



MAXX – Mobile Assembly X-System

The rate of energy-efficient refurbishment in Europe currently amounts to just 1% of the existing building stock each year. Yet, this sector is responsible for 48% of society's total energy consumption and 35% of CO2 emissions. In the context of the European Green Deal 2050, MAXX – Mobile Assembly X-System provides a first plug & produce solution for (semi-) automated, scaffold-free assembly in building refurbishment. This patented robotic cable platform is adaptive and universally deployable in existing buildings—without extensive data collection or permanent human control.

Against the background of sustainability and the climate targets set out in the European Green Deal 2050, the energy-efficient refurbishment of buildings (windows, thermal insulation, plastering, painting) has been identified as an important future growth market. Already today, 80% of construction activities in Germany involve existing buildings stock. By the end of 2030, a market potential of over EUR 400 billion is expected for the refurbishment of building envelopes.

Challenges and Solutions

External building envelope refurbishment is currently unattractive due to the risk of accidents, high physical strain and the lack of variety of tasks. Thus, it contributes to the massive refurbishment backlog in Germany. Additionally, inner-city building refurbishments present particular challenges: Limited setup areas, difficult storage and transportation possibilities for components and scaffolding elements stress residents and complicate the work of craftspeople.

Moreover, the German construction industry shows a pronounced shortage of skilled labour: The number of retirements in 2021 was 1.5 times higher than the number of new apprenticeship contracts.

In order to accelerate building stock refurbishment in Germany and keep people in work as long as possible, external building envelope refurbishment must become significantly faster, safer, and more attractive for both young and experienced refurbishment specialists.

Innovative Approach of the MAXX System

MAXX – Mobile Assembly X-System addresses these challenges with presenting a first plug & produce solution for (semi-) automated, scaffold-free assembly in building refurbishment.

The developments and studies on the use of digitally controlled robots in combination with cable-driven systems open up new potentials and incentives for external refurbishments, e.g., of façade elements. The automation of the process and the resulting relief from physically heavy work significantly improve work safety and increase the quality and efficiency of craft companies. At the same time, MAXX contributes to the preservation of existing buildings, promoting circularity in the construction industry by making future refurbishment faster, more sustainable and less expensive than demolition.

MAXX consists of a lifting platform, which is positioned on the façade by means of a cable-driven system—in this case a mobile Jekko crane. A custom gripper system stabilizes the platform against wind forces on the façade substructure. A KUKA robot equipped with a special multi-sensor system precisely positions the Fundermax façade panels, which are transported in a magazine integrated into the platform, and attaches them to the substructure. Based on the principle of “programming by demonstrating”, the KUKA robot learns the panel size, interstice width, and the installation process directly from the foreman, who manually installs the first row of panels. The trajectories and installation logic of the first row of panels are automatically captured by the robot using optical sensors. Then MAXX carries out the installation of the next row, panel by panel, fully automatically.

A world first is the fully automated robot-crane collaboration: A KUKA robot communicates directly with a Jekko crane via 5G and controls it. Once a row of façade panels has been completed, the robot reports the next starting position to the crane via 5G and prompts the crane to lift the platform to the next start position in the installation process. Therefore, the refurbishment expert does not need to plan, manually control, or even program MAXX himself. Consequently, the MAXX operator can fully focus on quality and safety checks, such as ensuring that the Fundermax panels have been correctly inserted into the platform before starting MAXX.

The innovative MAXX plug & produce process neither requires a digital building model nor robot path planning and adapts to the varying geometry of different existing buildings resulting in the elimination of planning efforts, surveying technology, and scaffolding. As the first plug & produce system, MAXX improves schedule and cost reliability and achieves greater independence from preliminary work in the value chain.

Versatility and Sustainability

The current installation of Fundermax panels represents an initial prototype application for scaffold-free façade refurbishment. The MAXX system is scalable to projects of any size and, through interchangeable tools, supports further refurbishment activities. It helps preserve existing building stock and promotes circular economy in construction. Sustainable and partially autonomous refurbishment processes are made faster and safer. MAXX – Mobile Assembly X-System is the ideal partner for refurbishment professionals, keeping workers out of hazardous areas and making their job easier.

Support and Development Partners

The project was funded by the “Digitalization of the Construction Industry and Innovative Building” initiative of the Ministry of Home Affairs, Municipal Affairs, Building and Digitization of North Rhine-Westphalia (NRW) and was developed with the support of the industry partners of the Center Construction Robotics at RWTH Aachen, including Fundermax GmbH, KUKA AG, and Jekko Srl.

Visit MAXX at bauma 2025 in Munich April 7–13, 2025, at the Jekko stand, NR. 903/6 – FS outdoor area

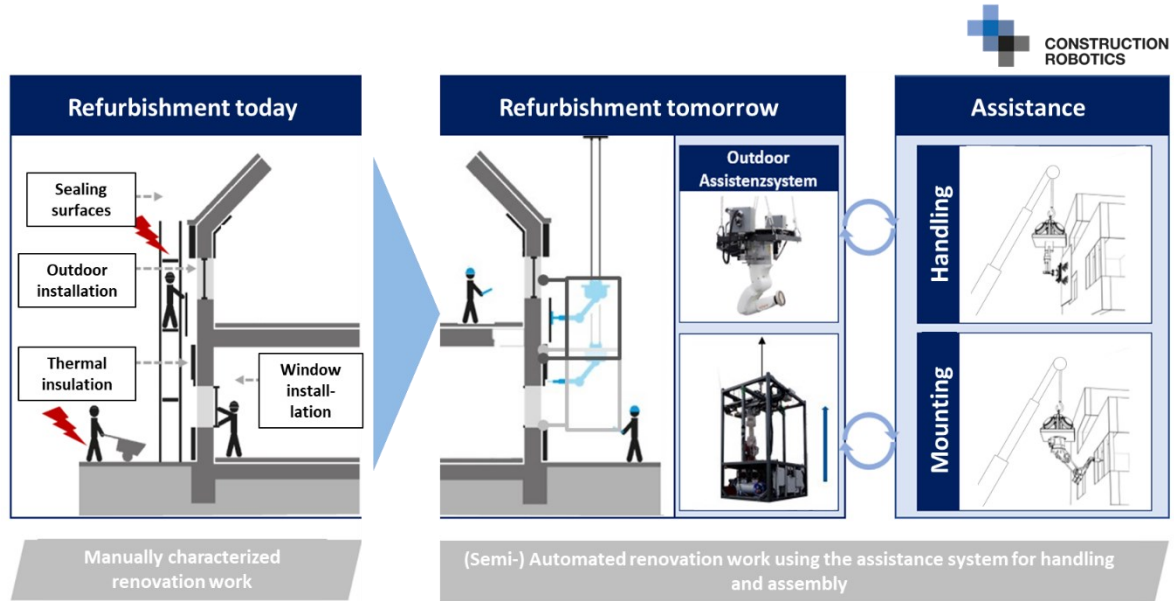


Figure 1: Concept of the MAXX - Mobile Assembly X-System



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Figure 2: Overall MAXX System – Mobile Jekko Crane and Robotic Platform



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Figure 3: MAXX during the robotic installation of a Fundermax façade panel