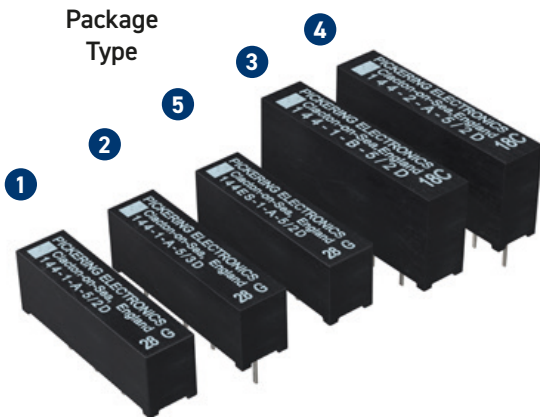
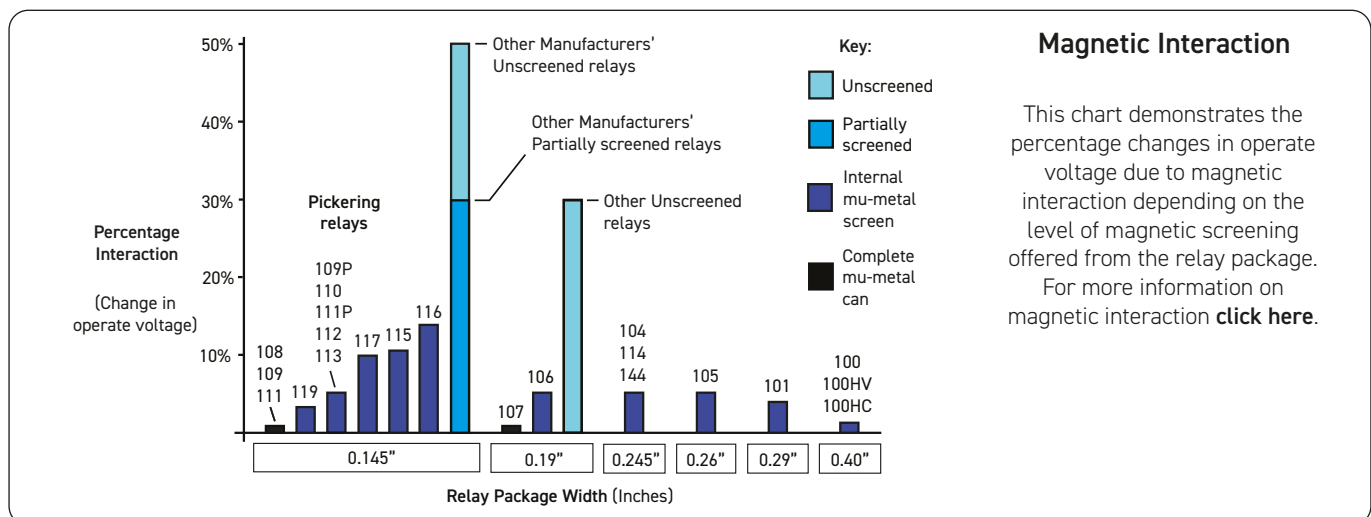


- **1 A** switching at up to **80 W**
- **2 A** switching at up to **60 W**
- Up to **3 kV** stand-off
- Switching Voltage **1000 VDC** up to **10 W**
- Up to **3 A** continuous carry current
- Small size. Stacking on **0.25 Inches** pitch
- Internal mu-metal magnetic screen
- Optional electrostatic screen
- **1 Form A, 2 Form A & 1 Form B** configurations
- **5 V, 12 V** or **24 V** Coils with optional internal diode
- **Additional build options are available including many pin configurations**
- Many benefits compared to industry standard relays [\(see last page\)](#)
- Suitable for high power applications and in many cases, may be used as an alternative to mercury wetted reed relays or miniature electromechanical relays



The Series 144 reed relays are ideal for mixed signal semiconductor testers, photovoltaic and EV applications, mining gas analysis, medical electronics, in-circuit test equipment, high voltage instrumentation, and much more. In many cases they can also be an alternative to mercury wet reed relays or miniature electromechanical relays, where the low level performance and high isolation can be a significant advantage.

