WAB *IMPA°CT REACTOR®*

An inductively heated agitator bead mill reactor for continuous **mechanochemistry.**

WAB-GROUP

WAB

MECHANO CHEMISTRY

Mechanochemical reactions are understood to be “chemical transformations initiated or sustained by mechanical force”.[1]

This technology has been developed “to a widely applicable technique”[1] and allows a cleaner synthesis for chemical reactions and offers many opportunities for developing and producing new molecules and materials.

The major advantage of mechanochemistry is “green chemistry, specifically the need of pharmaceutical and chemical industries for cleaner, safer, and more efficient transformations.”[1]

WAB considers mechanochemistry to be a major technology for a greener future in chemical industries. For this reason, WAB has been investing for several years intaking this technology out of the research laboratory for use in industrial applications. The **WAB** *IMPA°CT REACTOR®* is the first agitator bead mill reactor developed with an inductive heating system for continuous mechanochemistry.

(1) Do, Jean-Louis & Friščić, Tomislav. Mechanochemistry: A Force of Synthesis. ACS Central Science 2017, 3, 1, 13–19.

FROM THE LAB TO INDUSTRIAL APPLICATIONS

Researchers have proven the great advantages of mechanochemistry over conventional production processes. The conversion into industrial applications has not yet taken place because no suitable and scalable equipment was available. The **WAB** *IMPA°CT REACTOR®* closes this gap: it applies mechanical energy by bead milling, enables in-situ heating, pressure activation in continuous flow and is scalable to industry requirements.

MOST INNOVATIVE TOOL IN MECHANOCHEMISTRY

The **WAB** *IMPA°CT REACTOR®* is our latest innovation in the field of mechanochemistry. An inductive heater arranged around the stirring elements enables direct and efficient heating of the reactants up to +160 °C.

Together with the impact beads located in the reactor chamber, the **WAB** *IMPA°CT REACTOR®* is a ground-breaking, user friendly and application-specific apparatus for molecular synthesis by means of mechanochemistry.

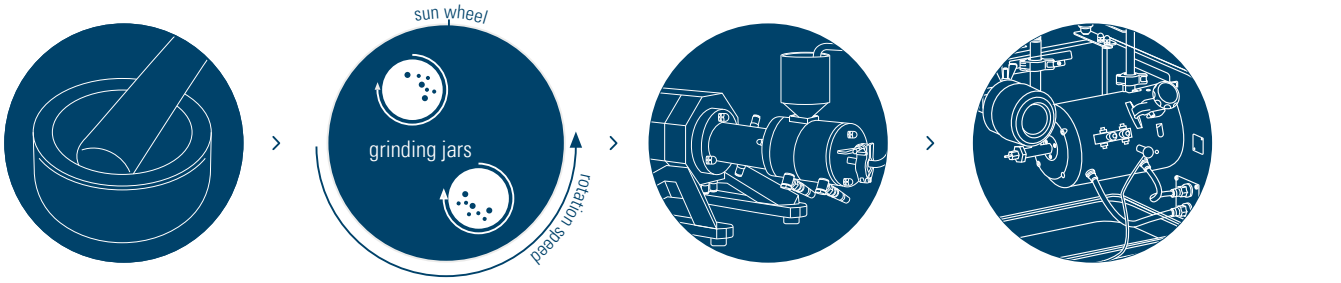
Conventional batch processes can be replaced by a continuous process. The newly developed **WAB** *IMPA°CT REACTOR®* enables faster, more selective and novel reactivities.

And an industrial scale-up from g/h to tons/h is also available.

EVOLUTION OF GRINDING

The easiest way to perform a mechanochemical reaction is to use a pestle and mortar. How these reactions behave is different. The reason for this is that each operator applies a different level of energy into the reaction. Using a planetary ball simplifies the work and enables stable results, but it is limited to a batch process, it is not possible to control the temperature inside the jar and the reaction progress cannot be monitored.

Working with a WAB DYNO®-MILL suited for mechanochemistry allows you to apply different reaction times with one or more pre-mixtures. It conserves valuable raw materials by reducing the necessity of cleaning between each trial and allows you to control and log important process parameters such as product temperature and energy input.



Mortar and pestle
- historical

Planetary ball mill
- batch process only
- small scale
- no temperature control

Current agitator bead mill technology
- mechanochemistry with DYNO®-MILL series based on bead milling
- for a continuous process
- allows temperature control and scaling-up

WAB *IMPA°CT REACTOR®*
- mechanochemistry with DYNO®-MILL series based on bead milling
- for a continuous process
- allows temperature control and scaling-up

\+ **in-situ heating up to + 160°C**

= **chemical reaction under continuous flow**

THE WORKING PRINCIPLE

THE **WAB** *IMPA°CT REACTOR®* with a horizontal reaction chamber is a tool for an effective mass transportation and efficient activation of a chemical reaction. It can be used for liquid and viscous pumpable products and heterogenous catalysts, combining the three impact technologies in one reactor:

- the DYNO®-ACCELERATOR
- the patented DYNO®-DISC BC agitator discs
- the DYNO®-DISC KD agitator discs

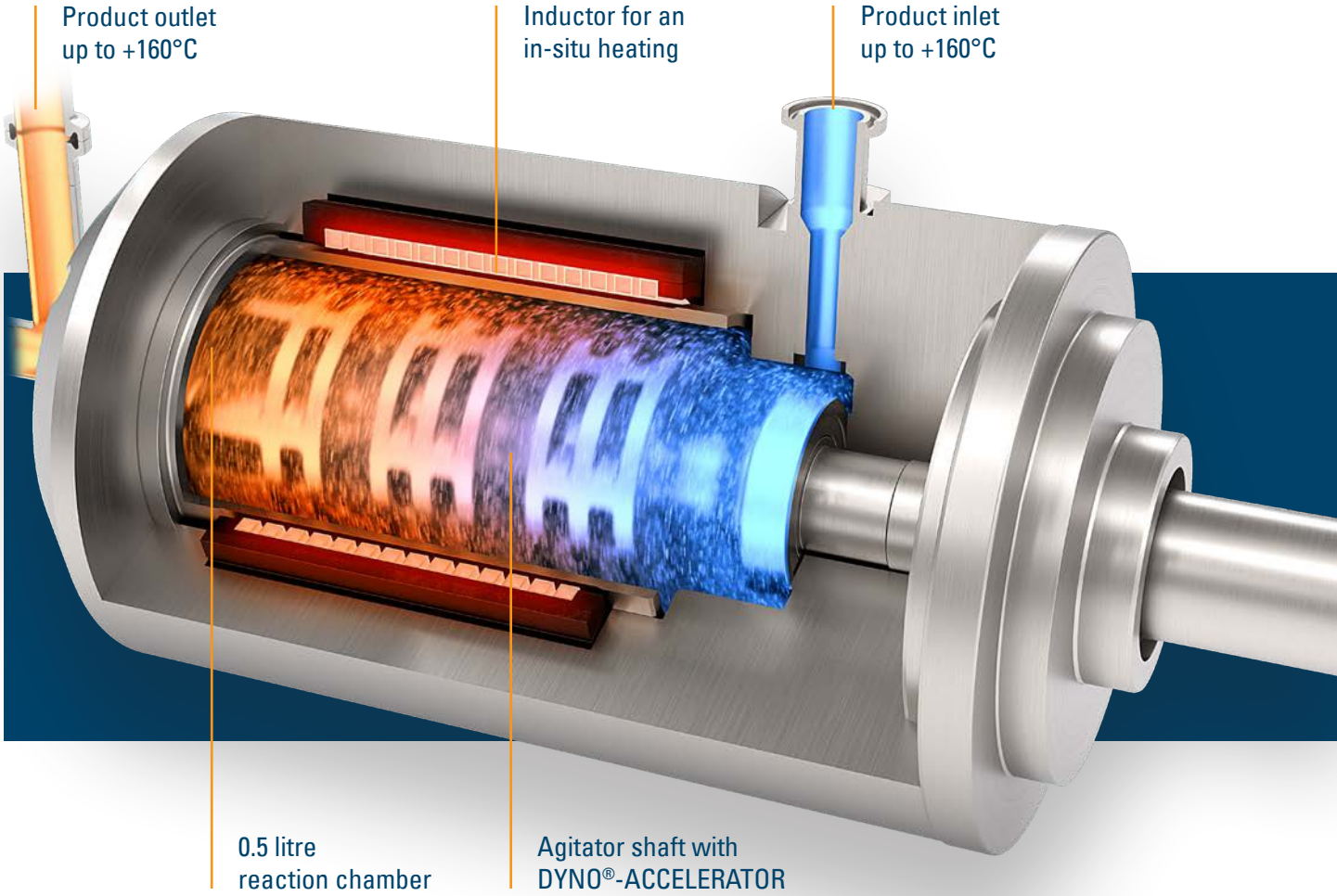
Together with the impact beads, this technology guarantees a high and uniform mechanical energy input and surface renewal of the reactants.

Additionally to the application of endothermic processes, it can also be used for exothermic reactions due to its excellent cooling properties.

UP TO
160°C

The patented WAB inductive heating system allows direct heating of the reactants up to **+160 °C.**

INSIDE THE WAB *IMPA°CT REACTOR®*



A RELIABLE SOLUTION FOR YOUR PROCESS: BENEFITS AT A GLANCE

If you need to consider the following points, our **WAB** *IMPA°CT REACTOR®* will be the right system for your lab and production site.

Reduction
of carbon footprint

Reduction
of costs by process intensification

Cost competetive
equipment in terms of CAPEX and OPEX

Technical leverage
by a new approach compared to existing technologies

HIGH PROCESS FLEXIBILITY

The machine will be operated by a graphic display which shows all important process information such as product temperature, pressure and flow rate. These data will be logged and can be read out from the system.

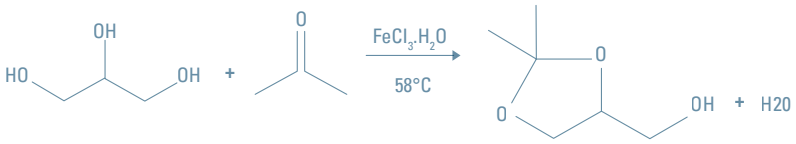
The **WAB** *IMPA°CT REACTOR*® is a complete process system consisting of an inductively heated agitator bead mill, two product pumps, a mobile operator panel and switch cabinet.

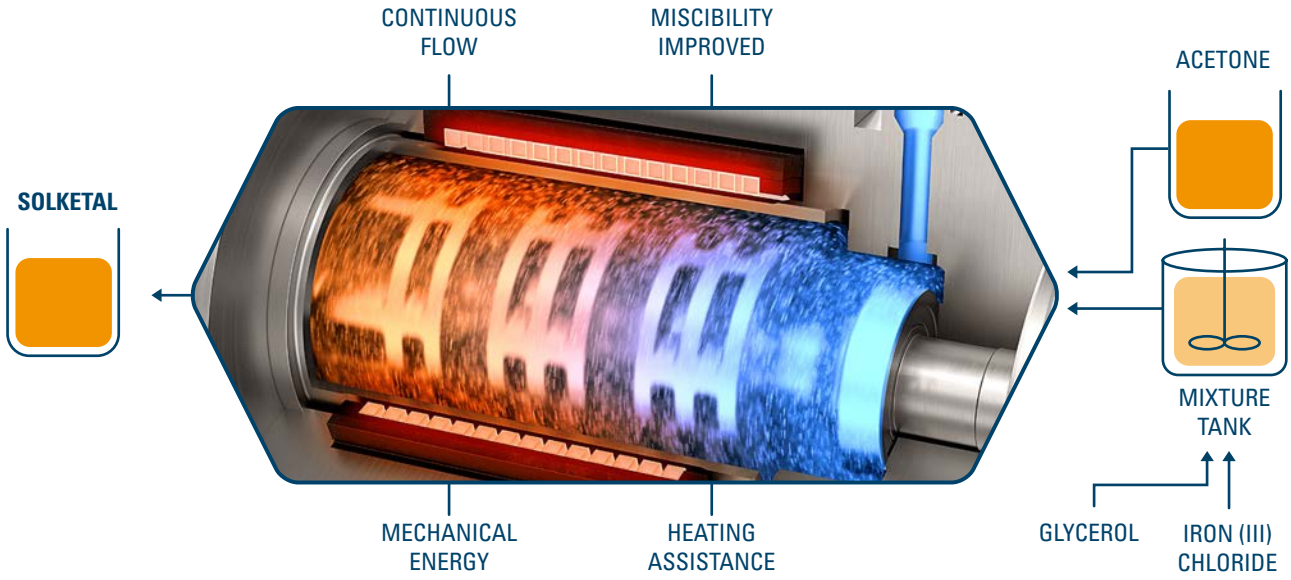
The system allows working in both passage and circulation processes. Processing starts with 1 litre of suspension and can be scaled-up to the larger models of the DYNO®-MILL series.

APPLICATION EXAMPLES

Synthesis of Solketal

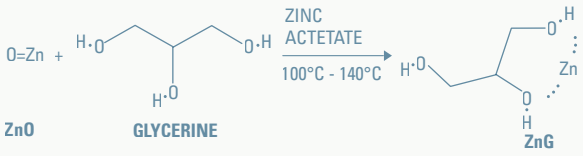
Solketal is a synthesis building block in the chemical and pharmaceutical industry and can be produced on the **WAB** *IMPA°CT REACTOR®*.

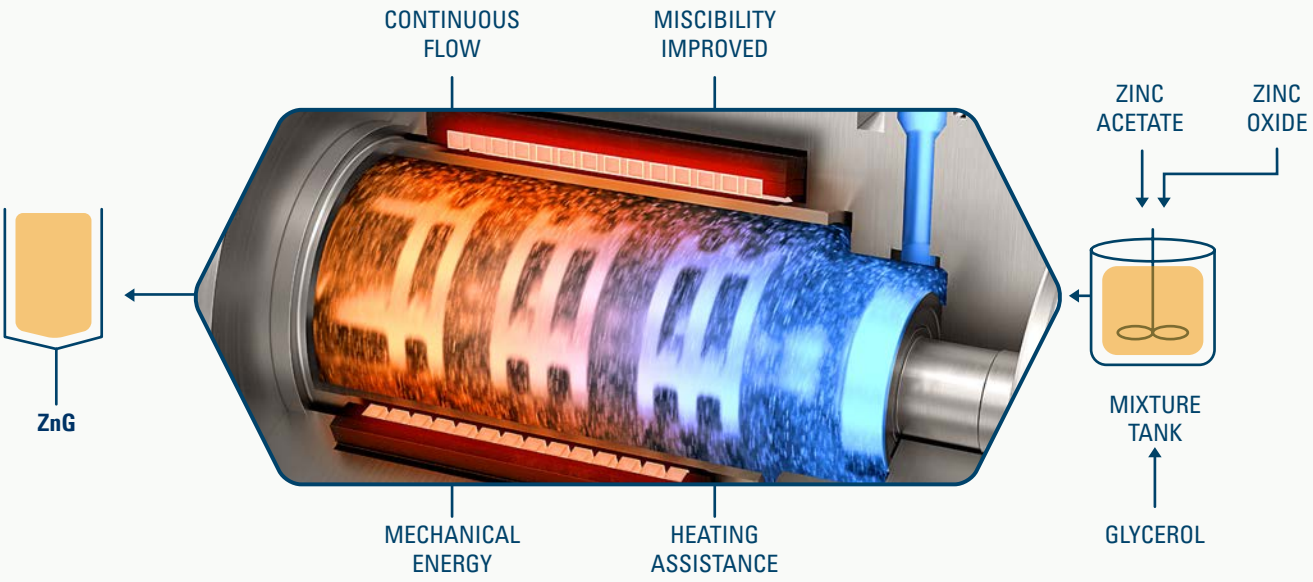




Synthesis of Zinc monoglycerolate (ZnG)

Zinc monoglycerolate is used as an additive for the vulcanisation of rubber and in the plastics industry. **WAB** *IMPA°CT REACTOR®* enables a high reaction temperature and is predestined for the production of ZnG.





WAB-GROUP ENTITIES

WAB-GROUP is your reliable global partner. Our local presence around the world ensures expert support. Production facilities on four continents manufacture to the highest quality standards.

Willy A. Bachofen AG
Junkermattstrasse 11
P.O. Box 944
4132 Muttenz 1
Switzerland
+41 61 6867-100
wab@wab-group.com
www.wab-group.com

WAB US Corp.
3 Pearl Court
Suite E
Allendale, NJ 07401
USA
+1 973 873-9155
wab-us@wab-group.com
www.wab-group.com

Willy A. Bachofen S.à.r.l.
3, rue Paul Henri Spaak
68390 Sausheim
France
+33 389 31 17 00
wab-fr@wab-group.com
www.wab-group.com

Willy A. Bachofen GmbH
Liebigstrasse 16
61130 Nidderau-Heldenbergen
Germany
+49 6187 9394-0
wab-de@wab-group.com
www.wab-group.com

WAB India Pvt. Ltd.
Plot No. D 36/3B
T.T.C. Industrial Area, Turbhe
Navi Mumbai - 400 705
India
+91 22 613 171-00
wab-in@wab-group.com
www.wab-group.com

WAB Branch Office (Shanghai) Co., Ltd.
Rm 22A06, Yitianxia Building
No. 360 Hengtong Road
Jing'an District, Shanghai - 200070
China
+86 (0)21 6380 6481
wab-cn@wab-group.com
www.wab-group.com

WAB Machinery (Shenzhen) Co., Ltd.
Unit 102, Floor 1, Plant Building 1
Everbrite Technology Park, Minqing Road
Longhua District, Shenzhen 518109
China
+86 755 2813 5108
wab-cn@wab-group.com
www.wab-group.com

Contact our WAB-GROUP locations
or numerous partners within our strong network:

SCAN THE CODE TO GET MORE INFORMATION
www.wab-group.com

WAB-GROUP

WAB