

- Stacking on **4 mm x 4 mm** pitch allowing the highest packing density currently available
- **3, 5 or 12 V** 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
- Sputtered ruthenium instrumentation grade switch
- Insulation resistance **>10<sup>12</sup> Ω**
- **Additional build options are available**
- Many benefits compared to industry standard relays (see last page)



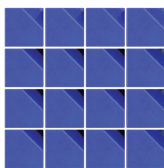
The Series 120 reed relay range takes up the minimum board area making them ideal for very high density applications such as A.T.E. switching matrices or multiplexers. Requiring a board area of only 4 mm x 4 mm, these relays allow the highest packing density currently available.

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.

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 2 mm 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 4 mm pitch.

## Examples of Packing Density

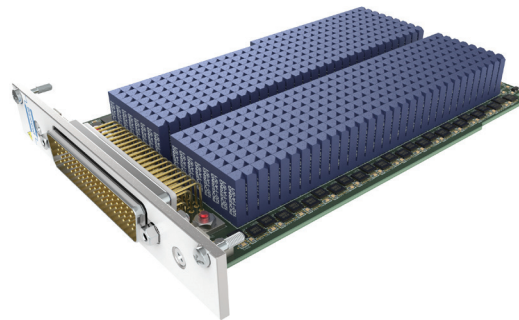


Pickering Electronics' Series 120



Industry standard reed relay of the same electrical specification

The above actual size graphic shows sixteen Series 120 Relays packed into an area of 1.6 cm x 1.6 cm. In comparison, only four of the industry standard reed relays can be fitted into the same area.



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

## Switch Ratings - Dry Switches

1 Form A (energize to make)
20 W at 200 V
15 W at 200 V
10 W at 200 V

## Series 120 switch ratings - contact ratings for each switch type

Switch No	Switch form	Power rating	Max. switch current	Max. carry current	Max. switching volts	Life expectancy ops typical (see Note <sup>1</sup> )	Operate time inc bounce (max)	Release time	Special features
1	A	20 W (~15W)	1.0A	1.2A	200	10 <sup>9</sup>	0.5 ms	0.2 ms	General purpose
2	A	10W	0.5A	1.2A	200	10 <sup>9</sup>	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.

### Note<sup>1</sup>: 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 10<sup>9</sup> ops. At the maximum load (resistive), typical life is 1 x 10<sup>7</sup> 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.

## 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

## Environmental Specification/Mechanical Characteristics

In the table below, 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](mailto:sales@pickeringrelay.com) for assistance.

Operating Temperature Range	-20 °C to +85 °C
Storage Temperature Range	-35 °C to +100 °C
Shock Resistance	50 g
Vibration Resistance (10 - 2000 Hz)	20 g
Soldering Temperature (max) (10 s max)	270 °C
Washability (Proper drying process is recommended)	Fully Sealed

## Dry Relay: Series 120 Coil data and type numbers

Device Type	Type Number	Coil (V)	Coil resistance	Max. contact resistance (initial)	Insulation resistance (minimum)		Capacitance (typical) (see Note <sup>2,3</sup> )	
					Switch to coil	Across switch	Closed switch to coil	Across open switch
1 Form A, Switch No. 1 (*Note 15 W for 3 V coil) Package Type 1	120-1-A-3/1 *	3	200 Ω	0.18 Ω	10 <sup>12</sup> Ω	10 <sup>12</sup> Ω	2.9 pF	0.14 pF
	120-1-A-5/1	5	300 Ω					
	120-1-A-12/1 †	12	800 Ω					
1 Form A Switch No. 2 Package Type 1	120-1-A-3/2	3	200 Ω	0.18 Ω	10 <sup>12</sup> Ω	10 <sup>12</sup> Ω	2.9 pF	0.14 pF
	120-1-A-5/2	5	500 Ω					
	120-1-A-12/2 †	12	800 Ω					

† See Note<sup>4</sup> below.

