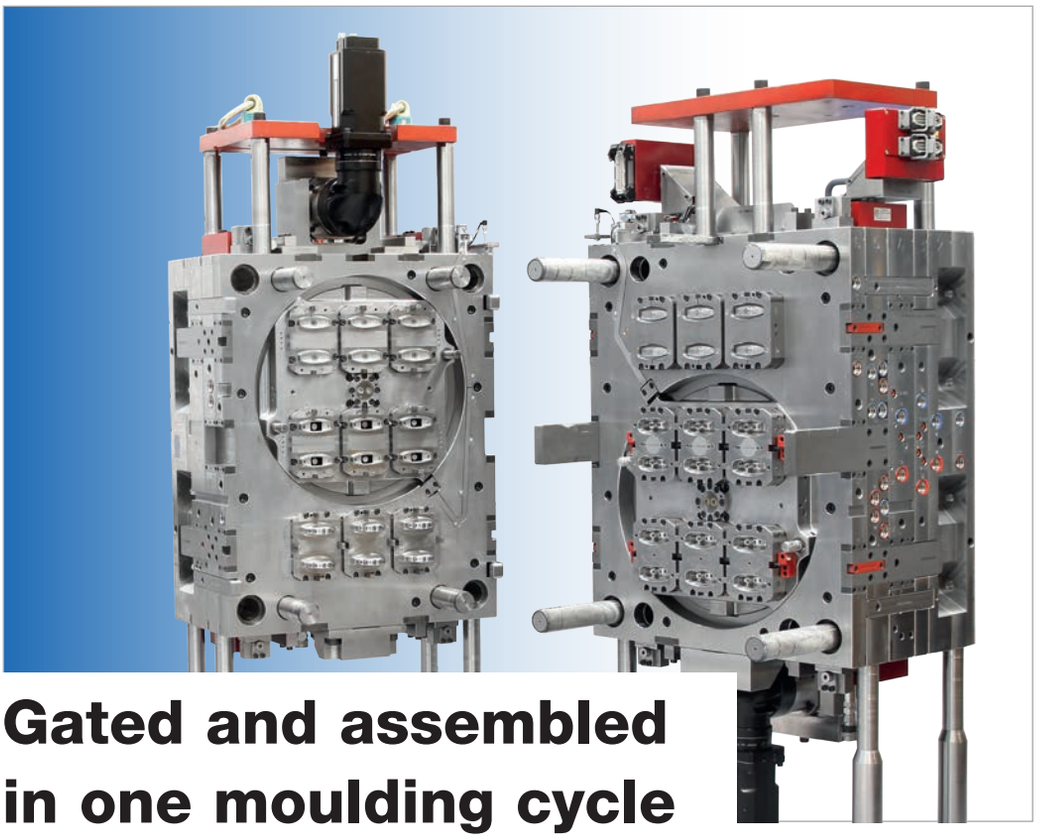
EWIKON

Customer information from **EWIKON Heißkanalsysteme GmbH**

Hotline

May 2018



Gated and assembled in one moulding cycle

Tailored hot runner solution for a demanding 3-component mould concept Pages 2 - 5

