HEIDENHAIN

Technical Information

Workpiece touch probes increase productivity in manufacturing

The use of touch probes reduces setup times, helps to increase machine usage time, and improves the dimensional accuracy of the finished workpieces. Their setup, measuring and monitoring functions can be performed manually or automatically. Touch probes are used primarily on milling machines and machining centers, and they are suitable for a large number of measuring tasks—both in the workshop and in series production.

Real-world designs for various applications

The touch probes are available in two versions, depending on the application:

- The TS workpiece touch probe is inserted directly into the machine tool spindle. It can be ordered with a cable or with an infrared interface. Some of its typical tasks are workpiece alignment, presetting, and workpiece measurement.
- The TT tool touch probe permits fully automatic measurement of stationary or rotating tools right in the machine, depending on the functions featured by the NC control.

High long-term stability through wear-free optical sensor

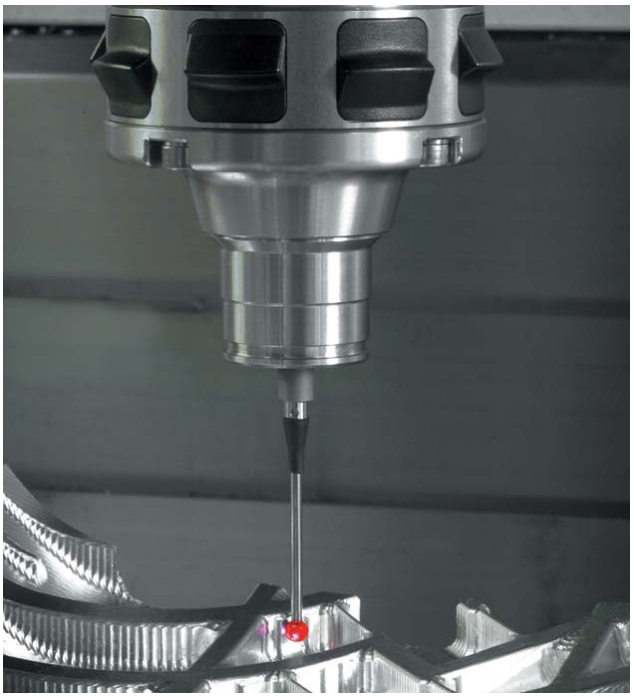
When the probe contact is deflected, HEIDENHAIN touch probes generate a trigger signal from an optical sensor. A lens system collimates the light generated from an LED and focuses it onto a differential photocell. When the stylus is deflected, the point of light changes its position on the photocell, releasing a trigger signal. With the contact-free operation of the optical switch, the sensor does not wear, which guarantees the high long-term stability of HEIDENHAIN touch probes.

Optical display

With the HEIDENHAIN touch probes' optical display, the user can check whether the touch probe is properly switched off or on. The device indicates its readiness explicitly with a blinking light. Manual probing is also very convenient for the user because stylus deflection is indicated by a continuous light.

Operating times more than doubled

Working with the standard touch probes TS 640 and TS 440 has become more convenient. The revised electronics now operate significantly more economically, so that the operating time with one set of batteries has more than doubled.



The operating time, i.e. the time for which the touch probe is actually in operation, is now approx. 800 hours for the TS 640 and approx. 200 hours for the compact TS 440.

This example illustrates the improvements:

Assuming that probing occupies 5% of working time and a plant runs 3 shifts for 220 days per year, the batteries would not need to be exchanged until after about 3 years for the TS 640 and after about ¾ of a year for the TS 440.

Different possible types of batteries
HEIDENHAIN touch probes are supplied with lithium batteries. This makes it possible to keep the intervals between battery exchange as long as possible. Besides lithium batteries, HEIDENHAIN touch probes can also be operated with standard alkaline batteries or rechargeable batteries. Thank to the sophisticated electronics, even batteries with very low voltage can be used. With these batteries, however, you would have to plan for shorter battery exchange intervals.

TS 740—The Infrared Touch Probe System for Stringent Requirements
Standard touch probes like the TS 640 and TS 440 operate on the principle of an optical switch as sensor. The TS 740, however, which was introduced at the EMO 2007, features a newly developed sensor with pressure elements at its core. When probing a workpiece, the stylus is deflected so that a force acts on

