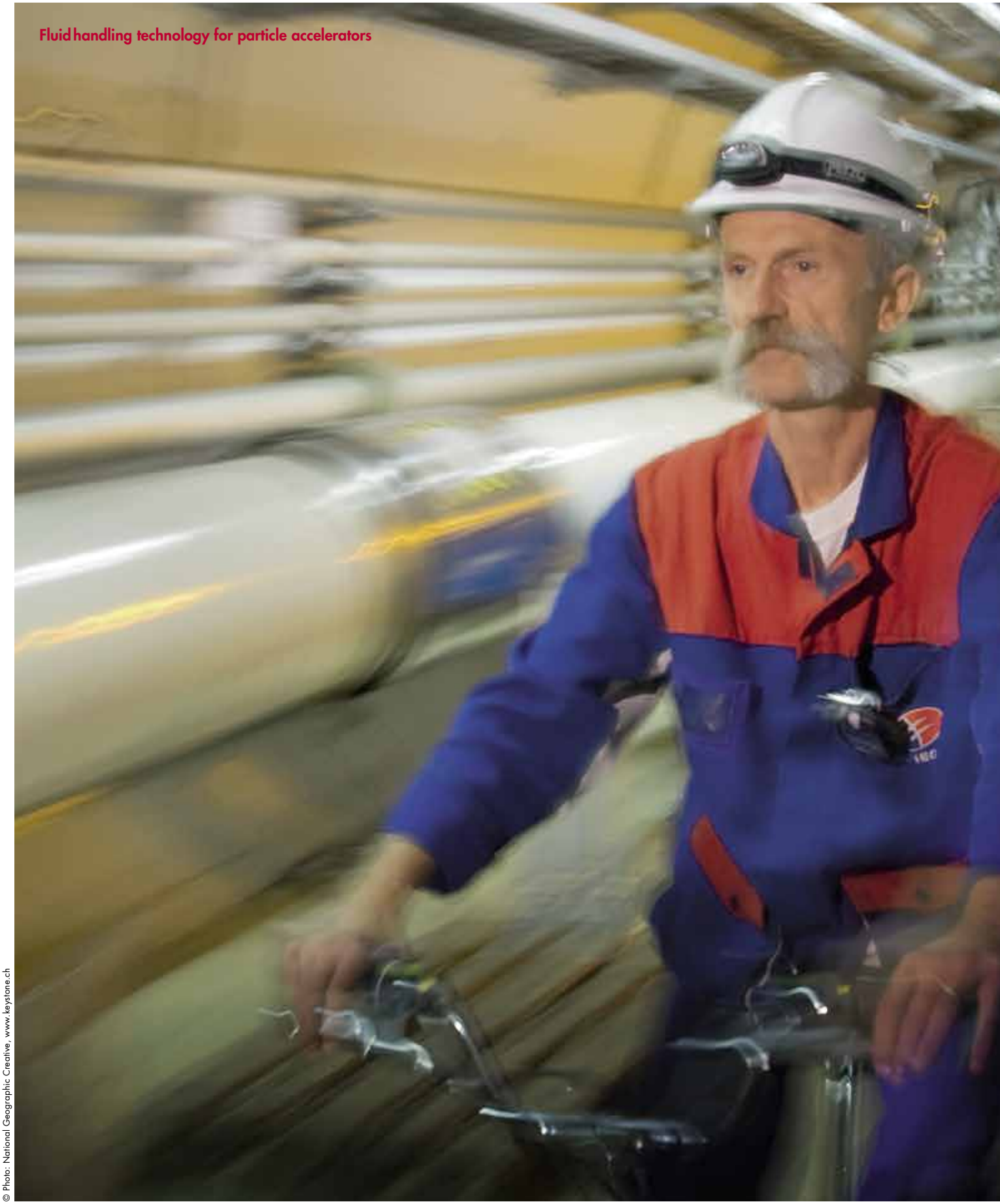
