



## TESTAF

Technischer Standard  
Fliegeruhren



857 UTC TESTAF



*Sinn*


SPEZIALUHREN ZU FRANKFURT AM MAIN





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## DEAR CUSTOMER,

We know from numerous conversations that the people who buy our watches do so out of conviction. This includes people with a pronounced affinity to technology who are fascinated, for example, by the solutions we have devised for protection from magnetic fields and scratch resistance. Some of our customers, such as divers, pilots and the German GSG 9 special police unit, rely on their watches in their respective careers because their lives depends on it.

They all swear by the performance, resilience and durability, as well as the quality and precision of our watches. That is why Hamburg-based Germanischer Lloyd regularly tests and certifies the water and pressure resistance of our diving watches.

We have selected pilot's watches tested and certified to the Technical Standard for Pilot's Watches (TESTAF) by Aachen University of Applied Sciences. The TESTAF ensures that a pilot's watch meets all timekeeping requirements during flight operations in accordance with visual and instrumental flight regulations and is suitable for professional use. Functionality is our top priority and ultimately determines the design. Only the technical features that are really needed can be found on our watches. Because we believe that products have to speak for themselves.

The basic question that we ask ourselves is: which innovative technologies and materials can be employed for our craft and provide solutions for rendering our watches even more practical for everyday use? It is often worth indulging in a little lateral thinking to see what is going on in other industrial sectors or fields of science. We repeatedly go to the limits of physical resources to upgrade our watches – with the aim of making what's good even better. Most of our best developments are yet to come!

I am delighted that you have decided to buy a SINN timepiece and hope that it will continue to give you pleasure for many years to come.

Yours sincerely,

A handwritten signature in black ink, appearing to read 'L. Schmidt', with a stylized flourish at the end.

Lothar Schmidt

## FOREWORD AACHEN UNIVERSITY OF APPLIED SCIENCES DEPARTMENT OF AEROSPACE TECHNOLOGY



Aviation, in all its forms, combines emotion and technical excellence like almost no other mode of transport. It's not just pilots who have always demonstrated their connection to flying by wearing a special timepiece – the pilot's watch.

In the early days of aviation, the pilot's watch was one of the primary navigation instruments alongside the aviation map and a compass. Charles Lindberg would rather have gone without a radio than a second timepiece on his legendary transatlantic flight. To this day, most flight procedures in instrument flying carry a corresponding time stamp.

"Pilot's watch" is however not a protected term. It is often used for purely design-oriented models, which hardly do justice to the technical requirements for a flight instrument. It was therefore natural for the Department of Aeronautics and Astronautics at the Aachen University of Applied Sciences, as one of the leading educational and research facilities for aviation, to take on the development of a test standard based on the official certification procedure for general aviation. A considerable

number of pilots, airline companies and engineers were involved in creating the requirements and the development of the extensive test procedures.

TESTAF, the technical standard for the pilot's watch, was officially presented to the public in the autumn of 2012, in the deliveries hangar of the Eurocopter company in Donauwörth. The advisory board set up for this purpose, consisting of recognised experts in aviation and the watch industry, will ensure the future continuous updating and technical advancement of the contents and test procedures.

The team at SINN, led by Lothar Schmidt, of course immediately took on this challenge and met all requirements with flying colours after an intensive development phase. You hold the result in your hands today, the TESTAF-certified pilot's watch – a very special timepiece.

Sincerely

A handwritten signature in black ink, appearing to read 'Janser', with a large, stylized flourish above it that loops back to the right.

Prof. Dr.-Ing. Frank Janser

## GREETING FROM VOLKER BAU

CHIEF TEST PILOT, EUROCOPTER DEUTSCHLAND GMBH

Eurocopter develops, builds and tests the latest and most modern helicopters. The EC145T2, a civil multi-mission and rescue helicopter, is the latest addition to the BK117 group. In order to ensure that the helicopter can be deployed anywhere in the world, it needs to be tested under extreme environmental conditions.

A measurement system with more than 400 sensors was installed for this reason. All data is recorded with highest level of precision with regard to time. Time measurement must function just as reliably in temperatures of +50 °C in the Arizona desert as in -45 °C at 20,000 ft in Inuvik, NWT, in Canada. For time measurement inside the cockpit, we chose the EZM10 special watch (TESTAF), specially designed and tested for aviation.



