

Unbreakable?

MEETING THE CHALLENGE OF DEVELOPING THE WORLD'S MOST ROBUST COMPACT JOYSTICK CALLED FOR GREAT STRIDES IN TERMS OF DESIGN, ELECTRONICS AND MATERIAL SPECIFICATION

▶ A diminutive joystick possesses the power to control the multimillion-dollar machines used by mining and demolition companies. So when a joystick failure occurs, no work can be achieved until it's replaced. But what if an unbreakable joystick could be incorporated – then operations would be safer, more efficient and provide increased profitability!

The Swedish company Caldaro, known for its high-quality OEM products, tackled this special challenge faced by mining and heavy equipment operations. The result was the C15, a joystick that can be used across the application spectrum, from the toughest working environments to exquisitely high-precision fine-tuned medical equipment.

Claudio Talamo, the company's managing director, initiated the challenge and had a few thoughts about how to construct this new joystick, according to Erik Kauppi, sales engineer at Caldaro. "We have been working together with two customers from heavy industry, with a focus on creating the world's most robust compact joystick," he says. "A crucial part of this new joystick is an axis manufactured as a single piece and with double-diameter dimensions. This makes it practically impossible to bend."



Under a stripped-down C15 you'll find the extremely strong shaft and electronics potted with a protective compound

Another important constituent is that the circuit board and electronics are potted in a protective compound after mounting under the base of the axis. This completely protects the circuit board, enabling it to become impervious to degradation and short circuits from threats such as salt mist, water, lubricants and virtually all chemicals.

The C15 joystick offers single, double or double-independent signals, with the double-independent variant meeting the most safety demands.

"As we developed the C15," Kauppi elaborates, "we thought of the many different kinds of electronic specifications we get and said: 'Let's create one electrical solution and solve them all!' So we did just that. It's even possible to replace older joysticks with the superior C15."

The third factor that makes the C15 a masterpiece of construction is the selection of materials. "Our ambition was to create the best joystick, bar none," he continues. "We ignored the cost of materials early on to enhance engineering creativity, and therefore incorporated only the very best materials available. Surprisingly it turned out that ultimate production costs are still lower than that of earlier joystick models. This is due to an interaction of our superior concept and materials with manufacturing excellence."

Caldaro uses a rubber mixture that endures the toughest conditions encountered in both mining and demolition. When underground, salts, minerals and water create mixtures that can be very dangerous for any machine. Above ground, sunlight brings UV light that dries and cracks many rubber compounds. A rubber blending that tolerates oil well is often sensitive to low temperatures and results in the rubber being too hard. With this in mind, the company therefore carefully incorporated planned testing, resulting in a rubber compound that tolerates all these challenges over widely ranging temperatures.

Can anything break the C15?

All the work from development through production is done in Sweden. "We cooperate with people from heavy industries who know what it means to use a joystick," says Kauppi, "and combine their experience with handpicked experts from all over our nation."

Early test results are extremely impressive. The actual break point has been a very important part of



C15 joystick fitted with a compact and ergonomic multifunctional grip – one of many alternative grips

the development – if the C15 breaks, it must break in such a way that it is still functional enough to bring the machine to a safe state. "We call this safety feature 'graceful dead'," Kauppi concludes. "In all mechanical evaluated fail modes, we have repeatedly confirmed this graceful dead state, maintaining functionality well within the original specification. We have succeeded in this challenge and believe that we have now developed the most robust joystick in the world. We're proud to present the C15!" **IVT**

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