Processing of sensitive materials

Enhanced process reliability with "cold" valve pin seal

Pages 6 - 7

Optimal adaption to application requirements

EWIKON valve gate range with extended tip versions

Page 8

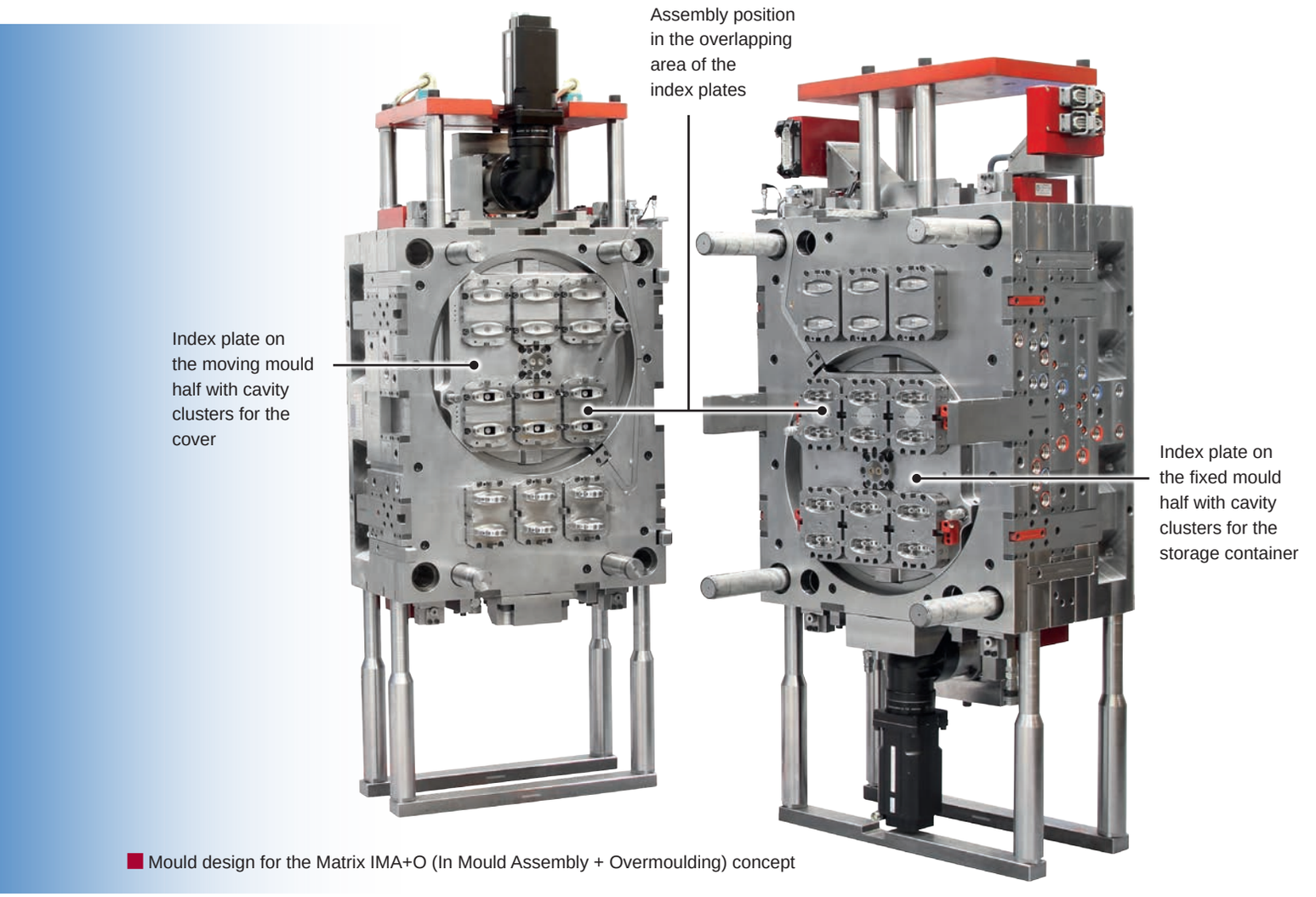
Hotline May 2018

Gated and assembled in one moulding cycle

Tailored hot runner solution for a demanding 3-component mould concept

For the production of a container for a disinfectant gel precision mould maker Matrix developed a complex 6+6+6-drop 3-component mould. The concept allows the production of two single parts and their precise and leakproof connection by overmoulding with a third component in one moulding cycle. The demanding mould design which uses two rotating index plates required a tailored hot runner solution which was supplied by EWIKON.

The final product is hollow and consists of two single polypropylene parts, a bulbous storage container and a flat cover with dispensing opening which are connected by an assembly operation. For the end customer a leakage-free connection was decisive because an escape of fluid during storage had to be avoided. Further requirements were clean surfaces with high transparency giving the end user optimal visibility of the coloured disinfectant gel inside as well a comfortable consumption control. The first idea was to mould the two parts separately and then connect them by ultrasonic sealing. However, due to the different part geometries and the resulting different shrinkage behaviour this concept turned out not to be feasible because the two oval openings could not be assembled with a sufficiently accurate fit. Thus, a leakproof sealing could not be guaranteed.