Testing a high-performance helicopter in extreme conditions, and discovering and defining the limits of performance, demands everything from pilots, materials and from the EZM10. Extreme temperature differences from +20 °C in the hangar to -40 °C outdoors put extreme stress on the materials.

Along with the EC145T2 and the EZM10, the team all came through these tests with flying colours after almost one and a half years. The EZM10 has proven itself to be a completely reliable and indestructible partner.



Sincerely

Dipl.-Ing. Volker Bau

## SINN SPEZIALUHREN ZU FRANKFURT AM MAIN

It was back in 1961 that pilot and blind-flying instructor Helmut Sinn founded the company. Since then, we have been committed to producing high-specification mechanical watches. In 1994, the graduate engineer Lothar Schmidt took over the company. This marked the beginning of a new era for the SINN brand, because the new owner took a decisive step towards more innovation. Under his leadership, new technologies and materials were introduced, thus providing the crucial incentives for our company's evolution and gradual emergence as an insider's tip for lovers of fine watches. Today, our name stands for technical innovations – much to the delight of both the trade and our customers alike.



## Advancements in endurance testing

Take, for example, the absolutely condensation-free, anti-reflective, german submarine steel diving watch – made possible by HYDRO technology. Other examples include a chronometer chronograph fashioned from a 22-carat gold alloy that is as hard as stainless steel and a chronometer with a magnetic resistance 20 times the standard. There are also watches with a clockwork mechanism optimally protected from aging by an inert gas and integrated dehumidifying capsule. The list would not be complete without mentioning the development of mission timers (Einsatzzeitmesser or EZM in German) for special police units and border patrol guards as well as temperature resistance technology to keep mechanical watches performing at temperatures ranging from  $-45^{\circ}\text{C}$  to  $+80^{\circ}\text{C}$ . This technology has proven its worth in the EZM 10 TESTAF model, for example, used as part of the official approvals procedure for Eurocopter's EC 145 T2 high-performance helicopter. Hot and cold climate tests and high-altitude experiments were carried out in the deserts of the USA, the Rocky Mountains and the frozen wastes of Canada. The watch was worn unprotected, outside the pilot's overall, during cold climate tests at temperatures reaching  $-45^{\circ}\text{C}$ .



## **Innovations and certifications**

Germanischer Lloyd, the world's largest classification society for maritime safety, has been testing our diving watches for pressure and water resistance since 2005. As part of Germanischer Lloyd's official certification process, our diving watches have been treated as part of diving equipment since 2006 and tested and certified in accordance with European diving equipment standards. This is unparalleled in the watch industry.

We have had selected pilot's watches tested and certified to the Technical Standard for Pilot's Watches (TESTAF) by Aachen University of Applied Sciences since 2012. The TESTAF, the result of a research project at the initiative of Sinn Spezialuhren, ensures that a pilot's watch meets all timekeeping requirements during flight operations in accordance with visual and instrumental flight regulations and is suitable for professional use.

DIAPAL is one of our most important technological developments, with oiling no longer needed for the most important functions in the watch thanks to the materials we select. This technology was first used in 2001. With the aid of TEGIMENT technology, we achieve greatly increased scratch resistance through surface hardening.

## Ongoing advancement in technology and quality

Our top priority has always been to develop watches that offer superior performance – both in daily and in professional use. Which is why our engineers are working continually to identify which innovative methods, materials and technologies are best suited for optimising our watches. Each new development has to first undergo rigorous practical tests before being incorporated. And no watch leaves our workshops before it has been subjected to thorough checking and fine adjustment by our master watchmakers.

## Workshop modifications and hand-engraving

From the robust case and the polished crystal through to elaborate refinements: we make sure that each and every detail of our watches is fit for purpose. The same applies to our workshop modifications. Only the perfect interaction of all components and technologies ensures that our watches can meet all their design specifications in full. Take for example the SZ02 calibre of our U1000 diving chronograph. The 60-minute scale of the stopwatch minute counter is much simpler and more intuitive to read than the 30-minute scale commonly found on other watches. The hand-engraving represents a highly personal form of refinement. If required, our specially trained master engraver can etch a name, initials, monograms or symbols onto the rotor, movement bridge and case back.



