounting



Important: For all Form B types, the correct coil polarity must be observed. The positive connection is shown by the red spot on the package.

3D Models: Interactive models of the complete range of Pickering relay products can be downloaded from the web site.

Order Code

60 - 1 - A - 5 / 2

Series _____

Number of reeds _____

Switch form _____

Coil voltage _____

Switch number (See table adjacent) _____

Other Pickering HV reed relays

If similar relays with push on connections are preferred, please look at our Series 62 and 63. If your requirement is for voltages up to 3kV, please look at our Series 104 Single-in-Line relays.

Help

If you need any technical advice or other help, for example, any special tests that you would like carried out, please do not hesitate to contact our Technical Sales Department. We will always be pleased to discuss Pickering relays with you. email: techsales@pickeringrelay.com

Please ask us for a FREE evaluation sample.



Pickering Series 62, 63

High Voltage Dry Reed Relays

for up to 15kV

Features

- **SoftCenter®** construction
- Up to 15 kV stand-off
- Up to 12.5 kV switching
- Small size
- Easy mounting
- Long life
- Fully encapsulated

Series 62 - Chassis mounting with push-on connections on the top face

Series 63 - Printed circuit mounting with push-on high voltage connections on the top face

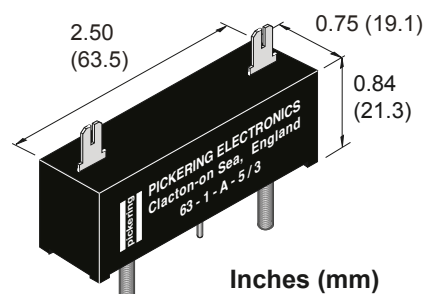
The Series 62 and 63 ranges of high voltage reed relays feature push-on terminals and are supplied complete with the appropriate connectors and insulating boots.

They are available for up to 15kV stand-off, 12.5kV switching at 50 Watts maximum. Tungsten plated contacts ensure a long and reliable life.

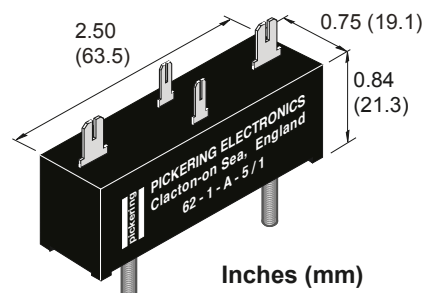
Both Form A (energize to make) and Form B (energize to break) configurations are available and it is usually possible to achieve a Form C (change-over) function by using a Form A and a Form B type together.

These relays feature an internal mu-metal magnetic screen which permits the Form A (energize to make) versions to be mounted side by side. Special versions can be manufactured with an electrostatic screen and/or earth connection to the magnetic screen. This can often be useful where EMC problems are encountered, please contact our technical sales office.

Form B types are magnetically biased and should not be mounted directly onto ferrous metal chassis or less than 1 inch (25mm) away from other relays as the coil operating voltage characteristics will be altered due to magnetic interaction. The coils of Form B relays are polarity sensitive, the positive connection is identified by a red spot. 5, 12, and 24 volt coils are available as standard other voltages can be supplied to special order.



Series 63



Series 62

Switch Ratings

- **1 Form A (energize to make)** Switch Number 1, 5kV stand-off. 3.5kV switching at up to 50 Watts
- **1 Form A (energize to make)** Switch Number 2, 10kV stand-off. 7.5kV switching at up to 50 Watts
- **1 Form A (energize to make)** Switch Number 3, 15kV stand-off. 12.5kV switching at up to 50 Watts
- **1 Form B (energize to break)** Switch Number 1, 5kV stand-off. 3.5kV switching at up to 50 Watts
- **1 Form B (energize to break)** Switch Number 2, 10kV stand-off. 7.5kV switching at up to 50 Watts

Series 62, 63 switch ratings - The contact ratings for each switch type are shown below:

Switch No	Switch form	Power rating	Max. switch current	Max. carry current	Max. switching volts	Max. stand-off volts	Life expectancy ops typical (see Note ² below)	Operate time inc bounce (max)	Release time
1	A or B	50 W	3 A (Note ¹)	3 A	3500	5000	10E7	3 ms	2 ms
2	A or B	50 W	3 A (Note ¹)	3 A	7500	10000	10E7	3 ms	2 ms
3	A	50 W	3 A (Note ¹)	3 A	12500	15000	10E7	3 ms	2 ms

Operating voltages

Coil voltage - nominal	Must operate voltage - maximum at 25°C	Must release voltage - minimum at 25°C
5 V	3.75 V	0.5 V
12 V	9 V	1.2 V
24 V	18 V	2.4 V

Series 62 Coil data and type numbers

Device type	Type Number	Coil (V)	Coil resistance	Max. contact resistance (initial)	Insulation resistance (minimum)		Capacitance (typical) (see Note ³ below)	
					Switch to coil	Across switch	Closed switch to coil	Across open switch
1 Form A (energize to make) Switch No. 1 (5kV Stand-Off)	62-1-A-5/1	5	50 Ω					
	62-1-A-12/1	12	150 Ω	0.12 Ω	10E12 Ω	10E12 Ω	3 pF	0.15 pF
	62-1-A-24/1	24	500 Ω					
1 Form A (energize to make) Switch No. 2 (10kV Stand-Off)	62-1-A-5/2	5	50 Ω					
	62-1-A-12/2	12	150 Ω	0.12 Ω	10E12 Ω	10E12 Ω	3 pF	0.15 pF
	62-1-A-24/2	24	500 Ω					
1 Form B (energize to break) Switch No. 1 (5kV Stand-Off)	62-1-B-5/1	5	50 Ω					
	62-1-B-12/1	12	150 Ω	0.12 Ω	10E12 Ω	10E12 Ω	3 pF	0.15 pF
	62-1-B-24/1	24	500 Ω					
1 Form B (energize to break) Switch No. 2 (10kV Stand-Off)	62-1-B-5/2	5	50 Ω					
	62-1-B-12/2	12	150 Ω	0.12 Ω	10E12 Ω	10E12 Ω	3 pF	0.15 pF
	62-1-B-24/2	24	500 Ω					

Series 63 Coil data and type numbers

Device type	Type Number	Coil (V)	Coil resistance	Max. contact resistance (initial)	Insulation resistance (minimum)		Capacitance (typical) (see Note ³ below)	
					Switch to coil	Across switch	Closed switch to coil	Across open switch
1 Form A (energize to make) Switch No. 1 (5kV Stand-Off)	63-1-A-5/1	5	50 Ω					
	63-1-A-12/1	12	150 Ω	0.12 Ω	10E12 Ω	10E12 Ω	3 pF	0.15 pF
	63-1-A-24/1	24	500 Ω					
1 Form A (energize to make) Switch No. 2 (10kV Stand-Off)	63-1-A-5/2	5	50 Ω					
	63-1-A-12/2	12	150 Ω	0.12 Ω	10E12 Ω	10E12 Ω	3 pF	0.15 pF
	63-1-A-24/2	24	500 Ω					
1 Form A (energize to make) Switch No. 3 (15kV Stand-Off)	63-1-A-5/3	5	25 Ω					
	63-1-A-12/3	12	75 Ω	0.12 Ω	10E12 Ω	10E12 Ω	3 pF	0.15 pF
	63-1-A-24/3	24	350 Ω					
1 Form B (energize to break) Switch No. 1 (5kV Stand-Off)	63-1-B-5/1	5	50 Ω					
	63-1-B-12/1	12	150 Ω	0.12 Ω	10E12 Ω	10E12 Ω	3 pF	0.15 pF
	63-1-B-24/1	24	500 Ω					
1 Form B (energize to break) Switch No. 2 (10kV Stand-Off)	63-1-B-5/2	5	50 Ω					
	63-1-B-12/2	12	150 Ω	0.12 Ω	10E12 Ω	10E12 Ω	3 pF	0.15 pF
	63-1-B-24/2	24	500 Ω					

Environmental specification

Standard operating temperature range: -20 to +85 °C.	
Note: The upper temperature limit can be extended to +125 °C if the coil drive voltage is increased to accommodate the resistance/temperature coefficient of the copper coil winding. This is approximately 0.4% per °C. This means that at 125 °C the coil drive voltage will need to be increased by approximately $40 \times 0.4 = 16\%$ to maintain the required magnetic drive level. Please contact sales@pickeringrelay.com for assistance if necessary.	
Vibration: Maximum 20 G	Shock: Maximum 50 G

Note¹ Important - Current Rating

This is the maximum current rating at 50 Watts. If, for example, you wish to switch 5000 volts, the maximum current will be 10mA. Multiply your instantaneous switching current by the voltage to be switched, to ensure that you do not exceed this 50 Watts rating. Capacitive inrush currents can sometimes be high due to the voltages involved, if possible insert a series resistance into the circuit to limit this. Contact our Technical Department for assistance if required.

Note² Life expectancy

The life of a reed relay depends upon the switch load and end of life criteria. For example, for an 'end of life' contact resistance specification of 1 Ω, switching low loads (10 V at 10 mA resistive) or when 'cold' switching, typical life is approx 10 x 10⁶ ops. At the maximum load (resistive), typical life is 1 x 10⁶ ops. In the event of abusive conditions, e.g. high currents due to capacitive inrushes, this figure reduces considerably. Pickering will be pleased to perform life testing with any particular load condition.

Note³ Capacitance across open switch

The capacitance across the open switch was measured with other connections guarded.

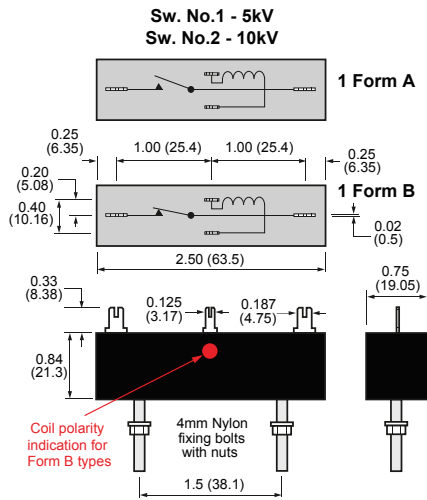


ISO9001 Manufacture of
Reed Relays FM 29036

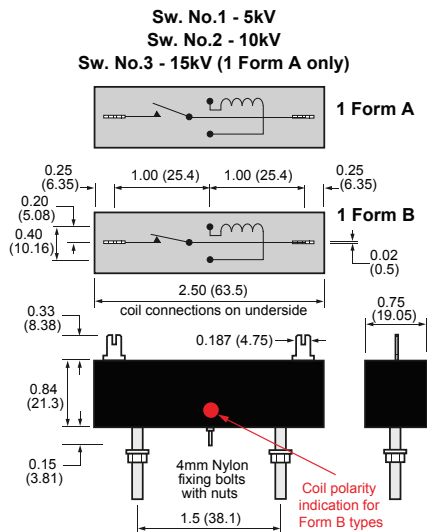
Pin Configuration and Dimensional Data

Dimensions in Inches (Millimeters in brackets)

Series 62 Chassis mounting



Series 63 PCB mounting



Important: For all Form B types, the correct coil polarity must be observed. The positive connection is shown by the red spot on the package.

3D Models: Interactive models of the complete range of Pickering relay products can be downloaded from the web site.

Order Code

62 - 1 - A - 5 / 2

Series _____

Number of reeds _____

Switch form _____

Coil voltage _____

Switch number (See table adjacent) _____

Other Pickering HV reed relays

If similar relays with PCB pins for both switch and coil connections are preferred, please look at our Series 65. If your requirement is for voltages up to 3kV, please look at our Series 104 Single-in-Line relays.

Help

If you need any technical advice or other help, for example, any special tests that you would like carried out, please do not hesitate to contact our Technical Sales Department. We will always be pleased to discuss Pickering relays with you. email: techsales@pickeringrelay.com

Please ask us for a FREE evaluation sample.



email: sales@pickeringrelay.com

pickeringrelay.com

Surface Mount Reed Relays

Including coaxial types for up to 5GHz

Features

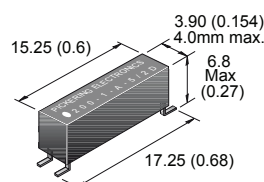
- **SoftCenter®** construction
- Highest quality instrumentation grade switches
- Encapsulated in plastic package with internal mu-metal screen for side-by-side mounting without magnetic interaction
- Insulation resistance greater than 10^{12} ohms for Form A devices
- Dry and mercury wetted switches available
- Wide range of switch configurations - 1 Form A, 1 Form B, 2 Form A and 1 Form C
- For R.F. or high speed digital applications, 50 or 75 ohms coaxial devices are available in the same small package
- 3, 5, and 12 volt coils are standard, with or without internal diode
- 100% tested for dynamic contact resistance

The Series 200 is a complete range of surface mount reed relays. Both dry and mercury wetted switches are available in a wide range of configurations including coaxial types for RF up to 5GHz, or high speed digital switching with a step response time of less than 30ps. Please contact our technical department for supplementary RF data.

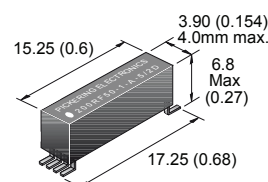
The special high temperature plastic package will withstand the temperatures associated with Infra-red or vapor phase reflow soldering processes. A flexible inner encapsulant protects the sensitive glass/metal reed switch seals - this is a very big advantage over the more usual hard moulded package.

