

## Safety in each phase of the flight - Pilz ensures flight safety on the Sky Roller



Speed and thrills are what's required of the attractions on offer at funfairs and amusement parks. On today's modern fairground attractions, riders are catapulted through extreme radii or carried along in hair-raising positions; these attractions need to perform their service reliably and virtually failure-free. Where the laws of gravity appear to be temporarily suspended, as on the Sky Roller, a Pilz programmable safety system is there in the background, making sure that nothing gets out of hand.

The Sky Roller from Gerstlauer Amusement Rides looks a little like a cross between a chairplane and a freefall tower. The company manufactures stationary and transportable amusement rides and is based in Münsterhausen near Günzburg. It is mostly famous for its daring, innovative roller coasters, but now it has developed a new type of power tower.

Sixteen gondolas are arranged in pairs: the tower rotates, at the same time rising telescopically to around twice its initial height. A chain hoist gradually pulls the rim up the tower segment; the rim has eight arms, on the end of each are two gondolas. Once the rim has reached its final height, the arms tilt outwards ninety degrees: now the seats are no longer alongside each other in parallel but are vertically one on top of the other; the flight, and the fun, can start. How the rest of the ride progresses depends on the courage and skill of each individual rider. If you prefer the quiet life, you can just go round as you would on a regular chair plane.

### **Universal safety concept leaves nothing to chance**

When the operator of the Sky Roller presses the start button on his control panel, he initiates a defined, highly automated motion sequence. Where programmable software controls all the drives and movements there must be an intelligent safety system in the background, which monitors compliance with the specified movements, speeds and status conditions and checks that the accelerated flying gondolas do not stray off course. In the Sky Roller's central control cabinet, the flexible Pilz PSS 3000 programmable control system is responsible for safe processes in the field, in conjunction with the decentralised I/O system PSSuniversal. "The PSS 3000 monitors all the drives and sensors and runs security checks almost constantly", says Erwin Haider, Head of Electrical Engineering at

Gerstlauer, explaining the principle. For this purpose the control system has 80 safe inputs and 56 safe outputs at its disposal. In the field – in this case on the moving parts of the arms - the PSSuniversal modules provide 64 safe inputs and 24 safe outputs.

Not one safety-related movement or safety-related status on the Sky Roller passes by the modular control system unnoticed. It starts right at the beginning: The lifting movement must not exceed a specified speed; the gondolas must not tilt into their vertical flight condition until the arms have reached their defined end position (an RFID transponder monitors the position of the arms). How heavy is the strain on the chain hoist as the tower accelerates? Does its rotational speed stay below the maximum permitted value? Does the hydraulic pressure lie between the defined minimum and maximum value? These and other security checks are run throughout the whole flight phase and are completed within fractions of a second. The passenger is oblivious to the whole thing.

But what happens in a worst case scenario? If the PSS control system detects any safety-related deviation from the norm, anywhere in the cycle, it immediately brings the system to a safe condition. Emergency stop buttons are installed at relevant positions to stop the ride manually. “The safety of the passengers is always the top priority. It is practically impossible for the Sky Roller to be out of control”, explains Erwin Haider. What’s special about the Sky Roller: Signals between the arms on the rotating tower and the programmable control system are exchanged safely using a safe wireless system from Schweizer Elektronik AG, a company based in Reiden (CH). In conjunction with the Pilz safe bus system SafetyBUS p, reliable data transfer is safely guaranteed in both directions. This solution is far superior to the conventional sliding contact systems positioned on the turntable, which are subject to wear. Safe position detection of the arms on the turntable is provided by the non-contact, coded safety switches PSEncode, from Pilz.



Just one of the convincing features of the flexible PSS control system is its compact dimensions; it requires little space in the control cabinet. The decentralised I/O system PSSuniversal is equally compact as well as being modular and expandable; it performs specific plant control and monitoring functions in the field.

Communication with the periphery devices presents no problem thanks to the safe bus system SafetyBUS p; setup and programming of the control system is simple and transparent. During the operational phase, a touch screen display provides constant information about the current status; in the event of an emergency, the operator immediately knows with absolute certainty what the problem is and where it’s located.

### **Decentralised signal processing reduces reaction times**

“Not all that long ago, the same functionality could only have been implemented with an immense investment in terms of devices, cabling, time and costs”, is how Erwin Haider summarises the situation. Gerstlauer is not only delighted about the general progress in technological development but also by the fact that control systems such as the PSS 3000, in conjunction with PSSuniversal, can detect and process not just safety but also standard control signals at field level. This type of close dovetailing shortens reaction times and increases plant availability, without compromising on safety. The absence of feedback and clear separation are guaranteed using appropriate security mechanisms, which simply rule out the possibility of manipulation, whether accidental or intentional.

**Contact: Pilz Safe Automation**

**Phone: 03 9544 6300**

**Email: [safety@pilz.com.au](mailto:safety@pilz.com.au)**

**Web: [www.pilz.com.au](http://www.pilz.com.au)**