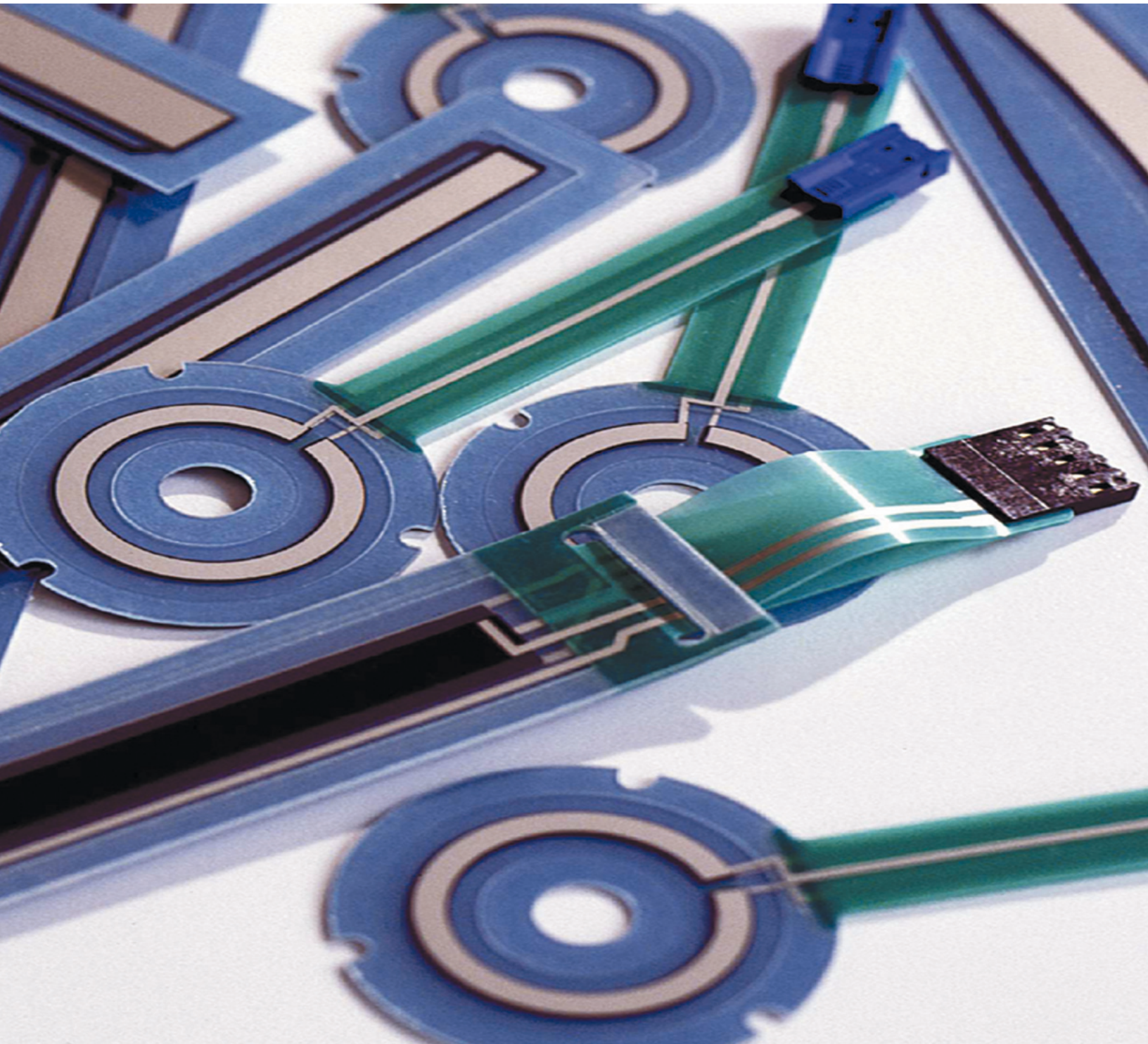


PRODUCT INFORMATION AND TECHNICAL SPECIFICATIONS

SENSOFOIL® Membrane Potentiometer

Innovative ultra-flat linear and rotary position sensors



PRODUCT DESCRIPTION

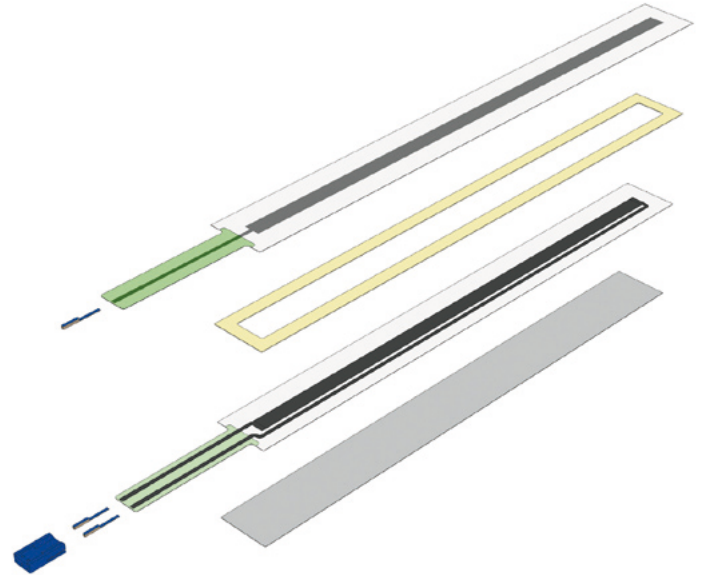
SENSOFOIL® MEMBRANE POTENTIOMETER

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 film, 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



GENERAL PRODUCT INFORMATION

Due to their flat design of 0.7 mm to 2.2 mm and their simple adaptation to customer requirements, SENSOFOIL® membrane potentiometers from Hoffmann + Krippner are the perfect solution for restricted installation conditions.

The technical specifications of the SENSOFOIL® 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.

