Introduction

Dear Customers,

Thank you for purchasing a Synventive Hot Runner System. Our objective is to provide you with a product that is a good fit for the application, trouble free in performance, and support it with the best service in the industry. If problems occur during the use of this product please contact us at one of the locations provided.

This manual is designed as a reference only document for the proper installation, operation and maintenance of Synventive Hot Runner Systems as well as a guideline for securing occupational health and safety in connection with the use of this system. Synventive does not warrant that the information is complete or accurate for every application. Synventive reserves the right to make changes to this document from time to time as new products are developed and new information identified.

This manual contains essential information, to ensure its general applicability to Synventive Hot Runner Systems. The customer is exclusively responsible for the protection of their equipment and personnel. Synventive is not liable for any personal injury or damage caused by improper use, installation or handling of the product. This product should only be installed and used by fully trained and qualified personnel. The customer is required to provide the necessary personal protective equipment, such as protective gloves, hearing protection, protective shields etc. In no case does this document provided by Synventive release the customer from its obligations.

This manual is intended for tooling and molding personnel who install and maintain the hot runner system. It should be forwarded with the hot runner system when shipped from the tool maker to the molder or between molding locations.

This document is copyright protected and is intended exclusively for the users of Synventive Hot Runner Systems. It may not be copied and distributed without the written consent of Synventive Molding Solutions.

Yours faithfully,

Synventive Molding Solutions

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1 Safety Instructions

1.1 CE approved Equipment

- Only CE approved equipment rated for application should be used with Synventive Hot Runner Systems.

1.2 Purpose of use of a Hot Runner System

1.2.1 Use compatible with the intended Purpose

- The goal of the Hot Runner System is to carefully transport the melt from the plastification unit to the cavity with an optimum temperature distribution and optimum distribution concept.

- Synventive Hot Runner Systems and single nozzles are not stand alone systems and must be incorporated in the injection mold for use.

- All Synventive Hot Runner Systems are used exclusively for the processing of thermoplastic materials based on the individual requirements of the specified material.

- A max. injection pressure of 30,000 psi (2068 bar) applies to Synventive HR standard components (unless otherwise stated).

- Use in conformity with the specified purpose also includes the study and understanding of and the compliance with all instructions and tasks of the submitted instructions for use.

- Synventive Hot Runner Systems may be incorporated only into specially designed cavities of injection molds.

- To guarantee a reliable operation of the Hot Runner System, it is necessary to comply with the specified periodic inspections and regular maintenance.

1.2.2 Use in conflict with the intended Purpose

- Synventive Hot Runner Systems may be only used in the manner described in section 1.2.1 Use compatible with the intended Purpose. Any other use is excluded. If the Hot Runner System is used in any manner that contradicts the intended purpose, the right to any warranty claims shall cease to exist.

1.3 Definition of Qualified Persons with Technical Knowledge

Technical knowledge means that personnel must:

- Be capable of reading and fully understand electrical/hydraulic circuits
- Fully understand the interrelationship of the built-in safety systems
- Have knowledge regarding the function and build-up of technical components.

A qualified person is one who, due to his technical training and experience, has sufficient knowledge that he can evaluate the work transferred to him or she:

- can recognise possible hazards.
- can instigate measures to eliminate hazards.
- has the required repair and assembly knowledge.
1.4 Safety Instructions within the Instruction Manual

- The Hot Runner System is an incomplete machine. When the Hot Runner System is fitted into a machine, the interaction between the entire machine and the Hot Runner System, causes changes to the potential hazards. In particular, the influence of hydraulic and electrical controls on hydraulic drives which cause mechanical movements. This necessitates a hazard analysis and operating instructions for the entire machine.

- These operating instructions are intended to provide information and to prevent hazards when installing the Hot Runner System in the machine as well as information and guidelines for transport, storage and maintenance (inspection, servicing, repair) of the Hot Runner System.

- Only by strictly observing these operating instructions, is it possible to prevent accidents and material damage and ensure fault-free operation of the Hot Runner System.

1.5 The HR System Instruction Manual / Part of the Synventive Customer Documentation

- Comply with all safety instructions contained in the customer drawings.

- Use customer drawings for general information only. For detailed information, refer to the supplied Synventive 3D model.

Parts of the Synventive customer documentation are:

- User instruction (http://www.synventive.com/servicesupport/-------------)
- Customer drawings
- Electrical wiring information
- Product Certificate / Hot Runner Check List
- Manifold mounting check list
- Parts list
- 3D-Model (in digital form)
- General safety instruction for the Synventive HR-system
1.6 Safety Instructions and Symbols used

The following safety instructions and symbols and operating advice are used in this manual. They are highlighted by the respective word. The described measures are used to prevent injuries and avoid damage to the Hot Runner System and must be followed.

1.6.1 Danger Symbols Definitions

**Danger**
indicates an imminent hazardous situation which may result in death or serious injury.

**Warning**
indicates a dangerous situation that may lead to irreversible injury.

**Caution**
indicates a dangerous situation that may lead to reversible injury.

**Notice**
indicates a situation that may lead to material damage and provides additional information on proper procedures and trouble-free labor without the possibility of personal injury.

1.6.2 Mandatory Safety Signs of the Personal Protective Equipment

<table>
<thead>
<tr>
<th>Safety Instruction</th>
<th>Personal Protective Equipment</th>
</tr>
</thead>
<tbody>
<tr>
<td>Read the user instruction</td>
<td>Wear safety shoes</td>
</tr>
<tr>
<td>Wear headgear</td>
<td>Wear protective goggles</td>
</tr>
<tr>
<td>Wear work gloves or anti oil gloves</td>
<td>Wear apron against high temperature</td>
</tr>
<tr>
<td>Wear close-fitting working cloth</td>
<td>Wear face protection</td>
</tr>
<tr>
<td>Wear hearing protection</td>
<td></td>
</tr>
</tbody>
</table>

1.6.3 Symbols of Warnings

<table>
<thead>
<tr>
<th>Warning</th>
<th>Symbol</th>
</tr>
</thead>
<tbody>
<tr>
<td>General warning</td>
<td>!</td>
</tr>
<tr>
<td>Warning of electrical danger</td>
<td>⚡</td>
</tr>
<tr>
<td>Warning of hot surface</td>
<td>🌡</td>
</tr>
<tr>
<td>Warning of overhead load</td>
<td>🧽</td>
</tr>
<tr>
<td>Warning of fork lift trucks operating</td>
<td>🚜</td>
</tr>
<tr>
<td>Warning of falling objects</td>
<td>🛑</td>
</tr>
<tr>
<td>Warning of oxidising materials</td>
<td>♂</td>
</tr>
<tr>
<td>Warning of explosive atmosphere</td>
<td>⚡</td>
</tr>
</tbody>
</table>

1.6.4 Symbols of Prohibition

- Don't use the cylinder housing as assembly support to get the system into the mold:
- Do Not Pinch Signal Wire

1.7 General Safety Instructions

All safety instructions shall be carefully studied before the operation of the Synventive Hot Runner System is initiated. When working with the Hot Runner System, all safety instructions contained here in must be followed.

Noncompliance with safety notes and instructions could result in serious injuries.

**DANGER**

**Danger to Life by Electric Shock**

- Serious personal injury or death can result from electrical contact.
- Electrical work must be carried out by qualified persons.
- Verify that all power source connections are properly grounded.
- In Emergency case - Switch all systems off.
- For first aid contact your medical / safety representing.

**Danger to Life by Hydraulic**

- Serious personal injury or death can result from connecting or disconnecting hydraulic hoses under pressure.
- Hydraulic works must be carried out by qualified persons.
- Use personal protective equipment, face protection, headgear, anti oil gloves.
- The hoses in Hot Runner systems and the injection mold are under high pressure and high temperatures.
- Before disconnecting or connecting any hydraulic hoses:
  - The Injection Molding Machine must be shut down.
  - The electrical disconnect properly locked out.
  - The hoses have to be depressurized.
- In Emergency case - Switch all systems off.
- For first aid contact your medical / safety representing.
### Safety Instructions

#### Danger to Life by Pneumatics

**Danger to Life by Pneumatics**

Serious personnel injury or death can result from connecting or disconnecting pneumatic hoses under pressure.

Pneumatic works must be carried out by qualified persons.

Use protective goggles or face protection or protective goggles, hearing protection (PPE).

The hoses in Hot Runner systems and the injection mold are under high pressure.

Before disconnecting or connecting any Pneumatic hoses:
- The injection machine / pneumatic compressor must be shut down.
- The electrical disconnect properly locked out.
- Pressure from the hoses must be removed.

*For first aid contact your medical / safety representing.*

#### Heavy Weight Hazard

**Heavy Weight Hazard**

Transport and lifting equipment should be operated only by trained personnel.

Operate lifting and transport equipment slowly and carefully to avoid uncontrolled swinging of the manifold.

Lifting and transport equipment for lifting Hot Runner Systems shall be approved and properly rated taking into account the weight and size of the manifold.

When unpacking the Hot Runner System, there is a risk of injury due to falling parts and sharp edges. Maintain a minimum distance of 1 m from the Hot Runner System.

Use personal protective equipment, such as head gear, safety shoes and work gloves.

*For first aid contact your medical / safety representing.*

#### Danger of Unexpected Discharge

**Danger of Unexpected Discharge**

If production operation stops while Hot Runner heating is on, the melt can overheat easily. Overheated plastic may emit dangerous vapors that could eject explosively if the mold gate is opened.

Upon each interruption of production operations, retract the machine’s injection unit to make sure the pressure in the Hot Runner System can normalize through the inlet bushing.

**Hot Surfaces Hazard**

Contact between the skin and the hot injection mold could result in burns.

Use personal protective equipment, such as work gloves, apron, sleeves and face protection, to guard against burns.

When servicing or handling the hot runner system outside the manifold plates or the injection molding machine, care must be taken to heed the hot surface exposure warnings.

*For first aid contact your medical / safety representing.*
## Safety Instructions

### NOTICE

**Danger of Material Defects**

- Only approved and CE certified temperature controllers rated for application with over current / voltage protection should be used with Hot Runner Systems.
- Verify that all cables are damage free and in good condition.
- Verify that all electrical connectors are clean and making good contact, and are securely fastened and latched. Dirty or otherwise contaminated connector pins can cause loss of signal and subsequent errors.
- Clean all connectors with a spray-type commercial electrical contact cleaner / degreaser and allow them to dry fully before reconnecting.
- Verify that all hydraulic hoses and connectors are damage free and in good condition.
- All Synventive Hot Runner Systems shall be fitted with a temperature controller to provide separate temperature adjustment for each heating zone; the controller shall have the Soft-Start function for gradual heat-up. In this way you can prevent premature wearing and damage to the hot runner system.
- To extend the lifetime of temperature sensors, avoid long-term operation of temperature control in manual mode.
- Immediately replace defective temperature sensors.
- If you replace heaters or their parts, always use original spare parts from Synventive and carry out the replacement as described in this Manual.
- Do not interchange power supply cables with temperature sensor cables. Temperature sensor cables are not suitable for high voltage applications and will melt if exposed to high currents. Power supply cables are not suitable for use as temperature sensor cables for data transfer to the temperature controller.
- To maximize the life of temperature sensors, maintain the operating temperature as specified in the respective material safety data sheets during processing.
- Take notice of the production and color identification of temperature sensor cables (section 5.2.3.1).
- Always use the specified temperature sensor.
- Check that the aluminum surfaces of heaters do not come in contact to the nozzle cut-outs. If they do, enlarge the nozzle cutout’s as needed. Any contact between the heaters and the nozzle cutouts will lead to the risk of improper temperature control, which could result in damage to the aluminum casting.
- If applicable, set the necessary operating temperature to the lowest level possible to avoid plastic degradation and to prevent damage to the temperature sensors.
- The highest operating temperature of nozzles with heat pipes (APT nozzles) is 343 °C (650 °F). Operation above this temperature will result in heat pipe failure and loss of thermal performance.
- The cooling compound for nozzles with a cooling insert should always have the correct mixing ratio to prevent corrosion and obstructed circulation.
2 Product Description

Synventive Hot Runner Systems are temperature-controlled runner systems (230V) installed in injection molds for melt distribution and generally for plastics manufacturing optimization.

![Diagram of Hot Runner System]

**Synventive Hot Runner Systems generally comprise an:**

1. Inlet bushing
2. Manifold
3. Nozzles
4. System support elements

**NOTICE**

These essential parts can be optionally supplemented with meltflow control, connections, hot halves and temperature controllers, depending on type or application.
2.1 Nozzle Types

There are three types of Synventive hot runner nozzles which can be heated in two ways.

- Sprue bushings
- Support ring nozzles
- Threaded nozzles

2.1.1 API heating

API nozzles are heated from outside through one or more heating zones with the corresponding power distribution. These zones are placed in multiple points along flow path so as to provide an optimum energy amount to the specific sections, thus ensuring a homogeneous temperature profile.

2.1.2 APT heating

APT nozzles are heated from outside using a single zone. Heat pipes are located parallel to the flow channel; through active energy transfer and distribution from the respective thermal source, these pipes ensure a homogeneous temperature profile along flow path. A heater is usually incorporated, depending on application specifics.

2.1.2.1 Heat pipe operation

The heat pipe comprises of a vacuum cut out (a) with a capillary structure (b) inside. Heat transfer inside this pipe is ensured by circulation provided by evaporation, vapor expansion, vapor condensation and condensate backflow due to capillary forces.

- c) Energy intake through evaporation
- d) Vapor expansion in the direction of lower pressure
- e) Heat transfer through condensation
2.1.3 Sprue Bushing Nozzles

Single nozzles are hot runner nozzles with the inlet bushing directly mounted on the nozzle head. These nozzles are therefore also called heated inlet bushings or heated sprue bushings.

Sprue Bushing, API type

Sprue Bushing, APT type

2.1.4 Support Ring Nozzles

Support ring nozzles are hot runner nozzles mounted to manifolds by pressing the face of the nozzle head to the bottom surface of the manifold, the connection being such that during heating, the expanding manifold can “slide” on the nozzle heads.

Support ring nozzles, API type

Support ring fit nozzles, APT type
2.1.5 Threaded Nozzles

Threaded nozzles are hot runner nozzles screwed into the manifold.

- API type

- APT type – Doc003094.png
2.2 Hot Half

Synventive can also supply Hot Runner Systems as a complete hot half. Hot half is a preliminary stage for the fixed mold half and, as such, is supplied inclusive of the respective plates. The plates are fitted with cables and, if applicable, hose connections (hydraulics and pneumatics, if applicable), fully mounted and ready for assembly. Hot halves are designed and built to the customer’s mold specifications.

Components

(1) Threaded nozzle
(2) Support ring nozzle
(3) Manifold
(4) Valve gate actuator
(5) Connection box (electricity)
(6) Hose connections
(7) Clamping plate
(8) Spacer plate
(9) Cavity plate
(10) Inlet bushing
3 Preparation for Incorporation

⚠️ WARNING

**Heavy Weight Hazard**

Transport and lifting equipment should be operated only by trained personnel.

Operate lifting and transport equipment slowly and carefully to avoid uncontrolled swinging of the manifold.

Lifting and transport equipment for lifting Hot Runner Systems shall be approved and properly rated taking into account the weight and size of the manifold.

When unpacking the Hot Runner System, there is a risk of injury due to falling parts and sharp edges. Maintain a minimum distance of 1 m from the Hot Runner System.

Use personal protective equipment, such as head gear, safety shoes and work gloves.

For first aid contact your medical / safety representing.

**Hazard of Pressurized Air**

When working with pressurized air, there is a risk of flying metal chips and other foreign bodies getting into the eyes.

Hearing impairment could arise.

Use work gloves, protective goggles or face protection and hearing protection (PPE).
3.1 Unpacking the Hot Runner System

1) Verify that the transport crate is not damaged.

   **NOTICE**
   
   If damage is noted, contact Synventive and the shipping carrier immediately to report a claim.
   Synventive cannot be held liable for damage occurred during shipping.
   Failure to report shipping damage may void any future warranty claims.

2) Open the transport crate
   
   ● Loosen the crate’s side walls and cover.
   ● Dismantle the whole crate.

3) To prevent occupational injuries, allow for a sufficient access to the transport crate and a sufficient area around it.

4) Verify the crate’s contents against the supplied Bill of Materials and that the supplied parts match the customer drawing. Verify that the Hot Runner System has not been damaged during transport.

5) Check if all major dimensions, such as the mold cavity, gauge and length of cables and hoses connected to the Hot Runner System, match the customer drawing.

6) Unscrew the screws that affixed the Hot Runner System during transport.
7) Check if the paint applied during assembly for sealing reasons is not damaged on the hose connections of the hydraulic system.

**NOTICE**

If the paint has been damaged or otherwise shows signs of tampering, contact Synventive immediately.

---

8) Before the HR-System will be assembled into the hot-half, remove the assembly pillars (a), provided with the HR-system.

**NOTICE**

Keep the assembly pillars (a) for storage and transport of the hot runner system.

This hot runner system has been shipped with assembly pillars installed to prevent damage to the actuators and valve pin bushings while being assembled or in transit. These assembly pillars must be removed prior to installing the top clamp plate.

**WARNING**

Do not use the assembly pillars as lifting device.

---

**NOTICE**

Synventive does not accept returns on transport packages and any other packaging. This does not apply to euro-pallets, which are to be returned to Synventive (please note regional distinctions).
3.2 Cleaning Hot Runners and Cutout

⚠️ WARNING

Hazard of Pressurized Air

- When working with pressurized air, there is a risk of flying metal chips and other foreign bodies getting into the eyes.
- Hearing impairment could arise.
- Use protective goggles or protective goggles and hearing protection (PPE).

Notice

Before the hot runner is installed, the whole surface of the plate and the cutouts shall be carefully and completely cleaned.

1) Remove the protective cases from the nozzles.

2) Remove any residual anti-corrosion agent used by Synventive for preservation of the individual system parts using a dry cloth.

3) Clean the cavity plate using a dry cloth.

4) If the cutouts are not easily accessible, blow them out with pressurized air and wipe with a clean cloth.

5) For larger and difficult to access areas, a small quantity of solvent or chemical cleaner can be used.
### 3.3 List of necessary Tools

Table 1: List of necessary tools

<table>
<thead>
<tr>
<th>Tools</th>
<th>Purpose of use</th>
<th>Size / Design</th>
</tr>
</thead>
<tbody>
<tr>
<td>Allen screw key</td>
<td>Hexagonal socket screws</td>
<td>Depends on system and parts (See section 13).</td>
</tr>
<tr>
<td>Micrometer depth gauge</td>
<td>Depth measurement</td>
<td>-</td>
</tr>
<tr>
<td>Slide gauge</td>
<td>Depth and thickness measurement</td>
<td>-</td>
</tr>
<tr>
<td>Torque wrench</td>
<td>For the uniform tightening of nozzles, screws and nozzle tips using the defined force</td>
<td>4-400 Nm / 3-295 ft-lbs. Depends on system and parts (See section 13).</td>
</tr>
<tr>
<td>Spotting paste (Engineer’s blue)</td>
<td>Blueing of all contact points where the manifold contacts the mold</td>
<td>Common type</td>
</tr>
<tr>
<td>High-temperature assembly paste</td>
<td>Applied to make sure all threaded connections are easily disassembled at a later date</td>
<td>Resistant to temperature Solid lubricant paste (e.g. Molykote®1000)</td>
</tr>
<tr>
<td>Carpenter’s hammer or hammer and chisel</td>
<td>Opening the transport crate</td>
<td>Common type</td>
</tr>
<tr>
<td>Box end wrench</td>
<td>For unscrewing nozzle tips from nozzle bodies</td>
<td>HEX 7, 10, 14, 17, 21, 24, 27, 36, 46, 55 (depends on nozzle size)</td>
</tr>
<tr>
<td>Anti-corrosion agent</td>
<td>Protection of parts</td>
<td>We recommend the multipurpose spray CC 80 by Metaflux.</td>
</tr>
<tr>
<td>Engineer’s wrench</td>
<td>Nozzle tip</td>
<td>HEX 7</td>
</tr>
<tr>
<td>Braces for vice jaws</td>
<td>Tightening of nozzles, actuators etc. for dismantling</td>
<td>Common type (aluminum)</td>
</tr>
<tr>
<td>Soft face hammer</td>
<td>For assistance during work, if needed</td>
<td>Common type</td>
</tr>
<tr>
<td>Pliers</td>
<td>General use</td>
<td>-</td>
</tr>
<tr>
<td>Round-nosed pliers</td>
<td>Bend the cold length of heater</td>
<td></td>
</tr>
<tr>
<td>Spiral wire brush</td>
<td>Cleaning of the nozzle flow channels</td>
<td>Common type, matching the flowbore diameter</td>
</tr>
<tr>
<td>Tools by Synventive</td>
<td>Tools for assembling and disassembling the actuator</td>
<td>Upon request from Synventive (See also 8</td>
</tr>
<tr>
<td>Pulling hammer</td>
<td>For releasing nozzles</td>
<td>Upon request from Synventive</td>
</tr>
</tbody>
</table>
4 Installation of the Hot Runner System

This section describes the steps for installing the Hot Runner System in the injection mold. Please identify the necessary dimensions from the customer drawing for the Synventive Hot Runner System.

4.1 General Instructions for Installation

- If the cavity plate is not guided on pillars or pins when moving, there is a risk of damage to the nozzle tips.
- Electrical terminals for attaching cables to the Hot Runner System shall never be allowed to come into contact with the coolant or hydraulic fluid. This could lead to a short circuit in the system, or cause an electrical fire which may lead to damage of the Hot Runner System.
- To ensure long life and continued flawless operation of the actuator, we recommend using a coolant that complies with the requirements of classification 21/18/13 pursuant to ISO 4406. The coolant used should be properly modified, e.g. filtered water with an anti-corrosion and frost proof agent.
- Power cables and fluid distribution systems should be installed loosely, making sure they are not compressed during assembly. Keep in mind the thermal expansion of the Hot Runner System during operation.
- During assembly, the Hot Runner System and the injection mold shall have the same temperature. Synventive Hot Runner Systems are designed to be installed and removed from the mold at room temperature. Installing or removing Hot Runner Systems while hot could result in damage to the mold or the Hot Runner System, or both.
- All Synventive systems work with alternating current and the operating voltage of 230V ±10%.
- The prescribed torque values of fittings and fasteners must be met, using a torque wrench to properly torque all fasteners to specification. See the torques indicated in the torque table (section 13).
- All parts subjected to thermal and dynamic stress shall be treated with high-temperature assembly paste (anti-seize compound) to guarantee an easy release of the connections. This especially applies to screwed connections between the manifold and the injection mold.
- Whenever installing any threaded component or fastener, always use high-temperature assembly paste (anti-seize compound).
- During assembly, avoid moisture on all surfaces.
- In case of Hot Runner Systems with Support Ring nozzles replace all sealing rings after each dismantling and before each assembly.
- After mounting a hot runner system with bridge manifold, the dowel pins with internal threads (DIN7979) must be removed. Otherwise, it may cause damage due to thermal expansion on the hot runner system.

Dowel Pin DIN7979
Installation of the Hot Runner System

4.1.1 Requirements on the Injection Mold

This section defines design and technical requirements essential for the flawless operation of the Synventive HR System.

- The planned injection cavity shall be designed as instructed by Synventive to ensure suitability of fluid distribution systems and minimal heat convection. It is therefore necessary to provide sufficient mold rigidity.
- “Balancing” only applies to Synventive Hot Runner System. Effects related to runners and balanced part filling are the toolmakers responsibility.
- All dimensions specified in the customer drawing apply to the reference temperature of 20 °C (68 °F).
- The toolmaker needs to adjust the relevant parts to fit the injection mold taking into account the specific heat expansion of the following parts:
  - All nozzles, except for SR16, SR20, SR24, T16, T20 and T24 (unless otherwise noted).
  - All injection nozzle tips.
  - Support elements (center support, support pad and support pillar) supplied with extra trim stock.

**NOTICE**

Not designated in the PLUG’N PLAY®-Hot Runner System is an adjustment of center support and support pad with extra trim stock.

- The machine nozzle orifice diameter (machine nozzle – inlet bushing) shall be made with a tolerance of Ø/:-1 mm (Ø/:- 0.04”).
- The machine nozzle shall be centered with respect to the inlet bushing. The inlet bushing shall be centered as instructed by Synventive using a centering ring and secured against lateral stress.
- If the hoses and pipes leading to the injection system actuators are not part of Synventive’s supply, the toolmaker has to prepare a space with appropriate clearance for them.
- To avoid leakage between the manifold and the nozzles, a pre-load of 0.1 mm (0.004”) is needed for nozzles SR16, SR20 and SR24.
- All modifications to the hot runner system should be carried out only in consultation with Synventive. Exception is a contour adjustment at the nozzle tip.
- To ensure a correct gate break point, it is necessary to control the temperature around the hot runner gate using a temperature control system.
- The thermal transfer losses of the Hot Runner System shall be compensated by corresponding temperature control (cooling fluid) channels. Appropriate cooling channels must be incorporated in the appropriate areas of the injection mold as specified by Synventive to ensure proper Hot Runner System operation.
- To facilitate assembly, install any threaded components using high-temperature assembly paste (anti-seize compound).
- The operating safety of our Synventive Hot Runner Systems is based on the assumption that the molds, injection molds and injection molding machines intended for them have a sufficient stability to withstand deflection and are fitted with adequate temperature control systems, which properly manage the heat loss from the Synventive Hot Runner System.
- All machined surfaces shall have a medium roughness level of Ra 1.6 at the maximum after processing. If roughness is greater, leakage may occur on the Hot Runner System, resulting in severe damage.
- Nozzle length expansion due to heating shall be taken into account at the nozzle tip face, so the nozzle tip face shall be placed so that it is opposite a piece of plastic with the minimum thickness of 0.5 – 1.0 mm (0.02 – 0.04”) during injection.
Installation of the Hot Runner System

- In the area of the inlet orifice, it is recommended to use replaceable hardened inserts with the minimum required hardness of 52 +2/-1 HRC.
- The design of all cut outs and contact surfaces shall comply with the requirements submitted by Synventive. Contact with any other surfaces will compromise proper temperature control of the Synventive Hot Runner System.
- To ensure the static stability of the Hot Runner System as a whole, use the supports supplied together with the system, or as pre-fitted.
- To ensure support of the hot runners in the nozzle area, it is necessary to screw the clamping plate and the cavity plate together with a radius of approx. 80 – 100 mm (3.15 – 3.94") using two opposite screws, min. M10 as per DIN912-12.9. Both plates must be sufficiently rigid so as to avoid flexion under clamping and injection pressure.
- When the valve pin is mated with the nozzle tip, the front geometry of the pin shall be fitted with a radius / bevel as originally specified / supplied by Synventive.
- All mating surfaces and surfaces that come into contact with plastics that are finished later (pre-chamber) shall be made with a roughness of Ra 0.8.
- All mounting threads in the manifold shall be used during installation and disassembly of the Hot Runner System from the injection mold.
- After disassembly of the Hot Runner System, the original sealing rings shall be replaced with new sealing rings as required by Synventive.
- The support pads and support elements of the hot runner body shall mate with the hardened surfaces with the minimum required hardness of 52 +2/-1 HRC. If hardened inserts are not applied, it is necessary to use a mold plate with the minimum hardness of 52 +2/-1 HRC to prevent spot deformation due to the effect of these support elements. For the hardened discs diameter we recommend 1.5 times the diameter of the thrust pads.
- Each nozzle shall be fitted with two screw connections. The screws shall be fixed in the manifold to retain tension caused by thermal expansion, i.e. preventing plate deflection.

4.1.2 Requirements on Temperature Control

- On your system it is necessary to clearly define the applicable connection points of hydraulic and coolant distribution systems to make sure that Synventive Customer Service could easily install the Hot Runner System.
- Most commonly available systems can be used for temperature control.

**NOTICE**

In case of any uncertainty, please contact Synventive Customer Service or Technical Support.

- The power interface between the injection mold and the temperature controller comprises of connection boxes on either the wire management channels of the system, or directly on the injection mold.

**NOTICE**

The connections supplied are in accordance with your specifications.

- Not more than three actuators can be connected in series in any single cooling circuit.

**NOTICE**

The connection of more than three actuators will result in insufficient cooling, which could lead to severe actuator damage.

- Temperature sensors are positioned to provide precise temperature control.
Installation of the Hot Runner System

**NOTICE**

Never relocate a temperature sensor without first contacting Synventive.

- Connection cables must never be in contact with the Hot Runner manifold.
- Synventive Hot Runner Systems shall always be operated with a single temperature control system. The use of multiple, separate control systems can cause poor temperature stability.

### 4.2 Table - Expansion Gap (Joint Z)

<table>
<thead>
<tr>
<th>Manifold production series</th>
<th>Dimension (mm)</th>
<th>Steel</th>
<th>Z (mm) for ΔT (K) = 100</th>
<th>Z (mm) for ΔT (K) = 150</th>
<th>Z (mm) for ΔT (K) = 200</th>
<th>Z (mm) for ΔT (K) = 250</th>
<th>Z (mm) for ΔT (K) = 300</th>
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<td>0.09</td>
<td>0.13</td>
<td>0.16</td>
<td>0.16</td>
</tr>
</tbody>
</table>

Recommended plastic:
- POM, PVC
- PE, PP, PA, PBT, PS, ABS, PC
- PEI

**NOTICE**

Incorrectly adjusted support pads could result in high heat stress and plastic leakages in the injection mold (Hot Runner cutout).

Comply precisely with the dimensions specified in the customer drawing.
4.3 Installation of HR Systems with Support Ring Nozzles (APT)

**WARNING**

**Heavy Weight Hazard**
- Transport and lifting equipment should be operated only by trained personnel.
- Operate lifting and transport equipment slowly and carefully to avoid uncontrolled swinging of the manifold.
- Lifting and transport equipment for lifting Hot Runner Systems shall be approved and properly rated taking into account the weight and size of the manifold.
- When unpacking the Hot Runner System, there is a risk of injury due to falling parts and sharp edges. Maintain a minimum distance of 1 m from the Hot Runner System.
- Use personal protective equipment, such as head gear, safety shoes and work gloves.
- For first aid contact your medical / safety representing.

**NOTICE**

**Hazard of Material Damage**
- Without consulting Synventive it is not permitted to do modifications to the hot runner system e.g. geometrical changes to the nozzle tip, except the part shape adjustment in the area of material allowance.
- Move the Hot Runner System only up or down at room temperature 20 °C (68 °F).
- Always tighten the screws to the torque specified in the respective table in section 13.

Depending on system complexity, some Synventive Hot Runners will include special assembly notes and instructions, which will be included on the system general assembly drawing.

The following pages use numbers for the individual parts of the Hot Runner System based on the figure on this page.

**Parts of the Hot Runner System with Support Ring Nozzles**

1. Thrust pad
2. Nozzle tip
3. Center locator
4. Positioning dowel
5. Cavity plate *
6. Clamping plate *
7. Spacer plate *

* Not included in delivery
Installation of HR Systems with Support Ring Nozzles (APT)

4.3.1 Support Ring Nozzle Installation

1) Clean the nozzle cutout and remove metal chips if necessary.
2) Confirm that the nozzle cutouts match the hot runner general assembly drawing.

**NOTICE**

The nozzle should have contact only on the sealing diameter of the nozzle tips and the face and diameter of the support ring.

The nozzle assembly should not make any other contact with the mold.

3) Confirm the diameter and depth of the support ring counterbores and positioning dowel (4) holes.

4) Confirm that positioning dowel locations match the hot runner and the customer drawing.

**NOTICE**

These positioning dowels (4) locate the manifold and control the direction of thermal expansion.
Installation of HR Systems with Support Ring Nozzles (APT)

5) Carefully slide the nozzles into the nozzle cutouts in the tool.
   Each nozzle is numbered.
   
   **NOTICE**
   Check the general assembly drawing for the correct location of each nozzle.
   
   **NOTICE**
   Pay careful attention not to pinch the heater and thermocouple wires.
   These wires will exit through the slot in the cavity plate under the support ring.

6) Once all nozzles have been installed measure the height that the face of each nozzle protrudes from the cavity plate using a depth gauge.
   
   **NOTICE**
   All nozzles should be within 0.1 mm (.004") of each other.

7) Install the positioning dowels (4) into the cavity plate (5).

8) Without the nozzle sealing rings in place, and using the lift holes provided, carefully lower the manifold onto the nozzles and dowels.
9) Measure the distance between the face of the thrust pads (1) and the top of the spacer plate (7).
10) Confirm with the general assembly drawing that there is the correct amount of cold gap or preload.

---

**WARNING**

Heavy Weight Hazard

11) Carefully lift the manifold off the dowels and nozzles.

---

12) Check to see if there are any loose heaters or thermocouples that need to be installed onto the hot runner system.

**NOTICE**

If a heater or thermocouple needs to be installed, label the end of the wires with the correct zone number.

---

13) Insert the new sealing rings in the seal ring groove on each nozzle face.

**NOTICE**

Verify that the sealing rings always stand slightly proud above the nozzle head contact face upon first insertion.
### WARNING

**Heavy Weight Hazard**

14) Using lift holes provided on the manifold, carefully lower the hot runner system into the mold.

**NOTICE**

Pay special attention to any wiring underneath or on the side of the hot runner manifold so no wires are pinched or crushed during installation.

Be careful not to dislodge the seal rings.

**NOTICE**

It is often helpful, using non flammable tape, to tape any loose wires to the manifold prior to dropping the hot runner into the mold.

---

### WARNING

**Heavy Weight Hazard**

15) Install the clamping plate (6).

**NOTICE**

Be careful not to pinch or trap any wires or other components.
4.3.2 For non pre-wired Systems

**DANGER**

**Danger to Life by Electric Shock**

Serious personal injury or death can result from electrical contact.

Power supply should only be connected by properly trained and qualified personnel.

Verify that all power source connections are properly grounded (proceed as described in section 5.2).

For first aid contact your medical / safety representing.

1) Run all the wiring through wire slots in the cavity plate out to the location of the wiring box.

**NOTICE**

Allow enough wire length for a service loop, which will allow the connectors to be removed from the terminal box without removing the wiring.

2) Re-label the wires before cutting to length.

3) If wire lengths are excessive, trim wires to proper length.

4) It may be necessary to re-label the zone numbers if the original numbers are on the length of wire being removed.

5) Connect wires to power and thermocouple connectors.

**NOTICE**

The manner in which they connect is dependent on the electrical connectors being used.

4.3.3 For pre-wired Systems

**DANGER**

This terminal box contains components with electrical potential, if it is connected to voltage.

Do not open this housing.

**NOTICE**

Removal of the Synventive label external and internal will void the warranty.
4.4 Installation of HR Systems with Threaded Nozzles (API)

**WARNING**

**Heavy Weight Hazard**

- Transport and lifting equipment should be operated only by trained personnel.
- Operate lifting and transport equipment slowly and carefully to avoid uncontrolled swinging of the manifold.
- Lifting and transport equipment for lifting Hot Runner Systems shall be approved and properly rated taking into account the weight and size of the manifold.
- When unpacking the Hot Runner System, there is a risk of injury due to falling parts and sharp edges. Maintain a minimum distance of 1 m from the Hot Runner System. Use personal protective equipment, such as head gear, safety shoes and work gloves.
- For first aid contact your medical / safety representing.

**NOTICE**

**Hazard of Material Damage**

- Without consulting Synventive it is not permitted to do modifications to the hot runner system e.g. geometrical changes to the nozzle tip, except the part shape adjustment in the area of material allowance.
- Never install or remove the hot runner when the manifold or nozzles are hot, this may cause damage to the nozzles.
- Move the Hot Runner System only up or down at room temperature 20 °C (68 °F).
- Always tighten the screws to the torque specified in the respective table in section 13.

The following pages use numbers for the individual parts of the Hot Runner System based on the figure on this page.

**Parts of the Hot Runner System with Threaded Nozzles (API)**

1. Insulation plate *
2. Support pillar
3. Nozzle tip
4. Center support
5. Cavity plate *
6. Spacer plate *
7. Clamping plate *
8. Center locating ring *

* Not included in delivery
### 4.4.1 Preparation for System Installation

1) Clean the nozzle clearances and remove metal chips if necessary.

2) Apply plasticine or any other similar substance on the nozzle tip (3).

3) Apply a general-purpose grease to the mating surface (d) of the nozzle tip.

4) Apply spotting ink on support elements:
   - Center support (4)
   - Support pillar (bottom surface) (2).

5) If your Hot Runner System has guiding elements, install them into the respective bores.

**NOTICE**

Take care the guiding elements are fully seated in the drilled holes.
The following steps have to be done at room temperature 20 °C (68 °F).

6) Lower the Hot Runner System into the mold without twisting.

   Carefully and slowly lower the Hot Runner System, paying close attention especially during the last 10 mm.
   The guiding elements have to remain inside the mold.

7) Ensure that the Hot Runner System seats completely on the cavity plate.

8) Lubricate the thread of the screws manifold / cavity plate (5) with high-temperature assembly paste (antiseize compound).

   **NOTICE**

   This is an important measure to prevent thread corrosion due to aggressive gases, which could be released during plastics processing.

9) Bolt together the Hot Runner System and the cavity plate.

   **NOTICE**

   Use torque wrench with wrench insert and the torque specified in the respective table in section 13.

10) Unscrew the fastening screws.

**WARNING**

Heavy Weight Hazard

11) Lift up the Hot Runner System carefully.
12) Check the spotting ink matching of:
   - Support pillar (2)
   - Center support (4)

   **NOTICE**
   The edge of the center support should not bear on the manifold.
   If this happens, the issue must be resolved by the corresponding beveling of the outer edge of the center support (4).

13) All contact surfaces have to be clearly recognizable.

   **NOTICE**
   If not check the mold and the support elements, if necessary rework them.
   In case of any uncertainty, please contact the Synventive Customer Service or Technical Support.

14) Clean spotting ink surface.
15) Check possible damages from the first assembly.

16) Check if the plasticine at the nozzle tip (3) or nozzle is evenly distributed.

   **NOTICE**
   Ensure there is enough gap between mold and nozzle tip (3). If not rework them.
   Please note that the distance between mold and nozzle tip (3) will be reduced by thermal expansion while the hot runner is heated up.

17) Remove the plasticine.
4.4.2  Nozzle Tip Adjustment

In some cases it is necessary to adjust the nozzle tips to the cutout shape for the injected part. If the nozzle tips are too long, they have to be removed and cut shorter.

**WARNING**

**Hot Surfaces Hazard**

Contact between the skin and the hot injection mold could result in burns.

Use personal protective equipment, such as gloves, apron, sleeves and face protection, to guard against burns.

---

Precondition for nozzle tip adjustment is a complete installed system (Hot half)

1) Heat up the complete assembled system to operating temperature.
2) Check the length from the nozzle tip (3) at the cavity plate.
3) Mark the contour at the nozzle tip.

4) Wait until the system cools down to room temperature.
5) Unscrew the fastening screws.

**WARNING**

**Heavy Weight Hazard**

6) Lift up the Hot Runner System carefully from the cavity plate (5).

7) Check possible damage from the first assembly.

**NOTICE**

In case of any uncertainty, please contact the Synventive Customer Service or Technical Support.
Installation of HR Systems with Threaded Nozzles (API)

Hazard of Material Damage

Without consulting Synventive it is not permitted to do modifications to the hot runner system e.g. geometrical changes to the nozzle tip, except the part shape adjustment in the area of material allowance.

When removing the nozzle tip from the threaded nozzles, secure the nozzle body using an engineer's wrench at the hexagonal section.

This is done to prevent the nozzle body from rotating which could result in leakage.

When cutting nozzle tips short, make sure not to shorten beyond the dimension L (nominal size).

The nominal size is the size between the seat of the nozzle (face fit nozzle) respectively the lower edge of the manifold (screw fit nozzles) and the nozzle tip (point F0).

For the dimension L refer to the general assembly drawing.

The dimension “L” is the nominal dimension of a heated nozzle.

8) If necessary you must shorten the nozzle tip (3).

    NOTICE

    Unscrew the nozzle tip (3) and machine to length.

9) Mount the shortened nozzle tip (3) on the nozzle body.

    WARNING

Heavy Weight Hazard

10) After reassembly of the Hot Runner System lower it into the mold without twisting.

    NOTICE

    Carefully and slowly lower the Hot Runner System, paying close attention especially during the last 10 mm.
Installation of HR Systems with Threaded Nozzles (API)

**Hot Runner System**

11) Ensure that the Hot Runner System seats completely on the cavity plate.

12) Lubricate the thread of the fastening screws Hot Runner System / cavity plate (5) with high-temperature assembly paste (antiseize compound).

**NOTICE**

This is an important measure to prevent thread corrosion due to aggressive gases, which could be released during plastics processing.

13) Bolt together the Hot Runner System and the cavity plate.

**NOTICE**

Use torque wrench with wrench insert and the torque specified in the respective table in section 13.

14) Remove all guiding elements if used.

---

**WARNING**

**Hot Surfaces Hazard**

15) Heat the hot runner to normal operating temperature.

16) Contour the nozzle tip to the cavity if required.

17) Machine the contour of the nozzle tip when nozzle is installed in the cavity.

18) In the case where the final contour needs to be placed on the valve pin, the valve pin must be rounded at the adjusted area also.

**NOTICE**

Generally only tips with extension are allowed to be contoured.

---

**WARNING**

**Heavy Weight Hazard**

19) Install the clamping plate (7) and the insulation plate (1).

20) Lubricate the thread of the screws insulation plate (1) / clamping plate (7) with high-temperature assembly paste (antiseize compound).

**NOTICE**

This is an important measure to prevent thread corrosion due to aggressive gases, which could be released during plastics processing.
21) Screw the insulation plate (1) and the clamping plate (7) together.

**NOTICE**
Use torque wrench with wrench insert and the torque specified in the respective table in section 13.

**Requirements on the injection mold:**
- The machine nozzle orifice diameter (machine nozzle – inlet bushing) shall be made with a tolerance of 0 /-1 mm (0 / -0.04").
- The machine nozzle shall be centered with respect to the inlet bushing.
- The inlet bushing shall be centered as instructed by Synventive using a centering ring and secured against lateral stress.

22) Place the center locating ring (8) on the inlet bushing.
23) Check if the center locating ring inner diameter correctly accommodates the fit diameter of the inlet bushing without side preload or a gap.

24) Lubricate the threads of the center locating ring (8) fastening screws with high-temperature assembly paste (antiseize compound).

**NOTICE**
This is an important measure to prevent thread corrosion due to aggressive gases, which could be released during plastics processing.

25) Screw the center locating ring (8) together with the clamping plate (7).

**NOTICE**
Use torque wrench with wrench insert and the torque specified in the respective table in section 13.

26) Lubricate the thread of the hot half / mold plate screws with high-temperature assembly paste (antiseize compound).

**NOTICE**
This is an important measure to prevent thread corrosion due to aggressive gases, which could be released during plastics processing.

27) Screw the hot half and the mold plate together.

**NOTICE**
Use torque wrench with wrench insert and the torque specified in the respective table in section 13.
4.4.3 For non pre-wired Systems

DANGER

Danger to Life by Electric Shock

Serious personal injury or death can result from electrical contact.

Power supply should only be connected by properly trained and qualified personnel.

Verify that all power source connections are properly grounded (proceed as described in section 5.2).

For first aid contact your medical / safety representing.

1) Run all the wiring through wire slots in the cavity plate out to the location of the wiring box.

NOTICE

Allow enough wire length for a service loop, which will allow the connectors to be removed from the terminal box without removing the wiring.

2) Re-label the wires before cutting to length.

3) If wire lengths are excessive, trim wires to proper length.

4) It may be necessary to re-label the zone numbers if the original numbers are on the length of wire being removed.

5) Connect wires to power and thermocouple connectors.

