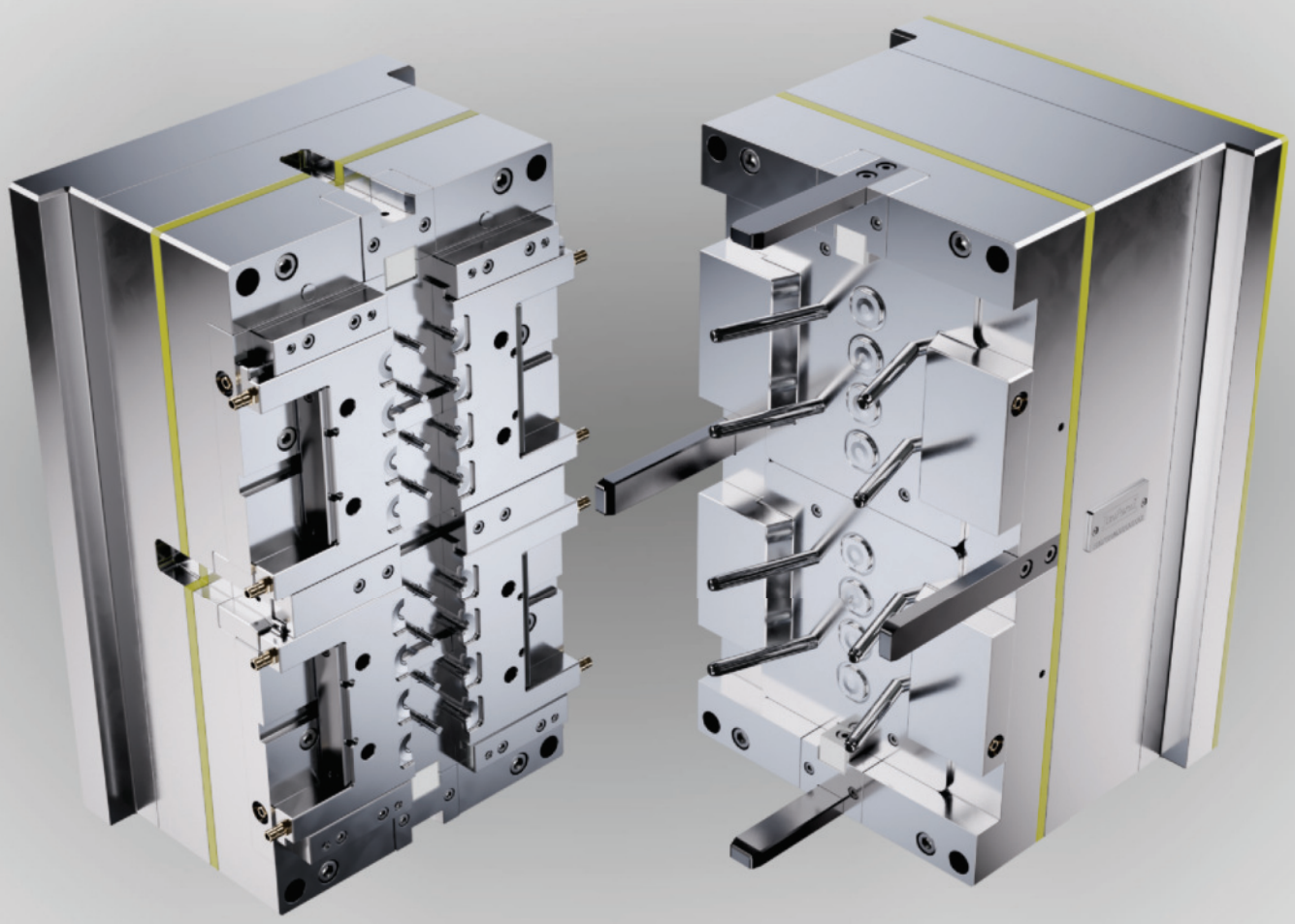
# IsoForm®

DAS FORMENKONZEPT

*Process reliability • Precision*
*Sustainability • Energy efficiency*



Kb-Hein.de/isoform

incl. information on

HeiNo®

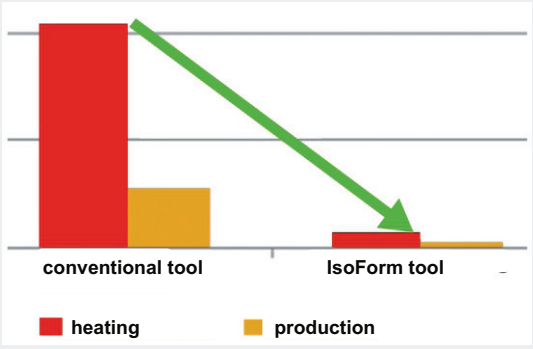
standard elements for gates,
ventilation and temperature regulation

# IsoForm® - The isolated tool concept

***... ensures a high process reliability for thermoplastics, thermosets, elastomers and diecasting***

Due to demographic changes we will soon be confronted with the need for automation in any area of plastics processing. First and foremost, sustainable mould tool concepts today therefore need to be suitable for automation.

IsoForm® tools comply with this requirement as they reach process temperatures energy-efficiently, sustainably and fast. Depending on the selected layout, a robot may e.g. change the insert or the mould plate automatically on the machine. You will thus be well prepared for an extended automation as the completely automatic start-up of the injection process will become more and more common. An exchange of the mould tool or of the insert will be possible within a few minutes.

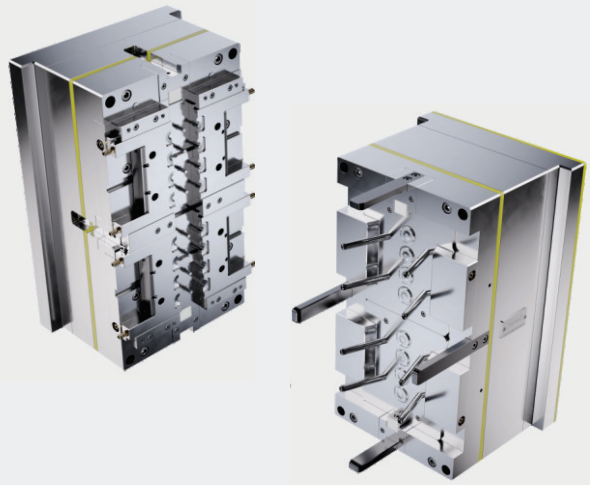



Reducing energy costs with IsoForm®

Konstruktionsbüro Hein GmbH developed the **protected concept** and the corresponding standard elements are distributed by the project partner Nonnenmann GmbH. Upon placing the order for customised IsoForm® standard elements with Nonnenmann GmbH, the corresponding **rights of use** will be assigned for the tool in perpetuity.

Project partners from different fields of plastics and metal processing helped to establish a comprehensive range of solutions. This brochure can only present a fraction of them.

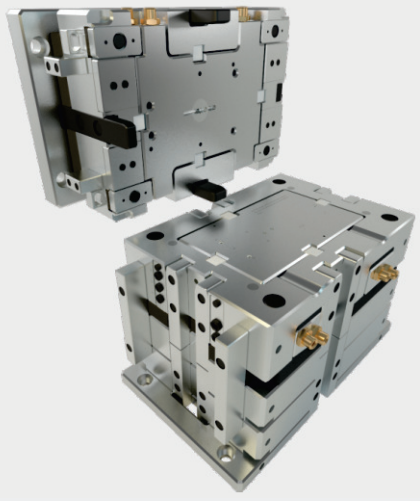
IsoForm® systems can easily be combined with different systems for sensor technology and ventilation. There will also be a **customised IsoForm® solution** for your specific task.



IsoForm® mould tool with slides

The isolated tool concept **IsoForm®**, together with **HeiNo®** standard elements, forms the basis for a **holistic approach** including the subsequent advantages for process reliability and efficiency with regard to quality, costs, time and energy requirements - not to mention for work safety for temperatures over 80°C.

No matter which kind of temperature regulation you plan to use – **water, vapour, coolant, oil, electric or inductive heating** – the IsoForm® system always forms an improved basis for an increased process reliability at a lower energy demand.



