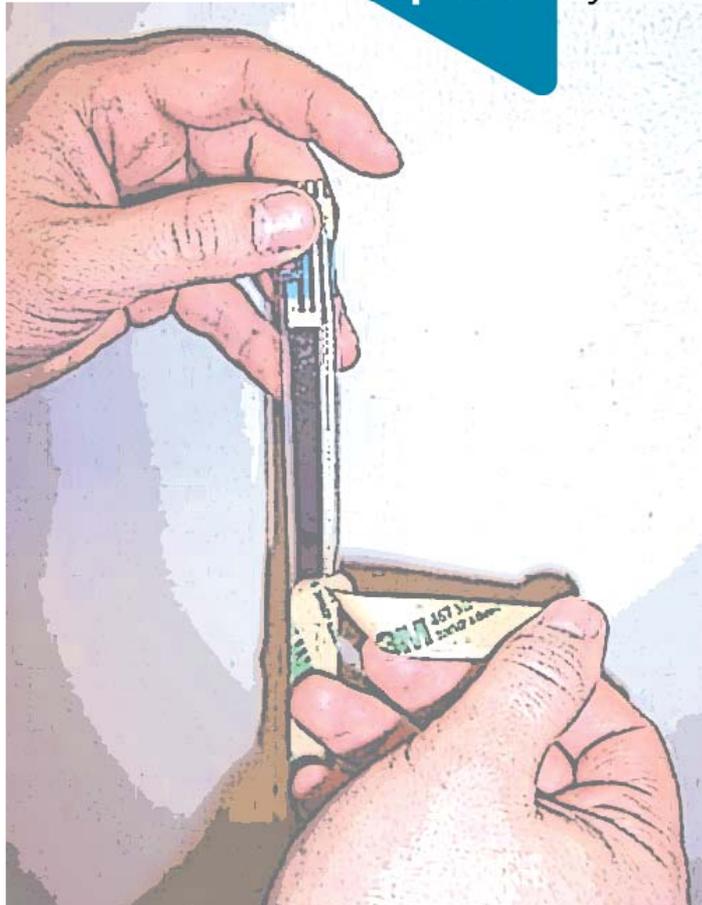


# Infofolder



**... reset your thinking  
think differently...**

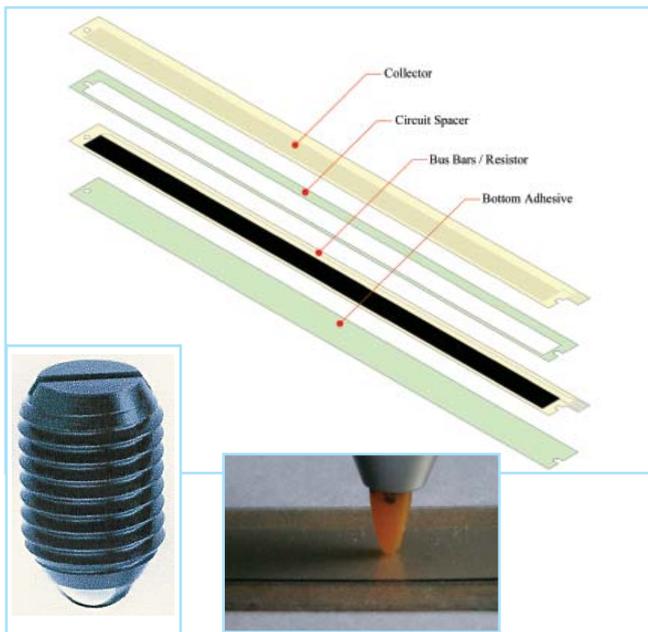


## The company

Spectra Symbol is an American company located in Salt Lake City, Utah, which began in the membrane switch industry in 1975. The owner, David Marriott, oversaw the development of the membrane potentiometer technology and the initial patent of the SoftPot potentiometer in 1982.



Although Spectra Symbol has a strong position in membrane switch technology, this has partnered well with the membrane potentiometer technology, allowing Spectra Symbol to offer sensing and switching on the same substrate. Patents have provided excited opportunities as the membrane potentiometer becomes an international industry standard option in the sensing world.



