NEW

3D Printing with Inorganic Binder

A decisive step towards a green foundry

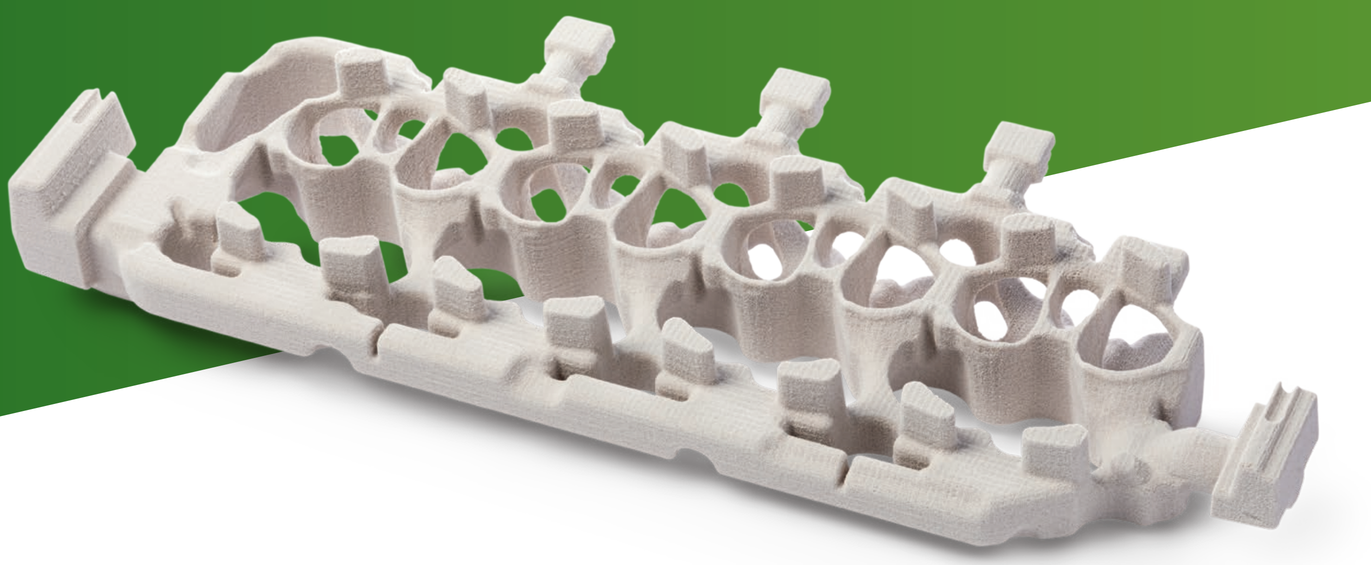
ExOne™

Less emissions, more ecological responsibility

Flexible inorganic binder processing creates potential for the future

Increasing awareness of environmental issues and the efficient use of natural resources are requiring industrial sectors to rethink production strategies. Inorganic binders now enable sand cores to be 3D printed in a more environmentally friendly process.

Particularly relevant for foundries and automotive manufacturers with an interest in more ecological responsibility, inorganic binder is increasingly used in lightweight metalcasting with aluminum. ExOne offers a complete inorganic binder manufacturing solution where users benefit from reduced emissions, more streamlined, cost-efficient processing and storage, and increased automation options.



BENEFITS TO 3D PRINTING CORES WITH INORGANIC BINDER:

1. Lower emissions during printing and casting
   - Higher yields due to lower rejection rates caused by gas-related defects during casting
2. Environmentally friendly processing and storage
   - No investment or operating costs for air treatment measures
   - Simple storage due its low German water hazard classification (WGK 1)
   - Odor-neutral binder for user-friendliness
3. Increased performance through excellent surface quality, edge sharpness, and casting quality
4. Flexibility to produce more complex core geometries
5. Easy finishing thanks to reduced sand adhesion
   - Significant time savings
   - Enabling options for partial or full automation of core production

Technical data

PHYSICAL AND CHEMICAL PROPERTIES

The binder (FB901) used in the inorganic process is based on sodium silicate chemistry, commonly known as water glass. The cured printed product is hygroscopic, so should be used quickly for best results or kept in a dry storage environment. Cast properties can be adjusted by dosing various additive quantities and the strength of the printed cores is regulated by the amount of binder.

	Binder (FB901)	**Cleaner (FC903)**	**Additive (AD901)**	**Additive (AD903)**
pH value	12 (highly alkaline)	9.2 (alkaline)	–	–
Density	1.3 g/cm³	0.993 g/cm³	0.35 g/cm³	1.02 g/cm³

