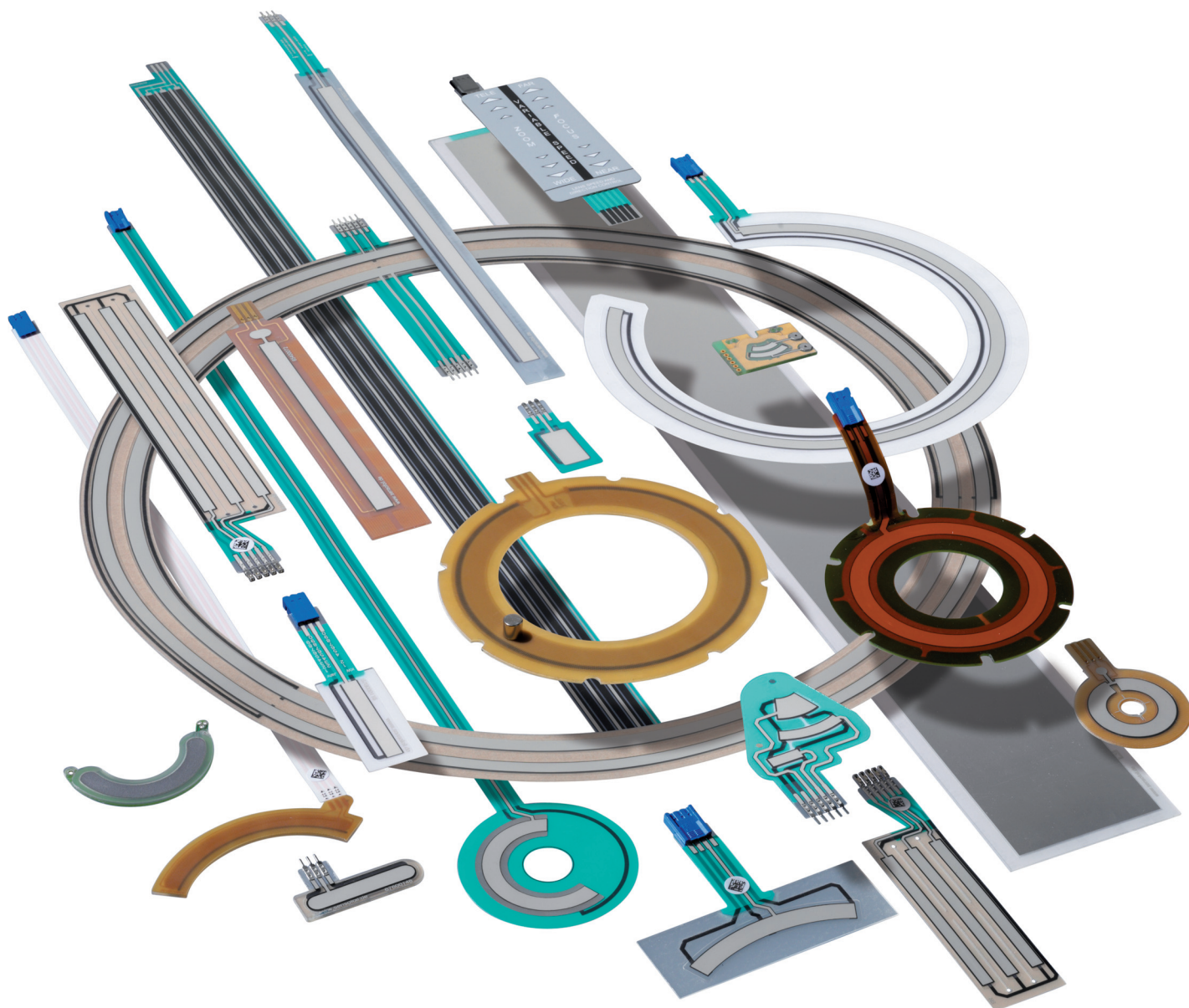


## PRODUCT INFORMATION AND TECHNICAL SPECIFICATIONS

### **SENSOFOIL® Membrane Potentiometer**

Innovative ultra-flat linear and radial position sensors



## SENSOFOIL® PRODUCT INFORMATION

### Flat, durable, and sealed: Sensofoil® potentiometers - the ideal solution for linear and radial position sensing

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. Different standard sizes of 50 mm to 500 mm length are available in stock.