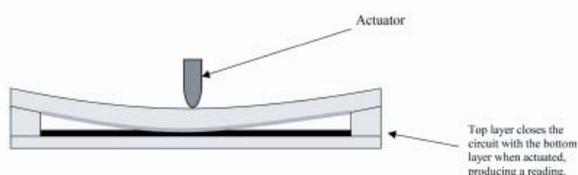
## Membrane Potentiometer

Membrane potentiometers are versatile and user-friendly. Produced in both linear and rotary dimensions, these potentiometers have changed the electrical potentiometer industry. The membrane potentiometers are only 0.5mm in thickness and up to 2400mm in length and can be produced as multipleganged parts. The (foil) membrane potentiometer is made of materials ranging from polyesters to fiberglass, and are covered by many Spectra Symbol patents. This potentiometer also functions as a voltage divider. By pressing the wiper down on the top circuit to close the connection with the bottom circuit, the desired electrical output is achieved. The membrane potentiometer can also be actuated through manual (hand) control. The construction of the wiper design allows for a constantly "open" circuit until the wiper connects the top and bottom circuit.

Spectra Symbol customers use our potentiometers in many applications, like medical, linear drives, valves, pedal switches, Joysticks, door controls, etc.

## Design & Construction

In basic terms, a membrane potentiometer is a conductive plastic sensor with a sealed encasement and with a simple wiper assembly. The wiper is a non-conductive part that connects the top and bottom circuit as the wiper actuates the potentiometer from the outside of the element. The membrane potentiometer is a three-wire system: a layer of material with the resistance output channels two outputs and the other layer serves as the electrical output wiper. The spacing between the top and bottom circuit is 0.127mm of distance that is separated by spacer adhesive build-up in the materials.



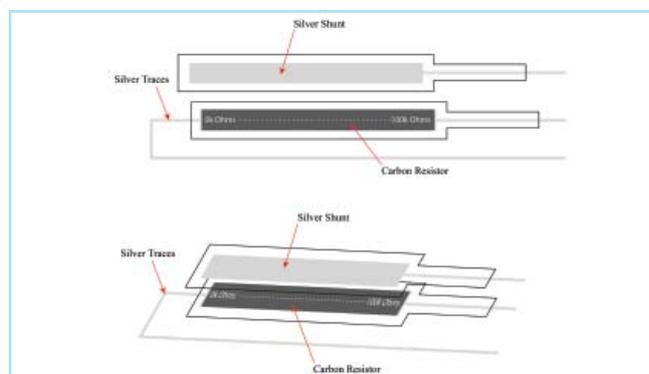
The contact occurs by pressure from the wiper on the top circuit, which pushes down until the top circuit connects with the bottom circuit to create a potentiometric output.

Spectra Symbol provides membrane potentiometers for multiple applications. The temperature ranges allow for applications across the board, from -45 C, to 125 C. Additionally, the life cycle limit is beyond 10 million cycles.

Some of the basic benefits the membrane potentiometer offers:

- Less expensive sensor element than classic potentiometers
- An inexpensive mounting system
- Thin product height (0.5mm)
- No radial load problems
- Low initial cost for customization
- Higher wiper current possible

Spectra Symbol has nearly a quarter century of membrane potentiometer production and development, and has been able to adapt and improve for the needs of its customers.



With a thickness of less than 0.5mm, the possibility of application fit and function together with price make it an attractive sensing component for many industries.

## Inexpensive Customized Applications

Our tooling costs for customized applications are economical, making a unique design within the prototype budgets of any corporation. Our design staff and field representation in most countries can help design the optimum use of our membrane potentiometer for specific applications. Just ask a local representative.

We hold multiple patents in the membrane potentiometer technology, some patents were established as recently as this current year. Our membrane potentiometer products are continually expanding and our technology is the most advanced for this field in the world.

If you have a design, feel free to send it by paper, fax, or (preferred), as an electronic file via email.

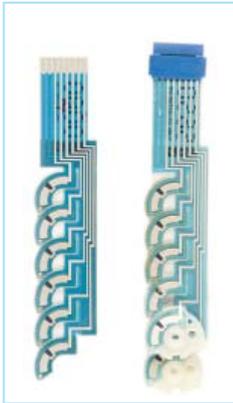
**Our design team most often works in the following programs:** Auto-CAD, Adobe Illustrator, Corel Daw

### Accepting file types:

.pdf, .dxf, .dwg, .ai, .cdr, .eps, .def, .wmf, .emf, .ps, .jpg, .gif, .tif, .bmp and most other image files.

## Applications

The membrane potentiometer is versatile, and can be used as a replacement sensor for current applications, reducing costs



in the actual sensor cost and in the application space, weight and fixturing costs. Linear applications for similar potentiometer output will cost up to 10X's the cost of the Spectra Symbol linear membrane potentiometer. We have saved in cost of production and in material.



This is a more efficient measurement system. In the rotary applications, side-load is a thing of the past with this improved potentiometer construction. Just ask our specialists

how they can help you improve your sensing.