SENSOFOIL® follows the shape and function of the specific application: linear, circular or customer-specific shapes are available, on request also with non-contact connection.

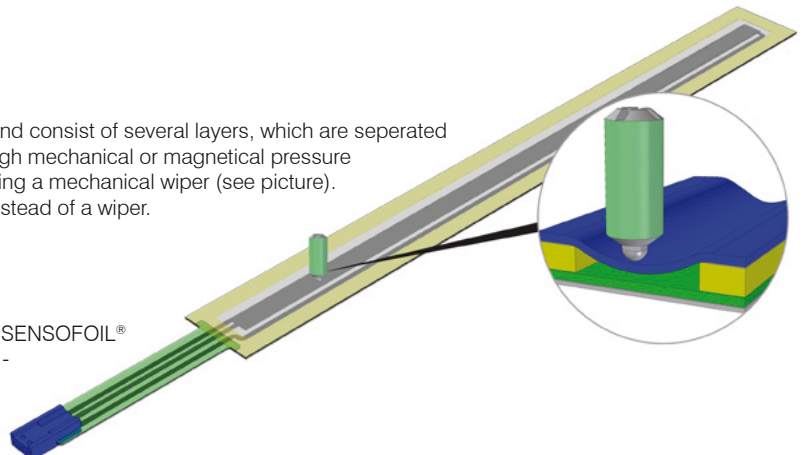
Depending on various parameters, the service life comprises 1 million cycles to 20 million cycles and the repeat accuracy 1 mm to 0.5mm. The standard products are sealed to IP 42 with an optional sealing to IP67 / NEMA 4X.

HOW DOES IT WORK?

SENSOFOIL® membrane potentiometers are used as voltage dividers and consist of several layers, which are separated by a so-called '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 SENSOFOIL® membrane potentiometers. No matter if linear, rotary or custom shaped - with SENSOFOIL® almost any customer requirement can be fulfilled.