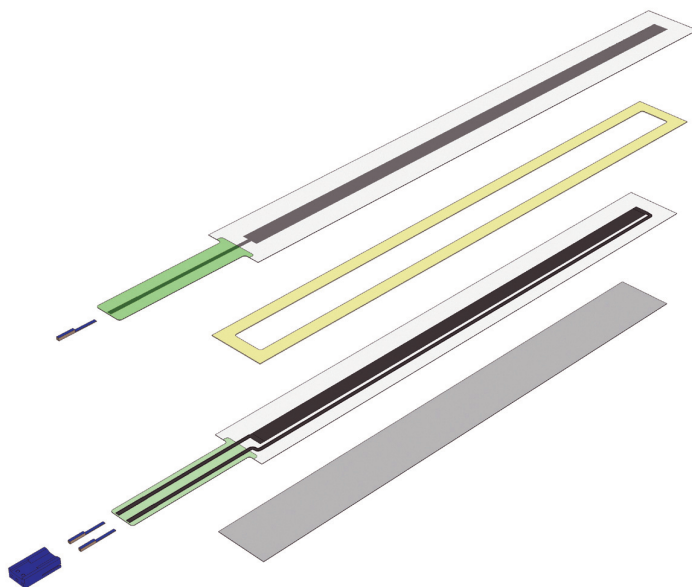
With Sensofoil®, we offer fully customizable positions sensors, based on the specific application. The layered composition allows for almost limitless dimensions in length and radius. Depending on the various parameters, the service life can range from 1 million to 20 million operations with an exceptional wiper dependent repeat accuracy.

### FEATURES

- Flat design between 0.5 mm (PET) and 2.1 mm (Magnet)
- Linear and radial designs
- Excellent accuracy and linearity
- Life cycle between 1 and 20 million operations
- Temperature ranges of -40°F to +257°F
- Sealed up to IP 65
- Operation possible by hand, wiper, or magnet
- Easily adapted to customer specific design

### COMPOSITION

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

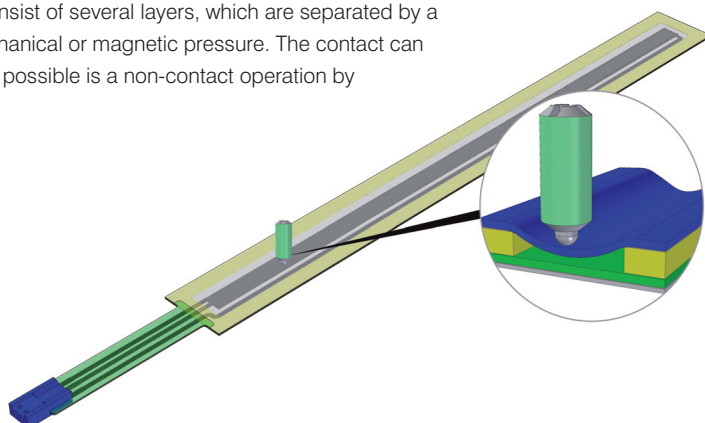


### HOW DOES IT WORK?

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 magnetic pressure. The contact can be made either by hand or by using a mechanical wiper (see image). Also possible is 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® potentiometers. No matter if linear, radial, or custom shaped – with Sensofoil® almost any customer requirement can be fulfilled.



## **SENSOFOIL® MATERIALS AND VARIATIONS**

Sensofoil® offers flexibility through which a diverse range of solutions can be achieved. Due to its compositions, the ultra-flat design, and the easily adaptable features, Sensofoil® can be conveniently integrated into existing applications. Our Sensofoil® team will guide you through the customization and implementation process.

With Sensofoil® the collector foil is always in place to function as electrical tap. A mechanical plunger in the form of a wiper or magnet forms the electrical contact between the resistor track and collector (tap).

### **POLYESTER (PET) - resistive track printed on PET-Foil:**

The membrane potentiometers based on PET foil are inexpensive and easy-to-use position sensors for operating temperature up to 55°C. They follow the shape and function required by the application. Given the flat design of only 0.5mm in height and up to 0.5m in length, this fully sealed system provides an unbeatable cost advantage.

As an actual value transmitter, Sensofoil® PET is mostly applied with medical technology, actuator systems, door systems on busses and trains, test systems, and many more. However, Sensofoil PET is also implemented as a set point adjuster (manual operation) into fully sealed input devices to avoid any openings. Integrated into membrane keyboards, it can also function as a stepless variable switch with which Sensofoil PET offers the advantage of reduced feeder line through stress analysis.

### **HYBRID - resistive track printed on PET-Foil or FR4:**

As the new generation of Sensofoil® potentiometers, the patented Sensofoil® Hybrid is the most advanced membrane potentiometer on the market in regards to life cycles for temperatures up to 125°C/257°F. Featuring the same composition as the Sensofoil® PET, the upper foil of the Sensofoil® Hybrid is suited for higher temperatures due to an integrated flexible metal layer. Perfect for high temperatures, long periods of wiper inactivity and harsh environmental conditions.

Sensofoil® Hybrid is applicable in the automotive industry, military and aerospace applications as well as industrial applications experiencing high operating temperatures. Sensofoil® Hybrid is available in operating temperature ranges up to 105°C/221°F. In addition, Sensofoil® Hybrid allows for developmental use temperature ranges up to 125°C/257°F.

### **MAGNET - resistive track printed on PET-Foil or FR4:**

Featuring the same composition as the Sensofoil® PET, an integrated ferromagnetic material allows for non-contact operation, also capable of operating through a thin enclosure.

This composition is applied where long life cycles are required. Sensofoil® Magnet is implemented in the optic industry and medical technology, as actuators and memory functions for seats and beds.