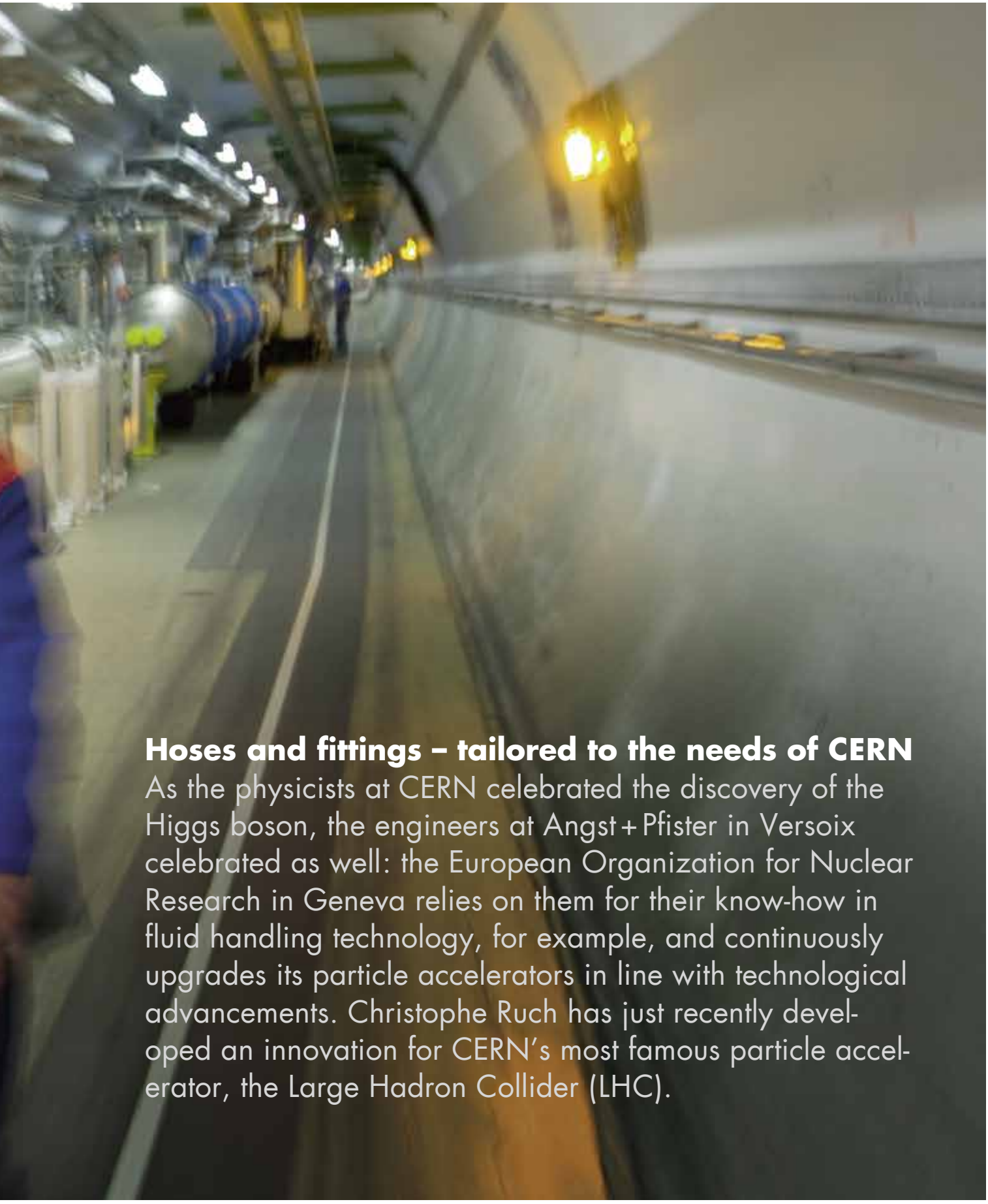