NOTICE

The manner in which they connect is dependent on the electrical connectors being used.

4.4.4 For pre-wired Systems

This terminal box contains components with electrical potential, if it is connected to voltage.

Do not open this housing.

NOTICE

Removal of the Synventive label external and internal will void the warranty.
4.5 Installation of PLUG´N PLAY® HR Systems with Threaded Nozzles

**WARNING**

**Heavy Weight Hazard**

Transport and lifting equipment should be operated only by trained personnel. Operate lifting and transport equipment slowly and carefully to avoid uncontrolled swinging of the manifold. Lifting and transport equipment for lifting Hot Runner Systems shall be approved and properly rated taking into account the weight and size of the manifold. When unpacking the Hot Runner System, there is a risk of injury due to falling parts and sharp edges. Maintain a minimum distance of 1 m from the Hot Runner System. Use personal protective equipment, such as head gear, safety shoes and work gloves. For first aid contact your medical / safety representing.

**NOTICE**

**Hazard of Material Damage**

Without consulting Synventive it is not permitted to do modifications to the hot runner system e.g. geometrical changes to the nozzle tip, except the part shape adjustment in the area of material allowance. Never install or remove the hot runner when the manifold or nozzles are hot, this may cause damage to the nozzles. Move the Hot Runner System only up or down at room temperature 20 °C (68 °F). Always tighten the screws to the torque specified in the respective table in section 13.

The PLUG´N PLAY® hot runner system is supported by thrust pads, center support and positioning dowels. It is not screwed to the cavity plate. The system can be assembled without adjustment. The thrust pads take up the thermal expansion. The following pages reference numbers for the individual parts of the Hot Runner System based on the figure on this page.

**Parts of the PLUG´N PLAY® Hot Runner System**

1. Insulation plate *
2. Cavity plate *
3. Nozzle tip
4. Center support
5. Spacer plate *
6. Thrust pad
7. Clamping plate *
8. Positioning dowel
9. Center locating ring *

* Not included in delivery
4.5.1 Preparation for System Installation

1) Clean the mold cutout and remove metal chips if necessary.

2) Apply plasticine or any other similar substance on the nozzle tip (3).

3) Apply a general-purpose grease to the mating surface (d) of the nozzle tip.

4) Place positioning dowel (8) in the cavity plate (2).

**NOTICE**
Ensure the positioning dowel is fully seated in the bottom of the drilled hole.

5) Apply spotting ink on the support elements center support (4) and thrust pad (6) (bottom surface).
NOTICE
The following steps have to be done at room temperature 20 °C (68 °F).

WARNING
Heavy Weight Hazard
6) Lower the Hot Runner System into the mold without twisting. Carefully and slowly lower the Hot Runner System, paying close attention especially during the last 10 mm.
7) Ensure that the Hot Runner System seats completely on the mold / cavity plate (2).

8) Spotting ink thrust pad (6) and spacer plate (5).

WARNING
Heavy Weight Hazard
9) Carefully lift the clamping plate (7) on the Hot Runner system. Remove clamping plate (7).
10) Lift up the Hot Runner system carefully from the cavity plate.

12) Check the spotting ink surfaces on:
   - Thrust pad (6)
   - Spacer plate (5)

NOTICE
All contact surfaces have to be clearly recognizable.
If not check the mold and the support elements, if necessary rework them.
In case of any uncertainty, please contact the Synventive Customer Service.

13) Clean spotting ink surface.
14) Check possible damages from the first assembly.
15) Check if the plasticine at the nozzle tip (3) or nozzle is evenly distributed.

**NOTICE**

Ensure there is enough gap between mold and nozzle tip (3). If not rework them.

Please note that the distance between mold and nozzle tip (3) will be reduced by thermal expansion while the hot runner is heated up.

16) Remove the plasticine.

### 4.5.2 System Installation

**NOTICE**

**Hazard of Material Damage**

Precondition to assembly the system is:

- Applied spotting ink test in the relevant areas.
- Applied plasticine test regarding the nozzle cutouts.

**Parts of the PLUG’N PLAY® Hot Runner Systems with Threaded Nozzles (API)**

1) Insulation plate
2) Cavity plate
3) Nozzle tip
4) Center support
5) Spacer plate
6) Thrust pad
7) Clamping plate
8) Positioning dowel
9) Center locating ring

1) Clean the mold cutout and remove metal chips if necessary.

2) Place positioning dowel (8) in the cavity plate (2).

**NOTICE**

Ensure the positioning dowel is fully seated in the bottom of the drilled hole.
Installation of PLUG N PLAY® HR Systems with Threaded Nozzles

**WARNING**

Heavy Weight Hazard

3) Lower the Hot Runner System into the cavity plate without twisting.

**NOTICE**

Carefully and slowly lower the Hot Runner System, paying close attention especially during the last 10 mm.

**WARNING**

Heavy Weight Hazard

4) Carefully lift the clamping plate (7) on the Hot Runner System.

5) Lubricate the thread of the fastening screws (clamping plate / spacer plate / cavity plate) with high-temperature assembly paste (anti-seize compound).

**NOTICE**

This is an important measure to prevent thread corrosion due to aggressive gases, which could be released during plastics processing.

6) Screw the clamping plate / spacer plate / cavity plate together with the fastening screws.

**NOTICE**

Use torque wrench with wrench insert and the torque specified in the respective table in section 13.

**Requirements on the injection mold:**

The machine nozzle orifice diameter (machine nozzle – inlet bushing) shall be made with a tolerance of 0 /-1 mm (0/-0.04").

The machine nozzle shall be centered with respect to the inlet bushing. The inlet bushing shall be centered as instructed by Synventive using a centering ring and secured against lateral stress.

7) Place the center locating ring (9) on the inlet bushing.

8) Check if the center locating ring inner diameter correctly accommodates the fit diameter of the inlet bushing without side pre-load or a gap.
9) Lubricate the threads of the center locating ring (9) fastening screws with high-temperature assembly paste (antiseize compound).

**NOTICE**

This is an important measure to prevent thread corrosion due to aggressive gases, which could be released during plastics processing.

10) Screw the center locating ring (9) together with the clamping plate (7).

**NOTICE**

Use torque wrench with wrench insert and the torque specified in the respective table in section 13.

11) Lubricate the thread of the fastening screws hot half / cavity plate with high-temperature assembly paste (antiseize compound).

12) Bolt together the hot half and the cavity plate.

**NOTICE**

Use torque wrench with wrench insert and the torque specified in the respective table in section 13.

### 4.5.3 Nozzle Tip Adjustment

In some cases it is necessary to adjust the nozzle tips to the cutout shape for the injected part. Only nozzle tips with tip extension can be cut. If the nozzle tips with extension are too long, they have to be removed and cut shorter.

**WARNING**

**Hot Surfaces Hazard**

Contact between the skin and the hot injection mold could result in burns. Use personal protective equipment, such as gloves, apron, sleeves and face protection, to guard against burns.

Precondition for nozzle tip adjustment is a complete installed system (Hot half)

**WARNING**

**Hot Surfaces Hazard**

1) Heat up the complete assembled system to operating temperature.
2) Check the length from the nozzle tip (3) at the cavity plate.
3) Mark the contour at the nozzle tip.
**NOTICE**

**Hazard of Material Damage**

Without consulting Synventive it is not permitted to do modifications to the hot runner system e.g. geometrical changes to the nozzle tip, except the part shape adjustment in the area of material allowance.

When removing the nozzle tip from the threaded nozzles, secure the nozzle body using an engineer's wrench at the hexagonal section.

This is done to prevent the nozzle body from rotating which could result in leakage.

When cutting nozzle tips short, make sure not to shorten beyond the dimension L (nominal size).

The nominal size is the size between the seat of the nozzle (face fit nozzle) respectively the lower edge of the manifold (screw fit nozzles) and the nozzle tip (point F0).

For the dimension L refer to the general assembly drawing.

The dimension "L" is the nominal dimension of a heated nozzle.

---

4) Wait until the system cool down to room temperature.

5) If necessary you must shorten the nozzle tip (3).

**NOTICE**

To shorten the nozzle tip, the hot runner system has to be disassembled out of the mold and the nozzle tip has to be unscrewed from the nozzle (e.g. section 10.1.1.2 Page 274).

---

6) Install the shortened nozzle tip (3) on the nozzle (e.g. section 10.1.1.3 Page 279).

---

**WARNING**

**Heavy Weight Hazard**

7) After reassembly of the Hot Runner System lower it into the mold without twisting.

**NOTICE**

Carefully and slowly lower the Hot Runner System, paying close attention especially during the last 10 mm.
8) Lubricate the thread of the fastening screws (clamping plate / spacer plate / cavity plate) with high-temperature assembly paste (anti-seize compound).

**NOTICE**
This is an important measure to prevent thread corrosion due to aggressive gases, which could be released during plastics processing.

9) Bolt together the clamping plate / spacer plate / cavity plate with the fastening screws.

**NOTICE**
Meet the prescribed torque values and use high-temperature assembly paste for the threads.

10) Remove all guiding elements if used.

**WARNING**
Hot Surfaces Hazard

11) Heat the hot runner to normal operating temperature.
12) Contour the nozzle tip to the cavity if required.
13) Machine the contour of the nozzle tip when nozzle is installed in the cavity.
14) In the case where the final contour needs to be placed on the valve pin, the valve pin must be rounded at the adjusted area also.

**NOTICE**
Generally only tips with extension are allowed to be contoured.

**WARNING**
Heavy Weight Hazard

15) Install the clamping plate (7) and the insulation plate (1).
16) Lubricate the thread of the insulation plate (1) / clamping plate (7) screws with high-temperature assembly paste (antiseize compound).

**NOTICE**
This is an important measure to prevent thread corrosion due to aggressive gases, which could be released during plastics processing.
17) Screw the insulation plate (1) and the clamping plate (7) together.

**NOTICE**

Use torque wrench with wrench insert and the torque specified in the respective table in section 13.

---

**Requirements on the injection mold:**

The machine nozzle orifice diameter (machine nozzle – inlet bushing) shall be made with a tolerance of 0/-1 mm (0/-0.04").

The machine nozzle shall be centered with respect to the inlet bushing.

The inlet bushing shall be centered as instructed by Synventive using a centering ring and secured against lateral stress.

18) Place the center locating ring (9) on the inlet bushing.

19) Check if the center locating ring inner diameter correctly accommodates the fit diameter of the inlet bushing without side preload or a gap.

---

20) Lubricate the threads of the center locating ring (9) fastening screws with high-temperature assembly paste (antiseize compound).

**NOTICE**

This is an important measure to prevent thread corrosion due to aggressive gases, which could be released during plastics processing.

21) Screw center locating ring (9) together with the clamping plate (7).

**NOTICE**

Use torque wrench with wrench insert and the torque specified in the respective table in section 13.

---

22) Lubricate the thread of the fastening screws hot half / cavity plate with high-temperature assembly paste (antiseize compound).

23) Screw the hot half and the cavity plate (2) together.

**NOTICE**

Use torque wrench with wrench insert and the torque specified in the respective table in section 13.
4.5.4 For non pre-wired Systems

⚠️ DANGER ⚠️

Danger to Life by Electric Shock

Serious personal injury or death can result from electrical contact.

- Power supply should only be connected by properly trained and qualified personnel.
- Verify that all power source connections are properly grounded (proceed as described in section 5.2).
- For first aid contact your medical / safety representing.

1) Run all the wiring through wire slots in the cavity plate out to the location of the wiring box.

**NOTICE**

Allow enough wire length for a service loop, which will allow the connectors to be removed from the terminal box without removing the wiring.

2) Re-label the wires before cutting to length.
3) If wire lengths are excessive, trim wires to proper length.
4) It may be necessary to re-label the zone numbers if the original numbers are on the length of wire being removed.
5) Connect wires to power and thermocouple connectors.

**NOTICE**

The manner in which they connect is dependent on the electrical connectors being used.

4.5.5 For pre-wired Systems

⚠️ DANGER ⚠️

This terminal box contains components with electrical potential, if it is connected to voltage.
Do not open this housing.

**NOTICE**

Removal of the Synventive label external and internal will void the warranty.
4.6 Installation of HR Systems with Threaded Nozzles (APT)

**WARNING**

**Heavy Weight Hazard**

Transport and lifting equipment should be operated only by trained personnel. Operate lifting and transport equipment slowly and carefully to avoid uncontrolled swinging of the manifold.

Lifting and transport equipment for lifting Hot Runner Systems shall be approved and properly rated taking into account the weight and size of the manifold.

When unpacking the Hot Runner System, there is a risk of injury due to falling parts and sharp edges. Maintain a minimum distance of 1 m from the Hot Runner System. Use personal protective equipment, such as head gear, safety shoes and work gloves.

*For first aid contact your medical / safety representing.*

**NOTICE**

**Hazard of Material Damage**

Without consulting Synventive it is not permitted to do modifications to the hot runner system e.g. geometrical changes to the nozzle tip, except the part shape adjustment in the area of material allowance.

Never install or remove the hot runner when the manifold or nozzles are hot, this may cause damage to the nozzles.

Move the Hot Runner System only up or down at room temperature 20°C (68 °F).

Always tighten the screws to the torque specified in the respective table in section 13.

Depending on system complexity, some Synventive Hot Runners will include special assembly notes and instructions, which will be included on the system general assembly drawing.

The following pages use numbers for the individual parts of the Hot Runner System based on the figure on this page.

**Parts of the Hot Runner System with Threaded Nozzles.**

1. Insulation plate *
2. Thrust pad
3. Nozzle tip
4. Center support
5. Cavity plate *
6. Spacer plate *
7. Clamping plate *
8. Center locating ring *
9. Inlet bushing
10. Positioning dowel

* Not included in delivery
4.6.1 Preparation for System Installation

1) Clean the nozzle cutout and remove metal chips if necessary.

2) Confirm that the nozzle cutout match the hot runner general assembly drawing.

3) Confirm the positioning dowel (10) locations match the hot runner general assembly drawing.

4) Install the positioning dowel (10) into the cavity plate (5).

5) Apply plasticine or any other similar substance on the nozzle tip (3).

6) Apply a general-purpose grease to the mating surface (d) of the nozzle tip.

7) If your Hot Runner System has guiding elements, install them into the respective bores.

**NOTICE**
Take care the guiding elements are fully seated in the drilled holes.
8) Spotting ink the contact surface of:
   - Thrust pad (2)
   - Center support (4).

---

**WARNING**

Heavy Weight Hazard

**NOTICE**

Ensure no wires are pinched or crushed during installation.

9) Lower the Hot Runner System into the mold without twisting.
   - Carefully and slowly lower the Hot Runner System, paying close attention especially during the last 10 mm.
   - The guiding elements have to remain inside the mold.

---

10) Once the hot runner is in the mold and resting on the support pillar, ensure that the Hot Runner System seats completely on the cavity plate.

11) Take measurements to confirm proper thrust pad clearance or preload.

**NOTICE**

The proper top thrust pad clearance or preload is shown on the general assembly drawing.

---

12) Spotting ink the contact surface of:
   - Thrust pads (2)
   - Spacer plate (6)

---

13) Lubricate the thread of the fastening screws (clamping plate / spacer plate / cavity plate) with high-temperature assembly paste (anti-seize compound).

**NOTICE**

This is an important measure to prevent thread corrosion due to aggressive gases, which could be released during plastics processing.
14) Bolt together the clamping plate (7), spacer plate (6) and the cavity plate (5).

**NOTICE**

Use torque wrench with wrench insert and the torque specified in the respective table in section 13.

15) Unscrew the fastening screws cavity plate (5), spacer plate (6), clamping plate (7).

16) Lift up the clamping plate (7) carefully.

17) Check the spotting ink surfaces of:
- Thrust pads (2)
- Spacer plate (6)

**NOTICE**

All contact surfaces have to be clearly recognizable.
If not check the mold and the support elements, if necessary rework them.
In case of any uncertainty, please contact the Synventive Customer Service.

18) Clean spotting ink surface.
19) Check possible damages from the first assembly.

20) Lift up the Hot Runner System carefully from the cavity plate (5).
Installation of HR Systems with Threaded Nozzles (APT)

Parts of the HR system with Threaded Nozzles.

1. Insulation plate
2. Thrust pad
3. Nozzle tip
4. Center support
5. Cavity plate
6. Spacer plate
7. Clamping plate
8. Center locating ring
9. Inlet bushing
10. Positioning dowel

21) Check the spotting ink matching of:
   - Thrust pad (2)
   - Center support (4)

**NOTICE**

The edge of the center support should not bear on the manifold.
If this happens, the issue must be resolved by the corresponding beveling of the outer edge of the center support (4).

22) All contact surfaces have to be clearly recognizable.

**NOTICE**

If not check the mold and the support elements, if necessary rework them.
In case of any uncertainty, please contact the Synventive Customer Service or Technical Support.

23) Clean spotting ink surface.

24) Check possible damages from the first assembly.

25) Check if the plasticine at the nozzle tip (3) or nozzle is evenly distributed.

**NOTICE**

Ensure there is enough gap between mold and nozzle tip (3).
If not rework them.
Please note that the distance between mold and nozzle tip (3) will be reduced by thermal expansion while the hot runner is heated up.

26) Remove the plasticine.
4.6.2 Nozzle Tip Adjustment

In some cases it is necessary to adjust the nozzle tips to the cutout shape for the injected part. If the nozzle tips are too long, they have to be removed and cut shorter.

**WARNING**

Hot Surfaces Hazard

Contact between the skin and the hot injection mold could result in burns.

Use personal protective equipment, such as gloves, apron, sleeves and face protection, to guard against burns.

For first aid contact your medical / safety representing.

Precondition for nozzle tip adjustment is a complete installed system (Hot half)

**WARNING**

1) Heat up the complete assembled system to operating temperature.
2) Check the length from the nozzle tip (3) at the cavity plate.
3) Mark the contour at the nozzle tip.

4) Wait until the system cool down to room temperature.
5) Unscrew the fastening screws cavity plate (5), spacer plate (6), clamping plate (7).

**WARNING**

Heavy Weight Hazard

6) Lift up the Hot Runner System carefully.

7) Check possible damages from the first assembly.

**NOTICE**

In case of any uncertainty, please contact the Synventive Customer Service or Technical Support.
Installation of HR Systems with Threaded Nozzles (APT)

NOTICE

Hazard of Material Damage

Without consulting Synventive it is not permitted to do modifications to the hot runner system e.g. geometrical changes to the nozzle tip, except the part shape adjustment in the area of material allowance.

When removing the nozzle tip from the threaded nozzles, secure the nozzle body using an engineer’s wrench at the hexagonal section.

When cutting nozzle tips short, make sure not to shorten beyond the dimension L (nominal size).

The nominal size is the size between the seat of the nozzle (face fit nozzle) respectively the lower edge of the manifold (screw fit nozzles) and the nozzle tip (point F0).

For the dimension L refer to the general assembly drawing.

The dimension “L” is the nominal dimension of a heated nozzle.

8) If necessary you must shorten the nozzle tip (3).

NOTICE

Unscrew the nozzle tip (3) and machine to length.

9) Install the shortened nozzle tip on the nozzle (e.g. section)

WARNING

Heavy Weight Hazard

10) After reassembly of the Hot Runner System lower it into the mold without twisting.

NOTICE

Carefully and slowly lower the Hot Runner System, paying close attention especially during the last 10 mm.
NOTICE

Ensure that the Hot Runner System seats completely on the cavity plate.

11) Lubricate the thread of the fastening screws (Hot Runner System / cavity plate) with high-temperature assembly paste (anti-seize compound).

NOTICE

This is an important measure to prevent thread corrosion due to aggressive gases, which could be released during plastics processing.

12) Install fastening screws (Hot Runner System / cavity plate).

NOTICE

Use torque wrench with wrench insert and the torque specified in the respective table in section 13.

13) Remove all guiding elements if used.

WARNING

Hot Surfaces Hazard

14) Heat the hot runner to normal operating temperature.
15) Contour the nozzle tip to the cavity if required.
16) Machine the contour of the nozzle tip when nozzle is installed in the cavity.
17) In the case where the final contour needs to be placed on the valve pin, the valve pin must be rounded at the adjusted area also.

NOTICE

Generally only tips with extension are allowed to be contoured.

WARNING

Heavy Weight Hazard

18) Install the clamping plate (7) and the insulation plate (1).
Installation of HR Systems with Threaded Nozzles (APT)

Requirements on the injection mold:

The machine nozzle orifice diameter (machine nozzle – inlet bushing) shall be made with a tolerance of 0 /-0.04\".
The machine nozzle shall be centered with respect to the inlet bushing.
The inlet bushing shall be centered as instructed by Synventive using a centering ring and secured against lateral stress.

19) Place the center locating ring (8) on the inlet bushing.
20) Check if the center locating ring inner diameter correctly accommodates the fit diameter of the inlet bushing without side pre-load or a gap.

21) Lubricate the threads of the center locating ring (8) fastening screws with high-temperature assembly paste (antiseize compound).

**NOTICE**

This is an important measure to prevent thread corrosion due to aggressive gases, which could be released during plastics processing.

22) Screw center locating ring (8) together with the clamping plate (7).

**NOTICE**

Use torque wrench with wrench insert and the torque specified in the respective table in section 13.

23) Bolt together the hot half and the mold plate.

**NOTICE**

Use torque wrench with wrench insert and the torque specified in the respective table in section 13.
4.6.3 For non pre-wired Systems

**DANGER**

**Danger to Life by Electric Shock**
Serious personal injury or death can result from electrical contact.
Power supply should only be connected by properly trained and qualified personnel.
Verify that all power source connections are properly grounded (proceed as described in section 5.2).
For first aid contact your medical / safety representing.

1) Run all the wiring through wire slots in the cavity plate out to the location of the wiring box.

**NOTICE**
Allow enough wire length for a service loop, which will allow the connectors to be removed from the terminal box without removing the wiring.
Re-label the wires before cutting to length.
2) If wire lengths are excessive, trim wires to proper length.
3) It may be necessary to re-label the zone numbers if the original numbers are on the length of wire being removed.
4) Connect wires to power and thermocouple connectors.

**NOTICE**
The manner in which they connect is dependent on the electrical connectors being used.

4.6.4 For pre-wired Systems

**DANGER**
This terminal box contains components with electrical potential, if it is connected to voltage.
Do not open this housing.

**NOTICE**
Removal of the Synventive label external and internal will void the warranty.
5 Start-up of the Hot Runner System

⚠️ DANGER

**Danger to Life by Disfunction of Safety Devices**
Serious personal injury or death can result from disfunctions of safety devices.
Before machine operation, properly set all safety devices and use them at all times.
For first aid contact your medical / safety representing.

**Danger to Life by Electric Shock**
Serious personal injury or death can result from electrical contact.
Electrical work must be carried out by qualified persons.
Verify that all power source connections are properly grounded.
When working on electric parts of the machine, switch off:
- Temperature control of the Hot Runner System
- Injection molding machine
- Electric connections to the Hot Runner System or machine have to be disconnected.
For first aid contact your medical / safety representing.

**Danger to Life by Hydraulic**
Serious personal injury or death can result from connecting or disconnecting hydraulic hoses under pressure.
Hydraulical works must be carried out by qualified persons.
Before you start any hose related work:
- The hoses have to be depressurized.
- The electrical disconnect properly locked out.
For first aid contact your medical / safety representing.

---

⚠️ WARNING

**Heavy Weight Hazard**
Transport and lifting equipment should be operated only by trained personnel.
Operate lifting and transport equipment slowly and carefully to avoid uncontrolled swinging of the manifold.
Use personal protective equipment, such as head gear, safety shoes and work gloves.
Lifting and transport equipment for lifting Hot Runner Systems shall be approved and properly rated taking into account the weight and size of the manifold.
When unpacking the Hot Runner System, there is a risk of injury due to falling parts and sharp edges. Maintain a minimum distance of 1 m from the Hot Runner System.
For first aid contact your medical / safety representing.
### Start-up of the Hot Runner System

#### WARNING

**Oil sprayed from leakages in the oil distribution systems**

- may result in injury, e.g. to the eyes.
  - Use personal protective equipment, in this case specifically a face shield or protective goggles.

**Leaking oil may result in severe injuries due to slipping**

- Eliminate contamination from lubricants.
  - When you are working in the vicinity of the machine, pay close attention to the safety of your workplace.
  - For first aid contact your medical / safety representing

#### NOTICE

**DO NOT heat the Hot Runner System if cooling is not available**

- Severe damage to actuators will result.
  - Cooling shall be switched on together with the heating system.
  - Average temperature: min. 30 °C (86 °F), max. 60 °C (140 °F), max. pressure 8 bar (116 psi); max. temperature difference between inlet and outlet 5 °C (9 °F).

**Parts of the system obstruct movable parts of the machine**

- Make sure the hoses of the hydraulic, pneumatic and cooling systems as well as all electric cables do not obstruct movable parts of the machine, do not interfere with the machine’s area of movement and the area of automatic handling, if applicable.

**Rheologic calculation from the customer’s point**

- To provide to the mold function, to determine operating data and to verify the eligibility and functional reliability of the Synventive Hot Runner System as specified and approved by the customer, it is necessary to carry out a rheologic calculation from the customer’s point of view based on our knowledge.
  - Upon request at the time of the purchase order, we can submit free of charge the dimensions of the melt flow channels, necessary for the calculation, converted into the form of three-dimensional data.

**Air intake in the hydraulic hoses**

- may result in incomplete valve pin closing, which may lead to a large gate vestige on the molded part.
  - Make sure that the connected hydraulic hoses are fully bled of all air prior to molding parts.
5.1 Preparation for Start up

**NOTICE**

If you are restoring the operation of the injection mold use the list of adjustment values that state the operating conditions under which the injection mold was initially tested.

1) Check if the molding machine nozzle flow channel diameter = ØA matches the inlet bushing flow channel diameter = ØE, or if it is smaller by not more than 1.0 mm (0.04”).
   
\[ \phi_E = \phi_A + 0/-1.0 \text{ mm} \] (±0/-0.04”) 

2) Attach the complete injection mold using the applicable screws and, if necessary, fix to the injection molding machine using retaining or clamping elements.

3) Connect the hoses of the coolant distribution systems to the connection points of the Hot Runner System and check for leakage.

4) Connect the hoses of the hydraulic and/or pneumatic distribution systems to the connection points of the Hot Runner System and check for leakage.

5) If you are restoring the operation of the injection mold, make sure that the fittings on the tool in the molding machine are tight.

5.2 Power Supply Connection

**DANGER**

**Danger to Life by Electric Shock**

Incorrectly installed power supply lines may result in severe burns and even cardiac arrest and possible risk of death.

Power supply have to be connected by qualified persons.

For any work on the Hot Runner System, check that the system is properly grounded.

For first aid contact your medical/safety representing.

1) Close the injection mold.

2) Switch off temperature control of the Hot Runner System and the control system of the injection molding machine.

3) Disconnect all power supply lines to the Hot Runner System, temperature controller and the injection molding machine.

4) Check if the connector arrangement of your temperature control system matches the connection diagram and wiring schematics supplied by Synventive.
5.2.1 Grounding Check

1) To check if the Hot Runner System is grounded, hold a multimeter between temperature control grounding and manifold grounding.

⚠️ DANGER

The measured resistance value should be zero Ω.

5.2.2 Verification of Heater Grounding

⚠️ DANGER

Danger to Life by Electric Shock

Electrical work must be carried out by qualified persons.

For any work on the Hot Runner System, check that the system is properly grounded.

For first aid contact your medical / safety representing.

⚠️ DANGER

Never operate the heaters at full capacity if resistance is below 230 kΩ.

Notice

Heaters may accumulate ambient humidity, which could reduce resistance to a value between 100 kΩ and 10 MΩ.

1) In case resistance is below 230 kΩ, heat the system to 50 °C (122 °F) for the first 10 to 15 minutes. (Slow start).

2) If resistance is lower than 1 MΩ, heating can be set to the processing temperature.
5.2.3 Information on Heater Connection

5.2.3.1 Color coding of Thermocouples

**NOTICE**

Take notice of the production and color identification of thermocouple cables.

Synventive uses J and K type thermocouples. Their color coding is given in the following table.

<table>
<thead>
<tr>
<th>Type</th>
<th>International standard IEC 584-3</th>
</tr>
</thead>
<tbody>
<tr>
<td>J</td>
<td>Black</td>
</tr>
<tr>
<td></td>
<td>+ Black</td>
</tr>
<tr>
<td></td>
<td>- White</td>
</tr>
<tr>
<td>K</td>
<td>Green</td>
</tr>
<tr>
<td></td>
<td>+ Green</td>
</tr>
<tr>
<td></td>
<td>- White</td>
</tr>
</tbody>
</table>

**Table 1: International color coding for temperature sensors**

<table>
<thead>
<tr>
<th>Type</th>
<th>ANSI/MC 96:1</th>
<th>JIS C-1610-1981</th>
</tr>
</thead>
<tbody>
<tr>
<td>J</td>
<td>Black</td>
<td>Yellow</td>
</tr>
<tr>
<td></td>
<td>+ White</td>
<td>+ Red</td>
</tr>
<tr>
<td></td>
<td>- Red</td>
<td>- White</td>
</tr>
<tr>
<td>K</td>
<td>Green</td>
<td>Blue</td>
</tr>
<tr>
<td></td>
<td>+ Yellow</td>
<td>+ Red</td>
</tr>
<tr>
<td></td>
<td>- Red</td>
<td>- White</td>
</tr>
</tbody>
</table>

**Table 2: Color coding of temperature sensors by customer request**

Coating: Litz wire “+”

Litz wire “-”
5.3 Hot Runner System Start-up

**WARNING**

**Danger of Unexpected Discharge**

If the inlet bushing does not heat up as quickly as the manifold, pressure inside the manifold may increase due to the thermal expansion properties of plastics.

Move injection unit towards the injection mold to engage the heated machine nozzle is pressed against the inlet bushing.

**NOTICE**

This ensures additional heat supply for the inlet bushing, to be transmitted to the cold plastic.

Use personal protective equipment.

For first aid contact your medical / safety representing.

1) Switch on machine control, temperature control of the injection molding machine and the mold cooling.

2) Move the injection unit slowly to the injection mold until the heated molding machine nozzle is pressed against the inlet bushing.

3) Set the temperature control of the Hot Runner System and the plastification unit (screw and barrel) to the operating temperature given in the plastic’s material safety data sheet.

**NOTICE**

Ideally, all hot runner heating zones and the plastification unit should reach the given temperature at the same time.

It is advisable to wait at least 15 minutes after operating temperature is reached to allow for full thermal soak prior to attempting to mold parts.
Start-up of the Hot Runner System

**WARNING**

**Danger of Unexpected Discharge**

Uneven heating of the Hot Runner System and the material may result in damage to the Hot Runner System.

When the machine reaches the required temperature (based on the temperature control indicator), let it heat soak for another fifteen minutes prior to beginning molding operations.

If the injection mold is opened, the material injected into the Hot Runner System under high pressure could be ejected causing severe injury.

Never inject the melt under high pressure into an open injection mold.

If production operation stops while Hot Runner heating is on, the melt can overheat easily. Overheated plastic may emit dangerous vapors that could eject explosively if the mold gate is opened.

Upon each interruption of production operations, retract the machine’s injection unit to make sure the pressure in the Hot Runner System can normalize through the inlet bushing.

Use personal protective equipment.

For first aid contact your medical / safety representing.

---

4) Start-up of a new and empty Hot Runner System (initial start-up):

Extrude or gently purge plastic material through the Hot Runner System and the injection mold under a low pressure of 10 bar (145 psi) to 14 bar (200 psi).

Doc003125: Mold flush

5) Start-up if there is plastic in the Hot Runner System (repeated start-up):

Retract the plastification unit from the inlet bushing and purge the unit until fresh, clean plastic material is exiting the machine nozzle, then return it back to the hot runner inlet bushing.

Doc003126: Injection unit flush
6) Set the molding parameters of shot size, time and pressure depending on the size of the molded part, runner size and material.

7) Set the valve pin open time to 0.2 to 0.5 s before injection starts.

**NOTICE**

At least one valve gate must be opened before start of injection.

8) In manual mode do a visual check (using a mirror if possible) that each valve pin opens and closes.

9) Make sure the valve pins are closed before starting the injection cycle.

10) Start the injection cycle in semi-automatic mode and verify that all machine functions are operating correctly.

11) Switch the machine to automatic mode.

**NOTICE**

The production process may require some additional fine-tuning. Record the optimum set-point values for operating cycle or on the molded part’s quality.
5.4 Color Change

If a Hot Runner System is to be used for color-change applications, it is advisable to use a clear or natural material at first shots to ease future color changes.

**NOTICE**

If possible, colors should be changed from light to dark to prevent any unnecessary waste.

5.4.1 Color Change of direct contact Nozzles (plunged through-Nozzles)

1) Remove all residues of the previously processed material from the hopper.

2) Retract the plastification unit from the inlet bushing and flush the plastification unit with the new material until no signs of the previous material are visible.

**NOTICE**

Do not change the barrel temperature in the process.
Set the temperature of the injection mold as follows:

3) While cleaning the plastification unit, increase the temperature of the hot runner manifold and the nozzles by 38°C (68 °F).

**NOTICE**

The condition is that the plastic intended for processing withstands this temperature increase.

4) Increase the mold temperature on the nozzle side by 15°C (27 °F).

---

**WARNING**

Danger of Unexpected Discharge

There is a risk of material degradation or unexpected discharge.
Once the new required temperature is achieved, leave the hot runner at least 4 minutes at the increased temperature.
Purge or extrude through the manifold.
Use personal protective equipment.
For first aid contact your medical / safety representing.
Start-up of the Hot Runner System

5) If possible, purge or extrude the new material through the open injection mold until no residues of the old material are visible.

**NOTICE**
If this is not possible, go to the next step.

6) Perform 20-30 shots at a reduced injection speed (approx. by 30%) and reduced part cooling time (approx. by 20%) to make sure that the color in the injection mold can change.

**NOTICE**
If the material cannot be purged or extruded through the open mold, you may be required to run more than 30 shots.

7) Reduce the temperature of the hot runner and the injection mold back down to normal operating temperature.

8) Run 10-20 shots to completely remove all scattered material residues from the whole injection mold.

9) Resume normal production once all evidence of the previous color has disappeared from the parts.

10) If the color is still not fully changed, repeat steps (1-7) once more or use a granulated cleaner instead of natural or clear plastic.
5.4.2 Color change of Nozzles with pre-chamber isolation without removable cavity plate

In case of difficult color change and material (e.g. from black to white) the isolation cap should be removed from the nozzle.

For such cases the injection mold is equipped with a replaceable cavity plate, so it is possible to remove the isolation caps directly on the mold.

If your injection mold is not fitted with a removable cavity plate, please contact our Customer Services.

5.4.3 Color change of Nozzles with pre-chamber isolation and replaceable cavity plate (not plunged through-Nozzles)

1) Remove residues of the previously processed material from the hopper.

2) Purge the plastification unit with the new material until no signs of the old material are visible.

   **NOTICE**
   
   Do not change the barrel temperature in the process.
   Set the temperature of the injection mold as follows:

3) While purging the plastification unit, increase the temperature of the hot runner manifold and the nozzles by 20-30 °C (36-54 °F)

   **NOTICE**
   
   The condition is that the plastic intended for processing withstands this temperature increase.

4) Switch off the Hot Runner System (manifold and nozzles).

   **NOTICE**
   
   System with Support Ring Face Fit nozzles:
   Leave the nozzles until they cool down to not more than 50 °C (122 °F), to prevent damage to the nozzle tip. (The manifold temperature may be higher).

   System with Threaded Screw Fit nozzles:
   Leave the hot runner system (manifold and nozzles) until it cool down to not more than 50 °C (122 °F), to prevent damage to the nozzle tip.
Start-up of the Hot Runner System

**WARNING**

**Danger of Unexpected Discharge**

- There is a risk of material degradation or unexpected discharge.
- Once the new required temperature is achieved, leave the hot runner at least 4 minutes at the increased temperature.
- Flush through the manifold.
- Use personal protective equipment.
- For first aid contact your medical / safety representing.

5) Slide away the cavity plate on the guiding elements.

6) Heat the nozzles to a temperature 50°C (90°F) lower than the processing temperature for the specific plastic.
   
   **Example:**
   
   Processing temperature = 260 °C (500 °F) - 50 °C (90 °F) = 210 °C (410 °F).
   
   In this case the nozzle temperature would be set to 210 °C (410 °F).

7) Remove all isolation caps using a suitable aluminum or brass tool.

8) Switch off the nozzles once again and wait until they cool down to about 50 °C (122°F).

9) Slide the cavity plate onto the guiding pins until the cavity plate engages the nozzle tips. Fasten the plates.

**WARNING**

**Hot Surfaces Hazard**

10) Heat the hot runner to normal operating temperature and produce parts using normal cycle.
5.5 Hot Runner System Switch-off

**NOTICE**

<table>
<thead>
<tr>
<th>Hazards</th>
<th>Material Damage</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Safety</strong></td>
<td><strong>instructions</strong></td>
</tr>
</tbody>
</table>

**Do not switch the machine off, if there is ethylene vinyl alcohol (EVOH) copolymer inside.**

Because of its low viscosity, it could be difficult to remove the cleaning material from the hot runner.

Switch off hot runner heating and continue injecting until the melt in the hot runner solidifies and the material stops spreading.

Solidification occurs when the cavity plates do not fill with the material any more. Then finish injecting.

**System shutoff without aftercooling could result in damage to the sealing at actuator seals.**

To avoid this, the cooling of hydraulic actuators should continue for at least 15 minutes after the system power is disconnected.

**The liquid flowing from leaking hoses or connections could result in short circuit or fire in case of contact with electric parts.**

Maintain good condition of the hoses and their connections through regular maintenance.

**The coolant and the hydraulic fluid should not be located near the electric connections and devices on the machine.**

1) Close the valve pin after the last molding shot.

2) Switch off the temperature control of the Hot Runner System.

3) Switch on mold cooling and wait until the material inside the Hot Runner System freezes, i.e. until the temperature in the manifold drops under the melting point of the processed material.

4) Retract the injection unit from the inlet bushing.

5) Flush the injection unit with a suitable granulated cleaner.

6) As soon as the granulated cleaner is completely discharged from the injection unit without any impurity, disconnect the unit.

7) Switch off the control system and the temperature control of the machine.
5.6 Storage of Hot Runner System during Shutdowns

If you want to shut down the Hot Runner System temporarily, comply with the following instructions after dismantling.

1) Treat the Hot Runner System by injecting a protective anti-corrosion agent.

   **NOTICE**
   
   We recommend the multipurpose spray CC80 by Metaflux as an anti-corrosion agent.

2) Store the mold in the horizontal position.

   **NOTICE**
   
   Use the assembly pillars (a) for a secure storing.

   This hot runner system has been shipped with assembly pillars installed to prevent damage to the actuators and valve pin bushings while being assembled or in transit. These assembly pillars must be removed prior to installing the top clamp plate.

   **WARNING**
   
   Do not use the assembly pillars as lifting device.

3) Store the Hot Runner System in a dry location.
6 Defect Identification and Troubleshooting

6.1 Defects Table

The following table contains a list of some of the most frequent molding problems, their possible causes and methods of rectify. Although the description is made to the best of our knowledge, we cannot guarantee that the problems will be successfully rectified using these measures. The list is to be used as a general guideline. The operator should make a detailed analysis of the defect on-site.

