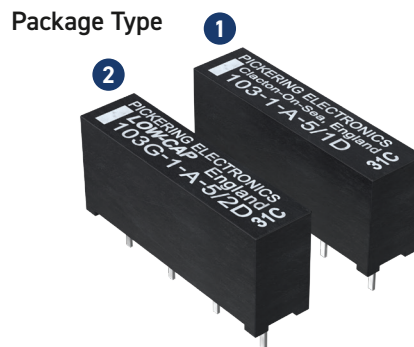


- Up to **20 W** switching
- Stacking on **0.2 Inches** pitch
- Highest quality instrumentation grade switches
- Inter-terminal capacitances are a fraction of that for standard SIL relays
- **1 Form A** or **1 Form A (Coaxial)** configurations
- Pin compatible with standard **0.2 Inch SIL** relays
- Optional internal mu-metal magnetic screen
- Optional internal coaxial electrostatic screen
- Insulation resistance **>10<sup>12</sup> Ω**
- Suitable for wide bandwidth A.T.E. switching matrices and attenuator switching
- **Additional build options are available**
- Many benefits compared to industry standard relays **(see last page)**



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.

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)	1 Form A co-axial (energize to make)
Up to 20 W at 1 A	Up to 20 W at 1 A (50 Ω)

## Series 103 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 (*15 W)	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>8</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 10 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 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

## Coil data and type numbers

Device Type	Switch		Type Number	Coil (V)	Coil resistance	Max. contact resistance (initial)	Insulation resistance (minimum)		Capacitance (typical) (see Note <sup>2</sup> )	
	Form	Type					Switch to coil	Across switch	Closed switch to coil (C1 & C2)	Across open switch (C3)
No magnetic screen or guard screen (*Note 15 W for 5 V coil) Package Type 1	A	1	103-1-A-5/1D *	5	150 Ω	0.15 Ω	10 <sup>12</sup> Ω	10 <sup>12</sup> Ω	0.4 pF	0.13 pF
	A	2	103-1-A-5/2D	5	150 Ω	0.12 Ω				0.10 pF
Magnetic screen only (*Note 15 W for 5 V coil) Package Type 1	A	1	103M-1-A-5/1D *	5	150 Ω	0.15 Ω	10 <sup>12</sup> Ω	10 <sup>12</sup> Ω	0.45 pF	0.13 pF
	A	2	103M-1-A-5/2D	5	150 Ω	0.12 Ω				0.10 pF
Guard screen only (*Note 15 W for 5 V coil) Package Type 2	A	2	103G-1-A-3/2D	3	300 Ω	0.12 Ω	10 <sup>12</sup> Ω	10 <sup>12</sup> Ω	0.1 pF	0.08 pF
	A	1	103G-1-A-5/1D *	5	500 Ω	0.15 Ω				0.10 pF
	A	2	103G-1-A-5/2D	5	500 Ω	0.12 Ω				0.08 pF
	A	1	103G-1-A-12/1D	12	1000 Ω	0.15 Ω				0.10 pF
	A	2	103G-1-A-12/2D	12	1000 Ω	0.12 Ω				0.08 pF
Guard screen and magnetic screen Package Type 2	A	2	103GM-1-A-3/2D	3	300 Ω	0.12 Ω	10 <sup>12</sup> Ω	10 <sup>12</sup> Ω	0.2 pF	0.08 pF
	A	1	103GM-1-A-5/1D	5	500 Ω	0.15 Ω				0.10 pF
	A	2	103GM-1-A-5/2D	5	500 Ω	0.12 Ω				0.08 pF
	A	1	103GM-1-A-12/1D	12	1000 Ω	0.15 Ω				0.10 pF
	A	2	103GM-1-A-12/2D	12	1000 Ω	0.12 Ω				0.08 pF

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

### Note<sup>2</sup>: Capacitance across open switch

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

### Note<sup>3</sup>: Capacitance values

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

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.

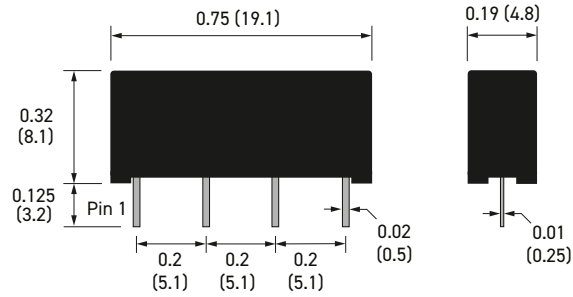
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## Pin Configuration, Weights and Dimensional Data (dimensions in inches, millimeters in brackets)