TECHNICAL SPECIFICATIONS

SENSOFOIL® MEMBRANE POTENTIOMETER

	SENSOFOIL® foil-based			SENSOFOIL® FR4-based			Options
Electrical Data	SENSOFOIL® Standard	SENSOFOIL® Magnet	SENSOFOIL® Hybrid ⁽¹⁾	SENSOFOIL® Standard	SENSOFOIL® Magnet	SENSOFOIL® 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	SENSOFOIL® Standard	SENSOFOIL® Magnet	SENSOFOIL® Hybrid	SENSOFOIL® Standard	SENSOFOIL® Magnet	SENSOFOIL® 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	# 64500002		# 64500003	# 64500002		# 64500003	
Recommended Magnet		# 60000048			# 60000048		
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	SENSOFOIL® Standard	SENSOFOIL® Magnet	SENSOFOIL® Hybrid	SENSOFOIL® Standard	SENSOFOIL® Magnet	SENSOFOIL® Hybrid	Options
SENSOFOIL® 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
SENSOFOIL® 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	SENSOFOIL® Standard	SENSOFOIL® Magnet	SENSOFOIL® Hybrid	SENSOFOIL® Standard	SENSOFOIL® Magnet	SENSOFOIL® 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

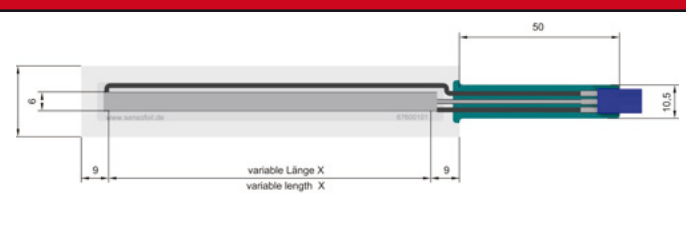
Remarks:

- (1) Values based on current product development.
- (2) Values can vary depending on customer design.
- (3) Values have been determined with Hoffmann + Krippner specifications. Life Cycle can vary depending on customer wiper design.
- (4) Recommended magnet D44/N52 with 2mm distance will create 1N wiper pressure (with standard products).
- (5) Dimensions based on DIN ISO 2768.
- (6) Active electrical path.

OFF-THE-SHELF SOLUTIONS FOR EASY INTEGRATION


SENSOFOIL® STOCK PRODUCTS linear membrane potentiometers

SENSOFOIL® STANDARD LINEAR Foil/Foil			
Part #	Active Length	Active Width	Height
676 00 100	50 mm	22 mm	0.7 mm
676 00 101	100 mm	22 mm	0.7 mm
676 00 102	200 mm	22 mm	0.7 mm
676 00 103	300 mm	22 mm	0.7 mm
676 00 104	400 mm	22 mm	0.7 mm
676 00 105	500 mm	22 mm	0.7 mm




SENSOFOIL® MAGNET LINEAR Foil/Foil			
Part #	Active Length	Active Width	Height
676 00 068	100 mm	22 mm	1.7 mm
676 00 069	300 mm	22 mm	1.7 mm

Standard connector: BERG 3-pole jack connector



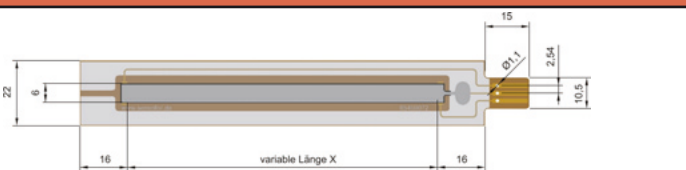
SENSOFOIL® HYBRID LINEAR Foil/Foil			
Part #	Active Length	Active Width	Height
676 00 062	100 mm	22 mm	0.7 mm