Table 6: List of defects

<table>
<thead>
<tr>
<th>Sign</th>
<th>Possible cause</th>
<th>Resolution</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sink marks on the molded part</td>
<td>Cushion too small. Sink marks close to the gate or in thick-wall areas.</td>
<td>Shot-size increase. Increase backpressure, optimize backpressure time. Increase backpressure. Decrease mold wall temperature. Decrease shot speed. Adjust gate diameter.</td>
</tr>
<tr>
<td></td>
<td>Sink marks far from the gate or in thin-wall areas.</td>
<td>Optimize backpressure time. Increase backpressure. Increase shot speed. Increase melt temperature. Increase mold wall temperature. Adjust gate diameter.</td>
</tr>
<tr>
<td>Deformation during ejection.</td>
<td></td>
<td>Increase cooling time.</td>
</tr>
<tr>
<td>Melt too cold, resulting in too high shear stress.</td>
<td></td>
<td>Increase melt temperature. Increase hot runner temperature.</td>
</tr>
<tr>
<td>Melt too hot, resulting in damage to the molded part due to high temperature.</td>
<td>Decrease material setpoint temperature. Decrease hot runner temperature (do not decrease nozzle temperature too much, could cause freezing-off). Decrease shot speed. Adjust gate diameter.</td>
<td></td>
</tr>
<tr>
<td>Temperature sensor of the hot runner (inlet bushing, manifold, nozzle).</td>
<td>Temperature sensor position: Sensor too far from heating, in a cold area. Place the sensor closer to heating. Temperature sensor function: Correct sensor type (K, J)? Correctly calibrated controller (K, J)?</td>
<td></td>
</tr>
</tbody>
</table>

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## Defect Identification and Troubleshooting

<table>
<thead>
<tr>
<th>Sign</th>
<th>Possible cause</th>
<th>Resolution</th>
</tr>
</thead>
<tbody>
<tr>
<td>Burnt smudges (brown or silver)</td>
<td>Cushion too large.</td>
<td>Reduce cushion.</td>
</tr>
<tr>
<td></td>
<td>Shear stress on the actuator too high.</td>
<td>Decrease screw rotation speed.</td>
</tr>
<tr>
<td></td>
<td>Long residence time in plastification unit under critical conditions.</td>
<td>Decrease cycle time. Increase delay at feeding. Use a smaller plastification unit.</td>
</tr>
<tr>
<td></td>
<td>Shear stress at gate too high.</td>
<td>Decrease shot speed. Check / adjust gate diameter. Remove transitions with sharp edges from the hot runner system.</td>
</tr>
<tr>
<td></td>
<td>Material too dry.</td>
<td>Check/reduce temperature/drying time. See drying instructions from material producer.</td>
</tr>
<tr>
<td></td>
<td>Differences in hot runner diameter too big Channel diameter for the melt too big (long residence time).</td>
<td>Clean the hot runner. Adjust the channels for the melt in the hot runner. Wrong, excessive dimensioning.</td>
</tr>
<tr>
<td></td>
<td>Contact between hot runner nozzles and manifold, resulting in overheating (noticeable on the high load of the heating zone).</td>
<td>Check the cut out and the contact surfaces of the hot runner and the manifold vs. the injection mold. Increase the isolation gap (Joint Z). Cut out dimensions as per the customer drawing</td>
</tr>
<tr>
<td>The cavity stops filling with material after more than 5 shots</td>
<td>Check the cut out and the contact surfaces or the hot runner and the manifold vs. the injection mold. Cold nozzles, frozen gate.</td>
<td>Check if the nozzle does not bear on the cut out (take into account thermal expansion), correct, if needed. Check injection mold, machine nozzle and inlet bushing for tightness. Check the function of heaters and replace them, if needed. Check the temperature at mold gate using a pyrometer. Increase temperature at mold gate by 28-56°C (50-100°F) above operating temperature until all cavities are filled, and decrease to normal operating temperature. Caution is required: not all plastics withstand this temperature increase. If this is the case do not set such a high temperature.</td>
</tr>
</tbody>
</table>
## Defect Identification and Troubleshooting

<table>
<thead>
<tr>
<th>Sign</th>
<th>Possible cause</th>
<th>Resolution</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Dark spots</strong></td>
<td>Granulate contaminated.</td>
<td>Prevent contamination. Maintain the plastification unit and the hot runner.</td>
</tr>
<tr>
<td></td>
<td>Melt temperature too high.</td>
<td>Decrease melt temperature. Decrease hot runner temperature.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Decrease screw rotation speed.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Decrease hot runner temperature (avoid nozzle freezing).</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Decrease dynamic pressure.</td>
</tr>
<tr>
<td></td>
<td>Too long melt residence time in the system.</td>
<td>Decrease cycle time. Increase delay at feeding. Use a smaller plastification unit.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Check the channel diameter in the hot runner.</td>
</tr>
<tr>
<td><strong>Stringing in the gate area</strong></td>
<td>Melt temperature too high.</td>
<td>Decrease melt temperature. Decrease hot runner temperature.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Decrease screw rotation speed.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Decrease hot runner temperature (avoid nozzle freezing).</td>
</tr>
<tr>
<td></td>
<td>Gate area too hot.</td>
<td>Decrease mold temperature. Check contact tightness between nozzle tip and mold.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Check mating between nozzle tip and mold.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Check isolation cap thickness.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Use colder nozzle / cone point insert.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Temperature sensor position: Sensor too far from heating, in a cold area. Place the sensor closer to heating.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Temperature sensor function: Correct sensor type (K, J)?</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Correctly calibrated controller (K, J)?</td>
</tr>
<tr>
<td><strong>Part deformation</strong></td>
<td>Injection pressure too low.</td>
<td>Increase injection pressure.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Increase cooling time.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Increase injection mold surface temperature.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Decrease regrind percentage.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Increase gate diameter.</td>
</tr>
<tr>
<td></td>
<td>Afterpressure time too short.</td>
<td>Incomplete heating.</td>
</tr>
<tr>
<td><strong>Smudges</strong></td>
<td>Material too cold.</td>
<td>Increase material temperature.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Increase injection mold surface temperature.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Increase gate or runner channel.</td>
</tr>
<tr>
<td></td>
<td>Gate or channel too small.</td>
<td>Increase injection mold surface temperature.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Increase gate or runner channel.</td>
</tr>
<tr>
<td></td>
<td>Injection mold too cold.</td>
<td>Increase gate or runner channel.</td>
</tr>
<tr>
<td></td>
<td>Nozzle hole too small.</td>
<td>Increase gate or runner channel.</td>
</tr>
<tr>
<td><strong>Matt surfaces</strong></td>
<td>Material / injection mold too cold.</td>
<td>Increase material / injection mold temperature.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Increase injection mold surface temperature.</td>
</tr>
<tr>
<td><strong>Molded parts are brittle</strong></td>
<td>Material / injection mold too cold / hot.</td>
<td>Increase injection mold temperature.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Increase injection speed.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Increase / decrease injection mold temperature.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Increase gate or flow channel.</td>
</tr>
</tbody>
</table>
## Defect Identification and Troubleshooting

<table>
<thead>
<tr>
<th>Sign</th>
<th>Possible cause</th>
<th>Resolution</th>
</tr>
</thead>
<tbody>
<tr>
<td>Actual temperature does not reach the required value:</td>
<td>Heating power does not cover heat losses due to support elements, center rings and inlet bushing. Nozzle heating in contact with the injection mold.</td>
<td>Verify correct Hot Runner System installation in mold.</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Unstable value of actual temperature</td>
<td>Unstable value of actual temperature.</td>
<td>Check temperature controller Verify correct assembly dimensions.</td>
</tr>
<tr>
<td></td>
<td>Unsuitable sensor position.</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Defective sensor.</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Unstable system contact, synchronization with injection cycle.</td>
<td></td>
</tr>
<tr>
<td>Max. heating power cannot be reached</td>
<td>Weak temperature control. Heating power limited by manual setting.</td>
<td>Increase heating power set manually.</td>
</tr>
<tr>
<td>Gate freezing</td>
<td>Gate too small.</td>
<td>Check for presence of cold / non-plastified material.</td>
</tr>
<tr>
<td></td>
<td>Contact surfaces too large.</td>
<td>Check injection mold and processing temperature.</td>
</tr>
<tr>
<td></td>
<td>Foreign body in the gate.</td>
<td>Check for presence of foreign material.</td>
</tr>
<tr>
<td></td>
<td>Nozzle run, cold plug.</td>
<td>Check temperature controller Notify Services.</td>
</tr>
<tr>
<td></td>
<td>Defective sensor or heating.</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Heating in contact with the mold.</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Irregular injection cycle.</td>
<td>Mold temp too low.</td>
</tr>
<tr>
<td>Plastic leakage</td>
<td>Temperature too high.</td>
<td>Check temperature.</td>
</tr>
<tr>
<td></td>
<td>Gate too large.</td>
<td>Increase screw decompression.</td>
</tr>
<tr>
<td></td>
<td>Matt places around the gate or at sharp edges.</td>
<td>Check pressure.</td>
</tr>
<tr>
<td></td>
<td>Contact surfaces too small.</td>
<td>Replace tips.</td>
</tr>
<tr>
<td>Matt places around the gate or at sharp edges</td>
<td>Shot speed too high.</td>
<td>Graduated injection speed profile slow – medium – fast.</td>
</tr>
<tr>
<td></td>
<td>Melt temperature too low.</td>
<td>Increase injection pressure.</td>
</tr>
<tr>
<td></td>
<td>Mold temperature too low / uneven.</td>
<td>Increase mold temperature.</td>
</tr>
<tr>
<td></td>
<td>Melt face speed too high.</td>
<td>Significantly decrease shot speed before the flow face reaches sharp edges in the mold.</td>
</tr>
</tbody>
</table>
Service and Maintenance

This section describes maintenance procedures that need to be carried out by the user. For any replaced parts, always verify contact surfaces dimensions using spotting paste, or by comparing the measurement with the part being replaced.

7.1 Maintenance of Valve Gate Systems

To provide for the continuous optimum operation of the Hot Runner System with valve gates, it is necessary to perform periodic visual inspections after every 6 months of operation or after each 150,000 shots (whichever is reached first).

7.1.1 Checklist for Valve Gate System Maintenance

1) Check of pneumatic and hydraulic distribution systems
   - Are the connections and lines properly installed?
   - Are the connections and lines intact (pipe/hose bends and fittings, damaged or worn hoses, uncontaminated distribution etc.)?
   - Is there a noticeable loss of oil?
   - Are the warranty seals intact?

2) Check of actuator cooling (only for manifold mounted actuator)
   - Are the connections and lines properly installed?
   - Is the condition of the closing plug of the cooling circuit good?
   - Are the connections and lines intact (pipe/hose bends and fittings, damaged or worn hoses, uncontaminated)?
   - Is there a visible coolant leakage?

3) Check of valve pin guide bushing
   - Is there any plastic leakage visible (leaking melt)?
   - Do the valve pins or guide bushings show any signs of wearing?
   - This inspection should be done more frequently when using materials with fillers such as glass-fiber, ceramics, minerals, talc, or metals.

4) Check of tightness between valve pin and nozzle tip
   - Is there any leakage visible (is a large circular residue created when demolding)?
   - Does the valve pin or nozzle tip show any signs of wear?

5) Test of temperature sensors (thermocouples)
   - Are all temperature sensor cables properly installed?
   - Are all cables intact (insulation, contacts)?
   - Using a surface pyrometer, verify that the controlled temperature is correct.

6) Check of cables
   - Are all heating circuit and temperature sensor cables properly installed?
   - Are all cables intact (insulation, contacts)?
   - Are any of the coolant lines clogged?
   - Are any parts of the system corroded or otherwise showing signs of wear?

7) Check of manifold – nozzle connection
   - Is there any leaking melt visible?
7.1.2 Cleaning out the Hot Runner System

If your Hot Runner System is highly contaminated you may drill it out if it is provided with replaceable runner plugs.

To drill out the hot runner you need the following tools:

- Drilling machine
- An extended drill bit. The diameter of the drill bit has to be 2,5 mm (0,1") smaller than the diameter of the hot runner. The drill bit end has to be rounded off. The brazed extension has to be concentric.
- An extended reamer. The diameter of the reamer has to be 0,05 mm (0.02") smaller than the diameter of the hot runner. The brazed extension has to be concentric.
- A spiral wire brush. The diameter of the brush has to be a little bigger than the diameter of the hot runner. The spiral wire brush can be extended through a conduit and it has to be concentric to the extension.

1) Prior to drilling, mark the maximum depth (a) at the drill bit extension, the drill bit is allowed to go into the hot runner.

(a) = Depth labeling

2) Do not drill deeper than about 13 mm (1/2") at once, then remove the material from the drill bit.

**NOTICE**

This is done to avoid the drill sticking inside the material or getting damaged.

3) Repeat this process until it reaches the end of the bore.

4) Ream the bore carefully with the reamer.

5) Brush the bore out with the spiral wire brush.
8 Actuators

8.1 Hydraulic Actuators
This section describes the disassembly and reassembly process to replace seals and adjust the valve pin for the following production series:

HB...Series

HYC...M Series

QCVG Series
8.1.1 Actuator HB Series

8.1.1.1 Technical Data

<table>
<thead>
<tr>
<th>Parameters</th>
<th>HB2508</th>
<th>HB4016</th>
</tr>
</thead>
<tbody>
<tr>
<td>Valve Pin Diameter</td>
<td>3 mm, 3.8 mm</td>
<td>5 mm, 6 mm, 8 mm, 12 mm</td>
</tr>
<tr>
<td>Nozzle Series</td>
<td>06E, 09E</td>
<td>12E, 16E, 22E</td>
</tr>
<tr>
<td>Pin Adjustment</td>
<td>+/- 1 mm</td>
<td>+/- 1.5 mm</td>
</tr>
<tr>
<td>Min/Max Close Forces</td>
<td>1963/2945N</td>
<td>5027/7540N</td>
</tr>
<tr>
<td>Min/Max Open Forces</td>
<td>443/2267N</td>
<td>3506/5259N</td>
</tr>
<tr>
<td>Min/Max Hydraulic Pressure</td>
<td>40/60 bar (600/870 psi)</td>
<td>40/60 bar (600/870 psi)</td>
</tr>
<tr>
<td>Valve Pin Stroke</td>
<td>8 mm</td>
<td>16 mm</td>
</tr>
<tr>
<td>Hydraulic Connections</td>
<td>M10x1.0</td>
<td>M10x1.0</td>
</tr>
<tr>
<td>Cooling Temperature</td>
<td>30-60°C</td>
<td>30-60°C</td>
</tr>
<tr>
<td>Cooling Connections</td>
<td>M10x1.0</td>
<td>M12x1.5</td>
</tr>
</tbody>
</table>

Recommended HB4016 Actuator Pressure Settings when Hydraulic Manifold Block is not Supplied on Hot Runner

<table>
<thead>
<tr>
<th>Pin Diameter (mm)</th>
<th>Actuator Pressure (PSI)</th>
<th>Bar</th>
</tr>
</thead>
<tbody>
<tr>
<td>5</td>
<td>300</td>
<td>20</td>
</tr>
<tr>
<td>6</td>
<td>450</td>
<td>30</td>
</tr>
<tr>
<td>8 &amp; 12</td>
<td>600</td>
<td>40</td>
</tr>
</tbody>
</table>

Thermocouple and Position Sensor optional on all models. Maximum 3 Actuators per cooling zone on all models.

NOTICE

To ensure long life and continued flawless operation of the actuator, we recommend using a service medium that complies with the requirements of classification 21/18/13 pursuant to ISO 4406.

The coolant should be properly modified e.g. filtered water with an anti-corrosion and frost proof agent.

After switching off the Hot Runner heater, the cooling for the actuator should remain on for at least 15 minutes, to avoid damage to the Actuator seals and the position sensor.
8.1.1.2 Exploded View

### Replacement Items

<table>
<thead>
<tr>
<th>Item</th>
<th>Description</th>
<th>Qty</th>
<th>Item</th>
<th>Qty</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Seal Kit</td>
<td>1</td>
<td>SKT40B</td>
<td>1</td>
</tr>
<tr>
<td>1.1</td>
<td>Piston Seal</td>
<td>1</td>
<td>K30-40-40-32-3.2</td>
<td>1</td>
</tr>
<tr>
<td>1.2</td>
<td>Rod Seal</td>
<td>1</td>
<td>CT-2038-V3664</td>
<td>1</td>
</tr>
<tr>
<td>1.3</td>
<td>O-Ring Seal</td>
<td>1</td>
<td>VIOR45X2FPM80</td>
<td>1</td>
</tr>
<tr>
<td>1.4</td>
<td>Retaining Ring</td>
<td>1</td>
<td>DIN472-45X1.75</td>
<td>1</td>
</tr>
<tr>
<td>1.5</td>
<td>EIS RESTRICTOR</td>
<td>1</td>
<td>EIS-TM-04-010</td>
<td>1</td>
</tr>
<tr>
<td>2</td>
<td>Position Sensor, including 1 m Cable</td>
<td>1</td>
<td>HESASSY01</td>
<td>1</td>
</tr>
<tr>
<td>2</td>
<td>Position Sensor, including 3 m Cable</td>
<td>1</td>
<td>HESASSY03</td>
<td>1</td>
</tr>
<tr>
<td>2</td>
<td>Position Sensor, including 5 m Cable</td>
<td>1</td>
<td>HESASSY05</td>
<td>1</td>
</tr>
<tr>
<td>3</td>
<td>Plug</td>
<td>2</td>
<td>VSTI10X1ORVITCF</td>
<td>N/A</td>
</tr>
</tbody>
</table>

### Torque Chart

<table>
<thead>
<tr>
<th>Parts</th>
<th>Thread Size</th>
<th>Wrench Size</th>
<th>Nm</th>
<th>ft-lbs</th>
</tr>
</thead>
<tbody>
<tr>
<td>DIN912-1212MISO4762</td>
<td>M5</td>
<td>HEX4</td>
<td>8</td>
<td>6</td>
</tr>
<tr>
<td>DIN912-1212MISO4762</td>
<td>M6</td>
<td>HEX5</td>
<td>14</td>
<td>10</td>
</tr>
<tr>
<td>DIN91345HISO4082</td>
<td>M6</td>
<td>HEX4</td>
<td>10</td>
<td>7</td>
</tr>
<tr>
<td>DIN912M3X8ISO4762</td>
<td>M3</td>
<td>HEX2.5</td>
<td>1.5</td>
<td>1.1</td>
</tr>
<tr>
<td>VSTVI10X1ORVITCF</td>
<td>M10</td>
<td>HEX5</td>
<td>6</td>
<td>4.5</td>
</tr>
<tr>
<td>VSTI10X1ORVITCF</td>
<td>M10</td>
<td>HEX5</td>
<td>14</td>
<td>10</td>
</tr>
</tbody>
</table>

Master Language is English

Hot Runner System Installation Guide

SVC-17-0001_EN-Rev11

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8.1.1.3 Tools for Assembling and Disassembling the Actuator

The following overview contains a list of special tools required for the assembly and disassembly of the Actuator and to replace seals. The assembly and disassembly tools are identified in the table below.

### Assembly and Disassembly Tools - ATCYL##

<table>
<thead>
<tr>
<th>Pos.</th>
<th>Description</th>
<th>HB2508 Tools</th>
<th>HB4016 Tools</th>
</tr>
</thead>
<tbody>
<tr>
<td>T3</td>
<td>Valve pin Disassembly tool</td>
<td>ATCYL0805</td>
<td>ATCYL0303</td>
</tr>
<tr>
<td>T4</td>
<td>Installation cone</td>
<td>ATCYL0203</td>
<td>ATCYL0304</td>
</tr>
<tr>
<td>T5</td>
<td>Spread tube</td>
<td>ATCYL0202</td>
<td>ATCYL0105</td>
</tr>
<tr>
<td>T6</td>
<td>Calibration sleeve</td>
<td>ATCYL0204</td>
<td>ATCYL0107</td>
</tr>
<tr>
<td>T7</td>
<td>Piston and Cap Assembly tool</td>
<td>ATCYL45</td>
<td>ATCYL27</td>
</tr>
</tbody>
</table>

**NOTICE**

These tools are not included with the Hot Runner system and must be ordered from Synventive separately.
8.1.1.4 Dismounting the Actuators of the HB Series

**DANGER**

**Danger to Life by Hydraulics**

Serious personnel injury or death can result from connecting or disconnecting hydraulic hoses under pressure.

Hydraulic works must be carried out by qualified persons.

Use personal protective equipment, such as face protection, headgear, anti oil gloves.

The hoses in Hot Runner Systems and the injection mold are under high pressure and high temperatures.

Before disconnecting or connecting any Hydraulic hoses:

- The injection machine / hydraulic pump must be shut down.
- The electrical disconnect properly locked out.
- Pressure from the hoses must be removed.

*For first aid contact your medical / safety representing*

**Dismounting Procedure**

1) Locate and remove the four screws (F) on top of the actuator housing (A).
2) Push the whole actuator housing (A) in the direction specified on the pin release indicator label (I).
   This will disengage the actuator from the valve pin.
3) Lift the entire actuator housing (A) out of the assembly. Removal of the cooling plate (B) is not required when removing the actuator housing assembly.

4) Unscrew and remove the M6 socket head cap screws (R).

5) Lift out the mounting plate (S).

8.1.1.5 Seal Replacement

Disassembly

1) Remove Snap Ring (A).

<table>
<thead>
<tr>
<th>LETTER</th>
<th>PART</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>Snap ring</td>
</tr>
<tr>
<td>B</td>
<td>Piston seal</td>
</tr>
<tr>
<td>C</td>
<td>Rod seal</td>
</tr>
<tr>
<td>D</td>
<td>Valve piston</td>
</tr>
<tr>
<td>E</td>
<td>Piston</td>
</tr>
<tr>
<td>F</td>
<td>Piston cap</td>
</tr>
<tr>
<td>G</td>
<td>O-Ring</td>
</tr>
<tr>
<td>J</td>
<td>Actuator housing</td>
</tr>
</tbody>
</table>
2) Remove piston (E) and cap (F) with a valve pin.

3) Separate piston (E) from cap (F).

4) Dismount seals:
   - Rod seal (C)
   - Piston seal (B)
   - O-Ring (G)

5) After disassembly of the sealing elements, the original seals must be replaced. See the following sections for additional details.

8.1.1.6 Cooling Plate Maintenance

Cooling Plate Removal
1) With the actuator dismounted, lift up the cooling plate (2).
Cleaning the Cooling Plate
Removing the cooling plate plug (VST10X10RVITCF) facilitates the cleaning of the cooling plate.
1) Remove the cooling plate plug (3) with a HEX5 wrench.
2) Clean the cooling plate (2).
3) Replace plug by torqueing to 6 Nm.

Replace of the Bleeder
The seal kit is also supplied with a replacement Bleeder (B). Replace the Bleeder (B) at the same intervals as when replacing the actuator seals.

1) Unscrew and remove the Plug (A).
2) Unscrew and remove the Bleeder (B).
3) Insert the Bleeder (B) into the housing and torque.

**NOTICE**
Use a torque wrench for a torque of 2 Nm (2.2 ft-lbs).
4) Insert Plug (A) and torque.

**NOTICE**
Use a torque wrench for a torque of 12 Nm (8.9 ft-lbs).
8.1.1.7 Assembling the Actuator HB Series

Installing the Piston Seal

To mount the piston seal (1.9.1) on the piston (1.2) proceed as follows:

1) Fit the mounting cone (T4) on the piston (1.2).

   NOTICE
   After disassembly of the seal, the original seals should be replaced.

2) Lubricate the two elements of the piston seal (1.9.1) with hydraulic oil or white grease.
   - O-ring (1.9.1) (a)
   - Sealing element (1.9.1) (b)

3) Mount the O-ring (1.9.1) (a) into the seal groove of the piston (1.2).

4) Using the spreader sleeve (T5) and the mounting cone (T4), push the sealing element (1.9.1) into the seal groove of the piston (1.2).

5) The sealing element (1.9.1) (b) is placed in the seal groove of the piston (1.2) above the O-ring (1.9.1) (a).

6) Insert the piston in the calibration sleeve (T6). This will precisely align the piston seal (1.9.1) with the piston (1.2).
Reassembly

1) Replace rod seal (C) and O-ring (G).

<table>
<thead>
<tr>
<th>LETTER</th>
<th>PART</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>Snap Ring</td>
</tr>
<tr>
<td>B</td>
<td>Piston Seal</td>
</tr>
<tr>
<td>C</td>
<td>Rod Seal</td>
</tr>
<tr>
<td>D</td>
<td>Valve Piston</td>
</tr>
<tr>
<td>E</td>
<td>Piston</td>
</tr>
<tr>
<td>F</td>
<td>Piston Cap</td>
</tr>
<tr>
<td>G</td>
<td>O-Ring</td>
</tr>
<tr>
<td>T7</td>
<td>Piston and Cap Assembly Tool</td>
</tr>
<tr>
<td>J</td>
<td>Actuator Housing</td>
</tr>
</tbody>
</table>

2) Assemble piston (E) to cap (F).

3) Insert piston (E) and cap (F) into actuator housing (J).

4) Reinsert snap ring (A).
Mounting the Actuator on a Manifold

1) Position the mounting plate on the manifold.
2) Lubricate the thread of the hexagon socket head cap screws (5) with high temperature assembly paste (anti-seize compound).

**NOTICE**

Anti-seize compound is an important measure to prevent thread corrosion due to aggressive gasses which could be released during plastic processing.

3) Screw the mounting plate (3) onto the manifold with the socket head cap screws (5) M6x14.
4) Place the cooling plate (2) on the mounting plate (3).

5) Insert valve pin (6) into bushing (7).

6) Slide the actuator so it engages the pin head slots of the piston.
7) Lubricate the thread of the socket head cap screws (F) with high temperature assembly paste (anti-seize compound).

**NOTICE**

Anti-seize compound is an important measure to prevent thread corrosion due to aggressive gasses which could be released during plastic processing.

8) Secure the actuator with socket head cap screws (F).
9) Tighten the socket head cap screws (F) in an “X” pattern (a, d, c, and b). Use a torque wrench to torque to specifications listed in the table in section 13.

**NOTICE**

Do not use cylinder housing as support to get the system into the mold, (no hammering e.g.)
8.1.1.8 Position Sensor

The Position Sensor (J) provides the user with additional information such as if the pins are in the fully open, fully closed or in an intermediate position.

**NOTICE**
The position sensor (J) has a maximum temperature rating of 150 degrees C and a maximum cable (K) rating of 200 degrees C.

**Removal**

**NOTICE**
Before removal and installation check that the cable (K) is not pinched and is free of tension.

1) Locate and remove the three M3 screws (L) on the side of the actuator housing (A).
2) Gently remove the position sensor (J) and cable (K) making sure not to touch the printed circuit board underneath.

**Installation**

**NOTICE**
When reinstalling make sure the mating surface is clean of oil and debris.

1) Place sensor in the correct location and install the three M3 screws (L).
2) Torque M3 screws to 1.5 Nm.
8.1.1.9 Valve Pin Adjustment

**WARNING**

**Hot Surfaces Hazard**

Contact between the skin and hot surfaces could result in burns.

Use personal protective equipment, such as gloves, apron, sleeves and face protection, to guard against burns. When servicing or handling the hot runner system outside the manifold plates or the injection molding machine, care must be taken to heed the hot surface exposure warnings.

1) Bring the manifold and mold to the operating temperatures for the material to be molded.
2) Insert the adjustment tool (T14), Synventive part number ATA01, on the top of the actuator.
3) Loosen the locking screw (M6).
4) Close the valve gate by applying pneumatic pressure on the closed port.
5) Rotate the adjusting screw (AJS) in a clockwise (forward) direction to pre-set the valve pin position.
   - Conical Gate: Turn the adjusting screw (AJS) clockwise until the valve pin seats firmly in the gate. When valve pin position is achieved, then turn adjusting screw clockwise (forward) an additional 1/10th of a turn in order to achieve proper valve pin position during operation. 1/10th increments are provided adjacent to the screw for reference.
   - Cylindrical Gate: Turn the adjusting screw (AJS) clockwise until the valve pin protrudes beyond the gate according to dimension specified on general assembly drawing.

**NOTICE**

One full (360 degree) rotation equals one millimeter of adjustment. Stop if heavy resistance is felt. Do not overtighten as damage to components may occur. Remove pneumatic pressure and loosen the adjusting screw (AJS).

6) Remove adjustment tool (T14) and tighten locking screw (M6) to the specification on the locking screw.

**NOTICE**

It is necessary to always adjust the pin position by rotating the adjusting screw (AJS) in a clockwise (forward) direction in order to achieve proper pin position during operation. In the event that the actuator was “over adjusted” or needs re-adjustment, first remove pressure from the “close” port, fully loosen the adjusting screw (AJS) then return to step 4.

**NOTICE**

Torque Value locking screw (M6)
HB2508 - 14 Nm / HB4016 - 18 Nm
## 8.1.2 Actuator HCY4520M04 Series

### 8.1.2.1 Technical Data HCY4520M04-F, HCY4520M04-R

<table>
<thead>
<tr>
<th>Actuator, bolted to manifold.</th>
</tr>
</thead>
</table>

**Valve pin Operation**

<table>
<thead>
<tr>
<th>Operation medium</th>
<th>hydraulic</th>
</tr>
</thead>
<tbody>
<tr>
<td>Operation pressure</td>
<td>120 bar (1740 psi)</td>
</tr>
<tr>
<td>Flow rate</td>
<td>3 l/min / 40 bar (580 psi)</td>
</tr>
<tr>
<td>Valve pin response time</td>
<td>~0.5 s / 40 bar (580 psi)</td>
</tr>
<tr>
<td>Valve pin stroke</td>
<td>20 mm</td>
</tr>
<tr>
<td>Valve pin adjustment</td>
<td>± 1.5 mm via adjustment threads from outside</td>
</tr>
</tbody>
</table>

| Closing force | 14100 N / 120 bar (1740 psi) |
| Opening force | 14100 N / 120 bar (1740 psi) |
| Connections | M 12 x 1.5 (8-L) |

**Cooling**

<table>
<thead>
<tr>
<th>Medium</th>
<th>Cooling water</th>
</tr>
</thead>
<tbody>
<tr>
<td>Flow rate</td>
<td>6 l/min</td>
</tr>
<tr>
<td>Pressure</td>
<td>max. 8 bar (116 psi)</td>
</tr>
<tr>
<td>Temperature</td>
<td>30 - 60 °C (86 °F - 140 °F)</td>
</tr>
<tr>
<td>Temp. difference IN/OUT</td>
<td>max. 5 °C</td>
</tr>
<tr>
<td>Connections</td>
<td>M 12 x 1.5 (8-L) max. 3 actuators in a row</td>
</tr>
</tbody>
</table>

**Valve Pin**

<table>
<thead>
<tr>
<th>Valve gate pin</th>
<th>Ø 6 mm, Ø 8 mm</th>
</tr>
</thead>
<tbody>
<tr>
<td>Attachment</td>
<td>Quick coupling, antirotation</td>
</tr>
</tbody>
</table>

---

**NOTICE**

To ensure long life and continued flawless operation of the actuator, we recommend using a service medium that complies with the requirements of classification 21/18/13 pursuant to ISO 4406.

The coolant used should be properly modified, e.g. filtered water with an anti-corrosion and frost-proof agent.

After switch off the hot runner heater, the cooling for the actuator have to be turned on for at least 15 minutes, to avoid damages of the actuator sealing.
8.1.2.2 Exploded View HYC4520M04 Series

HYC4520M04 Series: This actuator is for position monitoring with position sensor unit.

In this section the actuator parts are identified with the numbers indicated in the following figure, which shows the components.

**NOTICE**

Always tighten the screws to the torques specified in the respective table (section 13).

<table>
<thead>
<tr>
<th>No.</th>
<th>Qty.</th>
<th>Description</th>
<th>Item</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>1</td>
<td>Cylinder housing complet</td>
<td>HYC4520HC01</td>
</tr>
<tr>
<td>1.1</td>
<td>1</td>
<td>Cylinder housing</td>
<td>HYC4520CH02</td>
</tr>
<tr>
<td>1.2</td>
<td>1</td>
<td>Piston</td>
<td>HYC4520PI02</td>
</tr>
<tr>
<td>1.3</td>
<td>1</td>
<td>Adjustment screw</td>
<td>HYC4520AS01</td>
</tr>
<tr>
<td>1.4</td>
<td>1</td>
<td>Adjustment screw core</td>
<td>HYC4520AC01</td>
</tr>
<tr>
<td>1.5</td>
<td>1</td>
<td>Spacer</td>
<td>HYC4520SP01</td>
</tr>
<tr>
<td>1.6</td>
<td>-</td>
<td>Vacant</td>
<td></td>
</tr>
<tr>
<td>1.7</td>
<td>1</td>
<td>Position sensor unit</td>
<td>DFPS02</td>
</tr>
<tr>
<td>1.8</td>
<td>1</td>
<td>Seal kit (complet)</td>
<td>HYC4520SK01</td>
</tr>
<tr>
<td>1.8.1</td>
<td>1</td>
<td>Piston seal</td>
<td>2G2/45-37,5-3,2</td>
</tr>
<tr>
<td>1.8.2</td>
<td>2</td>
<td>Rod seal</td>
<td>C1-2038-V3664</td>
</tr>
<tr>
<td>1.8.3</td>
<td>2</td>
<td>Guiding element</td>
<td>FB2,3-1,5L70,5</td>
</tr>
<tr>
<td>1.8.4</td>
<td>1</td>
<td>O-ring</td>
<td>VIOR37x4FPM80</td>
</tr>
<tr>
<td>1.8.5</td>
<td>2</td>
<td>Back up ring</td>
<td>Y22331PS030</td>
</tr>
<tr>
<td>1.9</td>
<td>1</td>
<td>Adapter</td>
<td>HYC4520AD02</td>
</tr>
<tr>
<td>1.10</td>
<td>3</td>
<td>Socket head cap screw</td>
<td>DIN912-M6x20-12.9</td>
</tr>
<tr>
<td>1.11</td>
<td>2</td>
<td>Socket head cap screw</td>
<td>DIN912-M4x12-12.9</td>
</tr>
<tr>
<td>1.12</td>
<td>1</td>
<td>Socket set screw</td>
<td>DIN913-M8x16-45H</td>
</tr>
<tr>
<td>1.13</td>
<td>4</td>
<td>Socket head cap screw</td>
<td>Din912 M4x16-12.9</td>
</tr>
<tr>
<td>2</td>
<td>1</td>
<td>Cooling plate (F) full contact surface</td>
<td>HYC4018CP01</td>
</tr>
<tr>
<td>2</td>
<td>1</td>
<td>Cooling plate (R) reduced contact surface</td>
<td>HYC4018CP02</td>
</tr>
<tr>
<td>3</td>
<td>1</td>
<td>Spacer plate</td>
<td>HYC4013MP02</td>
</tr>
<tr>
<td>4</td>
<td>4</td>
<td>Socket head cap screw</td>
<td>DIN912-M6x95-12.9</td>
</tr>
<tr>
<td>5</td>
<td>4</td>
<td>Socket head cap screw</td>
<td>DIN912-M6x14-12.9</td>
</tr>
</tbody>
</table>
8.1.2.3 Tools for Assembling and Disassembling the Actuator

The following overview contains a list of special tools needed for the assembly and disassembly of the actuator.

In this section assembly and disassembly tools are identified as shown in this figure, which shows the components.

### Assembly and Disassembly Tools - ATCYL04

<table>
<thead>
<tr>
<th>No.</th>
<th>Description</th>
<th>Item</th>
</tr>
</thead>
<tbody>
<tr>
<td>(T01)</td>
<td>Adjustment Tool cpl.</td>
<td>ATCYL0301</td>
</tr>
<tr>
<td>(T01.1)</td>
<td>Body</td>
<td>ATCYL030101</td>
</tr>
<tr>
<td>(T01.2)</td>
<td>Handle</td>
<td>ATCYL030102</td>
</tr>
<tr>
<td>(T02)</td>
<td>Fitting nut cpl.</td>
<td>ATCYL0402</td>
</tr>
<tr>
<td>(T02.1)</td>
<td>Fitting nut</td>
<td>ATCYL040201</td>
</tr>
<tr>
<td>(T02.2)</td>
<td>Socket</td>
<td>ATCYL040202</td>
</tr>
<tr>
<td>(T03)</td>
<td>Installation cone</td>
<td>ATCYL0404</td>
</tr>
<tr>
<td>(T04)</td>
<td>Spread tube</td>
<td>ATCYL0405</td>
</tr>
<tr>
<td>(T05)</td>
<td>Calibration tube</td>
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<tr>
<td>(T06)</td>
<td>Assembly tool cpl.</td>
<td>ATCYL0407</td>
</tr>
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<td>Assembly tool body.</td>
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<td>Handle</td>
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<tr>
<td>(T06.3)</td>
<td>Parallel pin DIN6325-3m 6x10</td>
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<tr>
<td>(T07)</td>
<td>Assembly tool</td>
<td>ATCYL0408 AS</td>
</tr>
<tr>
<td>(T08)</td>
<td>Cylinder pin</td>
<td>ATCYL0104</td>
</tr>
</tbody>
</table>

**NOTICE**

These tools are not included with the Hot Runner System and must be ordered from Synventive separately.
8.1.2.4 Enhancements, Options and Accessories

<table>
<thead>
<tr>
<th></th>
<th>Cooling Full for Valve Pin Guide</th>
<th>Cooling Reduced for Valve Pin Guide</th>
<th>Position Sensor Unit</th>
</tr>
</thead>
<tbody>
<tr>
<td>HYC4520M04-F</td>
<td>●</td>
<td>–</td>
<td>●</td>
</tr>
<tr>
<td>HYC4520M04-R</td>
<td>–</td>
<td>●</td>
<td>●</td>
</tr>
</tbody>
</table>

- Standard
○ Optional
- not possible

**Cooling Plate with Contact Surface to the Valve Pin Guide**

HYC4520M04-F with cooling plate HYC4018CP01 for full contact surface to the valve pin guide.

HYC4520M04-R with cooling plate HYC4018CP02 for reduced contact surface to the valve pin guide.
8.1.2.5 Disassembling the Actuator HYC4520M04 Series

DANGER

Danger to Life by Hydraulic

Serious personal injury or death can result from connecting or disconnecting hydraulic hoses under pressure.

Hydraulic works must be carried out by qualified persons.

Use personal protective equipment, face protection, headgear, anti oil gloves.

The hoses in Hot Runner systems and the injection mold are under high pressure and high temperatures.

Before disconnecting or connecting any hydraulic hoses:

- The Injection Molding Machine must be shut down.
- The electrical disconnect properly locked out.
- The hoses have to be depressurized.

In Emergency case - Switch all systems off.

1) Close the valve pin gate, so that the piston (1.2) is in bottom position.
2) Remove the hydraulic hoses from the actuator connection ports.

3) Unscrew and remove the socket head cap screws (4).
4) Slide the actuator in the indicated direction (Sign, Pin Release) on top of the actuator.

**NOTICE**

This will disengage the actuator from the valve pin.

Regular positioning of the actuator on the cooling plate (A)

**NOTICE**

The movement depends on the direction of connections for coolant distribution.

Positioning of the actuator crosswise to the cooling plate (B)

**NOTICE**

In case of mounting crosswise on the cooling plate, it is possible to disengage the actuator from the valve pin in opposite direction too.

5) Remove the actuator housing (1) from the cooling plate (2).
Disassembling the Adjustment Screw Assembly and Piston

1) Unscrew the two socket head cap screws (1.11).
2) Remove the position sensor unit (1.7).

3) Unscrew the three socket head cap screws (1.10).
4) Remove the spacer (1.5).

5) Loosen the socket set screw (1.12).

6) Using the assembly aid (T06), unscrew the adjustment screw (1.3) inclusive adjustment screw core (1.4) out of the actuator housing (1.1).
NOTICE

During the work at the piston, make sure the magnetic core will not be damaged.

7) Screw the fitting nut (T02) into the actuator housing (1.1).

8) Install a valve pin (VP) so it engages into the slots of the piston (1.2).

9) Pull the piston (1.2) with the valve pin (VP) while turning the fitting nut (T02) until the piston (1.2) is released.

10) Dismount the two elements of the piston seal (1.8.1).
    - O-ring (1.8.1) (a)
    - sealing element (1.8.1) (b)

11) Dismount the following seals out of the actuator housing (1.1).
    (1.8.2) Rod seal
    (1.8.3) Guiding element
    (1.8.5) Back up ring
Dismounting the Adjustment Screw Seal Kit

1) To unscrew the adjustment screw core (1.4) from the adjustment screw (1.3), insert this assembly in the assembly tool (T07).

2) Insert cylinder pins (T08) in the respective holes of the assembly tool (T07).

3) Unscrew the four socket head cap screws (1.13).

4) Pull the cylinder pins (T08) from the holes.
5) Pull the adjustment screw (1.3) from the assembly aid (T07).

6) Pull out the complete sealing kit from the adjustment screw assembly (1.3), (1.4):
   - (1.8.2) Rod seal
   - (1.8.3) Guiding element
   - (1.8.4) O-ring
   - (1.8.5) Back up ring
8.1.2.6 Assembling the Actuator HYC4520M04 Series

Installing the Piston Seal

To mount the piston seal (1.8.1) on the piston (1.2), proceed as follows:

1) Fit the mounting cone (T03) on the piston (1.2).

**NOTICE**

During the work at the piston, make sure the magnetic core will not be damaged.

2) Mount the O-ring (1.8.1) (a) into the seal groove of the piston (1.2).

3) Lubricate the sealing element (1.8.1) (b) of the piston (1.2) with hydraulic oil or white grease.

4) Using the spreader sleeve (T04) and the mounting cone (T03), push the sealing element (1.8.1) (b) into the seal groove of the piston (1.2).

**NOTICE**

The sealing element (1.8.1) (b) is placed in the seal groove of the piston (1.2) above the O-ring (1.8.1) (a).

5) Insert the piston (1.2) uniformly in the calibration sleeve (T05).

**NOTICE**

This will precisely align the piston seal (1.8.1) with the piston (1.2).
Installing the Piston into the Actuator Housing

1) Apply Loctite 272 adhesives to the thread of the adapter (1.9) at the position sensor side.

2) Screw the magnetic core of the position sensor (1.7) into the adapter (1.9).

3) Apply Loctite 272 adhesives to the thread of the adapter (1.9) at the piston side.

4) Screw the premounted magnetic core (1.7) and adapter (1.9) with a screw M2 (b), a counter nut (a) and allen key into the piston (1.2).

5) Lubricate the following seals with hydraulic oil or white grease.
   (1.8.2) Rod seal
   (1.8.3) Guiding element
   (1.8.5) Back up ring

6) Insert seals (1.8.2) (1.8.3) (1.8.5) into the actuator housing (11).

7) Fix spacer (1.5) with three socket head cap screws (1.10) secured by Loctite adhesives.

8) Position the fitting nut (T02.1) (T02.2) over the piston (1.2).
NOTICE
During mounting of the piston (1.2), it is important the piston is not jammed in the actuator housing (1.1).

9) Install the piston (1.2) while turning clockwise the fitting nut (T02.1) (T02.2) into the actuator housing (1.1) up to the stop.

10) Position piston by using the adjustment tool (T01).

NOTICE
Ensure, valve pin slot (a) in piston is facing in the direction of hydraulic supplies (b).

11) Insert the position sensor (1.7) into the octagonal cutout of the piston.

NOTICE
The cable at the position sensor (1.7) has to be facing in the direction of hydraulic supplies (b) at the actuator housing (1.1).

12) Fix position sensor unit (1.7) with two socket head cap screws (1.11) secured by Loctite adhesives.
Installing the Adjustment Screw Assembly into the Actuator Housing

**NOTICE**
After disassembly of the system, the original sealing elements should be replaced.

1) Lubricate the following seals with hydraulic oil or white grease.
   (1.8.2) Rod seal
   (1.8.3) Guiding element
   (1.8.4) O-ring
   (1.8.5) Back up ring

2) Insert seals into adjustment tool assembly (1.3) (1.4).

3) Put upper adjustment tool (1.3) and lower adjustment tool core (1.4) into assembly tool assembly tool (T07).
4) Secure against rotation with cylinder pins Ø 5 mm (T08).
5) Lubricate the thread of the socket head cap screws (1.13) with Loctite adhesives.
6) Screw adjustment tool (1.3) and adjustment tool core (1.4) together by using four socket head cap screws (1.13).

**NOTICE**
Use torque wrench with wrench insert and the torque specified in the respective table in section 13.

7) Pull the cylinder pins (T08) out of the holes.
8) Take the adjustment screw assembly (1.3) (1.4) out of the assembly tool (T07).
9) Lubricate all seals of the adjustment tool assembly (1.3) (1.4) with hydraulic oil or white grease.
   (1.8.2) Rod seal
   (1.8.3) Guiding element
   (1.8.4) O-ring
   (1.8.5) Back up ring

10) By using assembly tool cpl. (T06) screw adjustment screw (1.3) (1.4) into cylinder housing (1.1).

11) Screw the adjustment screw assembly (1.3) (1.4) to basic position, 1.5 mm deep into the actuator housing to the basic position.

12) Fix the adjustment screw assembly (1.3) (1.4) with the hexagon socket set screw (1.12).

   NOTICE
   Use a torque wrench for a torque of 15 Nm (11 ft-lbs).
Mounting the Actuator on the Manifold

**Insertion of valve pin head into piston cutout**

**NOTICE**

Do not use the cylinder housing as support to get the system into the mold (no hammering e.g.).

This sign refers to the direction of valve pin release.

---

1) Slide the actuator so it engages the pin head slots (b).
2) Place the actuator on the cooling plate (2).
3) Move the actuator so that the valve pin head (a) slides in the final position inside the piston (1.2) cutout (b).

---

4) Lubricate the thread of the socket head cap screws (4) with high-temperature assembly paste (anti-seize compound).

**NOTICE**

This is an important measure to prevent thread corrosion due to aggressive gases, which could be released during plastics processing.

5) Screw the actuator with socket head cap screws (4).

**NOTICE**

Tighten socket head cap screws (4) in an X pattern (a, d, c, b).
Use torque wrench with wrench insert and the torque specified in the respective table in section 13.
8.1.2.7 Valve Pin Height Adjustment HYC4520M Series

Precondition for the following steps are to be performed with the Hot Runner installed in the mold, and the system at operating temperature.

**Hot Surfaces Hazard**

Contact between the skin and hot surfaces could result in burns.

Use personal protective equipment, such as gloves, apron, sleeves and face protection, to guard against burns.

When servicing or handling the hot runner system outside the manifold plates or the injection molding machine, care must be taken to heed the hot surface exposure warnings.

For first aid contact your medical / safety representing

**Hazard of Material Damage**

The following steps are to be performed with the Hot Runner installed in the mold, and the system at operating temperature.

Actuator cooling must be on to prevent damage to the actuator seals.

- Cooling medium temperature: min. 30 °C max. 60 °C
- Pressure cooling medium max. 8 bar
- Temp. difference IN/OUT max. 5 °C

After switch off the hot runner heater, the cooling for the actuator have to be turned on for at least 15 minutes, to avoid damages of the actuator sealing.
Height Adjustment of Cylindrical shut-off Valve Pin

**WARNING**

Hot Surfaces Hazard

Contact between the skin and hot surfaces could result in burns.

1) Loosen the socket set screw (1.12).
2) Close the valve gate by pressure on the hydraulic connection (A) (closed).

**NOTICE**

For part identification see the related exploded views in the actuator section 8.1.2.2

3) Turn the adjustment screw assembly (1.3) (1.4) with the suitable pin (a) in the required position.

HYC4520M series - dowel pin (a) 5 mm Ø (0.197”)

**NOTICE**

HYC4520M series valve pin height can be adjusted within +/- 1.5 mm (0.06”).

Turning one hole forward results in a height adjustment of 0.25 mm at the valve pin.

4) Fix the adjustment screw assembly (1.3) (1.4) with the socket set screw (1.12) in the actuator housing (1.1) to the torque value below.

**NOTICE**

Torque value 15 Nm (11 ft-lbs)
Height Adjustment of Conical shut-off Valve Pin

**WARNING**

**Hot Surfaces Hazard**

Contact between the skin and hot surfaces could result in burns.