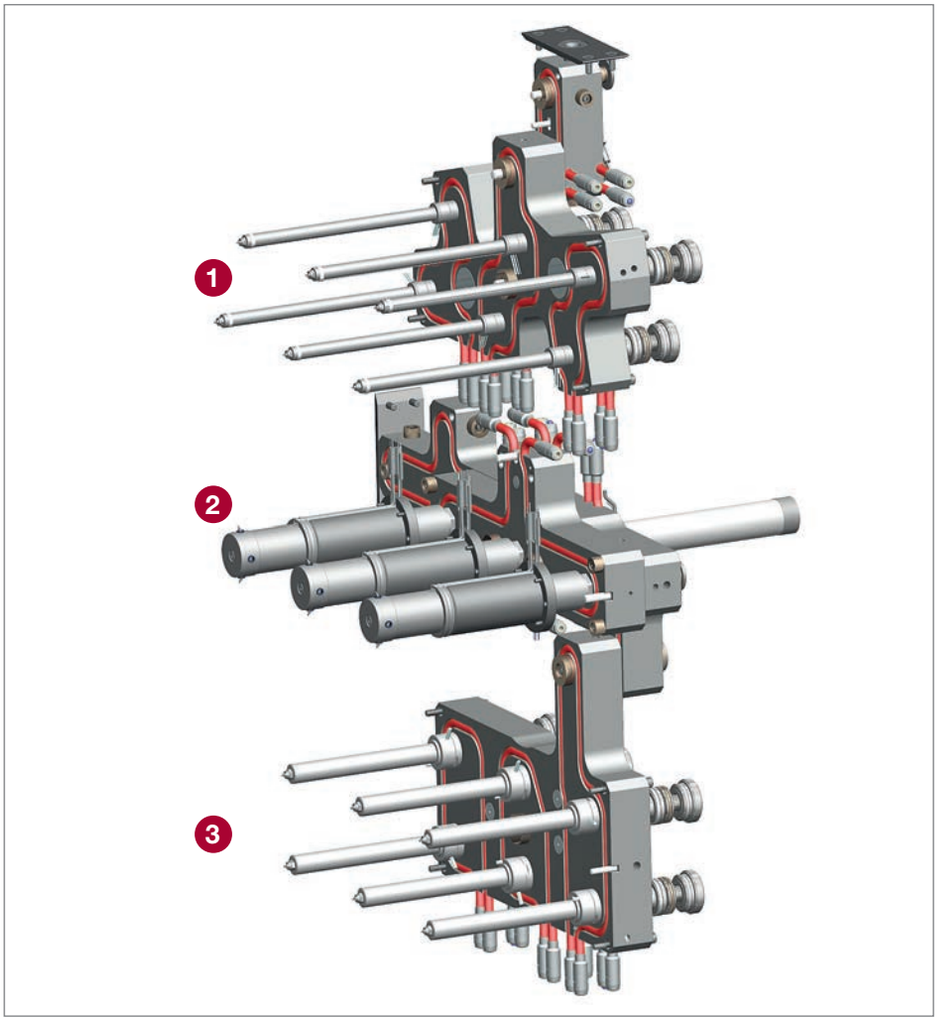


Mould design for the Matrix IMA+O (In Mould Assembly + Overmoulding) concept

As an alternative Matrix decided to use a self-developed 3-component mould concept which features a full hot runner system. This concept makes it possible to gate the two single parts, to pre-assemble them in the mould and to connect them by overmoulding with a third component within one moulding cycle. An essential feature of this procedure that Matrix themselves names IMA+O (In Mould Assembly + Overmoulding) is that during the pre-assembly step the two parts are only fitted together by form-locked connection. The final force-locked connection is only achieved by overmoulding with the third component. Furthermore, the concept does not require any transfer of parts from cavity to cavity during the assembly process. The gated single parts stay in their cavities and thus can be pre-assembled with utmost precision. The mould consists of three clusters of six cavities in a stacked arrangement. Each cavity cluster contains two horizontal rows of three cavities. The cover is gated in the top cavity cluster, the storage container in the bottom one. In order to assemble both single parts in the centre cavity cluster the mould concept uses an innovative combination of two rotating index plates. One of them is placed in the lower section of the fixed mould half, the other one in the upper section of the moving mould half. Each plate contains a double cavity cluster for the cover (index plate on the moving mould half) and the storage container (index plate on the fixed mould half) respectively. The clusters are positioned symmetrically above and below the rotating axis of the index plate. Both index plates overlap in the centre of the mould in such a way that one cavity cluster for the cover and one for the storage container face each other. In the first production step the single parts are gated in the top and bottom cavity cluster. In order to achieve maximum process reliability valve gate technology is used for gating of both parts. The mould opens, both index plates rotate by 180° within 0.5 seconds and move the filled cavity clusters into the assembly position. During this working step slider mechanisms ensure that the parts remain in the cavities of the respective index plate. When the mould closes again the parts are pre-assembled. A special contouring ensures a form-locked positioning but leaves out a defined ring-shaped recess in which the sealing component is injected from the side in the last working step. At the same time new single parts are produced in the top and bottom cavity clusters. After assembly and overmoulding the finished parts stay in the cavity cluster in the index plate of the moving mould half and are ejected from there. Demoulding is additionally supported by an ejector mechanism in the fixed mould half.

