



Manual Work Means Top Quality

Every detail counts. With this in mind, Leica Geosystems develop instruments and fastidiously design complementary accessories, such as prisms, for these instruments. Gerhard Sönsner, product manager for original accessories, explains the steps required to manufacture a 360° prism, such as the Leica GRZ4 and GRZ122, and how an original Leica Geosystems accessory differs from a third-party prism.

Who manufactures the prism?

Gerhard Sönsner: The Leica GRZ4 and GRZ122 are produced by our strategic partner, SwissOptic AG, in Heerbrugg, Switzerland. SwissOptic is a former Leica

optics producer located on our premises in Heerbrugg and has been part of the Berliner Glas Group since 2004.

How can a piece of glass, even one which is admittedly precision-ground, be comparatively cost-intensive?

It's hard to believe it when you see the finished product, but there are about 90 steps involved in manufacturing this product, and most of them are done manually. At the beginning is a block of glass. It is optical glass and must be absolutely stress-free, which is why the molten product has to cool over a period of weeks or even months.

A 360° prism starts life as a glass cube with an edge length of 45 mm (1.8 in). How is this cube made, and how exactly is it ground?

Cubes are ground from a block of glass. All six sides are then ground with an angular accuracy of less than 8", lapped (smoothed by machining) and then polished. The precision of the evenness is in the two-digit nanometer range after polishing. To achieve this, each of the prisms must undergo optical contact blocking. Four triangular pyramids of the same size are then ground from the cube. To be able to polish the entry and exit faces, the prisms must undergo optical contact bonding again. This achieves an angular accuracy of 2"!

After every step, the various specifications are checked using a host of different measuring instruments, e.g. an interferometer, which is essential. This high degree of precision is especially important so that the signal returns to the Total Station receiver even over long distances. Operational range in tracking mode is up to 800m (2,600ft). An angular error in the prism of 1' corresponds to a 1 cm (0.4 in) signal offset at 1,000m (3,300ft).

What does optical contact blocking mean?

It's a procedure whereby the prisms are set firmly in place on a device by hand, where the attachment occurs purely through natural adhesive force. It cannot be done by machines, as it requires a highly developed sense of touch, competency and experience. To retain this special knowledge, SwissOptic invest greatly in training junior employees.

How are the six individual prisms united to form a complete prism?

The six individual prisms are bonded to one another very precisely using special bonding devices. The entire process takes 2 weeks, whereby the hardening process takes the most time.

The finished prism is a golden-brown color. Is there a technical reason for this?

The color is a result of the copper coating. We use copper because it is optimally attuned to the wave length of our instruments. The coating itself is comprised of an adhesive layer, the copper layer and then a top layer. This arrangement makes the prism highly resistant to environmental influences. The coating must be applied in a clean room in a vacuum and under specific climatic conditions.

About 90 processes are required to make a 360° prism ready for sale. What are the most critical aspects? What is the relationship between production and inspection/testing of the quality of the intermediate steps and the end product?

The most critical aspects are definitely the manufacturing of the glass, the coating and the bonding process. The entire process to make a finished prism takes 5 to 6 months if the block of glass used for processing is already available. Naturally, CNC technology is also used in modern optics production. However, highly precise manual work is often required before the parts can be made with such machines. All quality testing is done by hand as well. Thus the great majority of work is still manual.

If a single element is damaged, can it be repaired? If so, is the cost justified?

The prism is a bonded block. You would have to disassemble the entire prism, and then it wouldn't be possible to reuse it. Each 360° prism is unique, which is why it isn't possible to swap out individual prisms.

How do you test final quality and environmental specifications?

All original accessory parts are subject to stringent quality requirements, from reflector poles, tribrachs and batteries to the carriers and even the tripods. For example, the 360° prism is tested by knocking over the pole from a height of 2 m (6.6 ft). A variety of endurance tests under climatic conditions from -40°C to +70°C and high humidity must also be passed before it can be put on the market. In addition to precision, environmental compatibility must also be tested. All accessories are subject to quality testing on a regular basis.

Speaking of original accessories: In many sectors they're considered too expensive and third party products are thought to be just as good. How would you convince people otherwise?

Our accessories are optimally matched to our instruments. Naturally, we also test accessories from other manufacturers. So-called Leica-like, Leica-type or Leica-lookalike products look deceptively similar to the original accessory, but fall far short of meeting our quality requirements. Customers often purchase such products thinking they are original accessories. If they end up being defective or if the results aren't right, they bring them in to our service centers. Initially this puts our products in a bad light. Then they



Who is SwissOptic AG?

SwissOptic AG is recognized worldwide as a provider of quality and highest precision in the world of optics. Former Leica optics producers, they became independent in 1997 and have been part of the Berliner Glas Group since 2004. The company develops and produces a wide range of precise optical and optoelectronic components, modules and systems.

SwissOptic is a competent partner along the entire process chain, from design to series production. SwissOptic is located on the Leica Geosystems AG premises in Heerbrugg, Switzerland.

www.swissoptic.com

realize they have nothing but a cheap copy of the real thing. Incidentally, we hold the patent for the 360° prism.

What do you do to protect yourselves from other companies making copies of your products?

We take this issue very seriously, both for our sake and that of our customers, and are currently working on measures to make all our accessories unique and easier to identify.

Where can customers find out which accessories are right for their needs?

We have a dedicated website for accessories: accessories.leica-geosystems.com. You will find all

relevant information there, including white papers on the comprehensive testing we've done and recommendations derived from them. Naturally, customers also receive expert advice at our sales and distribution offices around the globe. ■

Thank you for the detailed information, Mr. Sönser!

The original version of this interview between Gerhard Sönser and the VDV editor-in-chief Rolf Bull appeared in the June issue of the German VDVmagazin, 3/13.