1) Loosen the socket set screw (1.12).
2) Close the valve gate by pressure on the hydraulic connection (A) (closed).
3) Turn the adjustment screw assembly (1.4) (1.3) with the suitable dowel pin (a) clockwise to the front position.

HYC4520M series - dowel pin (a) Ø 5 mm (0.197”)

**NOTICE**

Turning one hole forward results in a height adjustment of 0.25 mm at the valve pin.

HYC4520M series valve pin height can be adjusted within +/- 1.5 mm (0.06”).

4) Move the valve gate pin in the valve gate closed position with a reduced air pressure of approx. 2.76 bar (40 psi) at the ‘CLOSED‘ hydraulic connection (b).

5) Turn the adjustment screw assembly (1.4) (1.3) using the suitable pin (a) counter clockwise until you feel resistance.

**NOTICE**

Now the valve pin is adjusted without preload.

6) Depressurize the actuator and turn the adjustment screw assembly (1.4) (1.3) clockwise in the range from a half to a full pitch (0.13 mm, 0.005” - 0.25 mm, 0.010”) of hole to preload the valve pin

7) Fix the adjustment screw assembly (1.4) (1.3) with the socket set screw (1.12) in the actuator housing (1.1) to the torque value below.

**NOTICE**

Torque value 15 Nm (11 ft-lbs)
### 8.1.3 Actuator QCVG16M04/-MF04/-M06/-M07

#### 8.1.3.1 Technical Data QCVG 16 Series

<table>
<thead>
<tr>
<th>Valve pin operation</th>
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</tr>
</thead>
<tbody>
<tr>
<td>Operation medium</td>
<td>Hydraulic</td>
</tr>
<tr>
<td>Pressure range</td>
<td>35 - 100 bar (500 - 1500 psi)</td>
</tr>
<tr>
<td>Pressure max.</td>
<td>103 bar (1500 psi)</td>
</tr>
<tr>
<td>Operating flow rate - Instantaneous</td>
<td>1.8 l/min</td>
</tr>
<tr>
<td>Operating flow rate - Continuous</td>
<td>0.3 l/min At full open position only</td>
</tr>
<tr>
<td>Valve pin response time</td>
<td>Application dependent</td>
</tr>
<tr>
<td>Valve pin stroke</td>
<td>16 mm</td>
</tr>
<tr>
<td>Adjustment</td>
<td>± 1 mm via adjustment nut from top</td>
</tr>
<tr>
<td>Connections</td>
<td>1/8 NPT</td>
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</tbody>
</table>

#### Cooling

<table>
<thead>
<tr>
<th>Medium</th>
<th>Clamping Plate Cooling (max. 100°C / 210 °F)</th>
</tr>
</thead>
</table>

#### Valve pin

<table>
<thead>
<tr>
<th>Valve pin diameter</th>
<th>Ø 5 mm, Ø 6 mm, Ø 8 mm</th>
</tr>
</thead>
<tbody>
<tr>
<td>Attachment</td>
<td>Quick coupling, antirotation</td>
</tr>
</tbody>
</table>

---

**NOTICE**

To ensure long life and continued flawless operation of the actuator, we recommend using a service medium that complies with the requirements of classification 21/18/13 pursuant to ISO 4406.

The coolant used should be properly modified, e.g. filtered water with an anti-corrosion and frost-proof agent. After switch off the hot runner heater, the cooling for the actuator have to be turned on for at least 15 minutes, to avoid damages of the actuator sealing.
8.1.3.2 Exploded View QCVG16 Series

This section describes the disassembly and reassembly process to replace seals.

In this section the actuator parts are identified with the numbers indicated in the following figure.

**NOTICE**

Always tighten the screws to the torques specified in the respective table (section 13).

### Actuator Parts QCVG16M04 Series

<table>
<thead>
<tr>
<th>No.</th>
<th>Qty.</th>
<th>Description</th>
<th>Item</th>
</tr>
</thead>
<tbody>
<tr>
<td>(01)</td>
<td>1</td>
<td>Cylinder housing for QCVG16M04</td>
<td>QCVG16HA04</td>
</tr>
<tr>
<td>(01)</td>
<td>1</td>
<td>Cylinder housing with flats for use when pitch is less than 126 mm</td>
<td>QCVG16HA04F</td>
</tr>
<tr>
<td>(02)</td>
<td>1</td>
<td>Cylinder cap</td>
<td>QCVG16CC01</td>
</tr>
<tr>
<td>(03)</td>
<td>1</td>
<td>Piston</td>
<td>QCVG16PI03</td>
</tr>
<tr>
<td>(04)</td>
<td>1</td>
<td>O-ring</td>
<td>47-98-041</td>
</tr>
<tr>
<td>(05)</td>
<td>1</td>
<td>Seal</td>
<td>OE070052020212C</td>
</tr>
<tr>
<td>(06)</td>
<td>2</td>
<td>Poly-Pack</td>
<td>47-98-9001</td>
</tr>
<tr>
<td>(07)</td>
<td>8</td>
<td>Socket head cap screw</td>
<td>DIN912-M5x12-12.9</td>
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<tr>
<td>(08)</td>
<td>4</td>
<td>Socket head cap screw</td>
<td>DIN912-M6x50-12.9</td>
</tr>
<tr>
<td>(09)</td>
<td>1</td>
<td>Adjusting screw</td>
<td>QCVG16AS01</td>
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<tr>
<td>(10)</td>
<td>1</td>
<td>Actuator coupling</td>
<td>QCVG16AC01</td>
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<tr>
<td>(11)</td>
<td>1</td>
<td>Actuator disk</td>
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<td>(12)</td>
<td>1</td>
<td>Snap ring</td>
<td>73-011-5100-118</td>
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<tr>
<td>(13)</td>
<td>1</td>
<td>M6 x 18 long cap screw</td>
<td>DIN912-M6x18-12.9</td>
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<td>(14)</td>
<td>1</td>
<td>Actuator support</td>
<td>QCVG16SU01</td>
</tr>
<tr>
<td>(15)</td>
<td>4</td>
<td>Flat head screw</td>
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<tr>
<td>(16)</td>
<td>1</td>
<td>Pin head adapter Ø 8.0</td>
<td>QCVG16PH0801</td>
</tr>
<tr>
<td>(17)</td>
<td>1</td>
<td>Valve pin bushing nut</td>
<td>see BOM</td>
</tr>
<tr>
<td>(18)</td>
<td>1</td>
<td>ø 8.0 Valve pin bushing</td>
<td>see BOM</td>
</tr>
<tr>
<td>(19)</td>
<td>1</td>
<td>Support spacer (when required)</td>
<td>47-30-130-06</td>
</tr>
<tr>
<td>(20)</td>
<td>2</td>
<td>Hexagon Socket countersunk head cap screw DIN7991</td>
<td>DIN 7991-M6X20-10.9</td>
</tr>
<tr>
<td>(21)</td>
<td>1</td>
<td>QCVG16 P/S assy 3 m cable</td>
<td>QCVG16ESASS03</td>
</tr>
<tr>
<td>(22)</td>
<td>1</td>
<td>QCVG16 P/S assy 5 m cable</td>
<td>QCVG16ESASS05</td>
</tr>
<tr>
<td>(23)</td>
<td>1</td>
<td>Support spacer with flats (when required)</td>
<td>47-30-132-06-F</td>
</tr>
</tbody>
</table>

**QCVG16M04 Series Parts w/Position Sensor**

<table>
<thead>
<tr>
<th>No.</th>
<th>Qty.</th>
<th>Description</th>
<th>Item</th>
</tr>
</thead>
<tbody>
<tr>
<td>(09)</td>
<td>1</td>
<td>Adjusting screw assembly with magnets</td>
<td>QCVG16ASMAG01</td>
</tr>
<tr>
<td>(13)</td>
<td>1</td>
<td>M6 Titanium Socket cap screw 17 mm long</td>
<td>209220</td>
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<td>(20)</td>
<td>2</td>
<td>Hexagon Socket countersunk head cap screw DIN7991</td>
<td>DIN 7991-M6X20-10.9</td>
</tr>
<tr>
<td>(21)</td>
<td>1</td>
<td>QCVG16 P/S assy 3 m cable</td>
<td>QCVG16ESASS03</td>
</tr>
<tr>
<td>(22)</td>
<td>1</td>
<td>QCVG16 P/S assy 5 m cable</td>
<td>QCVG16ESASS05</td>
</tr>
</tbody>
</table>

The actuator support spacer is only used if the bottom airgap is greater than 22 mm with a maximum of 28 mm. When using spacers, use DIN7991-M6x20-10.9 flat head screws (qty4) instead of DIN7991-M6x12-10.9 to bolt down actuator support.
### Actuator Parts QCVG16M04/M06/M07

<table>
<thead>
<tr>
<th>No.</th>
<th>Qty.</th>
<th>Description</th>
<th>Item</th>
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<tbody>
<tr>
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<td>Cylinder housing for:</td>
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<tr>
<td></td>
<td></td>
<td>QCVG16M04</td>
<td>QCVG16HA04 QCVG16HA06 QCVG16HA07</td>
</tr>
<tr>
<td>(01)</td>
<td>1</td>
<td>Cylinder housing with flats for use when pitch is less than 126 mm</td>
<td>QCVG16HAF04</td>
</tr>
<tr>
<td>(02)</td>
<td>1</td>
<td>Cylinder cap</td>
<td>QCVG16CC01 QCVG16CC02</td>
</tr>
<tr>
<td></td>
<td></td>
<td>QCVG16M04 / M07</td>
<td></td>
</tr>
<tr>
<td>(03)</td>
<td>1</td>
<td>Piston</td>
<td>QCVG16PI03</td>
</tr>
<tr>
<td>(04)</td>
<td>1</td>
<td>O-ring</td>
<td>47-98-041</td>
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<tr>
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<td>Seal</td>
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<td>(06)</td>
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<td>Poly-Pack</td>
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</tr>
<tr>
<td>(07)</td>
<td>8</td>
<td>Socket head cap screw</td>
<td>DIN912-M5x12-12.9</td>
</tr>
<tr>
<td>(08)</td>
<td>4</td>
<td>Socket head cap screw</td>
<td>DIN912-M6x50-12.9</td>
</tr>
<tr>
<td>(09)</td>
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<td>Sensor Plate (Used on QCVG16M06)</td>
<td>47-30-400</td>
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<tr>
<td>(10)</td>
<td>4</td>
<td>M3x8 Flat head screws Torque 1 Nm (Used on QCVG16M06)</td>
<td>DIN7991-M3x8-10.9</td>
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</table>

### QCVG16M04/M06/M07 Series Parts (Self Bleeding)

<table>
<thead>
<tr>
<th>No.</th>
<th>Qty.</th>
<th>Description</th>
<th>Item</th>
</tr>
</thead>
<tbody>
<tr>
<td>(01)</td>
<td>1</td>
<td>Cylinder housing for:</td>
<td>QCVG16M04 QCVG16M06 QCVG16M07</td>
</tr>
<tr>
<td></td>
<td></td>
<td>QCVG16M04</td>
<td>QCVG16HA04 QCVG16HA06 QCVG16HA07</td>
</tr>
<tr>
<td></td>
<td>3</td>
<td>CV Plug Ø 3.9 mm</td>
<td>09-156-00</td>
</tr>
<tr>
<td></td>
<td>1</td>
<td>CV Plug Ø 5.5 mm</td>
<td>09-218-00</td>
</tr>
<tr>
<td></td>
<td>1</td>
<td>Restrictor Plug</td>
<td>EIS-RE-040-010</td>
</tr>
</tbody>
</table>
8.1.3.3 Disassembling the Actuator QCVG16 Series

**DANGER**

**Danger to Life by Hydraulic**

Serious personal injury or death can result from connecting or disconnecting hydraulic hoses under pressure.

Hydraulic works must be carried out by qualified persons.

Use personal protective equipment, face protection, headgear, anti oil gloves.

The hoses in the Hot Runner System and in the injection mold are under high pressure and high temperatures.

Before disconnecting or connecting any hydraulic hoses:

- The injection machine/hydraulic pump must be shut down.
- The electrical disconnect - properly locked out.
- Pressure from the hoses must be removed.

1) Disconnect the hydraulic lines from the actuator.

**NOTICE**

Ensure connections are labelled.

2) Remove the snap ring (12).
3) Unscrew and remove the four socket head cap screws M6x50 (08).
4) Remove the actuator housing (01) with 2 long M6 screws in the two threaded holes (a) out of the clamping plate.

Disassembly of the Actuator and the Seal

1) Remove the socket head cap screws (07) from the actuator cap (02).
2) Remove the piston (03) from the actuator housing (01) with a soft face hammer, clamp, or small press.

3) Carefully remove the seals and O-rings:
   - (04) O-ring
   - (05) O-ring
   - (06) Poly-Pack (x2)

**NOTICE**
The piston seal will need to be cut for removal.
8.1.3.4 Assembling the Actuator QCVG16M04/MF04/M06/M07

Installation of the Piston Seal

1) Clean the seal groove and ensure that there are no scratches.

   **NOTICE**

   After disassembly of the sealing elements, the original seals should be replaced.

2) Install two-piece seal (05). Install inner, rubber portion first. The outer (Teflon) ring will need modest stretching before installation. This may be done by hand. Exercise restraint as over-stretching will make final assembly more difficult. The correct stretch is just enough to allow installation of outer seal by hand.

3) Lubricate the inner seal (05).

4) Install outer, PTFE portion with the support of the tool ATCYL46 to push it into the groove of QCVG16M04.

5) Alternately, the outer (PTFE) ring can be installed by hand; it will need modest stretching before installation. Exercise restraint as over-stretching will make final assembly more difficult. The correct stretch is just enough to allow installation of outer seal by hand.
Installation of the Actuator Housing Poly-Pack

1) Clean the seal groove (a).

**NOTICE**
Ensure that the groove (a) has no scratches.

2) Lubricate the seal Poly-Pack (06) with hydraulic oil or white grease.
3) Install the seal Poly-Pack (06) into the groove of the actuator housing (01).

**NOTICE**
Pay attention to correct seal orientation.
The lip of the seal Poly-Pack (06) has to be inward facing to the center of the actuator housing (01).
4) Make certain the seal Poly-Pack (06) is completely seated in the groove.
Installation of the Actuator Cap Inner Seal

1) Clean the seal groove (b).

**NOTICE**
Ensure that the groove (b) has no scratches.

2) Lubricate the seal Poly-Pack (06) with hydraulic oil or white grease.
3) Install the seal Poly-Pack (06) into the groove of the actuator cap (02).

**NOTICE**
Pay attention to correct seal orientation.
The lip of the seal Poly-Pack (06) has to be toward facing to the contact surface of the actuator housing (01).

4) Make certain the seal Poly-Pack (06) is completely seated in the groove.

Installation of the Actuator Cap outside O-ring Seal

1) Clean the O-ring groove (c).

**NOTICE**
Ensure that the groove has no scratches.

**NOTICE**
After disassembly of the sealing elements, the seals should be replaced with original seals.

2) Lubricate the O-ring (04) with hydraulic oil or white grease.
3) Install the O-ring (04) into the groove of the actuator cap (02).

**NOTICE**
Make certain the seal is completely seated in the groove.
Installation of the Piston in the Actuator Housing

1) Lubricate all seals with hydraulic oil or white grease.
2) Use a soft face hammer or a small press to fully seat the piston (03) into the actuator housing (01). Insert as shown in figure at right.

**NOTICE**
Resistance will be felt as the seals are compressed. Be careful not to pinch or otherwise damage the new seals during piston (03) insertion into the actuator housing (01).

3) Place a flat plate (P) on piston (03).
4) Install piston (03) into housing with the flange near the Synventive logo side as shown. So not pinch or damage the Teflon Seal (piston).

**NOTICE**
After disassembly of the sealing elements, the original seals should be replaced.

5) Lubricate the O-ring (04) of the cylinder cap (02) with hydraulic oil or white grease.
6) Place the cylinder cap (02) over the actuator housing (01).
NOTICE
Use a small press to slowly install the cylinder cap (02).

7) Place a flat plate (P) on cylinder cap (02).
8) Align the screw holes before installing cap.
9) Install cylinder cap (02) along with seal to cylinder housing (01) using a light press as shown.

10) Lubricate the thread of the socket head cap screws (07) with high-temperature assembly paste (anti-seize compound).

NOTICE
This is an important measure to prevent thread corrosion due to aggressive gases, which could be released during plastics processing.

11) Tighten the socket head cap screws (07) M5x12.

NOTICE
Torque per specification engraved on the actuator cap.

Installation of the Actuator on the Clamping Plate

1) Install the actuator housing (01) with 4 mounted M6 socket head cap screws (08) into the clamping plate pocket.

NOTICE
Use torque wrench with wrench insert and the torques indicated in the torque table.

2) Connect the hydraulic hoses to the actuator.
Actuator Bleeding QCVG16

Actuator Auto Bleeding (QCVG16M04 / M06 / M07)

Bleeding of the actuator is not necessary due to the “auto-bleed” feature. When the cylinder is in the open position, a small amount of oil is allowed to pass from the pressure side to the tank side. At all other positions, valves prevent hydraulic fluid from bleeding. The amount of oil is small enough to maintain full pressure while allowing enough oil to carry any air from the lines to the tank. It is only necessary to apply pressure for about 2 minutes with the actuators in the open position to complete the bleeding process.

8.1.3.5 Assembling and Disassembling the Position Sensor to QCVG16M04/MF04

1) Assembly: Fix the Position Sensor Assembly (21) onto the hydraulic actuator QCVG16M04 / MF04 with screws DIN7991-M6X20-10.9 (20).

2) Disassembly: Remove the screws DIN7991 M6x20 (20) and then remove the Position Sensor Assembly (21) from the hydraulic actuator QVCG16M04.

**NOTICE**

Adjusting screw (09) protrusion above the back of the piston will result in Position Sensor damage.
8.1.3.6 Valve Pin Height Adjustment QCVG Actuator

Precondition for the following steps are to be performed with the QCVG actuator installed in the mold, and the system at operating temperature.

**WARNING**

**Heavy Weight Hazard**

- Transport and lifting equipment should be operated only by trained personnel.
- Operate lifting and transport equipment slowly and carefully to avoid uncontrolled swinging of the manifold.
- Lifting and transport equipment for lifting Hot Runner Systems shall be approved and properly rated taking into account the weight and size of the manifold.
- For first aid contact your medical / safety representing

**Hot Surfaces Hazard**

- **Contact between the skin and hot surfaces could result in burns.**
- Use personal protective equipment, such as gloves, apron, sleeves and face protection, to guard against burns.
- When servicing or handling the hot runner system outside the manifold plates or the injection molding machine, care must be taken to heed the hot surface exposure warnings.
- For first aid contact your medical / safety representing

**NOTICE**

**Hazard of Material Damage**

- The highest operating pressure is 103 bar (1500 psi), the typical operating pressure is between 41 bar and 82 bar (600 psi and 1200 psi).
- A lower operating pressure increases the seal life.
- The following steps are to be performed with the system at operating temperature.
- Clamping plate cooling (max. 100 °C / 210 °F) must be on to prevent damage to the actuator seals.
- **After switch off the hot runner heater, the cooling for the actuator have to be turned on for at least 15 minutes, to avoid damages of the actuator sealing.**
Height Adjustment of shut-off Valve Gate Pins with QCVG Actuator

Installation and valve pin adjustment

1) Slide the valve pin (VP) into pin head adapter (16).

   NOTICE
   If the pin has previously been contoured, note the orientation.
   The pin head adapter (16) is keyed to the actuator support (14), found on the manifold.

2) Place the actuator coupling (10) with the valve pin (VP) and pin head adapter (16) on the actuator support (14).

3) If the Hot Runner System is using a tapered shut-off, make sure the valve pin (VP) is not seated in the gate at this time.

4) Verify that the flange of the actuator coupling (10) is resting on the actuator support (14).

   If a gap is present:
   NOTICE
   This indicates the valve pin is making contact in the gate.
   • Rotate the adjusting screw (09) to lift the valve pin until the gap is eliminated.

5) Tighten the set with the socket head cap screw (13).
WARNING

Heavy Weight Hazard

6) Install the clamping plate (with the actuator housing already installed in them).

Actuator parts

- (01) Actuator housing
- (02) Actuator cap
- (03) Piston
- (04) O-ring
- (05) O-ring
- (06) Poly-Pack
- (07) Socket head cap screw M5x12
- (08) Socket head cap screw M6x50
- (09) Adjusting screw
- (10) Actuator coupling
- (11) Actuator disk
- (12) Retaining ring for shafts
- (13) Socket head cap screw M6x18
- (14) Actuator support
- (15) Flat head screw M6x12
- (15) Flat head screw M6x20
- (16) Pin head adapter ø8.0
- (17) Valve pin bushing nut
- (18) Valve pin bushing
- (19) Support spacer (when required)
7) Install the actuator disk (11) over the actuator coupling (10) in the piston (03).

8) Ensure that the retaining ring (12) is correctly positioned in groove of actuator coupling (10).

---

**WARNING**

**Hot Surfaces Hazard**

Contact between the skin and hot surfaces could result in burns.

9) Heat the mold up to operating temperature.

**NOTICE**

Wait additional 30 minutes until the system is entirely heated up.

---

10) Close the actuator with a hydraulic pressure of 2,75 bar (36 psi).
Height adjustment of straight shut-off valve gate pins

- Turn the adjusting screw (09) until the face of the valve pin (VP) is in the desired location for molding (typically 0.13 mm (005") protrusion through the gate).
- To take up the play in the valve pin (VP) and coupling assembly, access the parting-line side of the valve pin (VP) and push against it before locking the socket head cap screw (13).

**NOTICE**
The adjusting Screw (09) has a 1 mm pitch to facilitate fine adjustment.

Height adjustment of conical shut-off valve gate pins

- Turn the adjusting screw (09) clockwise until the valve pin (VP) seats in the gate.
- Then turn off the hydraulics and turn the adjustment screw (09) an additional 1/8 turn clockwise to preload the valve pin (VP) 0.13 mm (005").

**NOTICE**
The adjusting Screw (09) has a 1 mm pitch to facilitate fine adjustment.

11) Holding the adjustment screw (09) in place.
12) Tighten the socket head cap screw (13).

13) Actuate the valve gate several time and check for correct valve pin seating.
8.2 Pneumatic Actuators

This section describes the disassembly and reassembly process to replace seals and adjust the valve pin for the following production series:

**PB...Series**

**PNC...B Series**

**VP...P Series**
8.2.1 Actuator PB Series

8.2.1.1 Technical Data

<table>
<thead>
<tr>
<th>Parameters</th>
<th>PB4008</th>
<th>PB6016</th>
<th>PB8016</th>
</tr>
</thead>
<tbody>
<tr>
<td>Valve Pin Diameter</td>
<td>3 mm, 3.8 mm</td>
<td>5 mm, 6 mm</td>
<td>5 mm, 6 mm, 8 mm</td>
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<tr>
<td>Nozzle Series</td>
<td>06E, 09E</td>
<td>12E</td>
<td>12E, 16E, 22E</td>
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<tr>
<td>Pin Adjustment</td>
<td>+/- 1 mm</td>
<td>+/- 1.5 mm</td>
<td>+/- 1.5 mm</td>
</tr>
<tr>
<td>Min/Max Close Forces</td>
<td>754/1508N</td>
<td>1696/3393N</td>
<td>3016/6032N</td>
</tr>
<tr>
<td>Min/Max Open Forces</td>
<td>526/1052N</td>
<td>1468/2937N</td>
<td>2788/5576N</td>
</tr>
<tr>
<td>Min/Max Pneumatic Pressure</td>
<td>6/12bar (87/175psi)</td>
<td>6/12bar (87/175psi)</td>
<td>6/12bar (87/175psi)</td>
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<tr>
<td>Valve Pin Stroke</td>
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<td>16 mm</td>
<td>16 mm</td>
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<td>Pneumatic Connections</td>
<td>M10x1.0</td>
<td>M10x1.0</td>
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<td>Cooling Temperature</td>
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<td>30/60°C</td>
<td>30/60°C</td>
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<td>M12x1.5</td>
<td>M12x1.5</td>
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</tbody>
</table>

Thermocouple and Position Sensor optional on all models. Maximum 3 Actuators per cooling zone on all models.

**NOTICE**

To ensure long life and continued flawless operation of the actuator, we recommend using filtered compressed air.

The coolant should be properly modified e.g. filtered water with an anti-corrosion and frost proof agent.

After switching off the Hot Runner heater, the cooling for the actuator should remain on for at least 15 minutes, to avoid damage to the actuator seals and the position sensor.
8.2.1.2 Exploded View

![Exploded View Diagram]

**Replacement Items**

<table>
<thead>
<tr>
<th>Item Description</th>
<th>Qty</th>
<th>PB4008 Item</th>
<th>Qty</th>
<th>PB6016 Item</th>
<th>Qty</th>
<th>PB8016 Item</th>
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</thead>
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<tr>
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<td>1</td>
<td>SKT40B</td>
<td>1</td>
<td>SKT60B</td>
<td>1</td>
<td>SKT80B</td>
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<td>1.1 Piston Seal</td>
<td>1</td>
<td>K30-40-40-3.2</td>
<td>1</td>
<td>K30-60-49-4.2</td>
<td>1</td>
<td>K30-80-69-4.2</td>
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<tr>
<td>1.2 Rod Seal</td>
<td>1</td>
<td>C1-2038-V3664</td>
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<td>C1-2038-V3664</td>
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<tr>
<td>1.3 O-Ring Seal</td>
<td>1</td>
<td>VOR45X2FPM80</td>
<td>1</td>
<td>VOR65X2FPM80</td>
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<td>VOR85X2FPM80</td>
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<tr>
<td>1.4 Retaining Ring</td>
<td>1</td>
<td>DIN472-45X1.75</td>
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<td>DIN472-65X2.5</td>
<td>1</td>
<td>DIN472-85X3</td>
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<td>2 Position Sensor, 1 m Cable</td>
<td>1</td>
<td>HESASSY01</td>
<td>1</td>
<td>HESASSY01</td>
<td>1</td>
<td>HESASSY01</td>
</tr>
<tr>
<td>2 Position Sensor, 3 m Cable</td>
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<td>HESASSY03</td>
<td>1</td>
<td>HESASSY03</td>
</tr>
<tr>
<td>2 Position Sensor, 5 m Cable</td>
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<td>1</td>
<td>HESASSY05</td>
<td>1</td>
<td>HESASSY05</td>
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<td>3 Plug</td>
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<td>VSTI10X1ORVITCF</td>
<td>2</td>
<td>VSTI10X1ORVITCF</td>
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<td>VSTI10X1ORVITCF</td>
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**Parts**

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<tr>
<th>Thread Size</th>
<th>Wrench Size</th>
<th>Nm</th>
<th>ft-lbs</th>
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<tbody>
<tr>
<td>M5</td>
<td>HEX4</td>
<td>8</td>
<td>6</td>
</tr>
<tr>
<td>M6</td>
<td>HEX5</td>
<td>14</td>
<td>10</td>
</tr>
<tr>
<td>M6</td>
<td>HEX4</td>
<td>10</td>
<td>7</td>
</tr>
<tr>
<td>M3</td>
<td>HEX2.5</td>
<td>1.5</td>
<td>1.1</td>
</tr>
<tr>
<td>M10</td>
<td>HEX5</td>
<td>6</td>
<td>4.5</td>
</tr>
<tr>
<td>M10</td>
<td>HEX5</td>
<td>14</td>
<td>10</td>
</tr>
</tbody>
</table>
8.2.1.3 Tools for Assembling and Disassembling the Actuator

The following overview contains a list of special tools required for the assembly and disassembly of the actuator and to replace seals. The assembly and disassembly tools are identified in the table below.

### Assembly and Disassembly Tools - ATCYL##

<table>
<thead>
<tr>
<th>Pos.</th>
<th>Description</th>
<th>PB4008 Tools</th>
<th>PB6016 Tools</th>
<th>PB8016 Tools</th>
</tr>
</thead>
<tbody>
<tr>
<td>T3</td>
<td>Valve pin disassembly tool</td>
<td>ATCYL0805</td>
<td>ATCYL0303</td>
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<tr>
<td>T4</td>
<td>Installation cone</td>
<td>ATCYL0304</td>
<td>ATCYL38</td>
<td>ATCYL39</td>
</tr>
<tr>
<td>T5</td>
<td>Spread tube</td>
<td>ATCYL0105</td>
<td>ATCYL36</td>
<td>ATCYL37</td>
</tr>
<tr>
<td>T6</td>
<td>Calibration sleeve</td>
<td>ATCYL0107</td>
<td>ATCYL17</td>
<td>ATCYL35</td>
</tr>
<tr>
<td>T7</td>
<td>Piston and Cap Assembly Tool</td>
<td>ATCYL47</td>
<td>ATCYL28</td>
<td>ATCYL29</td>
</tr>
</tbody>
</table>

**NOTICE**

These tools are not included with the Hot Runner system and must be ordered from Synventive separately.
Dismounting the PB Series Actuators

**Danger to Life by Pneumatics**
Serious personnel injury or death can result from connecting or disconnecting pneumatic hoses under pressure. Pneumatic works must be carried out by qualified persons. The hoses in Hot Runner systems and the injection mold are under high pressure and high temperatures. Before disconnecting or connecting any Pneumatic hoses:
- The injection machine / pneumatic compressor must be shut down.
- The electrical disconnect properly locked out.
- Pressure from the hoses must be removed.

Dismounting Procedure

1) Locate and remove the four screws (F) on top of the actuator housing (A).
2) Push the whole actuator housing (A) in the direction specified on the pin release indicator label (I). This will disengage the actuator from the valve pin.
3) Lift the entire actuator housing (A) out of the assembly. Removal of the cooling plate (B) is not required when removing the actuator housing assembly.
4) Unscrew and remove the M6 socket head cap screws (R).
5) Lift out the mounting plate (S).

8.2.1.5 Seal Replacement

Disassembly

1) Remove Snap Ring (A).

<table>
<thead>
<tr>
<th>LETTER</th>
<th>PART</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>Snap Ring</td>
</tr>
<tr>
<td>B</td>
<td>Piston Seal</td>
</tr>
<tr>
<td>C</td>
<td>Rod Seal</td>
</tr>
<tr>
<td>D</td>
<td>Valve Piston</td>
</tr>
<tr>
<td>E</td>
<td>Piston</td>
</tr>
<tr>
<td>F</td>
<td>Piston Cap</td>
</tr>
<tr>
<td>G</td>
<td>O-Ring</td>
</tr>
<tr>
<td>J</td>
<td>Actuator Housing</td>
</tr>
</tbody>
</table>

2) Remove piston (E) and cap (F) with a valve pin.
3) Separate piston (E) from cap (F).

4) Dismount seals: Rod seal (C), piston seal (B) and O-Ring (G).

5) After disassembly of the sealing elements, the original seals must be replaced. See the following sections for additional details.

### 8.2.1.6 Cooling Plate Maintenance

#### Cooling Plate Removal

1) With the actuator dismounted, lift up the cooling plate (2).

#### Cleaning the Cooling Plate

Removing the cooling plate plug (VST10X10RVITCF) facilitates the cleaning of the cooling plate.

1) Remove the cooling plate plug (3) with a HEX5 wrench.
2) Clean the cooling plate (2).
3) Replace plug by torquing to 6 Nm.
8.2.1.7 Assembling the Actuator PB Series

Installing the Piston Seal

To mount the piston seal (1.9.1) on the piston (1.2) proceed as follows:

1) Fit the mounting cone (T4) on the piston (1.2).

**NOTICE**

After disassembly of the seal, the original seals should be replaced.

2) Lubricate the two elements of the piston seal (1.9.1) with Krytox GPL205.
   - O-ring (1.9.1) (a)
   - Sealing element (1.9.1) (b)

3) Mount the O-ring (1.9.1) (a) into the seal groove of the piston (1.2).

4) Using the spreader sleeve (T5) and the mounting cone (T4), push the sealing element (1.9.1) into the seal groove of the piston (1.2).

5) The sealing element (1.9.1) (b) is placed in the seal groove of the piston (1.2) above the O-ring (1.9.1) (a).

6) Insert the piston in the calibration sleeve (T6). This will precisely align the piston seal (1.9.1) with the piston (1.2).
Reassembly

1) Replace Rod Seal (C) and O-Ring (G).

<table>
<thead>
<tr>
<th>LETTER</th>
<th>PART</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>Snap Ring</td>
</tr>
<tr>
<td>B</td>
<td>Piston Seal</td>
</tr>
<tr>
<td>C</td>
<td>Rod Seal</td>
</tr>
<tr>
<td>D</td>
<td>Valve Piston</td>
</tr>
<tr>
<td>E</td>
<td>Piston</td>
</tr>
<tr>
<td>F</td>
<td>Piston Cap</td>
</tr>
<tr>
<td>G</td>
<td>O-Ring</td>
</tr>
<tr>
<td>T7</td>
<td>Piston and Cap Assembly Tool</td>
</tr>
<tr>
<td>J</td>
<td>Actuator Housing</td>
</tr>
</tbody>
</table>

2) Assemble piston (E) to cap (F).

3) Insert piston (E) and cap (F) into Actuator Housing (J).

4) Reinsert Snap Ring (A).
Mounting the Actuator on a Manifold

1) Position the mounting plate on the manifold.
2) Lubricate the thread of the hexagon socket head cap screws (5) with high temperature assembly paste (anti-seize compound).

**NOTICE**

Anti-seize compound is an important measure to prevent thread corrosion due to aggressive gasses which could be released during plastic processing.

3) Screw the mounting plate (3) onto the manifold with the socket head cap screws (5) M6x14.
4) Place the cooling plate (2) on the mounting plate (3).

5) Insert Valve Pin (6) into bushing (7).

6) Slide the Actuator so it engages the pin head slots of the piston.
7) Lubricate the thread of the socket head cap screws (F) with high temperature assembly paste (anti-seize compound).

**NOTICE**

Anti-seize compound is an important measure to prevent thread corrosion due to aggressive gasses which could be released during plastic processing.

8) Secure the Actuator with socket head cap screws (F).
9) Tighten the socket head cap screws (F) in an “X” pattern (a, d, c, and b). Use a torque wrench to torque to specifications listed in the table in section 13.

**NOTICE**

Do not use cylinder housing as support to get the system into the mold, (no hammering e.g.)
8.2.1.8 Position Sensor

The Position Sensor (J) provides the user with additional information such as if the pins are in the fully open, fully closed or in an intermediate position.

**NOTICE**
The position sensor (J) has a maximum temperature rating of 150 degrees C and a maximum cable (K) rating of 200 degrees C.

**Removal**

**NOTICE**
Before removal and installation check that the cable (K) is not pinched and is free of tension.

1) Locate and remove the three M3 screws (L) on the side of the actuator housing (A).
2) Gently remove the position sensor (J) and cable (K) making sure not to touch the printed circuit board underneath.

**Installation**

**NOTICE**
When reinstalling make sure the mating surface is clean of oil and debris.

1) Place sensor in the correct location and install the three M3 screws (L).
2) Torque M3 screws to 1.5 Nm.
8.2.1.9 Valve Pin Adjustment

**WARNING**

**Hot Surfaces Hazard**
Contact between the skin and hot surfaces could result in burns.

Use personal protective equipment, such as gloves, apron, sleeves and face protection, to guard against burns. When servicing or handling the hot runner system outside the manifold plates or the injection molding machine, care must be taken to heed the hot surface exposure warnings.

1) Bring the manifold and mold to the operating temperatures for the material to be molded.

2) Insert the adjustment tool (T14), Synventive part number ATA01, on the top of the actuator.

3) Loosen the locking screw (M6).

4) Close the valve gate by applying pneumatic pressure on the closed port.

5) Rotate the adjusting screw (AJS) in a clockwise (forward) direction to pre-set the valve pin position.

   - Conical Gate: Turn the adjusting screw (AJS) clockwise until the valve pin seats firmly in the gate. When valve pin position is achieved, then turn adjusting screw clockwise (forward) an additional 1/10th of a turn in order to achieve proper valve pin position during operation. 1/10th increments are provided adjacent to the screw for reference.

   - Cylindrical Gate: Turn the adjusting screw (AJS) clockwise until the valve pin protrudes beyond the gate according to dimension specified on general assembly drawing.

**NOTICE**

One full (360 degree) rotation equals one millimeter of adjustment. Stop if heavy resistance is felt. Do not overtighten as damage to components may occur. Remove pneumatic pressure and loosen the adjusting screw (AJS).

6) Remove adjustment tool (T14) and tighten locking screw (M6) to the specification on the locking screw.

**NOTICE**

It is necessary to always adjust the pin position by rotating the adjusting screw (AJS) in a clockwise (forward) direction in order to achieve proper pin position during operation. In the event that the actuator was “over adjusted” or needs re-adjustment, first remove pressure from the “close” port, fully loosen the adjusting screw (AJS) then return to step 4.

**NOTICE**

Torque Value locking screw (M6) PB series

18 Nm
8.2.2 Actuator PNC3008B02

8.2.2.1 Technical Data PNC3008B02

Actuator, bolted to manifold

**Valve pin operation**

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Specification</th>
</tr>
</thead>
<tbody>
<tr>
<td>Operation medium</td>
<td>pneumatic</td>
</tr>
<tr>
<td>Pressure range</td>
<td>6 - 12 bar (87 - 174 psi)</td>
</tr>
<tr>
<td>Pressure max.</td>
<td>14 bar (203 psi)</td>
</tr>
<tr>
<td>Flow rate</td>
<td>1.5 l/min</td>
</tr>
<tr>
<td>Valve pin response time</td>
<td>~0.5 s / 6 bar (87 psi)</td>
</tr>
<tr>
<td>Valve pin stroke</td>
<td>8 mm</td>
</tr>
<tr>
<td>Adjustment</td>
<td>± 1 mm via adjustment threads from topside</td>
</tr>
<tr>
<td>Closing force</td>
<td>424 N / 6 bar (87 psi)</td>
</tr>
<tr>
<td>Opening force</td>
<td>332 N / 6 bar (87 psi)</td>
</tr>
</tbody>
</table>

**Cooling**

The design provides an indirect cooling through the back plate (max. 80 °C / 175 °F), otherwise cooling lines are required.

Piping: No piping.

**Valve pin**

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Specification</th>
</tr>
</thead>
<tbody>
<tr>
<td>Valve pin diameter</td>
<td>Ø 3 mm</td>
</tr>
<tr>
<td>Attachment</td>
<td>T - head</td>
</tr>
</tbody>
</table>

Valve pin is not secured against rotation.

**NOTICE**

To ensure long life and continued flawless operation of the actuator, we recommend using filtered compressed air.

The coolant used should be properly modified, e.g. filtered water with an anti-corrosion and frost-proof agent.
8.2.2.2 Exploded View PNC3008B02

This section describes the disassembly and reassembly process to replace seals.

In this section the actuator parts are identified with the numbers indicated in the following figure, which shows the components.

**NOTICE**

Always tighten the screws to the torques specified in the respective table (section 13).

### Actuator Parts - PNC3008B02

<table>
<thead>
<tr>
<th>No.</th>
<th>Qty.</th>
<th>Description</th>
<th>Item</th>
</tr>
</thead>
<tbody>
<tr>
<td>(1)</td>
<td>1</td>
<td>Cylinder housing</td>
<td>PNC3008CH01</td>
</tr>
<tr>
<td>(2)</td>
<td>1</td>
<td>Piston</td>
<td>PNC3008PI02</td>
</tr>
<tr>
<td>(3)</td>
<td>1</td>
<td>Hanger screw</td>
<td>PNC3008HS01</td>
</tr>
<tr>
<td>(4)</td>
<td>1</td>
<td>Lock screw</td>
<td>PNC3008LS01</td>
</tr>
<tr>
<td>(5)</td>
<td>1</td>
<td>Buffer</td>
<td>PNC3008BU01</td>
</tr>
<tr>
<td>(6)</td>
<td>1</td>
<td>Retaining ring for bores</td>
<td>DIN472/34X1.5</td>
</tr>
<tr>
<td>(7)</td>
<td>1</td>
<td>Seal Kit PNC3008</td>
<td>PNC3008B01SK01</td>
</tr>
<tr>
<td>(7.1)</td>
<td>1</td>
<td>Piston seal</td>
<td>K30-30-2.5-3.2-VIOR</td>
</tr>
<tr>
<td>(7.2)</td>
<td>1</td>
<td>Rod seal</td>
<td>C1-1039-V3664</td>
</tr>
<tr>
<td>(7.3)</td>
<td>1</td>
<td>Guiding element</td>
<td>FB2.3-1.5L41.5</td>
</tr>
<tr>
<td>(7.4)</td>
<td>1</td>
<td>O-ring seal</td>
<td>VIOR-26x2-FPM80</td>
</tr>
<tr>
<td>(7.5)</td>
<td>1</td>
<td>O-ring seal</td>
<td>VIOR-36x1.5-FPM80</td>
</tr>
<tr>
<td>(7.6)</td>
<td>1</td>
<td>O-ring seal</td>
<td>VIOR-19x1.5-FPM80</td>
</tr>
<tr>
<td>(8)</td>
<td>1</td>
<td>Holding ring</td>
<td>PNC3008HR01</td>
</tr>
<tr>
<td>(9)</td>
<td>2</td>
<td>Hexagon socket cap screw</td>
<td>DIN912-M4X14-12.9</td>
</tr>
<tr>
<td>(10)</td>
<td>2</td>
<td>Hexagon socket set screw</td>
<td>DIN914-M3X5-45H</td>
</tr>
</tbody>
</table>
8.2.2.3 Tools for Assembling, Disassembling and Adjusting the Actuator

The following overview contains a list of special tools needed for the assembly and disassembly of the actuator and to replace seals.

The assembly and disassembly tools are identified with the numbers indicated in the following figure, which shows the components in this section.

**Tools to Mount Actuator Seals and the Piston**

<table>
<thead>
<tr>
<th>No.</th>
<th>Description</th>
<th>Item</th>
</tr>
</thead>
<tbody>
<tr>
<td>(T1)</td>
<td>Spreader sleeve</td>
<td>ATCYL15</td>
</tr>
<tr>
<td>(T2)</td>
<td>Mounting cone</td>
<td>ATCYL14</td>
</tr>
<tr>
<td>(T3)</td>
<td>Calibration sleeve (cone 30)</td>
<td>ATCYL13</td>
</tr>
</tbody>
</table>

**Valve Pin Disassembly Tool ATCYL16**

<table>
<thead>
<tr>
<th>No.</th>
<th>Description</th>
<th>Item</th>
</tr>
</thead>
<tbody>
<tr>
<td>(T4.1)</td>
<td>Adapter for valve pin ø 3 mm and ø 3.8 mm</td>
<td>ATCYL1601</td>
</tr>
<tr>
<td>(T4.2)</td>
<td>Slice hammer</td>
<td>ATCYL0101</td>
</tr>
<tr>
<td>(T4.3)</td>
<td>Guid</td>
<td>ATCYL0102</td>
</tr>
<tr>
<td>(T4.4)</td>
<td>Stop bolt</td>
<td>ATCYL0104</td>
</tr>
</tbody>
</table>

**Assembly Tool ATCYL12**

<table>
<thead>
<tr>
<th>No.</th>
<th>Description</th>
<th>Item</th>
</tr>
</thead>
<tbody>
<tr>
<td>(T5.1)</td>
<td>Adjustment Tool Typ01</td>
<td>ATCYL1201</td>
</tr>
<tr>
<td>(T5.2)</td>
<td>Adjustment Tool Typ02</td>
<td>ATCYL1202</td>
</tr>
<tr>
<td>(T5.3)</td>
<td>Adjustment Tool Typ03</td>
<td>ATCYL1203</td>
</tr>
<tr>
<td>(T5.4)</td>
<td>Retaining ring</td>
<td>DIN471-15x1</td>
</tr>
<tr>
<td>(T5.5)</td>
<td>Socket head cap screws</td>
<td>DIN912-M4x30-12.9</td>
</tr>
</tbody>
</table>

**NOTICE**

The tools ATCYL13, ATCYL14, ATCYL15 and ATCYL16 are not included with the Hot Runner System and must be ordered from Synventive separately.
8.2.2.4 Disassembling Actuator PNC3008B02

1) Hold against turning:
   - Piston (2) with the adjustment tool (T5.1).
   - Hanger screw (3) with the hexagon socket wrench (T6).
   At the same time loosen the lock screw (4) with the assembly tool (T5.2) and ring wrench (T7).