Hot runner system design

1. Gating of the cover:
   HPS III-S3 valve gate nozzles,
   flow channel Ø 3 mm,
   customized length of 212 mm
2. Assembly position, overmoulding with sealing component:
   HPS III-MH nozzles
   for direct side gating,
   radial version with
   2 tip inserts
3. Gating of the storage container:
   HPS III-S valve gate nozzles,
   flow channel Ø 4.5 mm

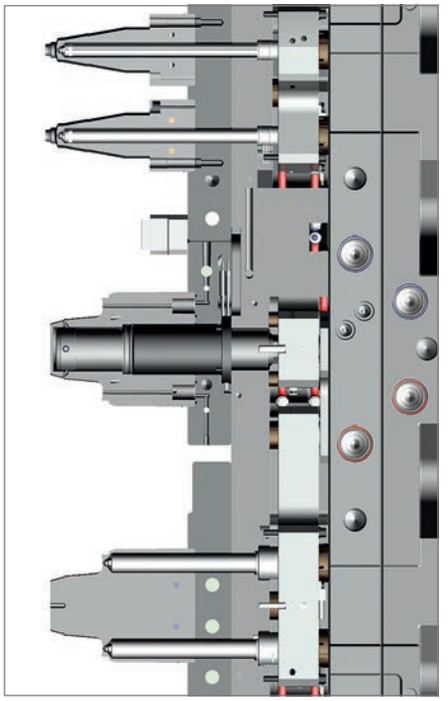


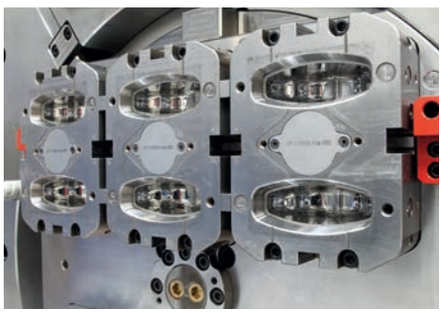
The concept has been used before in a simpler form for the production of a pump dispenser where a membrane was connected with the pump body by overmoulding with a third component. However, this application required a more demanding mould layout. “In the first application using the concept all three components were gated in demoulding direction”, explains Joan Millán, managing director at Matrix, “this is not possible here. While storage container and cover are gated in demoulding direction the sealing component has to be injected from the side to connect both parts with a thin ring. This procedure does not only require a precise form-locked positioning of the parts but also a lowest possible injection pressure to prevent the sealing component from penetrating the hollow space inside the article. Additionally, a special polypropylene with low viscosity was used to enable an optimum filling of the contour with its thin cross section and long flow path.”

