

HepcoMotion's GV3 accommodates high forces and maintains accuracy of cutting in G.Kraft's cardboard cutting machine

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INDUSTRY	PRODUCT	COUNTRY	PROCESS
Packaging	GV3 - V Linear Guide System	Germany	

G. Kraft Maschinenbau GmbH, based in Germany, develop special machines for different industries including the packaging industry. Packaging processes are often complex and the requirement for machines which can offer flexibility in cardboard processing is steadily rising. G. Kraft have subsequently developed the automated cardboard cutting machine, 'VPS100.' In order to move quickly and precisely, the developers rely on HepcoMotion's GV3 linear guides. Thanks to its special features and properties, the GV3 range was a clear choice over competitors' guide systems. The V-bearings and rollers are able to provide smooth movement despite the high forces applied during processing; a must to enable precise processing of cartons.

A special all-rounder:

The VPS100 automated cardboard cutting machine makes grooves, cuts, perforations and scores. The VPS100 is available in two variations: the smaller one is suitable for cardboard up to 1.5m wide and the larger for widths up to 2.5m. Each machine stands at 1.7m and 2.25m high respectively, making the VPS100 extremely compact when installed. Tools are installed in pairs in each machine, with the smaller machine holding a range of 4-6 tools whilst the large machine can accommodate 6-12 tools. Serrated knives allow clean processing of the cartons. The narrowest tools are just 40mm wide and are installed on specially-designed V-shape guide carriages. With this design, it is possible to nest the tools in one another and drive them in very close succession. This makes it possible to create grooves as close as 14mm apart.

Thanks to the programmable perforation rate, the folding behaviour and stability of packaging can be tailored to individual needs with product changes easily implemented. The use of complex cutters and the availability of a variety of tools negates the need to reverse the direction of travel of the cardboard during processing. All tools are able to cut, perforate, groove or carve as required and each tool is moved with its own servo motor. Thanks to the precision of the tools, the continuous stream of cardboard is process-optimised for cutting.

The VPS100 is utilised in many different industries, as Bernd Krimphove, Head of packaging at G. Kraft explains: “Basically, the cardboard cutting machine is industry independent; everything needs to be packed in cardboard. Our machine is perfect where batch sizes are small and there are frequent product changes.”

In the furniture industry and with online mail order, the VPS100 is ideally suited as it is able to make cuts and grooves in very close succession. Thus, the machine is able to process cardboard for even the slimmest products, such as individual floorboards.

A special feature of the VPS100 is the ability not only to score, cut and perforate cardboard but also to scratch them. This sets Kraft apart from its competitors. This ability is particularly advantageous when processing very stiff and unyielding cardboard, as the cartons can be more easily folded. These processes are made possible by linear motion technology.

“Most competitors work with pneumatic drives; with these it is not possible to control position. You make a cut or you don’t, and there is no in-between,” says Krimphove. While pneumatically driven machines always need compressed air, the VPS100 simply requires a power connection. This is a huge advantage, especially for smaller companies who would not need to install compressed air supplies.”

With a maximum processing speed of 1.6m/s and the option to process cardboard up to 7mm thick, the VPS100 is extremely efficient and effective. In order to maintain the accuracy and precision despite the strong forces generated by high speeds, the design of the guide system to which the tools are attached is critical. It has to be extremely smooth and able to withstand these forces, without transferring them to the tools.

In the search for a suitable linear guide supplier, Kraft decided to use HepcoMotion, specialists in linear guide system and automation components.

Flexible linear guidance system of the ‘components principle’:

During the selection of a suitable guidance system, the designers had to consider factors such as how the movement would be carried out, which external forces will affect the guidance system and how flexible the system must be for the application. After comparing different systems, HepcoMotion’s GV3 range presented as a clear favourite: “We decided on the HepcoMotion guide system as it could accommodate large forces relative to its size and also maintain accuracy at the point of processing. With other guidance systems, it was not possible to achieve this,” said Krimphove.

The modular design of the GV3 range was also a huge advantage for the designers as it allowed them to meet their individual requirements. The guidance system can be considered a complete package as it is available as an assembled unit but also in component form. The GV3 components HepcoMotion supplied for the VPS100 were slides made of hardened steel, V-bearings and lubrication blocks. G. Kraft developed their own carriage plate and trolley, constructed in a V-shape, allowing the tools to move in very close succession.

Compared to classic recirculating ball guides, the GV3 guide system has advantages, as Thorsten Pfau, Technical Sales Manager at HepcoMotion explains: “A precise guidance system like GV3 is cleaner and smoother than those with recirculating ball guides.” The V-bearings are responsible for this smooth running. Each carriage uses two eccentric and two concentric bearings. The eccentric

bearings are used to remove play and set preload in the carriage when they are adjusted to the rail. This enables the running properties of each carriage to be individually adjusted and controlled.

For Bernd Krimphove, the main advantage of HepcoMotion's GV3 system is its load carrying capacity. "Despite its extremely small size, it can absorb extremely high forces. When the guides lie flat, we can transfer significantly higher forces. This was basically the decisive advantage for us."

In this application, the GV3 must withstand high external forces due to the high moment loads acting on the guidance system. At a weight of just under 6kg per tool, these machines operate with rapidly changing velocities. In order for the tools to work precisely and remain rigid, the guidance system must operate very smoothly. The GV3 system allows this with load capacities up to 10,000N.

When cardboard is processed, dust from the card accumulates and contaminates the guide rail. Thanks to the profile of the V-rail, a snow-plough effect is created, clearing dust and debris as the bearings pass across the guide rail, pushing contamination away from the slide. The guidance system is therefore virtually self-cleaning. Since the cutting tools are about 340mm from the guidance system, in reality there is very little contamination on the guide system, which greatly increases the robustness and service life of the system.

The lubrication blocks supplied by HepcoMotion also improve system life. They are made with impact resistant plastic with spring-loaded, grease impregnated felts for low-friction lubrication. In some instances it is possible to operate the GV3 system without lubrication (which you cannot do with recirculating ball guides), but this reduces system life and load carrying capacity.

With the high processing speed and the ability to adjust tools and functions between processing options, the VPS100 automatic cardboard cutting machine is an extremely versatile machine. HepcoMotion's GV3 provides the necessary precision at the point of cutting, whilst working with high forces generated by machining.

Image 1:

Thanks to its compact method of construction, the VPS100 is ideal for integration into small businesses. The precise processing of endless lengths of cardboard reduces waste, making the automated carton machine very resource saving. ©G. Kraft Maschinenbau GmbH

Image 2:

Up to twelve tools can be installed in the VPS100. To ensure precision at the point of cutting, high demands are placed on the GV3 guidance system, for example the enormous forces generated by machining. ©G. Kraft Maschinenbau GmbH

Image 3:

The special V guides ensure clean and smooth running. ©G. Kraft Maschinenbau GmbH