Switch Ratings - Dry switches

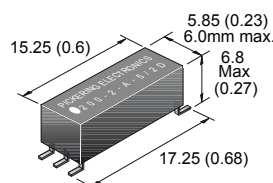
- 1 Form A (energize to make), 10 watts at 200V
- 1 Form A (energize to make), 15 watts at 200V
- 1 Form A (energize to make), 10 watts at 500V
- Coaxial 50Ω (energize to make), 10 watts at 200V
- Coaxial 75Ω (energize to make), 10 watts at 200V
- 1 Form B (energize to break), 10 watts at 200V
- 1 Form C (change-over), 3 watts at 200V
- 2 Form A (energize to make), 10 watts at 200V



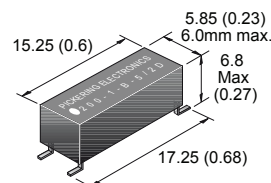
1 Form A



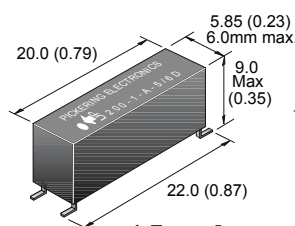
Coaxial



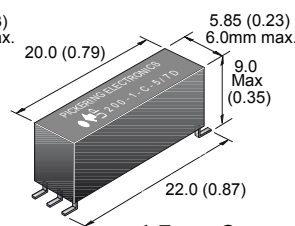
2 Form A



1 Form B



1 Form A
High voltage
Dry or Mercury



1 Form C
Dry

mm (Inches)

Switch Ratings - Mercury Wetted Switches

- 1 Form A (energize to make), 50 watts at 500V
- 1 Form A (Position insensitive), 50 watts at 500V

Dry Reed - Series 200 switch ratings - The contact ratings for each switch type are shown below:

Switch No	Switch form	Power rating	Max. switch current	Max. carry current	Max. switching volts	Life expectancy ops typical (see Note ¹ below)	Operate time inc bounce (max)	Release time	Special features
1	A	15 W	1.0 A	1.2 A	200	10E9	0.5 ms	0.2 ms	General purpose
2	A or B	10 W	0.5 A	1.2 A	200	10E9	0.5 ms	0.2 ms	Low level
3	C	3 W	0.25 A	1.2 A	200	10E7	1.0 ms	0.5 ms	Change-over
4	A	10 W	0.5 A	1.2 A	500	10E8	0.5 ms	0.2 ms	High voltage

Dry Relay - Coil data and type numbers

Device type	Package Number	Type Number	Coil (V)	Coil resistance	Max. contact resistance (initial)	Insulation resistance (minimum)		Capacitance (typical) (see Note ² below)	
						Switch to coil	Across switch	Closed switch to coil	Across open switch
1 Form A (energize to make) Switch No. 1	1	200-1-A-5/1D 200-1-A-12/1D	5 12	500 Ω 1000 Ω	0.15 Ω	10E12 Ω	10E12 Ω	2.5 pF	0.1 pF
1 Form A (energize to make) Switch No. 2	1	200-1-A-3/2D 200-1-A-5/2D 200-1-A-12/2D	3 5 12	250 Ω 500 Ω 1000 Ω	0.12 Ω	10E12 Ω	10E12 Ω	2.5 pF	0.1 pF
1 Form A 50 Ω coaxial Switch No. 2	2	200RF50-1-A-5/2D	5	250 Ω	0.12 Ω	10E12 Ω	10E12 Ω	2.5 pF	0.1 pF
1 Form A 75 Ω coaxial Switch No. 2	2	200RF75-1-A-5/2D	5	250 Ω	0.12 Ω	10E12 Ω	10E12 Ω	2.5 pF	0.1 pF
1 Form A (energize to make) HV Switch No. 4	5	200-1-A-5/4D 200-1-A-12/4D	5 12	500 Ω 1000 Ω	0.15 Ω	10E12 Ω	10E12 Ω	2.5 pF	0.1 pF
1 Form C (change-over) Switch No. 3	6	200-1-C-5/3D 200-1-C-12/3D	5 12	500 Ω 1000 Ω	0.20 Ω	10E12 Ω	10E11 Ω	See Note ³	See Note ³
1 Form B (energize to break) Switch No. 2	4	200-1-B-5/2D 200-1-B-12/2D	5 12	750 Ω 1000 Ω	0.12 Ω	10E12 Ω	10E12 Ω	2.5 pF	0.1 pF
2 Form A (energize to make) Switch No. 2	3	200-2-A-5/2D 200-2-A-12/2D	5 12	400 Ω 1000 Ω	0.12 Ω	10E12 Ω	10E12 Ω	See Note ³	See Note ³

When an internal diode is required, the suffix D is added to the part number as shown in the table.

Mercury Reed: Series 200 switch ratings - The contact ratings for each switch type are shown below:

Switch No	Switch form	Power rating	Max. switch current	Max. carry current	Max. switching volts	Life expectancy ops typical (see Note ¹ below)	Operate time (max)	Release time	Special features
6	A	50 W	2 A	3 A	500	10E8	2.0 ms	1.25 ms	Standard Mercury
8	A	50 W	2 A	3 A	500	10E8	2.0 ms	1.25 ms	Position insensitive

Mercury Relay: Coil data and type numbers

Device type	Type Number	Coil (V)	Coil resistance	Max. contact resistance (initial)	Insulation resistance (minimum)		Capacitance (typical) (see Note ² below)	
					Switch to coil	Across switch	Closed switch to coil	Across open switch
1 Form A (energize to make) Switch No. 6	200-1-A-5/6D 200-1-A-12/6D	5 12	140 Ω 500 Ω	0.075 Ω	10E12 Ω	10E10 Ω	4 pF	0.1 pF
1 Form A (energize to make) Position Insensitive Switch No. 8	200-1-A-5/8D 200-1-A-12/8D	5 12	140 Ω 500 Ω	0.100 Ω	10E12 Ω	10E10 Ω	4 pF	0.1 pF

When an internal diode is required, the suffix D is added to the part number as shown in the table.

Note¹ Life expectancy

The life of a reed relay depends upon the switch load and end of life criteria. For example, for an 'end of life' contact resistance specification of 1 Ω, switching low loads (10 V at 10 mA resistive) or when 'cold' switching, typical life is approx 1 x 10⁹ ops. At the maximum load (resistive), typical life is 1 x 10⁷ ops. In the event of abusive conditions, e.g. high currents due to capacitive inrushes, this figure reduces considerably. Pickering will be pleased to perform life testing with any particular load condition.

Note² Capacitance across open switch

This is measured with all other component leads connected to the guard terminal of the measuring bridge.

Note³ Capacitance values

The value will depend upon on the mode of connection/guarding of unused terminals. Please contact technical sales for details.



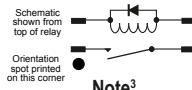
ISO9001 Manufacture of
Reed Relays FM 29036

Pin Configuration and Dimensional Data

Dimensions in Inches (Millimeters in brackets)

1 Form A (Energize to make)

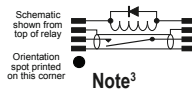
Package Number 1



Note³

1 Form A (Coaxial)

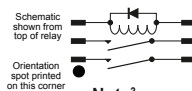
Package Number 2



Note³

2 Form A (Energize to make)

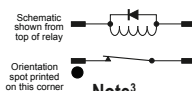
Package Number 3



Note³

1 Form B (Energize to break)

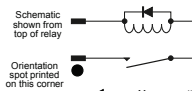
Package Number 4



Note³

1 Form A (Energize to make)

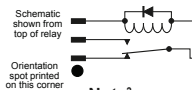
Package Number 5



Note³

1 Form C (Changeover)

Package Number 6



Note³

Note³: When an optional diode is fitted the orientation spot end of the relay forms the positive connection.

3D Models: Interactive models of the complete range of Pickering relay products can be downloaded from the web site.

Mercury Relays

With the exception of the position insensitive type, mercury relays should be mounted vertically in the direction of the arrow.

Order Code

200 - 1 - A - 5 / 2 D

Series _____

Number of reeds _____

Switch form _____

Coil voltage _____

Switch number (See table adjacent) _____

Diode if fitted (Omit if not required) _____

Help

If you need any technical advice or other help, for example, any special tests that you would like carried out, please do not hesitate to contact our Technical Sales Department. We will always be pleased to discuss Pickering relays with you. email: techsales@pickeringrelay.com

Please ask us for a FREE evaluation sample.



email: sales@pickeringrelay.com

pickeringrelay.com

High Power Dry SIL/SIP Reed Relays

40 Watts switching

Features

- **SoftCenter®** construction (see adjacent diagram)
- Highest quality instrumentation grade switches
- Small size
- Internal mu-metal magnetic screen
- One or two switches in a single package
- Form A (energise to make) or Form B (energise to break) configurations
- 3, 5, 12 and 24 Volt coils with or without internal diode
- 100% tested for dynamic contact resistance for guaranteed performance

The Series 114 is a range of Single-In-Line reed relays intended for power levels that are beyond the capabilities of conventional dry SIL reed relays.

The more usual dry relays are rated at 0.5 amps at 10 Watts. The Series 114 have a rating of 1 amp switching at up to 40 watts and will carry 2 amps. In many cases, this higher rating will allow them to be used as an alternative to mercury wetted reed relays.

Unusually for high power relays, they feature sputtered ruthenium contacts instead of the more common electroplated rhodium or tungsten types. This makes them suitable for low level or "dry" switching also.

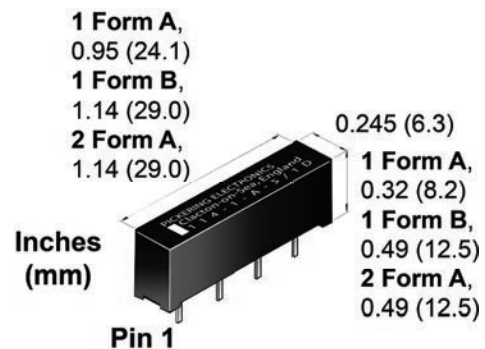
They are able to switch a.c. mains voltages so are suitable for interfacing to larger electromechanical relays or contactors. It is important however, to suppress back EMFs from inductive loads. This is achievable by using an RC snubber, varistor or similar voltage limiting device.

1 or 2 Form A (energize to make) or 1 Form B (energize to break) configurations are available.

The range features an internal mu-metal screen to minimize problems that would otherwise be experienced due to magnetic interaction when they are closely stacked.

Form A versions may be stacked side-by-side.

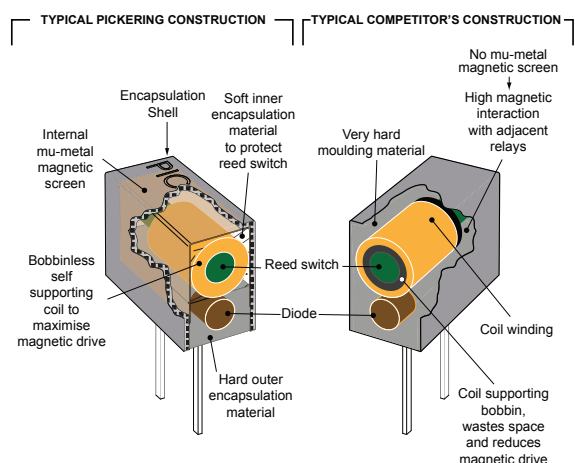
Due to the fact that the Form B types feature an internal biasing magnet, a gap of 0.4 inches minimum should be left between adjacent relays.



Switch Ratings - Dry switches

- 1 Form A (Energize to Make) relays.
200 Volts dc or 240 Volts ac rms switching at up to 40 Watts. 500 Volts dc or ac peak stand-off.
- 2 Form A (Energize to Make) relays.
200 Volts dc or 240 Volts ac rms switching at up to 40 Watts. 500 Volts dc or ac peak stand-off
- 1 Form C (Energize to Break) relays.
200 Volts dc or 240 Volts ac rms switching at up to 40 Watts. 500 Volts dc or ac peak stand-off

Typical Pickering **SoftCenter®** Construction



Series 114 switch ratings - The contact ratings for each switch type are shown below:

Switch No	Switch form	Power rating	Max. switch current	Max. carry current	Max. switching volts	Max. stand-off volts	Life expectancy ops typical (see Note ¹ below)	Operate time inc bounce (max)	Release time	Special features
1	A or B	40 W	1.0 A	2.0 A	200 V DC 240 V AC RMS	500	10E8	1.0 ms	0.5 ms	General purpose

Operating voltages

Coil voltage - nominal	Must operate voltage - maximum at 25°C	Must release voltage - minimum at 25°C
3 V	2.25 V	0.3 V
5 V	3.75 V	0.5 V
12 V	9 V	1.2 V
24 V	18 V	2.4 V

Coil data and type numbers

Device type	Type Number	Coil (V)	Coil resistance	Max. contact resistance (initial)	Insulation resistance (minimum)		Capacitance (typical) (see Note ² below)	
					Switch to coil	Across switch	Closed switch to coil	Across open switch
1 Form A (energize to make) General Purpose Switch No. 1	114-1-A-3/1D	3	75 Ω	0.15 Ω	10E12 Ω	10E12 Ω	2.0 pF	0.1 pF
	114-1-A-5/1D	5	250 Ω					
	114-1-A-12/1D	12	750 Ω					
	114-1-A-24/1D	24	2000 Ω					
2 Form A (energize to make) General Purpose Switch No. 1	114-2-A-5/1D	5	150 Ω	0.20 Ω	10E12 Ω	10E12 Ω	See Note ³	See Note ³
	114-2-A-12/1D	12	350 Ω					
	114-2-A-24/1D	24	1000 Ω					
1 Form B (energize to break) General Purpose Switch No. 1	114-1-B-5/1D	5	350 Ω	0.20 Ω	10E12 Ω	10E12 Ω	2.0 pF	0.1 pF
	114-1-B-12/1D	12	1000 Ω					
	114-1-B-24/1D	24	2200 Ω					

When an internal diode is required, the suffix D is added to the part number as shown in the table.

Environmental specification

Standard operating temperature range: -20 to +85 °C.	
Note: The upper temperature limit can be extended to +125 °C if the coil drive voltage is increased to accommodate the resistance/temperature coefficient of the copper coil winding. This is approximately 0.4% per °C. This means that at 125 °C the coil drive voltage will need to be increased by approximately $40 \times 0.4 = 16\%$ to maintain the required magnetic drive level. Please contact sales@pickeringrelay.com for assistance if necessary.	
Vibration: Maximum 20 G	Shock: Maximum 50 G

Note¹ Life expectancy

The life of a reed relay depends upon the switch load and end of life criteria. For example, for an 'end of life' contact resistance specification of 1 Ω, switching low loads (10 V at 10 mA resistive) or when 'cold' switching, typical life is approx 100 x 10⁶ ops. At the maximum load (resistive), typical life is 10 x 10⁶ ops. In the event of abusive conditions, e.g. high currents due to capacitive inrushes, this figure reduces considerably. Pickering will be pleased to perform life testing with any particular load condition.

Note² Capacitance across open switch

The capacitance across the open switch was measured with other connections guarded.

Note³ Capacitance values

The value will depend upon on the mode of connection/guarding of unused terminals. Please contact technical sales for details.