Standard connector: BERG 3-pole jack connector



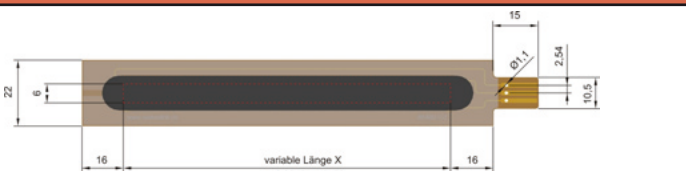
SENSOFOIL® STANDARD LINEAR FR4			
Part #	Active Length	Active Width	Height
676 00 072	100 mm	22 mm	1.2 mm

Standard connector: Solder tabs



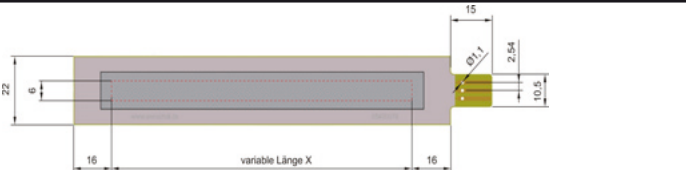
SENSOFOIL® MAGNET LINEAR FR4			
Part #	Active Length	Active Width	Height
676 00 084	100 mm	22 mm	2.2 mm

Standard connector: Solder tabs



SENSOFOIL® HYBRID LINEAR FR4			
Part #	Active Length	Active Width	Height
676 00 078	100 mm	22 mm	1.2 mm

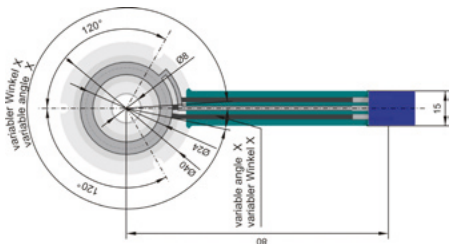
Standard connector: Solder tabs




OFF-THE-SHELF SOLUTIONS FOR EASY INTEGRATION

SENSOFOIL® STOCK PRODUCTS rotary membrane potentiometers


SENSOFOIL® STANDARD ROTARY Foil/Foil			
Part #	Diamter (ins.)	Diameter (outs.)	Radius
676 00 011	8 mm	40 mm	345°
676 00 012	8 mm	40 mm	360°
676 00 017	8 mm	40 mm	90°
676 00 018	8 mm	40 mm	180°
676 00 019	8 mm	40 mm	270°
Standard connector: BERG 3-pole jack connector			



SENSOFOIL® STANDARD ROTARY FR4			
Part #	Diamter (ins.)	Diameter (outs.)	Radius
654 00 107	8 mm	40 mm	340°
Standard connector: Solder tabs			




SENSOFOIL® MAGNET ROTARY FR4			
Part #	Diamter (ins.)	Diameter (outs.)	Radius
654 00 108	8 mm	40 mm	340°
Standard connector: Solder tabs			



SENSOFOIL® DEVELOPER KIT

SENSOFOIL® DEVELOPER KIT		
Part #	Total Parts	SENSOFOIL® Products
654 00 000	9 pcs	Standard, Hybrid & Magnet
1 x SENSOFOIL® STANDARD Linear Membrane Potentiometer 50 mm 1 x SENSOFOIL® STANDARD Linear Membrane Potentiometer 100 mm 1 x SENSOFOIL® STANDARD Rotary Membrane Potentiometer 360° 1 x SENSOFOIL® HYBRID Linear Membrane Potentiometer 100 mm 1 x SENSOFOIL® MAGNET Linear Membrane Potentiometer 100 mm 2 x WIPER 1-3N for SENSOFOIL® STANDARD 1 x WIPER 3-6N for SENSOFOIL® HYBRID 1 x MAGNET D44-N52 for SENSOFOIL® MAGNET		



SENSOFOIL® ACCESSORIES wipers & magnets

SENSOFOIL® STANDARD ROTARY Foil/Foil			
Part #	Product	For use with	Length
645 00 002	Wiper 1-3N	Standard	14 mm
645 00 003	Wiper 2-6N	Hybrid	14 mm
600 00 048	Magnet D44-N52	Magnet	6.35 mm