### **FR4 - resistive polymer ink printed on FR4:**

All Sensofoil® variations (PET, Hybrid and Magnet) are available on FR4. With FR4 as base material, the potentiometer can be mounted with screws instead of solely relying on adhesive. Additional cables and connectors are naturally easier to incorporate. Using the FR4 base, the potentiometer can directly be integrated into the circuit board. This concept has already been employed in the automotive industry and in medical technology, with actuators, joystick applications and many more.

Exposed potentiometers are also available as Sensolnk – FR4 imprinted with polymer resistor tracks. All potentiometer solutions based on FR4 are similar in that they can additionally be equipped with electronic components. Our resistor track withstands multiple soldering cycles.

### **MODULE:**

Any of these variations can be combined, FR4 with Hybrid or Magnet for example. Taking advantage of these modular capabilities, a solution for almost any customer application can be generated. With the FR4 base, any electronic components can be integrated in-house or on customer side.

## SENSOFOIL® SPECIFICATIONS

Most Sensofoil® applications require customization. Due to in-house production we are flexible in producing our membrane potentiometers cost efficiently to find the optimal solution to specific applications. Please find the standard Sensofoil® characteristics in the data sheet for in-stock products. The technical specifications for customized membrane potentiometers may vary.

### Specifications of Sensofoil® product variations:

#### SENSOFOIL® PET - printed resistor track on foil:

- Linearity: 2% as standard, optional 1% for linear Sensofoil®  
4% as standard, optional 2 % for radial Sensofoil®
- Resistance of 35  $\Omega$ /Square to 2100  $\Omega$ /Square due to customer specific resistance compositions. 35  $\Omega$ /Square are preferred
- Linear dimensions up to 800 mm length and radial dimensions up to a diameter of 400 mm

#### SENSOFOIL® FR4 - printed polymer resistor track on FR4:

- Linearity: 2% as standard, optional 1% for linear Sensofoil®  
4% as standard, optional 2 % for radial Sensofoil®
- Resistance of 300  $\Omega$ /Square to 2000  $\Omega$ /Square due to customer specific resistance compositions. 500  $\Omega$ /Square are preferred
- Linear dimensions up to 800 mm length and radial dimensions up to a diameter of 400 mm

#### SENSOFOIL® INTEGRATED:

This potentiometer type is printed directly onto the circuit board. Subsequent placement and soldering of electronic components is possible. Prior to the reflow soldering or SMD soldering process, Hoffmann + Krippner can apply the resistor or potentiometer directly onto the circuit board using the Hoffmann + Krippner developed polymer paste. Due to a unique foil, multiple soldering cycles can be achieved. With SensoInk, we are capable of imprinting the circuit board using our polymer paste, should the foil not be required as collector. Each of these solutions is to be adjusted according to application requirements.

#### FURTHER OPTIONS:

- Sensofoil® available as 360° radial version
- Sensofoil® for operation by hand and graphically designed control panels
- Sensofoil® integrated into membrane keyboards
- SensoTouch® a resistive X/Y-sensor controller that can be freely designed

#### TYPICAL CHARACTERISTICS FOR CUSTOMIZED SPECIFICATIONS:\*

	SENSOFOIL® foil-based			SENSOFOIL® FR4-based		
	SENSOFOIL® PET	SENSOFOIL® Magnet	SENSOFOIL® Hybrid	SENSOFOIL® PET	SENSOFOIL® Magnet	SENSOFOIL® Hybrid <sup>(1)</sup>
Linearity	1 - 2 % linear 2 - 4 % radial			0,5 - 2% linear 1,5- 4 % radial		
Life Cycle (Operations)	> 3 Million	> 20 Million	> 3 Million	> 1 Million	> 20 Million	n.a.
Height without connector	0,5 mm	1,6 mm	0,5 mm	0,9 mm	2,1 mm	0,9 mm
Temperature Range	-40°C / +55°C	-5°C / +55°C	-40°C / +105°C	-40°C / +55°C	-5°C / +55°C	-40°C / +125°C
	-40°F / +131°F	23°F / +131°F	-40°F / +221°F	-40°F / +131°F	23°F / +131°F	-40°F / +257°F
(1) Preliminary data, product is still in process of development						

All potentiometers are subject to a 100% final inspection and receive a DataMatrix Label to ensure proper identification and traceability.