The world's largest particle accelerator at present: the Large Hadron Collider (LHC) ring at CERN near Geneva has a circumference of approximately 27 km. Cutting-edge physical technology requires special solutions, including cooling the 200 converters that provide electric current for the superconducting magnets in the LHC.

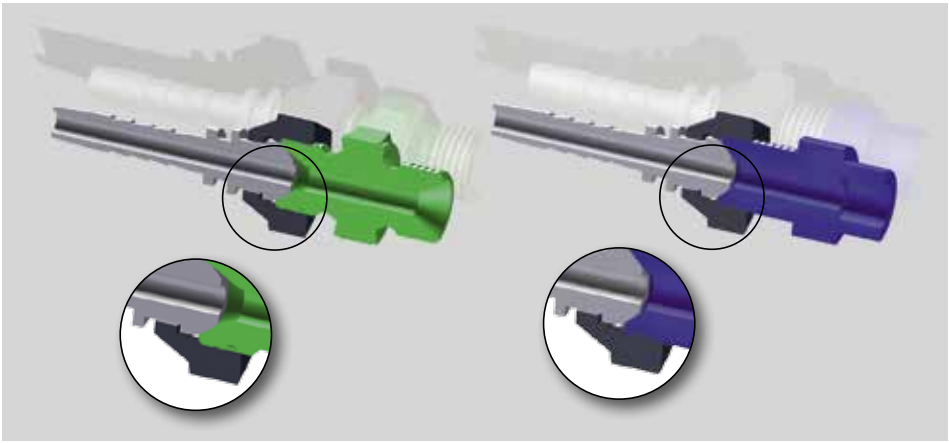


Hoses and fittings – tailored to the needs of CERN

As the physicists at CERN celebrated the discovery of the Higgs boson, the engineers at Angst+Pfister in Versoix celebrated as well: the European Organization for Nuclear Research in Geneva relies on them for their know-how in fluid handling technology, for example, and continuously upgrades its particle accelerators in line with technological advancements. Christophe Ruch has just recently developed an innovation for CERN's most famous particle accelerator, the Large Hadron Collider (LHC).

Magnetic fields, radio frequencies, physical particles accelerated almost to the speed of light and then colliding with each other from different directions: the environment of cutting-edge physical technology surrounding the Large Hadron Collider (LHC) demands special solutions – including for the lines used to cool the 200 converters that provide electric current of between 4,000 and 8,000 amperes for the superconducting magnets.

The connector fittings for the coolant lines are guaranteed leak-tight, as initial tests show.



The simulation shows that a connection fitting of both 60° and 90° can be tightly connected to the double seal cone. The sealing surface is sufficient in any event.

And now these lines have to be replaced. Christophe Ruch, a product application engineer at Angst+Pfister in Versoix, developed the solution in a customized approach aimed at meeting the high demands of CERN while at the same time building on standard products to keep costs as low as possible for the customer.

Perfect insulation The resulting solution: the hoses are made of an EPDM compound, with a double Kevlar® layer embedded in the wall. In this version, the hoses are 100% compliant with CERN's specifications: they provide complete electrical insulation. With their nominal diameter of 6 mm, they have to resist a minimum bursting pressure of 60 bars at an operating pressure of 20 bars and guarantee a bending radius of 70 mm.

The numerical Simulation shortened the development time. Analyses and test confirmed the result of the numerical simulation in practice.

The prowess of the fluid handling technology specialist Angst+Pfister designed two different connectors for this purpose, with the one hose nipple consisting of a double seal cone with a union nut, to which a connection fitting of both 60° and 90° can be tightly connected. The other hose nipple has an external thread with a 60° inner cone and a seal face applied to the hexagon, and is attached to the first connection fitting using a specially dimensioned gasket set made of metal and rubber. These connection solutions are necessary given the variability of the connections at CERN and the fact that they do not always correspond to standard hydraulic connections.

Simulation cuts development time Numerical simulation of the connecting pieces soon showed that the contact surface is sufficient both at a 60° and a 90° angle. The subsequent line prototypes and the pursuant analyses and tests confirmed the result of the numerical simulation in practice, so that production could begin.

Multifunctional adapter Just like the hose nipple, the straight adapter and the 90° angle adapter are designed to be connected both to the conical seal face and to the hexagon with the specially dimensioned gasket set. This leak-free gasket set consists of an Angst+Pfister Normatec® O-ring in FKM and a stainless steel retaining ring. Dimensions are based on the various possible installation situations.

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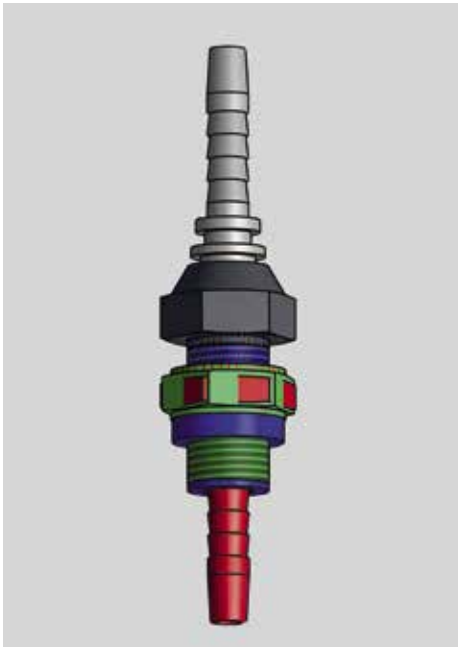

Designing complete systems including hose, fittings and seals is Angst+Pfisters specialty.