2) Unscrew hexagon socket set screws (10).
3) Slip the lug of the tool ATCYL1201 (T5.1) into the gap of the piston (2).

4) Tighten the piston (2) with tool ATCYL1201 (T5.1) and flat wrench 13 mm (T8).

5) With Hexagon socket wrench (T6) turn the hanger screw (3) clockwise until the hanger screw (3) is unscrewed out of the piston (2).

**NOTICE**

The actuator will be lifted from the holding ring (8) and will be separated from the valve pin and hanger screw (3).
6) Loosen the hanger screw (3) from the valve gate pin (VP).

7) Remove the retaining ring (6).

8) Press the piston (2) and buffer (5) out of the cylinder housing (1).

9) Dismount the two piston seal (7.1) elements.
   - O-ring (7.1) (a)
   - Sealing element (7.1) (b)

10) Dismantling the valve pin (see section 9.1).
8.2.2.5 Assembling the Actuator PNC3008B02

Lubrication of Piston and Ring Seals

**NOTICE**

For lubrication use Krytox GPL205.

To Lubricate the piston sliding surface is essential for the actuator life time.

To Lubricate the piston ring seals is helpful to assemble the actuator.

Installation of the Sealing Ring on the Piston

1) Put the mounting cone (T2) on the piston (2).

**NOTICE**

After disassembly of the sealing elements, the original seals should be replaced.

2) Mount the O-ring (7.1) (a) into the seal groove of the piston (2).

3) Using the spreader sleeve (T1) and the mounting cone (T2), push the sealing element (7.1) (b) into the seal groove of the piston (2).

**NOTICE**

The sealing element (7.1) (b) is placed in the seal groove of the piston (2) above the O-ring (7.1) (a).
Installation of the Piston into the Actuator Housing

1) Degrease the piston sliding surface.
2) Lubricate the piston sliding surface.

3) Insert the piston (2) into the calibration sleeve (T3).
4) Place the calibration sleeve (T3) into the cylinder housing (1).
5) Push the piston (2) into the cylinder housing.

**NOTICE**
The calibration sleeve (T3) prevents damage to the piston seal (7.1).

6) Install the following seals at the buffer (5).
   - Rod seal (7.2)
   - Guiding element (7.3)
   - O-ring seal (7.4)

7) Mount buffer (5) into the cylinder housing (1).
8) Lock the buffer with the retaining ring (6).
9) Install the following seals at the actuator housing (1).
   ● Viton-ring seal (7.5)
   ● Viton-ring seal (7.6)

### Mounting of the Actuator on the Manifold

1) Mount actuator to the holding ring (8).
2) Lubricate the thread of the hexagon socket set screws (10) with high-temperature assembly paste (anti-seize compound).
   
   **NOTICE**
   
   This is an important measure to prevent thread corrosion due to aggressive gases, which could be released during plastics processing.
3) Lock the actuator with hexagon socket set screws (10).
4) Push piston (2) in closed position.
   
   **NOTICE**
   
   Closed position is when the top edge of the piston has a distance of 3 mm to the top edge of the actuator housing.
5) Mount the valve pin (VP) into the valve pin guide.
6) Place the hanger screw (3) on the valve pin (VP) head.
8.2.2.6 Adjusting the Valve Pin to the Basic Position

1) Screw the valve gate pin (VP) with the hanger screw (3) into the piston (2).

2) Hold the piston (2) against turning with the adjustment tool (T5.1) and a flat wrench 13 mm (T8).
3) Adjust the valve pin with a hexagon socket wrench (T6) as followed.
4) Still hold the piston against turning with the adjustment tool (T5.1).

NOTICE
The basic setting for the valve gate pin is 10 mm between the piston (2) top edge and the top edge from the hanger screw (3).

5) Rotate the hanger screw (3) with a hexagon socket wrench (T6) into the piston (2).

NOTICE
The exact position for the valve pin (VP) has to be checked at the front of the valve pin - depends on the nozzle tip.

The reason to unscrew the hanger screw (3) would be for valve pin maintenance or replacement.

If the deviation to the basic settings of 10 mm is more than 0.5 mm, the adjustments do not correspond to the parameters of the mold or do not correspond to the Synventive standard.
6) Wrap lock screw (4) with Teflon band (2 layer).

7) Rotate the lock screw (4) with the assembly tool (T5.2) into the piston (2).

---

For actuator assembly the lock screw (4) has to be fastened against the hanger screw (3).

8) Hold against turning:
   - Piston (2) with the adjustment tool Typ01 (T5.1).
   - Hanger screw (3) with the hexagon socket wrench (T6).

9) At the same time tighten the lock screw (4) with the assembly tool (T5.2).
8.2.2.7 Valve Pin Height Adjustment PNC3008B02

Precondition for the following steps are to be performed with the Hot Runner installed in the mold, and the system at operating temperature.

**WARNING**

**Hot Surfaces Hazard**

Contact between the skin and hot surfaces could result in burns.

Use personal protective equipment, such as gloves, apron, sleeves and face protection, to guard against burns.

When servicing or handling the hot runner system outside the manifold plates or the injection molding machine, care must be taken to heed the hot surface exposure warnings.

For first aid contact your medical / safety representing

---

**Valve Pin Adjustment Tool Kit**

<table>
<thead>
<tr>
<th>No.</th>
<th>Description</th>
<th>Item</th>
</tr>
</thead>
<tbody>
<tr>
<td>(T5.1)</td>
<td>Adjustment Tool Typ01</td>
<td>ATCYL1201</td>
</tr>
<tr>
<td>(T5.2)</td>
<td>Adjustment Tool Typ02</td>
<td>ATCYL1202</td>
</tr>
<tr>
<td>(T5.3)</td>
<td>Adjustment Tool Typ03</td>
<td>ATCYL1203</td>
</tr>
<tr>
<td>(T5.4)</td>
<td>Retaining ring</td>
<td>DIN471-15x1</td>
</tr>
<tr>
<td>(T5.5)</td>
<td>Socket head cap screws</td>
<td>DIN912-M4x30-12.9</td>
</tr>
</tbody>
</table>
Valve Pin Adjustment at mounted Hot Runner System

**WARNING**

Hot Surfaces Hazard

Contact between the skin and hot surfaces could result in burns.

**NOTICE**

The actuator is covered with a plate, containing the pneumatic access to the actuator.

1) Enable access to the actuator.

2) Slip the lug of the tool ATCYL1201 (T5.1) into the gap of the piston.
NOTICE

The piston is in the closed position, when the top edge of the piston (2) has a distance of 3 mm to the top edge of the actuator housing (1).

3) Push the fixed piston (2) forward to the close position.

4) Place the retaining ring (T5.4) at the tool ATCYL1201 (T5.1).

5) Place the ATCYL1203 (T5.3) on the retaining ring (T5.4) at the tool ATCYL1201 (T5.1).

6) Fix the piston (2) against upstroke and rotation with the socket head cap screws (T5.5).

NOTICE

Use torque wrench with wrench insert and the torques indicated in the torque table (section 13).

7) Fix the hanger screw (3) with the socket wrench (T6).

8) Slacken the lock screw (4) with the adjustment tool ATCYL1202 (T5.2) and ring wrench (T7) attached to it.

Legend to Doc003023.png

(T5.1) Adjustment tool Typ01
- ATCYL1201

(T5.2) Adjustment tool Typ02
- ATCYL1202

(T5.3) Adjustment tool Typ03
- ATCYL1203

(3) Hanger screw

(4) Lock screw

(T6) Socket wrench HEX 4

(T7) Ring wrench HEX 7
9) To adjust valve pin position:
   - Fix the lock screw (4) with the adjustment tool ATCYL2102 (T5.2) and a ring wrench (T7).
   - Turn the hanger screw (3) with the socket wrench (T6).

**NOTICE**
The screw pitch is 1 mm (right hand thread).

---

**NOTICE**
The lock screw (4) has to be wrapped with Teflon tape (2 layer).

After several adjustments replace the Teflon tape.

**To fix the valve pin position:**

10) Secure with the hexagon socket wrench (T6) the hanger screw (3) against turning.

11) Tighten the lock screw (4) with the assembly tool ATCYL2102 (T5.2) and a ring wrench (T7).

**NOTICE**
The reason to unscrew the hanger screw (3) would be for valve pin maintenance or replacement.
NOTICE

For the control of the valve pins, a pneumatic system is installed.

12) In case where the clamping plate has an opening for the valve pin adjustment, the opening must be capped airtight.
8.2.3  Actuator PNC4508B Series

8.2.3.1  Technical Data PNC4508B-01, PNC4508B-02

Actuator, bolted to manifold pneumatic

**Valve pin operation**

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Specification</th>
</tr>
</thead>
<tbody>
<tr>
<td>Operation medium</td>
<td>pneumatic</td>
</tr>
<tr>
<td>Pressure range</td>
<td>6 - 12 bar (87 - 174 psi)</td>
</tr>
<tr>
<td>Operation pressure</td>
<td>max. 14 bar (203 psi)</td>
</tr>
<tr>
<td>Flow rate</td>
<td>1.5 l/min</td>
</tr>
<tr>
<td>Valve pin response time</td>
<td>~0.5 s / 6 bar (87 psi)</td>
</tr>
<tr>
<td>Valve pin stroke</td>
<td>8 mm</td>
</tr>
<tr>
<td>Adjustment</td>
<td>± 1 mm via adjustment threads from topside</td>
</tr>
<tr>
<td>Closing force</td>
<td>954 N / 6 bar (87 psi)</td>
</tr>
<tr>
<td></td>
<td>1272 N / 8 bar (116 psi)</td>
</tr>
<tr>
<td></td>
<td>1590 N / 10 bar (145 psi)</td>
</tr>
<tr>
<td></td>
<td>1908 N / 12 bar (174 psi)</td>
</tr>
<tr>
<td>Opening force</td>
<td>848 N / 6 bar (87 psi)</td>
</tr>
<tr>
<td></td>
<td>1131 N / 8 bar (116 psi)</td>
</tr>
<tr>
<td></td>
<td>1414 N / 10 bar (145 psi)</td>
</tr>
<tr>
<td></td>
<td>1696 N / 12 bar (174 psi)</td>
</tr>
</tbody>
</table>

**Cooling**

The design provides an indirect cooling through the back plate (max. 80 °C / 175 °F), otherwise cooling lines are required.

**Piping**

No piping.

**Valve pin**

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Specification</th>
</tr>
</thead>
<tbody>
<tr>
<td>Valve pin diameter</td>
<td>Ø 3.8 mm (PNC4508B-01)</td>
</tr>
<tr>
<td></td>
<td>Ø 3.0 mm (PNC4508B-02)</td>
</tr>
<tr>
<td>Attachment</td>
<td>T - head</td>
</tr>
</tbody>
</table>

Valve pin is not secured against rotation

**NOTICE**

To ensure long life and continued flawless operation of the actuator, we recommend using filtered compressed air.

The coolant used should be properly modified, e.g. filtered water with an anti-corrosion and frost-proof agent.
8.2.3.2 Exploded View PNC4508B Series

This section describes the disassembly and reassembly process to replace seals.

In this section the actuator parts are identified with the numbers indicated in the following figure, which shows the components.

NOTICE
Always tighten the screws to the torques specified in the respective table (section 13).

<table>
<thead>
<tr>
<th>No.</th>
<th>Qty.</th>
<th>Description</th>
<th>Item</th>
</tr>
</thead>
<tbody>
<tr>
<td>(1)</td>
<td>1</td>
<td>Cylinder housing complete</td>
<td>PNC4508B-HC-01</td>
</tr>
<tr>
<td>(1.1)</td>
<td>1</td>
<td>Cylinder housing</td>
<td>PNC4508B-CH-01</td>
</tr>
<tr>
<td>(1.2)</td>
<td>1</td>
<td>Piston</td>
<td>PNC4508B-PI-01</td>
</tr>
<tr>
<td>(1.3)</td>
<td>1</td>
<td>Buffer</td>
<td>PNC4508B-BU-01</td>
</tr>
<tr>
<td>(1.4)</td>
<td>1</td>
<td>Retaining ring</td>
<td>DIN472-50X2</td>
</tr>
<tr>
<td>* ( )</td>
<td>1</td>
<td>Seal Kit PNC4508B includes: (1.5), (1.6), (1.7), (1.8), (7), (8), (9)</td>
<td>PNC4508B-SK-01</td>
</tr>
<tr>
<td>(2)</td>
<td>1</td>
<td>Lock screw</td>
<td>PNC4508B-LS-01</td>
</tr>
<tr>
<td>(3)</td>
<td>1</td>
<td>Hanger screw, Valve pin 3.8 (PNC4508B-01)</td>
<td>PNC4508B-HS-01</td>
</tr>
<tr>
<td>(3)</td>
<td>1</td>
<td>Hanger screw, Valve pin 3.0 (PNC4508B-02)</td>
<td>PNC4508B-HS-02</td>
</tr>
<tr>
<td>(4)</td>
<td>1</td>
<td>Holding ring</td>
<td>PNC4508B-HR-01</td>
</tr>
<tr>
<td>(5)</td>
<td>2</td>
<td>Hexagon socket cap screw</td>
<td>DIN912-M5X16-12.9</td>
</tr>
<tr>
<td>(6)</td>
<td>2</td>
<td>Hexagon socket set screw</td>
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</tr>
<tr>
<td>* (7)</td>
<td>1</td>
<td>Viton-ring seal</td>
<td>VIOR-RING 9.25X1.78 FPM 80 GREEN</td>
</tr>
<tr>
<td>* (8)</td>
<td>1</td>
<td>Viton-ring seal</td>
<td>VIOR-RING 28.30X1.78 FPM 80</td>
</tr>
<tr>
<td>* (9)</td>
<td>1</td>
<td>Viton-ring seal</td>
<td>VIOR-RING 53.70X1.78 FPM 80</td>
</tr>
</tbody>
</table>
8.2.3.3 Tools for Assembling, Disassembling and Adjusting the Actuator

The following overview contains a list of special tools needed for the assembly and disassembly of the actuator and to replace seals.

The assembly and disassembly tools are identified with the numbers indicated in the following figure, which shows the components in this section.

### Tools to Mount Actuator Seals and the Piston

<table>
<thead>
<tr>
<th>No.</th>
<th>Description</th>
<th>Item</th>
</tr>
</thead>
<tbody>
<tr>
<td>(T1)</td>
<td>Spreader sleeve</td>
<td>ATCYL0405</td>
</tr>
<tr>
<td>(T2)</td>
<td>Mounting cone</td>
<td>ATCYL20</td>
</tr>
<tr>
<td>(T3)</td>
<td>Calibration sleeve (cone 45)</td>
<td>ATCYL19</td>
</tr>
</tbody>
</table>

### Valve Pin Disassembly Tool ATCYL16

<table>
<thead>
<tr>
<th>No.</th>
<th>Description</th>
<th>Item</th>
</tr>
</thead>
<tbody>
<tr>
<td>(T4.1)</td>
<td>Adapter for valve pin ø 3 mm and ø 3.8 mm</td>
<td>ATCYL1601</td>
</tr>
<tr>
<td>(T4.2)</td>
<td>Slice hammer</td>
<td>ATCYL0101</td>
</tr>
<tr>
<td>(T4.3)</td>
<td>Guid</td>
<td>ATCYL0102</td>
</tr>
<tr>
<td>(T4.4)</td>
<td>Stop bolt</td>
<td>ATCYL0104</td>
</tr>
</tbody>
</table>

### Assembly Tool ATCYL21

<table>
<thead>
<tr>
<th>No.</th>
<th>Description</th>
<th>Item</th>
</tr>
</thead>
<tbody>
<tr>
<td>(T5.1)</td>
<td>Adjustment Tool Typ01</td>
<td>ATCYL2101</td>
</tr>
<tr>
<td>(T5.2)</td>
<td>Adjustment Tool Typ02</td>
<td>ATCYL2102</td>
</tr>
<tr>
<td>(T5.3)</td>
<td>Adjustment Tool Typ03</td>
<td>ATCYL2103</td>
</tr>
<tr>
<td>(T5.4)</td>
<td>Retaining ring</td>
<td>DIN471-16x1</td>
</tr>
<tr>
<td>(T5.5)</td>
<td>Socket head cap screws</td>
<td>DIN912-M4x20-12.9</td>
</tr>
</tbody>
</table>

**NOTICE**

The tools ATCYL16, ATCYL19 and ATCYL20 are not included with the Hot Runner System and must be ordered from Synventive separately.
8.2.3.4 Disassembling Actuator PNC4508B Series

1) Hold against turning the hanger screw (3) with the hexagon socket wrench (T6).

2) At the same time loosen the lock screw (2) with the adjustment tool ATCYL2102 (T5.2) and ring wrench (T7).

3) Unscrew hexagon socket set screws (6).
4) With Hexagon socket wrench (T6) turn the hanger screw (3) clockwise until the hanger screw (3) is unscrewed out of the piston (1.2).

**NOTICE**
The actuator will be lifted from the holding ring (4) and will be separated from the valve pin (VP) and hanger screw (3).

5) Loosen the hanger screw (3) from the valve gate pin (VP).
6) Remove the retaining ring (1.4).

7) Press the piston (1.2) and buffer (1.3) out of the cylinder housing (1.1).
8) Dismount the two piston seal (1.5) elements.
   - O-ring (1.5) (a)
   - Sealing element (1.5) (b)

9) Dismantling the valve pin (see section 9.1).

8.2.3.5 Assembling the Actuator PNC4508B Series

Lubrication of Piston and Ring Seals

**NOTICE**

For lubrication use Krytox GPL205.
To Lubricate the piston sliding surface is essential for the actuator life time.

To Lubricate the piston ring seals is helpful to assemble the actuator.
Installation of the Sealing Ring on the Piston

1) Put the mounting cone (T2) on the piston (1.2).

 NOTICE
After disassembly of the sealing elements, the original seals should be replaced.

2) Mount the O-ring (1.5) (a) into the seal groove of the piston (1.2).
3) Using the spreader sleeve (T1) and the mounting cone (T2), push the sealing element (1.5) (b) into the seal groove of the piston (1.2).

 NOTICE
The sealing element (1.5) (b) is placed in the seal groove of the piston (1.2) above the O-ring (1.5) (a).

Installation of the Piston into the Actuator Housing

1) Degrease the piston sliding surface.
2) Lubricate the piston sliding surface.
3) Insert the piston (1.2) into the calibration sleeve (T3).
4) Place the calibration sleeve (T3) into the cylinder housing (1.1).
5) Push the piston (1.2) into the cylinder housing.

**NOTICE**

The calibration sleeve (T3) prevents damage to the piston seal (1.5).

---

6) Install the following seals at the buffer (1.3).
   - O-ring seal (1.6)
   - Rod seal (1.7)
   - Guiding element (1.8)

---

7) Mount buffer (1.3) into the cylinder housing (1.1).
8) Lock the buffer with the retaining ring (1.4).

---

9) Install the following seals at the actuator housing (1.1).
   - Viton-ring seal (8)
   - Viton-ring seal (9)
8.2.3.6 Mounting of the Actuator on the Manifold

1) Mount actuator to the holding ring (4).
2) Lubricate the thread of the hexagon socket set screws (6) with high-temperature assembly paste (anti-seize compound).

**NOTICE**
This is an important measure to prevent thread corrosion due to aggressive gases, which could be released during plastics processing.

3) Lock the actuator with hexagon socket set screws (6).
4) Push piston (1.2) in closed position.

5) Mount the valve pin (VP) into the valve pin guide.
6) Place the hanger screw (3) on the valve pin (VP) head.
### 8.2.3.7 Adjusting the Valve Pin to the Basic Position

1) Screw the valve gate pin (VP) with the hanger screw (3) into the piston (1.2).

#### NOTICE

After disassembly of the system, the original seals should be replaced with new seals.

2) Lubricate the viton-ring seal (7) with hydraulic oil or white grease.

3) Install the viton-ring seal (7) at the lock screw (2).

4) Adjust the valve pin with a hexagon socket wrench (T6) as followed.

#### NOTICE

The basic setting for the valve gate pin is 22 mm between the piston (1.2) top edge and the bottom edge from the hanger screw (3) socket wrench seat.

5) Rotate the hanger screw (3) with a hexagon socket wrench (T6) into the piston (1.2).
During the fine tuning process it is possible to move the valve pin (VP) in every direction 0.5 mm (1/2 rotation).

The exact position for the valve pin (VP) has to be checked at the front of the valve pin - depends on the nozzle tip.

The reason to unscrew the hanger screw (3) would be for valve pin maintenance or replacement.

If the deviation to the basic settings of 22 mm is more than 0.5 mm, the adjustments do not correspond to the parameters of the mold or do not correspond to the Synventive standard.

**NOTICE**

For actuator assembly the lock screw (2) has to be fastened against the hanger screw (3).

6) Rotate the lock screw (2) with the adjustment tool (T5.2) into the piston (1.2).

7) Hold against turning the hanger screw (3) with the hexagon socket wrench (T6).

8) At the same time tighten the lock screw (2) with the assembly tool (T5.2).
8.2.3.8 Valve Pin Height Adjustment PNC4508B Series

Precondition for the following steps are to be performed with the Hot Runner installed in the mold, and the system at operating temperature.

**WARNING**

Hot Surfaces Hazard

Contact between the skin and hot surfaces could result in burns.

Use personal protective equipment, such as gloves, apron, sleeves and face protection, to guard against burns.

When servicing or handling the hot runner system outside the manifold plates or the injection molding machine, care must be taken to heed the hot surface exposure warnings.

For first aid contact your medical / safety representing

Valve Pin Adjustment Tool Kit

<table>
<thead>
<tr>
<th>Tool Kit for PNC4508B, ATCYL21</th>
</tr>
</thead>
<tbody>
<tr>
<td>No.</td>
</tr>
<tr>
<td>-----</td>
</tr>
<tr>
<td>(T5.1)</td>
</tr>
<tr>
<td>(T5.2)</td>
</tr>
<tr>
<td>(T5.3)</td>
</tr>
<tr>
<td>(T5.4)</td>
</tr>
<tr>
<td>(T5.5)</td>
</tr>
</tbody>
</table>
Valve Pin Adjustment at mounted Hot Runner System

**WARNING**

Hot Surfaces Hazard

Contact between the skin and hot surfaces could result in burns.

**NOTICE**

The actuator is covered with a plate, containing the pneumatic access to the actuator.

1) Enable access to the actuator.

2) Slip the lug of the adjustment tool Typ01 (T5.1) into the gap of the piston (1.2).

3) Push the fixed piston (1.2) forward to the close position.
4) Place the retaining ring (T5.4) at the adjustment tool Typ01 (T5.1).
5) Place the adjustment tool Typ03 (T5.3) on the retaining ring (T5.4) at the adjustment tool Typ01 (T5.1).
6) Fix the piston (1.2) against upstroke with the socket head cap screws (T5.5).

**NOTICE**

Use torque wrench with wrench insert and the torques indicated in the torque table (section 13).
7) Fix the hanger screw (3) with the socket wrench (T6).

8) Slacken the lock screw (2) with the adjustment tool Typ02 (T5.2) and ring wrench (T7) attached to it.

**Legend to Doc003770.png**

- (T5.1) Adjustment tool Typ01
- (T5.2) Adjustment tool Typ02
- (T5.3) Adjustment tool Typ03
- (3) Hanger screw
- (2) Lock screw
- (T6) Socket wrench HEX 4
- (T7) Ring wrench HEX 7

---

9) To adjust valve pin position:

- Fix the lock screw (2) with the adjustment tool Typ02 (T5.2) and a ring wrench (T7).
- Turn the hanger screw (3) with the socket wrench (T6).

**NOTICE**

The screw pitch is 1 mm (right hand thread).
To Fix the Vale Pin Position:

10) Secure with the hexagon socket wrench (T6) the hanger screw (3) against turning.

11) Tighten the lock screw (2) with the adjustment tool Typ02 (T5.2) and a ring wrench (T7).

**NOTICE**
The reason to unscrew the hanger screw (3) would be for valve pin maintenance or replacement.

**NOTICE**
For the control of the valve pins, a pneumatic system is installed.

12) In case where the clamping plate has an opening for the valve pin adjustment, the opening must be capped airtight.
8.2.4  Actuator PNC4512B Series

8.2.4.1  Technical Data PNC4512B

**Actuator, bolted to manifold pneumatic**

<table>
<thead>
<tr>
<th>Valve Pin</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Valve gate pin diameter</td>
<td>Ø 3.8 mm</td>
</tr>
<tr>
<td>(PNC4512B-02, -04, -06)</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Ø 3.0 mm</td>
</tr>
<tr>
<td>(PNC4512B-03, -05, -07)</td>
<td></td>
</tr>
<tr>
<td>Attachment</td>
<td>T - head</td>
</tr>
</tbody>
</table>

**Valve Pin Operation**

<table>
<thead>
<tr>
<th>Operation</th>
<th>pneumatic</th>
</tr>
</thead>
<tbody>
<tr>
<td>Operation pressure</td>
<td>max. 14 bar (203 psi)</td>
</tr>
<tr>
<td>Flow rate</td>
<td>1.5 l/min</td>
</tr>
<tr>
<td>Valve pin response time</td>
<td>0.5 s</td>
</tr>
<tr>
<td>Valve pin Stroke</td>
<td>12 mm</td>
</tr>
</tbody>
</table>

| Closing force              | 954 N (6 bar) |
|                           | 1272 N (8 bar) |
|                           | 1590 N (10 bar) |
|                           | 1908 N (12 bar) |

| Opening force              | 848 N (6 bar) |
|                           | 1131 N (8 bar) |
|                           | 1414 N (10 bar) |
|                           | 1696 N (12 bar) |

**Actuator Operating Pressure Range**

<table>
<thead>
<tr>
<th>6 - 12 bar</th>
<th>87 - 174 psi</th>
</tr>
</thead>
</table>

**Cooling**

The design provides an indirect cooling through the cooled back plate.

**Cooling Temperature**

max. 80 °C / 175 °F

**Piping**

No piping. Pressure provided by back plate

---

**NOTICE**

To ensure long life and continued flawless operation of the actuator, we recommend using filtered compressed air.

The coolant used should be properly modified, e.g. filtered water with an anti-corrosion and frost-proof agent.
8.2.4.2 Exploded View PNC4512B

This section describes the disassembly and reassembly process to replace seals. In this section the actuator parts are identified with the numbers indicated in the following figure, which shows the components.

**NOTICE**

Always tighten the screws to the torques specified on the table in section “Hot Runner System Installation Guide” on page 545.

![Diagram](Doc006519.png)

<table>
<thead>
<tr>
<th>No.</th>
<th>Qty.</th>
<th>Description</th>
<th>Item</th>
</tr>
</thead>
<tbody>
<tr>
<td>(1)</td>
<td>1</td>
<td>Viton-ring seal</td>
<td>VIOR28.30X1.78-FPM-80-G</td>
</tr>
<tr>
<td>(2)</td>
<td>1</td>
<td>Viton-ring seal</td>
<td>VIOR53.70X1.78-FPM-80-G</td>
</tr>
<tr>
<td>(3)</td>
<td>1</td>
<td>Viton-ring seal</td>
<td>VIOR 9.25X1.78-FPM80</td>
</tr>
<tr>
<td>(4)</td>
<td>1</td>
<td>Piston Seal D45</td>
<td>2G2/45-37.5-3.2</td>
</tr>
<tr>
<td>(5)</td>
<td>1</td>
<td>Retaining ring</td>
<td>DIN472-50X2</td>
</tr>
<tr>
<td>(6)</td>
<td>1</td>
<td>Rod seal</td>
<td>C1-1044-V3664</td>
</tr>
<tr>
<td>(7)</td>
<td>1</td>
<td>O-ring seal</td>
<td>VIOR41X1.78FPM75</td>
</tr>
<tr>
<td>(8)</td>
<td>1</td>
<td>Guiding element</td>
<td>FB2.3-1.5L48.5</td>
</tr>
<tr>
<td>(9)</td>
<td>2</td>
<td>Hexagon socket cap screw</td>
<td>DIN912-M5X0.16-12.9</td>
</tr>
<tr>
<td>(10)</td>
<td>2</td>
<td>Hexagon socket set screw</td>
<td>DIN914-M4X8-45H</td>
</tr>
<tr>
<td>(11)</td>
<td>2</td>
<td>M2 X2 Pan head screw</td>
<td>DIN7985-M2X2</td>
</tr>
<tr>
<td>(12)</td>
<td>1</td>
<td>Position Sensor Assembly 1M cable</td>
<td>PNC4512-01 (02,03)</td>
</tr>
<tr>
<td></td>
<td>1</td>
<td>Position Sensor Assembly 3M cable</td>
<td>PNC4512-03 (06,07)</td>
</tr>
<tr>
<td>(13)</td>
<td>1</td>
<td>Hanger screw, 3.8 valve pin</td>
<td>PNC4508B-HS-01 (PNC4512B-02, -04, -06)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Hanger screw, 3.0 valve pin</td>
<td>PNC4508B-HS-02 (PNC4512B-03, -05, -07)</td>
</tr>
<tr>
<td>(14)</td>
<td>1</td>
<td>Lock screw</td>
<td>PNC4512B-LS-01</td>
</tr>
</tbody>
</table>
8.2.4.3 Tools for Assembling, Disassembling and Adjusting the Actuator

The following overview contains a list of special tools needed for the assembly and disassembly of the actuator and to replace seals.

The assembly and disassembly tools are identified with the numbers indicated in the following figure, which shows the components in this section.

**Tools to Mount Actuator Seals and the Piston**

<table>
<thead>
<tr>
<th>No.</th>
<th>Description</th>
<th>Item</th>
</tr>
</thead>
<tbody>
<tr>
<td>(T1)</td>
<td>Spreader sleeve</td>
<td>ATCYL0405</td>
</tr>
<tr>
<td>(T2)</td>
<td>Mounting cone</td>
<td>ATCYL20</td>
</tr>
<tr>
<td>(T3)</td>
<td>Calibration sleeve (cone 45)</td>
<td>ATCYL19</td>
</tr>
</tbody>
</table>

**Valve Pin Disassembly Tool ATCYL16**

<table>
<thead>
<tr>
<th>No.</th>
<th>Description</th>
<th>Item</th>
</tr>
</thead>
<tbody>
<tr>
<td>(T4.1)</td>
<td>Adapter for valve pin ø 3 mm and ø 3.8 mm</td>
<td>ATCYL1601</td>
</tr>
<tr>
<td>(T4.2)</td>
<td>Slice hammer</td>
<td>ATCYL0101</td>
</tr>
<tr>
<td>(T4.3)</td>
<td>Guide</td>
<td>ATCYL0102</td>
</tr>
<tr>
<td>(T4.4)</td>
<td>Stop bolt</td>
<td>ATCYL0104</td>
</tr>
</tbody>
</table>

**Assembly Tool ATCYL21**

<table>
<thead>
<tr>
<th>No.</th>
<th>Description</th>
<th>Item</th>
</tr>
</thead>
<tbody>
<tr>
<td>(T5.1)</td>
<td>Adjustment Tool Typ01</td>
<td>ATCYL2101</td>
</tr>
<tr>
<td>(T5.2)</td>
<td>Adjustment Tool Typ02</td>
<td>ATCYL2102</td>
</tr>
<tr>
<td>(T5.3)</td>
<td>Adjustment Tool Typ03</td>
<td>ATCYL2103</td>
</tr>
<tr>
<td>(T5.4)</td>
<td>Retaining ring</td>
<td>DIN471-16x1</td>
</tr>
<tr>
<td>(T5.5)</td>
<td>Socket head cap screws</td>
<td>DIN912-M4x20-12.9</td>
</tr>
</tbody>
</table>

**NOTICE**

The tools ATCYL16, ATCYL19 and ATCYL20 are not included with the Hot Runner System and must be ordered from Synventive separately.
8.2.4.4 Disassembling Actuator PNC4512B Series

**NOTICE**
For actuator disassembly the lock screw (2) of the hanger screw (3) needs to be loosened.

1) Hold against turning the hanger screw (3) with the hexagon socket wrench (T6).
2) At the same time loosen the lock screw (2) with the adjustment tool ATCYL2102 (T5.2) and ring wrench (T7).
3) Unscrew hexagon socket set screws (6).
4) With Hexagon socket wrench (T6) turn the hanger screw (3) clockwise until the hanger screw (3) is unscrewed out of the piston (1.2).

**NOTICE**
The actuator will be lifted from the holding ring (4) and will be separated from the valve pin (VP) and hanger screw (3).

5) Loosen the hanger screw (3) from the valve gate pin (VP).

6) Unscrew the 2 socket head cap screws (5) to release the holding ring (4).
7) Remove the retaining ring (1.4).

8) Press the piston (1.2) and buffer (1.3) out of the cylinder housing (1.1).
9) Dismount the two piston seal (1.5) elements.
   - O-ring (1.5) (a)
   - Sealing element (1.5) (b)

10) Dismantling the valve pin (see section 9.1).
8.2.4.5 Assembling the Actuator PNC4512B Series

Lubrication of Piston and Ring Seals

**NOTICE**
For lubrication use Krytox GPL205.
To lubricate the piston sliding surface is essential for the actuator life time.

To lubricate the piston ring seals is helpful to assemble the actuator.

Installation of the Sealing Ring on the Piston

1) Put the mounting cone (T2) on the piston (1.2).

**NOTICE**
After disassembly of the sealing elements, the original seals should be replaced.

2) Mount the O-ring (1.5) (a) into the seal groove of the piston (1.2).
3) Using the spreader sleeve (T1) and the mounting cone (T2), push the sealing element (1.5) (b) into the seal groove of the piston (1.2).
4) The sealing element (1.5) (b) is placed in the seal groove of the piston (1.2) above the O-ring (1.5) (a).
Installation of the Piston into the Actuator Housing

1) Degrease the piston sliding surface.
2) Lubricate the piston sliding surface with Krylox GPL205.

3) Insert the piston (1.2) into the calibration sleeve (T3).
4) Place the calibration sleeve (T3) into the cylinder housing (1.1).
5) Push the piston (1.2) into the cylinder housing.

**NOTICE**
The calibration sleeve (T3) prevents damage to the piston seal (1.5).

6) Install the following seals at the buffer (1.3).
   - O-ring seal (1.6)
   - Rod seal (1.7)
   - Guiding element (1.8)

7) Mount buffer (1.3) into the cylinder housing (1.1).
8) Lock the buffer with the retaining ring (1.4).
9) Install the following seals at the actuator housing (1.1).
   - Viton-ring seal (8)
   - Viton-ring seal (9)

**Mounting of the Actuator on the Manifold**

1) Mount actuator to the holding ring (4).
2) Lubricate the thread of the hexagon socket set screws (6) with high-temperature assembly paste (anti-seize compound).

   **NOTICE**
   This is an important measure to prevent thread corrosion due to aggressive gases, which could be released during plastics processing.

3) Lock the actuator with hexagon socket set screws (6).
4) Push piston (1.2) in closed position.

5) Mount the valve pin (VP) into the valve pin guide.
6) Place the hanger screw (3) on the valve pin (VP) head.
8.2.4.6 Adjusting the Valve Pin to the Basic Position

1) Screw the valve gate pin (VP) with the hanger screw (3) into the piston (1.2).

**NOTICE**
After disassembly of the system, the original seals should be replaced with new seals.

2) Lubricate the viton-ring seal (7) with Krytox GPL205, hydraulic oil, or white grease.
3) Install the viton-ring seal (7) at the lock screw (2).

4) Adjust the valve pin with a hexagon socket wrench (T6) as followed.

**NOTICE**
The basic setting for the valve gate pin is 22 mm between the piston (1.2) top edge and the bottom edge from the hanger screw (3) socket wrench seat.

5) Rotate the hanger screw (3) with a hexagon socket wrench (T6) into the piston (1.2).
NOTICE

During the fine tuning process it is possible to move the valve pin (VP) in every direction 0.5 mm (1/2 rotation). The exact position for the valve pin (VP) has to be checked at the front of the valve pin - depends on the nozzle tip. The reason to unscrew the hanger screw (3) would be for valve pin maintenance or replacement. If the deviation to the basic settings of 22 mm is more than 0.5 mm, the adjustments do not correspond to the parameters of the mold or do not correspond to the Synventive standard.

NOTICE

For actuator assembly the lock screw (2) has to be fastened against the hanger screw (3).

6) Rotate the lock screw (2) with the adjustment tool (T5.2) into the piston (1.2).
7) Hold against turning the hanger screw (3) with the hexagon socket wrench (T6).
8) At the same time tighten the lock screw (2) with the assembly tool (T5.2).
8.2.4.7 Valve Pin Height Adjustment PNC4512B Series

Precondition for the following steps are to be performed with the Hot Runner installed in the mold, and the system at operating temperature.

![Hot Surfaces Hazard](Doc003767.png)

**WARNING**

**Hot Surfaces Hazard**

Contact between the skin and hot surfaces could result in burns.

Use personal protective equipment, such as gloves, apron, sleeves and face protection, to guard against burns.

When servicing or handling the hot runner system outside the manifold plates or the injection molding machine, care must be taken to heed the hot surface exposure warnings.

For first aid contact your medical / safety representing

**Valve Pin Adjustment Tool Kit**

<table>
<thead>
<tr>
<th>No.</th>
<th>Description</th>
<th>Item</th>
</tr>
</thead>
<tbody>
<tr>
<td>(T5.1)</td>
<td>Adjustment Tool Typ01</td>
<td>ATCYL2101</td>
</tr>
<tr>
<td>(T5.2)</td>
<td>Adjustment Tool Typ02</td>
<td>ATCYL2102</td>
</tr>
<tr>
<td>(T5.3)</td>
<td>Adjustment Tool Typ03</td>
<td>ATCYL2103</td>
</tr>
<tr>
<td>(T5.4)</td>
<td>Retaining ring</td>
<td>DIN471-16x1</td>
</tr>
<tr>
<td>(T5.5)</td>
<td>Socket head cap screws</td>
<td>DIN912-M4x20-12.9</td>
</tr>
</tbody>
</table>
Valve Pin Adjustment at mounted Hot Runner System

**WARNING**

**Hot Surfaces Hazard**

Contact between the skin and hot surfaces could result in burns.

**NOTICE**

The actuator is covered with a plate, containing the pneumatic access to the actuator.

1) Enable access to the actuator.

2) Slip the lug of the adjustment tool Typ01 (T5.1) into the gap of the piston (1.2).

3) Push the fixed piston (1.2) forward to the close position.
4) Place the retaining ring (T5.4) at the adjustment tool Typ01 (T5.1).
5) Place the adjustment tool Typ03 (T5.3) on the retaining ring (T5.4) at the adjustment tool Typ01 (T5.1).
6) Fix the piston (1.2) against upstroke with the socket head cap screws (T5.5).

**NOTICE**

Use torque wrench with wrench insert and the torques indicated in the torque table (section 13).
7) Fix the hanger screw (3) with the socket wrench (T6).

8) Slacken the lock screw (2) with the adjustment tool Typ02 (T5.2) and ring wrench (T7) attached to it.

Legend to Doc003770.png
(T5.1) Adjustment tool Typ01
(T5.2) Adjustment tool Typ02
(T5.3) Adjustment tool Typ03
(3) Hanger screw
(2) Lock screw
(T6) Socket wrench HEX 4
(T7) Ring wrench HEX 7

9) To adjust valve pin position:
- Fix the lock screw (2) with the adjustment tool Typ02 (T5.2) and a ring wrench (T7).
- Turn the hanger screw (3) with the socket wrench (T6).

**NOTICE**
The screw pitch is 1 mm (right hand thread).
To Fix the Valve Pin Position:

10) Secure with the hexagon socket wrench (T6) the hanger screw (3) against turning
11) Tighten the lock screw (2) with the adjustment tool Typ02 (T5.2) and a ring wrench (T7).

**NOTICE**

The reason to unscrew the hanger screw (3) would be for valve pin maintenance or replacement.

---

**NOTICE**

For the control of the valve pins, a pneumatic system is installed.

12) In case where the clamping plate has an opening for the valve pin adjustment, the opening must be capped airtight.
8.2.5 Actuator PNC6018B-02

8.2.5.1 Technical Data PNC6018B-02

Actuator, bolted to manifold pneumatic

<table>
<thead>
<tr>
<th>Valve pin operation</th>
<th></th>
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<tbody>
<tr>
<td>Operation medium</td>
<td>pneumatic</td>
</tr>
<tr>
<td>Pressure range</td>
<td>6 - 12 bar (87 - 174 psi)</td>
</tr>
<tr>
<td>Operation pressure max</td>
<td>14 bar (203 psi)</td>
</tr>
<tr>
<td>Flow rate</td>
<td>1.5 l/min</td>
</tr>
<tr>
<td>Valve pin response time</td>
<td>0.5 s</td>
</tr>
<tr>
<td>Valve pin stroke</td>
<td>18 mm</td>
</tr>
<tr>
<td>Adjustment</td>
<td>± 1 mm via adjustment threads from topside</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Closing force</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>6 bar (87 psi)</td>
<td>1696 N</td>
</tr>
<tr>
<td>8 bar (116 psi)</td>
<td>2261 N</td>
</tr>
<tr>
<td>10 bar (145 psi)</td>
<td>2826 N</td>
</tr>
<tr>
<td>12 bar (174 psi)</td>
<td>3393 N</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Opening force</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>6 bar (87 psi)</td>
<td>1447 N</td>
</tr>
<tr>
<td>8 bar (116 psi)</td>
<td>1930 N</td>
</tr>
<tr>
<td>10 bar (145 psi)</td>
<td>2412 N</td>
</tr>
<tr>
<td>12 bar (174 psi)</td>
<td>2894 N</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Valve pin</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Valve pin diameter</td>
<td>Ø 5 mm, Ø 6 mm</td>
</tr>
<tr>
<td>Attachment</td>
<td>T - head Valve pin is secured against rotation</td>
</tr>
</tbody>
</table>

**NOTICE**

To ensure long life and continued flawless operation of the actuator, we recommend using filtered compressed air.

The coolant used should be properly modified, e.g. filtered water with an anti-corrosion and frost-proof agent.
8.2.5.2 Exploded View PNC6018B-02

This section describes the disassembly and reassembly process to replace seals.

In this section the actuator parts are identified with the numbers indicated in the following figure, which shows the components.

NOTICE
Always tighten the screws to the torques specified in the respective table (section 13).

