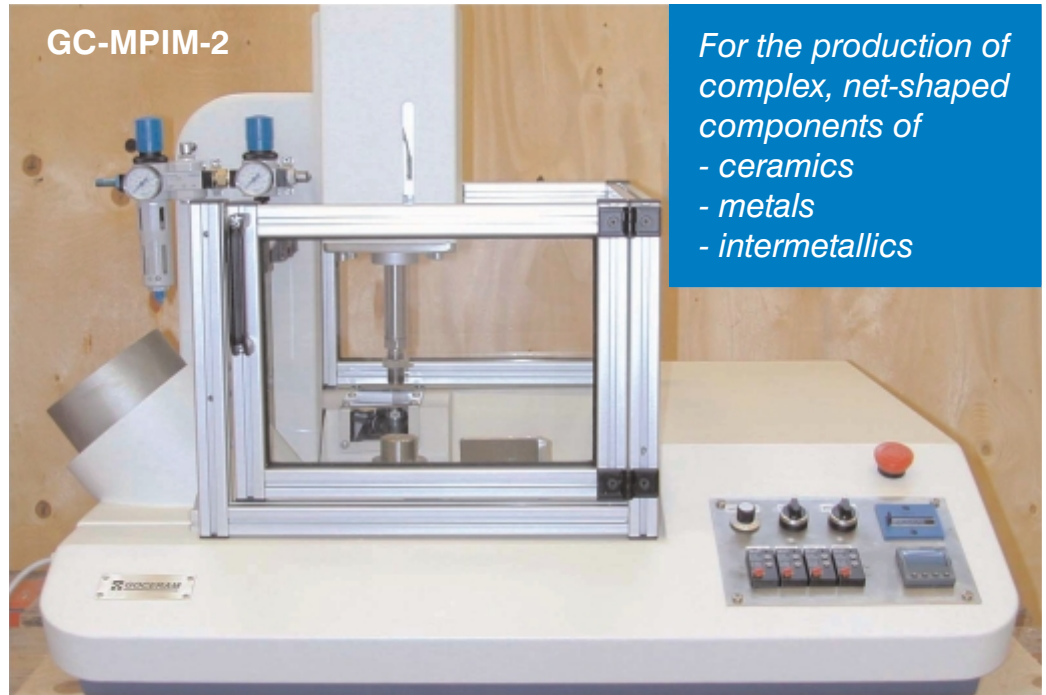


GC-MPIM-2, GC-MPIM-3

GOCERAM Medium Pressure Injection Moulding (MPIM) machines are designed for moulding of ceramic, metal and inter-metallic (tungsten carbide) feedstocks, primarily using wax-based binders. The machines are compact, flexible and service friendly and are constructed for durable large scale, fully automatic production, as well as for short series in semi-automatic or manual mode. There are two injection directions, either horizontal or vertical, of which the latter is suitable for the manufacture of prototypes, preceding large volume output in horizontal mode. The GC-MPIM-2-M(A) is an essential unit of a complete, cost-effective, production line for complex, net-shaped components of the materials listed above.

• CIModule®

Both GC-MPIM-2 and GC-MPIM-3 are equipped with a unique Compact Injection moulding Moudule-CIModule® in which the feedstock is kept. It consists of the pressure chamber, the injection piston and the hopper - all made of stainless steel. The module is designed to be easy to clean and repidly interchangeable (requires about 5 min). The versatile CIModule® can, in addition to the wax system, be used for other binder concepts, for instance gel-casting or freeze forming.



• Mode of operation

In the standard version of the MPIM Machines, the feedstock is injected into the mould by a pneumatic piston-a simple, reliable and robust system. As an option, the machines can be equipped with an electrical servo-motor with digital, high precision motion control including a supervising PC. In this case injections with different rate profiles can be run in order to perfectly adapt the injection cycle to a certain mould and/or feedstock.

• Tooling

Because of the moderate injection pressure, the tooling cost is low. The moulds can be produced of not only steel but also of more easy-to-machine metals such as aluminium and brass. In addition even plastics, preferably with heat conductive additives, can be used.

• Options

Fully automatic operation with a pick-up device

PC-controlled electrical servo-motor with digital motion control.

Pressure gauge in the CIModule® (including pressure chamber, piston and hopper), from 35 to 300 ccm in one stroke.