# THE WORLD'S FIRST, TESTAF-CERTIFIED TIMEPIECE



## TESTAF

Technischer Standard  
Fliegeruhren

**In a research project lasting four years, the Faculty of Aerospace Technology of the Aachen University of Applied Sciences (FH) and Sinn Spezialuhren have developed a technical standard for pilots' watches (TESTAF). TESTAF ensures that a pilot's watch meets all of the time measurement requirements for flights operated under both visual flight rules (VFR) and instrumental flight rules (IFR). The EZM 10 TESTAF, the 103 Ti TESTAF, 103 Ti UTC TESTAF and the 857 UTC TESTAF were the first SINN watches to undergo and pass the strict test procedures.**

For these watches to meet all the test criteria, we had to make various adjustments to them. The watches then passed all of the tests with flying colours. This means that they are suitable for professional use as a pilot's watch – a fact that is documented by a certificate and the TESTAF seal of quality on the face of the watch.

What are the distinguishing features of a professional pilot's watch? To provide a universally valid answer to this question, it was necessary to formulate a norm or standard, which did not exist for pilots' watches until today. And so in 2008, engineer Lothar Schmidt, managing director and owner of Sinn Spezialuhren, took the initiative to close this research gap together with engineering professor Frank Janser of the Aachen University of Applied Sciences.

TESTAF now provides the answers. For example, a pilot's watch must withstand rapid temperature changes and changes in ambient pressure up to 0.044 bar – equivalent to an altitude of about 21,300 metres. A pilot's watch is thus subjected to several thousand pressure change cycles in order to simulate the actual stress conditions on a pilot's wrist. Besides being water-resistant, the watch must also be resistant to common aviation fluids such as fuels, hydraulic fluids and cleaning and de-icing agents. It is also important that the magnetic field of the pilot's watch itself does not interfere with the avionics such as the aircraft's emergency compass. It may not dazzle the pilot or produce unnecessary reflections. The watch must also be resistant to shocks and vibrations and be perfectly readable in the dark.

The list of technical and functional specifications describe precisely and unambiguously the time measurement requirements during flight in the following categories.

### **1. Functionality**

- Required functions during flights operating under visual and instrument flight rules
- Readability in daylight and in darkness
- Good operability
- Accuracy and power reserve

### **2. Resistance to external stress**

- Absolute and cyclical ambient pressure changes
- Operative temperature range and rapid temperature change
- Shock and impact resistance, G-forces and vibration
- Resistance to water and other aviation fluids
- Effects of magnetic fields on the watch

### **3. Safety and compatibility with other instruments**

- Effects of the watch's magnetic signature on avionics
- Avoidance of reflections and dazzle
- Appropriate form
- Secure strap fastening

**A description and photos of the tests can be found at [www.testaf.org](http://www.testaf.org).**





Differential pressure test: The EZM 10 must withstand alternating ambient pressure levels.



Dynamic G-force test on the 103 Ti Ar.



A pilot's watch such as the EZM 10 must have no magnetic influence on the emergency compass.



## 857 UTC TESTAF

**The 857 UTC TESTAF was tested and certified to the "Technical Standard for Pilot's Watches" (TESTAF) by the Aachen University of Applied Sciences. This establishes its suitability for professional use as a pilot's watch. It is attested to by a certificate and the "TESTAF" quality seal on the dial.**

The case of the 857 UTC TESTAF has been hardened with TEGIMENT Technology to make it especially scratch-resistant. The range of technologies also includes Ar-Dehumidifying Technology for greater functional reliability and freedom from fogging and overall functional reliability at temperatures between  $-45^{\circ}\text{C}$  and  $+80^{\circ}\text{C}$ . The 857 UTC TESTAF features a further time measurement element: a display for a second time zone on a 24-hour basis.





**TESTAF®**  
Technischer Standard  
Fliegeruhren



## Zertifikat

Mit diesem Zertifikat wird bescheinigt, dass die im folgenden genannten Uhren die Überprüfung gemäß dem Technischen Standard Fliegeruhren (TESTAF), Version 01 (2012) bestanden haben:

Hersteller:	Sinn
Modellbezeichnung der Uhr:	857 UTC TESTAF
Seriennummernreihe:	857 1000 bis 857 5999
Armbandmaterial:	Lederarmband Metallarmband Silikonarmband, große Fallschleife Silikonarmband, kleine Fallschleife

Die Zertifizierung erfolgt gemäß Abschnitt 3.1.1 des TESTAF für Flüge nach Sitzflughäfen

und gemäß Abschnitt 3.2.2 des TESTAF von -10° C bis +50° C.

Die Konformitätserklärung des Herstellers und/oder Zulieferers zum Bestehen der Bauanforderung des Abschnitts 3.2.9 des TESTAF liegt dem Prüfprotokoll vor.