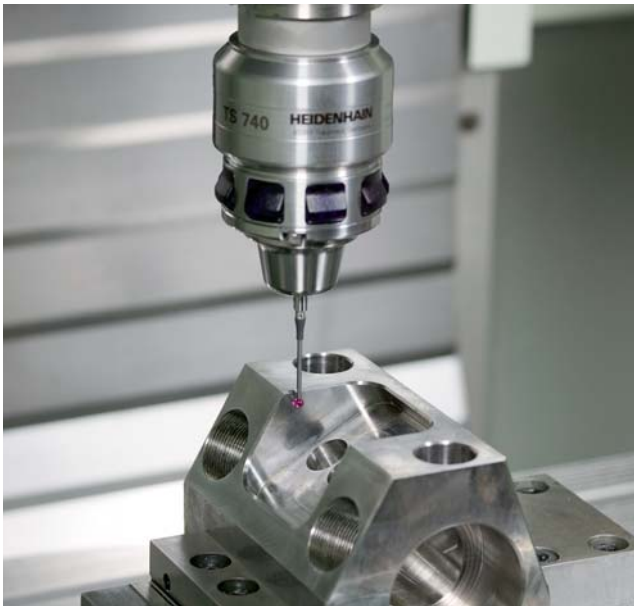


Figure 1: The TS 740 at work

these elements. The difference in forces is calculated by the electronics, and the trigger signal is generated. This system makes a probing accuracy of ≤±1 µm and a probing repeatability of 2 ≤0.25 µm possible. The TS 740 is designed for use in modern machine tools with fast tool changers. Likewise, rapid acceleration or deceleration does not cause uncontrolled trigger signals. The TS 740 distinguishes itself from the TS 640 with its higher probing accuracy and repeatability at a probing speed of 0.25 m/min (TS 640: 3 m/min.), and by its lower probing forces. The more complex electronics, however, necessitate shorter operating times between battery exchange than for the standard touch probes.

The new TS 740 infrared touch probe is used to perform measurement tasks in a machine tool where there is an especially high demand regarding the accuracy and repeatability of the touch probe.

TS 444—Battery-Free, Air-Driven Touch Probe
The TS 444 offers an innovative and smart solution: at the same time that it cleans the probing point, it generates its own energy. Compressed air must be supplied through the spindle in order to use the TS 444. The air is introduced into the touch probe via the taper shank and powers a turbine wheel inside the touch probe. The turbine wheel generates electrical energy through changes in the magnetic field, which is stored in high-power capacitors. As with conventional touch probes, the exit air is used for cleaning the probing point. This means that at the same time that the touch probe is charged with energy, the probing point is cleaned. Those who use the TS 444 need not handle, store or dispose of any batteries.

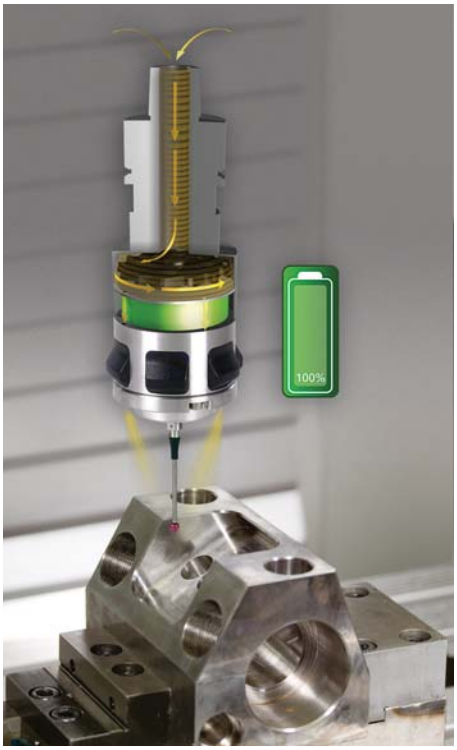


Figure 2: TS 444 principle of function

The charging time varies depending on the pressure: The higher the pressure, the shorter is the charging time. A supply pressure of 5 bars or more is recommended to ensure that charging is complete in a reasonably short time. For example, when a pressure of 5.5 bars is used, the touch probe is fully charged after around 3 seconds. With fully charged capacitors, the touch probe is able to probe for two minutes.

This touch probe is particularly interesting for those who manufacture in series and cannot allow any interruption in their processes at critical times in order to exchange batteries. But the TS 444 is also an interesting alternative for users who very seldom use a touch probe but cannot afford the delay that occurs when the proper size of batteries is not immediately available.

Tool Measurement
Tool measurement on the machine shortens non-productive times, increases machining accuracy and reduces scrapping and reworking of machined parts.

With the contactless scanning of the TT 3-D touch probes and the contact-free TL laser systems, HEIDENHAIN offers two completely different possibilities for tool measurement.

TT 140
The trigger signal is generated through a wear-free optical switch that ensures high reliability. The disk-type probe contact is easy to exchange. The connection pin to the touch probe's contact plate features a rated break point. This protects the touch probe very effectively from physical damage due to operator error.

TL laser systems
The TL Micro and TL Nano laser systems can measure tools at the rated speed without making contact. With the aid of the included measuring cycles you can have tool lengths and diameters measured, the form of the individual teeth inspected, and the tool checked for wear or breakage.

Conclusion
HEIDENHAIN touch probes offer a number of new benefits and innovations. Among these are their extremely extended operating times and more flexible battery handling with the standard models. In addition, the flushing/blowing feature typical to HEIDENHAIN touch probes now serves to power a new touch probe that operates entirely without batteries. Besides the optical standard sensor, HEIDENHAIN has introduced to the market a new sensor principle for very high measuring accuracy and, with it, offers one of the most accurate touch probes now available for machine tools on today's market.

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For more information:
• Brochure: *Touch Probes for Machine Tools*