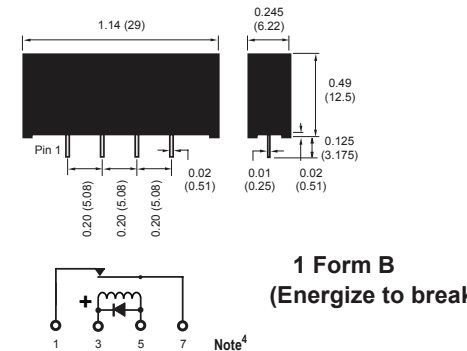
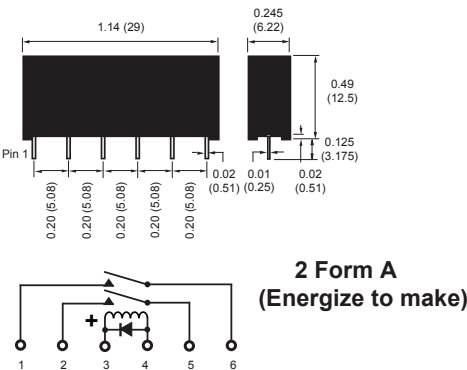
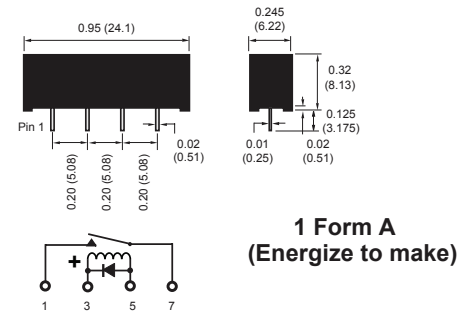
Internal Mu-metal Magnetic Screen

The Series 114 relays are fitted with an internal mu-metal magnetic screen which permits side-by-side stacking on 0.25 inches pitch for Form A devices.

Help

If you need any technical advice or other help, for example, any special tests that you would like carried out, please do not hesitate to contact our Technical Sales Department. We will always be pleased to discuss Pickering relays with you. email: techsales@pickeringrelay.com

Pin Configuration and Dimensional Data
Dimensions in Inches (Millimeters in brackets)



Important: Where the optional internal diode is fitted or for all Form B types, the correct coil polarity must be observed, as shown by the + symbol on the schematics.

Note⁴: Due to the presence of an internal biasing magnet, Form B relays have a higher level of magnetic interaction than Form A types. A space of 0.4 inches minimum should therefore be left between adjacent parts.

3D Models: Interactive models of the complete range of Pickering relay products can be downloaded from the web site.

Order Code
114 - 1 - A - 5 / 1 D

Series _____
Number of reeds _____
Switch form _____
Coil voltage _____
Switch number (Only Type 1 available) _____
Diode if fitted (Omit if not required) _____

Please ask us for a FREE evaluation sample.



High Coil Resistance Single-in-Line SIL/SIP Reed Relays

Up to 15 Watts switching - Very high packing density

Features

- **SoftCenter®** construction (see adjacent diagram)
- Highest quality instrumentation grade switches
- Sputtered ruthenium switches rated at 10 Watts, 0.5 A or 15 Watts, 1.0 A
- Plastic package with internal mu-metal magnetic screen
- They take up the minimum of board area, conserving board space
- Insulation resistance greater than $10^{12} \Omega$
- 3 or 5 Volt coils with or without internal diode
- 100% tested for dynamic contact resistance for guaranteed performance

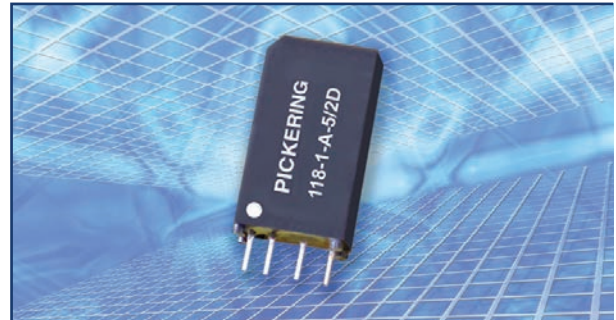
The Pickering Series 118 is a range of very sensitive reed relays that are ideal for portable electronic instruments or other applications where low power consumption and a very small footprint is important. They have 5 volt coils with a resistance up to 2200 Ω and the option of an internal diode.

Two switch types are available. Switch type number 1 is better suited for general purpose applications. Switch type 2 is better suited to low level or 'cold' switching.

Both types feature high quality, instrumentation grade switch contacts and require a board area of only 0.2 x 0.33 inches (5.1 x 8.4 mm).

These relays feature internal mu-metal magnetic screens. Mu-metal has the advantage of a high permeability and low magnetic remanence and eliminates problems that would otherwise occur due to magnetic interaction. Relays of this size without magnetic screening would be totally unsuitable for applications where dense packing is required.

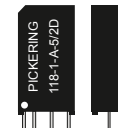
Initially, single pole versions only are available in this range but double pole versions will follow in the future.



0.32 nom (8.13) 0.19 nom (4.80)
0.33 max (8.38) 0.20 max (5.08)

Inches
(mm)

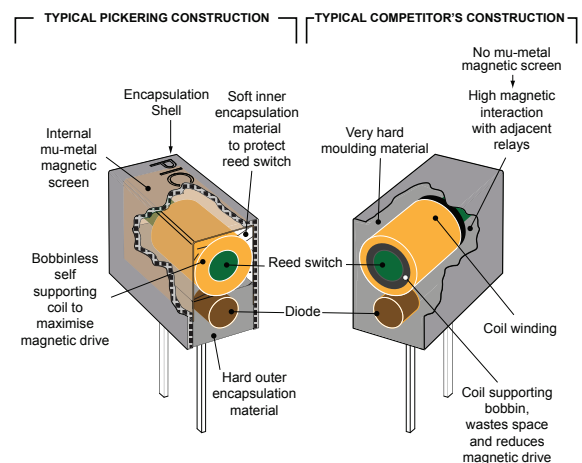
Pin 1



1 Form A

Actual size

Typical Pickering SoftCenter® Construction



Series 118 switch ratings - The contact ratings for each switch type are shown below:

Switch No	Switch form	Power rating	Max. switch current	Max. carry current	Max. switching volts	Life expectancy ops typical (see Note ¹ below)	Operate time inc bounce (max)	Release time	Special features
1	A	15 W	1.0 A	1.2 A	200	10E9	0.6 ms	0.35 ms	General purpose
2	A	10 W	0.5 A	1.2 A	200	10E9	0.6 ms	0.35 ms	Low level

Operating voltages

Coil voltage - nominal	Must operate voltage - maximum at 25°C	Must release voltage - minimum at 25°C
3 V	2.25 V	0.3 V
5 V	3.75 V	0.5 V

Coil data and type numbers

Device type	Type Number	Coil (V)	Coil resistance	Max. contact resistance (initial)	Insulation resistance (minimum)		Capacitance (typical) (see Note ^{2,3} below)	
					Switch to coil	Across switch	Closed switch to coil	Across open switch
1 Form A (energize to make) Switch No. 1	118-1-A-5/1D	5	1500 Ω	0.12 Ω	10E12 Ω	10E12 Ω	3.0 pF	0.14 pF
1 Form A (energize to make) Switch No. 2	118-1-A-3/2D	3	1000 Ω	0.12 Ω	10E12 Ω	10E12 Ω	3.0 pF	0.14 pF
	118-1-A-5/2D	5	2200 Ω	0.12 Ω	10E12 Ω	10E12 Ω	3.0 pF	0.14 pF

When an internal diode is required, the suffix D is added to the part number as shown in the table.

Environmental specification

Standard operating temperature range: -20 to +85 °C.	
Note: The upper temperature limit can be extended to +125 °C if the coil drive voltage is increased to accommodate the resistance/temperature coefficient of the copper coil winding. This is approximately 0.4% per °C. This means that at 125 °C the coil drive voltage will need to be increased by approximately $40 \times 0.4 = 16\%$ to maintain the required magnetic drive level. Please contact sales@pickeringrelay.com for assistance if necessary.	
Vibration: Maximum 20 G	Shock: Maximum 50 G

Note¹ Life expectancy

The life of a reed relay depends upon the switch load and end of life criteria. For example, for an 'end of life' contact resistance specification of 1 Ω, switching low loads (10 V at 10 mA resistive) or when 'cold' switching, typical life is approx 1 x 10⁹ ops. At the maximum load (resistive), typical life is 1 x 10⁷ ops. In the event of abusive conditions, e.g. high currents due to capacitive inrushes, this figure reduces considerably. Pickering will be pleased to perform life testing with any particular load condition.

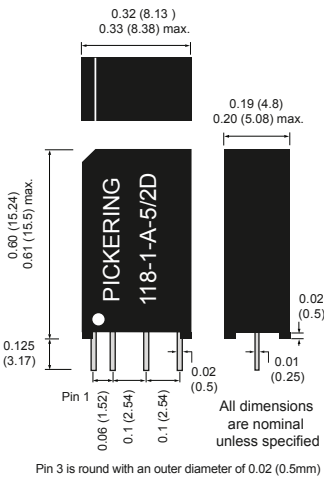
Note² Switch to coil capacitance

Due to the asymmetrical internal construction of the relay, the capacitance to the coil from one switch connection is approximately half the capacitance of the other switch connection, pin 3 is lower. In some applications this feature may be used to advantage for example, in a multiplexer where it is desirable to minimize the capacitance of the common connection to maximize bandwidth.

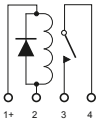
Note³ Capacitance across open switch

The capacitance across the open switch was measured with other connections guarded.

Pin Configuration and Dimensional Data
Dimensions in Inches (Millimeters in brackets)



1 Form A (Energize to make)



Note⁴

Note⁴: When an optional diode is fitted pin 1 is the positive connection.

3D Models: Interactive models of the complete range of Pickering relay products can be downloaded from the web site.

Internal Mu-metal Magnetic Screen

The Series 118 relays are fitted with an internal mu-metal magnetic screen which permits side-by-side stacking on 0.2 inches pitch.

Order Code

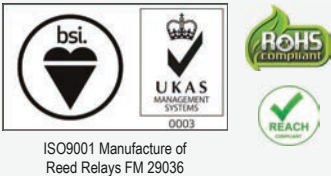
118 - 1 - A - 5 / 2 D

Series	_____
Number of reeds	_____
Switch form	_____
Coil voltage	_____
Switch number (1 or 2 See table adjacent)	_____
Diode if fitted (Omit if not required)	_____

Help

If you need any technical advice or other help, for example, any special tests that you would like carried out, please do not hesitate to contact our Technical Sales Department. We will always be pleased to discuss Pickering relays with you. email: techsales@pickeringrelay.com

Please ask us for a FREE evaluation sample.



ISO9001 Manufacture of
Reed Relays FM 29036

Pickering Series 101

CMOS Drive SIL/SIP Reed Relays

Direct drive from 74HC or HCT

Stacking on 0.3 inches pitch

Features

- **SoftCenter®** construction (see adjacent diagram)
- Highest quality instrumentation grade switches
- Board space may be saved by eliminating the need for drivers
- Direct drive from 74HC logic
- Encapsulated in plastic package with internal mu-metal magnetic screen
- Wide range of switch configurations - 1 Form A, 1 Form B, 2 Form A, 1 Form C
- Two pole relay requires the same board area as the single pole type
- Dry and mercury wetted switches are available with the same pin configuration and footprint
- Insulation resistance greater than $10^{12} \Omega$ for dry Form A devices
- 3, 5 12 or 24 Volt coils with or without internal diode
- 100% tested for dynamic contact resistance for guaranteed performance

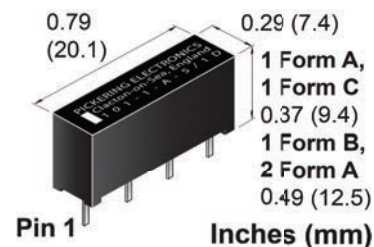
The Series 101 have very high coil resistances. 5 Volt dry versions may be driven directly from 74HC or 74HCT logic without the need for additional drivers.

74HC logic will drive up to 4mA at 5 Volts, therefore a coil resistance of 1600 ohms is desirable to avoid running the IC at its maximum rating; 1600 ohms is the coil resistance of the single pole dry Series 101. They may be stacked on 0.3 inches pitch (7.6mm) and as they have an internal mu-metal magnetic screen, there is no risk of magnetic interaction problems.

Both dry and mercury wetted switches are available in a range of configurations and coil voltages. The switches in the 2 Form A version are vertically stacked so the relay requires the same board area as the 1 Form A type.

A special 1 Form A, 5 Volt version is available with an even higher coil resistance of 3000 ohms. This is particularly suited to applications such as battery powered portable equipment as it requires a coil current of only 1.7 mA. This part, the 101-1-A-5/17 or 17D has the advantage of a lower level of thermal EMF of 3 microvolts or less.

Other special parts are also available that may be operated from 3 Volt logic.

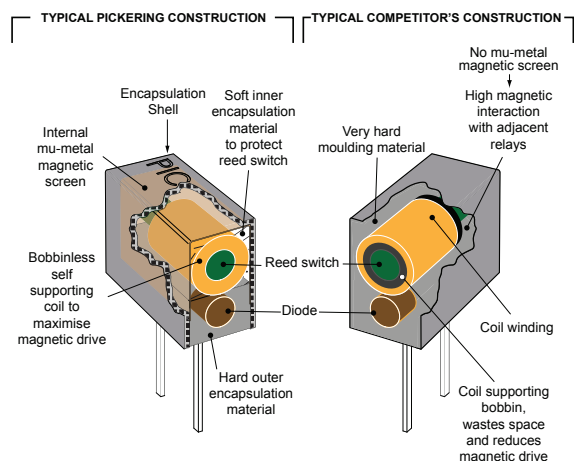


Switch Ratings - Dry switches

- Single or Double pole Form A (Energize to Make) relays. Up to 1 Amp switching at 20 Watts
- Single pole Form B (Energize to Break) relays. Up to 1 Amp switching at 20 Watts
- Single pole Form C (Change-over) relays. 0.25 Amps switching at 3 Watts

Switch Ratings - Mercury Wetted Switches

- Single or Double pole Form A (Energize to Make) relays. 2 Amp switching at 50 Watts
- Single pole, Non Position Sensitive, Form A (Energize to Make) relays. 2 Amp switching at 50 Watts

Typical Pickering **SoftCenter®** Construction

Series 101 switch ratings

- The contact ratings for each switch type are shown below:

Switch No	Switch form	Power rating	Max. switch current	Max. carry current	Max. switching volts	Life expectancy ops typical (see Note ¹ below)	Operate time inc bounce (max)	Release time	Special features
1	A or B	15 W (5 V Versions) 20 W (12 & 24 V)	1.0 A	1.2 A	200	10E9	1.0 ms	0.75 ms	General purpose
2	A	10 W	0.5 A	1.2 A	200	10E9	1.0 ms	0.75 ms	Low level
3	C	3 W	0.25 A	1.2 A	200	10E7	1.25 ms	1.0 ms	Change over
4	A	10 W	0.5 A	1.2 A	400	10E8	1.0 ms	0.75 ms	500V stand-off

Switch no.2 is particularly good for switching low currents and/or voltages. It is the ideal switch for A.T.E. systems where cold switching techniques are often used. Where higher power levels are involved, switch no.1 is more suitable.