The Series 144 feature sputtered ruthenium contacts instead of the more common rhodium associated with higher power reed relays. This combines their ability to switch higher power with excellent low level performance, making them the ideal choice where both high power and low level switching is required. The range also features an internal mu-metal screen to eliminate problems that would otherwise be experienced due to magnetic interaction when they are closely stacked, and an optional electrostatic shield between the switch and coil to minimise noise between the coil drive and high voltage circuits. With a maximum switching voltage of 1000 VDC up to 10 W and the option of 2 or 3 kV DC standoff makes these relays suitable for a very wide range of applications. The 3 kV versions having an increased clearance between the switch and the coil pins to accommodate the higher voltage. For information on the recommended spacing between high voltage parts please see [page 3](#).



Magnetic Interaction

This chart demonstrates the percentage changes in operate voltage due to magnetic interaction depending on the level of magnetic screening offered from the relay package. For more information on magnetic interaction [click here](#).

Switch Ratings - Dry Switches

1 Form A (energize to make)	1 Form B (energize to break)	2 Form A (energize to make)
2000 VDC min stand-off Up to 1000 VDC switching* Up to 80 W switching*	2000 VDC min stand-off Up to 1000 VDC switching* Up to 80 W switching*	2000 VDC min stand-off Up to 1000 VDC switching* Up to 80 W switching*
3000 VDC min stand-off Up to 1000 VDC switching* Up to 80 W switching*	-	-

* See contact ratings.

Dry Reed: Series 144 switch ratings - contact ratings for each switch type

Switch No	Switch form	Power rating	Max. switch current	Max. carry current	Max. switching volts	Min. stand-off volts	Life expectancy ops typical (see Note 1)	Operate time inc bounce (max)	Release time	Special features
2	A or B	80 W	1 A	3 A	250	2000	10 ⁹	1.0 ms	0.5 ms	High voltage
	A or B	60 W	2 A	3 A	250	2000	10 ⁹	1.0 ms	0.5 ms	High voltage
	A or B	10 W	10 mA	3 A	1000	2000	10 ⁹	1.0 ms	0.5 ms	High voltage
3	A	80 W	1 A	3 A	250	3000	10 ⁹	1.0 ms	0.5 ms	High voltage
	A	60 W	2 A	3 A	250	3000	10 ⁹	1.0 ms	0.5 ms	High voltage
	A	10 W	10 mA	3 A	1000	3000	10 ⁹	1.0 ms	0.5 ms	High voltage

For more information for the Series 144 switching specifications, see our application guide [Determining Switching Specifications.](#)

Note 1: Life Expectancy

Relay life depends upon switch load and end of life criteria. For an end of life contact resistance specification of 1Ω, 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 abusive conditions (e.g. high capacitive inrush current) this figure reduces considerably. Pickering can perform life testing with any load conditions.

Operating Voltages - Standard

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

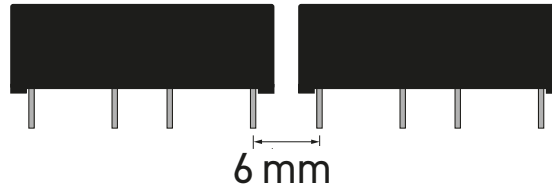
Environmental Specification/Mechanical Characteristics

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 for assistance.

Standard Operating Temperature Range	-20 °C to +85 °C
Standard 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

Recommended Spacing for High Voltage Parts

For high voltages, the recommended space between pins is 2 mm per 1kV stand-off voltage. For example, the 3 kV version of the 144 should have a gap of 6 mm between the pins.