IsoForm® mould tool - open

# Content

IsoForm®
DAS FORMENKONZEPT

# Efficiency starts with product development

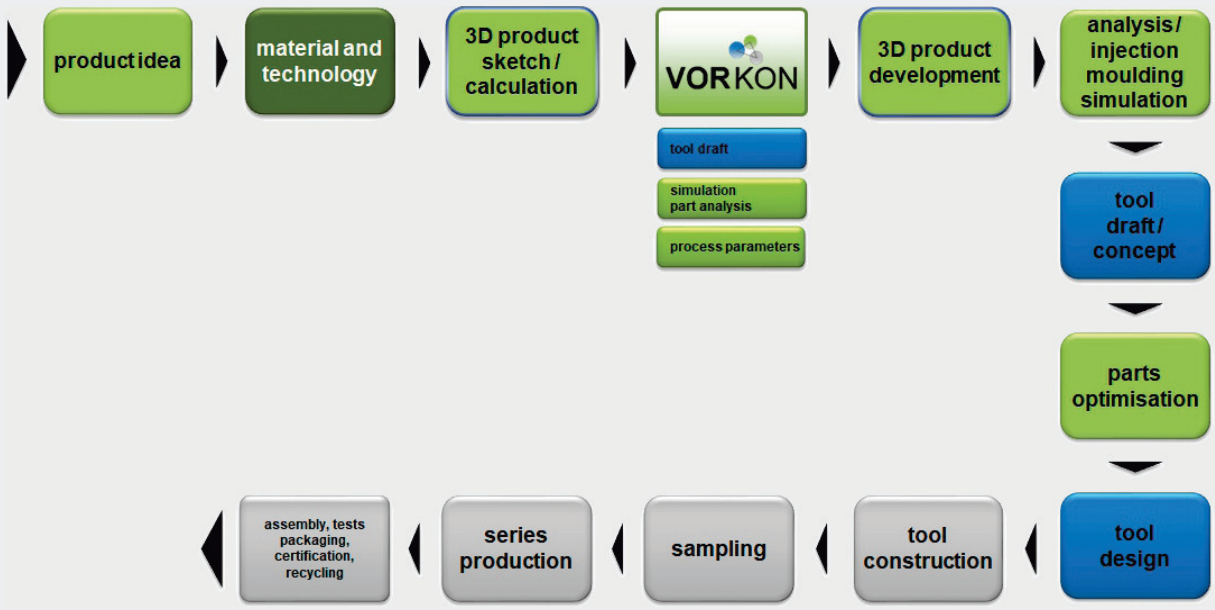
## OUR CONCEPT

- **VORKON** - simulated pre-concepts
- **product development**
- **parts optimisation**
- **injection moulding simulation**
- **FEM analysis**
- **shrinkage data**
- **tool concept**

Long-term recording of the entire project costs frequently discovers a **considerable potential for savings**.

In order to save inevitable follow-up costs it can thus become necessary to invest a little more cost and time into product development – always depending on the kind of task. These additional expenses are **exceeded several times by the savings** regarding follow-up costs.

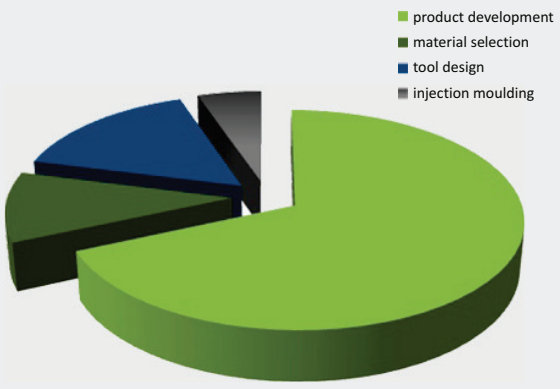
The required consistent and **qualified approach** already begins with the first sketch of the product. At this time already, before starting the actual design, early analyses should be done using VORKON, pre-concepts based on simulations, and the first simplified concepts should be drafted.




The reasonable path to obtaining a good plastic part

## YOUR GOALS = OUR GOALS

- ✓ high **part quality**
- ✓ high **process reliability**
- ✓ high **rentability**
- ✓ high **customer satisfaction**
- ✓ high **sustainability**
- ✓ high **degree of innovation**
- ✓ high **degree of automation**




Influences on the part quality:
investments during product development
will lead to considerable benefits

# What is an IsoForm® tool?

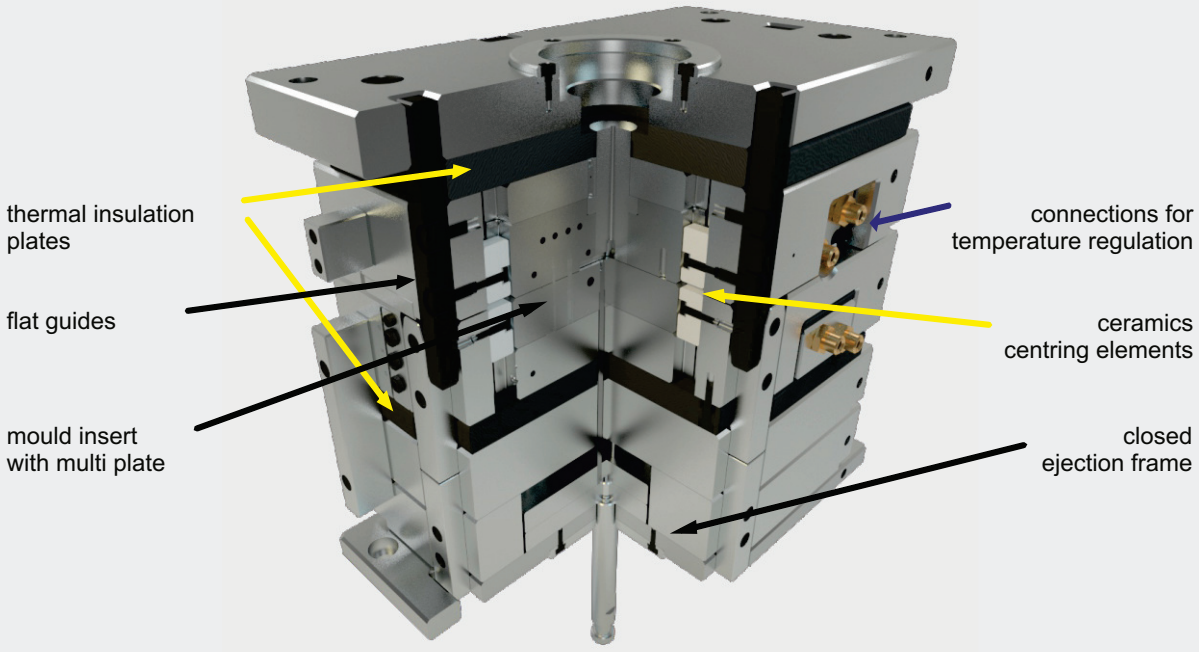
IsoForm® mould tools were designed based on a holistic approach to tool design with the subsequent advantages for process reliability, quality and energy efficiency.

We distinguish between the BASIC and PREMIUM product lines which differ regardingf the design of centring elements and the degree of isolation (see p. 9). Both lines are available in numerous variants, such as with exchangeable inserts or mould plates, and the contour-forming area is always thermally isolated.

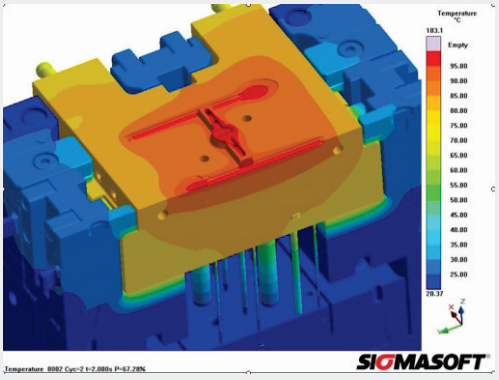
Konstruktionsbüro Hein GmbH developed the IsoForm® concept and the corresponding standard elements are distributed by Nonnenmann GmbH. We'll be happy to discuss your needs.