Part characteristics

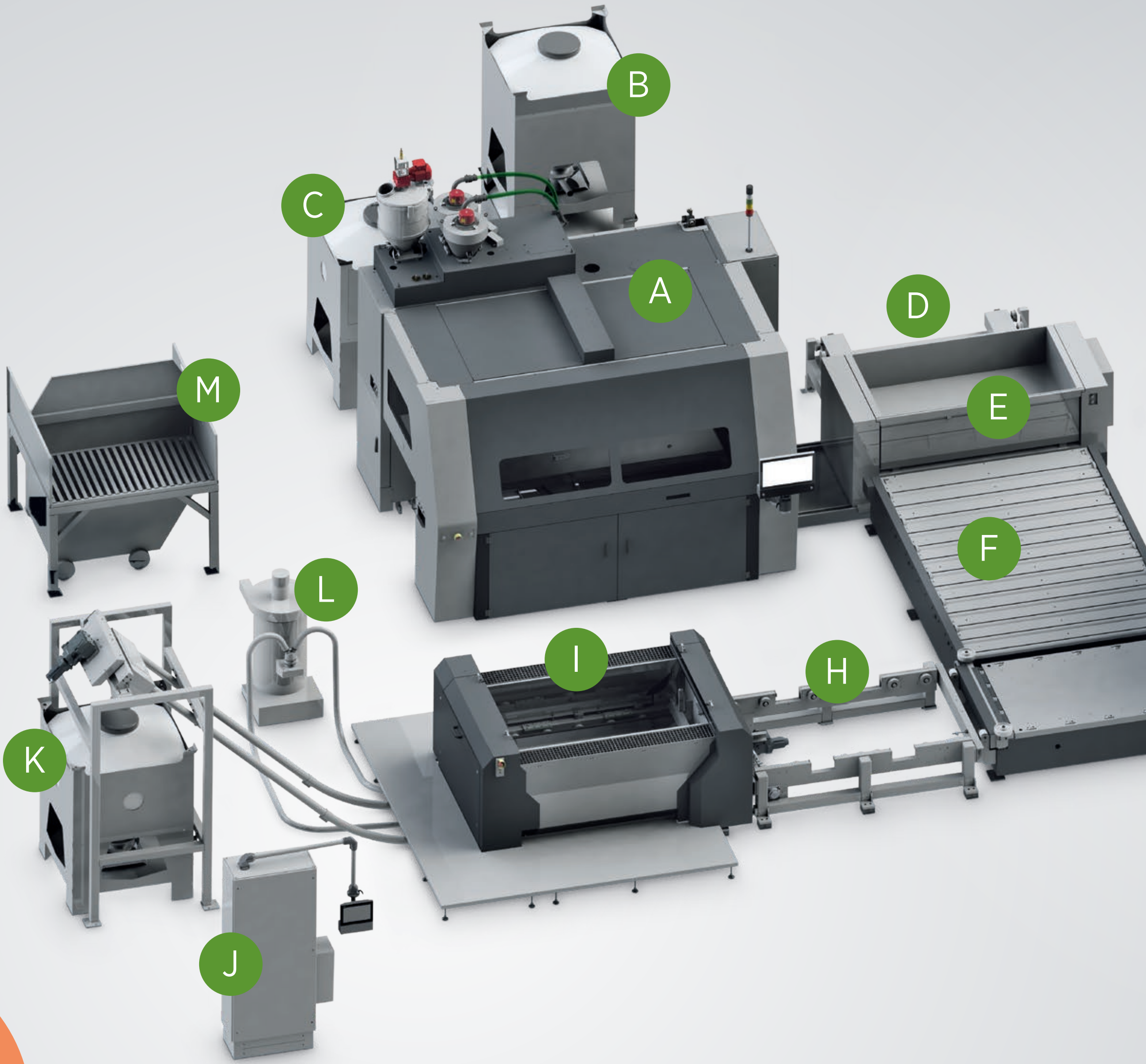
Loss on ignition (LOI)	< 0.5 % *
Typical strength	250 – 400 N/cm² *
Dimensional accuracy	+/- 0.5 mm **

* dependent on molding material and amount of binder
** dependent on size and geometry of the component (up to 0.1 % of component size)

APPLICATION AREA

The inorganic binder system is used to process silica sands and is primarily found in lightweight metalcasting.

A S-Max Pro
B Transport container (fresh sand)
C Transport container (recycled sand)
D Transfer station
E Job box
F Conveyor
G Microwave
H Transport module
I Desanding module
J Control cabinet
K Collection hopper with recycling bin
L Industrial dust collector
M Finishing area



More about the Automated Desanding Station
www.exone.com/autodesanding

1

FILE PREPARATION

A digital file of unstacked cores is processed in preparation software, sliced into print layers, and transferred to the machine as a print-ready file.

2

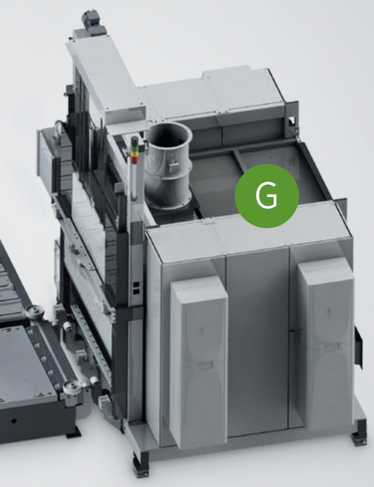
3D PRINTING

The printing of cores in the S-Max® Pro sand binder jetting system is started. Upon completion, the box-in-box system enables automatic job box replacement to start the subsequent job.

3

MICROWAVE CURING

The job box is transported to the microwave where cores take between 15 – 45 minutes to dry, significantly less time than in an oven and with more reliable results as cores are dried from the inside out.



Series production with inorganic binders – the system combination is key

The sodium silicate-based binder has been optimized for use in the S-Max® Pro sand 3D printer. When combined with a microwave and the automated desanding station from ExOne, manufacturing cells for the series production of sand cores using inorganic binder are made possible.

One desanding station and microwave can support up to four 3D printers, making it cost-efficient and sensible to connect multiple printers in a manufacturing cell.

Additional integration of robotic core removal, fine desanding, and quality inspection open the opportunity to expand automated processing.

4

AUTOMATIC DESANDING AND REMOVAL
The job box moves into the desanding station where coarse desanding is automatically completed in minutes, reducing the desanding time by up to 95 %.

5

FINISHING
Because of the reduced sand adhesion, fine desanding of inorganic cores can be completed using pressurized air and a brush in less time than processes required when using organic furan binder.

STORAGE

The cores are now ready for visual or laser inspection prior to going into dry storage or directly into the mold.

VIDEO – See the inorganic binder process:
www.exone.com/inorganicbinder

ExOne has facilities and representatives around the world.
To reach us, feel free to call or email us at the locations below,
or visit us at exone.com/locations.

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