Coil data and type numbers

Device type	Type Number	Coil (V)	Coil resistance	Max. contact resistance (initial)	Insulation resistance (minimum)		Capacitance (typical) (see Note ² below)	
					Switch to coil	Across switch	Closed switch to coil	Across open switch
1 Form A (energize to make) General Purpose Switch No. 1	101-1-A-3/1D	3	800 Ω	0.15 Ω	10E12 Ω	10E12 Ω	2.5 pF	0.1 pF
	101-1-A-5/1D	5	1600 Ω					
	101-1-A-12/1D	12	6000 Ω					
	101-1-A-24/1D	24	6000 Ω					
1 Form A (energize to make) Low Level Switch No. 2	101-1-A-3/2D	3	1600 Ω	0.12 Ω	10E12 Ω	10E12 Ω	2.5 pF	0.1 pF
	101-1-A-5/2D	5	1600 Ω					
	101-1-A-12/2D	12	6000 Ω					
	101-1-A-24/2D	24	6000 Ω					
1 Form A (energize to make) High Voltage Switch No. 4	101-1-A-5/4D	5	1600 Ω	0.15 Ω	10E12 Ω	10E12 Ω	2.5 pF	0.1 pF
	101-1-A-12/4D	12	6000 Ω					
	101-1-A-24/4D	24	6000 Ω					
	101-1-A-24/4D	24	6000 Ω					
1 Form C (change-over) Switch No. 3	101-1-C-3/3D	3	700 Ω	0.20 Ω	10E12 Ω	10E10 Ω	See Note ³	See Note ³
	101-1-C-5/3D	5	1600 Ω					
	101-1-C-12/3D	12	6000 Ω					
	101-1-C-24/3D	24	6000 Ω					
1 Form B (energize to break) General Purpose Switch No. 1	101-1-B-5/1D	5	3000 Ω	0.15 Ω	10E12 Ω	10E12 Ω	2.5 pF	0.1 pF
	101-1-B-12/1D	12	6000 Ω					
	101-1-B-24/1D	24	6000 Ω					
	101-1-B-24/1D	24	6000 Ω					
2 Form A (energize to make) General Purpose Switch No. 1	101-2-A-5/1D	5	1000 Ω	0.17 Ω	10E12 Ω	10E12 Ω	See Note ³	See Note ³
	101-2-A-12/1D	12	3000 Ω					
	101-2-A-24/1D	24	6000 Ω					
	101-2-A-24/1D	24	6000 Ω					
2 Form A (energize to make) Low Level Switch No. 2	101-2-A-3/2D	3	1000 Ω	0.15 Ω	10E12 Ω	10E12 Ω	See Note ³	See Note ³
	101-2-A-5/2D	5	1000 Ω					
	101-2-A-12/2D	12	3000 Ω					
	101-2-A-24/2D	24	6000 Ω					
1 Form A (energize to make) Special Extra Sensitive Version Low Level Switch No. 2	101-1-A-5/17D	5	3000 Ω	0.12 Ω	10E12 Ω	10E12 Ω	2.5 pF	0.1 pF

When an internal diode is required, the suffix D is added to the part number as shown in the table.

Mercury Reed: Series 101 switch ratings

- The contact ratings for each switch type are shown below:

Switch No	Switch form	Power rating	Max. switch current	Max. carry current	Max. switching volts	Life expectancy ops typical (see Note ¹ below)	Operate time (max)	Release time	Special features
6	A	50 W	2 A	3 A	500	10E8	1.75 ms	1.75 ms	Standard Mercury
8	A	50 W	2 A	3 A	500	10E8	1.75 ms	1.75 ms	Position Insensitive

Mercury Relay: Coil data and type numbers

Device type	Type Number	Coil (V)	Coil resistance	Max. contact resistance (initial)	Insulation resistance (minimum)		Capacitance (typical) (see Note ² below)	
					Switch to coil	Across switch	Closed switch to coil	Across open switch
1 Form A (energize to make) Switch No. 6	101-1-A-5/6D	5	375 Ω	0.075 Ω	10E12 Ω	10E11 Ω	4.5 pF	0.08 pF
	101-1-A-12/6D	12	1000 Ω					
	101-1-A-24/6D	24	3000 Ω					
1 Form A (energize to make) Position Insensitive Switch No. 8	101-1-A-5/8D	5	375 Ω	0.100 Ω	10E12 Ω	10E11 Ω	4.5 pF	0.08 pF
	101-1-A-12/8D	12	1000 Ω					
	101-1-A-24/8D	24	3000 Ω					
2 Form A (energize to make) Switch No. 6	101-2-A-5/6D	5	150 Ω	0.100 Ω	10E12 Ω	10E11 Ω	See Note ³	See Note ³
	101-2-A-12/6D	12	650 Ω					
	101-2-A-24/6D	24	2000 Ω					

When an internal diode is required, the suffix D is added to the part number as shown in the table.

Note¹ Life expectancy

The life of a reed relay depends upon the switch load and end of life criteria. For example, for an 'end of life' contact resistance specification of 1 Ω, switching low loads (10 V at 10 mA resistive) or when 'cold' switching, typical life is approx 1 x 10⁹ ops. At the maximum load (resistive), typical life is 1 x 10⁷ ops. In the event of abusive conditions, e.g. high currents due to capacitive inrushes, this figure reduces considerably. Pickering will be pleased to perform life testing with any particular load condition.

Note² Capacitance across open switch

The capacitance across the open switch was measured with other connections guarded.

Note³ Capacitance values

The value will depend upon on the mode of connection/guarding of unused terminals. Please contact technical sales for details.

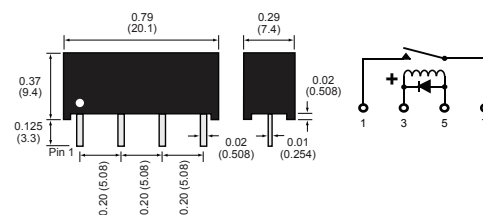


ISO9001 Manufacture of
Reed Relays FM 29036

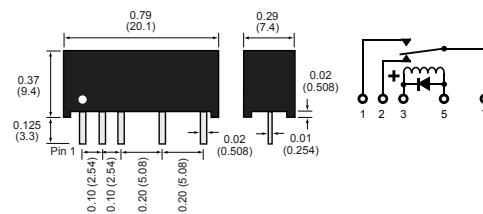
Pin Configuration and Dimensional Data

Dimensions in Inches (Millimeters in brackets)

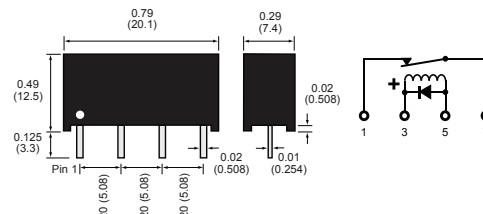
1 Form A (Energize to make)



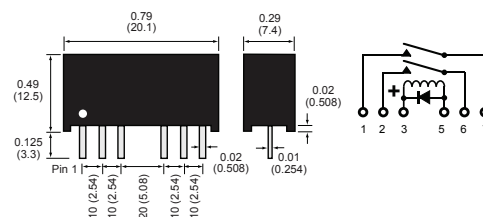
1 Form C (Changeover)



1 Form B (Energize to break)



2 Form A (Energize to make)



Important: Where the optional internal diode is fitted or for all Form B types, the correct coil polarity must be observed, as shown by the + symbol on the schematics.

3D Models: Interactive models of the complete range of Pickering relay products can be downloaded from the web site.

Mercury Relays

With the exception of the position insensitive type, mercury relays should be mounted vertically with pin 1 uppermost.

Internal Mu-metal Magnetic Screen

The Series 101 relays are fitted with an internal mu-metal magnetic screen which permits side-by-side stacking on 0.3 inches pitch.

Order Code

101 - 1 - A - 5 / 2 D

Series _____
Number of reeds _____
Switch form _____
Coil voltage _____
Switch number (See table adjacent) _____
Diode if fitted (Omit if not required) _____

Help

If you need any technical advice or other help, for example, any special tests that you would like carried out, please do not hesitate to contact our Technical Sales Department. We will always be pleased to discuss Pickering relays with you. email: techsales@pickeringrelay.com

Please ask us for a FREE evaluation sample.



email: sales@pickeringrelay.com

pickeringrelay.com

Low Thermal EMF SIL/SIP Reed Relays

Direct drive from CMOS

Features

- **SoftCenter®** construction (see adjacent diagram)
- Highest quality instrumentation grade switches
- Thermal EMF about 1 microvolt or less
- Low power consumption, ideal for portable equipment
- Encapsulated in a plastic package with internal mu-metal magnetic screen
- Wide range of switch configurations - 1 Form A, 1 Form B, 2 Form A, 1 Form C
- Two pole relay requires the same board area as the single pole type
- Dry and mercury wetted switches are available with the same pin configuration and footprint
- Insulation resistance greater than $10^{12} \Omega$ for dry Form A devices
- 3, 5, 12 or 24 Volt coils with or without internal diode
- 100% tested for dynamic contact resistance for guaranteed performance

The Pickering Series 100 is a complete range of Single-in- Line (SIL) reed relays primarily intended for direct drive from 4000B CMOS or NMOS logic or similar low current sources. The mercury wetted relays in the range may be driven directly from TTL logic.

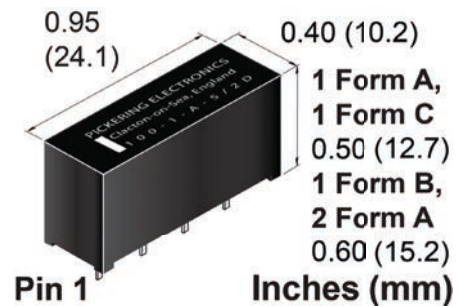
They are also useful for applications where conservation of current is important, for example, battery powered equipment.

The extremely low level of thermal EMF, about 1 microvolt or less, of the dry versions make them ideally suited to applications such as data acquisition or thermocouple switching.

An internal mu-metal magnetic screen is fitted to avoid the effects of magnetic interaction between relays.

If you do not require quite such high coil resistances or if a slightly smaller device is desired, please look also at our Series 101 which may be driven directly by 74HC or 74HCT logic.

Other special parts are also available that may be operated from 3 Volt logic, please contact our Sales Office for further information.



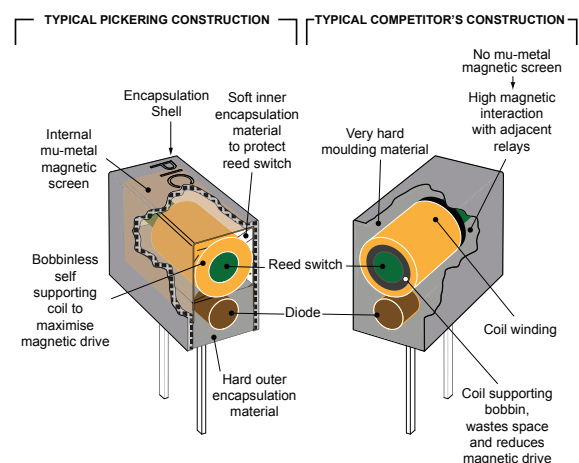
Switch Ratings - Dry switches

- 1 Form A (energize to make), 10 watts at 200V
- 1 Form A (energize to make), 10 watts at 500V
- 1 Form B (energize to break), 10 watts at 200V
- 1 Form C (change-over), 3 watts at 200V
- 2 Form A (energize to make), 10 watts at 200V

Switch Ratings - Mercury Wetted Switches

- 1 Form A (energize to make), 50 watts at 500V
- 1 Form A (Position insensitive), 50 watts at 500V
- 2 Form A (energize to make), 50 watts at 500V

Typical Pickering **SoftCenter®** Construction



Series 100 switch ratings - The contact ratings for each switch type are shown below:

Switch No	Switch form	Power rating	Max. switch current	Max. carry current	Max. switching volts	Life expectancy ops typical (see Note ¹ below)	Operate time inc bounce (max)	Release time	Special features
1	A or B	10 W	0.5 A	1.2 A	200	10E9	1.0 ms	1.0 ms	General purpose
2	A	10 W	0.5 A	1.2 A	200	10E9	1.0 ms	1.0 ms	Low level
3	C	3 W	0.25 A	1.2 A	200	10E7	1.0 ms	1.0 ms	Change over
4	A	10 W	0.5 A	1.2 A	500	10E8	1.75 ms	1.75 ms	1000V stand-off

Switch no.2 is particularly good for switching low currents and/or voltages. It is the ideal switch for A.T.E. systems where cold switching techniques are often used. Where higher power levels are involved, switch no.1 is more suitable.

Coil data and type numbers

Device type	Type Number	Coil (V)	Coil resistance	Max. contact resistance (initial)	Insulation resistance (minimum)		Capacitance (typical) (see Note ² below)	
					Switch to coil	Across switch	Closed switch to coil	Across open switch
1 Form A (energize to make) General Purpose Switch No. 1	100-1-A-5/1D	5	3300 Ω	0.15 Ω	10E12 Ω	10E12 Ω	3.5 pF	0.1 pF
	100-1-A-12/1D	12	6800 Ω					
	100-1-A-24/1D	24	6800 Ω					
1 Form A (energize to make) Low Level Switch No. 2	100-1-A-3/2D	3	2000 Ω	0.12 Ω	10E12 Ω	10E12 Ω	3.5 pF	0.1 pF
	100-1-A-5/2D	5	3300 Ω					
	100-1-A-12/2D	12	6800 Ω					
1 Form A (energize to make) High Voltage Switch No. 4	100-1-A-3/4D	5	2200 Ω	0.15 Ω	10E12 Ω	10E12 Ω	3.5 pF	0.1 pF
	100-1-A-12/4D	12	6800 Ω					
	100-1-A-24/4D	24	6800 Ω					
1 Form C (change-over) Switch No. 3	100-1-C-5/3D	5	3300 Ω	0.20 Ω	10E12 Ω	10E10 Ω	See Note ³	See Note ³
	100-1-C-12/3D	12	6800 Ω					
	100-1-C-24/3D	24	6800 Ω					
1 Form B (energize to break) General Purpose Switch No. 1	100-1-B-5/1D	5	2700 Ω	0.17 Ω	10E12 Ω	10E12 Ω	See Note ³	See Note ³
	100-1-B-12/1D	12	6000 Ω					
	100-1-B-24/1D	24	6000 Ω					
2 Form A (energize to make) General Purpose Switch No. 1	100-2-A-5/1D	5	2700 Ω	0.20 Ω	10E12 Ω	10E12 Ω	See Note ³	See Note ³
	100-2-A-12/1D	12	6000 Ω					
	100-2-A-24/1D	24	6000 Ω					
2 Form A (energize to make) Low Level Switch No. 2	100-2-A-5/2D	5	2700 Ω	0.18 Ω	10E12 Ω	10E12 Ω	See Note ³	See Note ³
	100-2-A-12/2D	12	6000 Ω					
	100-2-A-24/2D	24	6000 Ω					

When an internal diode is required, the suffix D is added to the part number as shown in the table.

