

# Multicoloured CAD/CAM Milling Blanks for the Dental Industry

Innovative power compacting technology enables the economically efficient and fully automatic production of multilayer components from different materials or in different colours. In the dental industry, this technology is applied for the production of multicoloured CAD/CAM milling blanks for tooth restorations made of zirconia. Depending on the type of press, DORST TECHNOLOGIES/DE offers solutions for up to 8 different materials or colour layers, with and without preliminary compaction.

## Introduction

Metal-free dentures based on zirconia have meanwhile become a widely recognized standard in the dental industry. Nowadays, the advancing digitisation of medical engineering and latest manufacturing technology make it possible to produce dentures with high precision and within a few hours.

## Keywords

*CAD/CAM dental blanks, multicoloured blanks, multilayer filling, uniaxial powder pressing, isostatic powder pressing*

Basis for the above are powder-pressed ceramics blanks in the form of discs and blocks, from which the individual crown or bridge will be milled out in a 3D-CAD/CAM process.

Multicoloured circular blanks and blocks represent an attractive niche in the mass market of single-coloured, white milling blanks.

## Colour gradients

The objective is to present a colour gradient that is as natural as possible; this can

be achieved by means of fine shading from layer to layer. The more layers and thus colours can be produced, the more similar the artificial dentures can imitate the natural colour gradient of the patient's teeth.

The advantage is that this type of dentures is able to meet the high aesthetic requirements in the front tooth region without the need for elaborate rework by artistic painting. When it comes to multicoloured milling blanks, the work of the dental technician is reduced to a final adaption and the finish of the restoration in the overall appearance.



## Experience and competence in high performance ceramics!

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We offer components according to your design and processing equipment requirements made of tailored, application approved  $\text{Si}_3\text{N}_4$ ,  $\text{ZrO}_2$  and  $\text{SiC}$  based ceramic materials.

We are specialized in very large and complex shapes, as well as high precision parts. Furthermore we are experienced in integration and joining technologies.





Fig. 1  
Multicoloured dental discs up to 8 layers  
made of zirconia powders

Depending on the supplier of multicoloured CAD/CAM blank, there are models available with 4 colours, 5 colours, 7 colours, up to a maximum of 9 colour layers. The number of layers actually produced using the PM filling technology, depends entirely on the method of counting. If the transition zones formed during sintering between the two filling layers are counted as an independent layer, an in principle 4-layer blank will at the end become a 7-layer component by definition.

### Advanced filling system

Frequently, multicoloured dental blanks are today produced on standard pressing and by means of a manual filling process. However, the growing market for this attractive niche product calls for suitable pressing systems with fully automatic and flexible filling systems.

DORST TECHNOLOGIES has become a trendsetter and pioneer for the dental industry by having developed a filling system with a maximum of 8 different materials for the production of up to 8 actually filled powder layers on a hydraulic CNC universal press with 2500 kN pressing force.

An independent filling shoe with independent powder supply is assigned to each material. Four filling shoes each are assigned to two opposing, closed-loop controlled standard filler axes. The system is designed in such a manner that each material and each layer will be treated in the same manner as a standard 1-material filling device. Per layer, only as much powder as required will be filled. All materials are located in independent systems and will only make contact with one another in the die of the pressing tool.

The allocation to two filler axes allows flexible material and filling strategies depending on the specific application. Fig. 1 shows real multi-coloured CAD/CAM blanks with 8 layers made of original dental zirconia powder as well as 2-colour mock-up sections and monochrome samples for better illustration.

For applications in the range of medium pressing force, i.e. between 2000–1000 kN pressing force, there are available hydraulic CNC presses with multi-chamber filling shoes for 5 or 6 material layers.

When it comes to pressing forces lower than 1000 kN, servo-motorized uniaxial presses are of particular interest, because they can be equipped with up to three independent filler axes and with each an independent filling device. Using so-called double-chamber filling shoes, up to 4 powder layers can be realized with two filler axes. The aforementioned uniaxial presses with their special filling technology are not only suitable for the production of dental blanks, completely pressed to final density. They can also be used for the production of preformed for later isostatic post-compaction.

The technical solutions concerning filling technology are, of course, not limited to applications in dental ceramics and various colours of a ceramic base material. In the end, the presses with their filling technology are capable of being used for all PM applications, where different materials or material qualities are required in thin layers.

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