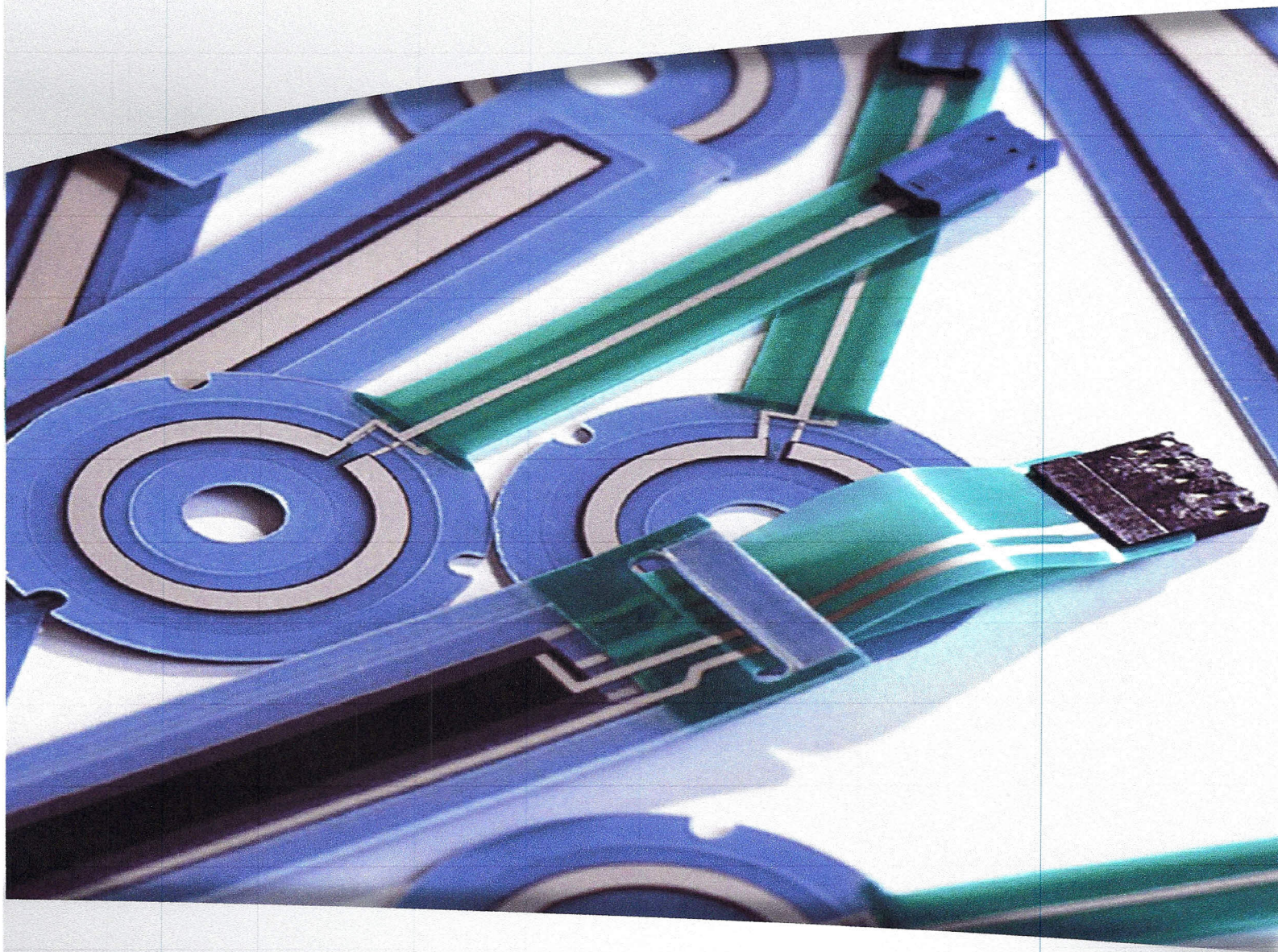




# Membrane Potentiometers



ETI Systems, Inc.  
1954 Kellogg Ave.  
Carlsbad, CA 92008

Tel: 760.929.0749  
Fax: 760.929.0748  
[www.etisystems.com](http://www.etisystems.com)



