

DORST FlexCell16 – Fully Integrated Production System as the Key to Greater Efficiency and Higher Production Output

When it comes to the preparation and forming of technical ceramics, hard metals, iron powders and special materials, DORST Technologies/DE has always enjoyed an excellent reputation as a reliable and highly competent partner. Production systems made in Kochel am See and Bad Kötzing have been setting standards in terms of performance and quality for decades. Combined solutions consisting of press and automation, too, have been part of DORST's portfolio for many years. The fully integrated FlexCell series combination of a servo-motorized CNC press and CNC press part will now raise them to a new level.

1 Introduction

In close cooperation with their customers, DORST has designed an innovative and uncompromising new combination of precision powder press and part handling. The fully integrated CNC axis developed by DORST and used for the removal of the compacts will meet the toughest demands while being easy to use and yet more effective than other systems of its kind.

With its so-called FlexCell, DORST will provide their customers with a system that will enable them to increase their productivity even further without changing the pressing cycle.

The FlexCell16 will be available for a pressing force range of 16–200 t. All types will be available in die withdrawal version with the 16 t machine additionally being available in ejection version. The first time to see the first model of this new series, the FlexCell16, live will be at the ceramitec 2022 trade fair.

2 Main features

The FlexCell16 is characterized by an extremely rigid lower part. The upper part of the frame, placed on top, is free of force and only serves to guide the upper crosshead of the press. Backlash-free guides enable a maximum of precision and concentricity. High-precision position sensors guarantee a positioning accuracy of $\pm 0,001$ mm of the pressing axes. The high-resolution force measurement covers a wide range, thus creating the perfect basis for the production of even very small compacts and enabling their gentle removal without cracking or



Fig. 1 FlexCell16 press and automated part handling – fully integrated

destroying them. Both pressing to constant height and to constant density is possible.

The pairs of gears located off-center and used for the movements of the axes guarantee perfect track accuracy. Being completely encapsulated, the press drives are well-protected against dirt accumulation and premature wear. DORST's customers confirm: the press module of FlexCell16 stands out due to its unique long-term stability and a tool wear lower than anything that has yet been achieved in the market.

The CNC automation axis is equipped with an absolute measuring system that does not require a reference movement after start-up, which makes it less prone to failures. The moving masses have been minimized to

guarantee a perfect transient response and thus enable short access times. Its positioning accuracy is $\pm 0,01$ mm. The automation module can be attached either at the rear or at the side of the press.

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Fig. 2 FlexCell16 – Insight into the fully integrated, part handling system

2.1 Maximum productivity

Once pressed, the CNC automation axis will place the compact very gently onto a sintering tray with several intermediate steps such as deburring, cleaning by air jet, weighing etc. being possible in-between. If necessary, it is also possible to carry out an automatic punch cleaning. Due to its uniquely high dynamics, the access times of the removal axis are kept so low that a productivity that is hardly less than the productivity of a press without automation system is achieved. The optional second removal device allows to compensate the stabilization time of a balance.

The FlexCell16 is also well prepared for frequent product changes. Optional quick-action clamping systems for punch and die and the standard quick-change system at the gripper arm allow for a rapid product change within a very short time, thus increasing the production times even further.

2.2 Ultra flexible

The flexible use of vacuum suction grippers, grippers with expandable membrane and gripper jaws, both in single and multi design, makes it possible to produce a large range of different parts. Sample parts can be taken by means of a special belt without interrupting the production process. Appropriate kinematics such as rotating, tilting or turning enable to handle even complex parts perfectly.

Owing to the referencing carried out, a created pressing/removal program is transferred seamlessly to another FlexCell16 where it can be used immediately.

2.3 Perfect parts quality at any time

To ensure a consistent quality of the pressed parts, the FlexCell16 is also equipped with the optional function of automatic punch cleaning. Unlike other systems already available in the market, the punch cleaning unit will not always be taken along as an additional weight on the gripper arm but will be fetched from its waiting position when needed.