## OUR OFFER

- **thermal separation**
- **consistent hub-centring**
- **innovative ejection frame**
- **can be combined with almost any application and system**
- **tool change systems**




section of IsoForm® tool




IsoForm®: only heating mould inserts

## YOUR BENEFIT

- ✓ high **process reliability and energy efficiency**
- ✓ for **any kind of temperature regulation**
- ✓ high **precision due to hub-centring**
- ✓ reduced **deflexion**
- ✓ reduced **follow-up costs**
- ✓ perfect for **automation, change of inserts and tools**

# Thermal separation and temperature regulation

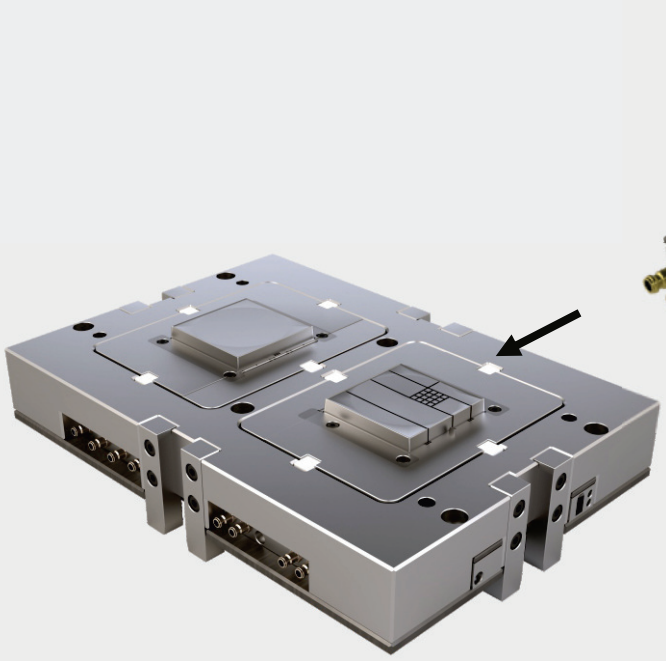
## ISOLATION

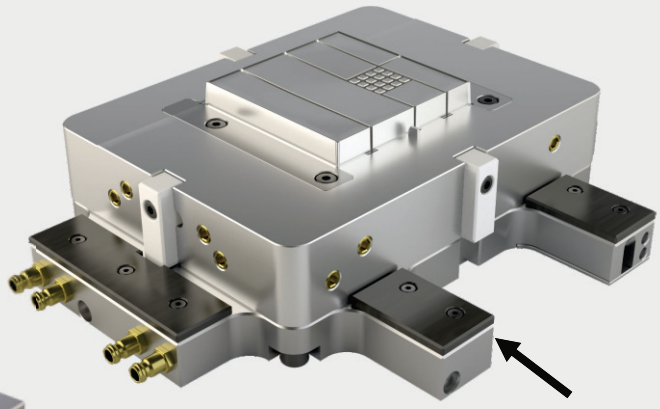
- **thermal separation**
- **isolated mould inserts**
- **defined air gap**
- **ceramic elements**
- **thermal insulation plates**

Up to now, the temperature was regulated in order to obtain a consistent temperature level of the entire tool. IsoForm® tools allow for particularly regulating the temperature of the mould inserts and of other contour-forming components isolated from the surrounding tool.

The mould inserts are centred by means of key and slot joints (arrow, fig. left) made from ceramics (heat co-efficient 2W/mK).

The isolated multi plate (arrow, fig. right) below the insert serves for supplying the temperature regulation medium and for the support of pins and cores. The mould inserts and the mould support are isolated from the surrounding tool using defined air gaps and high-strength thermal insulation plates.

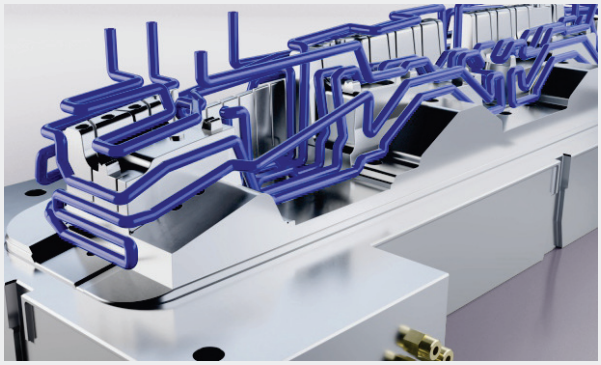




example: IsoForm® Premium

## TEMP. REGULATION

- any **method for temperature regulation**
- heating elements, water, oil, gas
- **cycle-dependent** temperature regulation
- **pulsed temperature regulation**
- right temperature at right time and place
- high **energy efficiency**



temperature regulation close to the contour

# Hub-centring and ejection system

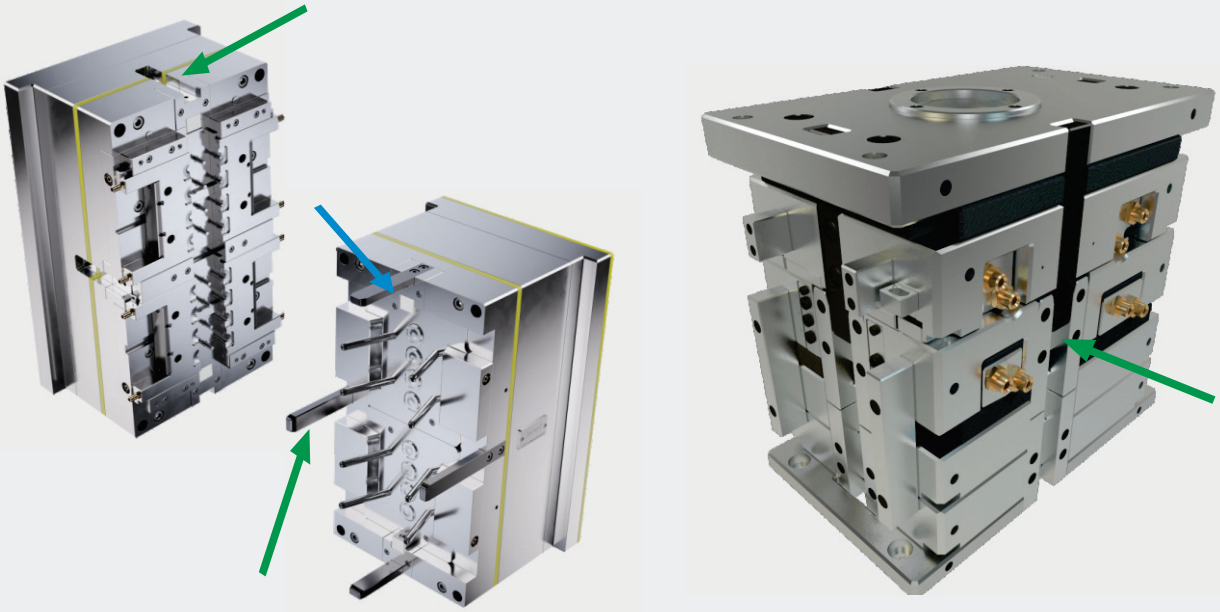
For the mould inserts, ceramic centring elements are used (**blue arrow,** fig. left). The ceramic centring elements (2W/mK) are the only direct contact between the "hot" mould insert and the mould support frame and thus also provide for thermal separation.

On the outside of the tool, centring is done using flat centring elements (**green arrows,** fig. left) avoiding clamping and seizing of guide systems and centring elements, which may occur when using columns due to different linear expansion.

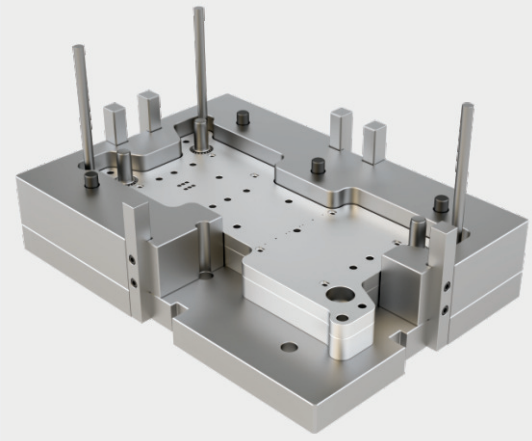
Hub-centring between mould plates (**green arrow**, fig. right) allows for adapting temperature regulation to different requirements and for a simple, fast and precise mounting and dismounting of the tool.