# MEMBRANE POTENTIOMETER

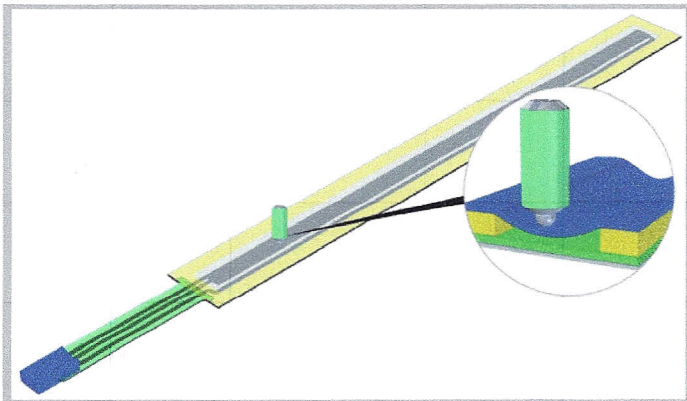
## Product Guide

### FEATURES

- Thickness: 0.7mm (Standard), 1.7mm (Magnetic), and 0.7mm (Hybrid)
- Linear and rotary (incl. multi-turn) designs are possible
- Excellent accuracy and linearity
- Life cycle: between 1 and 20 million operations
- Temperature ranges: up to +125° C (257°F)
- NEMA 4 sealed (IP 42) – Up to IP 67 / NEMA 4X possible upon request
- Non-contact (magnetic) version with excellent product features available
- All products can be fully customized with a short lead time

### COMPOSITION (from bottom to top)

- Adhesive fillm, selection according to requirement
- Basic membrane with potentiometer resistance
- Spacers between upper and lower membrane
- Collector membrane as wiper tap for hand or wiper actuation

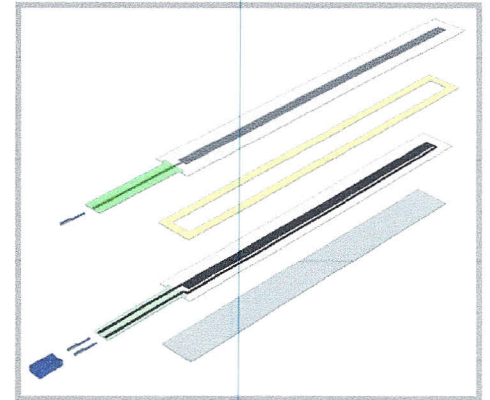


### HOW DOES IT WORK?

Membrane potentiometers are used as voltage dividers and consist of several layers, which are separated by a spacer. These layers are connected to each other through mechanical or magnetical pressure and create a contact. The contact can be made either by hand or by using a mechanical wiper (see picture). It is also possible to have a non-contact operation by using a magnet instead of a wiper.

### CUSTOMIZED DESIGN

There are virtually no limitations when it comes to the customization of membrane potentiometers. No matter if linear, rotary or custom shaped with membrane technology almost any customer requirement can be fulfilled.



### GENERAL PRODUCT INFORMATION

Due to their design of 0.7 mm to 2.2 mm and their simple adaptation to customer requirements, membrane potentiometers from ETI Systems are the perfect solution for restricted installation conditions. The technical specifications of the membrane potentiometers correspond to those of conventional precision potentiometers or even surpass these. They offer an attractive cost advantage and are easy to use.

Standard elements of 50 mm to 500 mm are available, as well as very favorably priced customer-specific variations. In particular, the good repeat accuracy, the easy to achieve redundancy and the problem-free integration represent decisive advantages. The potentiometer follows the shape and function of the specific application: linear, circular or customer-specific shapes are available, on request also with non-contact connection.

Depending on various parameters, the service life comprises 1 million cycles to 20 million cycles and the repeat accuracy 1 mm to 0.5mm. The standard products are sealed to IP 42 with an optional sealing to IP67 / NEMA 4X.