Dry Relay: Series 144 Coil Data and Type Numbers

Device Type	Type Number	Coil (V)	Coil resistance	Max. contact resistance (initial)	Insulation resistance (minimum at 25 °C) (see Note ⁴)		Capacitance (typical) (see Note ²)	
					Switch to coil	Across switch	Closed switch to coil	Across open switch
1 Form A Switch No. 2 (2 kV) Package Type 1 *	144-1-A-5/2D	5	200Ω	0.15Ω	10 ¹² Ω	10 ¹² Ω	2.5pF	0.1pF
	144-1-A-12/2D	12	750Ω					
	144-1-A-24/2D	24	2000Ω					
1 Form A Switch No. 3 (3 kV) Package Type 2	144-1-A-5/3D	5	200Ω	0.15Ω	10 ¹² Ω	10 ¹² Ω	2.5pF	0.1pF
	144-1-A-12/3D	12	750Ω					
	144-1-A-24/3D	24	2000Ω					
1 Form B Switch No. 2 (2 kV) Package Type 3	144-1-B-5/2D	5	300Ω	0.20Ω	10 ¹² Ω	10 ¹² Ω	2.5pF	0.1pF
	144-1-B-12/2D	12	1000Ω					
	144-1-B-24/2D	24	2200Ω					
2 Form A Switch No. 2 (2 kV) Package Type 4	144-2-A-5/2D	5	100Ω	0.20Ω	10 ¹² Ω	10 ¹² Ω	See Note ³	See Note ³
	144-2-A-12/2D	12	350Ω					
	144-2-A-24/2D	24	1000Ω					

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

* Package Type 2 available, contact Pickering for more details.

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.

Note⁴: Insulation resistance

Insulation resistance will reduce at higher temperatures. For more information on temperature effects [click here](#), or [contact Pickering](#) for more in depth guidance.

Dry Relay: Series 144 (Electrostatic Shield) Coil Data and Type Numbers

Device Type	Type Number	Coil (V)	Coil resistance	Max. contact resistance (initial)	Insulation resistance (minimum at 25 °C) (see Note ³)		Capacitance (typical) (see Note ²)	
					Switch to coil	Across switch	Closed switch to coil	Across open switch
1 Form A (ES Shielded) Switch No. 2 (2 kV) Package Type 5	144ES-1-A-5/2D	5	50Ω	0.15Ω	10 ¹² Ω	10 ¹² Ω	2.5pF	0.1pF
	144ES-1-A-12/2D	12	400Ω					
	144ES-1-A-24/2D	24	1200Ω					
1 Form A (ES Shielded) Switch No. 3 (3 kV) Package Type 5	144ES-1-A-5/3D	5	50Ω	0.15Ω	10 ¹² Ω	10 ¹² Ω	2.5pF	0.1pF
	144ES-1-A-12/3D	12	400Ω					
	144ES-1-A-24/3D	24	1200Ω					

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

Note²: Capacitance across open switch

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

Note³: Insulation resistance

Insulation resistance will reduce at higher temperatures. For more information on temperature effects [click here](#), or [contact Pickering](#) for more in depth guidance.