During cleaning of the punches by means of a rotating brush, the cleaning dusts of the FlexCell16 will be vacuumed off right at the brushes. In addition to that, spray nozzles make it possible to use cleaning agents to remove persistent residues from the tool.

2.4 Modular and suitable for every requirement

The FlexCell16 is available in two automation versions. The most uncomplicated and cost-effective variant comes with a positionable deposit table the size of 900 mm x 600 mm, which can be equipped individually with sintering trays from the customer's existing stock. The alternative is a double belt system, which can also handle cus-

tomers sintering trays, yet in that case of a maximum size of 310 mm x 500 mm. The sintering trays will be changed without interrupting the process. The system can also be expanded by a storage trolley, which will grant autonomy for up to 10 h, depending on the size of the parts. The second removal device, too, can be added at a later time.

2.5 Easy operation, quick success

The Intelligent Program Generator – IPG® makes creating a new pressing program a matter of minutes. An optimization function (weight, density or height of the pressed part) helps the operator to obtain good parts after no more than a couple of pressings. The program for removal and depositing on sintering trays will be created at the same time.

To operate the system, the user can choose between keyboard, mouse and a 21" touch visualization monitor whose swivel range makes it possible to work either at the front of the press or at the side of the automation system without requiring any additional handhelds. In addition to that, a wireless hand-held controller is available as an option, which can be used to operate other existing machines as well in a safe manner.

2.6 Safe and convenient programming

The complete integration of the axes guarantees maximum process safety. Optimized sequences of movements can be created very conveniently and the integrated Virtual Stroke will carry out a plausibility check once programming has been completed. An electronic handwheel enables to move both the pressing and the removal axis step by step forwards and backwards through the programmed pressing and removal cycle, thus allowing safe optimization of the cycle time and preventing damages to the tools.

2.7 Minimized tying of employees

In automatic mode, the system will readjust itself autonomously, either through force, position or weight as required, which leaves the employee largely free for other tasks and guarantees the production of good parts within the smallest tolerances possible.

The safety device has been designed in a way that makes it easy to clean. Vacuuming off the dusts right during punch clean-

ing minimizes dirt accumulation in the press interior and thus reduces the frequency of cleaning.

2.8 Minimized maintenance

Owing to the high track accuracy and by using preferably low-wear and low-maintenance components, DORST was able to reduce the time spent on maintenance to a minimum.

2.9 Ergonomic, tried-and-tested safety device, Plug & Play

The system's protective device complies with the statutory provisions regarding dust-proofness, has been ergonomically optimized and meets CE conformity. Its design is reduced, straight and simple. Due to the compact arrangement of all modules of the FlexCell16, the entire space required incl. switch cabinet is only about 5 m². The entire unit will be delivered on one plate, thus enabling a Plug & Play installation and

making it possible to relocate the system easily at a later time.

2.10 IoT Solutions

The large number of data produced during the operation of the FlexCell16 can be collected in real-time, prepared and made available for use down to single-part level by means of additional optional hardware and the software suite IoT-Fieldmanager.

The data facilitates the improvement of parts quality and productivity and enables monitoring of the machine state while corresponding interfaces make it possible to transfer the data to a higher-level MES or database system. The interlinkage of existing machines and systems in the IoT-Fieldmanager dashboard provides the operator with the possibility to monitor all of them jointly.

The optional module SMART MAINTENANCE helps to detect impending machine failures derived from the machine data at an

early stage. In case service or assistance is required, we will be able to provide support by means of Augmented Reality at any time. If not yet available, the necessary equipment can also be purchased from DORST.

3 Conclusion

With little personnel expenditures, the FlexCell16 will allow DORST's customers to produce complex high-precision compacts of the highest quality in a more efficient manner than ever. The operator will enjoy a convenient and ergonomic environment while the times spent on product changes, programming, adjustments and maintenance have been reduced to a minimum. The high track accuracy finally made it possible to achieve unmatched tool wear and uniquely high long-term stability.

To sum up, DORST FlexCell16 is the perfect integral solution for discerning customers, who strive to optimize their business while at the same time wishing to remain flexible.