## SENSOFOIL® TECHNICAL DATA STOCK ITEMS\* (Extract)

	SENSOFOIL® foil-based			SENSOFOIL® FR4-based		
Electrical Data	SENSOFOIL® PET	SENSOFOIL® Magnet	SENSOFOIL® Hybrid <sup>(1)</sup>	SENSOFOIL® PET	SENSOFOIL® Magnet	SENSOFOIL® Hybrid <sup>(1)</sup>
Resistance	For single resistance values please check the stock list on the following pages			For single resistance values please check the stock list on the following pages		
Resistance Tolerance	± 30%	± 30%	± 30%	± 30%	± 30%	± 30%
Linearity linear	2%	2%	2%	2%	2%	n/a
Linearity radial	4%	n/a	n/a	4%	n/a	n/a
Repeat Accuracy <sup>(2)</sup>	0,3 mm	0,5 mm	0,4 mm	0,3 mm	0,5 mm	n/a
Voltage (Standard)	1V to 42 V	1V to 42 V	1V to 42 V	1V to 42 V	1V to 42 V	1V to 42 V
Mechanical Data	SENSOFOIL® PET	SENSOFOIL® Magnet	SENSOFOIL® Hybrid	SENSOFOIL® PET	SENSOFOIL® Magnet	SENSOFOIL® Hybrid
Life Cycle (Operations) <sup>(2)</sup>	> 3 Million	> 20 Million.	> 10 Million	> 1 Million	> 20 Million	n/a
Wiper Force <sup>(3)</sup>	1-3 N		2-6 N	1-3 N		2-6 N
Recommended Wiper	# 603 000 01		# 603 000 02	# 603 000 01		# 603 000 02
Recommended Magnet		# 603 000 04			# 603 000 04	
Distance to Magnet in mm		≤ 1.5 mm			≤ 1.5 mm	
Height without connector <sup>(4)</sup>	0.5 mm	1.6mm	0.5 mm	0.9 mm	2.1 mm	0.9 mm
Connector	Berg 3-pole	Berg 3-pole	Berg 3-pole	Solder tabs	Solder tabs	Solder tabs
Product Dimensions	SENSOFOIL® PET	SENSOFOIL® Magnet	SENSOFOIL® Hybrid	SENSOFOIL® PET	SENSOFOIL® Magnet	SENSOFOIL® Hybrid
SENSOFOIL® linear						
Length	50 - 500 mm <sup>(5)</sup>	105 mm	105 mm	105 mm	105 mm	
Width	22 mm	22 mm	22 mm	22 mm	22 mm	
SENSOFOIL® radial						
Inside diameter	8 mm			8 mm		
Outside diameter	40 mm			40 mm		
Other Specifications	SENSOFOIL® PET	SENSOFOIL® Magnet	SENSOFOIL® Hybrid	SENSOFOIL® PET	SENSOFOIL® Magnet	SENSOFOIL® Hybrid
Temperature Range	-40°C / +55°C	-5°C / +55°C	-40°C / +85°C	-40°C / +55°C	-5°C / +55°C	n/a
	-40°F / +131°F	23°F / +131°F	-40°F / +185°F	-40°F / +131°F	23°F / +131°F	n/a
IP Rating	IP 54	IP 42	IP 42	IP 42	IP 42	IP 42

### Remarks:

(\*) All data given has been established at room temperature

(1) Preliminary data, product is still in process of development

(2) All data was determined with Hoffmann + Krippner specifications. Product life cycles can vary with customer specific wipers

(3) Recommended magnet D44/N52 achieves a wiper force of 1N (Sensofoil PET) for 1.5 mm distance

(4) All values according to general tolerances specified in DIN ISO 2768

(5) 50mm/100mm/200mm/300mm/400mm/500mm

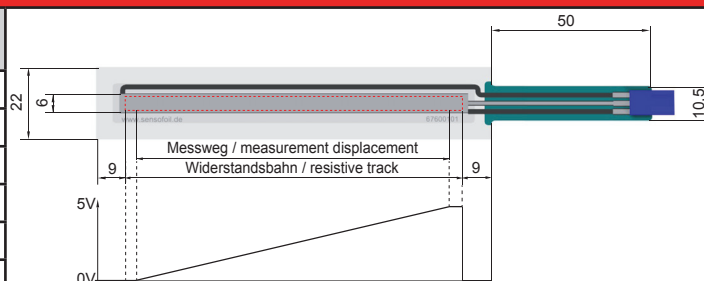
## SENSOFOIL® STOCK PRODUCTS

## linear membrane potentiometers

### SENSOFOIL® PET FOIL LINEAR

Part #	Measurement range	Resistance length	Height	Resistance
676 00 100	45 mm	50 mm	0,5 mm	1,25 kΩ
676 00 101	95 mm	100 mm	0,5 mm	2,5 kΩ
676 00 102	195 mm	200 mm	0,5 mm	5,0 kΩ
676 00 103	295 mm	300 mm	0,5 mm	7,5 kΩ
676 00 104	395 mm	400 mm	0,5 mm	10,0 kΩ
676 00 105	495 mm	500 mm	0,5 mm	12,5 kΩ

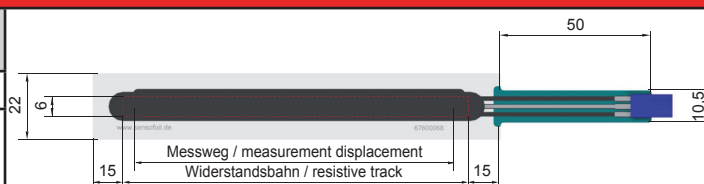
Standard connector: Berg 3-pole



### SENSOFOIL® PET MAGNET LINEAR

Part #	Measurement range	Resistance length	Height	Resistance
676 00 068	100 mm	105 mm	1.6 mm	2,5 kΩ