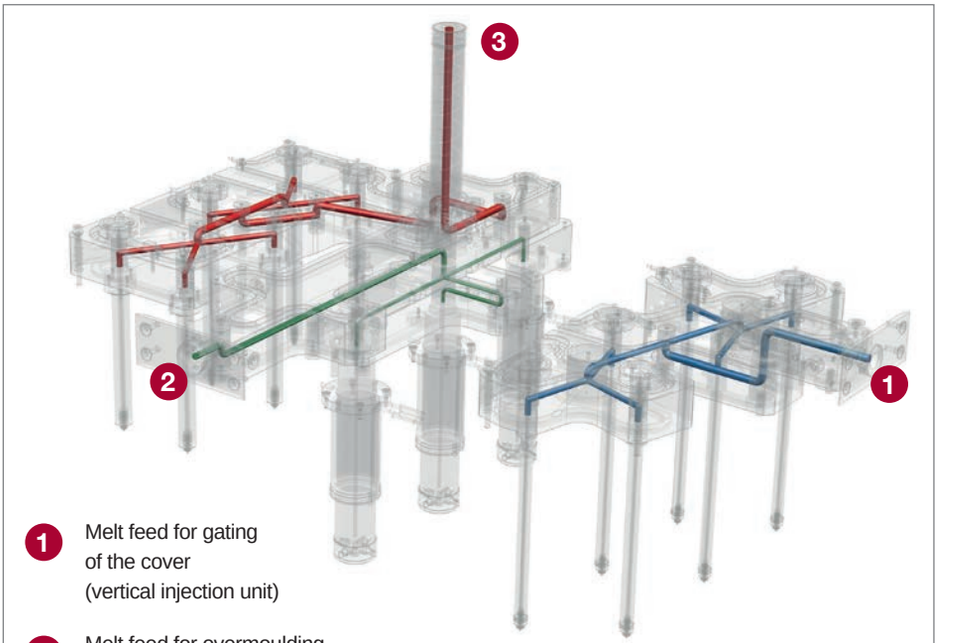
Following a long and successful co-operation in previous applications Matrix decided to use EWIKON hot runner technology for this project. “Matrix has an excellent reputation as a manufacturer of high performance moulds”, says Millán, “and we never accept compromises regarding such important components like hot runner systems. So we always put the focus on quality and never on cost reduction. This demanding project with rotating index plate on the fixed mould half required a complex mould layout and a correspondingly tailored hot runner system. We needed a powerful solution for direct side gating of the sealing component as well as slim valve gate nozzles for gating of the single parts and a specifically designed fully balanced manifold system. EWIKON could provide optimal solutions for all these requirements.”

On the hot runner side of the mould the article contour is divided with one part of it in the rotating index plate and other parts in fixed mould inserts which also have the hot runner nozzles integrated. The storage container is gated on the bottom by using slim valve gate nozzles with a flow channel diameter of 4.5 mm. For side gating of the sealing component in the assembly position three HPS III-MH nozzles are positioned in line between the two rows of the cavity cluster. Each nozzle has two oppositely arranged tip inserts and feeds two cavities. In order to place the gating point very close to the parting line of the mould the tips are angled by 60°. Since the index plate has to be lifted from the hot half in axial direction before rotating it, the fixed mould inserts also fulfill a centering function to precisely re-position the index plate when it is pulled back.

When it came to gating of the cover, the requirements on the nozzle technology used were particularly high. The part is gated internally. Due to the mould design where all parts stay in their cavities during the cycle this gating point is the one which is positioned farthest from the fixed mould half. Thus, the nozzle had to be long enough to reach it and at the same time had to feature a very slim design to fit into the very compact mould insert. “EWIKON was the only hot runner supplier who could supply a matching solution”, explains Millán. The HPS III-S3 nozzles used here only require an installation space of 12 mm and were manufactured in a customized length of 212 mm.







1 Melt feed for gating of the cover (vertical injection unit)

2 Melt feed for overmoulding with sealing component (horizontal injection unit)

3 Melt feed for gating of the storage container (main injection unit)

- To reach the gating points in the very compact mould inserts slim nozzle solutions were required (above left)
- Index plate on the fixed mould half. Cavity cluster in assembly position with HPS III-MH nozzles placed between the cavities (left)
- Fully balanced flow channel layout in the manifold (above)

The mould design requires five fully balanced manifolds which are equipped with EWIKON element technology. Two of them are bridge manifolds which are placed in a separate mould plate together with all pneumatic drive units required for the valve gate nozzles. All manifolds and valve gate drive components had to be arranged in a way that leaves enough space for the drive axis of the index plate which passes through the hot runner system. One bridge manifold supplies the manifold for gating of the cover and is fed by a vertical injection unit. Since all three components are polypropylene with the same processing temperature the manifolds for gating of the sealing component and the storage container are supplied by the same bridge manifold. It is simultaneously fed by two injection units, the machine's main injection unit and a horizontal injection unit which is placed opposite the operating side of the machine. By using the EWIKON element technology it was easily possible to arrange the flow channels for both components on two separate levels within the compact space available.

During the whole project the EWIKON and Matrix design departments worked in close cooperation. EWIKON delivered the hot runner system as a complete hot half. However, in the Matrix mould layout the hot runner plate assembly does not form the end of the fixed mould half but the middle part. Beside the hot runner components the EWIKON hot half also has the mounting for the index plate drive motor integrated. The clamping plate is manufactured by Matrix and contains the drive mechanism for the index plate which is operated by a drive belt.