## TECHNICAL SPECIFICATIONS

# Technical Specifications

	foil-based			FR4-based			Options
<b>Electrical Data</b>	Standard	Magnet	Hybrid <sup>(1)</sup>	Standard	Magnet	Hybrid <sup>(1)</sup>	
Resistance / 100mm (Standard)	2.5 kΩ	2.5 kΩ	2.5 kΩ	10 kΩ	10 kΩ	10 kΩ	up to 150 kΩ per 100mm
Resistance Tolerance	± 30%	± 30%	± 30%	± 30%	± 30%	± 30%	± 10%
Linearity (Independent) <sup>(2)</sup>	2% linear		n.a.	2% linear		n.a.	1% (Foil) 0.5% (FR4)
Repeat Accuracy	0.5 mm	1.0 mm	0.75 mm	0.5 mm	1.0 mm	0.75 mm	
Voltage (Standard)	5V to 30 V	5V to 30 V	5V to 30 V	5V to 30 V	5V to 30 V	5V to 30 V	1V to 64V
<b>Mechanical Data</b>	Standard	Magnet	Hybrid	Standard	Magnet	Hybrid	Options
Life Cycle (Operations) <sup>(3)</sup>	> 1 Million	> 20 Million	> 3 Million	> 1 Million	> 20 Million	> 3 Million	
Wiper Force <sup>(4)</sup>	1-3 N		2-6 N	1-3 N		2-6 N	
Recommended Wiper	WSN-3N		WH2-6N	WS1-3N		WH2-6N	
Recommended Magnet		MD44-N52			MD44-N52		
Distance to Magnet in mm		≤ 1.5 mm			≤ 1.5 mm		
Height without connector <sup>(5)</sup>	0.7 mm	1.7 mm	0.7 mm	1.2 mm	2.2 mm	1.2 mm	
Connector (Standard)	Berg 3-pole	Berg 3-pole	Berg 3-pole	Solder Tabs	Solder Tabs	Solder Tabs	Solder Tabs / ZIF
<b>Product Dimensions</b>	Standard	Magnet	Hybrid	Standard	Magnet	Hybrid	Options
<b>Linear</b>							
Stand. length (min./max.) <sup>(5,6)</sup>	50 - 500 mm	50 - 500 mm	50 - 500 mm	50 - 500 mm	50 - 500 mm	50 - 500 mm	9 - 1000 mm
Width (min. / Standard) <sup>(5)</sup>	13 mm / 22 mm	13 mm / 22 mm	16 mm / 22 mm	13 mm / 22 mm	13 mm / 22 mm	16 mm / 22 mm	min. 9 mm
<b>Rotary</b>							
Inside diameter (min./max.) <sup>(5,6)</sup>	0 - 450 mm	0 - 450 mm	0 - 450 mm	0 - 450 mm	0 - 450 mm	0 - 450 mm	Standard 8 mm
Outside diameter (min./max.) <sup>(5)</sup>	22 - 500 mm	22 - 500 mm	22 - 500 mm	22 - 500 mm	22 - 500 mm	22 - 500 mm	Standard 40 mm
<b>Other Specifications</b>	Standard	Magnet	Hybrid	Standard	Magnet	Hybrid	Options
Temperature Range	-40°C / +55°C	-25°C / +55°C	-40°C / +125°C	-40°C / +55°C	-25°C / +55°C	-40°C / +125°C	
	-40°F / +131°F	-13°F / +131°F	-40°F / +257°F	-40°F / +131°F	-13°F / +131°F	-40°F / +257°F	
IP Rating (full product)	IP 54	IP 42	IP 42	IP 42	IP 42	IP 42	up to IP 67

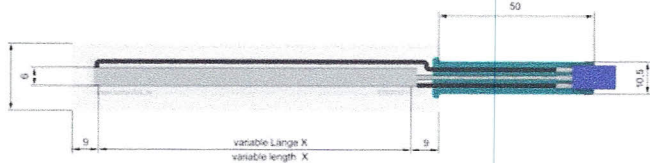
### Remarks:

- (1) Values based on current product development.
- (2) Values can vary depending on customer design.
- (3) Values have been determined with ETI Systems specifications. Life Cycle can vary depending on customer wiper design.
- (4) Recommended magnet MD44-N52 with 2mm distance will create 1N wiper pressure (with standard products).
- (5) Dimensions based on DIN ISO 2768.
- (6) Active electrical path.



