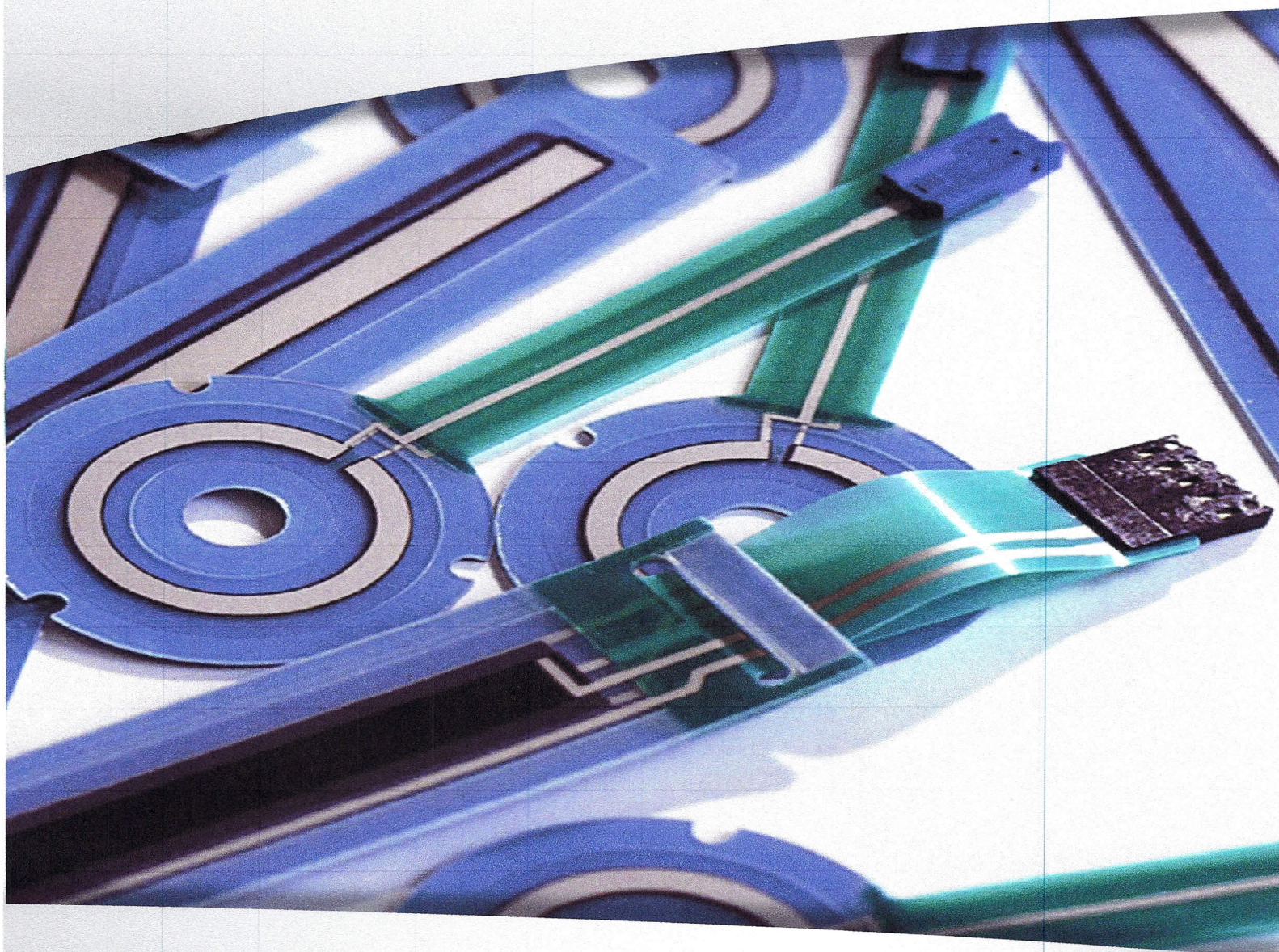




Membrane Potentiometers



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MEMBRANE POTENTIOMETER

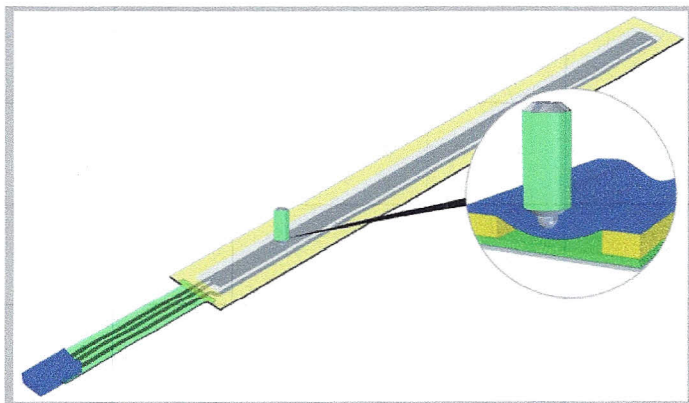
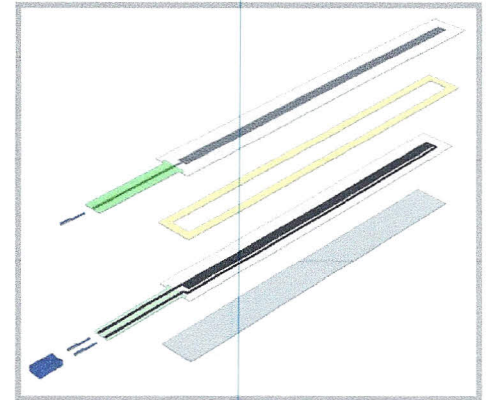
Product Guide