Die Gültigkeit dieses Zertifikats für die einzelnen Uhren aus dem oben genannten Seriennummernreife ist an die Zusage des Herstellers gebunden, dass jede in den Handel gebrachte Uhr die Anforderungen der Einzelprüfungen (vom Hersteller durchzuführen) gemäß der folgenden Abschnitte des TESTAF erfüllt:

3.1.5	Ganggenauigkeit
3.1.6	Gangreserve
3.2.7	Stoßsicherheit

Dieser Zuschreibung, die mit der Angabe von Ort, Datum und der Unterschrift eines verantwortlichen Mitarbeiters des Herstellers versehen ist, liegt dem Prüfprotokoll vor.

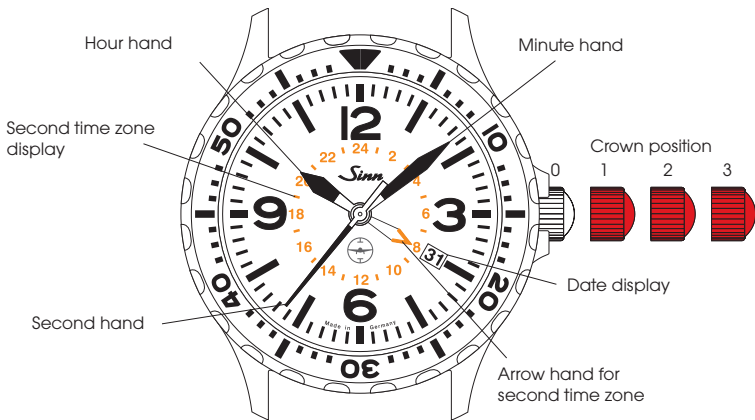
Durch die Erfüllung der Anforderungen des TESTAF wird bestätigt, dass die hier genannten Uhren für den professionellen Einsatz als Fliegeruhren geeignet sind. Für die langfristige Nutzung wird die Einholung der vom Hersteller angegebenen Service-Intervalle, eine regelmäßige Überprüfung von Ganggenauigkeit, Gangreserve und Wasserdruck sowie eine Sicht- und Funktionsprüfung empfohlen.

Aachen, den 10 April 2013

  
Prof. Dr.-Ing. Frank Jansen

The certificate confirms that the 857 UTC TESTAF has successfully passed the TESTAF test.

# INSTRUCTIONS FOR USE



## Winding the watch (crown position 1)

The crown is screwable (crown position 0). To loosen the crown, turn it *counter-clockwise*. The movement is wound by turning the crown *clockwise*. About 40 winds of the crown are generally enough to ensure reliable functionality. Under normal circumstances, simply wearing the watch every day should suffice to keep the self-winding mechanism wound. The power reserve allows you to take off your watch overnight without having to re-wind it.

### **Time adjustment (crown position 3)**

In crown position 3, the motion is paused. This helps you to set the watch precisely. To set the time accurately, we recommend moving the hand past the desired minute marker and then adjusting it *counter-clockwise*. Please make sure that the date changes at midnight and not at midday when adjusting the time. Move the hand forward until the date changes before you attempt to set the time. The movement restarts as soon as the crown is no longer in position 3.

### **Quickset date adjustment (crown position 2)**

Set the crown in position 2 and turn it *counter-clockwise* until the correct date appears in the date display window.

### **Setting the second time zone (crown position 2)**

The crown is screwable (crown position 0). To loosen the crown, turn it *counter-clockwise*. You can use the second time zone (UTC) display to show the time in a second location, such as New York (six hours behind Central European Time), or as an additional display the time of day. To do this, turn the crown in position 2 *clockwise* until you reach the correct time. The 24-hour arrow hand moves on the hour.

**Please take care to fasten the crown after making adjustments.**

### **Using the pilot's bezel to measure time**

The pilot's bezel is an outer ring divided into minutes, and can be moved manually in both directions. The triangle glows in the dark. It can be used in a number of ways, including to measure important lengths of time. For example, you can set the marking to the beginning of the time span to be measured, or you can use it to indicate the end of a given span of time. The triangle can be set in relation to the hour hand, minute hand or centre second hand.