The perfect combination of precision mould making and a high performance hot runner solution which has been customised according to the mould design requirements resulted in a very efficient 3-component mould. With a cycle time of only 11.5 seconds an output of 45.000 parts per day can be realised. The production takes place on an Arburg Allrounder 820S injection moulding machine with a clamping force of 400 tons.

Since the end product is currently undergoing a consumer test prior to the final market launch the parts are still produced at the Matrix site in Ripoll, Spain. During the testing period the mould mechanism as well as the hot runner technology worked absolutely trouble-free.

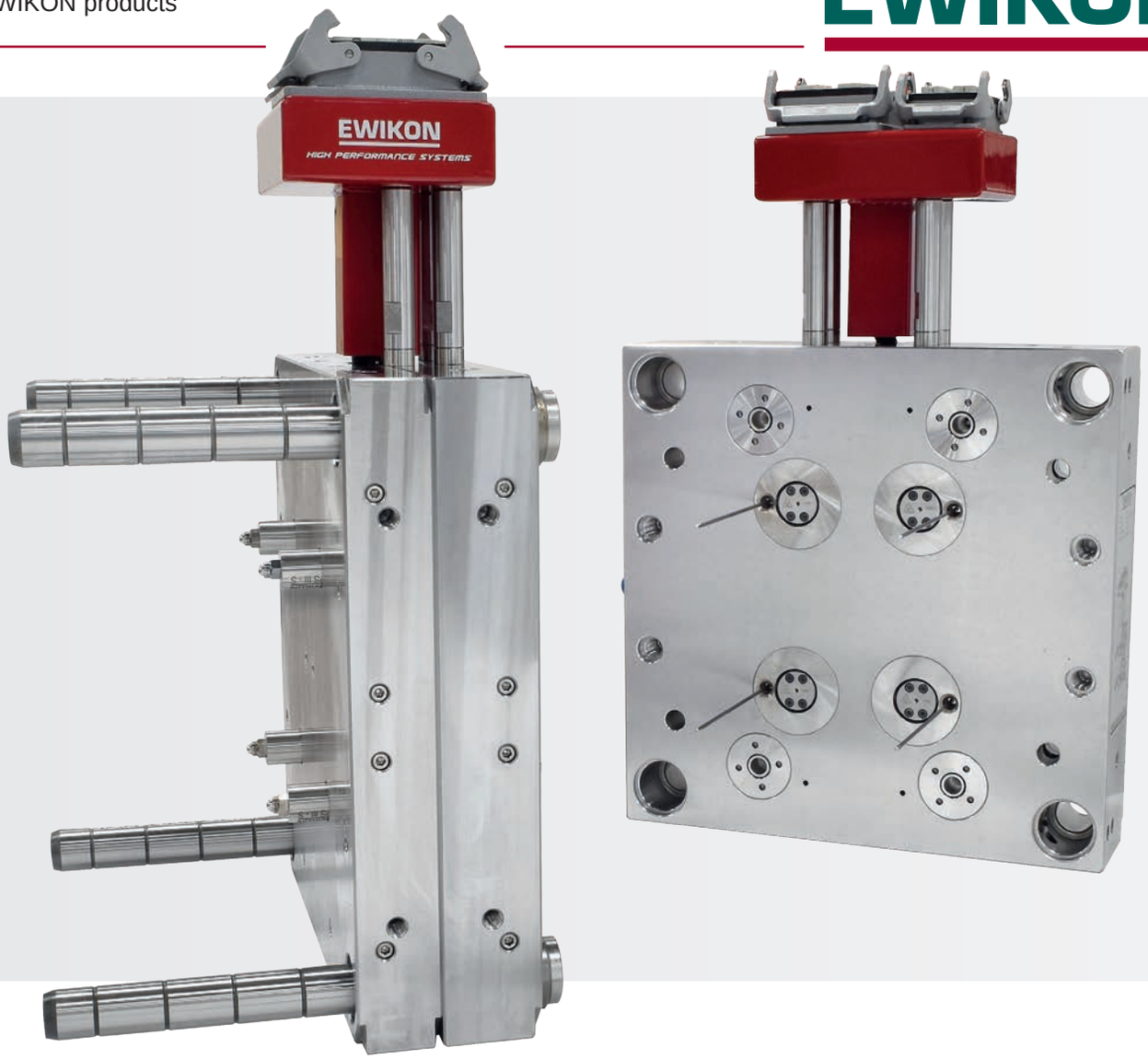
Contact

MATRIX MOULDING SOLUTIONS www.matrix-sa.com

Matrix SA

Ctra. C-26 Km.195
17500 Ripoll (Girona)
Spain

www.matrix-sa.com

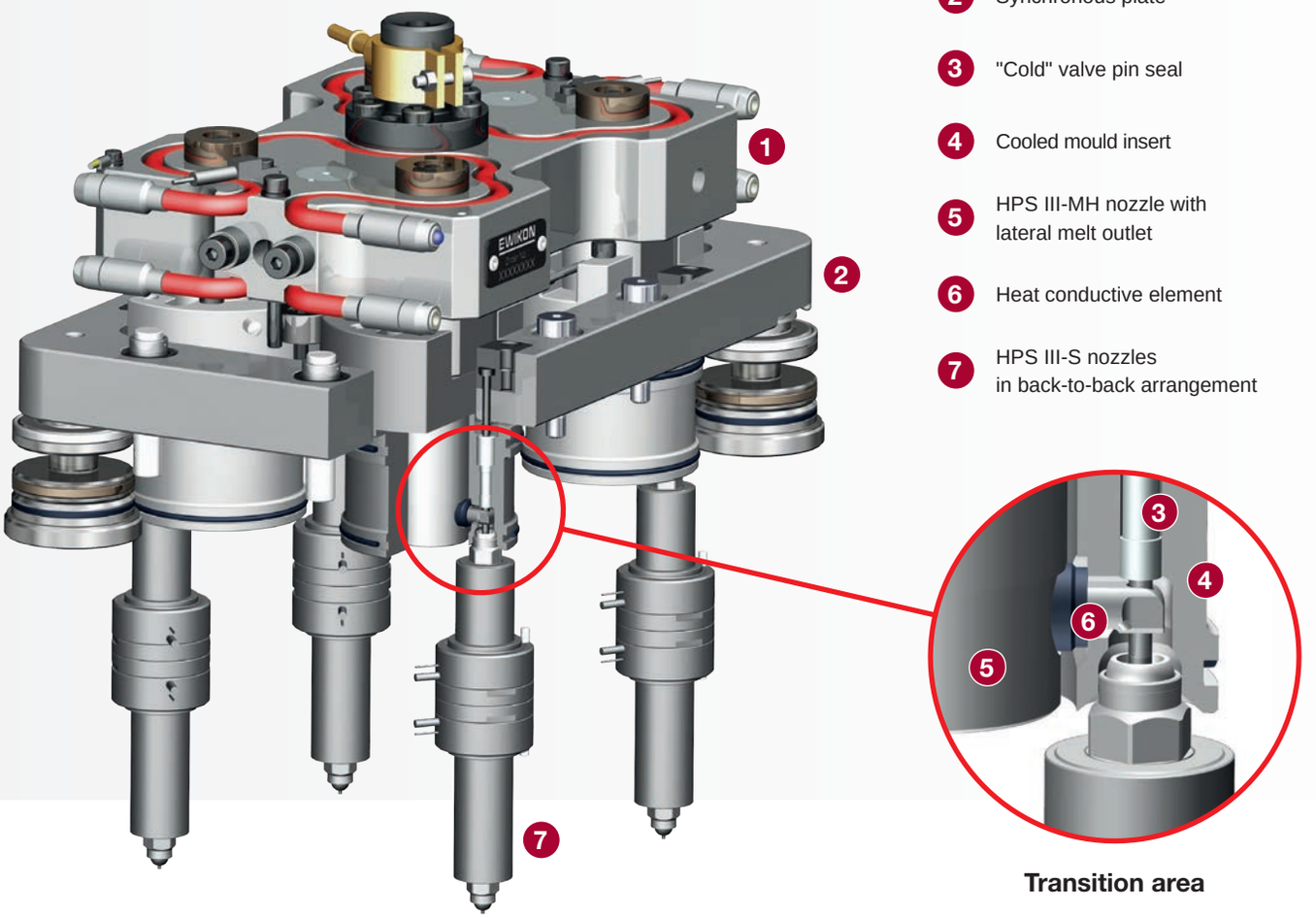


For sensitive materials

New valve gate concept with "cold" valve pin seal

When processing materials which are sensitive in terms of residence time – especially POM of the homopolymeric type – dead spots and gaps in the flow channel layout must be avoided. The "cold" valve pin seal prevents material degradation in the gap of the valve pin seal and thus significantly increases the process reliability.

