Pickering Series 103

Low Capacitance 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
- 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 \(10^{12}\) Ω
- 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), up to 20 watts at 1 Amp
- 1 Form A (co-axial), up to 20 watts at 1 Amp.

**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:

<table>
<thead>
<tr>
<th>Switch No</th>
<th>Switch form</th>
<th>Power rating</th>
<th>Max. switch current</th>
<th>Max. switch current</th>
<th>Max. switching voltage</th>
<th>Life expectancy (ops typical) (see Note1 below)</th>
<th>Operate time inc bounce (max)</th>
<th>Release time</th>
<th>Special features</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>A</td>
<td>20 W</td>
<td>1.0 A</td>
<td>1.2 A</td>
<td>200</td>
<td>10^6</td>
<td>0.5 ms</td>
<td>0.2 ms</td>
<td>General purpose</td>
</tr>
<tr>
<td>2</td>
<td>A</td>
<td>10 W</td>
<td>0.5 A</td>
<td>1.2 A</td>
<td>200</td>
<td>10^6</td>
<td>0.5 ms</td>
<td>0.2 ms</td>
<td>Low level</td>
</tr>
</tbody>
</table>

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

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

### Operating voltages

- **Coil voltage - nominal**:
  - 3 V: 2.25 V
  - 5 V: 3.75 V
  - 12V: 9 V

- **Must operate voltage - maximum at 25°C**: 0.3 V
- **Must release voltage - minimum at 25°C**: 0.3 V

**Dry Relays - Data and type numbers**

<table>
<thead>
<tr>
<th>Config</th>
<th>Switch Form</th>
<th>Type</th>
<th>Number</th>
<th>Coil (V)</th>
<th>Resistence</th>
<th>Insulation resistance (minimal)</th>
<th>Capcitance (typical) (see Note1 below)</th>
<th>Across open switch (C3)</th>
</tr>
</thead>
<tbody>
<tr>
<td>No</td>
<td>Magnetic screen or Guard (omit if not required)</td>
<td>A</td>
<td>2</td>
<td>103-1-A-5/1D</td>
<td>5</td>
<td>150 Ω</td>
<td>0.10 pF</td>
<td>0.13 pF</td>
</tr>
<tr>
<td></td>
<td>Magnetic screen only</td>
<td>A</td>
<td>2</td>
<td>103M-1-A-5/1D</td>
<td>5</td>
<td>150 Ω</td>
<td>0.10 pF</td>
<td>0.13 pF</td>
</tr>
<tr>
<td></td>
<td>Guard screen or Guard (omit if not required)</td>
<td>A</td>
<td>2</td>
<td>103G-1-A-5/1D</td>
<td>5</td>
<td>150 Ω</td>
<td>0.10 pF</td>
<td>0.13 pF</td>
</tr>
<tr>
<td></td>
<td>Guard screen only</td>
<td>A</td>
<td>2</td>
<td>103G-1-A-5/2D</td>
<td>5</td>
<td>150 Ω</td>
<td>0.10 pF</td>
<td>0.13 pF</td>
</tr>
<tr>
<td></td>
<td>Guard screen or Guard (omit if not required)</td>
<td>A</td>
<td>2</td>
<td>103G-1-A-12/1D</td>
<td>12</td>
<td>1000 Ω</td>
<td>0.10 pF</td>
<td>0.10 pF</td>
</tr>
<tr>
<td></td>
<td>Guard screen only</td>
<td>A</td>
<td>2</td>
<td>103G-1-A-12/2D</td>
<td>12</td>
<td>1000 Ω</td>
<td>0.10 pF</td>
<td>0.10 pF</td>
</tr>
</tbody>
</table>

Environmental specification

**Standard operating temperature range**: -20 to +65 °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 1** 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 10^6 ops. At the maximum load (resistive), typical life is 1 x 10^5 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 2** Capacitance across open switch

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

**Note 3** 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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For a full list of agents and representatives visit: pickeringrelay.com/agents

Pin Configuration and Dimensional Data

Dimensions in inches (Millimeters in brackets)

**1 Form A (Energize to make)**

<table>
<thead>
<tr>
<th>Pin 1</th>
<th>0.20 (5.08)</th>
<th>0.19 (4.8)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pin 2</td>
<td>0.20 (5.08)</td>
<td>0.32 (8.1)</td>
</tr>
<tr>
<td>Pin 3</td>
<td>0.19 (4.8)</td>
<td>0.01 (0.254)</td>
</tr>
<tr>
<td>Pin 4</td>
<td>0.19 (4.8)</td>
<td>0.32 (8.1)</td>
</tr>
<tr>
<td>Pin 5</td>
<td>0.19 (4.8)</td>
<td>0.32 (8.1)</td>
</tr>
<tr>
<td>Pin 6</td>
<td>0.19 (4.8)</td>
<td>0.32 (8.1)</td>
</tr>
<tr>
<td>Pin 7</td>
<td>0.19 (4.8)</td>
<td>0.32 (8.1)</td>
</tr>
</tbody>
</table>

**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.

**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**

<table>
<thead>
<tr>
<th>Series</th>
<th>Guard (omit if not required)</th>
<th>Mag. screen (omit if not required)</th>
<th>Number of reeds</th>
<th>Switch form</th>
<th>Coil Voltage</th>
<th>Switch number (See table adjacent)</th>
<th>Diode if fitted (Omit if not required)</th>
</tr>
</thead>
<tbody>
<tr>
<td>103 G M - 1 - A - 5 / 2 D</td>
<td>Guard (omit if not required)</td>
<td>Mag. screen (omit if not required)</td>
<td>Number of reeds</td>
<td>Switch form</td>
<td>Coil Voltage</td>
<td>Switch number (See table adjacent)</td>
<td>Diode if fitted (Omit if not required)</td>
</tr>
</tbody>
</table>

**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 Electronics continue to lead the high-end reed relay market through innovative product design, high performance components and exceptional quality control. Part of the privately-owned Pickering Group, company operations employ around 200 staff across quality accredited factories in the UK and Czech Republic, supplying demanding Aerospace, Infrastructure, Test & Measurement and ATE applications worldwide.

**Reliability through quality** – 50 Year reputation for exceptional product life longevity derived from continuous staged manufacturing inspection, strenuous full range thermal cycling and 100% testing for all operating parameters.

**Reliability through design** – Environmentally compliant designs and unique Softcenter® technology combine to create an optimised assembly that minimises internal lifetime stresses, extending working life and contact stability.

**Switching Performance** – Compared with common bobbin based products, our formerless coil constructions maximise magnetic efficiency resulting in faster switching speeds, optimal switching action and several orders of extended lifetime at operational extremes.

**Cost & Size Performance** – Industry leading mu-metal magnetically screened packages deliver ultra-high PCB packing densities, saving significant cost and space.

**Designers toolkit** – Free samples, worldwide tech support and an unrivalled range of specialist and custom devices, Pickering engineers work alongside customers to deliver problem solving solutions for complex and challenging applications.


**Distribution** – An established global network of group sales offices supported by local agents and distributors, Pickering operate an established logistical supply chain worldwide.

**The Pickering Group** – Employing around 400 staff across 8 sites in the UK and CZ, Pickering Electronics are a key technology partner for Pickering Interfaces and Pickering Connect, supporting the design and manufacture of high performance modular signal switching and simulation systems.

**Why Pickering Electronics?**

**Because Quality Matters**

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