## ADJUSTING THE LENGTH OF THE WATCH STRAPS

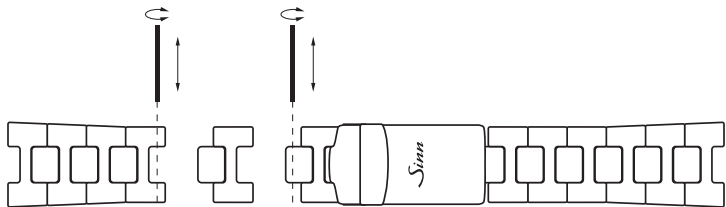
If you don't know how to shorten or lengthen the solid bracelet, please contact your SINN dealer or the watchmakers in our customer service department in Frankfurt am Main. Our customer service employees are also happy to help you over the telephone.

### **Adjusting the length of the solid bracelet**

Determine the relative lengths of the two sides before adjusting the length of the bracelet. To ensure maximum comfort, both sides of the bracelet should contain the same number of links. If this is not possible, the top bracelet strap (above the 12 on the clock) should be longer.

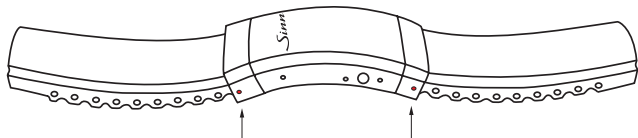
It is not necessary to detach the solid bracelet from the watch or the clasp.

1. Loosen the screws on the side of the bracelet link which is to be removed or added.
2. Remove the superfluous bracelet link or insert a new one.
3. Before screwing tight, add a small drop (no more!) of thread-locker (AN 302-42 medium-tight) to the thread of the bracelet screw.

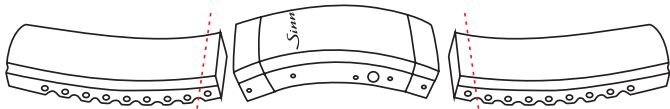


## Adjusting the length of the silicone strap

1. Release the silicone band from the clasp. To do so, use the pointed end of the band replacement tool to push the spring bar out of the fastener. The other side of the spring bar can be removed while the fastener is open, enabling you to remove the silicone band.



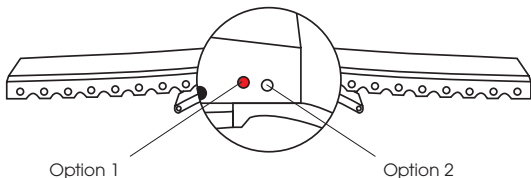
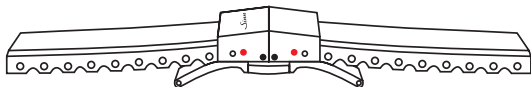
2. Using a knife or scissors, cut the silicone band in the middle between two metal pins. You should shorten the band symmetrically and little by little, starting from the clasp, until you have reached the desired length. Test the length from time to time before proceeding. Shortening both ends by the length of one metal pin results in a total difference of 10 mm in the length of the strap; shortening one end reduces the length by 5 mm.



3. Remove the first metal pin and replace it with the spring bar. Then reattach the clasp to the band.

## How to install the strap with a small butterfly clasp

There are two ways of installing the spring bar using the small butterfly clasp. We recommend inserting the bar in the opening shown here in red. Should the silicone strap be too tight, use the second option (shown here in white).



If you want to shorten the overall length of the silicone strap, refer to steps 1 to 3 in chapter "Adjusting the length of the silicone strap".

# Ar-DEHUMIDIFYING TECHNOLOGY

## Indication colours of the drying capsule



Pale blue

Up to 25%  
saturation



Light blue

Up to 50%  
saturation



Medium blue

Up to 75%  
saturation



Dark blue

Up to 100%  
saturation



Initial condition



Drying capsule  
saturated

The colour scale for the Ar-Dehumidifying Technology: the capsule continues to absorb moisture until the darkest colouration is reached.

### **Perfect freedom from fogging**

All watches in this series are water-resistant as per DIN 8310. But even with watertight instruments, the air enclosed in the case contains water in a gaseous state. And air can also penetrate the seals. When the water vapour in the case condenses into liquid, the instruments are impossible to read. To prevent this from happening, we have developed the Ar-Dehumidifying Technology. The combination of a special drying capsule, EDR seals (**extreme diffusion reduction**) and a filling of protective gas guarantee that the crystal remains free from fogging, even in difficult conditions.

