

Miprowa® for volume flows  
up to 2 m<sup>3</sup> per hour

## Rectangular cross-section for improved flow performance.

Because Miprowa® is a masterly scale-up concept.

The highly efficient Miprowa® reactors and heat exchangers are true masters when it comes to challenging chemical reactions, which need efficient heat dissipation or continuous mixing. Rapid scale-up from smallest scale to production level under steady operating conditions – with the innovative Miprowa® technology, this is engineered reality.

What is so special about it?

The secret of Miprowa® is the combination of rectangular channels with planar (comb shaped) static mixing inserts. The significantly higher surface-to-volume ratio of the channels compared to a round tube causes a considerably improved heat transfer between process and service medium. The static mixing inserts in the channels even increase this effect and additionally cause efficient continuous mixing also for multiphase reactions.

Exact temperature control enables increased selectivities and yields for highly exothermic reactions.

The Miprowa® technology sets new standards in terms of quick and easy scale-up from smallest scale to production level: These compact devices master an annual production of up to 20.000 t/a effortlessly.

Therefore, Miprowa® reactors offer companies in the chemical industry the key to smart production combined with fast returns on investment.

Our integrated scale-up concept guarantees a rapid scale-up within similar channel geometries. The channel configuration from pilot stage can simply be equalled up to production scale. The throughput is increased to the desired production capacity by a parallel setup of a large number of channels within one reactor.

### Scale-up with Miprowa®



**LAB Scale**  
0,6 – 15 L/h



**PILOT Scale**  
2 – 150 L/h



**PRODUCTION Scale**  
bis 10 m<sup>3</sup>/h

## From Lab to Production:

**Lab Scale:** The Miprowa® Lab reactor can be integrated into the Modular MiroReaction System (MMRS). Therefore, and thanks to its flexibility it is the perfect tool for process development and optimization.

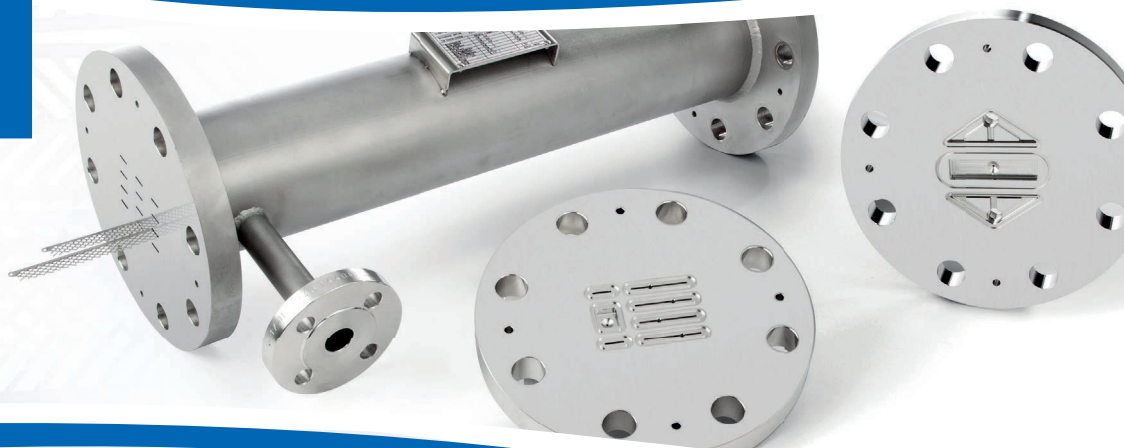
**Validation/Pilot Scale:** Up to three Miprowa® Matrix reactors can be modularly connected in a serial manner within one rack. In this way, a channel length of up to 11 meters can be realized. Here, the future production conditions can be precisely replicated using identical channel geometries.

**Production Scale:** The methods tested with the Miprowa® Matrix System are transferred to Miprowa® Production by parallelization of channels within one channel bundle.

## All advantages at a glance: Miprowa® devices

- are optimally suited for fast, severely exothermic and endothermic reactions
- excel in terms of quick and easy scalability
- offer multiple fields of application due to their modularity and flexibility
- convince with economic efficiency in terms of attractive return-on-investment periods
- are made of high quality materials like stainless steel or Hastelloy®, compact, sturdy and easy to maintain
- are attractive for companies operating in sectors like fine and specialty chemicals, petrochemicals, food and cosmetics industry as well as CMOs

Optimum temperature monitoring for highly exothermic reactions



## Technical Specifications:

	Miprowa® Lab	Miprowa® Matrix-System	Miprowa® Production
Channel cross section	12 x 1.5 mm <sup>2</sup>	18 x 3.2 mm <sup>2</sup>	18 x 3.2 mm <sup>2</sup>
Number of channels	8 (4)	1-9	up to ~ 500 per core
Mode of flow	serial	up to 9 serial / up to 3 parallel	parallel
Channel length (per passage / core)	300 mm	600 / 1200 mm	600 / 1200 mm
Process volume*	30 mL (15 mL)	15 ... 400 mL	up to ~ 150 L
Max. diameter at narrowest position	400 µm	1000 µm	1000 µm
Max. process pressure (at 200 °C)**	45 / 56 / 75 bar	24 / 56 bar	16 (56) bar
Temperature range***	-10 ... 200 °C	-10 ... 250 °C	-60 ... 250 °C (400 °C)
Volume flow****	~ 0.3 ... 15 L/h	~ 3 ... 150 L/h	up to several 10 m <sup>3</sup> /h
Retention time****	~ 4 s ... 6 min	~ 1 s ... 8 min	few s ... few min

Status August 2022. We reserve the right to changes and errors. Illustrations and drawings are only approximately determinant.

\* Depending on installed flow inserts; given values valid for standard type  
 \*\* Depending on material  
 \*\*\* Extension down to -50 °C and up to 250 °C on request  
 \*\*\*\* Rough estimation – strongly depending on the process conditions