### Note<sup>2</sup>: 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.

### Note<sup>3</sup>: Capacitance across open switch

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

### Note<sup>4</sup>: 12 volt coil versions

With limited room inside small packages, it is not possible to achieve the high coil resistance figures that would be preferred, without using extremely fine wire gauges. If these ultra-fine gauges were used, there would be a resultant risk of poorer reliability due to the delicate nature of such wire. Reliability is of paramount importance to Pickering, so ultra fine gauges are avoided. The heating effect from the coil ( $V^2/R$ ) will therefore be higher than for the 3 or 5 volt versions. For example:

**3 volt type:** 200 Ohms = 45 mWatts

**5 volt type:** 300 Ohms = 83 mWatts

**12 volt type:** 800 Ohms = 180 mWatts

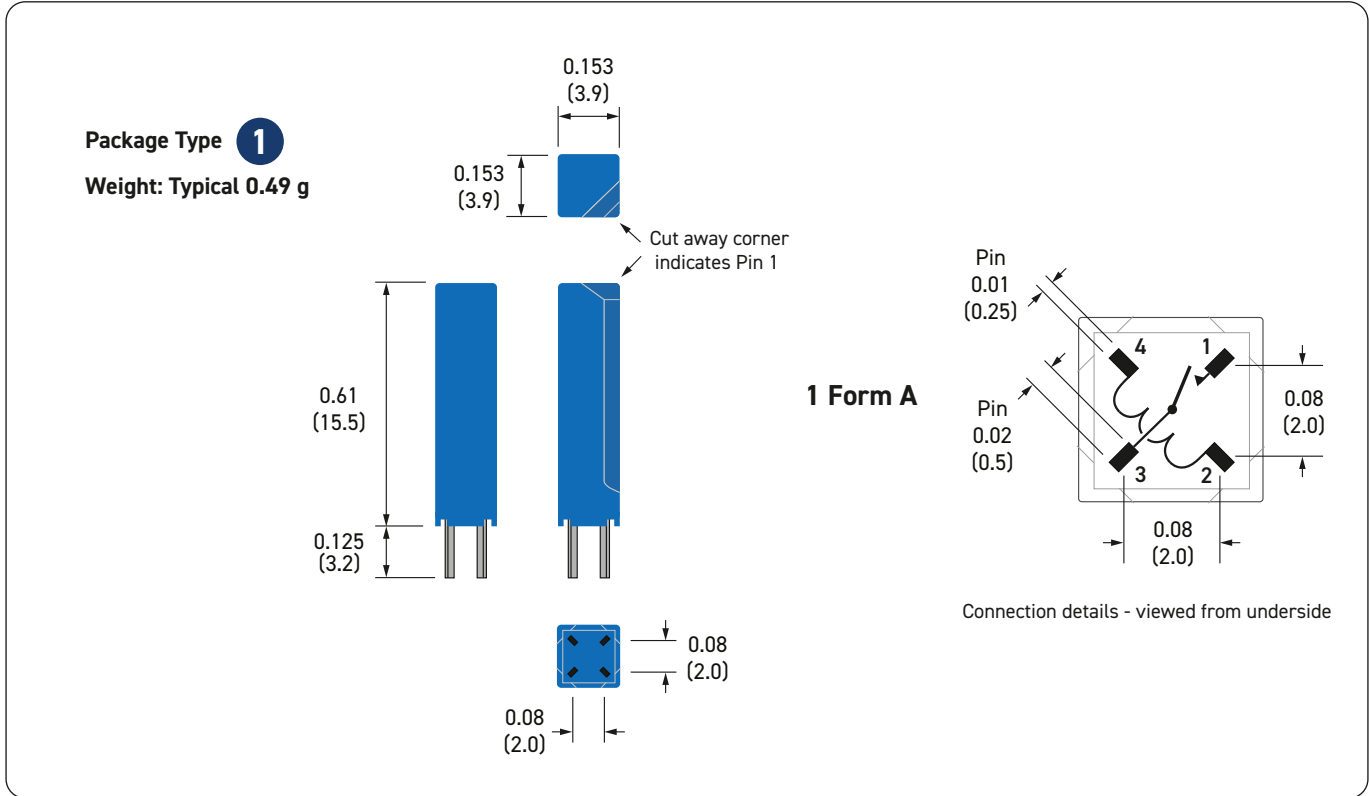
12 Volt versions are suitable for applications such as Multiplexers or Matrices where they are operated on a low duty cycle but consideration should be made where they are left operated for longer due to this heating effect.

