

# Pickering Series 103

## Low Capacitance SIL/SIP Reed Relays

Up to 15 Watts switching

Stacking on 0.2 inches pitch

### Features

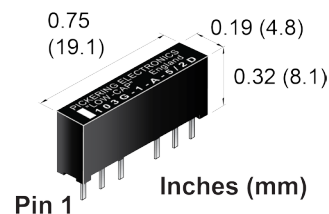
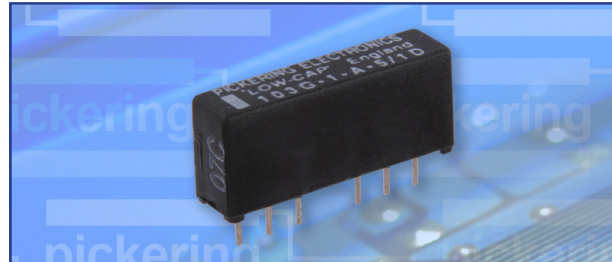
- **SoftCenter®** construction (see adjacent diagram)
- Highest quality instrumentation grade switches
- Inter-terminal capacitances are a fraction of that for standard SIL relays
- Pin compatible with standard 0.2 inch SIL relays
- Optional internal mu-metal magnetic screen
- Optional internal coaxial 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.



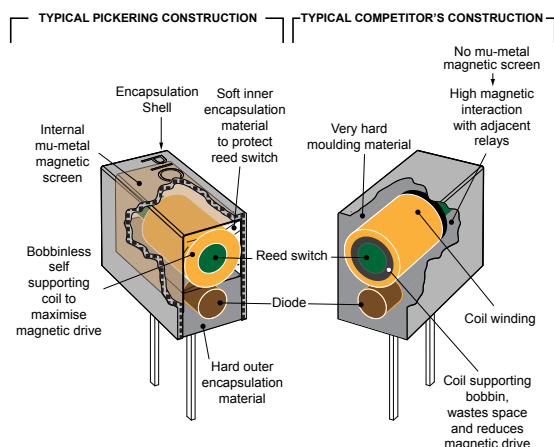
### Switch Ratings

- 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 <sup>1</sup> 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 <sup>2</sup> 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	10E12 Ω	10E12 Ω	0.4 pF	0.10 pF
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	10E12 Ω	10E12 Ω	0.45 pF	0.10 pF
Guard screen only	A	2	103G-1-A-3/2D	3	300 Ω	0.12 Ω	10E12 Ω	10E12 Ω	0.08 pF	0.10 pF
	A	1	103G-1-A-5/1D	5	500 Ω	0.15 Ω	10E12 Ω	10E12 Ω	0.1 pF	0.08 pF
	A	2	103G-1-A-5/2D	5	500 Ω	0.12 Ω	10E12 Ω	10E12 Ω	0.1 pF	0.08 pF
	A	1	103G-1-A-12/1D	12	1000 Ω	0.15 Ω	10E12 Ω	10E12 Ω	0.1 pF	0.10 pF
Guard screen and	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	10E12 Ω	10E12 Ω	0.2 pF	0.10 pF
Magnetic screen	A	2	103GM-1-A-5/2D	5	500 Ω	0.12 Ω	10E12 Ω	10E12 Ω	0.2 pF	0.08 pF
	A	1	103GM-1-A-12/1D	12	1000 Ω	0.15 Ω	10E12 Ω	10E12 Ω	0.2 pF	0.10 pF
A	2	103GM-1-A-12/2D	12	1000 Ω	0.12 Ω	10E12 Ω	10E12 Ω	0.2 pF	0.08 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

## 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.

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

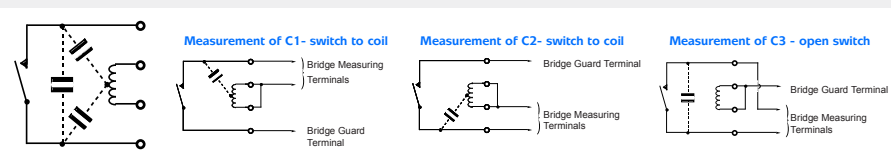
The capacitance across the open switch was measured with other connections guarded.

## 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.

## 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.



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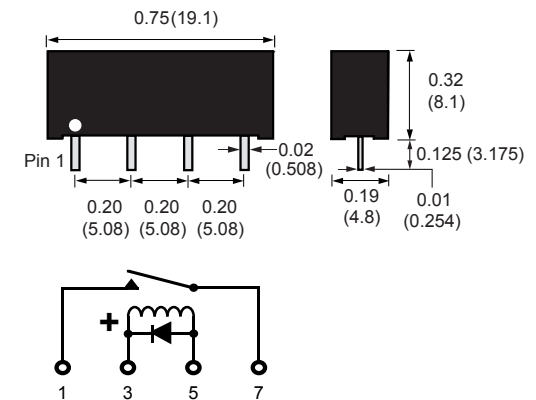
email: sales@pickeringrelay.com  
Tel. (UK) 01255 428141  
(International) +44 1255 428141  
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(International) +44 1255 475058



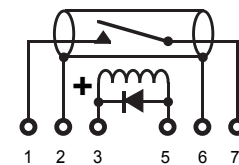
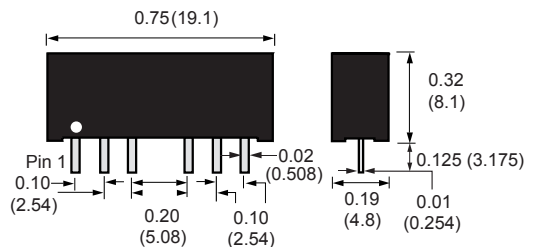
ISO9001 Manufacture of  
Reed Relays FM 29036

## 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.**