<table>
<thead>
<tr>
<th>No.</th>
<th>Qty.</th>
<th>Description</th>
<th>Item</th>
</tr>
</thead>
<tbody>
<tr>
<td>(1)</td>
<td>1</td>
<td>Cylinder housing complete</td>
<td>PNC6018B-HC-01</td>
</tr>
<tr>
<td>(1.1)</td>
<td>1</td>
<td>Cylinder housing</td>
<td>PNC6018B-CH-01</td>
</tr>
<tr>
<td>(1.2)</td>
<td>1</td>
<td>Piston</td>
<td>PNC6018B-PI-01</td>
</tr>
<tr>
<td>(1.3)</td>
<td>1</td>
<td>Buffer</td>
<td>PNC6018B-BU-01</td>
</tr>
<tr>
<td>(1.4)</td>
<td>1</td>
<td>Retaining ring</td>
<td>DIN472-65X2.5</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Seal Kit PNC6018B includes:</td>
<td>PNC6018B-SK-01</td>
</tr>
<tr>
<td></td>
<td></td>
<td>(1.5), (1.6), (1.7), (1.8), (7), (8), (9)</td>
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</tr>
<tr>
<td>(1.5)</td>
<td>1</td>
<td>Piston seal D60</td>
<td>K30-60-49-4.2</td>
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<tr>
<td>(1.6)</td>
<td>1</td>
<td>O-ring seal</td>
<td>VIOR 56.87X1.78FPM75</td>
</tr>
<tr>
<td>(1.7)</td>
<td>1</td>
<td>Rod seal</td>
<td>C1-2038-V3664</td>
</tr>
<tr>
<td>(1.8)</td>
<td>1</td>
<td>Guiding element</td>
<td>FB2.3-1.5L70.5</td>
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<tr>
<td>(2)</td>
<td>1</td>
<td>Lock screw</td>
<td>PNC6018B-LS-01</td>
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<tr>
<td>(3)</td>
<td>1</td>
<td>Hanger screw</td>
<td>PNC6018B-HS-02</td>
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<tr>
<td>(4)</td>
<td>1</td>
<td>Holding ring</td>
<td>PNC6018B-HR-01</td>
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<tr>
<td>(5)</td>
<td>2</td>
<td>Hexagon socket cap screw</td>
<td>DIN912-M6X16-12.9</td>
</tr>
<tr>
<td>(6)</td>
<td>2</td>
<td>Hexagon socket set screw</td>
<td>DIN914-M4X8-45H</td>
</tr>
<tr>
<td>(7)</td>
<td>1</td>
<td>Viton-ring seal</td>
<td>VIOR-RING 17.17X1.78 FPM75</td>
</tr>
<tr>
<td>(8)</td>
<td>1</td>
<td>Viton-ring seal</td>
<td>VIOR-RING 41X1.78 FPM75</td>
</tr>
<tr>
<td>(9)</td>
<td>1</td>
<td>Viton-ring seal</td>
<td>VIOR-RING 69.57X1.78 FPM75</td>
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</tbody>
</table>
8.2.5.3 Tools for Assembling, Disassembling and Adjusting the Actuator

The following overview contains a list of special tools needed for the assembly and disassembly of the actuator and to replace seals.

The assembly and disassembly tools are identified with the numbers indicated in the following figure, which shows the components in this section.

**NOTICE**

The tools ATCYL23, ATCYL24 and ATCYL0303 are not included with the Hot Runner System and must be ordered from Synventive separately.
8.2.5.4 Disassembling Actuator PNC6018B-02

![Disassembling Actuator PNC6018B-02](Doc003805.png)

**NOTICE**
For actuator disassembly the lock screw (2) of the hanger screw (3) needs to be loosened.

1) Hold against turning the hanger screw (3) with the hexagon socket wrench (T6).
2) At the same time loosen the lock screw (2) with the adjustment tool ATCYL2202 (T5.2) and ring wrench (T7).

![Disassembling Actuator PNC6018B-02](Doc003806.png)

3) Unscrew hexagon socket set screws (6).

**Worksteps to dissolve the Valve pin**

4) Turn the actuator counter clockwise until the hanger screw (3) is unscrewed out of the piston (1.2).

**NOTICE**
The actuator will be lifted from the holding ring (4) and will be separated from the valve pin (VP) and hanger screw (3).
5) Loosen the hanger screw (3) from the valve gate pin (VP).

6) Remove the retaining ring (1.4).

7) Press the piston (1.2) and buffer (1.3) out of the cylinder housing (1.1).
8) Dismount the two piston seal (1.5) elements.

- O-ring (1.5) (a)  
- Sealing element (1.5) (b)

9) Dismantling the valve pin (see section 9.1).
8.2.5.5 Assembling the Actuator PNC6018B-02

Lubrication of Piston and Ring Seals

**NOTICE**

For lubrication use Krytox GPL205.
To Lubricate the piston sliding surface is essential for the actuator life time.

To Lubricate the piston ring seals is helpful to assemble the actuator.

Installation of the Sealing Ring on the Piston

**NOTICE**

After disassembly of the sealing elements, the original seals should be replaced.

1) Mount the O-ring (1.5) (a) into the seal groove of the piston (1.2).
2) Push the sealing element (1.5) (b) into the seal groove of the piston (1.2).

**NOTICE**

The sealing element (1.5) (b) is placed in the seal grove of the piston (1.2) above the O-ring (1.5) (a).

Installation of the Piston into the Actuator Housing

1) Degrease the piston sliding surface.
2) Lubricate the piston sliding surface.
3) Insert the piston (1.2) into the calibration sleeve (T3).
4) Place the calibration sleeve (T3) into the cylinder housing (1.1).
5) Push the piston (1.2) into the cylinder housing.

**NOTICE**

The calibration sleeve (T3) prevents damage to the piston seal (1.5).
Service and Maintenance / Actuator PNC6018B-02

NOTICE
After disassembly of the system, the original seals should be replaced with new seals.

6) Install the following seals at the buffer (1.3).
   - O-ring seal (1.6)
   - Rod seal (1.7)
   - Guiding element (1.8)

7) Mount buffer (1.3) into the cylinder housing (1.1).
8) Lock the buffer with the retaining ring (1.4).

9) Install the following seals at the actuator housing (1.1).
   - Viton-ring seal (8)
   - Viton-ring seal (9)

Mounting of the Actuator on the Manifold

1) Mount actuator to the holding ring (4).
2) Lubricate the thread of the hexagon socket set screws (6) with high-temperature assembly paste (anti-seize compound).

   NOTICE
   This is an important measure to prevent thread corrosion due to aggressive gases, which could be released during plastics processing.

3) Lock the actuator with hexagon socket set screws (6).
4) Push piston (1.2) in closed position.
5) Mount the valve pin (VP) into the valve pin guide.
6) Place the hanger screw (3) on the valve pin (VP) head.

Adjusting the Valve Pin to the Basic Position

1) Screw the valve gate pin (VP) with the hanger screw (3) into the piston (1.2).

**NOTICE**

After disassembly of the system, the original seals should be replaced with new seals.

2) Lubricate the viton-ring seal (7) with hydraulic oil or white grease.
3) Install the viton-ring seal (7) at the lock screw (2).
4) Adjust the valve pin with a hexagon socket wrench (T6) as followed.

**NOTICE**

The basic setting for the valve gate pin is 32 mm between the piston (1.2) top edge and the bottom edge from the hanger screw (3) socket wrench seat.

5) Rotate the hanger screw (3) with a hexagon socket wrench (T6) into the piston (1.2).

**NOTICE**

The exact position for the valve pin (VP) has to be checked at the front of the valve pin - depends on the nozzle tip.

The reason to unscrew the hanger screw (3) would be for valve pin maintenance or replacement.

If the deviation to the basic settings of 32 mm is more than 0.5 mm, the adjustments do not correspond to the parameters of the mold or do not correspond to the Synventive standard.

6) Rotate the lock screw (2) with the adjustment tool (T5.2) into the piston (1.2).

7) Hold against turning the hanger screw (3) with the hexagon socket wrench (T6).

8) At the same time tighten the lock screw (2) with the assembly tool (T5.2).
8.2.5.6 Valve Pin Height Adjustment PNC6018B-02

Precondition for the following steps are to be performed with the Hot Runner installed in the mold, and the system at operating temperature.

⚠️ WARNING

Hot Surfaces Hazard

Contact between the skin and hot surfaces could result in burns.

Use personal protective equipment, such as gloves, apron, sleeves and face protection, to guard against burns.

When servicing or handling the hot runner system outside the manifold plates or the injection molding machine, care must be taken to heed the hot surface exposure warnings.

For first aid contact your medical / safety representing

Valve Pin Adjustment Tool Kit

<table>
<thead>
<tr>
<th>No.</th>
<th>Description</th>
<th>Item</th>
</tr>
</thead>
<tbody>
<tr>
<td>(T5.1)</td>
<td>Adjustment Tool Typ01</td>
<td>ATCYL2201</td>
</tr>
<tr>
<td>(T5.2)</td>
<td>Adjustment Tool Typ02</td>
<td>ATCYL2202</td>
</tr>
<tr>
<td>(T5.3)</td>
<td>Adjustment Tool Typ03</td>
<td>ATCYL2203</td>
</tr>
<tr>
<td>(T5.4)</td>
<td>Retaining ring</td>
<td>DIN471-25x1.2</td>
</tr>
<tr>
<td>(T5.5)</td>
<td>Socket head cap screws</td>
<td>DIN912-M4x20-12.9</td>
</tr>
</tbody>
</table>
Valve Pin Adjustment at mounted Hot Runner System

**WARNING**

Hot Surfaces Hazard

Contact between the skin and hot surfaces could result in burns.

**NOTICE**

The actuator is covered with a plate, containing the pneumatic access to the actuator.

1) Enable access to the actuator.

2) Slip the lug of the adjustment tool Typ01 (T5.1) into the gap of the piston (1.2).

3) Push the fixed piston (1.2) forward to the close position.

4) Place the retaining ring (T5.4) at the adjustment tool Typ01 (T5.1).

5) Place the adjustment tool Typ03 (T5.3) on the retaining ring (T5.4) at the adjustment tool Typ01 (T5.1).

6) Fix the piston (1.2) against upstroke with the socket head cap screws (T5.5).

**NOTICE**

Use torque wrench with wrench insert and the torques indicated in the torque table (section 13).
7) Fix the hanger screw (3) with the socket wrench (T6).

8) Slacken the lock screw (2) with the adjustment tool Typ02 (T5.2) and ring wrench (T7) attached to it.

**Legend to Doc003770.png**

(T5.1) Adjustment tool Typ01
(T5.2) Adjustment tool Typ02
(T5.3) Adjustment tool Typ03
(3) Hanger screw
(2) Lock screw
(T6) Socket wrench HEX 4
(T7) Ring wrench HEX 7

---

To adjust valve pin position:

9) Fix the lock screw (2) with the adjustment tool Typ02 (T5.2) and a ring wrench (T7).

10) Turn the hanger screw (3) with the socket wrench (T6).

**NOTICE**

The screw pitch is 1 mm (right hand thread).
To Fix the Vale Pin Position:

11) Secure with the hexagon socket wrench (T6) the hanger screw (3) against turning.
12) Tighten the lock screw (2) with the adjustment tool Typ02 (T5.2) and a ring wrench (T7).

**NOTICE**
The reason to unscrew the hanger screw (3) would be for valve pin maintenance or replacement.

---

**NOTICE**
For the control of the valve pins, a pneumatic system is installed.

13) In case where the clamping plate has an opening for the valve pin adjustment, the opening must be capped airtight.
8.2.6 Actuator VP4008P Series

8.2.6.1 Technical Data VP4008P01, VP4008P0301

**Actuator for hot runner systems, bolted to mold plate, pneumatic**

**Valve pin operation**
- Operation medium: pneumatic
- Pressure range: 6 - 10 bar (87 - 145 psi)
- Pressure max.: 11 bar (160 psi)
- Valve pin stroke: 8 mm
- Adjustment: By machining the adjustment plug
- Opening force: 754 N / 6 bar (87 psi)
- Closing force: 686 N / 6 bar (87 psi)
- Flow rate Instantaneous: 1.5 l/min / 6 bar (87 psi)
- Valve pin response time: ~0.5 s / 6 bar (87 psi)
- Connections: 1/8 NPT or M 10x1 (Goodridge 6-L / Parker 8-L) Connecting in clamping plate

**Cooling**
- Medium: Clamping Plate Cooling (max. 100°C / 210 °F)
- Cooling lines are required in clamping plate.

**Valve pin**
- Valve pin diameter: Ø 3.8 mm (VP4008P01)
- Ø 3.0 mm (VP4008P0301)
- Attachment: Valve pin head within the piston

**Miscellaneous Information**
- Minimum clamping plate thickness: 32 mm
- Minimum pitch of the actuators: 55 mm
- Maximum distance from center support: 650 mm

**NOTICE**
To ensure long life and continued, flawless operation, the use of filtered, dry, lubricated air is required.

The coolant used should be properly modified, e.g. filtered water with an anti-corrosion and frost-proof agent.

After switch off the hot runner heater, the cooling for the actuator have to be turned on for at least 15 minutes, to avoid damages of the actuator sealing.
8.2.6.2 Explosion view of the VP4008P Series

VP4008P01 - for valve pin Ø 3,8 mm  
VP4008P0301 - for valve pin Ø 3,0 mm

This section describes the disassembly and assembly process of the actuator to replace seals.

In this section the actuator parts are identified with the numbers indicated in the following figure, which shows the components.

**NOTICE**

Always tighten the screws to the torques specified in the respective table, see section 13.

### Actuator parts VP4008P Series

<table>
<thead>
<tr>
<th>No.</th>
<th>Qty.</th>
<th>Description</th>
<th>Item</th>
</tr>
</thead>
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<tr>
<td>(1)</td>
<td>1</td>
<td>Valve pin coupling (for valve pin Ø 3,8 mm)</td>
<td>VP4008PC01</td>
</tr>
<tr>
<td>(1)</td>
<td>1</td>
<td>Valve pin coupling (for valve pin Ø 3 mm)</td>
<td>VP4008PC0301</td>
</tr>
<tr>
<td>(2)</td>
<td>1</td>
<td>Retainer</td>
<td>VP4008RT01</td>
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<tr>
<td>(3)</td>
<td>1</td>
<td>Piston</td>
<td>VP4008P101</td>
</tr>
<tr>
<td>(4)</td>
<td>1</td>
<td>Adjustment plug</td>
<td>VP4008AP01</td>
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<tr>
<td>(5)</td>
<td>1</td>
<td>Cross pin</td>
<td>VP4008CP01</td>
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<tr>
<td>(6)</td>
<td>1</td>
<td>Cylinder cap</td>
<td>VP4008CC01</td>
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<td>(7)</td>
<td>1</td>
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<tr>
<td>(8)</td>
<td>2</td>
<td>Viton O-ring</td>
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<td>(9)</td>
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<td>Viton O-ring</td>
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<td>(13)</td>
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<td>Viton quad ring</td>
<td>VIQR-33.34X3.5-FPM-75-BL</td>
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<td>(14)</td>
<td>4</td>
<td>Countersunk head screw</td>
<td>DIN7991-M4x6-10.9</td>
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<td>(15)</td>
<td>1</td>
<td>Retainer</td>
<td>VP4008RT02</td>
</tr>
<tr>
<td>(16)</td>
<td>4</td>
<td>Countersunk head screw</td>
<td>DIN7991-M3x6-10.9</td>
</tr>
</tbody>
</table>
8.2.6.3 Basic Dimensions in Mold

Minimum Distance between Manifold and Clamping plate
The gap between the top of the manifold and the bottom of the top clamp plate should be 18 mm.
(see Doc003739.png)
This gap may be smaller due to customer plate thickness which will require a 35 diameter counterbore in the bottom of the top clamp plate to achieve the 18 mm gap.
(see Doc003516.png)

Valve pin length Calculation
The length of the valve pin in the cold condition is calculated with the formula:
(LM + 6.5 + Valve Pin Protrusion) / 1.002
“LM” is the distance between “0” extension of the gate to the top of the top air gap.
“P” is the Valve Pin Protrusion.
## WARNING

### Danger by Pneumatic

**Personal injury can result from connecting or disconnecting pneumatic hoses.**

Pneumatic works must be carried out by qualified persons.

Use protective goggles or face protection or protective goggles, hearing protection (PPE)

### Heavy Weight Hazard

Transport and lifting equipment should be operated only by trained personnel.

Use personal protective equipment, such as head gear, safety shoes and work gloves.

Operate lifting and transport equipment slowly and carefully to avoid uncontrolled swinging of the manifold.

**Lifting and transport equipment for lifting Hot Runner Systems shall be approved and properly rated taking into account the weight and size of the manifold.**

### Hot Surfaces Hazard

**Contact between the skin and hot surfaces could result in burns.**

Use personal protective equipment, such as work gloves, apron, sleeves and face protection, to guard against burns.

When servicing or handling the hot runner system outside the manifold plates or the injection molding machine, care must be taken to heed the hot surface exposure warnings.
8.2.6.4 First mounting of Actuator VP4008P

**NOTICE**

After disassembly of the sealing elements the original seals should be replaced.

1) Lubricate the VITON O-ring (10) with hydraulic oil or white grease.
2) Install the VITON O-ring (10) into the valve pin coupling (1) seal groove.
3) Lead the valve pin (VP) into the valve pin coupling (1).

**NOTICE**

When you lead the valve pin (VP) into the valve pin guide - the valve pin coupling (1) is settling down on the valve pin guide.

4) Install the VITON O-ring (11) into the adjustment plug (4) seal groove.
5) Place the adjustment plug (4) into the valve pin coupling (1).
6) Secure the adjustment plug (4) with the cross pin (5) in the valve pin coupling (1).

**NOTICE**

After disassembly of the sealing elements the original seals should be replaced.

7) Install the VITON quad ring (12) into the clamping plate (a) seal groove.
8) Install the retainer (15) with 4 screws (16) into the clamping plate (a).

**NOTICE**

Apply Loctite 272 on the thread of the 4 socket counter sunk head cap screws (20).

**WARNING**

Heavy Weight Hazard

9) Place the clamping plate (a) on the destined position on the mold.
10) Install the VITON quad ring (13) into the piston (3) seal groove.
11) Install the VITON O-ring (9) into the piston (3) seal groove.
12) Place the piston (3) into the cutout in the clamping plate.

**NOTICE**

The piston (3) will be placed on the flange of the valve pin coupling (1).
13) Place the retainer (2) on the piston.
14) Secure the retainer (2) with the snap ring (7) at the valve pin coupling (1).

15) Install the two VITON O-rings (8) into the cylinder cap (6) seal grooves.
16) Place the cylinder cap (6) on the piston (3).
17) Lubricate the thread of the countersunk head screws (14) with high-
temperature assembly paste (anti-seize compound).

**NOTICE**

This is an important measure to prevent thread corrosion due
to aggressive gases, which could be released during plastics
processing.

18) Attach the cylinder cap (6) at the clamping plate with the four
countersunk head screws (14).

**NOTICE**

Tighten the countersunk head screws (14) in an X pattern
(a, d, c, b).

Use torque wrench with wrench insert and the torque specified
in the respective table in section 13.

For valve pin height adjustment of the actuator VP4008P see section 8.2.6.6
8.2.6.5 Dismounting the Actuator VP4008P

1) Unscrew and remove the four countersunk head screw (14).
2) Remove the cylinder cap (6).
3) Remove the O-ring seals (8) out of the cylinder cap (6) seal grooves.

4) Remove the snap ring (7).
5) Remove the retainer (2).
**WARNING**

Heavy Weight Hazard

6) Lift the clamping plate (a) from the mold.

**NOTICE**

During lifting the clamping plate (a) from the mold, the piston (3) will be elevated up from of the valve pin coupling (1) flange.

7) Remove the retainer (15) with 4 screws (16) out of the clamping plate.

8) Remove the VITON quad ring (12) out of the clamping plate (a) seal groove.

9) Remove the VITON quad ring (13) out of the piston (3) seal groove.

10) Remove the O-ring (9) out of the piston (3) seal groove.

11) Remove the cross pin (5) out of the valve pin coupling (1) and the adjustment plug (4).

12) Remove the adjustment plug (4).

13) Remove the O-ring (11) out of the adjustment plug (4) seal groove.

14) Lift the valve pin coupling (1) from the valve pin guide.

**NOTICE**

During lifting the valve pin coupling (1) the valve pin (VP) will be pulled out of the valve pin guide.

15) Remove the O-ring seal (10) out of the valve pin coupling (1) seal groove.
8.2.6.6 Valve Pin Height Adjustment VP4008P Series

Precondition for the following steps are to be performed with the actuator installed in the mold.

For optimal gate performance and appearance, this dimension must be established fully assembled, at operating temperatures and at each location.

**WARNING**

**Heavy Weight Hazard**

Transport and lifting equipment should be operated only by trained personnel.
Operate lifting and transport equipment slowly and carefully to avoid uncontrolled swinging of the manifold.
Lifting and transport equipment for lifting Hot Runner Systems shall be approved and properly rated taking into account the weight and size of the manifold.
For first aid contact your medical / safety representing

**Hot Surfaces Hazard**

Contact between the skin and hot surfaces could result in burns.
Use personal protective equipment such as gloves, apron, sleeves and face protection to guard against burns.
When servicing or handling the hot runner system outside the manifold plates or the injection molding machine, care must be taken to heed the hot surface exposure warnings.
For first aid contact your medical / safety representing

**NOTICE**

**Hazard of Material Damage**

The following steps are to be performed with the actuator installed in the mold, and the system at operating temperature.

Clamping plate cooling (max. 100 °C / 210 °F) must be on to prevent damage to the actuator seals.

After switch off the hot runner heater, the cooling for the cylinder have to be turned on for at least 15 minutes, to avoid damages of the actuator sealing.
Thermal Expansion Calculation

In Cold Condition
the following parts are off center from the cylinder cap (6) and piston (3).
- Valve gate pin (VP)
- Valve pin coupling (1)
- Adjustment plug (4)
- Cross pin (5)
- Retainer (2)
- Snap ring (7)

At operating temperature of the hot runner system
the following parts are centric to cylinder cap (6) and piston (3).
- Valve gate pin (VP)
- Valve pin coupling (1)
- Adjustment plug (4)
- Cross pin (5)
- Retainer (2)
- Snap ring (7)

The hot runner system has been developed so that the valve gate pin is centered below the piston at operating temperature.
Height Adjustment of Cylindrical shut-off Valve pin

Valve pin height adjustment of cylindrical shut-off valve pins, found by machining the adjustment plug (4). This dimension is a function of the build-up of tolerances of many parts.

In this section the actuator parts are identified with the numbers indicated in the following figure, which shows the components.

### Actuator parts VP4008P

<table>
<thead>
<tr>
<th>No.</th>
<th>Qty.</th>
<th>Description</th>
<th>Item</th>
</tr>
</thead>
<tbody>
<tr>
<td>(1)</td>
<td>1</td>
<td>Valve pin coupling</td>
<td>VP4008PC01</td>
</tr>
<tr>
<td>(1)</td>
<td>1</td>
<td>Valve pin coupling</td>
<td>VP4008PC0301</td>
</tr>
<tr>
<td>(2)</td>
<td>1</td>
<td>Retainer</td>
<td>VP4008RT01</td>
</tr>
<tr>
<td>(3)</td>
<td>1</td>
<td>Piston</td>
<td>VP4008PI01</td>
</tr>
<tr>
<td>(4)</td>
<td>1</td>
<td>Adjustment plug</td>
<td>VP4008AP01</td>
</tr>
<tr>
<td>(5)</td>
<td>1</td>
<td>Cross pin</td>
<td>VP4008CP01</td>
</tr>
<tr>
<td>(6)</td>
<td>1</td>
<td>Cylinder cap</td>
<td>VP4008CC01</td>
</tr>
<tr>
<td>(7)</td>
<td>1</td>
<td>Snap ring</td>
<td>VP4008C-K-01</td>
</tr>
<tr>
<td>(8)</td>
<td>2</td>
<td>Viton O-ring</td>
<td>VIOR-41.28X1.8-FPM-75-BR</td>
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<tr>
<td>(9)</td>
<td>1</td>
<td>Viton O-ring</td>
<td>VIOR-20.64X1.8-FPM-75-BR</td>
</tr>
<tr>
<td>(10)</td>
<td>1</td>
<td>Viton O-ring</td>
<td>VIOR-9.13X1.0-FPM-75-BR</td>
</tr>
<tr>
<td>(11)</td>
<td>1</td>
<td>Viton O-ring</td>
<td>VIOR-5.15X1.0-FPM-75-BR</td>
</tr>
<tr>
<td>(12)</td>
<td>1</td>
<td>Viton quad ring</td>
<td>VIOR-20.64X2.6-FPM-75-BL</td>
</tr>
<tr>
<td>(13)</td>
<td>1</td>
<td>Viton quad ring</td>
<td>VIOR-33.34X3.5-FPM-75-BL</td>
</tr>
<tr>
<td>(14)</td>
<td>4</td>
<td>Countersunk head screw</td>
<td>DIN7991-M4x8-10.9</td>
</tr>
<tr>
<td>(15)</td>
<td>1</td>
<td>Retainer</td>
<td>VP4008RT02</td>
</tr>
<tr>
<td>(16)</td>
<td>4</td>
<td>Countersunk head screw</td>
<td>DIN7991-M3x6-10.9</td>
</tr>
</tbody>
</table>

1) Bring system to operating temperature and allow to soak for 60 minutes.

2) Loosen and remove:

   - Countersunk head screw (14)
   - Cylinder cap (6)
   - Cross pin (5)
   - Adjustment plug (4)

---

**WARNING**

Hot Surfaces Hazard

Contact between the skin and hot surfaces could result in burns.
3) Place a spacer block (b) over the valve pin coupling (1).
4) Measure dimension “A” with a micrometer (a) and record data.

**NOTICE**

Note contact (c) between valve gate pin (VP) / valve pin coupling (1) and piston (3) / retainer (15).

5) Install the adjustment plug (4) and cross pin (5).

6) Place the spacer block (b) over the valve pin coupling (1) again.
7) Provide a means of holding the Valve Pin flush with the surrounding gate area.

**NOTICE**

Any required valve pin protrusion will be added via calculation.

**NOTICE**

Note contact (c) between valve pin (VP) / valve pin coupling (1) and a gap (d) between piston (3) / retainer (15).

8) Measure dimension “B” with a micrometer (a) and record data.

**NOTICE**

The required machining to the adjustment plug (4) can now be calculated.
9) The quantity of material “C” to be removed from the adjustment plug (4) is given by the equation:

\[
C = (A - B) - P
\]

10) Remove the cross pin (5).
11) Take the adjustment plug (4) out of the valve pin coupling (1).
12) Mark on the adjustment plug (4) the position “C”.
13) Machine “C” from the valve pin head adapter (4).

**NOTICE**

The quantity “C” was determined in the preceding step.

14) Remove any burrs that may alter the adjustment.
15) Install the machined adjustment plug (4) in the corresponding location.
16) Install the cross pin (5).

17) Have an assistant press down (x) on the valve pin coupling (1).

**NOTICE**

Do not press down on the adjustment plug (4).
Taking care to not damage the surface of the valve pin (VP).

18) Apply pressure (x) to the gate end of the valve pin (VP) to take up any play in the system.
19) Check the protrusion (P) of the valve gate pin (VP) at the valve gate.

**NOTICE**

The protrusion is typically 0,13 mm (.005”).

20) Assemble the piston (3), retainer (2), snap ring (7) and cylinder cap (6) as described in section 8.2.6.4.
Height Adjustment of Conical shut-off Valve pin

Valve Pin adjustment is found by machining the adjustment plug (4). This dimension is a function of the build-up of tolerances of many parts. For optimal gate performance and appearance, this dimension must be established fully assembled, at operating temperatures and at each location.

In this section the actuator parts are identified with the numbers indicated in the following figure, which shows the components.

⚠️ WARNING

Hot Surfaces Hazard

Contact between the skin and hot surfaces could result in burns.

1) Bring system to operating temperature and allow to soak for 60 minutes.
2) Loosen and remove:
   - Countersunk head screw (14)
   - Cylinder cap (6)
   - Cross pin (5)
   - Adjustment plug (4)

3) Place a spacer block (b) over the valve pin coupling (1).

NOTICE

Note a gap (d) between valve pin (VP) / valve pin coupling (1) and contact (c) between piston (3) / retainer (15).

4) Measure dimension “A” with a micrometer (a) and record data.
5) Install the adjustment plug (4) and cross pin (5).

6) Place the spacer block (b) over the valve pin coupling (1) again.

**NOTICE**
The valve pin will rest in the tapered gate (f).

**NOTICE**
Note contact (c) between valve pin (VP) / valve pin coupling (1) and a gap (d) between piston (3) / retainer (15).

7) Measure dimension “B” with a micrometer (a) and record data.

**NOTICE**
The required machining to the adjustment plug (4) can now be calculated.

**NOTICE**
“C” is the length of material to be removed from the adjustment plug (as shown in Doc003521.png) “A” and “B” are the dimensions recorded from the previous steps. “P” is the protrusion of the Valve Pin. The protrusion is typically 0.13 mm (.005”).

8) The quantity of material “C” to be removed from the adjustment plug (4) is given by the equation:

\[ C = (A - B) - P \]
9) Remove the cross pin (5).
10) Take the adjustment plug (4) out of the valve pin coupling (1).
11) Mark on the adjustment plug (4) the position "C*"
12) Machine "C" from the adjustment plug (4).

**NOTICE**
The quantity "C" was determined in the preceding step.

13) Remove any burrs that may alter the adjustment.
14) Install the machined adjustment plug (4) in the corresponding location.
15) Install the cross pin (5).

---

16) Apply pressure (x) to the valve pin coupling (1).

**NOTICE**
Do not press down on the adjustment plug (4).

**NOTICE**
Note a gap (d) between pin head (VP) / valve pin coupling (1) and contact (c) between piston (3) / retainer (15).

17) Check the contact between valve gate pin (VP) and valve gate (f).
18) Check the protrusion (P) of the valve gate pin (VP) at the valve gate.

**NOTICE**
The protrusion is typically 0,13 mm (.005").

19) Assemble the piston (3), retainer (2), snap ring (7) and cylinder cap (6) as described in section 8.2.6.4
8.2.7 Actuator VP8016P Series

8.2.7.1 Technical Data VP8016P0501, VP8016P0601, VP8016P0801

NOTICE
To ensure long life and continued, flawless operation, the use of filtered, dry, lubricated air is required.

The coolant used should be properly modified, e.g. filtered water with an anti-corrosion and frost-proof agent.

After switch off the hot runner heater, the cooling for the actuator have to be turned on for at least 15 minutes, to avoid damages of the actuator sealing.

Actuator for hot runner systems, bolted to mold plate, pneumatic

Valve pin operation

<table>
<thead>
<tr>
<th>Operation medium</th>
<th>pneumatic</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pressure range</td>
<td>6 - 10 bar (87 - 145 psi)</td>
</tr>
<tr>
<td>Pressure max.</td>
<td>11 bar (160 psi)</td>
</tr>
<tr>
<td>Valve pin stroke</td>
<td>16 mm</td>
</tr>
<tr>
<td>Adjustment</td>
<td>By machining the adjustment plug</td>
</tr>
<tr>
<td>Opening force</td>
<td>2788 N / 6 bar (87 psi)</td>
</tr>
<tr>
<td>Closing force</td>
<td>3016 N / 6 bar (87 psi)</td>
</tr>
<tr>
<td>Flow rate Instantaneous</td>
<td>10 l/min / 6 bar (87 psi)</td>
</tr>
<tr>
<td>Valve pin response time</td>
<td>~0.5 s / 6 bar (87 psi)</td>
</tr>
<tr>
<td>Connections</td>
<td>1/4 NPT or M 12x1.5 (8-L) Connecting in clamping plate</td>
</tr>
</tbody>
</table>

Cooling

<table>
<thead>
<tr>
<th>Medium</th>
<th>Clamping Plate Cooling (max. 100 °C / 210 °F)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Clamping lines are required in clamping plate.</td>
<td></td>
</tr>
</tbody>
</table>

Valve pin

<table>
<thead>
<tr>
<th>Valve pin diameter</th>
<th>Ø 5 mm (VP8016P0501)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Ø 6 mm (VP8016P0601)</td>
</tr>
<tr>
<td></td>
<td>Ø 8 mm (VP8016P0801)</td>
</tr>
<tr>
<td>Attachment</td>
<td>Valve pin head within the piston</td>
</tr>
</tbody>
</table>

Miscellaneous Information

<table>
<thead>
<tr>
<th>Minimum clamping plate thickness</th>
<th>50 mm</th>
</tr>
</thead>
<tbody>
<tr>
<td>Minimum pitch of the actuators</td>
<td>97 mm</td>
</tr>
<tr>
<td>Maximum distance from center support</td>
<td>650 mm</td>
</tr>
</tbody>
</table>
8.2.7.2 Explosion view of the VP8016P Series

This section describes the disassembly and assembly process of the actuator to replace seals.

In this section the actuator parts are identified with the numbers indicated in the following figure, which shows the components.

NOTICE

Always tighten the screws to the torques specified in the respective table, see section 13.

<table>
<thead>
<tr>
<th>No.</th>
<th>Qty.</th>
<th>Description</th>
<th>Item</th>
</tr>
</thead>
<tbody>
<tr>
<td>(1)</td>
<td>1</td>
<td>Valve pin coupling</td>
<td>VP8016PC0501</td>
</tr>
<tr>
<td></td>
<td></td>
<td>(for valve pin Ø 5 mm)</td>
<td></td>
</tr>
<tr>
<td>(1)</td>
<td>1</td>
<td>Valve pin coupling</td>
<td>VP8016PC0601</td>
</tr>
<tr>
<td></td>
<td></td>
<td>(for valve pin Ø 6 mm)</td>
<td></td>
</tr>
<tr>
<td>(1)</td>
<td>1</td>
<td>Valve pin coupling</td>
<td>VP8016PC0801</td>
</tr>
<tr>
<td></td>
<td></td>
<td>(for valve pin Ø 8 mm)</td>
<td></td>
</tr>
<tr>
<td>(2)</td>
<td>1</td>
<td>Retainer</td>
<td>VP8016RT01</td>
</tr>
<tr>
<td>(3)</td>
<td>1</td>
<td>Piston</td>
<td>VP8016PI01</td>
</tr>
<tr>
<td>(4)</td>
<td>1</td>
<td>Adjustment plug</td>
<td>VP8016AP01</td>
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<tr>
<td>(5)</td>
<td>1</td>
<td>Cross pin</td>
<td>VP8016CP01</td>
</tr>
<tr>
<td>(6)</td>
<td>1</td>
<td>Cylinder cap</td>
<td>VP8016CC01</td>
</tr>
<tr>
<td>(7)</td>
<td>1</td>
<td>Anti rotation plug</td>
<td>VP8016AR01</td>
</tr>
<tr>
<td>(8)</td>
<td>1</td>
<td>Pin head</td>
<td>VP8016PH01</td>
</tr>
<tr>
<td>(9)</td>
<td>2</td>
<td>Dowel pin</td>
<td>DIN6325-5Mx14</td>
</tr>
<tr>
<td>(10)</td>
<td>1</td>
<td>Snap ring</td>
<td>VP8016SN100-102</td>
</tr>
<tr>
<td>(11)</td>
<td>2</td>
<td>Viton O-ring</td>
<td>VIOR-82.55x1.8-FPM-75-BR</td>
</tr>
<tr>
<td>(12)</td>
<td>1</td>
<td>Viton O-ring</td>
<td>VIOR-38.10x1.8-FPM-75-BR</td>
</tr>
<tr>
<td>(13)</td>
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<td>VIOR-24.00x1.0-FPM-75-BR</td>
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<tr>
<td>(14)</td>
<td>1</td>
<td>Viton O-ring</td>
<td>VIOR-18.10x1.0-FPM-75-BR</td>
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<tr>
<td>(15)</td>
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<td>VIQR-73.02x3.18-FPM-75-BL</td>
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<td>VIQR-41.28x3.18-FPM-75-BL</td>
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<td>(17)</td>
<td>1</td>
<td>Dowel pin</td>
<td>DIN6325-5Mx40</td>
</tr>
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<td>(18)</td>
<td>4</td>
<td>Countersunk head screw</td>
<td>DIN7991-M6x12-10.9</td>
</tr>
<tr>
<td>(19)</td>
<td>1</td>
<td>Retainer</td>
<td>VP8016RT02</td>
</tr>
<tr>
<td>(20)</td>
<td>4</td>
<td>Countersunk head screw</td>
<td>DIN7991-M4x10-10.9</td>
</tr>
</tbody>
</table>
8.2.7.3 Basic Dimensions in Mold

Minimum Distance between Manifold and Clamping plate

The gap between the top of the manifold and the bottom of the clamping plate should be 31 mm.
(see figure Doc003494.png)

The 31 mm gap may be smaller due to customer plate thicknesses which will require a 70 diameter counterbore in the bottom of the clamping plate to achieve the 31 mm gap.
(see figure Doc003744.png).

Dowel Hole Dimension and Location

Valve Pin Length Calculation

The length of the valve pin in the cold condition is calculated with the formula:

\[(LM + 6.5 + \text{Valve Pin Protrusion}) / 1.002\]

“LM” is the distance between “0” extension of the gate to the top of the top air gap.

“P” is the Valve Pin Protrusion.
| WARNING |
|------------------|------------------|
| **Danger by Pneumatic** |
| Personal injury can result from connecting or disconnecting pneumatic hoses. |
| Pneumatic works must be carried out by qualified persons. |
| Use protective goggles or face protection or protective goggles, hearing protection (PPE) |
| **Heavy Weight Hazard** |
| Transport and lifting equipment should be operated only by trained personnel. |
| Use personal protective equipment, such as head gear, safety shoes and work gloves. |
| Operate lifting and transport equipment slowly and carefully to avoid uncontrolled swinging of the manifold. |
| **Lifting and transport equipment for lifting Hot Runner Systems shall be approved and properly rated taking into account the weight and size of the manifold.** |
| **Hot Surfaces Hazard** |
| Contact between the skin and hot surfaces could result in burns. |
| Use personal protective equipment, such as work gloves, apron, sleeves and face protection, to guard against burns. |
| When servicing or handling the hot runner system outside the manifold plates or the injection molding machine, care must be taken to heed the hot surface exposure warnings. |
8.2.7.4 First mounting of Actuator VP8016P

**NOTICE**
After disassembly of the sealing elements the original seals should be replaced.

1) Lubricate the VITON O-ring (13) with hydraulic oil or white grease.
2) Install the VITON O-ring (13) into the valve pin coupling (1) seal groove.
3) Lead the valve pin (VP) into the valve pin guide (1).
4) Place the valve pin coupling (1) on the valve pin guide.
5) Place the pin head (8) on the valve pin (VP).
6) Fix with the dowel pins (9) the pin head (8) on the valve pin (VP).
7) Place the adjustment plug (4) on the pin head (8).
8) Lubricate the VITON O-ring (14) with hydraulic oil or white grease.
9) Install the VITON O-ring (14) into the anti rotation plug (7) seal groove.
10) Place the anti rotation plug (7) on the adjustment plug (4).
11) Secure the anti rotation plug (7) with the cross pin (5) in the valve pin coupling (1).

**NOTICE**
After disassembly of the sealing elements the original seals should be replaced.

12) Install the VITON quad ring (16) into the clamping plate (a) seal groove.
13) Install the retainer (19) with 4 screws (20) into the clamping plate (a).

**NOTICE**
Apply Loctite 272 on the thread of the 4 socket counter sunk head cap screws (20).

**WARNING**
Heavy Weight Hazard

14) Place the clamping plate (a) on the destined position on the mold.
15) Install the VITON quad ring (15) into the piston (3) seal groove.
16) Install the VITON O-ring (12) into the piston (3) seal groove.
17) Place the piston (3) into the cutout of the clamping plate.

**NOTICE**
The piston (3) will be placed on the flange of the valve pin coupling (1).
18) Place the retainer (2) on the piston (3).
19) Secure the retainer (2) with the snap ring (10) at the valve pin coupling (1).

20) Install the two VITON O-rings (11) into the cylinder cap (6) seal grooves.
21) Place the cylinder cap (6) on the clamping plate.
22) Lubricate the thread of the countersunk head screws (18) with high-temperature assembly paste (anti-seize compound).

**NOTICE**
This is an important measure to prevent thread corrosion due to aggressive gases, which could be released during plastics processing.

23) Attach the cylinder cap (6) at the clamping plate with the four countersunk head screws (18).

**NOTICE**
Tighten the countersunk head screws (18) in an X pattern (a, d, c, b).
Use torque wrench with wrench insert and the torque specified in the respective table in section 13.

For valve pin height adjustment of the actuator VP8016P see section 8.2.7.6

### 8.2.7.5 Dismounting the Actuator VP8016P

1) Unscrew and remove the four countersunk head screw (18).
2) Remove the cylinder cap (6).
3) Remove the O-ring seals (11) out of the cylinder cap (6) seal grooves.
4) Remove the snap ring (10).
5) Remove the retainer (2).

---

**WARNING**

Heavy Weight Hazard

6) Lift the clamping plate (a) from the mold.

**NOTICE**

During lifting the clamping plate (a) from the mold, the piston (3) will be elevated up from of the valve pin coupling (1) flange.

7) Remove the retainer (19) with 4 screws (20) out of the clamping plate.
8) Remove the VITON quad ring (16) out of the clamping plate (a) seal groove.
9) Remove the VITON quad ring (15) out of the piston (3) seal groove.
10) Remove the O-ring (12) out of the piston (3) seal groove.

11) Lift the valve pin coupling (1) from the valve pin guide.

**NOTICE**

During lifting the valve pin coupling (1) the valve pin (VP) will be lifted up from the valve pin guide.

12) Remove the cross pin (5) out of the valve pin coupling (1) and anti rotation plug (7).
13) Push the valve pin (VP) with the pin head (8), adjustment plug (4) and anti rotation plug (7) out of the valve pin coupling (1).
14) Remove the O-ring (14) out of the anti rotation plug (7) seal groove.
15) Remove the dowel pins (9) out of the pin head (8).
16) Lift the pin head (8) from the valve pin (VP).
17) Remove the O-ring seal (13) out of the valve pin coupling (1) seal groove.
8.2.7.6 Valve Pin Height Adjustment VP8016P Series

Precondition for the following steps are to be performed with the actuator installed in the mold.

For optimal gate performance and appearance, this dimension must be established fully assembled, at operating temperatures and at each location.

| WARNING |
|-----------------|-----------------|
| **Heavy Weight Hazard** | |
| Transport and lifting equipment should be operated only by trained personnel. | |
| Use personal protective equipment, such as head gear, safety shoes and work gloves. | |
| Operate lifting and transport equipment slowly and carefully to avoid uncontrolled swinging of the manifold. | |
| Lifting and transport equipment for lifting Hot Runner Systems shall be approved and properly rated taking into account the weight and size of the manifold. | |
| For first aid contact your medical / safety representing | |

| | |
| **Hot Surfaces Hazard** | |
| Contact between the skin and hot surfaces could result in burns. | |
| Use personal protective equipment such as gloves, apron, sleeves and face protection to guard against burns. | |
| When servicing or handling the hot runner system outside the manifold plates or the injection molding machine, care must be taken to heed the hot surface exposure warnings. | |
| For first aid contact your medical / safety representing | |

| NOTICE |
|-----------------|-----------------|
| **Hazard of Material Damage** | |
| The following steps are to be performed with the actuator installed in the mold, and the system at operating temperature. | |
| Clamping plate cooling (max. 100 °C / 210 °F) must be on to prevent damage to the actuator seals. | |
| After switch off the hot runner heater, the cooling for the cylinder have to be turned on for at least 15 minutes, to avoid damages of the actuator sealing. | |
Thermal Expansion Calculation

In cold condition
the following parts are off center from the cylinder cap (6) and piston (3).
- Valve gate pin (VP)
- Valve pin coupling (1)
- Adjustment plug (4)
- Cross pin (5)
- Retainer (2)
- Snap ring (7)

At operating temperature of the hot runner system
the following parts are centric to cylinder cap (6) and piston (3).
- Valve gate pin (VP)
- Valve pin coupling (1)
- Adjustment plug (4)
- Cross pin (5)
- Retainer (2)
- Snap ring (7)

The hot runner system has been developed so that the valve gate pin centered below the piston at operating temperature.
Height Adjustment of Cylindrical shut-off Valve pin

Valve pin height adjustment of cylindrical shut-off valve pins, found by machining the adjustment plug (4). This dimension is a function of the build-up of tolerances of many parts.