## HUB-CENTRING

- consistent **hub-centring** of all inserts, mould plates and mould halves against each other
- high **precision**
- differing **thermal expansing** is **compensated**



moulds for thermoplastics



closed ejection frame
(here partially sectional)

## EJECTION SYSTEM

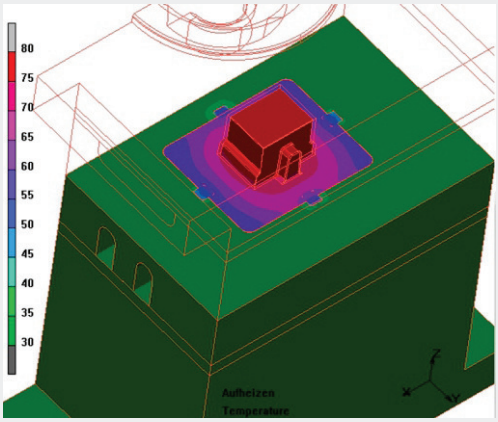
- functional design of ejection plates
- maximum passive **support**
- high **lifetime**
- low **deflexion**
- less **flash formation**

# Advantages of IsoForm® tools

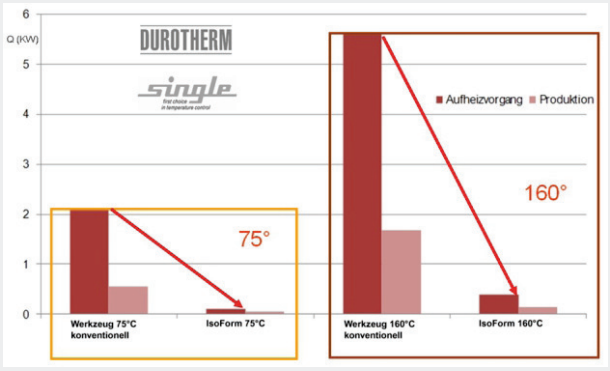
In addition to an increased process reliability a consistent thermal isolation of the contour-forming area offers considerable advantages for time and energy requirements:

For the application shown here, the sustainable IsoForm® tools need **up to 95 %** less energy in order to reach the process temperature compared with conventional tools.

The energy needed for heating a tool for the high temperature range (e.g. PEEK / rubber / silicone / thermosets) is reduced at the same rate.




IsoForm®: Only heating mould inserts




**Comparing the demand of heating energy for 75°C and 160°C**

The IsoForm® application shown here not only demonstrates that the process temperature is reached at only a fraction of the energy needed with a conventional tool but also that, in the given example, it is already reached in 1/5 to 1/10 of the time needed using a conventional tool.

Picture by Single/Durotherm
for IsoForm® experimental tool

## BENEFITS at a glance

- ✓ consistent **isolation** of contour-forming area against surrounding tool
- ✓ **reduced deflexion** - less flash formation
- ✓ short **set-up and heating times**
- ✓ consistent **hub-centring** > reduced offset of mould
- ✓ perfect as **base / principal mould**, as **exchangeable tool** remaining on the machine
- ✓ additonal isolation of **hot runner** available (minimizes heating requirements)
- ✓ perfect for **cycle-dependent temperature regulation**
- ✓ **reduced energy costs**, especially for high-temperature applications
- ✓ for **elastomers, thermoplastics, thermosets** and **diecasting**
- ✓ increased **process reliability,** as design and concept eliminate potential for error
- ✓ in any size - with IsoForm® benefits - available
- ✓ standard clamping systems may be used
- ✓ IsoForm® BASIC at comparable cost as conventional mould units - with more benefits
- ✓ BASIC product line upgradeable with ceramic centring elements at any time

# IsoForm®-BASIC and IsoForm®-PREMIUM

**centring of inserts** and of injection to closing side with centring elements incl. flat guides (at the same length as formerly used columns)

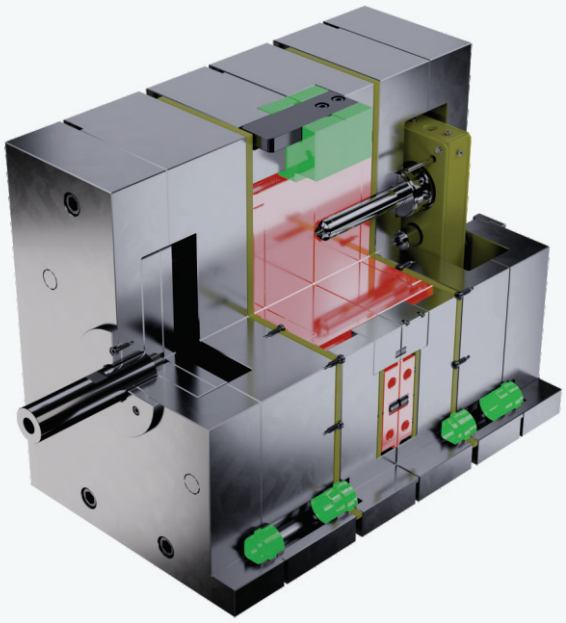
**isolation** of contour-forming area against the mould structure

**centring of mould plates** on closing and injection sides using bushings

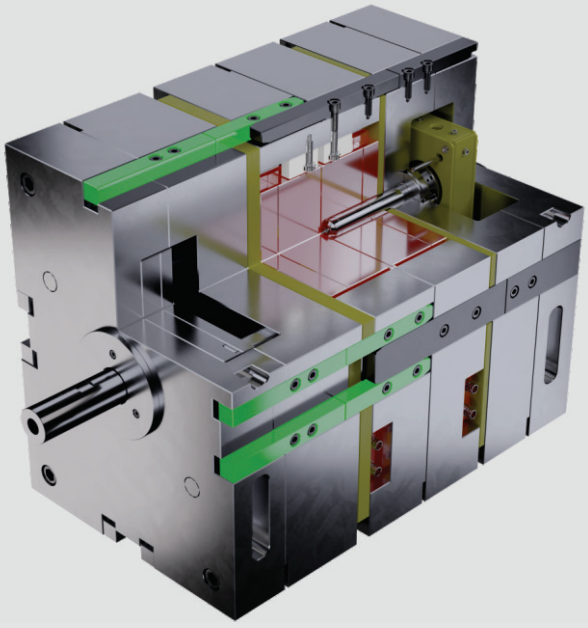
**bore holes** for wider clamping systems for further machining provided

## IsoForm® BASIC

- **cost-optimised standard**
- includes basic isolation and centring
- may be upgraded with **ceramic centring elements** at any time
- costs comparable to conventional mould units



IsoForm® **BASIC**



IsoForm® **PREMIUM**

**highest degree of isolation** of contour-forming area against mould structure (using ceramic centring elements)

**centring of inserts** and of injection to closing side with flat centring elements at length of parallel according to customer specifications

consistent **hub-centring of plates** at the outside of the tool

**bore holes** for standard clamping systems for further machining available

## IsoForm® PREMIUM

- **fast mounting** and **dismounting**
- **optimum solution with all advantages**
- **highest degree of isolation**
- consistent **hub-centring**
- **ceramic centring elements**
- also for **exchangeable mould plates**

# IsoForm® tool change systems

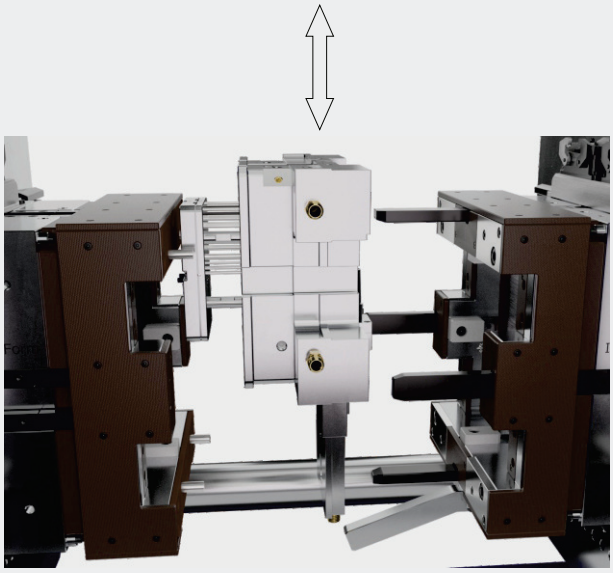
## Tool change systems

- all **IsoForm® benefits**
- **multiple use** of principal mould > lower proportional tool costs
- **fast and simple change** of production of different components