4-drop concept mould with "cold" valve pin seal



1. Manifold
2. Synchronous plate
3. "Cold" valve pin seal
4. Cooled mould insert
5. HPS III-MH nozzle with lateral melt outlet
6. Heat conductive element
7. HPS III-S nozzles in back-to-back arrangement

Transition area

When valve gating materials which are sensitive in terms of residence time the valve pin seal in the hot manifold is a critical zone. Due to the opening and closing movement of the valve pin combined with the melt pressure melt can intrude into the gap between the inner wall of the valve pin seal and the valve pin where the long residence time causes degradation of the material. The cyclic movement of the valve pin transports parts of the degraded polymer back into the flow channel. This can result in faulty parts with optical (streaks) or mechanical (embedding of degraded particles) defects.

The new EWIKON valve gate concept places the valve pin seal in a cooled mould insert where it does not have any contact with heated hot runner components. Thus, a leakproof sealing is achieved and a degradation of melt is avoided. In addition, the polymer that enters and fills the gap during the first start-up forms a thin polymer layer and acts as a sealing and lubricating film which minimises the wear between valve pin seal and valve pin. This "cold" valve pin seal principle is already successfully applied in HPS III-MH valve gate systems where the melt is fed from the side and the part is gated in demoulding direction. However, since these systems have the gate positioned in direct proximity of the nozzle body the range of applications is limited regarding part contour and shot weight. The new concept adapts the HPS III-MH valve gate technology for use with HPS III-S standard nozzles and considerably extends the possible range of applications.

An HPS III-MH transition nozzle with lateral melt outlet which features a special heat conductive element is installed under the manifold. It feeds the melt into a cooled mould insert where the valve pin seal is placed. From here the melt is transferred to for example a combination of two HPS III-S standard nozzles which are installed in back-to-back arrangement. The valve pin is installed parallel to the transition nozzle. It is guided through the valve pin seal, then crosses the heat conductive element of the transition nozzle through a bore without contact before it finally enters the standard nozzle and the gate. Normally the valve pins are actuated by a synchronous plate.

For the patent pending concept a 4-drop mould for a POM (homopolymeric type) application has been developed and is currently tested.

EWIKON valve gate technology

Extended range of tip versions

In all sectors of industry there is an increasing trend to use valve gate technology. Thus, the diversity of application requirements is steadily growing. For optimal adaption of the valve gate hot runner solution to the mould concept the range of tip inserts has been extended. As of immediately a new version is available which does not feature a permanent valve pin guide but has a pre-centering for the valve pin in the gate area. It is used when a fully open flow channel layout is required for example for the production of optical parts, for particularly quick colour changes or for the processing of reinforced and flame-retardant materials. The well established and proven version with permanent valve pin guide keeps the valve pin permanently guided on guiding ridges with high precision through the whole operation cycle. This version offers maximum wear resistance for valve pin and gate and therefore is particularly suitable for high-volume production moulds or applications with very short cycle times.

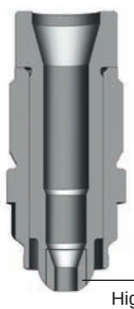
Both tip insert versions can be combined with gate exchange inserts which are directly installed in the contour insert. They facilitate the maintenance of the gate area which is particularly liable to wear and contain the already machined inner gate contour. In case of gate wear the gate exchange inserts can be replaced easily and there is no need to machine a new contour insert.

Permanent valve pin guide

Use for:

- High-volume production moulds
- Applications with short cycle times
- Large gate diameters

NEW! Valve pin guide with pre-centering



Highly wear-resistant insert

Use for:

- Optical applications
- Frequent colour changes
- Technical resins

Gate exchange insert

Optionally available for both versions.

EWIKON Heißkanalsysteme GmbH
Siegener Straße 35 • 35066 Frankenberg • Tel: +49 6451 501-0
Fax: +49 6451 501-202 • E-Mail: info@ewikon.com • **www.ewikon.com**