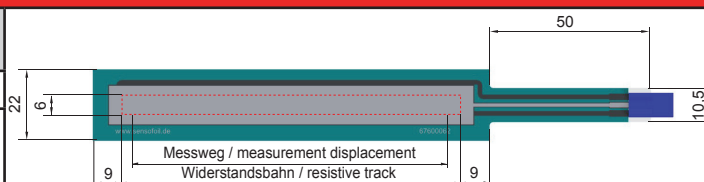
Standard connector: Berg 3-pole  
Magnet must operate on lower side



### SENSOFOIL® PET HYBRID LINEAR

Part #	Measurement range	Resistance length	Height	Resistance
676 00 062	100 mm	105 mm	0.5 mm	2,5 kΩ

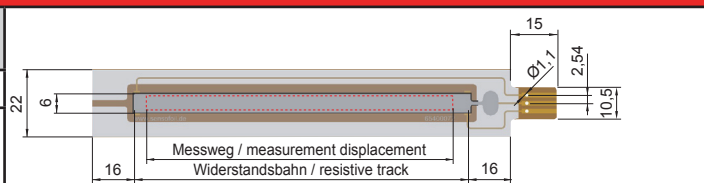
Standard connector: Berg 3-pole



### SENSOFOIL® FR4 FOIL LINEAR

Part #	Measurement range	Resistance length	Height	Resistance
654 00 072	100 mm	105 mm	0,9 mm	10 kΩ

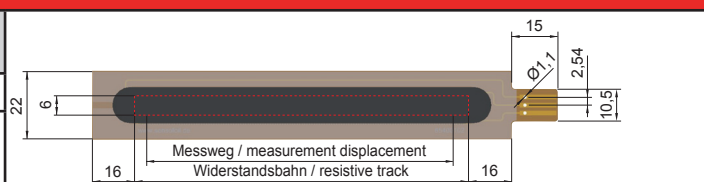
Standard connector: Solder tabs



### SENSOFOIL® FR4 MAGNET LINEAR

Part #	Measurement range	Resistance length	Height	Resistance
654 00 084	100 mm	105 mm	2.1 mm	10 kΩ

Standard connector: Solder tabs  
Magnet must operate on upper side





## SENSOFOIL® STOCK PRODUCTS

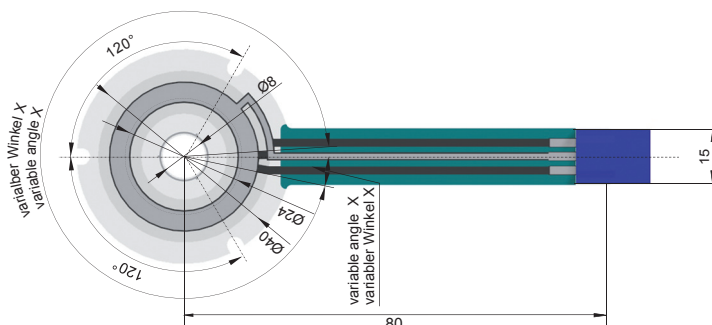
## radial membrane potentiometers

### SENSOFOIL® PET FOIL RADIAL

Part #	Radius inside	Radius outside	Radius	Resistance
676 00 011	8 mm	40 mm	345°	4,0 kΩ
676 00 019	8 mm	40 mm	270°	3,0 kΩ
676 00 018	8 mm	40 mm	180°	2,0 kΩ
676 00 017	8 mm	40 mm	90°	4,8 kΩ

Standard connector: Berg 3-pole

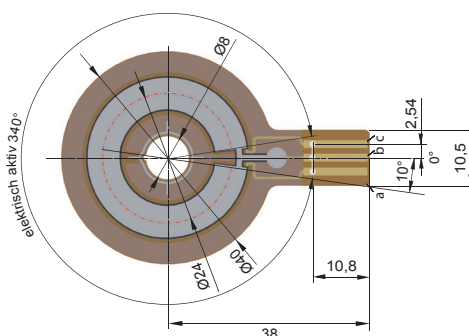
Image: 676 000 11



### SENSOFOIL® FR4 FOIL RADIAL

Part #	Radius inside	Radius outside	Radius	Resistance
654 00 107	8 mm	40 mm	340°	10 kΩ

Standard connector: Solder tabs



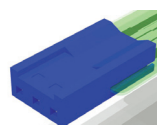
## SENSOFOIL® CONNECTORS

### SENSOFOIL® STANDARD CONNECTOR

3-pole Duflex connector Berg for Sensofoil® PET

Jack: 76785 - 301 LF  
Housing: 67013 - 003

Sensofoil® FR4 with solder tabs; Customer specific connectors on request



## SENSOFOIL® ACCESSORIES

### SENSOFOIL® WIPERS AND MAGNETS

Part #	Type	Sensofoil® type	Dimensions
603 00 001	Wiper 1-3N	PET	M6x1 L = 14 mm
603 00 002	Wiper 2-6N	Hybrid	M6x1 L = 14 mm
603 00 004	Magnet D44-N52	Magnet	D = 6,35 mm H = 6,35 mm