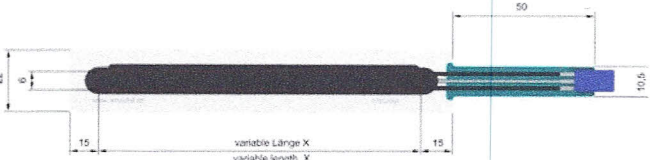
## STOCK PRODUCTS linear membrane potentiometers

STANDARD LINEAR Foil/Foil			
Part #	Active Length	Active Width	Height
SL67600162	50 mm	22 mm	0.7 mm
SL67600163	100 mm	22 mm	0.7 mm
SL67600164	200 mm	22 mm	0.7 mm
SL67600178	300 mm	22 mm	0.7 mm
SL67600172	400 mm	22 mm	0.7 mm
SL67600173	500 mm	22 mm	0.7 mm



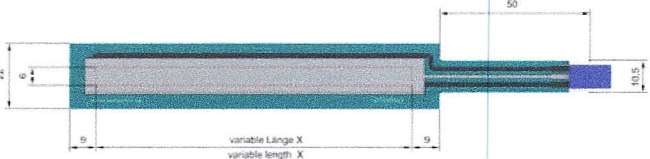
MAGNET LINEAR Foil/Foil			
Part #	Active Length	Active Width	Height
ML67600166	100 mm	22 mm	1.7 mm
ML67600176	300 mm	22 mm	1.7 mm

Standard connector: BERG 3-pole jack connector




HYBRID LINEAR Foil/Foil			
Part #	Active Length	Active Width	Height
HL67600165	100 mm	22 mm	0.7 mm

Standard connector: BERG 3-pole jack connector



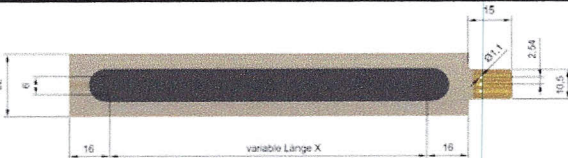
STANDARD LINEAR FR4			
Part #	Active Length	Active Width	Height
FSL6540127	100 mm	22 mm	1.2 mm

Standard connector: Solder tabs



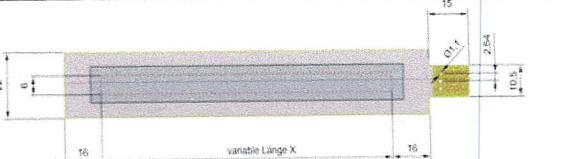
MAGNET LINEAR FR4			
Part #	Active Length	Active Width	Height
FML65400177	100 mm	22 mm	2.2 mm

Standard connector: Solder tabs



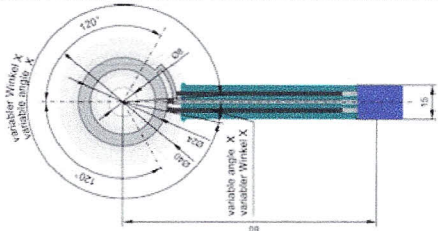
HYBRID LINEAR FR4			
Part #	Active Length	Active Width	Height
FHL65400176	100 mm	22 mm	1.2 mm

Standard connector: Solder tabs

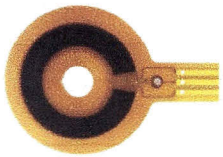


STOCK PRODUCTS rotary membrane potentiometers

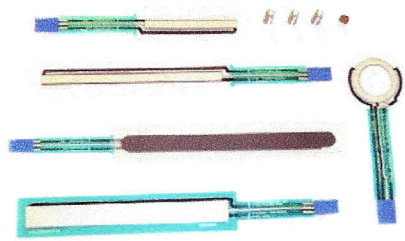
STANDARD ROTARY Foil/Foil			
Part #	Diameter (ins.)	Diameter (outs.)	Radius
SR67600168	8 mm	40 mm	345°
SR67600169	8 mm	40 mm	360°
SR67600178	8 mm	40 mm	90°
SR67600167	8 mm	40 mm	180°
SR67600177	8 mm	40 mm	270°
Standard connector: BERG 3-pole jack connector			