Mercury Reed: Series 100 switch ratings - The contact ratings for each switch type are shown below:

Switch No	Switch form	Power rating	Max. switch current	Max. carry current	Max. switching volts	Life expectancy ops typical (see Note ¹ below)	Operate time (max)	Release time	Special features
6	A	50 W	2 A	3 A	500	10E8	2.0 ms	2.0 ms	Standard Mercury
8	A	50 W	2 A	3 A	500	10E8	2.0 ms	2.0 ms	Position Insensitive

Mercury Relay: Coil data and type numbers

Device type	Type Number	Coil (V)	Coil resistance	Max. contact resistance (initial)	Insulation resistance (minimum)		Capacitance (typical) (see Note ² below)	
					Switch to coil	Across switch	Closed switch to coil	Across open switch
1 Form A (energize to make) Switch No. 6	100-1-A-5/6D	5	500 Ω	0.100 Ω	10E12 Ω	10E11 Ω	5 pF	0.3 pF
	100-1-A-12/6D	12	2000 Ω					
	100-1-A-24/6D	24	3300 Ω					
1 Form A (energize to make) Position Insensitive Switch No. 8	100-1-A-5/8D	5	370 Ω	0.120 Ω	10E12 Ω	10E11 Ω	5 pF	0.3 pF
	100-1-A-12/8D	12	1000 Ω					
	100-1-A-24/8D	24	3300 Ω					
2 Form A (energize to make) Switch No. 6	100-2-A-5/6D	5	370 Ω	0.150 Ω	10E12 Ω	10E11 Ω	See Note ³	See Note ³
	100-2-A-12/6D	12	1000 Ω					
	100-2-A-24/6D	24	3300 Ω					

When an internal diode is required, the suffix D is added to the part number as shown in the table.

Note¹ Life expectancy

The life of a reed relay depends upon the switch load and end of life criteria. For example, for an 'end of life' contact resistance specification of 1 Ω, switching low loads (10 V at 10 mA resistive) or when 'cold' switching, typical life is approx 1 x 10⁹ ops. At the maximum load (resistive), typical life is 1 x 10⁷ ops. In the event of abusive conditions, e.g. high currents due to capacitive inrushes, this figure reduces considerably. Pickering will be pleased to perform life testing with any particular load condition.

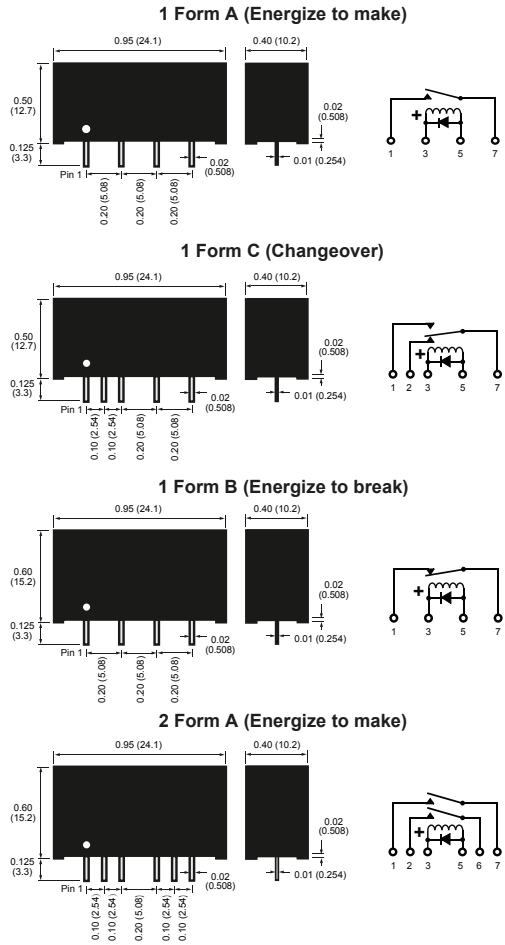
Note² Capacitance across open switch

The capacitance across the open switch was measured with other connections guarded.

Note³ Capacitance values

The value will depend upon on the mode of connection/guarding of unused terminals. Please contact technical sales for details.

Pin Configuration and Dimensional Data
Dimensions in Inches (Millimeters in brackets)



Important: Where the optional internal diode is fitted or for all Form B types, the correct coil polarity must be observed, as shown by the + symbol on the schematics.

3D Models: Interactive models of the complete range of Pickering relay products can be downloaded from the web site.

Mercury Relays

With the exception of the position insensitive type, mercury relays should be mounted vertically with pin 1 uppermost.

Internal Mu-metal Magnetic Screen

The Series 100 relays are fitted with an internal mu-metal magnetic screen which permits side-by-side stacking on 0.4 inches pitch.

Order Code

100 - 1 - A - 5 / 2 D

Series _____

Number of reeds _____

Switch form _____

Coil voltage _____

Switch number (See table adjacent) _____

Diode if fitted (Omit if not required) _____

Help

If you need any technical advice or other help, for example, any special tests that you would like carried out, please do not hesitate to contact our Technical Sales Department. We will always be pleased to discuss Pickering relays with you. email: techsales@pickeringrelay.com

Please ask us for a FREE evaluation sample.



Pickering Series 98

CMOS Drive DIL/DIP Reed Relays

Direct drive from 74HC or HCT

Features

- **SoftCenter®** construction
- Pin compatible with standard DIL relays
- Board space may be saved by eliminating drivers
- Encapsulated in a plastic package with internal mu-metal magnetic screen
- Wide range of switch configurations - 1 Form A, 1 Form B, 2 Form A, 1 Form C
- Dry and mercury wetted switches are available with the same pin configuration and footprint (see "A useful tip" below)
- 5, 12 and 24 Volt coils with or without internal diode
- 100% tested for dynamic contact resistance for guaranteed performance

The Pickering Series 98 is a range of Dual-In-Line relays, electrically equivalent to the Series 101 CMOS drive, Single-In-Line types, but pin compatible with standard DIL relays. The range features very high coil resistances, the 5 volt dry devices may be driven directly from 74HC or 74HCT logic without the need for additional drivers. Naturally, high resistance 12 and 24 volt coils are also available in this series.

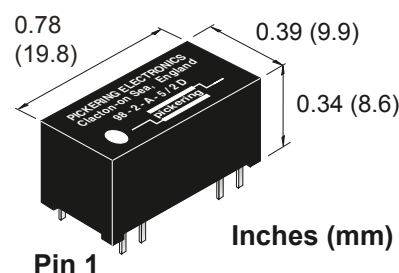
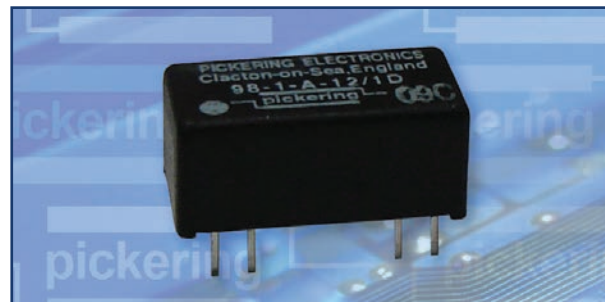
74HC logic will drive up to 4mA at 5 volts which means that a nominal coil resistance of 1600 ohms is required to avoid running the IC at its maximum rating; 1600 ohms is the coil resistance of the single pole dry Series 98. A special model with an even higher coil resistance of 3000 ohms is also available, our type number 98-1-A-5/17D (the D suffix indicates an internal diode).

It is often possible to replace TTL ICs with their equivalent CMOS ones and replace standard DIL relays with Pickering Series 98, to obtain the benefits of CMOS without any circuit or PCB redesign.

The range like its SIL equivalent has an internal mu-metal screen to enable high packing density with negligible interaction between adjacent devices.

A useful tip

If there is a chance that you might want to use mercury wetted relays instead of dry relays at a later date, for example to increase switch ratings, lay out the PCB initially as though for the mercury wetted type with pins 1 and 14 uppermost. This allows uprating later without PCB changes. The mercury versions in the Series 98 have identical pin configurations to the dry types.



Switch Ratings - Dry switches

- 1 Form A (energize to make), 10 or 15 watts at 200V
- 1 Form A (energize to make), 10 watts at 300V
- 1 Form B (energize to break), 15 watts at 200V
- 1 Form C (change-over), 3 watts at 200V
- 2 Form A (energize to make), 10 or 15 watts at 200V

Switch Ratings - Mercury Wetted switches

- 1 Form A (energize to make), 50 watts at 500V
- 1 Form A (Position insensitive), 50 watts at 500V
- 2 Form A (energize to make), 50 watts at 500V

Dry Reed - Series 98 switch ratings

The contact ratings for each switch type are shown below:

Switch No	Switch form	Power rating	Max. switch current	Max. carry current	Max. switching volts	Life expectancy ops typical (see Note ¹ below)	Operate time inc bounce (max)	Release time	Special features
1	A or B	15 W	1.0 A	1.2 A	200	10E8	1.0 ms	0.75 ms	General purpose
2	A	10 W	0.5 A	1.2 A	200	10E8	1.0 ms	0.75 ms	Low level
3	C	3 W	0.25 A	1.2 A	200	10E7	1.25 ms	1.0 ms	Change over
4	A	10 W	0.5 A	1.2 A	300	10E8	1.0 ms	0.75 ms	500V stand-off

Switch no.2 is particularly good for switching low currents and/or voltages. It is the ideal switch for A.T.E. systems where cold switching techniques are often used. Where higher power levels are involved, switch no.1 is more suitable.

Dry Relay - Coil data and type numbers

Device type	Type Number	Coil (V)	Coil resistance	Max. contact resistance (initial)	Insulation resistance (minimum)		Capacitance (typical) (see Note ² below)	
					Switch to coil	Across switch	Closed switch to coil	Across open switch
1 Form A (energize to make) General Purpose Switch No. 1	98-1-A-5/1D	5	1600 Ω					
	98-1-A-12/1D	12	6000 Ω	0.15 Ω	10E12 Ω	10E12 Ω	2.5 pF	0.1 pF
	98-1-A-24/1D	24	6000 Ω					
1 Form A (energize to make) Low Level Switch No. 2	98-1-A-5/2D	5	1600 Ω					
	98-1-A-12/2D	12	6000 Ω	0.12 Ω	10E12 Ω	10E12 Ω	2.5 pF	0.1 pF
	98-1-A-24/2D	24	6000 Ω					
1 Form A (energize to make) High Voltage Switch No. 4	98-1-A-5/4D	5	1600 Ω					
	98-1-A-12/4D	12	6000 Ω	0.15 Ω	10E12 Ω	10E12 Ω	2.5 pF	0.1 pF
	98-1-A-24/4D	24	6000 Ω					
1 Form C (change-over) Switch No. 3	98-1-C-5/3D	5	1600 Ω					
	98-1-C-12/3D	12	6000 Ω	0.20 Ω	10E12 Ω	10E10 Ω	See Note ³	See Note ³
	98-1-C-24/3D	24	6000 Ω					
1 Form B (energize to break) General Purpose Switch No. 1	98-1-B-5/1D	5	3000 Ω					
	98-1-B-12/1D	12	6000 Ω	0.15 Ω	10E12 Ω	10E12 Ω	2.5 pF	0.1 pF
	98-1-B-24/1D	24	6000 Ω					
2 Form A (energize to make) General Purpose Switch No. 1	98-2-A-5/1D	5	1000 Ω					
	98-2-A-12/1D	12	3000 Ω	0.17 Ω	10E12 Ω	10E12 Ω	See Note ³	See Note ³
	98-2-A-24/1D	24	6000 Ω					
2 Form A (energize to make) Low Level Switch No. 2	98-2-A-5/2D	5	1000 Ω					
	98-2-A-12/2D	12	3000 Ω	0.15 Ω	10E12 Ω	10E12 Ω	See Note ³	See Note ³
	98-2-A-24/2D	24	6000 Ω					
1 Form A (energize to make) Special Extra Sensitive Version Low Level Switch No. 2	98-1-A-5/17D	5	3000 Ω	0.12 Ω	10E12 Ω	10E12 Ω	2.5 pF	0.1 pF

When an internal diode is required, the suffix D is added to the part number as shown in the table.

Mercury Reed: Series 98 switch ratings

The contact ratings for each switch type are shown below:

Switch No	Switch form	Power rating	Max. switch current	Max. carry current	Max. switching volts	Life expectancy ops typical (see Note ¹ below)	Operate time (max)	Release time	Special features
6	A	50 W	2 A	3 A	500	10E8	1.75 ms	1.75 ms	Standard Mercury
8	A	50 W	2 A	3 A	500	10E8	1.75 ms	1.75 ms	Position Insensitive

Mercury Relay: Coil data and type numbers

Device type	Type Number	Coil (V)	Coil resistance	Max. contact resistance (initial)	Insulation resistance (minimum)		Capacitance (typical) (see Note ² below)	
					Switch to coil	Across switch	Closed switch to coil	Across open switch
1 Form A (energize to make) Switch No. 6	98-1-A-5/6D	5	375 Ω					
	98-1-A-12/6D	12	1000 Ω	0.075 Ω	10E12 Ω	10E11 Ω	4.5 pF	0.08 pF
	98-1-A-24/6D	24	3000 Ω					
1 Form A (energize to make) Position Insensitive Switch No. 8	98-1-A-5/8D	5	375 Ω					
	98-1-A-12/8D	12	1000 Ω	0.100 Ω	10E12 Ω	10E11 Ω	4.5 pF	0.08 pF
	98-1-A-24/8D	24	3000 Ω					
2 Form A (energize to make) Switch No. 6	98-2-A-5/6D	5	150 Ω					
	98-2-A-12/6D	12	650 Ω	0.100 Ω	10E12 Ω	10E11 Ω	See Note ³	See Note ³
	98-2-A-24/6D	24	2000 Ω					

When an internal diode is required, the suffix D is added to the part number as shown in the table.

Note¹ Life expectancy

The life of a reed relay depends upon the switch load and end of life criteria. For example, for an 'end of life' contact resistance specification of 1 Ω , switching low loads (10 V at 10 mA resistive) or when 'cold' switching, typical life is approx 1×10^8 ops. At the maximum load (resistive), typical life is 1×10^7 ops. In the event of abusive conditions, e.g. high currents due to capacitive inrushes, this figure reduces considerably. Pickering will be pleased to perform life testing with any particular load condition.