The technical information shown in this data sheet could contain inaccuracies or typographical errors. This information may be periodically changed or updated and these changes will be included in future versions of this data sheet.

For different values, latest specifications and product details, please contact you local Pickering sales office.




For **FREE** evaluation samples go to: [pickeringrelay.com/samples](http://pickeringrelay.com/samples)

## Pin Configuration, Weights and Dimensional Data (dimensions in inches, millimeters in brackets)



## Similar Relays Comparison

If the Series 120 is unsuitable for your application, Pickering also manufactures two other series of reed relays with similar characteristics, but in different package sizes.

Series Name		124-1-A	122-1-A	120-1-A	
Physical Outline					
Depth	mm (inches)	3.9 (0.153)	3.9 (0.153)	3.9 (0.153)	
Width		3.9 (0.153)	3.9 (0.153)	3.9 (0.153)	
Height		9.5 (0.375)	12.5 (0.492)	15.5 (0.61)	
Package Volume (mm <sup>3</sup> )		145	191	<b>1</b> 236	
Typical Weights (g)		0.28	0.37	0.49	
Contact Configuration		1-A (SPST)	1-A (SPST)	1-A (SPST)	
Reed Switch Type		Dry	Dry	Dry	Dry
Switching Voltage (V)		170	200	200	200
Switching Current (A)		0.5	0.5	1.0	0.5
Carry Current (A)		0.5	0.5	1.2	1.2
Switch Power (W)		10	10	20/15	10

## Reed Relay Selection Tool

Because Pickering offer the largest range of high-quality reed relays, sometimes it can be difficult to find the right reed relay you require. That is why we created the Reed Relay Selector, this tool will help you narrow down our offering to get you the correct reed relay for your application. To try the tool today go to: [pickeringrelay.com/reed-relay-selector-tool](https://pickeringrelay.com/reed-relay-selector-tool)

## Standard Build Options

The Series 120 Reed Relays are available with a number of standard build options to tailor them to your specific application. These options are detailed in the table below. If you decide to go ahead and specify one, or more, of these options you will be allocated a unique part number suffix.

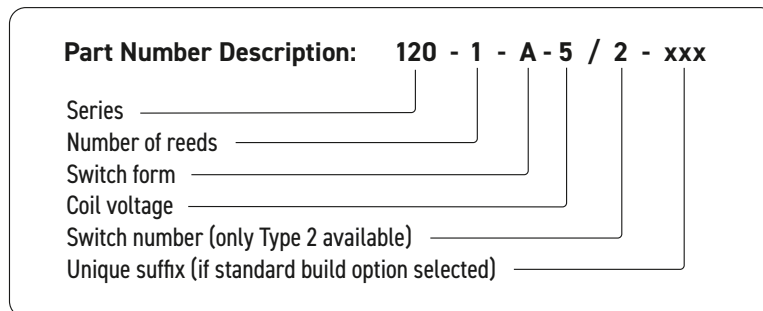
Mechanical Build Options	Electrical Build Options
Special pin configurations or pin lengths	Different coil resistance
Special print with customer's own part number or logo	Operate or de-operate time
	Pulse capability
	Enhanced specifications
	Non-standard coil voltages and resistance figures
	Special Life testing under customer's specific load conditions
	Specific environmental requirements
	Controlled thermal EMF possibility

## Customization

If your specific requirements are not met by standard relay, or any of the standard build options, please speak to us to discuss producing a customized reed relay to service your specific application: [pickeringrelay.com/contact](http://pickeringrelay.com/contact)

## 3D Models

Interactive 3D models of the complete range of Pickering relay products in STEP, IGS and SLDPRN formats can be downloaded from the website: [pickeringrelay.com/3d-models](http://pickeringrelay.com/3d-models)



## Help

If you need any technical advice or other help, 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](mailto:techsales@pickeringrelay.com)

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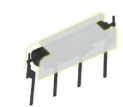
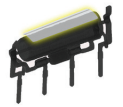