IDEAS FOR INNOVATIVE SOLUTIONS

SENSOFOIL® SAMPLE APPLICATIONS and SOLUTIONS

The fields of application for SENSOFOIL® membrane potentiometers from Hoffmann + Krippner 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 Audi *e-tron* 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: SENSOFOIL® 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: SENSOFOIL® is being 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: SENSOFOIL® 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: SENSOFOIL® is 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: SENSOFOIL® can be incorporated into touch screens to add scroll functions and can be used in various applications such as setting refrigerator and freezer temperatures. SENSOFOIL® 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 SENSOFOIL® is currently being used in parking garage gate systems.

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

• AVIATION AND SPACE

Current Applications: SENSOFOIL® is 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 SENSOFOIL® 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 SENSOFOIL® in the tiller head. We already realized double-digit cost savings for our customers with these applications.

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

• CYLINDERS AND ACTUATORS

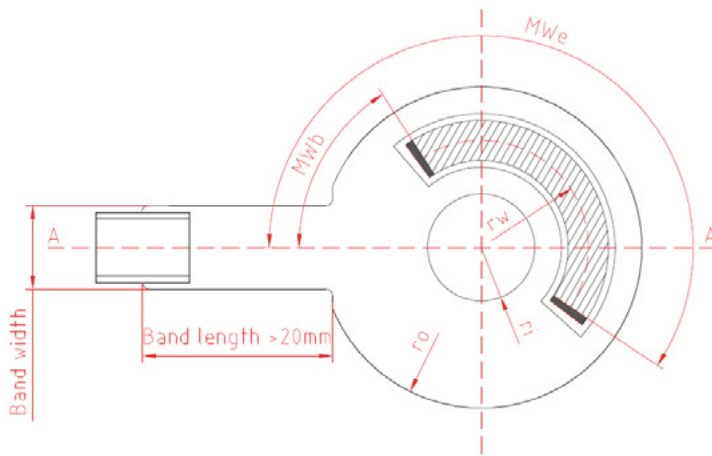
Current Applications: SENSOFOIL® is used to determine accurate positions in actuator systems.

Potential Applications: SENSOFOIL® can be integrated into cylindrical systems, both with contact or contactless with a magnet.

APPLICATIONS BASED ON YOUR INDIVIDUAL DEMANDS

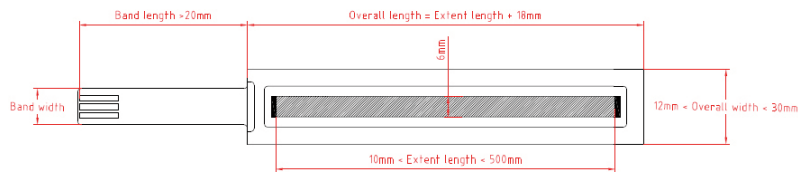
YOUR CUSTOMIZED SENSOFOIL®

SENSOFOIL® membrane potentiometers by Hoffmann + Krippner 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 Hoffmann + Krippner or hand it over to your sales representative.



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"/>

QUALITY. TECHNOLOGY. KNOW-HOW.

YOUR CONTACT TO HOFFMANN + KRIPPNER

Hoffmann + Krippner opens up new vistas, solves problems and realizes visions in its two main business areas **turnkey control units** and **ultra-flat position sensors**.

In business for more than 35 years, we now have become the leading manufacturer of customized keyboards, complex input systems and ultra-flat membrane potentiometers and are a market leader in Europe.

We develop and produce innovative input devices, control units and sensors for international customers in numerous industries, from consumer electronics, medical technology and aviation to mechanical engineering and military technology.

Hoffmann + Krippner's product portfolio meets the highest expectations, from simple membrane keyboards to complex designs including enclosure, electronics and software.



**INNOVATION MADE IN GERMANY.
HOFFMANN + KRIPPNER.**

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