The need for multiple potentiometers ganged together is solved by the Spectra Symbol membrane potentiometers. We have produced up to 40 potentiometers on the same substrate.

The picture demonstrates this application for a medical device company—and it is strong in the sterile and radioactive environment.

Multiple applications call for our potentiometer technology: medical, aerospace, industrial and automotive. Let us know how we can help you—our thin and elegant sensor can provide solutions for most position feedback needs. Our potentiometers work well in refrigerated storage and in high temperature machinery. Also, it is simple to adhere our pots directly onto a PCB that requires linear motion. Linear elements can be produced up to 2,400 mm in length, rotative up to 45cm diameter.

## Costs

Costs will always depend on many factors. While the membrane pot is not cheap, it is competitive with the traditional potentiometer technology and can save in the application.

In linear sensing, however, the membrane potentiometer offers a significant savings.

Call or visit our website at [www.spectrasymbol.com](http://www.spectrasymbol.com) and we will gladly assist you with a quotation and assist you in the fit of our technology into your application.

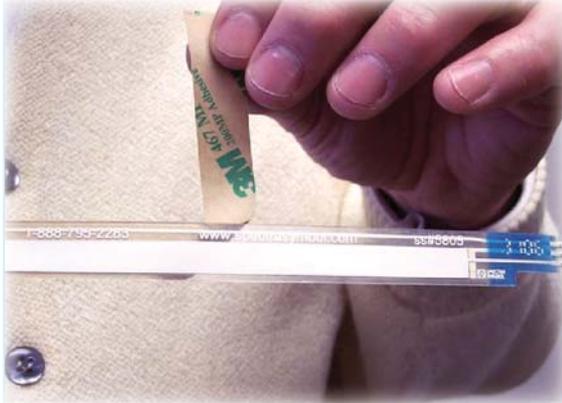
## Product description

■ SoftPot is the name of our membrane potentiometer recommended for commercial use. It works at temperatures of -45°C to 60°C in wiper-actuated applications reliably, while manual control (pressure on the top circuit with the finger) permits 75°C.

### Features

- Commercial temperatur range
- Life cycle time up to 1m cycles
- Human or actuator interface





■ ShieldedPot is called our patented new development, which advised starting from 2007 for the series production. It is settled technically and commercially between SoftPot and HotPot.

#### Features

- Industrial temperatur range
- High life cycle time
- Stable surface

■ HotPot is the name of our industrial use potentiometer. It is based on the SoftPot technology, yet uses a different substrate based on fiber glass, which permits a work temperature from -40°C to 125°C and 10 times increased life cycles from the SoftPot.

#### Features

- Higher industrial temperatur range
- Lifecycle time  $\geq 10m$  cycles
- Metall wiper for high life cycle



**Connectors** can be application customized. The tail length will vary often, as will the required contacts at the end of the tail. We offer a variety of solutions that are cost effective to connect to PCBs, wire, etc. Please note our standards in the data sheets.

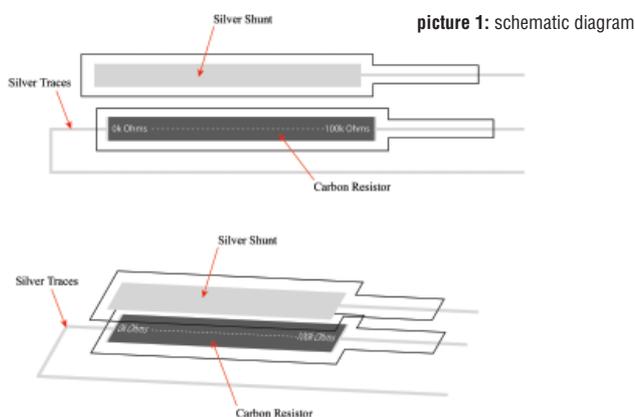
**Wipers** can comprise of spring-wipers, ball-plungers, rollers and sliders. To reduce costs, it is often useful to create the wiper together with the motion device, so that, for example, the lead screw has a plastic wiper attached to the screw to capture the motion as it moves by contacting the membrane potentiometer. We are happy to help you design the best wiper for your applications or recommend an off-the-shelf solution. Our standards are noted in the respective data sheets.

**Resistance** is created based on the length and thickness of the resistive substrate. The output is standard for the industry.



## Cost savings in product and mounting

With the membrane potentiometer “SoftPot” and “HotPot”, there is a flexibility for linear, rotary or custom designed for feedback or position signal. Embedded functions like a switch or wiper protection are possible. The operating temperature range is -40 C to +125 C. The construction is shown in the picture to the right. All of our membrane potentiometers are sealed to IP65.