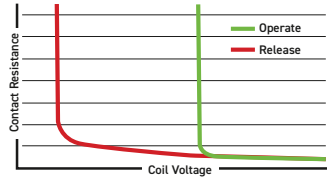

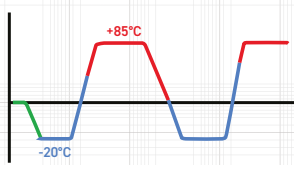

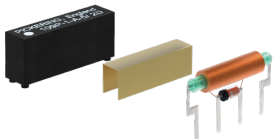

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For a full list of agents, distributors and representatives visit: [pickeringrelay.com/agents](http://pickeringrelay.com/agents)



# 10 Key Benefits of Pickering Reed Relays

Key Benefit	Pickering Reed Relays	Typical Industry Reed Relays	
<b>1</b> Instrumentation Grade Reed Switches	Instrumentation Grade Reed Switches with vacuum sputtered Ruthenium plating to ensure stable, long life up to 5x10E9 operations.	Often low grade Reed Switches with electroplated Rhodium plating resulting in higher, less stable contact resistance.	
<b>2</b> Formerless Coil Construction	Formerless coil construction increases the coil winding volume, maximizing magnetic efficiency, allowing the use of less sensitive reed switches resulting in optimal switching action and extended lifetime at operational extremes.	Use of bobbins decreases the coil winding volume, resulting in having less magnetic drive and a need to use more sensitive reed switches which are inherently less stable with greatly reduced restoring forces.	  Pickering former-less coil      Typical industry coil wound on bobbin
<b>3</b> Magnetic Screening	Mu-metal magnetic screening (either external or internal), enables ultra-high PCB side-by-side packing densities with minimal magnetic interaction, saving significant cost and space. <b>Pickering Mu-Metal magnetic screen - interaction approx. 5%</b>	Lower cost reed relays have minimal or no magnetic screening, resulting in magnetic interaction issues causing changes in operating and release voltages, timing and contact resistance, causing switches to not operate at their nominal voltages. <b>Typical industry screen - interaction approx. 30%</b>	  X-Ray of Pickering mu-metal magnetic screen      X-Ray of typical industry magnetic screen
<b>4</b> SoftCenter™ Technology	<b>SoftCenter™</b> technology, provides maximum cushioned protection of the reed switch, minimising internal lifetime stresses and extending the working life and contact stability.	Rigid hard moulded reed relays result in significant stresses to the glass reed switch which can cause the switch blades to deflect or misalign leading to changes in the operating characteristics, contact resistance stability and operating lifetime.	  Pickering soft center protection of the reed switch      Typical industry thermo-setting hard moulded protection of the reed switch
<b>5</b> 100% Dynamic Testing	100% testing for all operating parameters including dynamic contact wave-shape analysis with full data scrutiny to maintain consistency.	Simple dc testing or just batch testing which may result in non-operational devices being supplied.	<b>Dynamic Contact Resistance Test</b> 
<b>6</b> 100% Inspection at Every Stage of Manufacturing	Inspection at every stage of manufacturing maintaining high levels of quality.	Often limited batch inspection.	
<b>7</b> 100% Thermal Cycling	Stress testing of the manufacturing processes, from -20°C to +85°C to -20°C, repeated 3 times.	Rarely included resulting in field failures.	
<b>8</b> Flexible Manufacturing Process	Flexible manufacturing processes allow quick-turn manufacturing of small batches.	Mass production: Usually large batch sizes and with no quick-turn manufacturing.	
<b>9</b> Custom Reed Relays	Our reed relays can be customized easily, e.g. special pin configurations, enhanced specifications, non-standard coil or resistance figures, special life testing, low capacitance, and more.	Limited ability to customize.	
<b>10</b> Product Longevity	Pickering are committed to product longevity; our reed relays are manufactured and supported for more than 25 years from introduction, typically much longer.	Most other manufacturers discontinue parts when they reach a low sales threshold; costing purchasing and R&D a great deal of unnecessary time and money to redesign and maintain supply.	

For more information go to: [pickeringrelay.com/10-key-benefits](http://pickeringrelay.com/10-key-benefits)