Debinding Ovens

for Ceramics

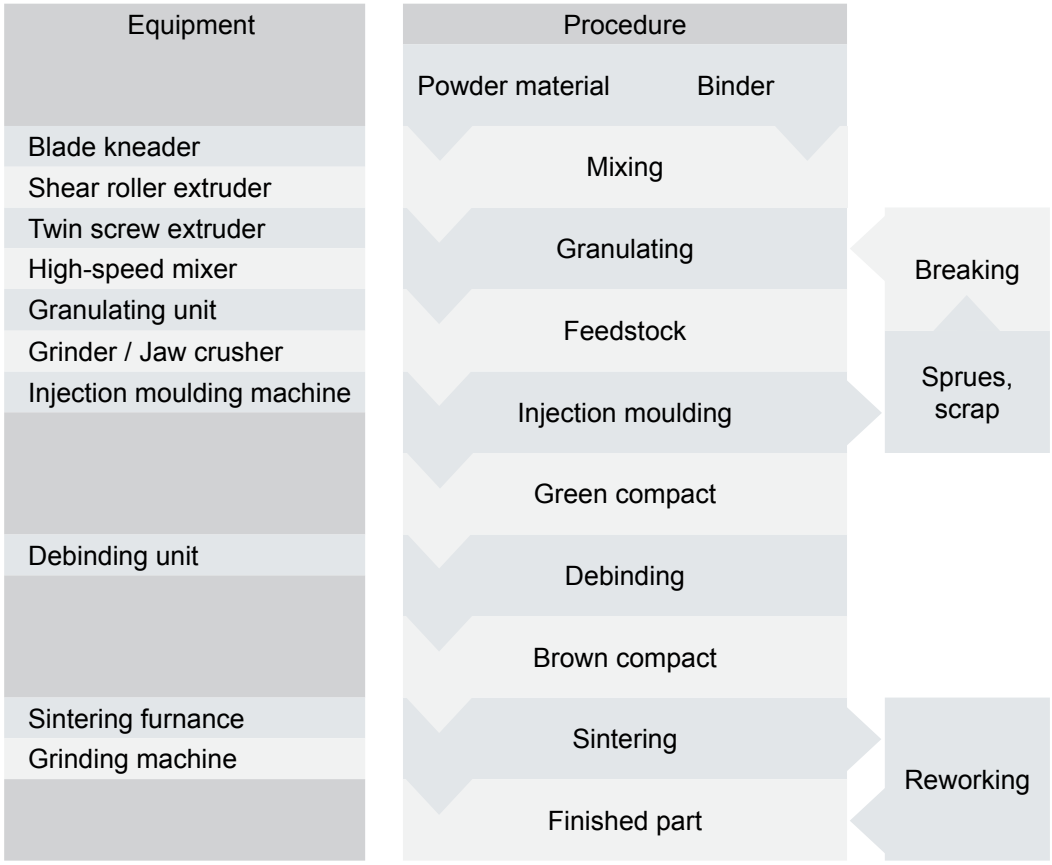
KARG Industrietechnik

Debinding Ovens

The technology of the powder injection moulding (Powder Injection Moulding - PIM) finds ever more largely becoming acceptance with the production of precise and complex construction units one. In the following ranges increasingly PIM-parts are used:

- Ceramic(s) and porcellain industry
- Textile mechanical engineering
- Watch-and-clock-making industry
- Eyeglass industry
- Tool industry

Basis materials for the injection moulding of metal and ceramic(s) powders are sinterable powders which a suitable grain size possess, in addition belong among other things: Carbides, silicate -, oxide and nitride ceramic(s) products. During the production of PIM-parts the process does not end after the injection moulding, but further processing steps follow like the debinding process (remove the plastic from the "green") as well as the sintering of the "brown".