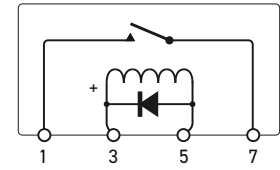
### Package Type 1

**103-1-A**  
Weight: Typical 0.92 g

**103M-1-A**  
Weight: Typical 1.14 g



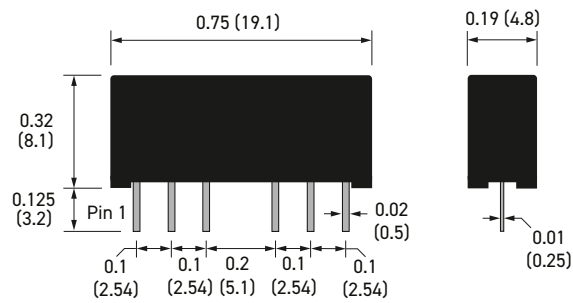
**1 Form A**



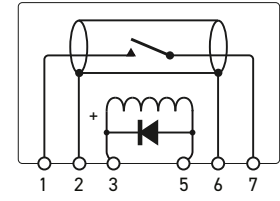
### Package Type 2

**103G-1-A**  
Weight: Typical 1.11 g

**103GM-1-A**  
Weight: Typical 1.28 g



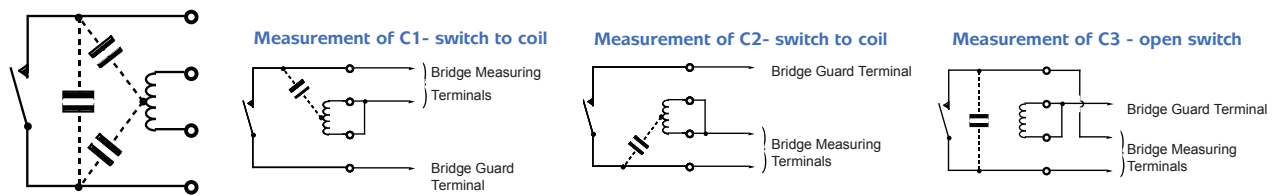
**1 Form A Coaxial**



**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.





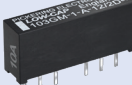
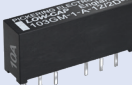
### Simplified Equivalent Circuits

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.



## Similar Relays Comparison

If the Series 103GM is unsuitable for your application, Pickering also manufactures three other reed relay types with similar characteristics, but in different package sizes.

Series Name		111RF-1-A	109RF50-1-A		109RF75-1-A		102M-1-A		102M-1-B		103GM-1-A	
Physical Outline												
Depth	mm (inches)	3.7 (0.145)	3.7 (0.145)		4.8 (0.19)		4.8 (0.19)		4.8 (0.19)		4.8 (0.19)	
Width		10.0 (0.39)	15.1 (0.595)		19.1 (0.75)		19.1 (0.75)		19.1 (0.75)		19.1 (0.75)	
Height		6.6 (0.26)	6.6 (0.26)		7.6 (0.3)		10.2 (0.4)		10.2 (0.4)		8.1 (0.32)	
Package Volume (mm <sup>3</sup> )		245	369		697		936		936		2 743	
Typical Weights (g)		0.56	0.88		0.87		1.43		2.19		1.28	
Contact Configuration		1-A (SPST)	1-A (SPST)		1-A (SPST)		1-A (SPST)		1-B (SPNC)		1-A (SPST)	
Reed Switch Type		Dry	Dry	Dry	Dry	Dry	Dry		Dry		Dry	
Stand-off Voltage (V)		-	-	-	-	-	-	-	-	-	-	-
Switching Voltage (V)		170	200	200	200	200	200	200	200	200	200	200
Switching Current (A)		0.5	1.0	0.5	1.0	0.5	0.5	1	0.5	1	1	0.5
Carry Current (A)		0.5	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2
Switch Power (W)		10	15/20	10	15/20	10	10	20	10	20	20	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](http://pickeringrelay.com/reed-relay-selector-tool)

## Standard Build Options

The Series 103 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.

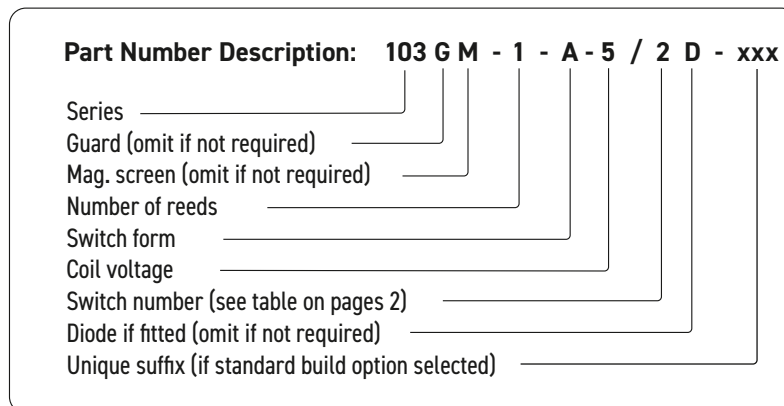
Mechanical Build Options	Electrical Build Options
Special pin configurations or pin lengths	Different coil resistance
Special print with customer's own part number or logo	Very low capacitance
Custom packaging possibility	Operate or de-operate time
	Pulse capability
	Enhanced specifications
	Non-standard 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 SLDPRPT 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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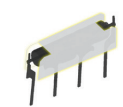
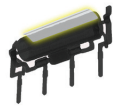


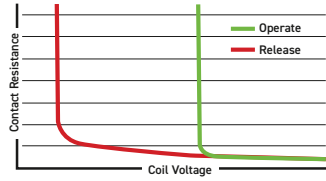

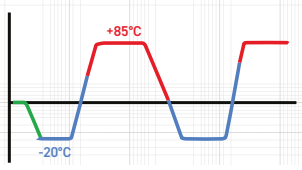

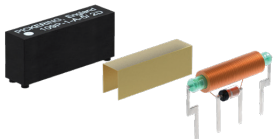

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# 10 Key Benefits of Pickering Reed Relays

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)