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
Electrical Data	Standard	Magnet	Hybrid ⁽¹⁾	Standard	Magnet	Hybrid ⁽¹⁾	
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) ⁽²⁾	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
Mechanical Data	Standard	Magnet	Hybrid	Standard	Magnet	Hybrid	Options
Life Cycle (Operations) ⁽³⁾	> 1 Million	> 20 Million	> 3 Million	> 1 Million	> 20 Million	> 3 Million	
Wiper Force ⁽⁴⁾	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 ⁽⁵⁾	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
Product Dimensions	Standard	Magnet	Hybrid	Standard	Magnet	Hybrid	Options
Linear							
Stand. length (min./max.) ^(5,6)	50 - 500 mm	50 - 500 mm	50 - 500 mm	50 - 500 mm	50 - 500 mm	50 - 500 mm	9 - 1000 mm
Width (min. / Standard) ⁽⁵⁾	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
Rotary							
Inside diameter (min./max.) ^(5,6)	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.) ⁽⁵⁾	22 - 500 mm	22 - 500 mm	22 - 500 mm	22 - 500 mm	22 - 500 mm	22 - 500 mm	Standard 40 mm
Other Specifications	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.

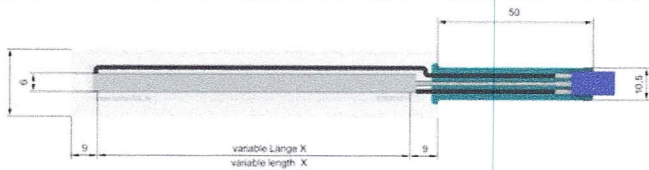
(3) Values have been determined with ETI Systems specifications. Life Cycle can vary depending on customer wiper design.

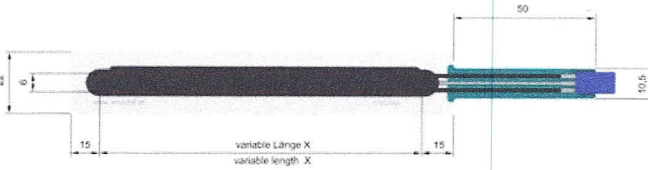
(4) Recommended magnet MD44-N52 with 2mm distance will create 1N wiper pressure (with standard products).

(5) Dimensions based on DIN ISO 2768.

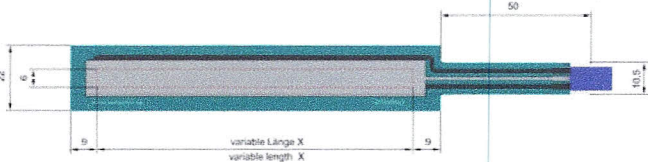
(6) Active electrical path.

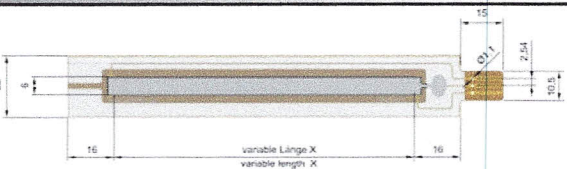
STOCK PRODUCTS linear membrane potentiometers

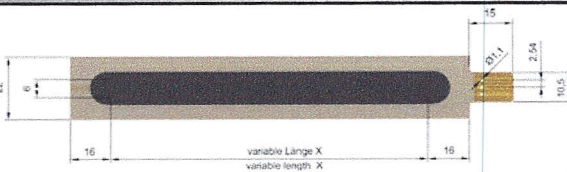
STANDARD LINEAR Foil/Foil				
Part #	Active Length	Active Width	Height	
SL67600162	50 mm	22 mm	0.7 mm	
SL67600163	100 mm	22 mm	0.7 mm	
SL67600164	200 mm	22 mm	0.7 mm	
SL67600178	300 mm	22 mm	0.7 mm	
SL67600172	400 mm	22 mm	0.7 mm	
SL67600173	500 mm	22 mm	0.7 mm	