In this section the actuator parts are identified with the numbers indicated in the following figure, which shows the components.

**Actuator parts VP8016P**

<table>
<thead>
<tr>
<th>No.</th>
<th>Qty.</th>
<th>Description Item</th>
<th>Item</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>1</td>
<td>Valve pin coupling (for valve pin Ø 5 mm)</td>
<td>VP8016PC0501</td>
</tr>
<tr>
<td>1</td>
<td>1</td>
<td>Valve pin coupling (for valve pin Ø 6 mm)</td>
<td>VP8016PC0601</td>
</tr>
<tr>
<td>1</td>
<td>1</td>
<td>Valve pin coupling (for valve pin Ø 8 mm)</td>
<td>VP8016PC0801</td>
</tr>
<tr>
<td>2</td>
<td>1</td>
<td>Retainer</td>
<td>VP8016RT01</td>
</tr>
<tr>
<td>3</td>
<td>1</td>
<td>Piston</td>
<td>VP8016PI01</td>
</tr>
<tr>
<td>4</td>
<td>1</td>
<td>Adjustment plug</td>
<td>VP8016AP01</td>
</tr>
<tr>
<td>5</td>
<td>1</td>
<td>Cross pin</td>
<td>VP8016CP01</td>
</tr>
<tr>
<td>6</td>
<td>1</td>
<td>Cylinder cap</td>
<td>VP8016CC01</td>
</tr>
<tr>
<td>7</td>
<td>1</td>
<td>Anti rotation plug</td>
<td>VP8016AR01</td>
</tr>
<tr>
<td>8</td>
<td>1</td>
<td>Pin head</td>
<td>VP8016PH01</td>
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<tr>
<td>9</td>
<td>2</td>
<td>Dowel pin</td>
<td>DIN6325-5M6x14</td>
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<tr>
<td>10</td>
<td>1</td>
<td>Snap ring</td>
<td>VP8016N5100-102</td>
</tr>
<tr>
<td>11</td>
<td>2</td>
<td>Viton O-ring</td>
<td>VIOR-82.55x1.8-FPM-75-BR</td>
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<tr>
<td>12</td>
<td>1</td>
<td>Viton O-ring</td>
<td>VIOR-38.10x1.8-FPM-75-BR</td>
</tr>
<tr>
<td>13</td>
<td>1</td>
<td>Viton O-ring</td>
<td>VIOR-24.00x1.0-FPM-75-BR</td>
</tr>
<tr>
<td>14</td>
<td>1</td>
<td>Viton O-ring</td>
<td>VIOR-18.10x1.0-FPM-75-BR</td>
</tr>
<tr>
<td>15</td>
<td>1</td>
<td>Viton quad ring</td>
<td>VIQR-73.02x3.18-FPM-75-BL</td>
</tr>
<tr>
<td>16</td>
<td>1</td>
<td>Viton quad ring</td>
<td>VIQR-41.28x3.18-FPM-75-BL</td>
</tr>
<tr>
<td>17</td>
<td>1</td>
<td>Dowel pin</td>
<td>DIN6325-5M6x40</td>
</tr>
<tr>
<td>18</td>
<td>4</td>
<td>Countersunk head screw</td>
<td>DIN7991-M6x12-10.9</td>
</tr>
<tr>
<td>19</td>
<td>1</td>
<td>Retainer</td>
<td>VP8016RT02</td>
</tr>
<tr>
<td>20</td>
<td>4</td>
<td>Countersunk head screw</td>
<td>DIN7991-M4x10-10.9</td>
</tr>
</tbody>
</table>

1) Bring system to operating temperature and allow to soak for 60 minutes.
2) Loosen and remove:
   - Countersunk head screw (18)
   - Cylinder cap (6)
   - Cross pin (5)
   - Anti rotation plug (7)

**WARNING**

Hot Surfaces Hazard

Contact between the skin and hot surfaces could result in burns.
3) Place a spacer block (b) over the valve pin coupling (1).

**NOTICE**

Note contact (c) between pin head (8) / valve pin coupling (1) and piston (3) / retainer (19).

4) Measure dimension "A" with a micrometer (a) and record data.

5) Place the adjustment plug (4) on the pin head (8).

6) Place the anti rotation plug (7) on the adjustment plug (4).

7) Secure the anti rotation plug (7) with the cross pin (5) in the valve pin coupling (1).

8) Place the spacer block (b) over the valve pin coupling (1) again.

9) Provide a means of holding the valve pin flush with the surrounding gate area.

**NOTICE**

Any required valve pin protrusion will be added via calculation.

**NOTICE**

Note contact (c) between pin head (8) / valve pin coupling (1) and a gap (d) between piston (3) / retainer (19).

10) Measure dimension "B" with a micrometer (a) and record data.

**NOTICE**

The required machining to the adjustment plug (4) can now be calculated.
11) The quantity of material “C” to be removed from the adjustment plug (4) is given by the equation:

\[ C = (A - B) - P \]

12) Take the adjustment plug (4) out of the valve pin coupling (1).
13) Mark on the adjustment plug (4) the position “C”.
14) Machine “C” from the adjustment plug (4).

**NOTICE**

The quantity “C” was determined in the preceding step.

15) Remove any burrs that may alter the adjustment.
16) Install the machined adjustment plug (4), the anti rotation plug (7) and cross pin (5) as described in section 8.2.7.4.

17) Have an assistant press down (x) on the valve pin coupling (1).

**NOTICE**

Do not press down on the adjustment plug (4).
Taking care to not damage the surface of the valve pin (VP).

18) Apply pressure (x) to the gate end of the valve pin (VP) to take up any play in the system.
19) Check the protrusion (P) of the valve gate pin (VP) at the valve gate (f).

**NOTICE**

The protrusion is typically 0.13 mm (.005”).

20) Assemble the piston (3), retainer (2), snap ring (7) and cylinder cap (6) as described in section 8.2.7.4.
Height Adjustment of Conical shut-off Valve pin

Valve Pin adjustment is found by machining the adjustment plug (4). This dimension is a function of the build-up of tolerances of many parts.

For optimal gate performance and appearance, this dimension must be established fully assembled, at operating temperatures and at each location.

In this section the actuator parts are identified with the numbers indicated in the following figure, which shows the components.

![Diagram of Hot Runner System with labels](Doc003490.png)

### WARNING

**Hot Surfaces Hazard**

Contact between the skin and hot surfaces could result in burns.

1) Bring system to operating temperature and allow to soak for 60 minutes.

2) Loosen and remove:
   - Four countersunk head screws (18)
   - Cylinder cap (6)
   - Cross pin (5)
   - Anti rotation plug (7)

3) Place the spacer block (b) over the valve pin coupling (1) again.

   **NOTICE**

   Note a gap (d) between pin head (8) / valve pin coupling (1) and contact (c) between piston (3) / retainer (19).

4) Measure dimension “A” with a micrometer (a) and record data.

![Diagram showing height adjustment](Doc003503.png)
5) Install the anti rotation plug (7) and cross pin (5).

6) Place a spacer block (b) over the valve pin coupling (1).

**NOTICE**
The valve pin will rest in the tapered gate (f).

**NOTICE**
Note contact (c) between pin head (8) / valve pin coupling (1) and a gap (d) between piston (3) / retainer (19).

7) Measure dimension “B” with a micrometer (a) and record data.

**NOTICE**
The required machining to the adjustment plug (4) can now be calculated.

**NOTICE**
“C” is the length of material to be removed from the adjustment plug (4).
(as shown in Doc003500.png)

“A” and “B” are the dimensions recorded from the previous steps.

“P” is the protrusion of the Valve Pin. The protrusion is typically 0.13 mm (.005’).

8) The quantity of material “C” to be removed from the adjustment plug (4) is given by the equation:

\[ C = (A - B) - P \]
9) Disassemble the adjustment plug (4) out of the valve pin coupling (1).
10) Mark on the adjustment plug (4) the position "C"
11) Machine "C" from the adjustment plug (4).

**NOTICE**
The quantity "C" was determined in the preceding step.

12) Remove any burrs that may alter the adjustment.

13) Install the machined adjustment plug (4), the anti rotation plug (7) and cross pin (5) as described in section 8.19.4.
14) Apply pressure (x) to the valve pin coupling (1).

**NOTICE**
Do not press down on the anti rotation plug (4).
Note a gap (d) between pin head (8) / valve pin coupling (1) and contact (c) between piston (3) / retainer (19).

15) Check the contact between valve gate pin (VP) and valve gate (f)
16) Check the protrusion (P) of the valve gate pin (VP) at the valve gate (f).

**NOTICE**
The protrusion is typically 0.13 mm (.005").

17) Assemble the piston (3), retainer (2), snap ring (7) and cylinder cap (6) as described in section 8.19.4.
# Valve Pins

## Valve Pin Dismantling

for HYC-, PNC-, VP- and QCVG series (variable adapters)

### WARNING

**Hot Surfaces Hazard**

Contact between the skin and hot surfaces could result in burns.

Use personal protective equipment, such as gloves, apron, sleeves and face protection, to guard against burns.

When servicing or handling the hot runner system outside the manifold plates or the injection molding machine, care must be taken to heed the hot surface exposure warnings.

1) Disassembling the actuator.

### WARNING

**Hot Surfaces Hazard**

Contact between the skin and hot surfaces could result in burns.

2) Heat the hot runner system to operating temperature.

3) Assemble the valve pin slide hammer tool (T9).
   - (T9.1) Adapter
   - (T9.2) Hammer
   - (T9.3) Guide pillar
   - (T9.4) Stop position
   - (T9.5) Socket head cap screw
4) Shift the valve pin slide hammer tool (T9) to make sure that the valve pin head (VP) locks in the adapter (T9.1).

5) Fit the valve pin slide hammer tool (T9) adapter (T9.1) on the valve pin head (VP).

6) Tighten the socket head cap screw (T9.5) firmly to make sure the valve pin (VP) is secured.
**WARNING**

Danger of injuries to hands.

*Wear work gloves.*

7) Slide the hammer (T9.2) against the stop position (T9.4) repeatedly until the valve pin is released.
9.2 Plate Actuation

9.2.1 Plate Actuation, Actuators above Plate

Plate actuation is ideal for synchronized filling of high cavitation molds

- High cavitation synchronized needle opening
- Consistent part filling (weight)
- Low service costs

Basic Elements of the Plate Actuation System:

- Actuation plate
- Stop buttons
- Actuators (pneumatic)
- Piston rod set
- Guiding set complete
- Valve pin suspension assemblies with anti rotation screws

Pitch Dimensions

Nozzle 06E = min. 22 mm
Nozzle 09E = min. 27 mm
9.2.1.1 Mounting the Plate Actuation System

**WARNING**

**Heavy Weight Hazard**

- Transport and lifting equipment should be operated only by trained personnel.
- Use personal protective equipment, such as head gear, safety shoes and work gloves.
- Operate lifting and transport equipment slowly and carefully to avoid uncontrolled swinging of the manifold.
- Lifting and transport equipment for lifting Hot Runner Systems shall be approved and properly rated taking into account the weight and size of the manifold.
- When unpacking the Plate Actuation Hot Runner System, there is a risk of injury due to falling parts and sharp edges. Maintain a minimum distance of 1 m from the Hot Runner System.
- For first aid contact your medical / safety representing.

**NOTICE**

**Hazard of Material Damage**

- Without consulting Synventive it is not permitted to do modifications to the hot runner system e.g. geometrical changes to the nozzle tip, except the part shape adjustment in the area of material allowance.
- Never install or remove the hot runner when the manifold or nozzles are hot, this may cause damage to the nozzles.
- Move the Hot Runner System only up or down at room temperature 20 °C (68 °F).
- Always tighten the screws to the torque specified in the respective table in section 4.

**Tools for Assembling, Disassembling and Adjusting the Valve Pins**

- Magnetic Rod
- Snap Ring Plier (Extra long)
- To adjust the valve pins, the tool ATCYL2102 and a commercially Hexagon Socket Wrench is required
9.2.1.2 Assemble the Actuation Plate

Assemble the Stop Buttons on both Side

1) Assemble the stop buttons on both side (Manifold Side / Clamping Plate Side).
2) Fix the stop buttons with screws.

Assemble the Anti-rotation Screws on the Manifold Side

1) Assemble the anti-rotation screws (DIN7984-M6X8) on the manifold side.

Assemble the Valve Pin Suspension Sleeve (VPSS-0x) on the Manifold Side

1) Assemble the valve pin suspension sleeves (01) at the actuation plate from the manifold side.
2) Fix the valve pin suspension sleeves (01) with washers (04) and retaining rings for shafts (05) from the clamping plate side.

Details Valve Pin Suspension
Valve Pin Suspension Version 1 for:
Valve pin Ø 3.0 mm VPS-30-01 / Valve pin Ø 3.8 mm VPS-38-01

<table>
<thead>
<tr>
<th>Pos.</th>
<th>Part No.</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>01</td>
<td>VPSS-01</td>
<td>Valve Pin Suspension Sleeve</td>
</tr>
<tr>
<td>02</td>
<td>PNC4508B-HS-02</td>
<td>Hanger screw M11x1, Valve pin Ø 3.0</td>
</tr>
<tr>
<td></td>
<td>PNC4508B-HS-01</td>
<td>Hanger screw M11x1, Valve pin Ø 3.8</td>
</tr>
<tr>
<td>03</td>
<td>PNC4508B-LS-01</td>
<td>Lock Screw M11x1</td>
</tr>
<tr>
<td>04</td>
<td>W-17-24-2-01</td>
<td>Washer, 17x24x2</td>
</tr>
<tr>
<td>05</td>
<td>DIN471-17X1</td>
<td>Retaining ring for shafts DIN471</td>
</tr>
<tr>
<td>06</td>
<td>DIN7984-M6X8-10.9</td>
<td>Hexagon socket cap screw DIN7984</td>
</tr>
</tbody>
</table>

Version 1 (normal)

Valve Pin Suspension Version 2 for:
Valve pin Ø 3.0 mm VPS-30-02 / Valve pin Ø 3.8 mm VPS-38-02

<table>
<thead>
<tr>
<th>Pos.</th>
<th>Part No.</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>01</td>
<td>VPSS-02</td>
<td>Valve Pin Suspension Sleeve</td>
</tr>
<tr>
<td>02</td>
<td>PNC4508B-HS-02</td>
<td>Hanger screw M11x1, Valve pin Ø 3.0</td>
</tr>
<tr>
<td></td>
<td>PNC4508B-HS-01</td>
<td>Hanger screw M11x1, Valve pin Ø 3.8</td>
</tr>
<tr>
<td>03</td>
<td>PNC4508B-LS-01</td>
<td>Lock Screw M11x1</td>
</tr>
<tr>
<td>04</td>
<td>W-17-24-2-02</td>
<td>Washer, 17x24x2</td>
</tr>
<tr>
<td>05</td>
<td>DIN471-17X1</td>
<td>Retaining ring for shafts DIN471</td>
</tr>
<tr>
<td>06</td>
<td>DIN7984-M6X8-10.9</td>
<td>Hexagon socket cap screw DIN7984</td>
</tr>
</tbody>
</table>

Version 2 (for small pitch dimensions)

Valve Pin Suspension Version 3 for:
Valve pin Ø 3.0 mm VPS-30-03 / Valve pin Ø 3.8 mm VPS-38-03

<table>
<thead>
<tr>
<th>Pos.</th>
<th>Part No.</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>01</td>
<td>VPSS-02</td>
<td>Valve Pin Suspension Sleeve</td>
</tr>
<tr>
<td>02</td>
<td>PNC4508B-HS-02</td>
<td>Hanger screw M11x1, Valve pin Ø 3.0</td>
</tr>
<tr>
<td></td>
<td>PNC4508B-HS-01</td>
<td>Hanger screw M11x1, Valve pin Ø 3.8</td>
</tr>
<tr>
<td>03</td>
<td>PNC4508B-LS-01</td>
<td>Lock Screw M11x1</td>
</tr>
<tr>
<td>04</td>
<td>W-17-24-2-01</td>
<td>Washer, 17x24x2</td>
</tr>
<tr>
<td>05</td>
<td>DIN471-17X1</td>
<td>Retaining ring for shafts DIN471</td>
</tr>
<tr>
<td>06</td>
<td>DIN7984-M6X8-10.9</td>
<td>Hexagon socket cap screw DIN7984</td>
</tr>
</tbody>
</table>

Version 3 (for small pitch dimensions)
Assemble the Guiding Bushings in the Actuation Plate

1) Assemble the guiding bushings (GB) in the guiding bush seat (GBS).
2) Fix the guiding bushings with retaining rings for shafts DIN471 (RB)
3) Screw the guiding bush seat (GBS) into the actuation plate.

Assemble the Piston Rod Set on the Actuation Plate

1) Install the seal (06) at the Piston Rods (04).
2) Assemble the Anti-rotation screws DIN7984-M8X8 (05) for the piston rod (04) on the manifold side of the actuation plate.
3) Assemble the piston rods (04) on the manifold side of the actuation plate.
4) Assemble the washers (03) and the retaining rings for shaft (02) at the piston rods (04) from the clamping plate side.

Details Piston Rod
9.2.1.3 Assemble the Hot Runner System

**WARNING**

Heavy Weight Hazard

1) Assemble the Hot Runner on the Cavity Plate.
2) Mount the Cooling Plate.

Mount the Guide Set Complete

1) Assemble all Guide Pillars (GP).
NOTICE
For lubrication use high-pressure long therm lubricant
Strack Z9080

2) Assemble the Ball Retainers (BR) on the Guide Pillars (GP).

WARNING
Heavy Weight Hazard

3) Mount the Actuation Plate (AP) into the Cooling Plate (CP).

WARNING
Heavy Weight Hazard

4) Assemble Top Clamp Plate (TCP).
9.2.1.4 Assemble the Actuator

**NOTICE**
For lubrication use Krytox GPL205. To lubricate the piston sliding surface is essential for the actuator lifetime.

To lubricate the piston ring seals is helpful to assemble the actuator.

**NOTICE**
The seals are already mounted on the actuators.

1) Insert the actuator Housing Cover 1 (HC) into the cutout of the Top Clamping Plate (TCP).

**NOTICE**
The seal on bottom of the Housing Cover 1 (HC) has to be directed against the cutout bottom.

2) Insert the Actuator (A) into the cutout.
3) Assemble the Fixing Unit (FU) on the Piston Rod (PR).

**NOTICE**
Use torque wrench with wrench insert and the torque specified in the respective table in section 4.

4) Assemble the upper Housing Cover (HCT).

**NOTICE**
The two threaded holes (x) must face upwards.

5) Fix the Housing Cover (HCT) with two Hexagon Socket Set Screws DIN912-M6X10-12.9 (M6) and Washers DIN125 A (W).

**NOTICE**
Use torque wrench with wrench insert and the torque specified in the respective table in section 4.
9.2.1.5  Assemble and Adjust the Valve Pins

Precondition for the following steps are to be performed with the Hot Runner installed in the mold, and the system at operating temperature.

**WARNING**

**Hot Surfaces Hazard**

Contact between the skin and hot surfaces could result in burns.

Use personal protective equipment, such as gloves, apron, sleeves and face protection, to guard against burns.

When servicing or handling the hot runner system outside the manifold plates or the injection molding machine, care must be taken to heed the hot surface exposure warnings.

**NOTICE**

**Hazard of Material Damage**

The following steps are to be performed with the HR installed in the mold, and the system at operating temperature.

Cooling must be on to prevent damage to the actuator seals.

The design provides an indirect cooling through the top clamp plate (max. 80 °C / 175 °F), otherwise cooling lines are required.

**NOTICE**

The hot runner system must be at operation temperature. The cooling in the mold must be turned on to prevent damaging of sealings in the actuator.

To adjust the valve pin, the actuation plate has to be on close position. In order to ensure this, we recommend fixing it with compressed air on the actuator.

The actuator must be under pneumatic pressure the whole time the valve pin adjustment operation is performed.

1) Move and fixing the actuation plate to close position use compressed pneumatic pressure on the actuator.

2) Fit in the valve pins.

**NOTICE**

In order to ensure this, we recommend fixing it with compressed air on the actuator.
Service and Maintenance / Plate Actuation, Actuators above Plate

3) Hang the valve pin into the hanger screw.
4) Push the valve pin via the hanger screw up to the suspension sleeve.
5) Screw the hanger screw with the attached valve pin into the valve pin suspension sleeve.

6) Adjust the valve pin with a hexagon Socket Wrench (SW) as followed.

**NOTICE**

The basic setting for the valve gate pin is 16 mm between the Valve pin Suspension (VS) top edge and the top edge from the Hanger Screw (HS).

7) Rotate the Hanger Screw (HS) with a hexagon socket wrench into the Valve pin Suspension sleeve (VS).

**NOTICE**

During the fine tuning process it is possible to move the Valve Pin (VP) in every direction 0.5 mm (1/2 rotation). The exact position for the valve pin has to be checked at the front of the valve pin - depends on the nozzle tip. The reason to unscrew the Hanger Screw (HS) would be for valve pin maintenance or replacement. If the deviation to the basic settings of 16 mm is more than 0.5 mm, the adjustments do not correspond to the parameters of the mold or do not correspond to the Synventive standard.
8) Heat the hot runner system to the working temperature.
9) Turn the Locking Screw (LS) up to the Hanger Screw (HS).

**NOTICE**
For actuator assembly the Lock Screw (LS) has to be fastened against the Hanger Screw (HS).

10) Rotate the Lock Screw (LS) with the Adjustment Tool ATCY2102 (AT) into the Valve pin Suspension sleeve (VS).
11) Apply pressure to pneumatic actuator to move the plate in close position. The actuators must be under pneumatic pressure the whole time the valve pin adjustment operation is performed.

**NOTICE**
The recommended air pressure is 87 psi (6 bars).

12) Push from the front (cavity side) the valve pin in order to compensate the axial play of the valve pin. And keep a slight pressure on the valve pin.
13) Adjust the valve pin and measure the valve pin position at the front (cavity) until in desired position.
14) Hold against turning the Hanger Screw (HS) with the hexagon Socket Wrench (SW).
15) At the same time tighten the Lock Screw (LS) with the Adjustment Tool ATCY2102 (AT) and a ring wrench (size 6 mm).
16) Repeat steps 11 - 15 for all valve pins.
17) Move the plate using pneumatic cylinders a few times in open and close position. Keep the plate in close position using pneumatic pressure.
18) Push from the front (cavity side) the valve pin in order to compensate the axial play of the needle.
19) Measure the valve pin position at the front (cavity). Readjust valve pin if necessary.

---

### 9.2.1.6 Tool Service without Plate Actuation System Disassembly

**WARNING**
Hot Surfaces Hazard
This operation has to be done with the tool cooled down to room temperature.

**NOTICE**
It's possible to disassemble the actuation plate system and valve pins can remain in manifold without changing settings.

This operation is only possible when the top clamping plate and cooling plate are separately screwed together.
9.2.1.7 Lift up the upper Half of the Tool

1) Remove the retaining ring DIN471-17X1 at the valve pin suspension.

**NOTICE**
Extra long snap ring plier is required for this. It is not necessary to remove the clamping plate.

2) Remove the washer W-17-24-2-02 with a magnetic Pick-Up tool.

**NOTICE**
Extra long snap ring plier is required for this. It is not necessary to remove the clamping plate.

---

**WARNING**

Heavy Weight Hazard

3) Unscrew the screws to disconnect the top package from the rest of the mold.

**NOTICE**
Refer to the mold assembly drawings.

4) After removing the retaining rings and washers at the valve pin suspension, the upper half of the tool can be lifted together with the actuation plate.

**NOTICE**
The valve pin suspension is not loosened, so valve pin position is not changed. It's possible to make a tool service without adjusting the valve pins again.

In case the screws have to be opened, the valve pins have to be adjusted again.

The complete valve pin suspension with hanger and lock screw is rotatable (without loosen the screws).
9.2.1.8  Assemble the upper Half of the Tool after Service

**NOTICE**

At all single valve pin suspension sets at the manifold side of the actuation plate are screws (Doc007523.png).

With this screws (DIN912-M6x10-12.9) it is not possible to rotate the suspension sleeve and the valve pin will be secured against anti-rotation. If the upper half of the tool (containing the actuation plate) will be assembled on the lower half of the tool (containing the hot runner system) then it is likely the recess at the suspension sleeve (see Doc007546.png) will not match with the screws (DIN912-M6x10-12.9).

1) Pre position the valve pin suspension sets to match the anti-rotation screws in the plate.

2) Place the upper half of the tool (containing the actuation plate) on the lower half of the tool.

**NOTICE**

As long as the guide is not in the correct position in the actuation plate, it can be rotated easily.
3) Rotate clockwise all valve pin suspension sleeves to match the markers on the actuation plate (bore) with the markers on the suspension sleeves.

**CAUTION**
If you try to bring the suspension bushing in the correct position by turning it to the left, it is possible that the lock of the valve pin suspension will be loosened.

**NOTICE**
When rotated against a resistance the valve pin position will get adjusted - the reference suspension sleeve - anti-rotation screw is provided.

4) Check for all suspension sleeves with a calliper the dimension from upper surface of the Top Clamp Plate (TCP) to the seat for the washer at the Actuation Plate (AP). The dimension has to be 79.1 mm.

**NOTICE**
A distance of 79.1 mm from upper surface of the Top Clamp Plate (TCP) to the seat for the washer at the Actuation Plate (AP) means the distance of 4.6 mm from upper surface of the Valve pin Suspension Sleeve (VS) to the seat of the washer at the Actuation Plate.

The 4.6 mm gauge on all valve pin mounting bushings (VS) is necessary for the valve pin suspension bushings to be fixed.
5) Place the washers W-17-24-2-02 on the seats at the valve pin suspension positions.

6) Assemble the retaining rings DIN471-17X1 at the valve pin suspensions.
9.2.1.9 Nozzle Deactivating

If necessary, each nozzle can be deactivated independently.

**NOTICE**
This is a fast solution when using the remaining nozzles.

**WARNING**
Hot Surfaces Hazard
This operation has to be done with the system cooled down to room temperature.

1) Apply compressed air to the pneumatic tool connection CLOSED, to bring the actuation plate to the valve gates closed position.
2) Remove the retaining ring DIN471-17X1 from the valve pin suspension.

**NOTICE**
To remove the retaining ring, without dismounting the clamping plate, an extra long snap ring plier is required.

3) Remove the washer W-17-24-2-02 with a Magnetic Rod / Pick-Up tool.

**NOTICE**
The valve pin can get damaged. To avoid this, the valve pin suspension must be adjusted to the front.
4) Hold against turning the Hanger Screw (HS) with the hexagon Socket Wrench (SW).

5) At the same time loosen the Lock Screw (LS) with the adjustment tool ATCY2102 (AT) and a ring wrench (size 6 mm).

6) Turn the Lock Screw (LS) three complete turns counterclockwise.

**NOTICE**

After one and a half turns, the valve pin suspension (VS) is released from the anti-rotation screw and thus no longer secured against rotation.

7) Fix the new position by turning the Hanger Screw (HS) counter clockwise and the Lock Screw (LS) clockwise.

**NOTICE**

Before the system is put back into operation after the nozzles have been deactivated, the heating of the out of service nozzles must also be deactivated.
9.2.1.10 Blocking Pin

**NOTICE**

After the unit “Valve Pin Suspension” has been detached from the actuation plate, the position of the valve pin has to be locked with a blocking pin. When this pin is not mounted, the valve pin could be pushed back by the injection pressure and open the nozzle.

1) The length X must be measured.
2) The blocking pin should be manufactured according to the dimensions in image Doc007744.png.
3) The blocking pin has to have contact to the machine plate.
9.2.2 Plate Actuation, Actuators below Plate

Plate actuation is ideal for synchronized filling of high cavitation molds

- High cavitation synchronized needle opening
- Consistent part filling (weight)
- Low service costs

Basic Elements of the Plate Actuation System:

- Actuation plate
- Stop buttons
- Actuators (pneumatic)
- Piston rod set
- Guiding set complete
- Valve pin suspension assemblies with anti rotation screws

Pitch Dimensions

Nozzle 06E = min. 22 mm
Nozzle 09E = min. 27 mm
9.2.2.1 Mounting the Plate Actuation System

![WARNING]

**Heavy Weight Hazard**

Transport and lifting equipment should be operated only by trained personnel.
Operate lifting and transport equipment slowly and carefully to avoid uncontrolled swinging of the manifold.
Lifting and transport equipment for lifting Hot Runner Systems shall be approved and properly rated taking into account the weight and size of the manifold.
When unpacking the Plate Actuation Hot Runner System, there is a risk of injury due to falling parts and sharp edges. Maintain a minimum distance of 1 m from the Hot Runner System.
Use personal protective equipment, such as head gear, safety shoes and work gloves.
*For first aid contact your medical / safety representing.*

![NOTICE]

**Hazard of Material Damage**

Without consulting Synventive it is not permitted to do modifications to the hot runner system e.g. geometrical changes to the nozzle tip, except the part shape adjustment in the area of material allowance.
Never install or remove the hot runner when the manifold or nozzles are hot, this may cause damage to the nozzles.
Move the Hot Runner System only up or down at room temperature 20 °C (68 °F).
Always tighten the screws to the torque specified in the respective table in section 4.

**Tools for Assembling, Disassembling and Adjusting the Valve Pins**

Adjusting tool ATCYL2102

Double Tube Wrench

![Doc007519.png]

![Doc007552.png]
9.2.2.2 Assembly of the Actuation Plate

Assembly of the Stop Buttons on both Sides

1) Assemble the stop buttons on both side (Manifold Side / Clamping Plate Side).
2) Fix them with screws.

Assembly of the Valve Pin Suspension Sleeves and Anti-rotation Screws

1) Assemble the valve pin suspension sleeves (1) at the actuation plate from the manifold side.
2) Fix them against turning with the anti-rotation screws from the manifold side.
3) Fix the valve pin suspension sleeves (1) with washers (4) and retaining rings for shafts DIN471 (5) from the clamping plate side.

Details
Valve pin suspension assembly
### Valve Pin Suspension Version 1 for:
Valve pin Ø 3.0 mm VPS-30-01 / Valve pin Ø 3.8 mm VPS-38-01

<table>
<thead>
<tr>
<th>Pos.</th>
<th>Part No.</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>01</td>
<td>VPSS-01</td>
<td>Valve Pin Suspension Sleeve</td>
</tr>
<tr>
<td>02</td>
<td>PNC4508B-HS-02</td>
<td>Hanger screw M11x1, Valve pin Ø 3.0</td>
</tr>
<tr>
<td></td>
<td>PNC4508B-HS-01</td>
<td>Hanger screw M11x1, Valve pin Ø 3.8</td>
</tr>
<tr>
<td>03</td>
<td>PNC4508B-LS-01</td>
<td>Lock Screw M11x1</td>
</tr>
<tr>
<td>04</td>
<td>W-17-24-2-01</td>
<td>Washer; 17x24x2</td>
</tr>
<tr>
<td>05</td>
<td>DIN471-17X1</td>
<td>Retaining ring for shafts DIN471</td>
</tr>
<tr>
<td>06</td>
<td>DIN7984-M6X8-10.9</td>
<td>Hexagon socket cap screw DIN7984</td>
</tr>
</tbody>
</table>

### Valve Pin Suspension Version 2 for:
Valve pin Ø 3.0 mm VPS-30-02 / Valve pin Ø 3.8 mm VPS-38-02

<table>
<thead>
<tr>
<th>Pos.</th>
<th>Part No.</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>01</td>
<td>VPSS-02</td>
<td>Valve Pin Suspension Sleeve</td>
</tr>
<tr>
<td>02</td>
<td>PNC4508B-HS-02</td>
<td>Hanger screw M11x1, Valve pin Ø 3.0</td>
</tr>
<tr>
<td></td>
<td>PNC4508B-HS-01</td>
<td>Hanger screw M11x1, Valve pin Ø 3.8</td>
</tr>
<tr>
<td>03</td>
<td>PNC4508B-LS-01</td>
<td>Lock Screw M11x1</td>
</tr>
<tr>
<td>04</td>
<td>W-17-24-2-02</td>
<td>Washer; 17x24x2</td>
</tr>
<tr>
<td>05</td>
<td>DIN471-17X1</td>
<td>Retaining ring for shafts DIN471</td>
</tr>
<tr>
<td>06</td>
<td>DIN7984-M6X8-10.9</td>
<td>Hexagon socket cap screw DIN7984</td>
</tr>
</tbody>
</table>

### Valve Pin Suspension Version 3 for:
Valve pin Ø 3.0 mm VPS-30-03 / Valve pin Ø 3.8 mm VPS-38-03

<table>
<thead>
<tr>
<th>Pos.</th>
<th>Part No.</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>01</td>
<td>VPSS-02</td>
<td>Valve Pin Suspension Sleeve</td>
</tr>
<tr>
<td>02</td>
<td>PNC4508B-HS-02</td>
<td>Hanger screw M11x1, Valve pin Ø 3.0</td>
</tr>
<tr>
<td></td>
<td>PNC4508B-HS-01</td>
<td>Hanger screw M11x1, Valve pin Ø 3.8</td>
</tr>
<tr>
<td>03</td>
<td>PNC4508B-LS-01</td>
<td>Lock Screw M11x1</td>
</tr>
<tr>
<td>04</td>
<td>W-17-24-2-01</td>
<td>Washer; 17x24x2</td>
</tr>
<tr>
<td>05</td>
<td>DIN471-17X1</td>
<td>Retaining ring for shafts DIN471</td>
</tr>
<tr>
<td>06</td>
<td>DIN7984-M6X8-10.9</td>
<td>Hexagon socket cap screw DIN7984</td>
</tr>
</tbody>
</table>
Assembly of the Guiding Bushings at the Actuation Plate

1) Assemble the Guiding Bushings (GB) in the Guiding Bush Seat (GBS).
2) Fix them with Retaining Rings for shafts DIN471 (RR).
3) Screw the Guiding Bushing Seat (GBS) into the actuation plate (Doc007549.png).

Assembly of the Piston Rod and Actuator

<table>
<thead>
<tr>
<th>Pos.</th>
<th>Part No.</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>01</td>
<td>00530084</td>
<td>Fixing Unit</td>
</tr>
<tr>
<td>02</td>
<td>PR-11-105-02</td>
<td>Piston Rod; D11.5; L105;</td>
</tr>
<tr>
<td>03</td>
<td>PRB-08-19-10-01</td>
<td>Piston Rod Bush</td>
</tr>
<tr>
<td>04</td>
<td>W-08-19-2-01</td>
<td>Washer; 8.5x19x2</td>
</tr>
<tr>
<td>05</td>
<td>DIN934-M8</td>
<td>Hexagon nut DIN934 / ISO4032</td>
</tr>
<tr>
<td>06</td>
<td>VIOR-5.00x1.50-FPM-75-G</td>
<td>This seal ring is included in actuator 00215485, not a part of the Piston Rod Set</td>
</tr>
</tbody>
</table>
**NOTICE**

For lubrication use Krytox GPL205. To lubricate the piston sliding surface is essential for the actuator life time.

To lubricate the piston ring seals is helpful to assemble the actuator.

1) Install the seal (06) at the piston rod (02).
2) Assemble the piston rod (02) at the Actuator (A).
3) Assemble the Fixing Unit (01) on the piston rod (02).

**NOTICE**

Use torque wrench with wrench insert and the torque specified in the respective table in section 4.

4) Insert the actuator Housing Cover 1 (HC).

**NOTICE**

The seal has to be directed against the cutout bottom.

5) Insert the actuators (A) into the Actuation Spacer Plate.
6) Assemble the upper housing cover (HCT).

**NOTICE**

The two threaded bores (x) must face outwards.

7) Fix the housing cover (HCT) with two hexagon socket set screws (M6) DIN912-M6X10-12.9 and two Washers DIN125 A (W)

**NOTICE**

Use torque wrench with wrench insert and the torque specified in the respective table in section 4.
9.2.2.3 Mounting of the Hot Runner System

The Control percentages and Control distances are edited in the Control Variables Screen.

⚠️ WARNING

Heavy Weight Hazard

1) Place the Spacer Plate onto the Cavity Plate.
2) Place the Manifold into the Cooling Plate / Cavity Plate.
3) Assemble the Guide Pillars (GP) into the Cooling Plate.

![WARNING]

Heavy Weight Hazard

4) Place the Cooling plate on the Spacer Plate.

5) Assemble the Ball Retainers (BR) on the Guide Pillars (GP).

6) Assemble the Piston Rod Bushes (RB) on the Piston Rods (PR).

![WARNING]

Heavy Weight Hazard

7) Place the Actuation Plate into the Cooling Plate.
8) Attach the Actuator with a Washer (WA) and a Nut DIN934 (NU) by fixing the Piston Rod (PR) with the T Wrench allen key (TW) and fasten the nut with the Box Spanner (BS) and spanner wrench.

9) Assemble Top Clamp Plate (TCP)

**WARNING**

Heavy Weight Hazard
## 9.2.2.4 Assembly and Adjust the Valve Pins

Precondition for the following steps are to be performed with the Hot Runner installed in the mold, and the system at operating temperature.

### Hot Surfaces Hazard

**Contact between the skin and hot surfaces could result in burns.**

Use personal protective equipment, such as gloves, apron, sleeves and face protection, to guard against burns.

When servicing or handling the hot runner system outside the manifold plates or the injection molding machine, care must be taken to heed the hot surface exposure warnings.

---

1) Fit in the valve pins via the top clamp plate into the cutout.

![Doc007550.png](Doc007550.png)

2) Hang the head of the valve pin (VP) into the Hanger Screw (HS).

3) Screw the Valve Pin (VP) with the Hanger Screw (HS), by using a T-wrench allen key, into the Valve pin Suspension sleeve.

![Doc007551.png](Doc007551.png)
Adjust the valve pins with a hexagon socket wrench as followed:

**NOTICE**

To adjust the valve pin, the Actuation Plate has to be stay on close position.

In order to ensure this, we recommend fixing it with compressed air on the actuator.

The basic setting for the valve gate pin is 16 mm between the Valve pin Suspension (VS) top edge and the top edge from the Hanger Screw (HS).

**NOTICE**

During the fine tuning process it is possible to move the Valve Pin (VP) in every direction 0.5 mm (1/2 rotation).

The exact position for the valve pin has to be checked at the front of the valve pin - depends on the nozzle tip.

The reason to unscrew the Hanger Screw (HS) would be for valve pin maintenance or replacement.

If the deviation to the basic settings of 16 mm is more than 0.5 mm, the adjustments do not correspond to the parameters of the mold or do not correspond to the Synventive standard.
**WARNING**

**Hot Surfaces Hazard**

Contact between the skin and hot surfaces could result in burns.

4) Heat up the system to the working temperature.
5) Turn with the Adjustment Tool ATCYL2102 (AT) the Locking Screw (LS) up to the Hanger Screw (HS).

**NOTICE**

For actuator assembly the Lock Screw (LS) has to be fastened against the Hanger Screw (HS).

6) Rotate the Lock Screw (LS) with the Adjustment Tool ATCY2102 (AT) into the Valve pin Suspension sleeve (VS).
7) Hold against turning the Hanger Screw (HS) with the hexagon Socket Wrench (SW).
8) At the same time tighten the Locking Screw (LS) with the Adjustment Tool ATCY2102 (AT) and a ring wrench (size 6 mm).
9) Repeat these steps of adjustment for all valve pins.
9.2.2.5 Nozzle Deactivating

If necessary, each nozzle can be deactivated independently.

**NOTICE**

This is a fast solution when using the remaining nozzles.

**WARNING**

Hot Surfaces Hazard

This operation has to be done with the system cooled down to room temperature.

1) Apply compressed air to the pneumatic tool connection CLOSED, to bring the actuation plate to the valve gates closed position.
2) Remove the Retaining Ring DIN471-17X1 (RR) from the valve pin suspension.

**NOTICE**

To remove the retaining ring, without dismounting the clamping plate, an extra long snap ring plier is required.

3) Remove the Washer W-17-24-2-02 (WS) with a Magnetic Rod / Pick-Up tool.
4) Hold against turning the Hanger Screw (HS) with the hexagon Socket Wrench (SW).

5) At the same time loosen the Lock Screw (LS) with the adjustment tool ATCY2102 (AT) and a ring wrench (size 6 mm).

6) Turn the Lock Screw (LS) with the adjustment tool ATCY2102 (AT) three complete turns counter clockwise.

**NOTICE**

After one and a half turns, the Valve pin Suspension sleeve (VS) is lower than the anti-rotation screw and it may rotate also.

7) Fix the new position by turning the Hanger Screw (HS) counter clockwise and the Lock Screw (LS) clockwise.

**NOTICE**

Before the system is put back into operation after the nozzles have been deactivated, the heating of the "out of service nozzles" must also be deactivated.
9.2.2.6 Blocking Pin

**NOTICE**

After the unit “Valve Pin Suspension” has been detached from the actuation plate, the position of the valve pin has to be locked with a blocking pin. When this pin is not mounted, the valve pin could be pushed back by the injection pressure and open the nozzle.

1) The length X must be measured.
2) The blocking pin should be manufactured according to the dimensions in image Doc007744.png
3) The blocking pin has to have contact to the machine plate.

[Diagram showing blocking pin installation]

Doc007743.png

Doc007744.png
10 Nozzles

This section describes the disassembly and assembly process to replace nozzles for the following production series:

**Threaded Nozzles 06E / 09E / 12E**

<table>
<thead>
<tr>
<th>Nozzle Series</th>
<th>Flow Bore Ø</th>
</tr>
</thead>
<tbody>
<tr>
<td>06E-02</td>
<td>6 mm</td>
</tr>
<tr>
<td>09E-01</td>
<td>9 mm</td>
</tr>
<tr>
<td>12E</td>
<td>12 mm</td>
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</tbody>
</table>

**Threaded Nozzles 16E-04 / 22E-04**

<table>
<thead>
<tr>
<th>Nozzle Series</th>
<th>Flow Bore Ø</th>
</tr>
</thead>
<tbody>
<tr>
<td>16E-04</td>
<td>16 mm</td>
</tr>
<tr>
<td>22E-04</td>
<td>22 mm</td>
</tr>
</tbody>
</table>

**Threaded Nozzles 12EX16 / 16EX22**

<table>
<thead>
<tr>
<th>Nozzle Series</th>
<th>Flow Bore Ø</th>
<th>Flow Bore Ø</th>
</tr>
</thead>
<tbody>
<tr>
<td>Front side</td>
<td>12 mm</td>
<td>16 mm (18 mm)</td>
</tr>
<tr>
<td>Rear side</td>
<td>16 mm</td>
<td>22 mm (20 mm, 24 mm)</td>
</tr>
</tbody>
</table>

**Support Ring Nozzles**

<table>
<thead>
<tr>
<th>Nozzle Series</th>
<th>Flow Bore Ø</th>
</tr>
</thead>
<tbody>
<tr>
<td>SR16</td>
<td>8 - 16 mm</td>
</tr>
<tr>
<td>SR20</td>
<td>8 - 20 mm</td>
</tr>
<tr>
<td>SR24</td>
<td>13 - 25 mm</td>
</tr>
</tbody>
</table>
**Hot Runner System Installation Guide**

**Service and Maintenance / Nozzles**

**Sprue Bushing 06S**

![Sprue Bushing 06S](Doc004799.tif)

<table>
<thead>
<tr>
<th>Nozzle Series</th>
<th>Flow Bore Ø</th>
</tr>
</thead>
<tbody>
<tr>
<td>06S</td>
<td>6 mm</td>
</tr>
</tbody>
</table>

**Sprue Bushing 09S**

![Sprue Bushing 09S](Doc004800.tif)

<table>
<thead>
<tr>
<th>Nozzle Series</th>
<th>Flow Bore Ø</th>
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</thead>
<tbody>
<tr>
<td>09S</td>
<td>9 mm</td>
</tr>
</tbody>
</table>

**Sprue Bushing 12S**

![Sprue Bushing 12S](Doc005218.tif)

<table>
<thead>
<tr>
<th>Nozzle Series</th>
<th>Flow Bore Ø</th>
</tr>
</thead>
<tbody>
<tr>
<td>12S</td>
<td>12 mm</td>
</tr>
</tbody>
</table>

**Sprue Bushing 16S / 22S**

![Sprue Bushing 16S / 22S](Doc006883.tif)

<table>
<thead>
<tr>
<th>Nozzle Series</th>
<th>Flow Bore Ø</th>
</tr>
</thead>
<tbody>
<tr>
<td>16S</td>
<td>16 mm</td>
</tr>
<tr>
<td>22S</td>
<td>22 mm</td>
</tr>
</tbody>
</table>

**Single Axis Valve Gate Nozzles (hydraulic)**

**12SVH / 16SVH**

![Single Axis Valve Gate Nozzles (hydraulic) 12SVH / 16SVH](Doc007461.png)

<table>
<thead>
<tr>
<th>Nozzle Series</th>
<th>Flow Bore Ø</th>
</tr>
</thead>
<tbody>
<tr>
<td>12SVH</td>
<td>12 mm</td>
</tr>
<tr>
<td>16SVH</td>
<td>16 mm</td>
</tr>
</tbody>
</table>

**Single Axis Valve Gate Nozzles (pneumatic)**

**09SVP / 12SVP / 16SVP**

![Single Axis Valve Gate Nozzles (pneumatic) 09SVP / 12SVP / 16SVP](Doc007460.png)

<table>
<thead>
<tr>
<th>Nozzle Series</th>
<th>Flow Bore Ø</th>
</tr>
</thead>
<tbody>
<tr>
<td>09SVP</td>
<td>9 mm</td>
</tr>
<tr>
<td>12SVP</td>
<td>12 mm</td>
</tr>
<tr>
<td>16SVP</td>
<td>16 mm</td>
</tr>
</tbody>
</table>
10.1 Threaded Nozzles

10.1.1 Nozzle 06E Series

**NOTICE**
Always tighten the screws to the torque specified in the respective table in section 13.

**WARNING**

**Hot Surfaces Hazard**

Contact between the skin and hot surfaces could result in burns.