### **Longer service intervals**

The sophisticated Ar-Dehumidifying Technology considerably slows the aging process of the watch's inner workings and keeps the movement functioning properly for longer. That is why we issue a three-year warranty on all our watches featuring Ar-Dehumidifying Technology. When the drying capsule is saturated, as indicated by a deep blue colour (refer to picture on the left side), we recommend you have it exchanged so you can continue to enjoy all the advantages of the Ar-Dehumidifying Technology (enhanced reliability, longer intervals between maintenance).



Luminous



# TECHNICAL DETAILS

## Mechanical Movement

- ETA 2893-2
- Self-winding mechanism
- 21 bearing jewels
- 28,800 semi-oscillations per hour
- Seconds stop function
- Shock resistant as per DIN 8308
- Anti-magnetic as per DIN 8309

## Functions

- Hours, minutes, seconds
- Second time zone on a 24-hour basis
- Date display
- Pilot's bezel with minute ratcheting and luminous key mark

## Dial & Hands

- Matte black dial
- Numbers and indices coated with luminescent colour
- Hour, minute and second hand coated with luminescent colour

## Tests and certification

- Tested and certified in accordance with TESTAF by Aachen University of Applied Sciences, Aerospace Engineering Department

## Watch Case

- Case made of stainless steel, bead-blasted
- Sapphire crystal glass in front, anti-reflective on both sides
- Case back screw-fastened
- Crown screwable
- Water-resistant as per DIN 8310
- Pressure resistant up to 20 bar (= 200 m water depth)
- Low pressure resistant
- Band lug width: 22 mm
- Case diameter: 43 mm

## SINN Technologies /

### Special Features

- TEGIMENT Technology, therefore especially scratch-resistant
- Ar-Dehumidifying Technology enhances functional reliability and freedom from fogging
- Temperature Resistance Technology, therefore functionally reliable at temperatures from  $-45^{\circ}\text{C}$  up to  $+80^{\circ}\text{C}$
- Captive bezel



## SERVICE

### **General advice**

To preserve the water resistance for as long as possible, the watch should be rinsed whenever it has been in contact with seawater, chemicals, etc. If your watch is frequently worn in water or underwater, we recommend having its water resistance checked at yearly intervals.

The watch is designed to withstand high levels of mechanical wear and tear and is shock resistant as per DIN 8308. Nevertheless, it goes without saying that continual mechanical stress in the form of impacts or vibration will affect its durability. Care should therefore be taken to protect your watch from unnecessary wear and tear. It is only possible to judge how well the watch keeps time after it has been in operation for approximately eight weeks, since it takes that long for the working mechanism to become adjusted, especially in view of the fact that everybody has different lifestyles and habits. In the event of any excessive deviation, please keep a day-to-day record of its timekeeping over a period of about one week, for example.

### **Do you have any questions?**

Our employees will be pleased to advise you. Simply get in contact with us. We look forward to talking to you.

Telephone: + 49 (0)69 978 414 400

Telefax: + 49 (0)69 978 414 401

E-mail: [kundendienst@sinn.de](mailto:kundendienst@sinn.de)



**Should you need to send your watch in to customer service, we need to ensure the process goes smoothly. We ask that you please include the following information:**

- Name, address, e-mail address and fax number (where applicable) and a daytime telephone number.
- A detailed description of the problem. What is the exact nature of the defect? At what time does the problem arise? How often does the problem occur?
- Wherever possible, please state the date of purchase and your customer number (indicated on the invoice) or enclose a copy of the invoice.

For information about the process, please refer to the section entitled 'Repairs' in our general terms and conditions of business. You'll find our general terms and conditions of business on our website [www.sinn.de/en](http://www.sinn.de/en). We would be happy to send you a copy of the general terms and conditions, or you can contact our customer service department directly. For insurance reasons, we strongly recommend sending us any return goods by registered parcel post. As an alternative for customers in Germany, there is also the option of a collection service covered by transport insurance, on request. To ensure your request is dealt with smoothly, please call our customer service department! We regret that we are unable to accept deliveries with unpaid postage!

**Please send your watch to the following address:**

Sinn Spezialuhren GmbH  
Kundendienst  
Im Fuldchen 5-7  
60489 Frankfurt am Main  
Germany

You can also find comprehensive information about SINN, our watches and technologies at [www.sinn.de/en](http://www.sinn.de/en).

# Sinn

SPEZIALUHREN ZU FRANKFURT AM MAIN

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Technische Änderungen vorbehalten.  
Technical specifications are subject to changes.