STANDARD ROTARY FR4			
Part #	Diameter (ins.)	Diameter (outs.)	Radius
FR65400178	8 mm	40 mm	340°
Standard connector: Solder tabs			

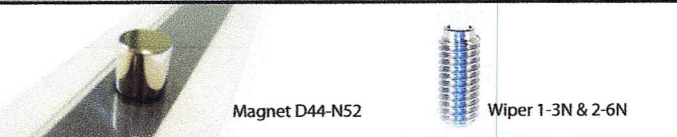


DEVELOPER KIT

DEVELOPER KIT		
Part #	Total Parts	Products
KIT-0001	9 pcs	Standard, Hybrid & Magnet
1 x STANDARD Linear Membrane Potentiometer 50 mm 1 x STANDARD Linear Membrane Potentiometer 100 mm 1 x STANDARD Rotary Membrane Potentiometer 360 1 x HYBRID Linear Membrane Potentiometer 100 mm 1 x MAGNET Linear Membrane Potentiometer 100 mm 2 x WIPER 1-3N for STANDARD 1 x WIPER 3-6N for HYBRID 1 x MAGNET D44-N52 for MAGNET		

ACCESSORIES wipers & magnets

STANDARD ROTARY Foil/Foil			
Part #	Product	For use with	Length
WS1-3N	Wiper 1-3N	Standard	14 mm
WH2-6N	Wiper 2-6N	Hybrid	14 mm
MD44-N52	Magnet D44-N52	Magnet	6.35 mm







## APPLICATIONS and SOLUTIONS

The fields of application for membrane potentiometers from ETI Systems are very diverse. Today, potentiometers are used in numerous applications and many different industries. The following is just a small selection of already realized or potential fields of application:

- **AUTOMOTIVE INDUSTRY**

**Current Applications:** Our membrane potentiometers are currently being used in the new to control various driver inputs such as radio, telephone, navigation, etc. They are also used to control functions such as windshield wipers, head lights, and blinkers in other automotive applications.

**Potential Applications:** Can be used in just about any application involving position adjustment or position sensing. For example, it can control and sense the position of a convertible hood or an electrically adjusted seat of an automobile.

- **MEDICAL INDUSTRY**

**Current Applications:** Used to sense position of an injection plunger that dispenses anesthesia to a patient in an operating room. It is also used to sense position of certain mammogram machine components and operating table positions.

**Potential Applications:** Can be used as an input system (alternative to knobs) or also to determine accurate values for pumps and other moving components.

- **FOOD PROCESSING INDUSTRY**

**Current Applications:** Mainly used as an input system to replace external knobs or keys. Especially the density (IP65/NEMA 4X) and the easy-to-clean options are featured highlights.

**Potential Applications:** Can be incorporated into touch screens to add scroll functions and can be used in various applications such as setting refrigerator and freezer temperatures. Hybrid or Magnet are great for position sensing in automated food packaging systems.

- **DOOR SYSTEMS**

**Current Applications:** Transportation applications have been successfully realized, mainly to sense the position of doors on buses and trains. Our rotary membrane is currently being used in parking garage gate systems.

**Potential Applications:** Along with monitoring door position, can be used to control a door's position and speed of rotation.

- **AVIATION AND SPACE**

**Current Applications:** Used to determine the position of movable business and first class seats (memory function) and is the perfect solution for input systems such as seat control units. It is also used in spacecraft actuator systems under vacuum conditions.

**Potential Applications:** The ultra-flat membrane potentiometers can be used to sense the position of chokes and other various flight control instrumentation. They can also be used to monitor the positions of cargo or weapon bay doors.

- **EXTRACTION TECHNOLOGY**

**Current Applications:** Vehicles such as forklifts use membrane potentiometers them in the tiller head. We already realized double-digit cost savings for our customers with these applications.