Washing Guidelines

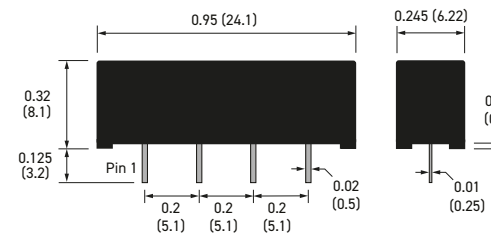
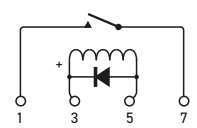
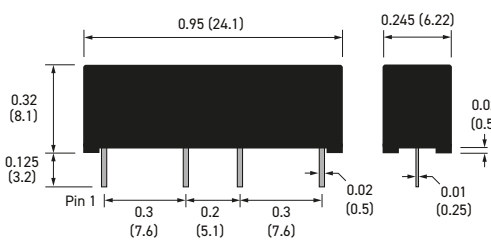
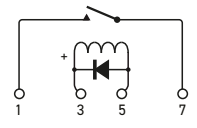
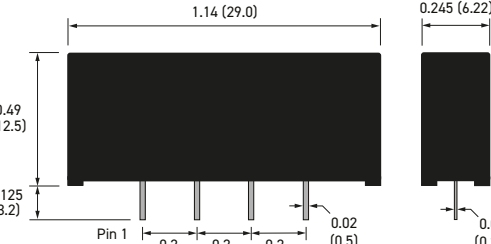
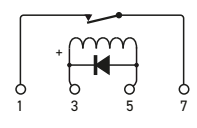
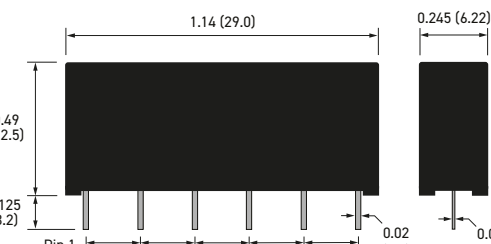
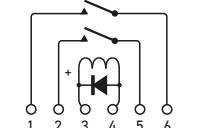
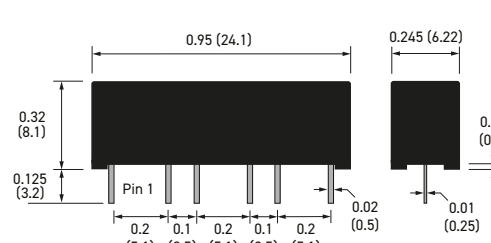
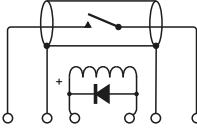
Pickering do not make any specific recommendations on washing reed relays, due to the large number of factors in cleaning processes, however we do have suggestions on best practices. Click [here](#) for more information.

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 your local Pickering sales office.

For **FREE** evaluation samples go to: pickeringrelay.com/samples







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

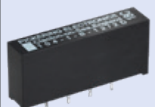
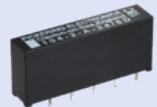

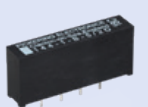
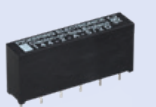

<p>Package Type 1</p> <p>Weight: Typical 2.06 g</p>		<p>1 Form A</p>  <p>Switch No. 2 (2 kV stand-off)</p>
<p>Package Type 2</p> <p>Weight: Typical 2.06 g</p>		<p>1 Form A</p>  <p>Switch No. 3 (3 kV stand-off)</p> <p>Additional Build Options: Switch No. 2 (2 kV stand-off)</p>
<p>Package Type 3</p> <p>Weight: Typical 3.75 g</p>		<p>1 Form B (see Note)</p>  <p>Switch No. 2 (2 kV stand-off)</p>
<p>Package Type 4</p> <p>Weight: Typical 3.70 g</p>		<p>2 Form A</p>  <p>Switch No. 2 (2 kV stand-off)</p>
<p>Package Type 5</p> <p>Weight: Typical 1.94 g</p>		<p>1 Form A Coaxial</p>  <p>Switch No. 2 (2 kV stand-off) Switch No. 3 (3 kV stand-off)</p>

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.

Similar Relays Comparison

If the Series 144 is unsuitable for your application, Pickering also manufactures five other series of reed relays with similar characteristics, but in different package sizes.

