

Microfactory: A Flexible Assembly Platform

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In the future, small components will be assembled on small machines. CSEM has designed small-sized Delta robots with integrated controller hardware and minimized external cabling and footprint. The PocketDelta is an ideal, modular, micro-assembly platform for automatic production in desktop applications. A demonstration Microfactory with four robots shows great potential for saving resources in miniaturized production systems.

In the past few years CSEM has invested in the miniaturization of robot systems based on parallel Delta kinematics. The result is the PocketDelta^[1], a highly integrated robot platform for micro-assembly applications with up to 4 degrees of freedom (Figure 1). This new tool shows a high potential for future assembly technologies due to the following specifications:

- High precision: Repeatability < 5 μm
- Short cycle time: up to 3 cycles per second
- Small size: 120 x 120 x 240 mm



Figure 1: The PocketDelta robot

In March 2007, CSEM was bestowed with the First Prize of the prestigious Swiss Technology Award^[2] for the concept of a miniaturized modular assembly line (Figures 2 and 3).



Figure 2: CSEM receives the First Prize of the Swiss Technology Award 2007 for its Microfactory concept

At the Hanover Fair 2007, CSEM presented a miniature assembly line with four PocketDelta robots (Figures 4 and 5), demonstrating assembly of micro-planetary gears with a housing diameter of 6 mm. CSEM landed within the top-five finalists of the Hanover-Fair-associated Hermes Award^[3].



Figure 3: Microfactory concept for a desktop assembly line with 5 PocketDelta robots



Figure 4: Microfactory assembly line with 4 PocketDeltas presented at the Hannover Fair 2007

The high position accuracy of the PocketDelta and its short cycle times bring new economical advantages. Note that the MicroFactory does not solve existing assembly problems. Rather, a new technology platform has been launched for future low-cost production systems. Products to be manufactured by this platform should be designed with its performance in mind. One great advantage, though, is the fact that the same system can be used during prototyping and production, reducing development time and risk.



Figure 5: Close-up look of the Microfactory assembly line

CSEM is developing additional components for the Microfactory, such as part feeders and integrated sensors for force measurement and automatic part location, which will improve the performance of the Microfactory assembly line.

[1] S. Perroud, *et al.*, "New pocket and desktop Delta robots with integrated controllers", CSEM Scientific and Technical Report 2006, page 80 (Developed in collaboration with the EPFL and BFH)

[2] <http://www.swisstechnology-award.ch>

[3] http://www.hannovermesse.de/hermesaward_e