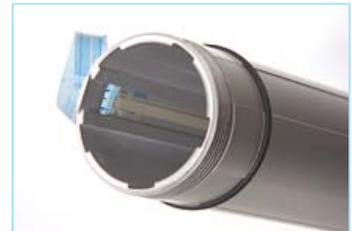
Spectra Symbol has been producing potentiometers since the early 1980's. Previously, this technology was not penetrating the market because of the low temperature requirements (not to exceed +60 C) due to material limitations. But Spectra Symbol obtained improved performance material which increased the temperature rating to +125° C.

We will demonstrate cost savings in current applications up to 30%, but we will also demonstrate system cost reductions. The main reason for savings in system costs is the form factor and mounting capability.



One excellent application is in actuators/servo drives. In this kind of application, savings of 10-45% are realized. Often our pot replaces an external linear sensor or an embedded sensor in the drives. These solutions take a great deal of space, while the traditional smaller solutions have

the disadvantage of an indirect measurement. The membrane potentiometer can be applied inside or outside the actuator/ drive casing. The picture to the left shows how the pot can be mounted inside without changing the dimensions. Within seconds, the pot is adhered to the inside of the actuator body and a contact wiper, such as plastic will be mounted on the moving shaft. The pot will supply a voltage divider signal.



Wipers have the single-most impact on the life of a membrane potentiometer. Typical life cycles should be in the range of 1-10 million cycles (2-20 million movements), with higher cycles possible. Additional R&D is currently being devoted to solutions to replace existing reed contacts for actuators.

Another kind of cost savings you will find on mounted PCB's. In many applications, it is helpful to have the pot and the electronic components on the same PCB.



picture 2:  
all membrane pots  
of us are sealed,  
meet IP 65 or better

Engineers will realize that there exist many methods to add a resistive track to a PC Board, such as printing the track and then adding mounted components. This method works with reflow soldering, but it is difficult with IR soldering.

And with RoHS compliancy implemented, the problem becomes even more challenging. To avoid problems with wave soldering, IR soldering or vapor phase soldering, there is a simple solution: solder first, then attach our completed and sealed 0.5mm membrane potentiometer on the board. That's all.

The material costs can be slightly cheaper with the membrane potentiometer, but the biggest gain can be in the efficiency and reliability. ♦

## Specification: HotPot (yellow colored)

Electrical Specifications	
Resistance Range	1 K ohms to 10 K ohms
Resistance Tolerance	Std. Yield = $\pm 20\%$
Resolution	Theoretical-Infinite; resolution dependant on contact wiper thickness
Linearity	Standard = 3%
Power Rating	1 Watt
Dielectric Value	500 V RMS 60 sec dwell time, no affect
Insulation Value	100 VDC, 60 sec dwell time, no affect
Mechanical Specifications	
Live Cycle	10,000,000 full-travel cycles at 1.1 N of applied force
Travel	10 mm to 2400 mm
Actuation Force	0.8 N - 1.7 N
Shock	3 orthogonal axis, 20 g. peak, 11 msec pulse, no affect
Vibration	10 - 55 Hz with 0.03 amplitude, no affect
Environmental Specifications	
Operating Temperature	-40°C to +125°C
Storage Temperature	-40°C to +125°C
Humidity	No affect @ 95% RH
Altitude	10,000 meters
IP Rating	65 for Pot itself



## Specification: SoftPot (grey colored)

SoftPot - Electrical Specifications	
Resistance Range	1K ohms to 10K ohms
Resistance Tolerance	Std. Yield = $\pm 20\%$
Resolution	Theoretical-Infinite; resolution dependant on contact wiper thickness
Lead line resistance	<2 ohms per inch
Power Rating	1 Watt max
Open Circuit resistance:	
Dielectric Value	No affect @ 500 VAC, 1 minute
Insulation Value	10 mega ohms
Mechanical Specifications	
Cycles	>1 million
Dithers	>5 million
Travel	10 mm to 2400 mm
Actuation Force	0.55 N to 1.5 N, with human interface up to 5 N
Environmental Specifications	
Operating Temperature	-45°C to +60°C; -40°C to +75°C with human interface
Storage Temperature	-65°C to +60°C; +50°C with permanent wiper force
Humidity	No affect @ 95% RH
Shock	No closures>10msec @ 100g half-sine on four sides
Vibration	No closure>10msec @ 1 hour random sine test
Salt Fog	No affect @ 24 hr and 34°C
Altitude	10,000 meters
IP Rating	65 for Pot itself