Series Name		131-1-A	119-1-A			119-2-A	119-1-B		104-1-A & 104HT-1-A						104ES-1-A		
Physical Outline																	
Depth	mm (inches)	3.7 (0.145)	3.7 (0.145)					6.3 (0.245)									
Width		12.5 (0.49)	15.1 (0.595)	20.1 (0.79)		15.1 (0.595)		24.1 (0.95)									
Height		6.6 (0.26)	6.6 (0.26)			8.9 (0.35)	8.9 (0.35)		8.2 (0.32)								
Package Volume (mm ³)		306	369	491	662	498	1245			1245	1245	1245	1245				
Typical Weights (g)		0.58	0.67	0.74	1.06	0.89	2.06			2.06	2.06	1.94					
Contact Configuration		1-A (SPST)	1-A (SPST)			2-A (DPST)	1-B (SPNC)		1-A (SPST)						1-A (SPST)		
Reed Switch Type		Dry	Dry	Dry	Dry	Dry	Dry	Dry	Dry	Dry	Mercury Wetted	Dry	Dry	Dry	Dry	Dry	Dry
Stand-off Voltage (V)		1500	1500	2000	3000	1500	1500	2000	1500	2000	1500	3000	4000	5000	1500	2000	3000
Switching Voltage (V)		1000	1000					1000			500	1000 (1500)			1000	1000	1000
Switching Current (A)		0.7	0.7					1			2	1			1	1	1
Carry Current (A)		1.25	1.25					1.5			3	1.5			1.5	1.5	1.5
Switch Power (W)		10	10					25			50	25 (3)			25	25	25

Series Name		104-1-B		104-2-A			144-1-A		144-1-B	144-2-A		144ES-1-A					
Physical Outline																	
Depth	mm (inches)	6.3 (0.245)										6.3 (0.245)					
Width		29 (1.14)					24.1 (0.95)		29.0 (1.14)	29.0 (1.14)		24.1 (0.95)					
Height		12.5 (0.49)										8.2 (0.32)		12.5 (0.49)	12.5 (0.49)		8.2 (0.32)
Package Volume (mm ³)		2284		2284			① 1245	② 1245	③ 2284	④ 2284		⑤ 1245					
Typical Weights (g)		3.75		3.70			2.06	2.06	3.75	3.70		1.94	1.94				
Contact Configuration		1-B (SPNC)		2-A (DPST)			1-A (SPST)	1-A (SPST)	1-B (SPNC)	2-A (DPST)		1-A (SPST)	1-A (SPST)				
Reed Switch Type		Dry	Dry	Dry	Dry	Mercury Wetted	Dry	Dry	Dry	Dry		Dry	Dry				
Stand-off Voltage (V)		1500	2000	1500	2000	1500	2000	3000	2000	2000		2000	3000				
Switching Voltage (V)		1000		1000			500	1000 (250)	1000 (250)	1000 (250)	1000 (250)		1000 (250)	1000 (250)			
Switching Current (A)		1		1			2	2 (1 / 0.01)		2 (1 / 0.01)	2 (1 / 0.01)		2 (1 / 0.01)				
Carry Current (A)		1.5		1.5			3	3		3	3		3				
Switch Power (W)		25		25			50	80 (60 / 10)		80 (60 / 10)	80 (60 / 10)		80 (60 / 10)				

Series Name		100HV-1-A			100HV-1-B		100HV-2-A	
Physical Outline								
Depth	mm (inches)	10.2 (0.40)			10.2 (0.40)		10.2 (0.40)	
Width		24.1 (0.95)			29 (1.14)		29 (1.14)	
Height		12.7 (0.50)			15.2 (0.60)		15.2 (0.60)	
Package Volume (mm ³)		3122		3122	4496		4496	
Typical Weights (g)		6.99			8.75		8.75	
Contact Configuration		1-A (SPST)			1-B (SPNC)		2-A (DPST)	
Reed Switch Type		Dry	Dry	Dry	Dry	Dry	Dry	Dry
Stand-off Voltage (V)		1500	2000	3000	1500	2000	1500	2000
Switching Voltage (V)		1000			1000		1000	
Switching Current (A)		1			1		1	
Carry Current (A)		1.5			1.5		1.5	
Switch Power (W)		25			25		25	