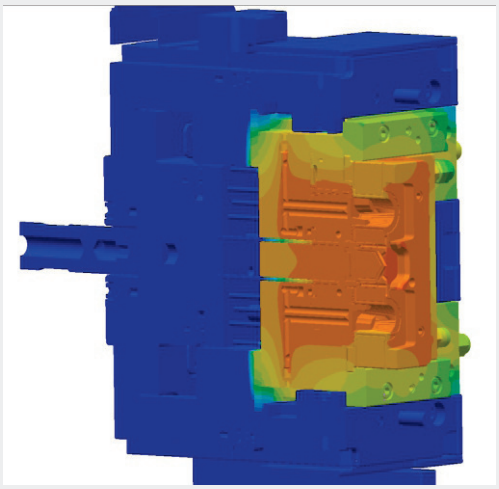
For multiple use, the IsoForm® program offers variations of standard elements where the inserts or entire mould plates (incl. slides and/or ejectors) can be exchanged from the **separation level.**

You may thus reach a fast, thermally separated tool change with precise hub-centring but **without leakage or difficulties**, if necessary even with transponders or **fully automatic**.

This means that the investment in the modular principal mould can be added to the **costs for the machine** which leads to lower costs for the tool.



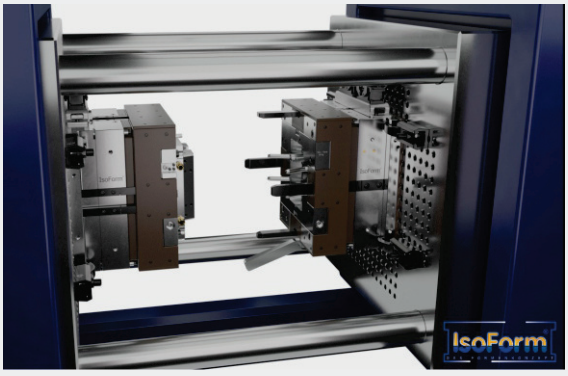
exchange of mould insert (ejection side)
incl. integrated exchangeable
ejection plate



only mould insert is heated
(picture by SIGMA Engineering GmbH)

## Exchangeable inserts

- only **mould insert with ejection plate** is changed
- for **small projected surfaces**
- **fitting panel** for exchange and for protecting the contour
- with **screws** or **locking bars** for **manual change**
- also available for **automatic change**




IsoForm® - exchangeable tool
with exchangeable mould inserts

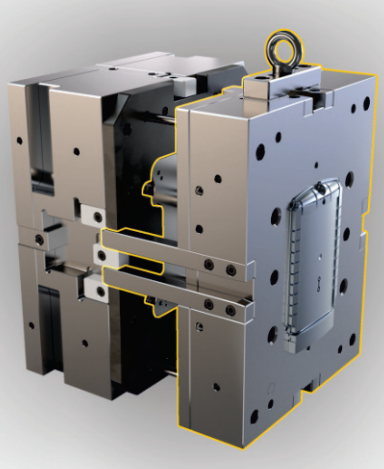
# IsoForm® tool change systems

Telenot is a company that develops electronic modules for the highest demands. The current project asked for a **high resilience** and **strength** of the parts at an **optimum sealing** as well as a possibility for a **tool change** for housing and cover. The two parts are now produced alternately on an IsoForm® tool with exchangeable mould inserts.

Again, the isolated mould concept IsoForm® for tool change offers a **high process reliability** and **precise centring** for a fast exchange of the contour-forming areas.

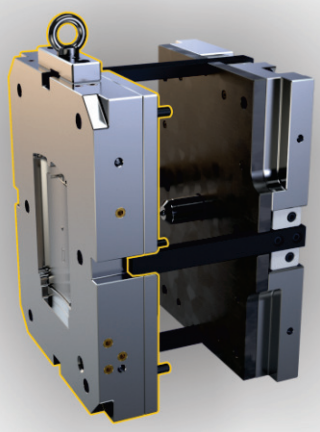
## Exchangeable plates

- **exchange** of mould plates
- for **larger projected surfaces**
- **contour areas** are protected with **cover plates**
- reduced **storage requirements**
- high **process reliability** and precise **centring**

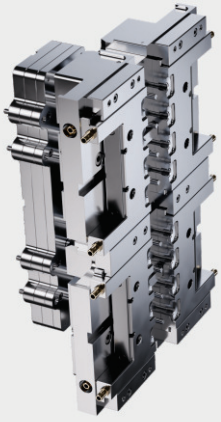


modular tool change system

pictures by Telenot



housing and cover (illustriations) are produced alternately



IsoForm® exchangeable inserts

## Exchangeable inserts

- with **slides**
- with **core pins** for **sleeve ejectors**
- **multiple applications** in one tool
- **energy efficient** and **sustainable**
- **fast and process reliable** in production

# IsoForm® for thermoplastics

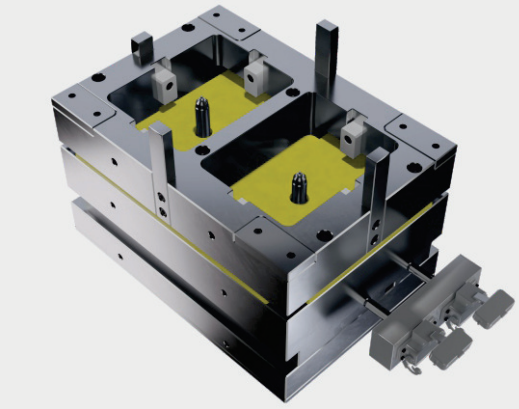
## IsoForm mould tool

- thermal **separation**
- **hub-centring**
- **individual temperature regulation**
- **moulds** in any size
- **slides** and **isolated hot runner** possible

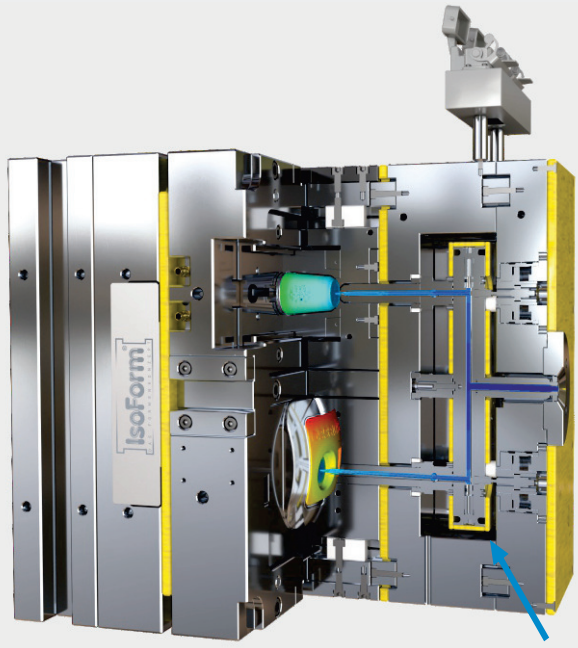
The IsoForm® principle of isolating the mould insert and other components forming the contour from the surrounding tool using air and ceramics forms the basis for all applications. Any temperature regulation system can be conveniently and individually used.

Hub-centring is as indispensable as the isolated multi plate below the insert for supplying the temperature regulation medium as well as for the support of pins and cores.

Standard elements with one or more inserts are available as well as those with an integrated isolated hot runner or with slides.



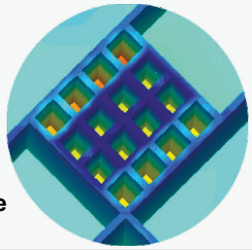
tool for thermoplastics, injection side



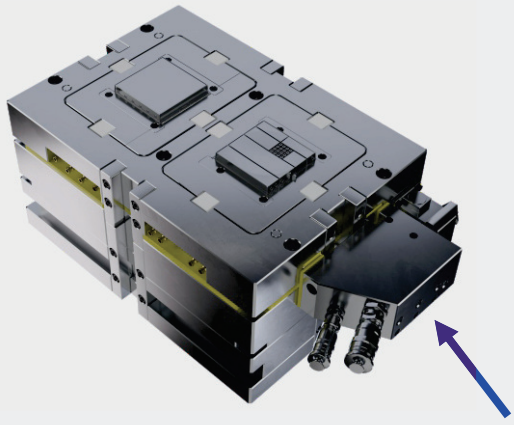

tool with hot unner completely isolated with ceramics and with needle valve and cascade technology

## Temperature regulation

The temperature regulation of the tools may be individually adapted so that you may use water on one side and a coolant on the other (fig. right; **blue arrow**), while connecting sensors and/or gas injection devices on the opposite side.



**hot spots with water temperature regulation are avoided by using a coolant for regulating the temperature of the partitioned area**



ejection side

# IsoForm® for thermoplastics

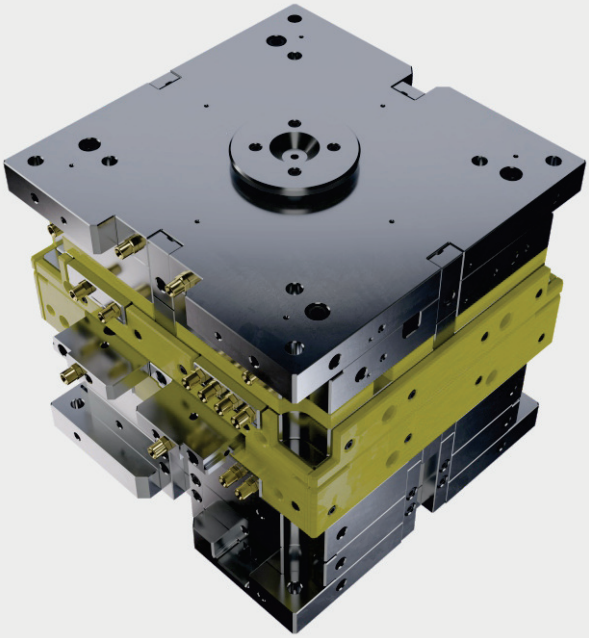
Tools with slides represent the majority of IsoForm® injection moulding tools to be built. One special feature is the consistently centred guidance of all slides corresponding to the hub-centring of any IsoForm® tool.

Another characteristic is the isolation of the slide(s) and its guiding elements from the mould support frame which we already know from the isolated mould inserts.

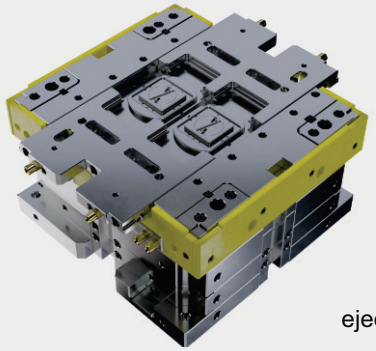
Thrust pads assist in fine-tuning the mould tool.

## Tools with slides

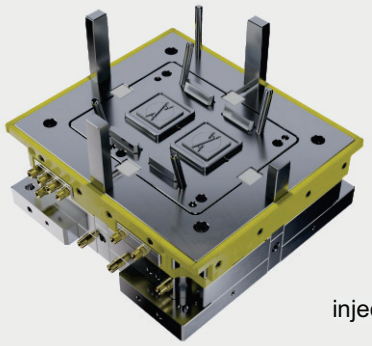
- **centred guidance** of slides
- **isolation** of slides
- **thrust pads** for fine-tuning, if applicable
- special **inclined slides**



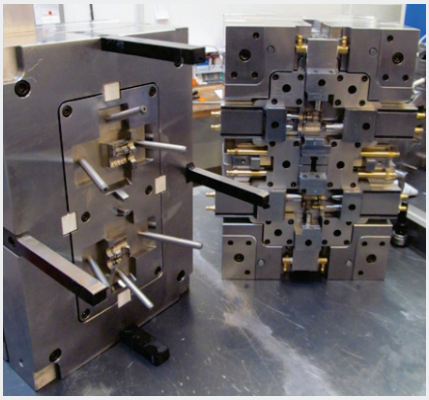
assembly slide mould for PPA
for 160°C surface temperature



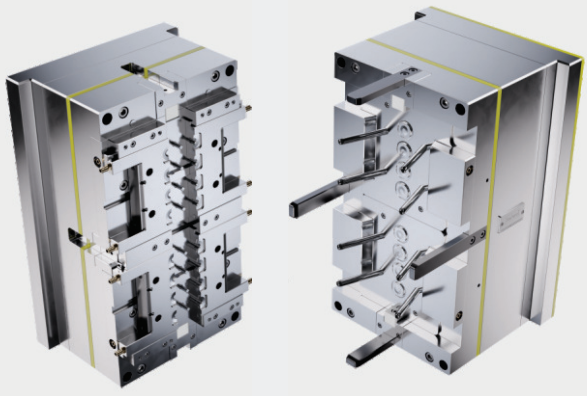
ejection side



injection side



IsoForm® tool (2013)
2 cavities with 8 slides (picture: Festo AG & Co. KG)



IsoForm® tool with slides (2018)

# IsoForm® for rubber, silicones and thermosets

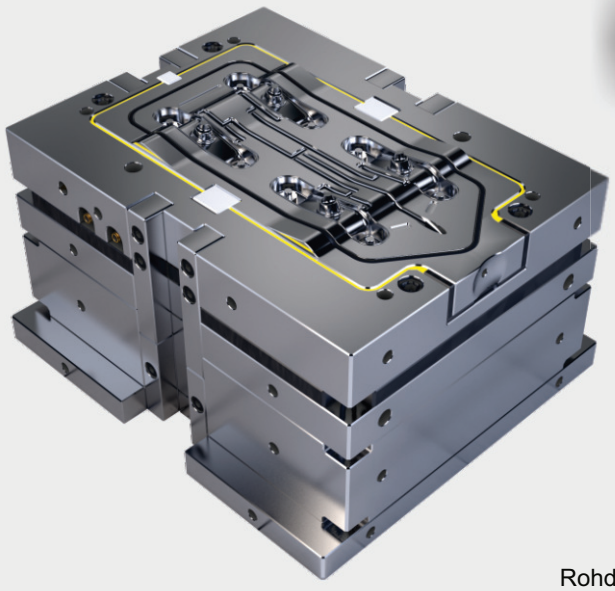
## RUBBER

- **thermal separation** between material feed and contour areas
- example **IsoForm® tool for rubber processing** for oscillatory element
- **tool for shuttle production**

Especially for the processing of crosslinking materials the thermal separation e.g. between the cold area of the material feed and the heated contour area is decisive.

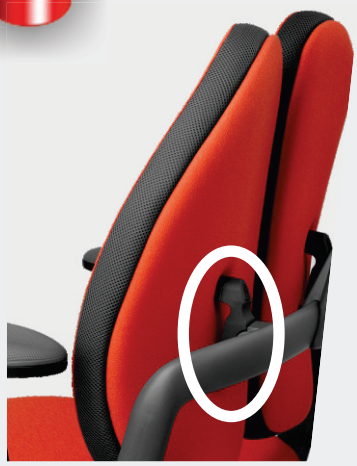
Up to 240°C, IsoForm® tools allow for a temperature regulation using water – up to 180°C even cycle-dependent - which avoids "scorching" within the cavity during the filling phase. Thus, crosslinking can then be intentionally started.

The figures below show an application for an oscillation element. Only by implementing IsoForm® the number of possible load cycles for the part could be more than tripled.



Rohde und Grahl / MBS UG

rubber part with inserts made from PA

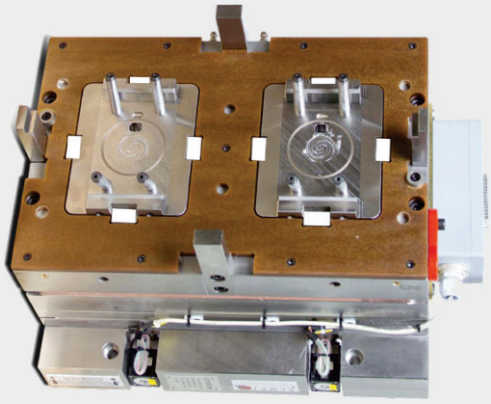


## SILICONES

The example on the right shows the implementation of an application for processing silicone by the tool manufacturer Heite & Krause GbR.

The slides were integrated into the isolated mould insert. The thermal insulation plates of the separation area represent a protection against contact.

Ceramic centring elements of mould inserts provide the fixation of the inserts and the outside lug centring elements guarantee that areas with necessarily different temperature regulation don't affect the functionality of the entire tool.



Heite & Krause GbR/DME Normalien GmbH

# HeiNo® standard elements

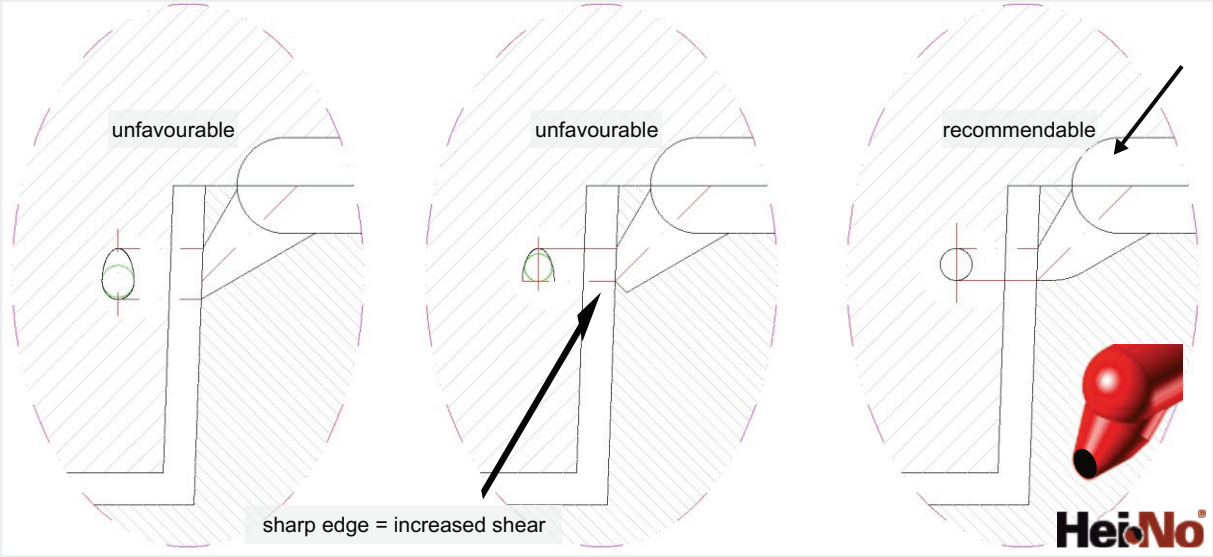
A production without unnecessary maintenance or cleaning breaks thanks to gate, ventilation and temperature regulation elements that match the requirements will lead to considerable savings regarding time and energy.

In addition to the IsoForm® concept we developed standard elements adapted to the **materials to be processed** and to the **intended temperature regulation** in order to allow for process-reliable production. This forms the basis for almost any application in mould design.

HeiNo® modules are protected by KB Hein and may be ordered from Nonnenmann GmbH.

## HeiNo elements

- **solutions** for **gates, ventilation, temperature regulation**
- save **time** and **energy**
- high **process reliability**
- minimum effort for **maintenance** and **cleaning**




example for a feed gate design for thermoplastics

For most thermoplastics, feeding needs to ensure that the mass is injected into the cavity by means of a cold manifold **at the lowest possible pressure and with the lowest possible shear** while allowing for optimum holding pressure. From elastomers to rubber materials a **controlled shear** is usually necessary during feeding. Therefore, special attention has to be paid to the cold runner with its **specified dead runner**, reasonable **balancing of channels** for multiple gates and a specific film or tunnel gate geometry. Frequently, the formation of **streaks**, **vacuoles** or **air traps** and an **inadequate surface structure** of the part are pre-determined at this point.

## COLDRUNNER

- **parameters** to be considered: **economic efficiency, part size, surface quality, mechanical and optical requirements, material**
- **decisions** to be made: **feed technology, position of gate, type of gate, dimensions**

# HeiNo® gate inserts (for thermoplastics)

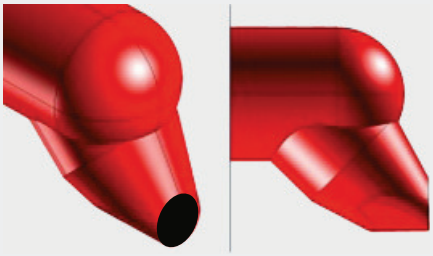
## TUNNEL GATE

- low or controlled **shear**
- **flow speed reduction** or **dead runner** on demand
- **temperature regulation of gate**
- **special steels** and **special surfaces** for materials highly reinforced with fibres and for high temperature materials

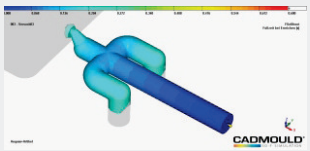
The protected and low-shear geometry for tunnel gates shown below is available as an electrode version for eroding or as a complete insert by Nonnenmann, with a **variety of methods for fastening**. Combined with "flow speed reduction" in the runner “halo formation“ and visible material orientation can be avoided.

Curved HeiNo® tunnel connections also a reasonable alternative for some applications. Here, we would like to point out the limited percentage of fibres that can be used.

Combined with the IsoForm® concept temperature regulation is also possible.



HeiNo® tunnel gate

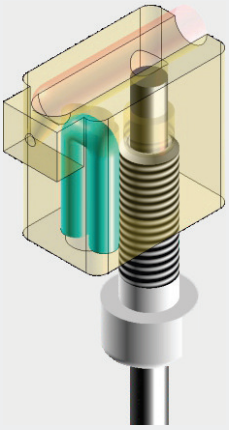




HeiNo® tunnel gate
with flow reduction and ventilated ejector

## Temperature regulation

- **temperature adapted** to the task in feed gate area
- smooth **redirection** of glass fibres
- maximum **effect of holding pressure**
- clean **shear-off of tunnel gate**
- high **part quality**



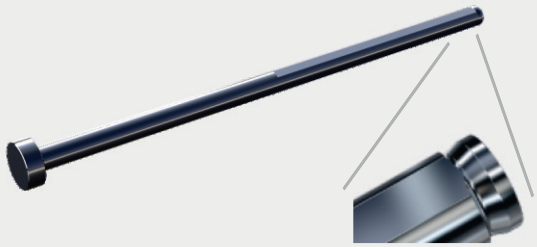
# HeiNo® ventilation (for thermoplastics)

Before the mass of a medium (e. g. plastic) can fill the mould cavity, the air that is located in the cavity has to vanish. If the air cannot be ousted fast enough this may result in defects and burn marks on the part.

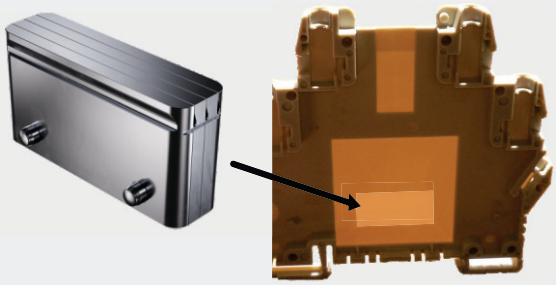
**Defaults** due to trapped air are a problem in themselves, the damage – often permanent – to the tool or just the **formation of deposits** represent further problems that can be avoided.

## VENTILATION

- **comprehensive** ventilation
- **simple** and **at low costs**
- **less** defects
- **lower** risk for tool damages and the formation of deposits
- many **variants** available

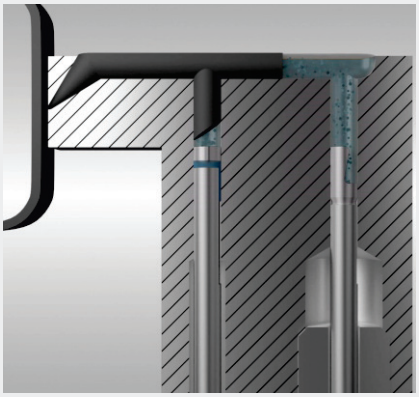


HeiNo® ventilated ejector



HeiNo® ventilation inserts

HeiNo® tunnel gate with overflow ventilation insert



principle of HeiNo® overflow ventilation

## Overflow ventilation

- high **weld line quality,** especially with glass fibres
- increased **resilience**
- comprehensive **ventilation**
- inhomogeneities inside the weld line are eliminated
- designed using simulation

# HeiNo® redirection elements (for any mould)

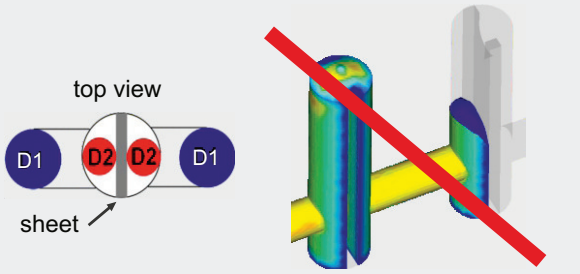
## Redirection elements

- homogeneous **flow sections**
- **turbulent temperature regulation** possible
- **reduced wear of tool**
- **process-reliable production**
- **high part quality**

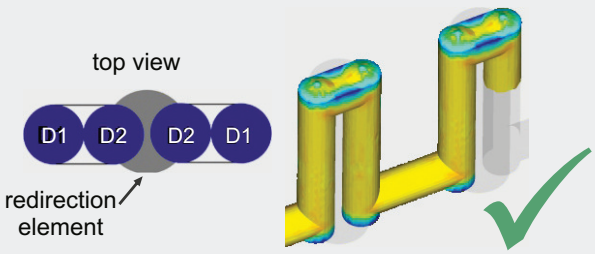
Holes for temperature regulation should always be round and connected for forced circulation. A temperature regulation using water is particularly effective when it is turbulent.

It is better not to use sheets for redirection, sputterers or cracks within the diameter from the bore hole connection to the place of redirection. These spots tend to clog, result in a high loss of pressure and prevent turbulent temperature regulation.

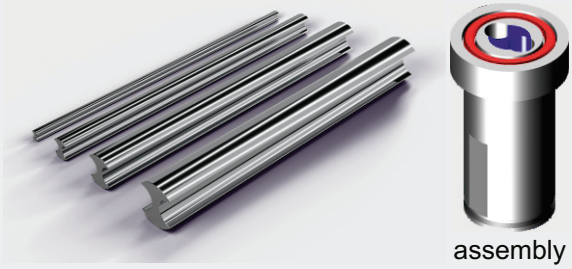
HeiNo® redirection elements guarantee a round section of holes for temperature regulation. HeiNo® redirection elements for temperature regulation are made from steel (for nickel-coating) and available as rods in different sizes to be ordered from Nonnenmann GmbH.




riser bore with metal sheet:
inhomogeneous flow section




homogeneous flow path sections thanks to HeiNo® redirection element



assembly

view with flowing medium

### *IsoForm® and HeiNo®: A convincing concept*

**In the meantime, many companies working with thermplastics, thermosets, elastomers and diecasting have discovered and used the advantages of the isolated tool concept IsoForm® and of the standard elements for gates, ventilation and temperature regulation from the HeiNo® program.**

*"At the beginning, our target was to reduce cooling and heating times, especially when working with high tool temperatures. Thanks to the thermal separation of mould inserts from the tool structure inherent to the IsoForm® concept, it was possible to only regulate the temperature where it is necessary. Considerable energy savings are a welcome side-effect here."*

*Benedikt Ostermann*
*Mawick Kunststoff-Spritzgusswerk GmbH & Co. KG*

co-operative • competent • fair

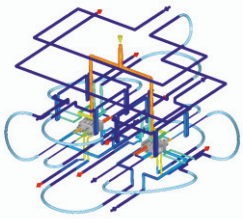
# Konstruktionsbüro Hein GmbH

QUALITÄTS-MANAGEMENT-SYSTEM ISO 9001 zertifiziert EQM ZERT

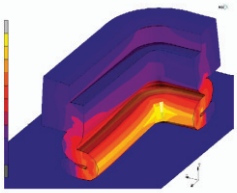
NEU VORKON
Das simulierte Vorkonzept mit Bauteilanalyse

**VORKON - PREconcepts**

**product development / prototyping**

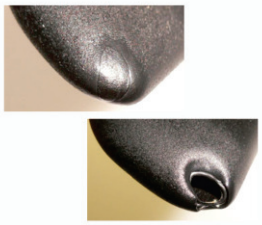


**simulation / parts optimisation**



**FEM analysis**

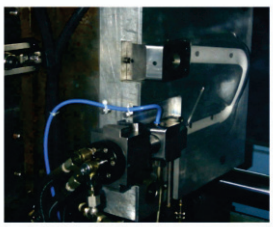

**shrinkage expert method**



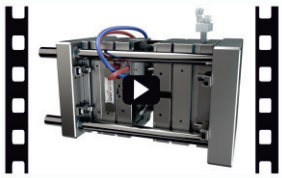
**avoid defects and optimise processes**

**feed gates, ventilation, temperature regulation**


**mould design IsoForm® tools**



**special technologies gas / water injection**



**images and animations rendered from 3D data**

**training courses**

**Technology Workshop**

IsoForm®
DAS FORMENKONZEPT

Gefördert durch:
Bundesministerium für Wirtschaft und Technologie
aufgrund eines Beschlusses des Deutschen Bundestages

# The isolated tool concept ensures a high process reliability
for thermoplastics, thermosets, elastomers and diecasting

**Isolated mould inserts**
reduce the costs and efforts for temperature regulation, improve process reliability and energy-efficiency considerably and quickly reach the target temperature.

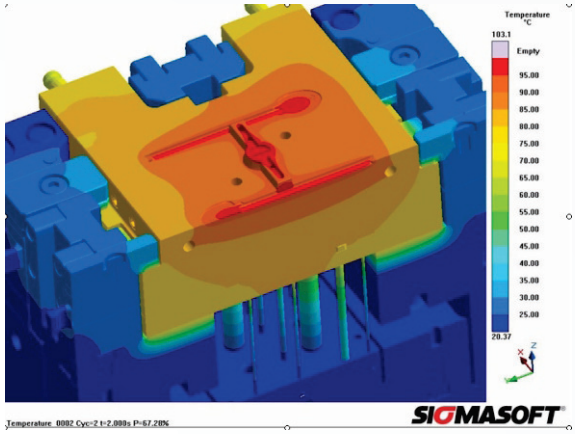
A **consistent hub-centring**
of all inserts, mould plates and mould halves against each other ensures high precision.

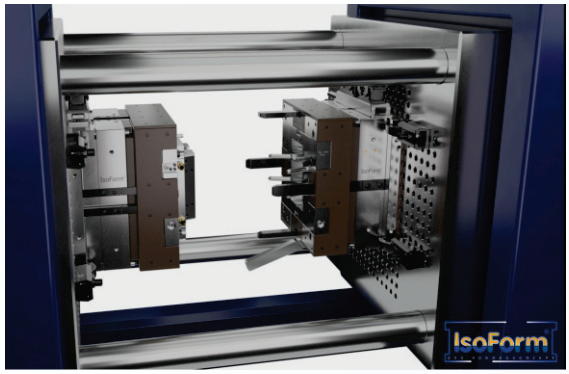
The **innovative design of the ejection frame**
results in a maximum support of the mould plate and thus reduces deflexion.

An optimum **gate system**
allows for a filling perfectly adapted to the material.

The **ventilation concept** and the **HeiNo® temperature regulation**
avoid many potential mistakes and optimise the part quality.

The **sensor technology**
for the contour area adapts the processing parameters to the actual conditions.

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