HotPot

SoftPot

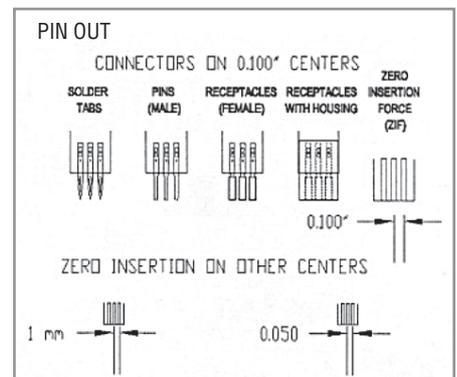
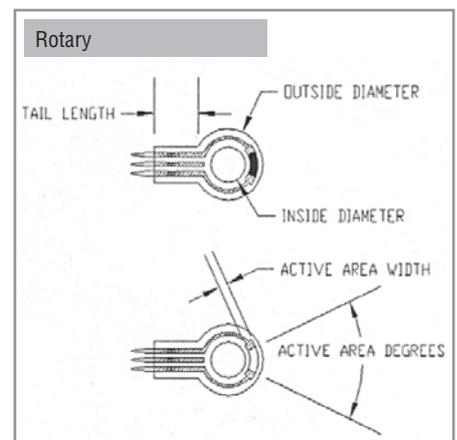
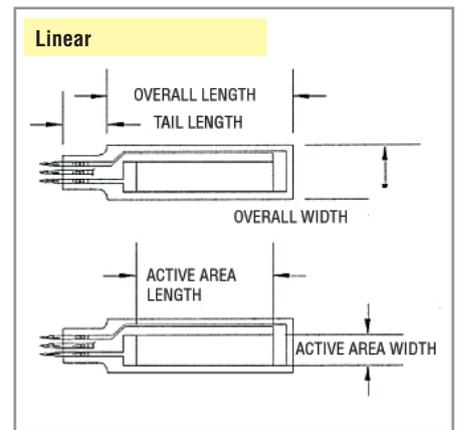
Return by fax to +49 5034 870 430

Customer (Distributor's customer)	State	ZIP *	City

\* ZIP: A = Austria; CH = Swiss; D = Germany; E = Spain; F = France; HR = Croatia; I = Italy, UK = United Kingdom; B = Belgium, CZ = Czech Rep.; DK = Denmark; FIN = Finland; H = Hungaria; IL = Israel; IRL = Ireland; L = Luxembourg; M = Malta; NL = Netherlands; N = Norway; P = Portugal; PL = Poland; RO = Romania; RUS = Russia; S = Sweden; SCG = Serbia+Montenegro; SK = Slovakia; SLO = Slovenia; SU = Serbia/Montenegro; TR = Turkey

Project Reference	
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Mechanical Data	recommended standards	possible values	Customer request
<b>Linear</b>			
Overall length	50 - 760	10 - 2400	mm
Overall width	7.5 - 12.7	on request	mm
Active area width	3 - 6.35	on request	mm
Active area length	40 - 730	10 - 2300	mm
<b>Rotary</b>			
Outside diameter			mm
Inside diameter	outside dia. -15mm	on request	mm
Active area width	3 - 6.35	on request	mm
Active area degrees	depending on dia.	335°	°
Position of active area, scetch or drawing attached <input type="checkbox"/>			
Tail length	min. 13 mm		mm
Seal conditions	meet IP 65	>IP65, Valve	
Operating Temp.: Softpot:	-40°C to 60/75°C		°C
	Hotpot: -40°C to 125°C		°C
Storage Temp			°C
Life cycles	depending on wiper 1 cycle: move 90% electr. travel and back		Million
Dithers	cycles x 5		Million
Wiper force	0.5N - 5.0N (details see spec)		N
Custom drawing			
Connector type			
<b>Electrical Data</b> (detailed spec on <a href="http://www.spectrasymbol.com/techspecs.html">http://www.spectrasymbol.com/techspecs.html</a> )			
Resistance	1kΩ - 10kΩ	1kΩ - 100kΩ	kΩ
Resistance Tolerance	±20%	on request	%
Linearity, independent	±3%	on request	%
Power Derating at 25°C	1 Watt		Watt
Power Derating at 70°C			Watt
Power Derating at 125°C (HotPot only)			Watt



<b>Commercial Data</b> *SOP = Date when massproduction shall start (yy.mm)			
SOP*(start of production)		Quantity 1st year:	Quantity 3rd year:
Target Price (for 1st year)		Quantity 2nd year:	Quantity 4th year: