

Stationary clamping device ■ CFK design ■ automated complete machining

Easy and lightness of clamping

Since 1981, the company, Peter Brehm, has stood for innovative endoprosthetics and spinal surgery. For the production of implants on an automated Hermle C30 the company relies on stationary lightweight design clamping devices from Hainbuch. With many advantages.

Every year in Germany approximately 400,000 people get a so-called endoprosthesis. In most cases these implants are artificial hip and knee joints, of which 210,000 hip joints and 165,000 knee joints are used. If after a number of years it is time to replace these prostheses, the primary joints used can no longer be implanted due to physiological changes of the patient. In these cases, so-called revision joints are necessary. The modular character of these joints offers more variation possibilities in the structure. For example, in accordance with the modular system, different bone grip situations can be created or the size can be varied.

Full-range provider with emphasis on revision prosthetics

As a full-range provider, Peter Brehm in Weisendorf Germany, develops, manufactures, and sells implants for primary and revision supply. The strength of the company is in the area of revision prosthetics – large joints for hip, knee, and spinal column.



1 The company, Peter Brehm, produces implants for primary prosthetics and revision prosthetics, as well as the instruments necessary for the implantation. The enterprise has specialized in implants for spinal column (photo), hip, and knee (photo: Peter Brehm)

Therefore, hip endoprostheses or spine fixators are important products in the portfolio. The product line also includes special implants that are used if the patient's bone defects are so extensive that they can no longer be covered with standard implants. Brehm also manufactures the instruments necessary for implantation.

The purchasers for all of these products are clinics – particularly those clinics that have specialized in the difficult revision operations. With few exceptions, all university hospitals in Germany belong to the customer base of the company. The company also supplies many international customers, as indicated by the current solid export share of 40 percent.

Brehm only uses high-quality materials, such as titanium, cobalt-base alloy, and ceramics that are particularly bio-compatible, strong, and low-wear to manufacture the implants and instruments. All semi-finished materials are forged so that the possibility of imperfections and fatigue failures are excluded to the extent possible. »As titanium material, we frequently work with the alloy TiAl6V4 that has established itself in the field of medical technology«, explains Gerd Kirsch, Production Manager at Peter Brehm. »For example, we use pure, grade



2 In prefabrication, Brehm is primarily involved with turning and milling. In this regard, in the milling area they work with four C30s from Hermle, of which one has been automated with an IH 60 pallet changer from Indunorm (photo: Hanser)

1 titanium for hip sockets, and cobalt-base alloys in the knee area due to the excellent polish ability and high strength.« For implants the lot sizes extend from five to a hundred parts, depending upon the product. »The trend is downward«, admits Kirsch. »This development also applies for smaller parts, like screws, which we formerly manufactured in either lots of 500 or 1,000. Today it is 300 or 200 pieces.« On the other hand, the company produces instruments in five to twenty-fold types to complete the so-called instrument sets. Nevertheless, such a set can include 3,000 individual parts.

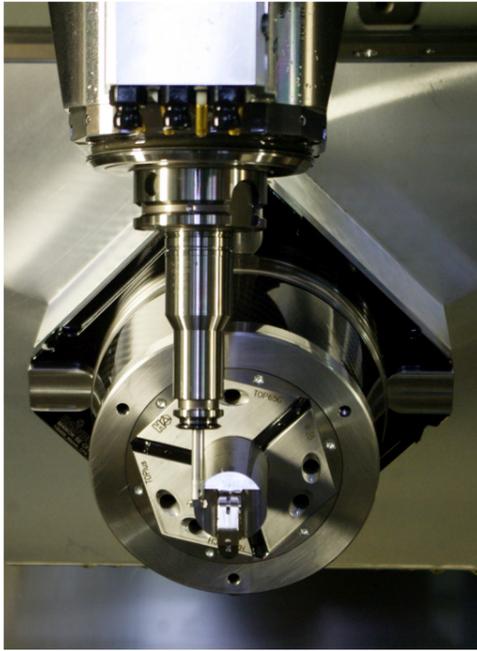
Unmanned manufacturing to lot size one with automation

The metal-cutting machining of the implants and instruments is allocated to the so-called prefabrication in Weisendorf. Here the emphasis is on turning and milling with the objective of increasingly complete machining is consistently pursued. »In this regard, with fixed headstock lathes and sliding headstock lathes from Traub, we can cover everything that is customary in the turning area«, emphasizes Kirsch. »Six years ago we decided on Hermle milling machine. Here we are universally prepared and set-up



3 In order to machine round material on the C30 in an automated process, Brehm use nine lightweight design Manoks CFK from Hainbuch. The stationary clamping devices are made of carbon fiber and are mounted on pallets with a zero position clamping system (photo: Hanser)

for every application in the field of medical technology. We invested in four C30s that are configured for simultaneous 5-axis machining.« We have automated one of the C30s, so that we can manufacture unmanned and with even shorter throughput times, »In this regard, we decided on a pallet automation with which we can manufacture either lots or just even a lot size one in any sequence, unmanned«, says Walter Kloha, Milling Technician. »Specifically, we have integrated an IH 60 pallet changer from Indunorm that has more than 24 pallet positions, and that can handle pallet weights up to 60 kg.



4 When swinging over on 5-axis machines, some clamping devices have problems with chip fall. This is not the case with the Manok and its minimal interference contour. Equipped with hexagon Toplus clamping heads, the stationary chuck is completely sealed, so that chips cannot penetrate into the clamping device (photo: Hanser)

5 Marco Horny, Walter Kloha, Stephan Stahl, Benjamin Schuh, and Gerd Kirsch (left to right) surround Edgar, who is considered the most prominent employee at Brehm. Transparent in every aspect, Edgar embodies the company's main products (photo: Hanser)

The automated C30 is currently operated by Marco Horny and Stephan Stahl, who alternately program the machine, i.e. prepare and run-in parts, in order to handle the high volume of parts. In this process today, they clamp round material with nine manual Manok CFK stationary chucks from Hainbuch. Five were purchased when the pallet changer was purchased. The chucks from a competitor, which were used until automating, did not have a construction height sufficient to move the loading station into the machine. Brehm was also dissatisfied with the interference contour of these clamping devices and the result of chip fall. In the subsequent search for an alternative, these and other criteria, for example, the new stationary clamping device should also be able to accommodate bars that are as long as possible. It should have a

low construction height to avoid long residual pieces and should be easily accessible. These were the crucial factors.

Minimal interference contours, lightweight, and not sensitive to contamination

»With these requirements we sought out different manufacturers. However, we stayed with Hainbuch«, explains Kirsch. »With Hainbuch preliminary discussions had already shown that with our ideas of obtaining a steel clamping device with as smooth a surface as possible, for diameters to 65 mm, we were already wandering in the customized solution. We decided on the Manok, which is made of carbon fiber.« In addition to the minimal interference contour, the CKF Manoks also offer a weight that is significantly lower than the steel version.

»The carbon variant is as much as 70 percent lighter«, says Benjamin Schuh, who is responsible for technical consulting and sales at Hainbuch. »At the same time, the lightweight design Manoks are extremely rigid because they are equipped with hexagon Toplus clamping heads that offer a positive locking of the clamping head and clamping device.« Unlike the round clamping heads, the hexagon model prevents radial displacements to the taper of the clamping device. Therefore, the chips cannot penetrate into the Manok. »This is particularly important in the milling area, where chips often fall over the clamping device«, points out Schuh.

In the meantime, Hainbuch has developed a new generation of CFK Manoks. Brehm is currently using four of these. »For this newer generation model the inner

mechanics were changed. The actuation unit was also adapted. The clamping device has been designed more shallow, with the same minimal interference contour«, explains Schuh, summarizing the innovations. The clamping device specialist, based in Marbach, Germany, offers different adaptations for both generations. For example, the hexagon Mando Adapt SE for I.D. clamping and the jaw module for clamping range extension can be combined in accordance with the modular system principle.

High holding forces, rigidity, and user friendly handling

Currently, a wide range of parts are milled from solid materials with the Manoks on the automated Hermle C30 machine. The clamping devices have repeatedly proven their capability for lot sizes of 30, 50 or 150 pieces. »For example, we once had the situation that we wanted to machine residual material, and we only had six millimeters for the clamping, recounts Stahl. »So we tried it, and it was rock solid. Compared with a conventional three-jaw chuck that needs at least 20 mm, of course there is significantly less material scrap with the Manok.«

The high holding forces and the high rigidity also have positive effects on the surface quality of the manufactured implants and instruments. »In addition to functionality, the appearance of our components also plays a very important role«, Kloha comments on this aspect. »Previously, we did indeed produce parts with the same quality. However, the effort was significantly higher. We simply had more rework.« Moreover, we were by no means able to run the cutting parameters that we are running today. Formerly, two steps were required. Today it is often only one step.

»However, the advantages of the Manok also include user friendly set-up, has vibration dampening, and lower in weight. The Manoks also reduce the formation of chatter marks. It is very easy to quickly change something in the machine«, reports Horny with regard to his daily work. »Also for parts where things get really tight when swinging over, they do quite well. With other chucks, in these cases, things would crash, or we would have to use longer tools, which could result in lower cutting values.« Because the components are

machined under oil on the Hermle C30, they run a wash program after milling. Afterwards not only are the parts completely free of chips, but also the clamping heads. »With open chucks, the chips fall through in the middle and stay at the bottom on the zero position clamping system«, is how Kloha describes his experiences. »Then if the pallets are changed automatically at night, eventually they will be placed on the chips. This cannot happen with the Manoks.«

In conclusion, the milling specialists at Peter Brehm have another useful tip for working with the stationary clamping devices. Unlike what is intended in a standard operation, they have installed a spacer plate between stationary chuck and the pallet. When swinging over in 5-axis operations, this prevents coming too close to the spindle, or even colliding with it. In their opinion, offering the spacer plate as an option would be an advantage for the both customer and manufacturer.

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