Mould tool with glass window for testing

Custom-built MPIM Machines according to specific requirements

Technical Data

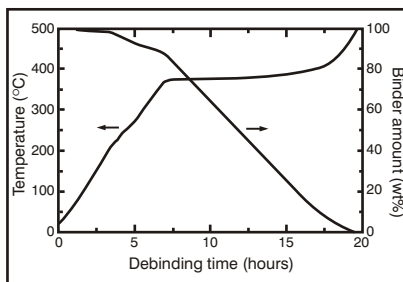
	GC-MPIM-2	GC-MPIM-3
GC-MPIM-2-MA, GC-MPIM-3-MA	Injection by pneumatic cylinder, Automatic and Manual mode	
GC-MPIM-2-M(A), GC-MPIM-3-M(A)	Injection by pneumatic cylinder, Manual mode (prepared for Automatic mode)	
GC-MPIM-2-MA-X, GC-MPIM-3-MA-X	Injection by servo-motor, Automatic and Manual mode	
Operation temperature	RT - 120°C	
Injection pressure	0 - 50 bar	
Mould cavity volume		
CIModule® 35	GC-MPIM-2	0.005 - 35 ccm
CIModule® 100	"	0.010 - 100 ccm
CIModule® 200	GC-MPIM-3	0.020 - 200 ccm
CIModule® 300	"	0.030 - 300 ccm
Injection rate		
CIModule® 35	GC-MPIM-2	0.1 - 20 ccm/s
CIModule® 100	"	0.3 - 60 ccm/s
CIModule® 200	GC-MPIM-3	0.4 - 100 ccm/s
CIModule® 300	"	0.6 - 150 ccm/s
Injection time	0.6 s - 60 min	
Production rate	up to 360 cycles/hour (one cavity tool)	
Hopper volume	1.25 l (GC-MPIM-2), 3.0 l (GC-MPIM-3)	
Weight, approx.	150 kg (GC-MPIM-2), 220kg (GC-MPIM-3)	
Mains connection	230 V 5%, 50-60 Hz, 1-phase, max. 2000 W	
Pressurised air supply	3-12 bar	

GC-DV, GC-DV-RC

GOCERAM Debinding Furnaces are adapted for industrial thermal debinding/removal of volatiles, such as polymers, waxes and solvents, from powder based green bodies. The furnaces can be run with vacuum, air, inert as well as reducing atmospheres (Naton). With a multi-level setting furniture, in combination with an internal convection fan, the production-size horizontal furnace can be efficiently filled with parts for rapid removal of almost unlimited amounts of volatiles. The furniture is sliding on runners for smooth and fast loading and unloading. All internal furnace parts are made of heat resistant stainless steel and there is no volatile-absorbing fibre insulation present inside, which makes the furnace robust and easy to maintain.

• Rate controlled debinding

The furnaces can be equipped with a PC-controlled balance, placed underneath the heating chamber, which continuously records the weight loss rate. With a software based on TestPoint™ from CEC, a pre-programmed weight loss rate controls the precess temperature, ensuring reduced debinding times and minimal risk of debinding defects. All furnaces are already from the beginning prepared for adding this device.



Thermal debinding / removal of

- polymers
- waxes
- solvents

in

- vacuum
- air
- inert or reducing atmosphere
- with or without weight-loss rate control

• Vapour collecting system

Binder vapours are collected in a cold trap, equipped with cooling water jacket and electrostatic filter. The cold trap chamber is made of stainless steel and is designed to be easy to empty and clean. As an option, an additional mist collector can be included in the vapour collecting system.

• Internal fan and gas flow

All furnaces are equipped with internal heat-resistant convection fans for even heat distribution and accelerated debinding rates. The rate of the gas, flowing through the furnace chamber and into the cold trap, is controlled by a flowmeter. To speed up the gas flow and at the same time save expensive gases, it is possible to recycle some of the gas from the cold trap outlet and feed it back into the furnace (option).

• Options

- Balance system for weight-loss rate control including PC control unit
- Extra multi-level furnace furniture
- Maximum temperature 800°C
- Gas recycle system
- Custom-built Debinding Furnaces according to specific requirements

Technical Data

GC-DV

GC-DV	GC-DV-RC
Effective chamber volume	50 litres, 100 litres
Atmosphere	Air, Inert, Naton (10% Hydrogen + 90% Nitrogen) & Vacuum
Maximum temperature	600°C (special design 800°C)
Rate of gas flow	0.1 - 200 litres/hr (50 litres), 0.2 - 400 liters/hr (100 litres)
Vacuum pressure	<10-1 mbar

-RC

-RC	Weight-loss Rate Control
Maximum load	6 kg (one balance), 60 kg (two balances, 2x30 kg)
Resolution	0.01 g (6 kg), 0.2 g (60 kg)
Minimum weight loss rate	0.005 gm/min (6 kg), 0.05 gm/min (60 kg)