Customer specific wipers on request

Wiper 1-3N & 2-6N



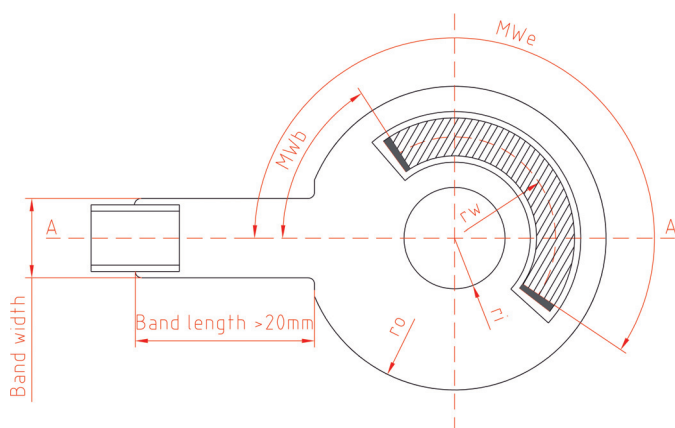
Magnet D44-N52



## SENSOFOIL® CONFIGURATOR

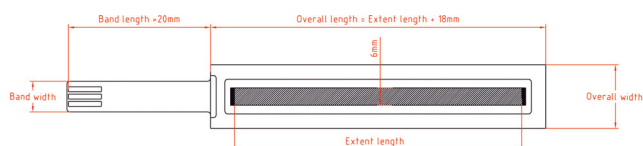
### YOUR CUSTOMISED SENSOFOIL®

Sensofoil® membrane potentiometers by Hoffmann + Krippner can be designed and manufactured based on your individual requirements. To do so, we will need your specifications.



#### RADIAL POTENTIOMETER

Outside diameter (ra)	<input type="text"/> mm	min 22 mm
Inside diameter (ri)	<input type="text"/> mm	
Wiper radius (rm)	<input type="text"/> mm	min / max
Active radius start (MWa)	<input type="text"/> °	0° - 360°
Active radius end (MWe)	<input type="text"/> °	0° - 360°



#### LINEARE POTENTIOMETER

Measurement range	<input type="text"/> mm	9 mm - 800 mm
Overall length	<input type="text"/> mm	27 mm - 1,018 mm
Overall width	<input type="text"/> mm	min. 9 mm

Sensofoil® Basis: ☐ PET ☐ FR4 ☐ Matching individual requirements

Quantity	<input type="text"/>	
Resistance	<input type="text"/> kΩ	Please see stock list; Customised solutions on request
Independent linearity	<input type="text"/> ± <input type="text"/> %	Standard: linear 2% radial 4%
Repeat accuracy	<input type="text"/> μm	
Band length	<input type="text"/> mm	
Connector	<input type="text"/>	Please see stock list
Wiper design	<input type="text"/>	Please see stock list
Wiper pressure	<input type="text"/> min <input type="text"/> N <input type="text"/> max <input type="text"/> N	
Life cycle	<input type="text"/>	Million Operations
Operating temperature	<input type="text"/> min <input type="text"/> max	<input type="checkbox"/> °C <input type="checkbox"/> °F

#### CUSTOMER DATA

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



## **SENSOFOIL® SAMPLE APPLICATIONS**

The fields of application for Sensofoil® membrane potentiometers are very diverse. Today, potentiometers are used in numerous applications and many different industries. The following is a small selection of those already realized:

### **• AUTOMOTIVE INDUSTRY**

The Sensofoil® potentiometer is currently used in the new Audi concept study e-tron to control various driver inputs such as radio, telephone, and navigation located on the steering wheel and dash board.

### **• FORK LIFT APPLICATIONS**

Sensofoil® PET is found in tiller heads of pallet trucks. Sensofoil® Hybrid can be implemented in forklift trucks for position recognition of the wheels and steering arm.

### **• FOOD PROCESSING INDUSTRY**

Sensofoil® is the ideal solution in fully sealed input devices to prevent external particles such as dust from entering the electronic unit. Due to the integration into membrane keypads, openings for set value actuators are no longer necessary. The ultra-flat, easy-to-clean Sensofoil is great for automated food processing systems.

### **• AVIATION AND SPACE**

Sensofoil® Hybrid is suited to determine the position of business and first class seats (memory function) in airplanes. It is the perfect solution as an actual value transmitter (potentiometer) as well as a reference value transmitter (keyboard).

In a joint partnership with MOOG Inc., Hoffmann + Krippner developed a noise-free membrane potentiometer for spaceflight use on basis of the Sensofoil®-Hybrid technology. Unique features of this product are the missing noise and drop out characteristics commonly associated with conventional potentiometers, the ultra-flat design and the exceptional linearity (better than 0.25%).

### **• MEDICAL TECHNOLOGY**

An example application would be a specially configured Sensofoil® on dosing pumps to adjust the amount and rate for intravenous administering of medication. Sensofoil® are also integrated for height and angle adjustment in operating tables and positioning of mammogram equipment.

