

## Scientific Information

Subject: **Programat® EP 5000**

Title: **Description of the IPF and CDS function in the new press furnace**

Author: Robert Grünenfelder, project manager Programat EP 5000,  
Ivoclar Vivadent AG, Bendererstrasse 2, 9494 Schaan, Liechtenstein

In 2007, Ivoclar Vivadent launched the new Programat EP 5000 press and ceramic furnace on the dental market. This press furnace offers two new technical features, which have been unique in dental furnaces to date.

The new functions are:

**IPF** Intelligent Press  
Function

**CDS** Crack Detector  
System

The description on the following pages provides a technical insight into these complex functions.



Open furnace head after the press cycle

# IPF «Intelligent Press Function»



The abbreviation IPF stands for “Intelligent Press Function”. This press program function which can be selected in addition to the standard programs is equipped with an intelligent technology. Before we take a closer look at this function, let us remember the following points: Each press process requires a certain time until the press cycle can be conducted, since the inside temperature of the investment ring should have a defined, homogeneous temperature. Various factors may have a considerable effect on this temperature. Consequently, it may not correspond with the required temperature for the press ceramic in the investment ring. These specifications have to be observed for both methods (conventional and IPF method).

In the conventional heating process (EP500, EP600, various competitive furnaces), the press furnace heats up to the required material temperature and holds the temperature until the investment ring has been properly heated after approx. 30 minutes and the press cycle can begin.

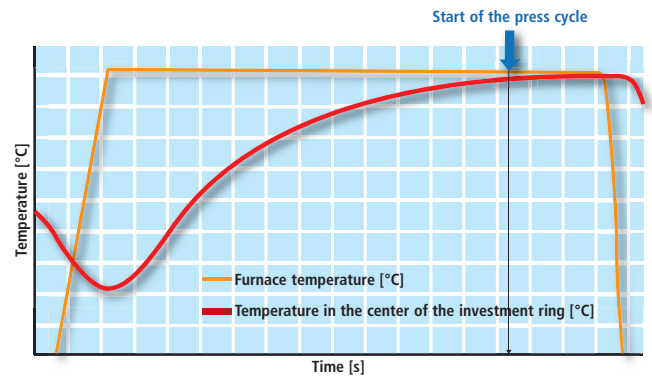


Figure 1  
This diagram shows the conventional heating process and the inside temperature curve of the investment ring.

In the new IPF procedure (EP 5000 optional), the press furnace heats up to considerably above the required press temperature (above 1000 °C) during the first phase. After a certain time, the temperature is reduced, so that the press temperature of the ceramic material is not exceeded. This procedure and the selected process helps to heat the investment ring faster and the press cycle can be conducted earlier.

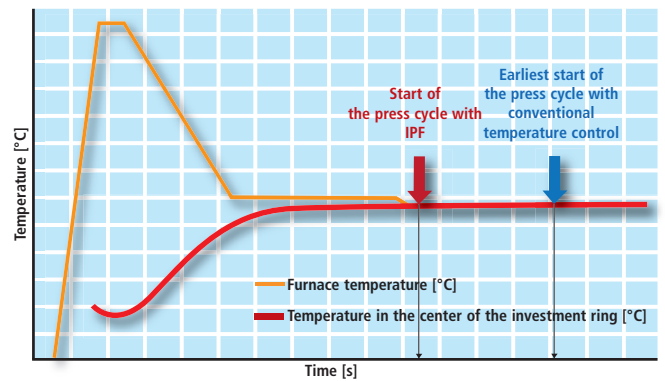


Figure 2  
The diagram shows the IPF heating process and the inside temperature curve of the investment ring.

Thus, the press cycle for some ceramic materials is reduced by up to 25%. Consequently, the intelligent press procedure also offers an economical advantage for the user. It is therefore possible to fabricate, for example, more units per day with the same furnace.