General

Dimensions (WxDxH)	90x135x175 cm3 (50 litres), 110x165x180 xm3 (100 litres)
Weight, approx.	100 kg (50 litres), 130 kg (100 litres)
Mains connection	230 VAC 5%, 50-60 Hz, 1-phase, 2200 W (50 litres), 3500 W (100 litres)

GC-SCE

Equipment features

Some features of the supercritical extraction equipment are a re-circulating CO₂ fluid system, resulting in very low CO₂ consumption and a separator continuously separating the binder from the CO₂ during extraction. The following example shows the efficiency of the system:

the 20 litre extractor can each time be set with 650 pieces of injection moulded watchcases. One complete extraction cycle takes only five to six hours, by which 90-95% of the binder is removed. The output of the 20 litre chamber units is thus more than sufficient for large-scale production.

Equally important, we have reationalised the unit design to be able to offer equipment at an attractive price. As a result, the investment cost in terms of output is comparable to thermal debinding systems.



For fast binder removal of all kind of injection moulded components, partially containing binders of short non-polar hydrocarbon chains

Advantages of supercritical extraction

- Considerably reduced debinding time
- Dispensable powder embedment
- Excellent shape stability - no shrinkage and no swelling
- High dimensional tolerances (no re-arrangement of particles)
- Improved surface finish
- Possible to extract thick-walled products
- No reaction between CO₂ and powder - CO₂ is thermodynamically stable
- Extracted paraffin can be recycled
- No additional CO₂ to the atmosphere



Technical Data

Technical Data	GC-SCE
Effective chamber volume	20 litres, 50 litres
Supercritical fluid	CO ₂
Pressure	- 300 bar
Temperature	- 90°C
Flow rate	1 kg CO ₂ /min (20 litres), 2 kg CO ₂ /min (50 litres)
Load	50 kg (20 litres), 100 kg (50 litres)
Extraction rate	0.2 kg binder/hr (20 litres), 0.4 kg binder/hr (50 litres)

General

Dimensions (WxDxH)	80x110x170 cm ³ (20 litres), 90x120x180cm ³ (50 litres)
Weight, approx.	350 kg (20 litres), 450 kg (50 litres)
Mains connection	230 VAC, 50-60 Hz, 1-ph, 1.5 kW (20 litres) 2.2 kW (50 litres)

Universal feedstock mixer for operation temperature up to 150°C, including stainless steel bowl with a capacity of 5 or 12 litres, stainless steel beater, protective shield, heat unit with heat jacket, thermocouple and temperature controller.

Technical Data

Operation temperature	RT - 150°C
Bowl volume	5 litres, 12 litres
Max feedstock capacity	4 litres (5 litres), 10 litres (12 litres)
Max feedstock weight	10 kg (5 litres), 25 kg (12 litres)
Beater speed	140 rpm (5 litres), 110 rpm (12 litres)
Mains connection	230 VAC, 50-60Hz, 1-ph, 750 W (5 litres), 1.5 kW (12 litres)
Dimensions (WxDxH)	30x40x44 cm ³ (5 litres), 46x52x65 cm ³ (12 litres)
Weight, approx	25 kg (5 litres), 85 kg (12 litres)

Specifications subject to change

*Feedstock mixer,
5 litre,
with heat unit*



CE Mark

The GC supercritical carbon dioxide extractors conform to the regulation stipulated by the European Community for CE-marking.

About GOCERAM

GOCERAM has long experience of net shape forming of ceramic and metal powder based components, especially utilising injection moulding. GOCERAM supplies complete production lines for injection moulding, including Roll Mills, Drying Ovens, **Mixers***, **Medium Pressure Injection Moulding Machines***, **Automatic Mould Tools***, **Debinding Furnaces***, with or without Weight Loss Rate Control, and **Special Sintering Furnaces***. In addition, a **know-how package** is offered for rapid start up of the production.

Complex-shaped metal and ceramic parts formed by GOCERAM's Medium Pressure Powder Injection Moulding - MEDPIMOULD™ Technology - from the following materials:

- Metals - MIM
- Stainless 316 Steel
- High-Speed Steel (HSS)
- Low-Alloy Steel
- Iron
- Tungsten Carbide
- Tungsten
- Cobalt
- Titanium
- Ceramics - CIM
- Alumina
- Zirconia
- Silicon Nitride
- Silicon Carbide
- PZT (Piezo material)
- Leucite
- Steatite
- Glass

GOCERAM also carries out test runs of a specific material and mould according to the client's wishes, on contract basis. Another service is prototype development and test production of a variety of components.

*Equipment designed and manufactured by GOCERAM

Please contact GOCERAM or its representatives for further information.

The picture shows a selection of ceramic, metal and tungsten carbide components manufactured by the GOCERAM route



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