Source: Arburg

Process sequence for the injection moulding of powder materials

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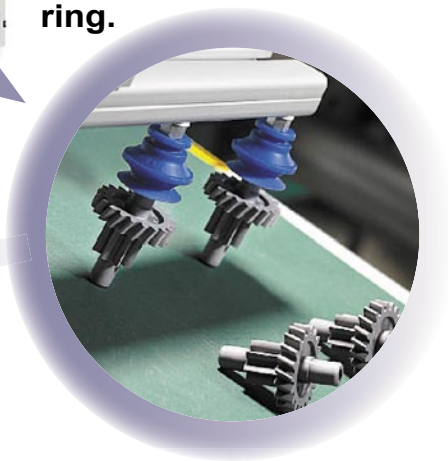
From the moulding machine .....to the debinding process

Powder injection moulding **consists of four process steps: Processing, injection moulding, debinding and sintering. The essential point during the conversion of the injection moulding process is to control the number of parameters which can influence the process and realizing a process control which facilitates a scrap minimized PIM/MIM manufacturing.**

Source: Arburg

Injection moulding machine



Green compact

During the debinding process, the binder will be removed from the green compact. The binder was only used to ensure the machinability of the compound during the injection moulding. The process control during the debinding process is dependent on the used binder system. They binder can be extracted in solvent baths or thermally catalytic or thermally oxidativ. The debinding process have to be controlled very evenly and uniformly.

The process by using solvent bathes or by using a catalytic debinding system is running surface controlled and guarantee a more stable process execution. After the debining, the result is a brown compact. This consists only of ceramic powder, that form is stabilized by adhesion and mechanical combination. The brown compact is mechanically relatively unstable and have to be supplied immediately to the sintering process.

Debinding oven

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The debinding of technical PIM / MIM parts demands for a vey good temperature distribution during the heating-up period, so that the debinded parts do not become destroyed. For this application, only ovens which supply a high forced air circulation can be used, because turbulence of the air optimizes the temperature distribution inside the oven.

The debinding oven series MDL and KUV with a high efficiency catalytic combustion unit (CPCU) connected at the outlet side, were developed in particular for this application.

MDL115 with CPCU

High-efficiency debinding oven, incorporating an efficient catalytic post combustion unit

Features / Equipment:

- Temperature range of 5 °C (9 °F) above ambient temperature up to 350 °C
- MCS controller with 25 storable programs of 100 sections each for a maximum of 500 program segments
- Variety of options for the graphic display of process parameter
- Heat output: 9.0 kW
- Adjustable ramp function via program editor
- Replaceable fresh-air filter cartridge, Class F6
- Fresh-air monitoring with acoustic alarm and automatic shut-off of heating
- RS 422 interface for communication software

KUV series with CPCU

High-efficiency debinding oven for large debinding processes

Features / Equipment:

- Temperature range of 5 °C (9 °F) above ambient temperature up to 250°C (300°C, 350°C or 400°C)
- Programmer for setting differents time / temperature steps
- Air inlet and/or outlet
- Temperature resistant door gasket
- Adjustable ramp function via program editor
- Replaceable fresh-air filter cartridge optional
- Independent adjustable temperature safety device, Class 2 (DIN 12880) with optical and acoustic alarm
- Fresh-air monitoring with acoustic alarm and automatic shut-off of heating
- RS 422 interface optional

Debinding Ovens

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Technical data:

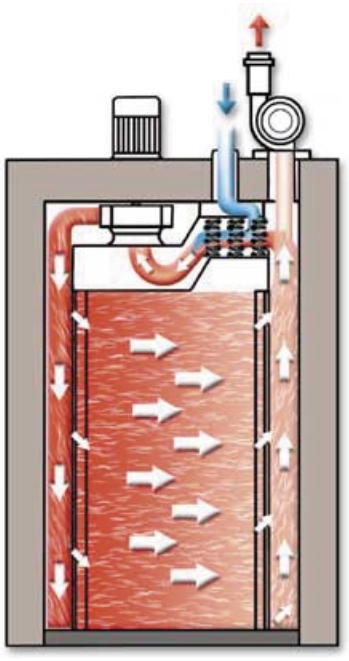
	MDL 115 with CPCU
Exterior dimensions	
Width (mm)	834
Height (inclusive feet/castors/CPCU) (mm)	1700
Depth (mm)	685
plus door handle (mm)	50
Wall clearance rear (mm)	100
Wall clearance side (mm)	160
Exhaust duct outer- Ø (mm) connected with the CPCU	100
Steam space volume (l)	156
Interior dimensions	
Width (mm)	600
Height (mm)	435
Depth (mm)	435
Interior volume (l)	115
Shelves, chrome-plated (number standard/max.)	2/5
Load per shelf (kg)	20
Permitted total load (kg)	50
Weight (empty) (kg.)	150
Temperature data	
Temperature range MDL, 5°C above ambient up to (°C)	350
Operating temperature CPCU (°C)	500
Temperature variation MDL at 70 °C (± °C)	2
Temperature variation MDL at 150 °C (± °C)	3,4
Temperature variation MDL at 300 °C (± °C)	7
Temperature variation MDL with door flap at 70 °C (± °C)	2
Temperature variation MDL with door flap at 150 °C (± °C)	3
Temperature variation MDL with door flap at 300 °C (± °C)	8
Temperature fluctuation MDL (± °C)	0,5
Heating-up time MDL 2) at 70 °C (Min.)	3,5
Heating-up time MDL 2) at 150 °C (Min.)	6
Heating-up time MDL 2) at 300 °C (Min.)	10
Recov. time after door was opened for 30 sec.2) at 70 °C (Min)	0,5
Recov. time after door was opened for 30 sec.2) at 150 °C (Min)	2
Recov. time after door was opened for 30 sec.2) at 300 °C (Min.)	4
Recov. time after door was opened for 30 sec 2) with door flap at 70 °C (Min.)	0,5
Recov. time after door was opened for 30 sec 2) with door flap at 150 °C (Min.)	1
Recov. time after door was opened for 30 sec 2) with door flap at 300 °C (Min.)	2
Air change (approx. x/min.) 3)	3
Air circulation (approx. x/min.)	40
Exhaust air volume flow (approx. L/Min. m³/h)	400 (24,0)
Air flow velocity (m/sec)	0,8-1,2
Electrical data MDL	
Housing protection acc. to EN 50529	IP 33
Nominal voltage (+10 %) 50/60 Hz (V)	(400 3/N)
Nominal power (W)	9000
Energy consumption at 300 °C (W)	2083
Electrical data CPCU	
Nominal voltage (+10 %) 50 Hz (V)	230
Nominal power (W)	3000

1) value without window 2) up to 98 % of set value 3) The air change depends on the inner chamber- and ambient temperature and is subject to significant individual variance. The indicated air change rate represents average values for standard equipment. Individual measurement of air change rate in acc. to ASTM D 5374 are optionally available.

All technical data are specified for units with standard equipment at an ambient temperature of + 25 °C and a voltage fluctuation of ± 10 %. The temperature data are determinated in accordance to factory standard following DIN 12880, part 2 respecting the recommended wall clearances of 10 % of the height, width and depth of the inner chamber. All indications are average values, typical for units produced in series. We reserve the right to alter technical specifications at all times.

Technical data:

	06-06-06	09-06-06	10-07-07	12-07-07	15-10-10	15-12-12	20-12-12	20-15-15	20-17-17	20-20-20
Exterior dimensions										
Width (mm)	900	900	1495	1495	1765	2015	2015	2265	2515	2765
Height (mm)	1775	1775	2090	2340	2615	2615	3045	3045	3045	3045
Depth (mm)	953	953	1180	1180	1425	1675	1640	1890	2140	2390
Steam space volume (l)	378	504	999	1200	2336	3490	4470	6207	8250	10602
Number of doors	1						2			
Interior dimensions										
Width (mm)	600	600	750	750	1000	1250	1250	1500	1750	2000
Height (mm)	600	900	1000	1250	1500	1500	2000	2000	2000	2000
Depth (mm)	600	600	750	750	1000	1250	1250	1500	1750	2000
Interior volume (l)	216	324	563	703	1500	2344	3125	4500	6125	8000
Temperature data										
Temperature range KUV, 5°C above ambient up to (°C)	250 (300, 350, 400) depending on the application									
Temperature variation KUV at 250 °C (± °C)	2	2	3	3	3	3	4	4	5	5
Exhaust air volume flow 350°C ... 400°C (approx. m³/min)	1,4	1,4	2,1	2,1	4,2	4,9	4,9	8,4	8,4	10,5
Exhaust air volume flow 250°C ... 300°C (approx. m³/min)	2	2	3	3	6	7	7	12	12	15
Air flow	horizontal									
Air flow velocity (m/sec)	0,5 ... 75									
Electrical data										
Housing protection acc. to EN 50529	IP 32 (heaters IP 20)		IP 54 (heates IP 20)							
Nominal voltage (+10 %) 50 Hz (V)	400 3 PE AC (other voltages / frequencies on request)									
Heating power 250 ... 300°C (kVA)	12 (13)	12 (13)	20 (21)	20 (21)	26 (28)	33 (36)	33 (36)	52 (55)	78 (83)	78 (83)
Heating power 350 ... 400°C (kVA)	14 (15)	14 (15)	27 (28)	27 (28)	34 (36)	44 (47)	44 (47)	65 (68)	105 (110)	105 (110)



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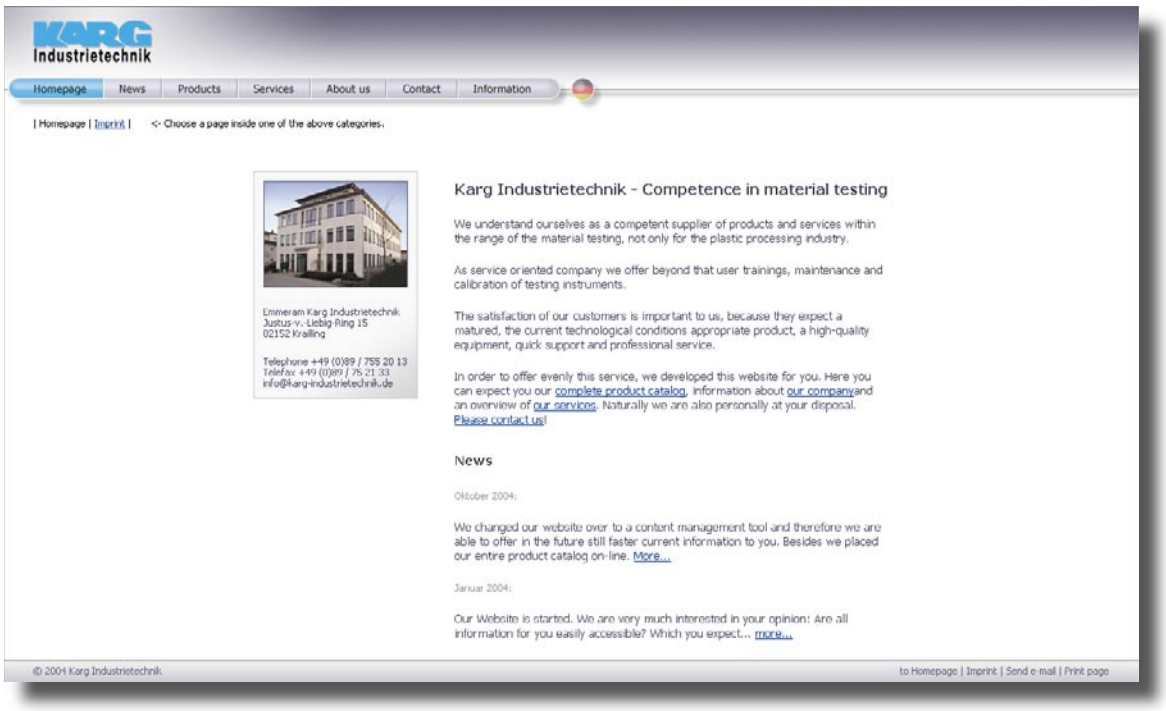

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KARG
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Competence in material testing

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Picture sources: Arburg (9 pictures), Pixelquelle, Karg