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				

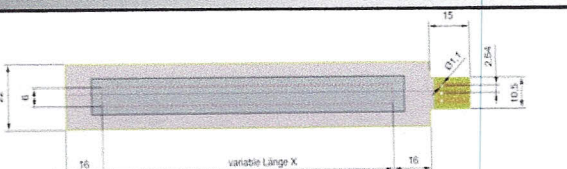
HYBRID LINEAR Foil/Foil				
Part #		Active Length	Active Width	Height
HL67600165		100 mm	22 mm	0.7 mm
Standard connector: BERG 3-pole jack connector				



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				

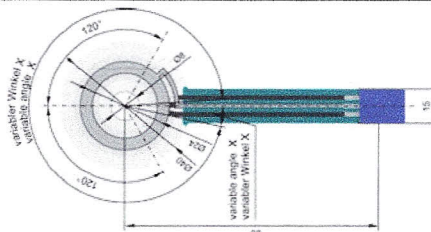
HYBRID LINEAR FR4				
Part #		Active Length	Active Width	Height
FHL65400176		100 mm	22 mm	1.2 mm
Standard connector: Solder tabs				



Technical drawing of a Hybrid Linear FR4 potentiometer. The drawing shows a rectangular component with a central active area. Dimensions are provided in millimeters: 100 mm for the active length, 22 mm for the active width, and 1.2 mm for the height. The drawing also indicates a variable length X for the outer sections. A detail view shows a cross-section of the component with dimensions 15, 2.54, and 10.5, and a note '0.1'.

STOCK PRODUCTS rotary membrane potentiometers

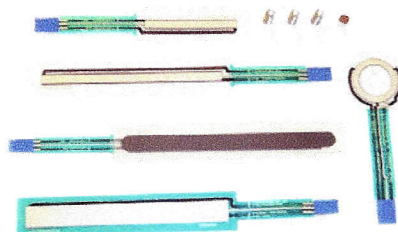
STANDARD ROTARY Foil/Foil			
Part #	Diameter (ins.)	Diameter (outs.)	Radius
SR67600168	8 mm	40 mm	345°
SR67600169	8 mm	40 mm	360°
SR67600178	8 mm	40 mm	90°
SR67600167	8 mm	40 mm	180°
SR67600177	8 mm	40 mm	270°
Standard connector: BERG 3-pole jack connector			



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

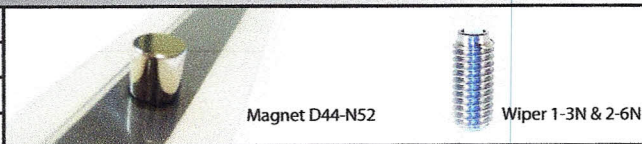


DEVELOPER KIT

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**

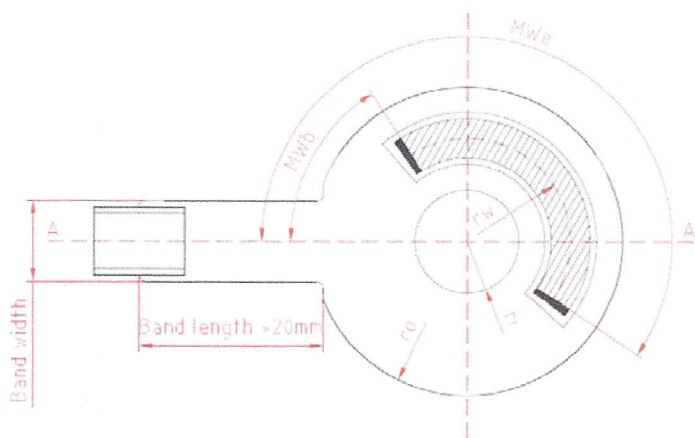
Current Applications: Used to determine accurate positions in actuator systems.

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

APPLICATIONS BASED ON YOUR INDIVIDUAL DEMANDS

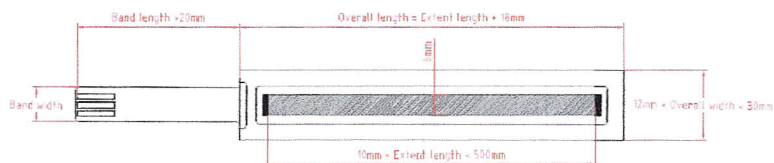
YOUR CUSTOMIZED MEMBRANE POTENTIOMETER

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)	mm	min 22 mm
Radius Inside (ri)	mm	none if no hole needed
Wiper Radius (rw)	mm	min / max
Active radius start	°	0° - 360°
Active radius end	°	0° - 360°



LINEAR POTENTIOMETER

Active (extent) length	mm	9 mm - 1,000 mm
Overall length	mm	27 mm - 1,018 mm
Overall width	mm	min. 9 mm

Resistance	kΩ	
Independent Linearity	± %	
Repeat accuracy	mm	
Band length	mm	
Connector		Standard connectors see spec sheet
Wiper design		Standard wiper or design by H+K
Wiper pressure	min N max N	
Life cycle	million operations	
Operating temperature	min max	☐ ° F or ☐ ° C

CUSTOMER DATA

Company	
Contact Person	
Position	
E-Mail address	
Phone number	
Fax number	
Company address	