Note² Capacitance across open switch

The capacitance across the open switch was measured with other connections guarded.

Note³ Capacitance values

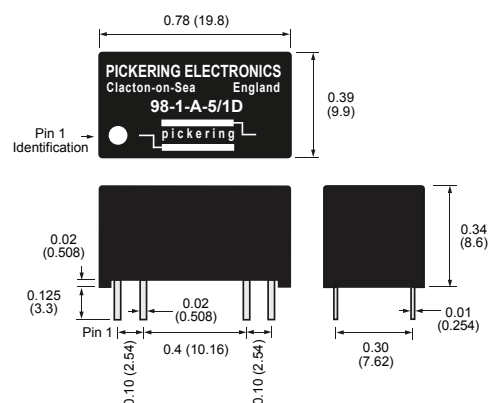
The value will depend upon on the mode of connection/guarding of unused terminals. Please contact technical sales for details.



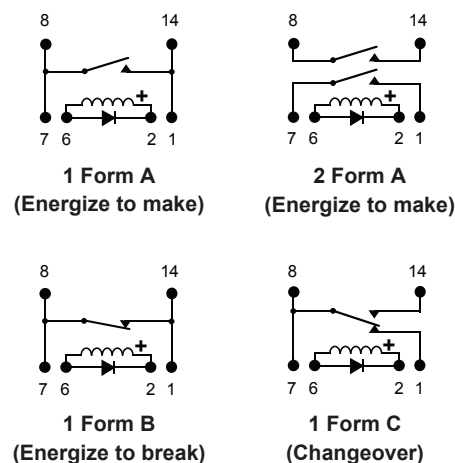
ISO9001 Manufacture of
Reed Relays FM 29036

Pin Configuration and Dimensional Data

Dimensions in Inches (Millimeters in brackets)



Schematics are shown from UNDERNEATH the relay.



Important: Where the optional internal diode is fitted or for all Form B types, the correct coil polarity must be observed, as shown by the + symbol on the schematics.

3D Models: Interactive models of the complete range of Pickering relay products can be downloaded from the web site.

Mercury Relays



With the exception of the position insensitive type, mercury relays should be mounted vertically with pin 1 uppermost.

Order Code

98 - 1 - A - 5 / 2 D

Series _____
Number of reeds _____
Switch form _____
Coil voltage _____
Switch number (See table adjacent) _____
Diode if fitted (Omit if not required) _____

Help

If you need any technical advice or other help, for example, any special tests that you would like carried out, please do not hesitate to contact our Technical Sales Department. We will always be pleased to discuss Pickering relays with you. email: techsales@pickeringrelay.com

Please ask us for a FREE evaluation sample.



email: sales@pickeringrelay.com

pickeringrelay.com

Dual-in-Line DIL/DIP Reed Relays

Up to 10 Watts switching for dry reed

Features

- Encapsulated in a plastic package with internal mu-metal magnetic screen
- Wide range of switch configurations - 1 Form A, 1 Form B, 2 Form A, 1 Form C
- Dry and mercury wetted switches are available with the same pin configuration and footprint (see "A useful tip" below)
- 5, 12 and 24 Volt coils with or without internal diode

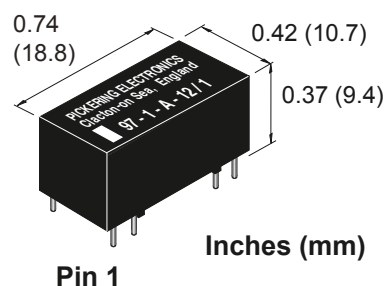
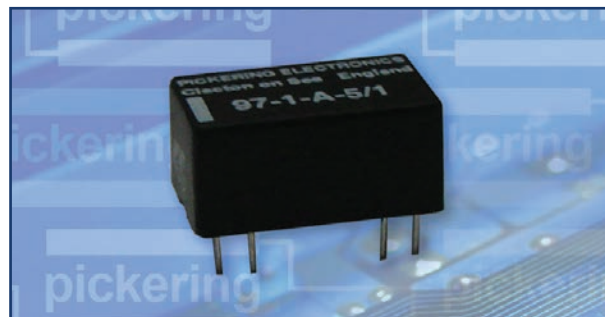
The Series 97 is a range of reed relays with pins in the popular Dual-in-Line format.

Being encapsulated in a plastic package using a very high resistivity epoxy resin gives the device several advantages over the more usual moulded construction. The reed switches are not subjected to the high temperatures and pressures of the transfer moulding process with the inherent risk of damage to the sensitive glass to metal seals. The construction incorporates a mu-metal wrap around the operating coil to eliminate magnetic interaction problems. Higher drive levels are achieved, allowing a full range of switching configurations including 1 or 2 Form A (energize to make), Form C (change-over) and Form B (energize to break) in both dry and mercury wetted types.

If higher coil resistance levels are required, please look at our Series 98 DIL relays which may be driven directly from 74HC or 74HCT CMOS logic.

A useful tip

If there is a chance that you might want to use mercury wetted relays instead of dry relays at a later date, for example to increase switch ratings, lay out the PCB initially as though for the mercury wetted type with pins 1 and 14 uppermost. This allows upgrading later without PCB changes. The mercury versions in the Series 97 have identical pin configurations to the dry types.



Switch Ratings - Dry switches

- 1 Form A (energize to make), 10 watts at 200V
- 1 Form A (energize to make), 10 watts at 300V
- 1 Form B (energize to break), 10 watts at 200V
- 1 Form C (change-over), 3 watts at 200V
- 2 Form A (energize to make), 10 watts at 200V

Switch Ratings - Mercury Wetted switches

- 1 Form A (energize to make), 50 watts at 500V

Dry Reed - Series 97 switch ratings

The contact ratings for each switch type are shown below:

Switch No	Switch form	Power rating	Max. switch current	Max. carry current	Max. switching volts	Life expectancy ops typical (see Note ¹ below)	Special features
1	A or B	10 W	0.5 A	1.2 A	200	10E8	General purpose
3	C	3 W	0.25 A	1.2 A	200	10E7	Change over
4	A	10 W	0.5 A	1.2 A	300	10E8	500V stand-off

Switch no.2 is particularly good for switching low currents and/or voltages. It is the ideal switch for A.T.E. systems where cold switching techniques are often used. Where higher power levels are involved, switch no.1 is more suitable.

Operating voltages

Coil voltage - nominal	Must operate voltage - maximum at 25°C	Must release voltage - minimum at 25°C
5 V	3.75 V	0.5 V
12 V	9 V	1.2 V
24 V	18 V	2.4 V

Dry Relay - Coil data and type numbers

Device type	Type Number	Coil (V)	Coil resistance	Max. contact resistance (initial)
1 Form A (energize to make) General Purpose Switch No. 1	97-1-A-5/1D	5	500 Ω	0.15 Ω
	97-1-A-12/1D	12	1000 Ω	
	97-1-A-24/1D	24	3000 Ω	
1 Form A (energize to make) High Voltage Switch No. 4	97-1-A-5/4D	5	500 Ω	0.15 Ω
	97-1-A-12/4D	12	1000 Ω	
	97-1-A-24/4D	24	3000 Ω	
1 Form C (change-over) Switch No. 3	97-1-C-5/3D	5	500 Ω	0.20 Ω
	97-1-C-12/3D	12	1000 Ω	
	97-1-C-24/3D	24	3000 Ω	
1 Form B (energize to break) General Purpose Switch No. 1	97-1-B-5/1D	5	1000 Ω	0.15 Ω
	97-1-B-12/1D	12	3000 Ω	
	97-1-B-24/1D	24	3000 Ω	
2 Form A (energize to make) General Purpose Switch No. 1	97-2-A-5/1D	5	500 Ω	0.17 Ω
	97-2-A-12/1D	12	1000 Ω	
	97-2-A-24/1D	24	3000 Ω	

When an internal diode is required, the suffix D is added to the part number as shown in the table.

Mercury Reed: Series 97 switch ratings

The contact ratings for each switch type are shown below:

Switch No	Switch form	Power rating	Max. switch current	Max. carry current	Max. switching volts	Life expectancy ops typical (see Note ¹ below)	Special features
6	A	50 W	2 A	3 A	500	10E8	Standard Mercury

Mercury Relay: Coil data and type numbers

Device type	Type Number	Coil (V)	Coil resistance	Max. contact resistance (initial)
1 Form A (energize to make) Switch No. 6	97-1-A-5/6D	5	140 Ω	0.075 Ω
	97-1-A-12/6D	12	500 Ω	
	97-1-A-24/6D	24	1500 Ω	

When an internal diode is required, the suffix D is added to the part number as shown in the table.

Environmental specification

Standard operating temperature range: -20 to +85 °C.

Note: The upper temperature limit can be extended to +125 °C if the coil drive voltage is increased to accommodate the resistance/temperature coefficient of the copper coil winding. This is approximately 0.4% per °C. This means that at 125 °C the coil drive voltage will need to be increased by approximately $40 \times 0.4 = 16\%$ to maintain the required magnetic drive level. Please contact sales@pickeringrelay.com for assistance if necessary.

Vibration: Maximum 20 G

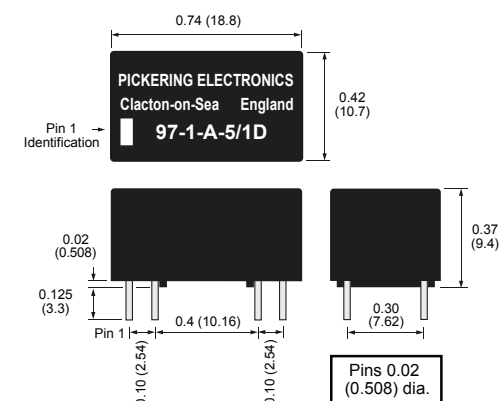
Shock: Maximum 50 G

Note¹ Life expectancy

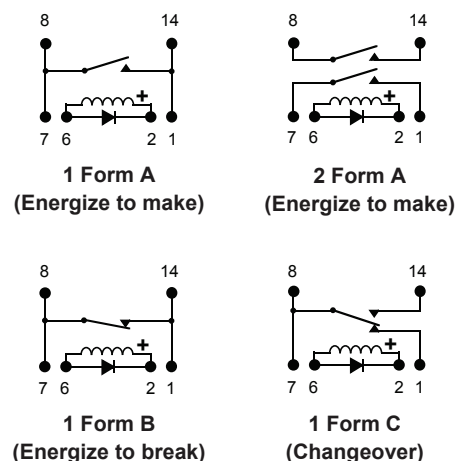
The life of a reed relay depends upon the switch load and end of life criteria. For example, for an 'end of life' contact resistance specification of 1 Ω, switching low loads (10 V at 10 mA resistive) or when 'cold' switching, typical life is approx 1×10^8 ops. At the maximum load (resistive), typical life is 1×10^7 ops. In the event of abusive conditions, e.g. high currents due to capacitive inrushes, this figure reduces considerably. Pickering will be pleased to perform life testing with any particular load condition.

Pin Configuration and Dimensional Data

Dimensions in Inches (Millimeters in brackets)



Schematics are shown from UNDERNEATH the relay.



Important: Where the optional internal diode is fitted or for all Form B types, the correct coil polarity must be observed, as shown by the + symbol on the schematics.

3D Models: Interactive models of the complete range of Pickering relay products can be downloaded from the web site.

Mercury Relays



With the exception of the position insensitive type, mercury relays should be mounted vertically with pin 1 uppermost.

Order Code

97 - 1 - A - 5 / 2 D

Series _____
Number of reeds _____
Switch form _____
Coil voltage _____
Switch number (See table adjacent) _____
Diode if fitted (Omit if not required) _____

Help

If you need any technical advice or other help, for example, any special tests that you would like carried out, please do not hesitate to contact our Technical Sales Department. We will always be pleased to discuss Pickering relays with you. email: techsales@pickeringrelay.com

Please ask us for a FREE evaluation sample.



ISO9001 Manufacture of
Reed Relays FM 29036



email: sales@pickeringrelay.com

pickeringrelay.com

High Sensitivity Reed Relays

Dry and mercury wetted

Features

- Encapsulated in a plastic package with internal mu-metal magnetic screen
- Wide range of switch configurations
- Dry and mercury wetted switches are available with the same pin configuration and footprint (see "A useful tip" below)
- 5, 12 or 24 Volt coils with or without internal diode

These ranges of reed relays are essentially the same as the dry Series 80 and 85 and the mercury wetted Series 88 and 89 but with coil resistances between 2 and 3 times higher. This feature is particularly useful when using large numbers of relays, to reduce overall current requirements and heating effects, or when the available coil drive power is restricted, for example, in battery operated equipment.

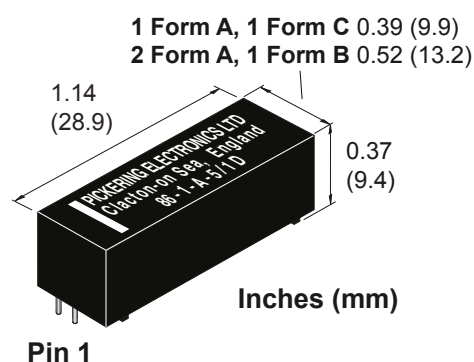
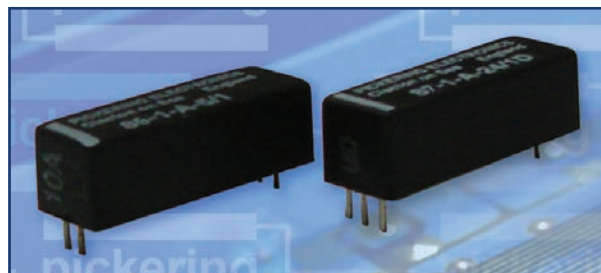
Many special resistances are available, and relays can be designed to customers specific requirements.

These Pickering reed relays fit straight onto P.C. boards with pins on 0.1 inch grid. They are completely protected, being encapsulated with plastic covers. All relays are fitted with internal magnetic screens to avoid stray magnetic interaction between adjacent relays.

The Series 86 and 87 are electrically identical ranges but offer alternative pin configurations. These are shown overleaf.

A useful tip

If there is a chance that you might want to use mercury wetted relays instead of dry relays at a later date, for example to increase switch ratings, lay out the PCB initially as though for the mercury wetted type. This allows uprating later without PCB changes.