**Potential Applications:** Can be used to control the throttle of electrically driven warehouse vehicles.

- **ROBOTIC SYSTEMS AND AUTOMATION**

**Current Applications:** Some robot builders use the ultra-thin in joint systems and joystick applications where space is limited.

Our membrane potentiometers are also being used in moisture sensing technology for landscaping irrigation systems.

**Potential Applications:** Hybrid or Magnet is perfect for automated linear and rotary position sensing due to the high number of life cycles available.

- **CYLINDERS AND ACTUATORS**

**Current Applications:** Used to determine accurate positions in actuator systems.

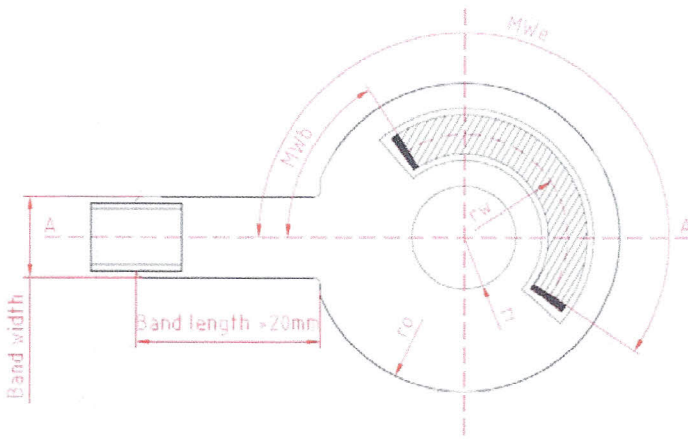
**Potential Applications:** : Can be integrated into cylindric systems, both with contact or contactless with a magnet.



APPLICATIONS BASED ON YOUR INDIVIDUAL DEMANDS

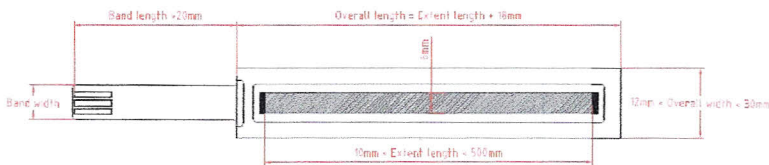
## YOUR CUSTOMIZED MEMBRANE POTENTIOMETER

Membrane potentiometers by ETI Systems can be designed and manufactured based on your individual requirements. To do so, we will need your specifications. Please send this page by fax to ETI Systems @ 760-929-0748



### ROTARY POTENTIOMETER

Radius Outside (ra)	<input type="text"/>	mm	min 22 mm
Radius Inside (ri)	<input type="text"/>	mm	none if no hole needed
Wiper Radius (rw)	<input type="text"/>	mm	min / max
Active radius start	<input type="text"/>	°	0° - 360°
Active radius end	<input type="text"/>	°	0° - 360°



### LINEAR POTENTIOMETER

Active (extent) length	<input type="text"/>	mm	9 mm - 1,000 mm
Overall length	<input type="text"/>	mm	27 mm - 1,018 mm
Overall width	<input type="text"/>	mm	min. 9 mm

Resistance	<input type="text"/>	kΩ
Independent Linearity	± <input type="text"/>	%
Repeat accuracy	<input type="text"/>	mm
Band length	<input type="text"/>	mm
Connector	<input type="text"/>	Standard connectors see spec sheet
Wiper design	<input type="text"/>	Standard wiper or design by H+K
Wiper pressure	min N <input type="text"/> max N <input type="text"/>	
Life cycle	<input type="text"/>	million operations
Operating temperature	min <input type="text"/> max <input type="text"/>	<input type="checkbox"/> ° F or <input type="checkbox"/> ° C

### CUSTOMER DATA

Company	<input type="text"/>
Contact Person	<input type="text"/>
Position	<input type="text"/>
E-Mail address	<input type="text"/>
Phone number	<input type="text"/>
Fax number	<input type="text"/>
Company address	<input type="text"/>