### **• DOOR SYSTEMS**

Based on the robustness of Sensofoil®, applications in facilities engineering have been realized to gather positions of doors and a radial Sensofoil® Magnet has been implemented in gate arms for parking decks. A modified version of the Sensofoil® Hybrid, featuring a length of up to 820mm, significantly increases the longevity of doors on streetcars.

### **• ROBOTIC SYSTEMS AND AUTOMATION**

Some customers in the field of robotics use the ultra-thin Sensofoil® in joint systems and joystick applications where space is limited. Motorized robots used for rescue missions in order to protect human lives are controlled using Sensofoil® FR4 technology. Sensofoil® Hybrid is also being used in moisture sensing technology for irrigation systems.

### **• CYLINDERS AND ACTUATORS**

The Sensofoil® Magnet (linear) has been successfully operated for years with pneumatic cylinders. Sensofoil® can be applied on both the inside and outside of the cylinder.

## SENSOINK HIGH END POLYMER PASTE SYSTEMS

Hoffmann + Krippner presents with Sensolnk an innovative solution based on printed polymer pastes. Sensolnk, with its polymer thick film technology offers a new way for printing potentiometers, resistors, switches or keyboard contacts on circuit boards or electronic components. Sensolnk offers the opportunity to realize quick and easy individual specifications, without any loss of quality.

Besides central features such as the excellent linearity, extreme durability and high temperature stability when used as a potentiometer, high voltage or power resistor, the integration Sensolnk offers an enormous potential of financial savings compared to conventional components.

### Open potentiometers as stand-alone solution

So far, printed open potentiometers are mainly used as a stand-alone solution. This generally means that potentiometers are being printed on ceramic material, circuit board, Kapton film or on other materials and a specific wiper (defined by shape and material) is used as collector. If operators are proficient in interacting with the potentiometric sensor and the dynamic contact (wiper), this leads to excellent results:

- Signal enhancement = 1; output signal equates input signal
- Passive system without any negative electromagnetic effects (Electromagnetic compatibility)
- Only two components are required for signal transformation; a printed potentiometer track on a carrier material (e.g. FR4 or PET foil) and a conductive wiper
- Wear free application as the result of the right tripological matching of the polymer layer and the wiper

Users should use professional advice for their specific applications. Optimal results can only be achieved by adjusting the wiper to the thick film polymer paste.

### Polymer-resistance tracks on printed circuit boards

The combination of open potentiometers on printed circuit boards was used so far as follows: a potentiometer, printed on a separate substrate, was attached after the assembly process of the circuit board. With Sensolnk this process can be simplified considerably. The potentiometer is printed directly onto the circuit board. After that the circuit board is equipped. Even repeated soldering processes (reflow or wave soldering) are possible.

This method comprises the same characteristics as printed potentiometers with the additional benefit that reduced process steps lead not only to reduced prices but as well to a reduced error rate (improved MTBF).

### Flexible potentiometer on radial surfaces

For applications on radial surfaces (tubes) usually PET or Kapton foils are used. Hoffmann + Krippner has developed a paste formula that allows to print abrasion and chemically resistant resistive paths on inexpensive PET. In order to achieve these specifications a polymer thick film paste, already in use by H+K, was modified to match the temperature level of the PET foil that the paste can be completely cross-linked and hardens. In terms of abrasion resistance and chemical resistance this technology is comparable to conductive polymers on printed circuit boards.

This new potentiometer option allows new and interesting possibilities for a variety of industrial applications.

### Wiper technology

Open potentiometers, printed on FR4 or PET, require conductive wipers. The lay-out of the wiper depends on the specific application, the resistor material and design. Mostly the so-called scoop wipers are used, but more and more they are replaced by scratch wipers. Scoop wiper or scratch wiper, in any case the applications determine the shape and material of the wiper and should be selected in cooperation with your H+K technicians.

Supported by:



The development of Sensolnk was made possible with the support of the German Ministry of Economics and Technology

## SENSOINK SPECIFICATION OVERVIEW

Hoffmann + Krippner presents with Sensolnk a new generation of printed polymer thick film paste systems. For more than 40 years we develop and manufacture products in the areas of membrane keyboards, ultra-flat membrane potentiometers and complex input systems. This professional know-how enables us to meet the highest standards in terms of quality and functionality for high end polymer paste systems.

### Sensolnk Potentiometer

Sensolnk potentiometers combined the high standards of Sensfoil® membrane potentiometers with the new generation of printable polymer pastes. As the result Sensolnk potentiometers offer a system with excellent signal quality, wear-free usage and high linearity that is hard to beat.

**Tolerances:** Sensolnk potentiometers allow standard resistor tolerances of  $\pm 30\%$ . Customized solutions with lower tolerances are possible upon request.