**Time-savings depending on the type of material :**

	Investment ring size		
	100 g	200 g	300 g
IPS Empress Esthetic	15 % *	25 % *	–
IPS e.max Press MO	15 % *	25 % *	–
IPS e.max ZirPress	–	–	45 % *
IPS e.max Press HO	–	–	–
IPS e.max Press LT	–	–	–
IPS InLine POM	–	–	40 % *

\* Faster than conventional pressing  
– IPF program not available

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This IPF feature is optional for the customer. Users who are pressed for time and attach great importance to faster press cycles (up to 25%) will definitely appreciate this function. Since this intelligent procedure is very complex and involves a lot of company know-how, not all the detailed parameters are shown on the display, as is the case for standard programs for copyright reasons. Therefore, the axes of certain diagrams have no labelling.

## CDS «Crack Detection System»

The CDS (Crack Detection System) identifies cracks in the investment ring during the press procedure.

Unfortunately, different circumstances (inadequate pre-heating of the investment ring, incorrect sprueing of the objects, agitation of the investment ring during the setting phase etc.) in daily laboratory procedures may cause cracks in the investment ring. The consequences of such cracks are known. In general, all the objects are lost and have to be fabricated again.

The CDS is the solution. The CDS function works fully automatically with real-time measurement.

An intelligent software identifies whether it is a normal condition (e.g. filling of hollow space, post-pressing) or a real crack in the investment material. High-performance electronic controls can make this decision within a tenth of a second.

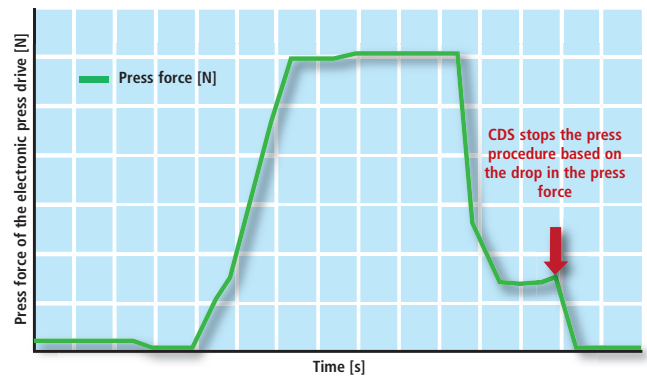


Figure 3  
This diagram shows the loss in power on the sensor in case of a crack in the investment ring when the CDS interrupts the procedure.

If there is a crack in the investment ring, the CDS function immediately stops the press force on the press plunger. By stopping the press force it is often possible to prevent complete fracture of the investment ring and leakage of the "liquid" ceramic material (Figure 4). Therefore, some pressed objects can be saved.

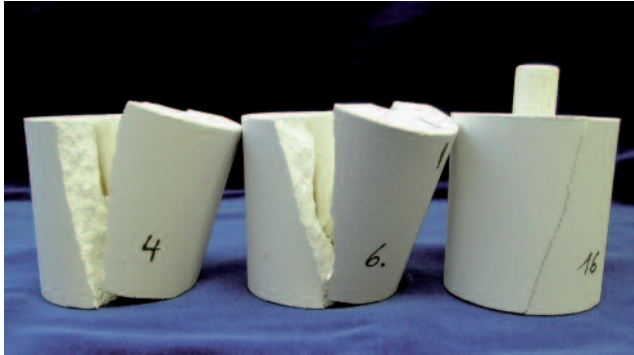


Figure 4  
Examples of cracks in the investment ring, which have occurred without the CDS function (4 and 6) and with the CDS function (16).

If the CDS function identifies a crack in the investment ring, it is shown on the display of the furnace. This function is always active for safety reasons and cannot be deactivated by the user. This feature also protects the QTK muffle and heating element from possible mechanical damage if the investment ring fractures.

Ivoclar Vivadent has again launched further innovations in the field of modern press and ceramic furnaces with these two new functions, which will set a new standard in the high-quality dental furnace technique.



**Literature:**

- Kuster A., *Konsequent wirtschaftlich*, Dental Dialogue 9. Jahrgang 2008
- Jussel R., *QTK-Muffeltechnologie*, Ivoclar Vivadent update technical 3/2007