Switch Ratings - Dry Switches

- 1 Form A (energize to make), 10 watts at 200V
- 1 Form B (energize to break), 10 watts at 200V
- 1 Form C (change-over), 3 watts at 200V
- 2 Form A (energize to make), 10 watts at 200V

Switch Ratings - Mercury Wetted Switches

- 1 Form A (energize to make), 50 watts at 500V

Series 86, 87 switch ratings - The contact ratings for each switch type are shown below:

Switch No	Switch form	Power rating	Max. switch current	Max. carry current	Max. switching volts	Life expectancy ops typical (see Note ¹ below)	Special features
1	A or B	10 W	0.5 A	1.2 A	200	10E8	General purpose
7	C	3 W	0.25 A	1.2 A	200	10E7	Change over

Operating voltages

Coil voltage - nominal	Must operate voltage - maximum at 25°C	Must release voltage - minimum at 25°C
5 V	3.75 V	0.5 V
12 V	9 V	1.2 V
24 V	18 V	2.4 V

Series 86, 87 Coil data and type numbers

Device type	Type Number Series 80	Type Number Series 85	Coil (V)	Coil resistance	Max. contact resistance (initial)
1 Form A (energize to make) General Purpose Switch No. 1	86-1-A-5/1D 86-1-A-12/1D 86-1-A-24/1D	87-1-A-5/1D 87-1-A-12/1D 87-1-A-24/1D	5 12 24	1000 Ω 3000 Ω 6000 Ω	0.15 Ω
1 Form B (energize to make) General Purpose Switch No. 1	86-1-B-5/1D 86-1-B-12/1D 86-1-B-24/1D	87-1-B-5/1D 87-1-B-12/1D 87-1-B-24/1D	5 12 24	1000 Ω 3000 Ω 6000 Ω	0.15 Ω
1 Form C (change-over) Switch No. 7	86-1-C-5/7D 86-1-C-12/7D 86-1-C-24/7D	87-1-C-5/7D 87-1-C-12/7D 87-1-C-24/7D	5 12 24	1000 Ω 3000 Ω 6000 Ω	0.20 Ω
2 Form A (energize to make) General Purpose Switch No. 1	86-2-A-5/1D 86-2-A-12/1D 86-2-A-24/1D	87-2-A-5/1D 87-2-A-12/1D 87-2-A-24/1D	5 12 24	1000 Ω 3000 Ω 6000 Ω	0.15 Ω

When an internal diode is required, the suffix D is added to the part number as shown in the table.

Mercury Reed: Series 86, 87 switch ratings - The contact ratings for each switch type are shown below:

Switch No	Switch form	Power rating	Max. switch current	Max. carry current	Max. switching volts	Life expectancy ops typical (see Note ¹ below)	Special features
8	A	50 W	2 A	3 A	500	10E8	Standard Mercury

Mercury Relay: Series 86, 87 Coil data and type numbers

Device type	Type Number Series 88	Type Number Series 89	Coil (V)	Coil resistance	Max. contact resistance (initial)
1 Form A (energize to make) Switch No. 8	86-1-A-5/8D 86-1-A-12/8D 86-1-A-24/8D	87-1-A-5/8D 87-1-A-12/8D 87-1-A-24/8D	5 12 24	350 Ω 1000 Ω 3000 Ω	0.07 Ω

When an internal diode is required, the suffix D is added to the part number as shown in the table.

Environmental specification

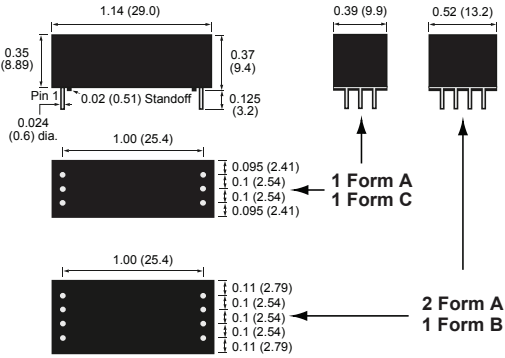
Standard operating temperature range: -20 to +85 °C. Note: The upper temperature limit can be extended to +125 °C if the coil drive voltage is increased to accommodate the resistance/temperature coefficient of the copper coil winding. This is approximately 0.4% per °C. This means that at 125 °C the coil drive voltage will need to be increased by approximately 40 x 0.4 = 16% to maintain the required magnetic drive level. Please contact sales@pickeringrelay.com for assistance if necessary.
Vibration: Maximum 20 G Shock: Maximum 50 G

Note¹ Life expectancy

The life of a reed relay depends upon the switch load and end of life criteria. For example, for an 'end of life' contact resistance specification of 1 Ω, switching low loads (10 V at 10 mA resistive) or when 'cold' switching, typical life is approx 1 x 10⁸ ops. At the maximum load (resistive), typical life is 1 x 10⁷ ops. In the event of abusive conditions, e.g. high currents due to capacitive inrushes, this figure reduces considerably. Pickering will be pleased to perform life testing with any particular load condition.

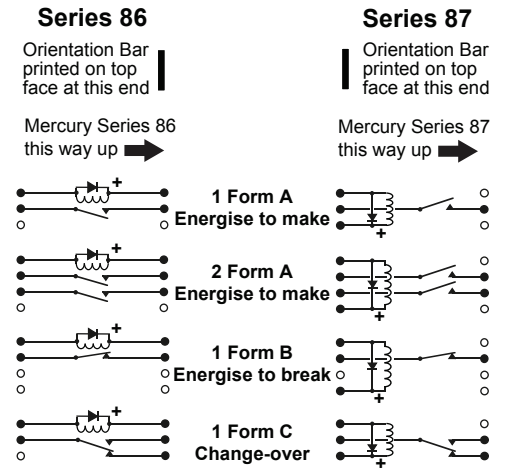
Dimensional Data

Dimensions in Inches (Millimeters in brackets)



Pin Configurations

Schematics are shown from UNDERNEATH the relay.



Important: Where the optional internal diode is fitted or for all Form B types, the correct coil polarity must be observed, as shown by the + symbol on the schematics.

3D Models: Interactive models of the complete range of Pickering relay products can be downloaded from the web site.

Mercury Wetted Versions

Mercury wetted relays should be mounted vertically in the direction of the arrow printed on the package.

Order Code

86 - 1 - A - 5 / 2 D

Series _____
Number of reeds _____
Switch form _____
Coil voltage _____
Switch number (See table adjacent) _____
Diode if fitted (Omit if not required) _____

Help

If you need any technical advice or other help, for example, any special tests that you would like carried out, please do not hesitate to contact our Technical Sales Department. We will always be pleased to discuss Pickering relays with you. email: techsales@pickeringrelay.com

Please ask us for a FREE evaluation sample.



Pickering Series 80, 85, 88, 89

General Purpose Reed Relays

Dry and Mercury wetted

Features

- Encapsulated in a plastic package with internal mu-metal magnetic screen
- Wide range of switch configurations
- Dry and mercury wetted switches are available with the same pin configuration and footprint (see "A useful tip" below)
- 5, 12 or 24 Volt coils with or without internal diode

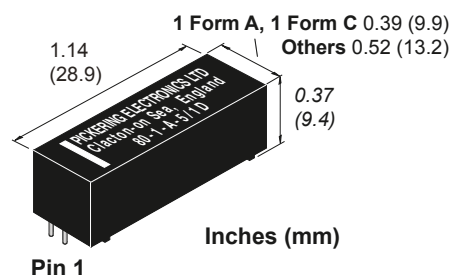
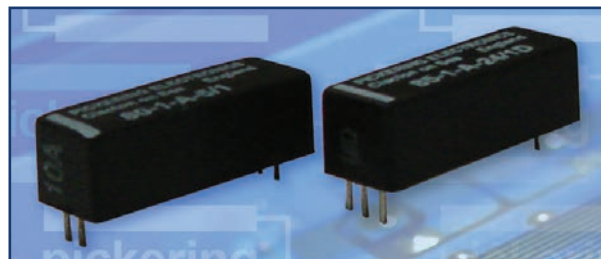
These ranges of reed relays are available with both dry and mercury wetted switches. They are available with 5, 12 and 24 volts coils, a particularly useful feature of the 5 volt dry devices is their ability to be driven directly from TTL, the coil requiring only 10mA of drive current. All units have an internal magnetic screen and can be supplied with built-in diode if required.

Standard coil voltages are 5, 12 and 24 volts. All relays are fitted with internal magnetic screen to avoid stray magnetic interaction between adjacent relays. Many special coil resistances are available, and relays can be designed to customers specific requirements. These Pickering relays fit straight onto P.C. boards with pins on the popular 0.1 inch grid. They are completely protected, being encapsulated in plastic cases. With these series you get the choice of three different dry reed switches and two mercury wetted switches in a range of configurations to cover all switching problems. See "Switch Ratings" in adjacent column.

The Series 80 and 85 are electrically similar ranges but with alternative pin configurations; these are shown overleaf. Their mercury wetted equivalents are prefixed 88 and 89 respectively.

A useful tip

If there is a chance that you might want to use mercury wetted relays instead of dry relays at a later date, for example to increase switch ratings, lay out the PCB initially as though for the mercury wetted type. This allows uprating later without PCB changes. The mercury Series 88 and 89 have identical pin configurations to the dry Series 80 and 85.



Switch Ratings - Dry Switches

- 1 Form A (energize to make), 10 watts at 200V
- 1 Form A (energize to make), 10 watts at 500V
- 1 Form B (energize to break), 10 watts at 200V
- 1 Form C (change-over), 3 watts at 200V
- 2 Form A (energize to make), 10 watts at 200V
- 2 Form C (change-over), 3 watts at 200V
- 3 Form A (energize to make), 10 watts at 200V

Switch Ratings - Mercury Wetted Switches

- 1 Form A (energize to make), 50 watts at 500V
- 1 Form B (energize to break), 50 watts at 500V
- 2 Form A (energize to make), 50 watts at 500V

Series 80, 85 switch ratings

- The contact ratings for each switch type are shown below:

Switch No	Switch form	Power rating	Max. switch current	Max. carry current	Max. switching volts	Life expectancy ops typical (see Note ¹ below)	Special features
1	A or B	10 W	0.5 A	1.2 A	200	10E8	General purpose
5	A	10 W	0.5 A	1.2 A	500	10E8	1000V stand-off
7	C	3 W	0.25 A	1.2 A	200	10E7	Change over

Series 80, 85 Coil data and type numbers

Device type	Type Number Series 80	Type Number Series 85	Coil (V)	Coil resistance	Max. contact resistance (initial)
1 Form A (energize to make) General Purpose Switch No. 1	80-1-A-5/1D 80-1-A-12/1D 80-1-A-24/1D	85-1-A-5/1D 85-1-A-12/1D 85-1-A-24/1D	5 12 24	500 Ω 1000 Ω 3000 Ω	0.15 Ω
1 Form A (energize to make) HV Switch No. 5 Note: Special Pin Configuration	80-1-A-5/5D 80-1-A-12/5D 80-1-A-24/5D	Not Available	5 12 24	500 Ω 1000 Ω 3000 Ω	0.15 Ω
1 Form B (energize to make) General Purpose Switch No. 1	80-1-B-5/1D 80-1-B-12/1D 80-1-B-24/1D	85-1-B-5/1D 85-1-B-12/1D 85-1-B-24/1D	5 12 24	1000 Ω 3000 Ω 3000 Ω	0.15 Ω
1 Form C (change-over) Switch No. 7	80-1-C-5/7D 80-1-C-12/7D 80-1-C-24/7D	85-1-C-5/7D 85-1-C-12/7D 85-1-C-24/7D	5 12 24	500 Ω 1000 Ω 3000 Ω	0.20 Ω
2 Form A (energize to make) General Purpose Switch No. 1	80-2-A-5/1D 80-2-A-12/1D 80-2-A-24/1D	85-2-A-5/1D 85-2-A-12/1D 85-2-A-24/1D	5 12 24	500 Ω 1000 Ω 3000 Ω	0.15 Ω
2 Form C (change-over) Switch No. 7	80-2-C-5/7D 80-2-C-12/7D 80-2-C-24/7D	85-2-C-5/7D 85-2-C-12/7D 85-2-C-24/7D	5 12 24	375 Ω 1000 Ω 3000 Ω	0.20 Ω
3 Form A (energize to make) General Purpose Switch No. 1	80-3-A-5/1D 80-3-A-12/1D 80-3-A-24/1D	Not Available	5	375 Ω 1000 Ω 3000 Ω	0.15 Ω

When an internal diode is required, the suffix D is added to the part number as shown in the table.

Mercury Reed: Series 88, 89 switch ratings

- The contact ratings for each switch type are shown below:

Switch No	Switch form	Power rating	Max. switch current	Max. carry current	Max. switching volts	Life expectancy ops typical (see Note ¹ below)	Special Features
1	A	50 W	2 A	3 A	500	10E8	Standard Mercury

Mercury Relay: Series 88, 89 Coil data and type numbers

Device type	Type Number Series 88	Type Number Series 89	Coil (V)	Coil resistance	Max. contact resistance (initial)
1 Form A (energize to make) Switch No. 1	88-1-A-5/1D 88-1-A-12/1D 88-1-A-24/1D	89-1-A-5/1D 89-1-A-12/1D 89-1-A-24/1D	5 12 24	140 Ω 750 Ω 2000 Ω	0.07 Ω
1 Form B (energize to break) Switch No. 1	88-1-B-5/1D 88-1-B-12/1D 88-1-B-24/1D	89-1-B-5/1D 89-1-B-12/1D 89-1-B-24/1D	5 12 24	90 Ω 430 Ω 1750 Ω	0.07 Ω
2 Form A (energize to make) Switch No. 1	88-2-A-5/1D 88-2-A-12/1D 88-2-A-24/1D	89-2-A-5/1D 89-2-A-12/1D 89-2-A-24/1D	5 12 24	90 Ω 430 Ω 1750 Ω	0.05 Ω

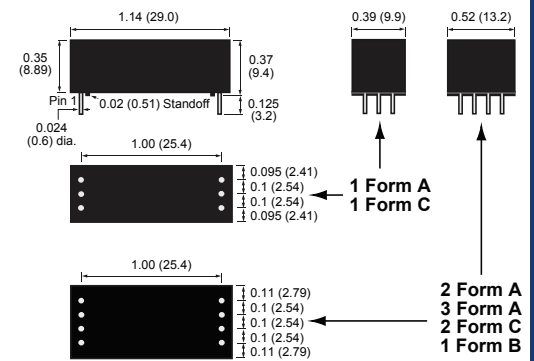
When an internal diode is required, the suffix D is added to the part number as shown in the table.

Note¹ Life expectancy

The life of a reed relay depends upon the switch load and end of life criteria. For example, for an 'end of life' contact resistance specification of 1 Ω, switching low loads (10 V at 10 mA resistive) or when 'cold' switching, typical life is approx 1×10^8 ops. At the maximum load (resistive), typical life is 1×10^7 ops. In the event of abusive conditions, e.g. high currents due to capacitive inrushes, this figure reduces considerably. Pickering will be pleased to perform life testing with any particular load condition.