Series Name		219-1-A			219-2-A		219-1-B	
Physical Outline								
Depth	mm (inches)	10.5 (0.42) Body, 13.8 (0.55) Across Legs						
Width		17.2 (0.677)						
Height		8.5 (0.34)						
Package Volume (mm ³)		1535			1535		1535	
Typical Weights (g)		2.12			2.39		2.19	
Contact Configuration		1-A (SPST)			2-A (DPST)		1-B (SPNC)	
Reed Switch Type		Dry	Dry	Dry	Dry	Dry	Dry	Dry
Stand-off Voltage (V)		1500	2000	3000	1500	1500	2000	2000
Switching Voltage (V)		1000						
Switching Current (A)		0.7						
Carry Current (A)		1.25						
Switch Power (W)		10						

Reed Relay Selection Tool

Pickering has created the Reed Relay Selector to assist you in selecting the correct high quality reed relay for your application from our extensive range. To try the tool today go to: pickeringrelay.com/reed-relay-selector-tool

Standard Build Options

The Series 144 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.

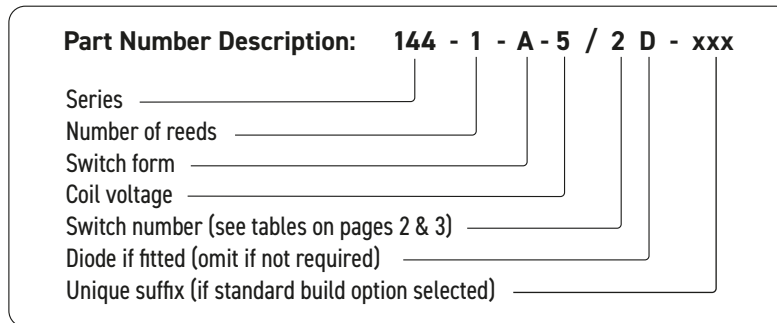
Mechanical Build Options	Electrical Build Options
Special pin configurations or pin lengths	Different coil resistance
Special print with customer's own part number or logo	Different stand-off or switching voltage
Custom packaging possibility	Operate or de-operate time
Equivalents to competitors discontinued parts	Pulse capability
	Enhanced specifications
	Equivalents to competitors discontinued parts
	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

3D Models

Interactive 3D models of the complete range of Pickering relay products in STEP, IGS and SLDPR formats can be downloaded from the website: 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 are happy to discuss any enquires with you. email: techsales@pickeringrelay.com

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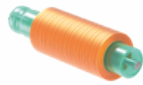
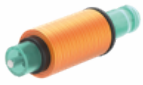




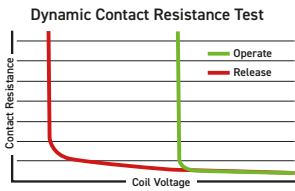

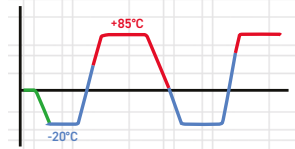

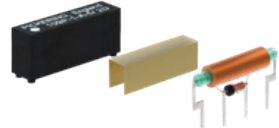

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For a full list of agents, distributors and representatives visit: pickeringrelay.com/agents



Key Benefit	Pickering Reed Relays	Typical Industry Reed Relays	
1 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.	
2 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
3 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. Pickering Mu-Metal magnetic screen - interaction approx. 5%	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. Typical industry screen - interaction approx. 30%	  X-Ray of Pickering mu-metal magnetic screen X-Ray of typical industry magnetic screen
4 SoftCenter™ Technology	SoftCenter™ technology, provides maximum cushioned protection of the reed switch, minimising internal lifetime stresses and extending the working life and contact stability.	Transfer moulded reed relays (produced using high temperature/pressure), 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
5 100% 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.	Dynamic Contact Resistance Test 
6 100% Inspection at Every Stage of Manufacturing	Inspection at every stage of manufacturing maintaining high levels of quality.	Often limited batch inspection.	
7 100% 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.	
8 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.	
9 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.	
10 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