**Linearity:** Depending on their specific design, Sensolnk Potentiometers have a default linearity between 0,5% and 4%.

#### Technical requirements for Sensolnk potentiometer

Resistor lenght	$\geq 2 \text{ mm}$
Resistor width	$\geq 1,5 \text{ mm}$
Overlap silver to copper	$\geq 0,25 \text{ mm}$
Overlap resistor to silver	$\geq 0,15 \text{ mm}$
Solder mask clearance	$\geq 0,25 \text{ mm}$
Wiper current (short time)	$< 100 \text{ mA}$
Operating temperature	$-40^{\circ}\text{C} / +150^{\circ}\text{C}$ $-40^{\circ}\text{F} / +257^{\circ}\text{F}$

### Sensolnk Resistors

Sensolnk is also suitable for the use as resistor on internal or external layers. Compared to common resistors Sensolnk provides numerous advantages. By integrating/printing the resistors directly on the material, Sensolnk simplifies manufacturing processes and offers tremendous potential for space and weight savings. In addition, by using special methods resistance tolerances can be reduced further to meet customer-specific requirements.

**Tolerances:** Sensolnk resistors have a standard resistance tolerance of  $\pm 30\%$ . Customized solutions with resistance tolerances to  $\pm 5\%$  are possible upon request.

#### Technical requirements for Sensolnk resistors on external layers

Resistor lenght	$\geq 2 \text{ mm}$
Resistor width	$\geq 1,5 \text{ mm}$
Overlap silver to copper	$\geq 0,25 \text{ mm}$
Overlap resistor to silver	$\geq 0,15 \text{ mm}$
Solder mask clearance	$\geq 0,25 \text{ mm}$

#### Technical requirements for Sensolnk resistors on internal layers

Resistor lenght	$\geq 2 \text{ mm}$
Resistor width	$\geq 1,5 \text{ mm}$
Overlap copper to resistor	$\geq 0,15 \text{ mm}$
Overlap resistor to copper	$\geq 0,25 \text{ mm}$

### Sensolnk Switches

Sensolnk switches are printed directly onto circuit boards to achieve the optimum utilization of space. An intelligent circuit layout and a high reliability system are the ideal preconditions for a use in systems where limited space specifies the design.

#### Technical requirements for Sensolnk switches

Overlap carbon to copper	$\geq 0,15 \text{ mm}$
Distance carbon coatings	$\geq 0,5 \text{ mm}$
Solder mask clearance	$\geq 0,25 \text{ mm}$
Distance carbon to dielectric	$\geq 0,15 \text{ mm}$
Dielectric width	$\geq 0,3 \text{ mm}$

### Sensolnk Keyboard contacts

Sensolnk keyboard contacts offer the use of innovative printing technology for long life and reliable systems with the highest quality standards. Due to the durability of the polymer paste systems against external influences Sensolnk provides the ideal solution for the use as keyboard contacts and

#### Technical requirements for Sensolnk keyboard contacts

Copper width	$\geq 2 \text{ mm}$
Overlap carbon to copper	$\geq 0,15 \text{ mm}$
Distance carbon coatings	$\geq 0,5 \text{ mm}$
Solder mask clearance	$\geq 0,25 \text{ mm}$



## TECHNICAL INNOVATION AT THE HIGHEST LEVEL

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 40 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.

### Germany

Hoffmann + Krippner GmbH  
Siemensstrasse 1  
74722 Buchen  
Tel. +49 (0) 6281 5200 0  
[info@tastatur.de](mailto:info@tastatur.de)  
[www.sensofoil.de](http://www.sensofoil.de)

### United States

Hoffmann + Krippner Inc.  
200 Westpark Drive  
Peachtree City, GA 30269  
Tel. +1 770 487-1950  
[sales@hoffmann-krippner.com](mailto:sales@hoffmann-krippner.com)  
[www.sensofoil.com](http://www.sensofoil.com)

### Switzerland

Hoffmann + Krippner GmbH  
Bernstrasse 4  
8964 Rudolfstetten  
+41 (0) 56 641 27 70  
[info@tastatur.ch](mailto:info@tastatur.ch)  
[www.tastatur.ch](http://www.tastatur.ch)

### United Kingdom

Hoffmann + Krippner GmbH  
Cowley Road  
Cambridge, CB4 0WS  
Tel.: +44 (0) 1223 421 889  
[info@hoffmann-krippner.co.uk](mailto:info@hoffmann-krippner.co.uk)  
[www.hoffmann-krippner.co.uk](http://www.hoffmann-krippner.co.uk)

### Netherlands

Hoffmann + Krippner B.V.  
Celsiusweg 32  
5928 PR Venlo  
Tel. +31 (0) 77 396 87 79  
[info@huk-bv.nl](mailto:info@huk-bv.nl)  
[www.huk-bv.nl](http://www.huk-bv.nl)

### Skandinavia

Regal Components AB  
Lefflersgatan 1  
754 50 Uppsala, Sweden  
Tel. +46 (0) 18 65 70 00  
[info@regal.se](mailto:info@regal.se)  
[www.hoffmann-krippner.se](http://www.hoffmann-krippner.se)



Sensofoil® ProductInfo US Version 1.3 05/2012