Dimensional Data

Dimensions in Inches (Millimeters in brackets)



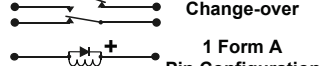
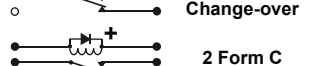
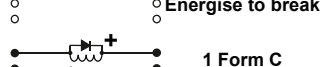
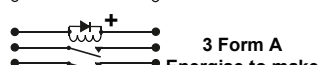
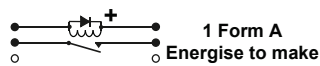
Pin Configurations

Schematics are shown from UNDERNEATH the relay.

Series 80 & 88

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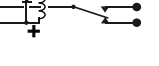
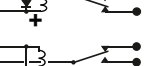
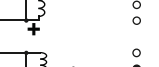
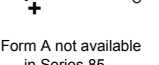
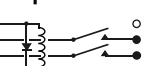
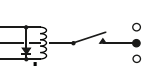
Mercury Series 88 this way up ➡



Series 85 & 89

Orientation Bar printed on top face at this end

Mercury Series 89 this way up ➡



Important: Where the optional internal diode is fitted or for all Form B types, the correct coil polarity must be observed, as shown by the + symbol on the schematics.

3D Models: Interactive models of the complete range of Pickering relay products can be downloaded from the web site.

Mercury Relays

Mercury wetted relays should be mounted vertically in the direction of the arrow printed on the package.

Order Code

80 - 1 - A - 5 / 2 D

Series _____
Number of reeds _____
Switch form _____
Coil voltage _____
Switch number (See table adjacent) _____
Diode if fitted (Omit if not required) _____

Help

If you need any technical advice or other help, for example, any special tests that you would like carried out, please do not hesitate to contact our Technical Sales Department. We will always be pleased to discuss Pickering relays with you. email: techsales@pickeringrelay.com

Please ask us for a FREE evaluation sample.



ISO9001 Manufacture of
Reed Relays FM 29036



email: sales@pickeringrelay.com

pickeringrelay.com

Custom Reed Relays

As well as the relays detailed in this catalog, Pickering also manufacture many thousands of special model relays, designed to meet our customer's particular requirements.

If you do not see what you require in our standard Series ranges, please contact our technical sales team (techsales@pickeringrelay.com) who will be happy to work with you and design a specific 'one of a kind' reed relay.

Features

- Special pin configurations or pin lengths
- Special print with customers own number or logo
- Custom packaging
- Controlled capacitance
- Controlled thermal emf
- Operate voltage
- Coil resistance, especially low power options
- Specific contact resistance requirements, including stability
- Switch life under specific loads
- Pin forming
- Specific operate & release times
- Specific environmental requirements



- 2-Pole Mercury Wet relay with custom pinout, an equivalent to a competitor's discontinued part

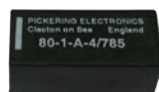


- 2-Pole Mercury Wet Changeover relay where a common open time is required

Custom Plastic Packages - Screened and Unscreened



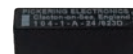
- Copper plated switches for RF/HF applications
- 1 and 2 Form A available



- Specialized Applications, for example, current operated relays



- Standard parts with custom pinouts or pin length



- Standard Catalog parts tested to a higher specification. For example, the Series 104 has been modified for applications requiring an increased voltage specification

Glossary of Terms

Actuate time

The time between the application of the coil voltage and the operation of the relay contact. Some manufacturers include bounce while others exclude it so caution is needed with this term. Pickering prefer to specify **Operate time** and **Bounce time**. See these terms.

Ampere-turns

A convenient measure of magnetic field level. Reed switch sensitivity is usually measured in Ampere-Turns (AT). The magnetic drive from the relay operating coil can be calculated in AT, simply the product of the number of wire turns on the coil and the current flowing through it.

Bias magnet

A permanent magnet which is added to a relay. Most commonly this technique is used to create a Form B (energize to break) relay. The magnet operates the reed switch and the field from the coil cancels the field from the magnet causing the switch to open when energized. The technique is also sometimes used to create a bi-stable or latching relay.

Bounce time

Contact Bounce is the intermittent opening of switch contacts occurring after the initial closure of the contacts due to mechanical rebound.

Breakdown voltage

The breakdown voltage is the maximum level that can be applied to the open switch contact before breakdown occurs. The level is primarily determined by the size of the contact gap and the type of inert gas used within the reed switch capsule. High voltage reed switches are normally in a vacuum. (See also **Stand-off voltage**).

Carry current

The maximum continuous current that can be carried by the switch contact after it has operated and contact bounce has ceased. This figure is usually higher than the switching current. There are other factors that determine this figure but the main one is the heating effect of the current and switch resistance (I^2R).

Coaxial shield

Usually in the form of a copper tube around the reed switch with a connection at each end of the device. Most commonly used to create a relay intended for high frequency or high speed digital applications with a 50 Ohms characteristic impedance.

Coil

An assembly consisting of many turns of wire which surrounds the reed switch. The magnetic field generated by the current flowing through this coil causes the operation of the reed switch.

Coil power

The power in Watts, required to operate the relay. This is the product of the current drawn and the coil voltage. Some sensitive Pickering relays have power levels of less than 10 mW.

Coil resistance

The nominal coil resistance of the relay operating coil and is usually specified at 25 Degrees Centigrade. The coil resistance will increase with temperature at a rate of approximately 0.4% per degree C, this being the coefficient of resistance of the copper coil winding. With increasing temperature and increasing coil resistance, the level of magnetic field generated by the coil will become lower as the current falls but this can sometimes be accommodated by increasing the coil voltage. This is the main factor that determines the upper temperature specification of the relay.

Coil voltage

The normal DC operating voltage of the relay coil.

Cold switching

The technique of applying the current through the switch contacts after the switch has operated and all bounce has ceased. The switch current is then removed before the switch is opened. If possible cold switching is preferred as there will be no switching current surges or arcing. This will maximize contact life.

Contact rating

A Reed Relay has a specification for the voltage, current and power that can be switched. The power rating is the product of the voltage across the open contact immediately before the contact is closed and the initial current switched when the contact first makes.

Contact resistance

The DC resistance of the closed contacts measured at the device terminals. Measurement is made after all contact bounce has ceased and the switch is in a stable state. The term is in reality a misnomer, as only a portion of this figure is due to the resistance of the switch contact point itself. The major part of this figure will be the nickel-iron switch connection leads and the lead-frame on which the relay is constructed. Only the resistance at the contact point will increase with life, the rest will be constant.

Contact

The switch contact is the area of the ferro-magnetic reed switch blades that come together to complete the electrical circuit when the coil is operated. This contact area is usually plated, galvanically or by vacuum deposition, with a suitable material, usually rhodium or ruthenium. In the case of very high voltage switches, it is usually tungsten due to its high melting temperature and resistance to welding due to arcing.

Duty cycle

The ratio of energized to de-energized time.

Electrostatic shield

A wrap of material, usually copper, between the switch and the operating coil. This is usually connected to one pin and to an earth connection to minimize the capacitive coupling of noise between the coil and the signal on the switch contacts.

Form A

Normally Open, Energize to Make switch configuration. A relay with a single switch would be known as a 1 Form A type or sometimes, Single Pole Single Throw (SPST). A relay with two switches would be a 2 Form A type or Double Pole Single throw (DPST).

Form B

Normally Closed, Energize to Break switch configuration. A relay with a single switch would be known as a 1 Form B type or sometimes, Single Pole Single Throw Normally Closed (SPST Normally Closed).

Form C

Change-over configuration. Each switch has three connections, a Common (or Wiper), a Normally Open (NO) and a Normally Closed (NC). When the relay is energized, the common connection will move from the NC contact to the NO contact with a break before make action. A single switch relay is known as a 1 Form C type or Single Pole Double Throw (SPDT) and a two switch version is a 2 Form C or Double Pole Double Throw (DPDT).

Form D

Change-over configuration. This is unusual for a reed relay but is more common with electromechanical relays. It is like the Form C above but with a make before break action.

Former-less coil

A construction method used extensively by Pickering, where the more usual coil supporting bobbin is eliminated and a self-supporting coil is used. The extra room that this makes available within the relay allows either a smaller package, a higher coil resistance or the use of less sensitive reed switches with inherently higher operating and restoring forces. These are all major advantages of this construction method.

Hermetic seal

With respect to Reed Relays, this usually refers to the glass to metal seal of the Reed Switch capsule itself. The capsule contains either an inert gas, usually nitrogen or in the case of high voltage reeds, a vacuum. The integrity of this seal is of paramount importance.

Hot switching

An arrangement where the voltage to be switched is present at the open contact before the coil is energized and the resultant current is actually switched by the contact as it closes.

Inrush current

The current initially switched when the load is first connected to the source. A high inrush current can sometimes flow through the relay contact when switching a non-linear load. Current surges into capacitive loads can be very damaging and high inrush currents should be avoided.

Insulation resistance

The DC resistance between two specified points. In reed relays this figure is normally specified for both the resistance across the open switch and for the resistance between the switch and the coil connections. The figure is usually very high, in the region of 10^{12} Ohms (1 TOhm) or higher. This figure is normally measured at 25 Degrees Centigrade and may fall slightly at higher temperatures.

Life expectancy

The average number of cycles that a relay will achieve under specified load conditions before the contacts fail due to sticking or excessive contact resistance. Usually expressed as Mean Cycles Before Failure (MCBF) rather than as Mean Time Before Failure (MTBF). Life depends on many factors, the type and level of load, current, voltage, power and the end of life criteria if contact resistance is critical.

Magnetic interaction

The effect of a relay being influenced by the magnetic field from an adjacent, energized relay. The magnetic field from unscreened relays can partially cancel those from adjacent relays, severely changing their operate sensitivity beyond their normal specification limits. A magnetic screen will reduce or eliminate this issue.

Magnetic screen

A ferromagnetic shield, either inside or on the exterior of a relay to reduce the magnetic coupling to adjacent parts. Pickering magnetic screens are mu-metal rather than steel. Mu-metal is preferable due to its high permeability and low magnetic remanence and will eliminate issues due to magnetic interaction between relays.

Mercury wetted relay

A form of reed relay in which the reed contacts are wetted by a film of mercury obtained by capillary action from a mercury pool within the reed switch capsule. This technique removes all contact bounce and generally gives a higher power rating. Traditional mercury wetted relays have to be mounted close to vertical so that the mercury drains correctly but versions with a slightly different construction and a reduced mercury content are available that can be used in any position. Mercury relays are not favoured today due to the restrictions of the RoHS Directive.

Must operate voltage

The specification for the DC voltage applied to the coil at which the relay must have operated. The industry standard for this figure is 75% of its nominal coil voltage at 25 Degrees Centigrade, that is for example, 3.75 Volts for a 5 Volt relay and 9 Volts for a 12 Volt relay. In reality, there will be a good margin on this figure and it will accommodate temperature effects on the coil resistance up to 85 Degrees Centigrade. Relay driver voltage drops should always be considered in the design process.

Must release voltage

The specification for the DC voltage applied to the coil above which the relay must have reverted to its un-operated state. The industry standard for this figure is 10% of its nominal coil voltage at 25 Degrees Centigrade.

Operate time

The time value measured from the energization of the coil to the first contact closure (Form-A) or the contact opening (Form-B). When considering operate delay times, contact bounce must also be considered. Pickering will normally specify Operate Time Including Bounce as this is the important figure. (See also **Actuate time** and **Bounce time**).

Operate voltage

The actual measured coil voltage at which a contact changes from its un-energized condition to its operated state. This voltage will change with temperature as the coil resistance changes. (See **Coil resistance** for explanation).

Release voltage

The actual measured coil voltage at which the contact returns to its de-energized state after the coil drive voltage is removed.

SoftCenter®

A registered Trademark belonging to Pickering Electronics describing the construction using a soft inner encapsulation material to protect the delicate glass/metal seal of the reed switch capsule.

Stand-off voltage

The stand-off voltage is the maximum voltage specification for the open switch contact and should not be exceeded. This level is primarily determined by the size of the contact gap and the type of inert gas used within the reed switch capsule. High voltage reed switches are normally in a vacuum. (See also **Breakdown voltage**).

Switching current

The maximum current that can be hot-switched by a relay. The constraints of the rated contact power and voltage should be considered also. (See **Contact rating**).

Switching voltage

The maximum voltage that can be hot-switched by a relay. The constraints of the rated contact power and current should be considered also. (See **Contact rating**).

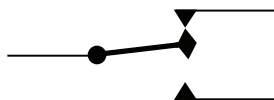
BASIC CIRCUIT SCHEMATICS



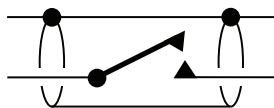
Form A - Energize to Make



Form B - Energize to Break



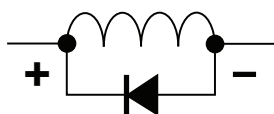
Form C - Change-over



Form A Coaxial - Energize to Make



Operating Coil



Operating Coil with Diode

Global Operations



Pickering operates globally with manufacturing facilities in the UK and Czech Republic, along with additional representation in countries throughout the Americas, Europe, Asia and Australasia.

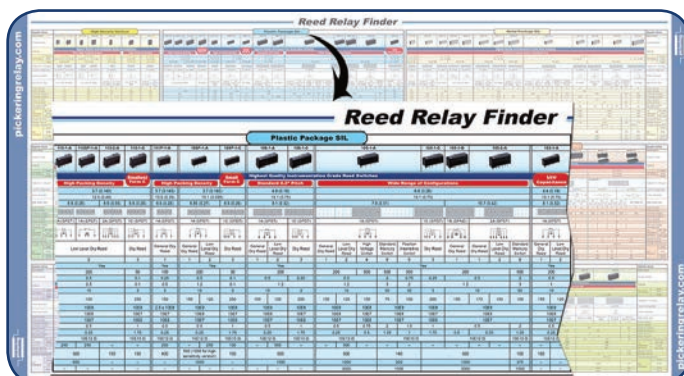
To contact an official Pickering agent please visit: pickeringrelay.com/agents

Support Literature

The Reed RelayMate book from Pickering is an educational book providing an overview of how reed relays work, how they are constructed and how to interpret their specifications and make best use of them in their applications.

The Reed Relay Finder is a single sheet reference to our entire range of high quality reed relays.

For your **free** Reed RelayMate and/or Reed Relay Finder please visit: pickeringrelay.com
Support literature is available to download as a pdf or you can request a hard copy.





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