Use personal protective equipment, such as gloves, apron, sleeves and face protection, to guard against burns.

When servicing or handling the hot runner system outside the manifold plates or the injection molding machine, care must be taken to heed the hot surface exposure warnings.

For first aid contact your medical / safety representing.

**Hazard of Pressurized Air**

Pressurized air blow can result in hot plastic or foreign bodies entering the eyes, causing vision damage.

Use personal protective equipment: Face protection, hearing protection and gloves.

For first aid contact your medical / safety representing.

**NOTICE**

**Hazard of Material Damage**

Without consulting Synventive it is not permitted to do modifications to the hot runner system e.g. geometrical changes to the nozzle tip, except the part shape adjustment in the area of material allowance.
In this section the nozzle parts are identified with the numbers indicated in the following figure.

**Parts of the Nozzle Nozzle 06E**

1. Nozzle body
2. Component Ring Version 01
3. Heating Element
4. Component Ring Version 02
5. Nozzle circlip
6. Tip
7. Wear Insert (Not shown)

![Doc006483.png](Doc006483.png)

In this section the Stripping and Mounting Tool parts are identified with the numbers indicated in the following figure.

**Parts of the Heater Stripping and Mounting Tool AT06E01**

(T1.1) Stop bolt ATCYL0104
(T1.2) Guide ATCYL0102
(T1.3) Slide hammer ATCYL0101
(T1.4) Adapter AT06E0101
(T1.5) Socket head cap screw M4

![Doc003038.png](Doc003038.png)
10.1.1.1 Dismounting and Mounting Thermocouple

**Dismounting Thermocouple**

**NOTICE**
For dismounting of the thermocouple from the nozzle heater, the nozzle heater must be dismantled from the nozzle.

1) Lift the thermocouple (3.1) at the retainer clip (a) out of the heating element (3) slot and pull it off the heating element.

**NOTICE**
The thermocouple (3.1) is clamped at the top of the heater element (3).
Mounting Thermocouple

**NOTICE**
For mounting of the thermocouple to the nozzle heater, the nozzle heater must be dismantled from the nozzle.

**Color coding of Thermocouples**

**NOTICE**
Take notice of the production and color identification of thermocouple cables.

Synventive uses J and K type thermocouples. Their color coding is given in the following table.

<table>
<thead>
<tr>
<th>Type</th>
<th>International standard IEC 584-3</th>
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<tr>
<td>J</td>
<td>Black, +Black, - White</td>
</tr>
<tr>
<td>K</td>
<td>Green, +Green, - White</td>
</tr>
</tbody>
</table>

1) Slide the thermocouple (3.1) in leadership of the heating element (3) until it stops.
2) Increase the pressure until the top of the thermocouple (3.1) completely is clamped in to the final position.
3) Check the position of the thermocouple (3.1).

4) Press the retainer clip (a) into the slot at the heating element (3).
10.1.1.2 Disassembly the Nozzle 06E

Disassembling the Nozzle Tip

1) Remove the circlip (5) from the nozzle tip (6).

2) Remove the component ring version 02(4).

---

**WARNING**

Hot Surfaces Hazard

Following works must be carried out by qualified persons.

Use personal protective equipment, such as gloves, apron, sleeves and face protection, to guard against burns.

Contact between the skin and the hot nozzle could result in burns.

**NOTICE**

To dismount the nozzle tip from the nozzle, if there is plastic material in the nozzle, the tip must be heated-up.

Never use an acetylene or welding torch, as severe nozzle damage can occur from over-heating.

3) Heat the nozzle tip (2) using a heat gun to the maximum temperature of 200 °C (392 °F).

---

**WARNING**

Hot Surfaces Hazard

The nozzle is still hot.

**NOTICE**

Unscrewing the nozzle tip may cause the nozzle to start rotating together with the nozzle tip, which could result in leakage at the base of the nozzle.

4) Hold the nozzle body (1) firmly using an engineer’s wrench at the hexagonal shape.

5) Unscrew the nozzle tip (6) from the nozzle body (1) using an engineer’s wrench.
**WARNING**

**Hazard of Pressurized Air**

Pressurized air blow can result in hot plastic parts or foreign bodies entering the eyes, causing vision damage.

6) Clean the nozzle tip using pressurized air to remove as much residual plastic as possible.

---

**Disassembling the Nozzle Heater**

![Diagram of Nozzle Heater Disassembly](Doc003042.png)

**WARNING**

**Hot Surfaces Hazard**

Contact between the skin and the hot nozzle could result in burns.

1) Cool the nozzle body to approximately 25 °C (77 °F).
2) Move the adapter of the dismantling tool (T1.4) over the heater.
3) Fix the heater with 2 socket head cap screws M4 (T1.5).
4) Screw the guide (T1.2) together with the stop bolt (T1.1) and the slide hammer (T1.3) into the adapter (T1.4).
5) To remove the nozzle heater, slide the hammer (T1.3) against the stop bolt (T1.1) repeatedly until the nozzle heater is released.

---

**Disassembling the Nozzle Body**

![Diagram of Nozzle Body Disassembly](Doc003040.png)

**WARNING**

**Hot Surfaces Hazard**

Contact between the skin and the hot nozzle could result in burns.

1) Ensure that the nozzle body (1) is cooled to approximately 25 °C (77 °F).
2) Unscrew nozzle body from the manifold.
10.1.1.3 Assembling the Nozzle 06E

**WARNING**

**Hot Surfaces Hazard**
Contact between the skin and the hot nozzle could result in burns.

Use personal protective equipment: Gloves resistant to high temperatures, apron, sleeves, to guard against burns.

---

**Nozzle 06E**

1. Nozzle body
2. Component Ring Version 01
3. Heating Element
4. Component Ring Version 02
5. Nozzle circlip
6. Tip
7. Wear Insert (Not shown)
Assembling the Nozzle Body

1) Apply spotting ink on the nozzle body (1) bottom surface (SF1).
2) Screw in the nozzle body (1) hand-tight into the manifold thread until seated.
3) Unscrew the nozzle body (1) from the manifold.

4) Check the matching between the manifold bottom surfaces (SF2) and the nozzle body (1) surface (SF1).

   **NOTICE**

   The manifold must bear on all surfaces uniformly and flatly, in particular on the nozzle head contact face.
   In case of any uncertainty, clean the surfaces with a cleaning cloth. If the next ink test is still unsatisfactory, please - contact Synventive Customer Service or Technical Support.

5) With a positive ink test clean the surfaces and proceed to the next step.

6) Lubricate the thread (not the face) of the nozzle body with high-temperature assembly paste (antiseize compound).

   **NOTICE**

   This is an important measure to prevent thread corrosion due to aggressive gases, which could be released during plastics processing.

7) Tighten nozzle body to manifold.

   **NOTICE**

   Use torque wrench with wrench insert and the torque specified in the respective table in section 13.
Assembling the Nozzle Heater to the Nozzle

1) Add component ring (2) (when used)

**NOTICE**
This component ring version 01 is an option (depend of the nozzle length). The high can be between 1 mm until 20 mm.

2) Mount heater top on top to nozzle body carefully with soft-head hammer and adapter (T1.4).

**NOTICE**
The adapter has to be turned in the pictured position.

**NOTICE**
To ensure the temperature control of the nozzle tip, the heater must be flush with the nozzle body.

3) Control the position of the heater.
Assembling the Nozzle Tip

1) Apply spotting ink on the nozzle tip bottom surface (SF1).
2) Screw in the nozzle tip hand-tight into the nozzle body until seated.
3) Unscrew the nozzle tip from the nozzle body.

4) Check the matching between the nozzle body surface (SF2) and the nozzle tip surface (SF1).

**NOTICE**
The nozzle must bear uniformly on the outer surfaces uniformly and flatly, in particular on the nozzle tip contact face.

**NOTICE**
In case of any uncertainty, clean the surfaces with a cleaning cloth. If the next ink test is still unsatisfactory - please contact Synventive Customer Service or Technical Support.

5) With a positive ink test, clean the surfaces and proceed to the next step.

6) Lubricate the thread (not the face) of the nozzle tip body with high-temperature assembly paste (antiseize compound).

**NOTICE**
This is an important measure to prevent thread corrosion due to aggressive gases, which could be released during plastics processing.

7) Screw in the nozzle tip into the nozzle body hand-tight.
8) Tighten the nozzle tip to nozzle at room temperature.

**NOTICE**
Use torque wrench with wrench insert and the torque specified in the respective table in section 13.

9) Place the component ring version 02 (4) on the nozzle heating (3).

10) Mount the circlip (5) at the nozzle tip (6).
10.1.2 Nozzle 09E-02 Series

**NOTICE**
Always tighten the screws to the torque specified in the respective table in section 13.

**WARNING**

**Hot Surfaces Hazard**
Contact between the skin and hot surfaces could result in burns.
Use personal protective equipment, such as gloves, apron, sleeves and face protection, to guard against burns.
When servicing or handling the hot runner system outside the manifold plates or the injection molding machine, care must be taken to heed the hot surface exposure warnings.
For first aid contact your medical / safety representing.

**Hazard of Pressurized Air**
Pressurized air blow can result in hot plastic or foreign bodies entering the eyes, causing vision damage.
Use personal protective equipment: Face protection, hearing protection and gloves.
For first aid contact your medical / safety representing.

**NOTICE**

**Hazard of Material Damage**
Without consulting Synventive it is not permitted to do modifications to the hot runner system e.g. geometrical changes to the nozzle tip, except the part shape adjustment in the area of material allowance.
In this section the nozzle parts are identified with the numbers indicated in the following figure.

![Parts of the Nozzle 09E-02](Doc003817.png)

**Parts of the Nozzle 09E-02**

1. Threaded nozzle body
2. Nozzle heater
3. Nozzle component ring version=4 for Brass Heater
4. Nozzle component ring version=2 (Heater locating ring)
5. Retaining ring DIN471
6. Socket set screw DIN914
7. Nozzle Tip Style Complete
   - Tip nut
   - Tip insert alternatively nozzle tip assemblies
7. Valve gate pin (not shown)

In this section the Stripping and Mounting Tool parts are identified with the numbers indicated in the following figure.

![Heater Disassembly Tool Compl. 09E AT09E03](Doc003818.png)

**Heater Disassembly Tool Compl. 09E AT09E03**

- (T1.1) Heater Disassembly Tool 09E Type 01 AT09E0301
- (T1.2) Heater Disassembly Tool 09E Type 02 AT09E0302
- (T1.3) Heater Disassembly Tool 09E Type 03 AT09E0303
10.1.2.1 Dismounting and Mounting Thermocouple

**Dismounting Thermocouple**

**NOTICE**
For dismounting of the thermocouple from the nozzle heater, the nozzle heater must be dismantled from the nozzle.

1) Lever the bracket of the heating element (2) with a screwdriver and pull the thermocouple (2.1) from its seat.
2) Pull the top of the thermocouple (2.1) from the bracket of the nozzle heater (2).

**NOTICE**
The thermocouple is pressed in.

**Mounting Thermocouple**

**NOTICE**
For mounting of the thermocouple to the nozzle heater, the nozzle heater must be dismantled from the nozzle.

**Color coding of Thermocouples**

**NOTICE**
Take notice of the production and color identification of thermocouple cables.

Synventive uses J and K type thermocouples. Their color coding is given in the following table.

<table>
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<td>J</td>
<td>Black + Black</td>
</tr>
<tr>
<td></td>
<td>- White</td>
</tr>
<tr>
<td>K</td>
<td>Green + Green</td>
</tr>
<tr>
<td></td>
<td>- White</td>
</tr>
</tbody>
</table>

1) Push the thermocouple (2.1) under the bracket on the nozzle heater (2).

**NOTICE**
The fixing is needed to secure the position.
A thermocouple (well-fixed in the holder) causes correct measured values.

2) Lever the clamp of the nozzle heater with a screwdriver and fix the thermocouple (2.1) below the clamp at the nozzle heater (2).
10.1.2.2 Disassembly the Nozzle 09E-02

Disassembling the Nozzle Heater

1) Remove the retaining ring (5) from the nozzle tip (7.1).
2) Remove the nozzle component ring - Frontring (3).
3) Unscrew and remove the socket set screw (6) from the nozzle heater locating ring (4).

4) Mount the heater disassembly tool Type 01 (T1.1).

   **NOTICE**
   
   The lower edge of the heater removal tool type 01 (T1.1) must be set below the heater locating ring (4).

5) Slide disassembly tool Type 02 (T1.2) along the disassembly tool Type 03 (T1.3).
6) Screw disassembly tool Type 03 (T1.3) onto disassembly tool Type 01 (T1.1).
Disassembling the Nozzle Tip and Nozzle Body

**WARNING**

**Hot Surfaces Hazard**

Contact between the skin and the hot nozzle could result in burns.

Following works must be carried out by qualified persons.

Use personal protective equipment, such as gloves, apron, sleeves and face protection, to guard against burns.

1) Heat the nozzle tip (7.1) using a heat gun to the maximum temperature of 200 °C (392 °F).

2) Hold the nozzle body (1) firmly using an engineer’s wrench at the hexagonal shape.

3) Unscrew the nozzle tip (7.1) from the nozzle body (1) using a ring wrench.

**WARNING**

**Hazard of Pressurized Air**

Pressurized air blow can result in hot plastic parts or foreign bodies entering the eyes, causing vision damage.

Use personal protective equipment: Face protection, hearing protection and gloves.

4) Clean the nozzle tip using pressurized air to remove as much residual plastic as possible.

**NOTICE**

To dismount the nozzle tip (7.1) from the nozzle, if there is plastic material in the nozzle, the tip (7.1) must be heated-up.

Never use an acetylene or welding torch, as severe nozzle damage can occur from overheating.

7) To remove the nozzle heater (2), slide the disassembly tool Type 02 (T1.2) against the disassembly tool Type 03 (T1.3) repeatedly until the nozzle heater (2) is released.

---

**Master Language is English**

**Hot Runner System Installation Guide**

**Service and Maintenance / Nozzle 09E-02 Series**

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**WARNING**

Hot Surfaces Hazard

Contact between the skin and the hot nozzle could result in burns.

5) Cool the nozzle body (1) to approximately 25 °C (77 °F).
6) Unscrew nozzle body (1) from the manifold.

---

**Assembling Nozzle 09E-02**

**Parts of the Nozzle 09E-02**

1) Threaded nozzle body
2) Nozzle heater
(2.1) Thermocouple
   (Part No. 09NC-T-###-###-0#)
3) Nozzle component ring version=4
   (front ring – Part No. 09nc-r-04) for
   Brass Heater
4) Nozzle component ring version=2
   (Heater locating ring)
5) Retaining ring DIN471
6) Socket set screw DIN914
7.1) Nozzle Tip Style Complete
   (7.1.1) Tip nut
   (7.1.2) Tip insert alternatively nozzle
   tip assemblies
   (7.2.x) Valve gate pin (not shown)
Assembling the Nozzle Body

1) Apply spotting ink on the nozzle body (1) bottom surface (SF1)

2) Screw in the nozzle body (1) hand-tight into the manifold thread until seated.

3) Unscrew the nozzle body (1) from the manifold.

4) Check the matching between the manifold bottom surfaces (SF2) and the nozzle body (1) surface (SF1).

   **NOTICE**
   The manifold must bear on all surfaces uniformly and flatly, in particular on the nozzle head contact face.
   In case of any uncertainty, clean the surfaces with a cleaning cloth. If the next ink test is still unsatisfactory, please - contact Synventive Customer Service or Technical Support.

5) With a positive ink test clean the surfaces and proceed to the next step.

6) Lubricate the thread (not the face) of the nozzle body with high-temperature assembly paste (antiseize compound).

   **NOTICE**
   This is an important measure to prevent thread corrosion due to aggressive gases, which could be released during plastics processing.

7) Tighten nozzle body (1) to the manifold.

   **NOTICE**
   Use torque wrench with wrench insert and the torque specified in the torque table in section 13.
8) Slide heater locating, ring (4), onto the nozzle body (1) up to the surface of the hexagon.

**NOTICE**
The opening of the heater locating ring (4), must be line up with the cable connections (see customer drawing).

9) Bend the heater and thermocouple (ex) leads.

**NOTICE**
Use round-nosed pliers only.

10) Mount the nozzle heater (2) onto the nozzle (1).

**NOTICE**
Take care that cold length of the nozzle heater (2) must be positioned through the opening of the nozzle component ring (4).
Check the correct position and fixation of the thermocouple (TC).

**Assembling the Nozzle Tip**

*good*  *good*  *good*  *incorrect*

**NOTICE**
See examples of good and incorrect insert installations.
Make sure the insert must not exceeds the height of the nozzle tip head.
Incorrect items should not be further processed.
1) Apply spotting ink on the nozzle tip (7.1) bottom surface (SF1).
2) Screw in the nozzle tip (7.1) hand-tight into the nozzle body (1) until seated.
3) Unscrew the nozzle tip (7.1) from the nozzle body (1).

4) Check the matching between the nozzle body surface (SF2) and the nozzle tip surface (SF1).

**NOTICE**
The nozzle must bear uniformly on the outer surfaces uniformly and flatly, in particular on the nozzle tip contact face.

**NOTICE**
In case of any uncertainty, clean the surfaces with a cleaning cloth. If the next ink test is still unsatisfactory - please contact Synventive Customer Service or Technical Support.

5) With a positive ink test, clean the surfaces and proceed to the next step.

6) Lubricate the thread (not the face) of the nozzle tip body with high-temperature assembly paste (antiseize compound).

**NOTICE**
This is an important measure to prevent thread corrosion due to aggressive gases, which could be released during plastics processing.
7) Tighten the nozzle tip (7.1) at the nozzle by room temperature.

**NOTICE**
Use torque wrench with wrench insert and the torque specified in the respective table in section 13.

8) Place the frontring (3) on the nozzle heater (2).

9) Mount the retaining ring (5) at the nozzle tip (7.1).

10) Move the nozzle component ring (4) and nozzle heater (2) tight to the frontring (3).

11) Fix the nozzle component ring (4) with the socket set screw (6) by a ½ up to ¾ turn.
10.1.3 Nozzle 12E Series

**NOTICE**

Always tighten the screws to the torque specified in the respective table in section 13.

---

**WARNING**

**Hot Surfaces Hazard**

Contact between the skin and hot surfaces could result in burns.

Use personal protective equipment, such as gloves, apron, sleeves and face protection, to guard against burns.

When servicing or handling the hot runner system outside the manifold plates or the injection molding machine, care must be taken to heed the hot surface exposure warnings.

For first aid contact your medical / safety representing.

---

**Hazard of Pressurized Air**

Pressurized air blow can result in hot plastic or foreign bodies entering the eyes, causing vision damage.

Use personal protective equipment: Face protection, hearing protection and gloves.

For first aid contact your medical / safety representing.

---

**NOTICE**

**Hazard of Material Damage**

Without consulting Synventive it is not permitted to do modifications to the hot runner system e.g. geometrical changes to the nozzle tip, except the part shape adjustment in the area of material allowance.
In this section the nozzle parts are identified with the numbers indicated in the following figure.

**Parts of the Nozzle 12E**

1. Threaded nozzle body
2. Nozzle heater
2.1 Thermocouple
3. Nozzle component ring version=1 (Pre centering ring)
4. Nozzle component ring version=2 (Heater locating ring)
5. Retaining ring DIN471
6. Socket set screw DIN914
7.1 Nozzle Tip Style Complete
    - Example of a nozzle tip assembly
    7.1.1 Tip nut
    7.1.2 Inner parts
    7.2.x Valve gate assembly (not shown)

In this section the Stripping and Mounting Tool parts are identified with the numbers indicated in the following figures.

**Heater Disassembly Tool Complete AT12E-0101**

(T1.1) Heater Disassembly Tool 12E Type 01 AT12E-010101
(T1.2) Heater Disassembly Tool 12E Type 02 AT12E-010102
(T1.3) Heater Disassembly Tool 12E Type 03 AT12E-010103

**Heater Assembly Tool AT12E-0102**

(T2) Tip Assemble Tool TTW, TTP, TFP AT12E-0103

**Seal Cap Assemble Tool AT12E-0105**

(T3) Seal Cap Assemble Tool AT12E-0105
10.1.3.1 Dismounting and Mounting Thermocouple

Dismounting Thermocouple

**NOTICE**
For dismounting of the thermocouple from the nozzle heater, the nozzle heater must be dismantled from the nozzle.

1) Lever the clamp of the heating element (2) with a screwdriver and pull the thermocouple (2.1) from its seat.
2) Pull the top of the thermocouple (2.1) from the bracket of the nozzle heater (2).

**NOTICE**
The thermocouple is pressed in.

Mounting Thermocouple

**NOTICE**
For mounting of the thermocouple to the nozzle heater, the nozzle heater must be dismantled from the nozzle.

Color coding of Thermocouples
Take notice of the production and color identification of thermocouple cables.
Synventive uses J and K type thermocouples. Their color coding is given in the following table.

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</tr>
<tr>
<td>K</td>
<td>Green + Green + Green - White</td>
</tr>
</tbody>
</table>

1) Push the thermocouple (2.1) under the bracket on the nozzle heater (2).

**NOTICE**
The fixing is needed to secure the position. A thermocouple (well-fixed in the holder) causes correct measured values.

2) Lever the clamp of the heating element with a screwdriver and fix the thermocouple (2.1) below the clamp at the nozzle heater (2).
10.1.3.2 Disassembly the Nozzle 12E

Disassembling the Nozzle Heater

1) Remove the retaining ring (5) from the nozzle tip (7.1).
2) Remove the nozzle component ring (3).
3) Unscrew and remove the socket set screw (6) from the nozzle heater locating ring (4).

4) Mount the heater disassembly tool Type 01 (T1.1).

**NOTICE**
The lower edge of the heater removal tool type 01 (T1.1) must be set below the heater locating ring (4).

5) Slide disassembly tool Type 02 (T1.2) along the disassembly tool Type 03 (T1.3).
6) Screw disassembly tool Type 03 (T1.3) onto disassembly tool Type 01 (T1.1).
7) To remove the nozzle heater (2), slide the disassembly tool Type 02 (T1.2) against the disassembly tool Type 03 (T1.3) repeatedly until the nozzle heater (2) is released.

Disassembling the Nozzle Tip and Nozzle Body

**NOTICE**

To dismount the nozzle tip (7.1) from the nozzle, if there is plastic material in the nozzle, the tip (7.1) must be heated-up. Never use an acetylene or welding torch, as severe nozzle damage can occur from over-heating.

1) Heat the nozzle tip (7.1) using a heat gun to the maximum temperature of 200 °C (392 °F).

2) Hold the nozzle body (1) firmly using an engineer’s wrench at the hexagonal shape.

3) Unscrew the nozzle tip (7.1) from the nozzle body (1) using a ring wrench.
**WARNING**

**Hazard of Pressurized Air**
Pressurized air blow can result in hot plastic or foreign bodies entering the eyes, causing vision damage.
Use personal protective equipment: Face protection, hearing protection and gloves- PSA.

4) Clean the nozzle tip using pressurized air to remove as much residual plastic as possible.

**WARNING**

**Hot Surfaces Hazard**
Contact between the skin and the hot nozzle could result in burns.

5) Cool the nozzle body (1) to approximately 25 °C (77 °F).
6) Unscrew nozzle body (1) from the manifold.

**10.1.3.3 Assembling the Nozzle 12E**

**Parts of the Nozzle 12E**

1) Threaded nozzle body
2) Nozzle heater
2.1) Thermocouple
3) Nozzle component ring version=1 (Pre centering ring)
4) Nozzle component ring version=2 (Heater locating ring)
5) Retaining ring DIN471
6) Socket set screw DIN914
7.1) Nozzle Tip Style Complete
7.1.1) Nozzle Tip Style Complete Example of a nozzle tip assembly
7.1.2) Inner parts
7.2.x) Valve gate assembly (not shown)
Assembling the Nozzle Body

1) Apply spotting ink on the nozzle body (1) bottom surface (SF1)
2) Screw in the nozzle body (1) hand-tight into the manifold thread until seated.
3) Unscrew the nozzle body (1) from the manifold.

4) Check the matching between the manifold bottom surfaces (SF2) and the nozzle body (1) surface (SF1).

   **NOTICE**
   
   The manifold must bear on all surfaces uniformly and flatly, in particular on the nozzle head contact face.
   
   In case of any uncertainty, clean the surfaces with a cleaning cloth. If the next ink test is still unsatisfactory, please - contact Synventive Customer Service or Technical Support.

5) With a positive ink test clean the surfaces and proceed to the next step.

6) Lubricate the thread (not the face) of the nozzle body with high-temperature assembly paste (antiseize compound).

   **NOTICE**
   
   This is an important measure to prevent thread corrosion due to aggressive gases, which could be released during plastics processing.

7) Tighten nozzle body (1) to the manifold.

   **NOTICE**
   
   Use torque wrench with wrench insert and the torque specified in the torque table in section 13.
8) Slide heater locating, ring (4), onto the nozzle body (1) up to the surface of the hexagon.

**NOTICE**
The opening of the heater locating ring (4), must be line up with the cable connections (see customer drawing).

9) Bend the heater and thermocouple (ex) leads.

**NOTICE**
Use round-nosed pliers only.

10) Mount the nozzle heater (2) onto the nozzle (1).

**NOTICE**
Take care that cold length of the nozzle heater (2) must be positioned through the opening of the nozzle component ring (4).
Check the correct position and fixation of the thermocouple (TC).

11) If necessary, use a soft faced hammer to drive the nozzle heater (2) into the final, right position.

**NOTICE**
To avoid damage to the heater use the hammer softly.
The P/N of assembly tool (AT) is AT12E-0102.
Check the correct position and fixation of the thermocouple (TC).
Assembling the Nozzle Tip TTW, TTP, TFP

1) 2) 3) 4) TTW Nozzle Tip Assembly

1) Place the tip nut (a) into the tool (T2).
2) Using the tool (T1) to push the tip insert (b) into the tip nut (a).
3) Place the torpedo (c) on the tip insert (b).
4) Using the tool (T1) to push the torpedo (c) and the tip insert (b) into the tip nut (a).

1) 2) 3) 4) TTP Nozzle Tip Assembly

1) Place the tip nut (a) on the tool (T2).
2) Using the tool (T1) to push the tip insert (b) into the tip nut (a).
3) Place the torpedo (c) on the tip insert (b).
4) Using the tool (T1) to push the torpedo (c) and the tip insert (b) into the tip nut (a).

1) 2) TFP Nozzle Tip Assembly

1) Place the tip nut on the tool (T2).
2) Using the tool (T1) to push the tip insert (b) into the tip nut (a).
Shown are the tip nuts, for checking the correct seating of the tip inserts

**NOTICE**
See examples of good and incorrect insert installations. Make sure the insert must not exceed the height of the nozzle tip head. Incorrect items should not be further processed.

Assemble the Seal Cap on VSW, VTW, TTW Nozzle Tips

1) Place the tip nut (a) on the tool (T1).
2) Place the seal cap (b) on the tip nut (a).
3) Using the tool (T3) to push the seal cap (b) on the tip nut (a).

**NOTICE**
The assembly tool (T3) has an engraved note on both sides, on the front side, for use with VSW, VTW or TTW tip nut (sign on assembly tool T3 is VW or TW).

Assembling the Nozzle Tip on the Nozzle

1) Apply spotting ink on the nozzle tip (7.1) bottom surface (SF1).
2) Screw in the nozzle tip (7.1) hand-tight into the nozzle body (1) until seated.
3) Unscrew the nozzle tip (7.1) from the nozzle body (1).
4) Check the matching between the nozzle body surface (SF2) and the nozzle tip surface (SF1).

**NOTICE**
The nozzle must bear uniformly on the outer surfaces uniformly and flatly, in particular on the nozzle tip contact face.

**NOTICE**
In case of any uncertainty, clean the surfaces with a cleaning cloth. If the next ink test is still unsatisfactory - please contact Synventive Customer Service or Technical Support.

5) With a positive ink test, clean the surfaces and proceed to the next step.

6) Lubricate the thread (not the face) of the nozzle tip body with high-temperature assembly paste (antiseize compound).

**NOTICE**
This is an important measure to prevent thread corrosion due to aggressive gases, which could be released during plastics processing.

7) Tighten the nozzle tip (7.1) at the nozzle by room temperature.

**NOTICE**
Use torque wrench with wrench insert (HEX21) and a torque of 100 Nm.
8) Place the pre centering ring version=1 (3) on the nozzle heater (2).

**NOTICE**

The component ring (3) is for pre centering of the nozzle in the cut-out.

9) Mount the retaining ring (5) at the nozzle tip (7.1).

10) Move the nozzle component ring (4) and nozzle heater (2) tight to the nozzle component ring (3).

11) Fix the nozzle component ring (4) with the socket set screw (6) by a ½ up to ¾ turn.
10.1.4 Nozzle 16E-04 / 22E-04 Series

**NOTICE**

Always tighten the screws to the torque specified in the respective table in section 13.

### WARNING

**Hot Surfaces Hazard**

Contact between the skin and hot surfaces could result in burns.

Use personal protective equipment, such as gloves, apron, sleeves and face protection, to guard against burns.

When servicing or handling the hot runner system outside the manifold plates or the injection molding machine, care must be taken to heed the hot surface exposure warnings.

For first aid contact your medical / safety representing.

### Hazard of Pressurized Air

Pressurized air blow can result in hot plastic or foreign bodies entering the eyes, causing vision damage.

Following work must be carried out by qualified and experienced persons.

Use personal protective equipment: Face protection, hearing protection and gloves.

For first aid contact your medical / safety representing.

### NOTICE

**Hazard of Material Damage**

Without consulting Synventive it is not permitted to do modifications to the hot runner system e.g. geometrical changes to the nozzle tip, except the part shape adjustment in the area of material allowance.
Technical Data - Threaded Nozzle 16E-04 / 22E-04 Series

<table>
<thead>
<tr>
<th>Threaded Nozzle 16E-04</th>
</tr>
</thead>
<tbody>
<tr>
<td>Flow bore (J)</td>
</tr>
<tr>
<td>Nozzle length (L)</td>
</tr>
<tr>
<td>Nozzle cutout (D)</td>
</tr>
<tr>
<td>Thermocouple</td>
</tr>
<tr>
<td>Nozzle tips</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Threaded Nozzle 22E-04</th>
</tr>
</thead>
<tbody>
<tr>
<td>Flow bore (J)</td>
</tr>
<tr>
<td>Nozzle length (L)</td>
</tr>
<tr>
<td>Nozzle cutout (D)</td>
</tr>
<tr>
<td>Thermocouple</td>
</tr>
<tr>
<td>Nozzle tips</td>
</tr>
</tbody>
</table>

Parts of the Nozzles 16E-04 / 22E-04

In this section the nozzle parts are identified with the numbers indicated in the following figure.

**NOTICE**

Always tighten the screws to the torque specified in the respective table in section 13.

<table>
<thead>
<tr>
<th>Pos.</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Nozzle body</td>
</tr>
<tr>
<td>2</td>
<td>Head ring</td>
</tr>
<tr>
<td>3</td>
<td>Rear heating element (optional)</td>
</tr>
<tr>
<td>4</td>
<td>Retaining ring</td>
</tr>
<tr>
<td>5</td>
<td>Cover tube</td>
</tr>
<tr>
<td>6</td>
<td>Front heater</td>
</tr>
<tr>
<td>7</td>
<td>Component ring</td>
</tr>
<tr>
<td>8</td>
<td>Retaining ring</td>
</tr>
<tr>
<td>9</td>
<td>Nozzle tip</td>
</tr>
<tr>
<td>10</td>
<td>Wear insert (optional)</td>
</tr>
<tr>
<td>11</td>
<td>Cooling bushing (optional)</td>
</tr>
</tbody>
</table>
Assembly / Disassembly Tools

In this section the Stripping and Mounting Tool parts are identified with the numbers indicated in the following figure.

**Heater Disassembly Tool Compl. AT16E-0102, AT22E-0102**

<table>
<thead>
<tr>
<th>Pos.</th>
<th>Qty.</th>
<th>Part No.</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>T1.1</td>
<td>1</td>
<td>ATCYL0104</td>
<td>Stop bolt</td>
</tr>
<tr>
<td>T1.2</td>
<td>1</td>
<td>ATCYL0102</td>
<td>Guide</td>
</tr>
<tr>
<td>T1.3</td>
<td>1</td>
<td>ATCYL0101</td>
<td>Slide Hammer</td>
</tr>
<tr>
<td>T1.4</td>
<td>1</td>
<td>AT16E010201</td>
<td>Disassembly tube 16E</td>
</tr>
<tr>
<td>T1.5</td>
<td>2</td>
<td>DIN6325-6M6X30</td>
<td>Parallel pin</td>
</tr>
<tr>
<td>T1.6</td>
<td>2</td>
<td>AT16E010202</td>
<td>Clamping jaws</td>
</tr>
<tr>
<td>T1.7</td>
<td>1</td>
<td>AT16E010203</td>
<td>Clamping ring</td>
</tr>
<tr>
<td>T1.8</td>
<td>2</td>
<td>DIN6325-6M6X20</td>
<td>Parallel pin</td>
</tr>
<tr>
<td>T1.9</td>
<td>2</td>
<td>DIN916-M4X6-45H</td>
<td>Set screw</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Pos.</th>
<th>Qty.</th>
<th>Part No.</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>T1.1</td>
<td>1</td>
<td>ATCYL0104</td>
<td>Stop bolt</td>
</tr>
<tr>
<td>T1.2</td>
<td>1</td>
<td>ATCYL0102</td>
<td>Guide</td>
</tr>
<tr>
<td>T1.3</td>
<td>1</td>
<td>ATCYL0101</td>
<td>Slide Hammer</td>
</tr>
<tr>
<td>T1.4</td>
<td>1</td>
<td>AT22E010201</td>
<td>Disassembly tube 16E</td>
</tr>
<tr>
<td>T1.5</td>
<td>2</td>
<td>DIN6325-6M6X30</td>
<td>Parallel pin</td>
</tr>
<tr>
<td>T1.6</td>
<td>2</td>
<td>AT22E010202</td>
<td>Clamping jaws</td>
</tr>
<tr>
<td>T1.7</td>
<td>1</td>
<td>AT22E010203</td>
<td>Clamping ring</td>
</tr>
<tr>
<td>T1.8</td>
<td>2</td>
<td>DIN6325-6M6X20</td>
<td>Parallel pin</td>
</tr>
<tr>
<td>T1.9</td>
<td>2</td>
<td>DIN916-M4X6-45H</td>
<td>Set screw</td>
</tr>
</tbody>
</table>
Nozzle Tip Assembly Tools

**Tip Assembly Tool for 16E-04 Nozzle Tips**
TTW, TTP, TFP
(T2) AT-16-040102  (T1) AT-16-040101
Also used for the assembly of seal caps.

**Tip Assembly Tool for 22E-04 Nozzle Tips**
TTW, TTP, TFP
(T2) AT-22-040102  (T1) AT-22-040101
Also used for the assembly of seal caps.

10.1.4.1 Nozzle Thermocouple Information

Heaters with J-type and K-type thermocouples are available.
The heater and the thermocouple are not separate heater an thermocouple have to be replaced together.

**Color Coding of Thermocouples**

**NOTICE**
Take notice of the production and color identification of thermocouple cables.
Synventive uses J and K type thermocouples. Their color coding is given in the following table.

<table>
<thead>
<tr>
<th>Type</th>
<th>International standard IEC 584-3</th>
<th>Coating</th>
<th>Litz wire “+”</th>
</tr>
</thead>
<tbody>
<tr>
<td>J</td>
<td>Black + Black</td>
<td>- White</td>
<td>Litz wire “-”</td>
</tr>
<tr>
<td>K</td>
<td>Green + Green</td>
<td>- White</td>
<td></td>
</tr>
</tbody>
</table>
10.1.4.2 Disassembly the Nozzle 16E-04 / 22E-04 Series

Disassembling the Nozzle Front Heater

1) Remove the retaining ring (8) from the nozzle tip (9).
2) Remove the component ring (7).

3) Unscrew and remove the socket set screws from the front heater (6).
4) Take the heater stripping tool (AT16E0102) and open the clamping jaws (T1.6).

5) Move the heater stripping tool (AT16E0102) over the front heater.

6) Close the clamping jaws (T1.6), by turning the clamping ring (T1.7).

**NOTICE**
The parallel pin (T1.8) has to be in the hole from the front heater (6).

7) To remove the nozzle front heater (6), slide the hammer (T1.3) against the stop bolt (T1.1) repeatedly until the nozzle heater is released.
Disassembling the Nozzle Rear Heater

**NOTICE**
Depending on the nozzle length is a rear heating element (3) used.

1) The nozzle front heater (6) must be dismounted from the nozzle body (1), as described in the above section.

2) Remove the cover tube (5).
3) Remove the retaining ring (4).

4) Pull the rear heating element (3) from the nozzle body (1).
5) Remove the head ring (2) from the nozzle body (1).
Disassembling the Nozzle and the Nozzle Tip

**WARNING**

**Hazard of Pressurized Air**

Pressurized air blow can result in hot plastic or foreign bodies entering the eyes, causing vision damage.

Following work must be carried out by qualified and experienced persons.

Use personal protective equipment: Face protection, hearing protection and gloves.

1) The nozzle has to be screwed into the manifold.

2) Remove the circlip (8) from the nozzle tip (9).

3) Remove the component ring (7).
**NOTICE**

To dismount the nozzle tip (7.1) from the nozzle, if there is plastic material in the nozzle, the tip (7.1) must be heated-up. Never use an acetylene or welding torch, as severe nozzle damage can occur from over-heating.

4) Heat the nozzle tip (7.1) using a heat gun to the maximum temperature of 200°C (392°F).

![Doc006856.png](Doc006856.png)

**WARNING**

**Hot Surfaces Hazard**

Contact between the skin and the hot nozzle could result in burns.

Following works must be carried out by qualified persons. Use personal protective equipment, such as gloves, apron, sleeves and face protection, to guard against burns.

5) Fix the nozzle body (1) with a wrench and loosen the nozzle tip (9) from the nozzle body (counter clockwise).

**WARNING**

**Hazard of Pressurized Air**

Pressurized air blow can result in hot plastic or foreign bodies entering the eyes, causing vision damage.

Use personal protective equipment: Face protection, hearing protection and gloves- PSA.

6) Clean the nozzle tip using pressurized air to remove as much residual plastic as possible.
Disassembling the Nozzle Body

**WARNING**

**Hazard of Pressurized Air**
Pressurized air blow can result in hot plastic or foreign bodies entering the eyes, causing vision damage.

Following work must be carried out by qualified and experienced persons. Use personal protective equipment: Face protection, hearing protection and gloves.

**Hot Surfaces Hazard**
Contact between the skin and the hot nozzle could result in burns.
Use personal protective equipment: Face protection, hearing protection and gloves.

1) Cool the nozzle body (1) to approximately 25 °C (77 °F)
2) Dismount the nozzle front heater (6) and rear heater (3), as described on page 308 and on page 310.
3) Dismount the nozzle tip (9) from the nozzle body (1), as described on page 313.

4) Use a wrench to loosen the nozzle body (1) from the manifold by rotation (counter clockwise).
10.1.4.3 Assembling the Nozzles 16E-04 / 22E-04 Series

In this section the nozzle parts are identified with the numbers indicated in the following figure.

**NOTICE**

Always tighten the screws to the torque specified in the respective table in section 13.

<table>
<thead>
<tr>
<th>Pos.</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Nozzle body</td>
</tr>
<tr>
<td>2</td>
<td>Head ring</td>
</tr>
<tr>
<td>3</td>
<td>Rear heating element (optional)</td>
</tr>
<tr>
<td>4</td>
<td>Retaining ring</td>
</tr>
<tr>
<td>5</td>
<td>Cover tube</td>
</tr>
<tr>
<td>6</td>
<td>Front heater</td>
</tr>
<tr>
<td>7</td>
<td>Component ring</td>
</tr>
<tr>
<td>8</td>
<td>Retaining ring</td>
</tr>
<tr>
<td>9</td>
<td>Nozzle tip</td>
</tr>
<tr>
<td>10</td>
<td>Wear insert (optional)</td>
</tr>
<tr>
<td>11</td>
<td>Cooling bushing (optional)</td>
</tr>
</tbody>
</table>
Assembling the Nozzle Body

1) Apply spotting ink on the nozzle body (1) bottom surface (SF1).

2) Screw in the nozzle body (1) hand-tight into the manifold thread until seated.
3) Unscrew the nozzle body (1) from the manifold.

4) Check the matching between the manifold bottom surfaces (SF2) and the nozzle body surface (SF1).

**NOTICE**

The surfaces must bear on all surfaces uniformly and flatly, in particular on the manifold contact face.

In case of any uncertainty, clean the surfaces with a cleaning cloth. If the next ink test is still unsatisfactory, please - contact Synventive Customer Service or Technical Support.

With a positive ink test, clean the surfaces and proceed to the next step.
5) Lubricate the thread (not the face) of the nozzle body with high-temperature assembly paste (antiseize compound).

**NOTICE**
This is an important measure to prevent thread corrosion due to aggressive gases, which could be released during plastics processing.

6) Tighten the nozzle body (1) to the manifold.

**NOTICE**
Use torque wrench with wrench insert and the torque specified in the torque table in section 13.

---

**Mounting the Nozzle Rear Heater**

1) Slide the head ring (2), onto the nozzle body (1) up to the surface of the hexagon.

**NOTICE**
The opening of the head ring (2) has to match with the cable connections (see customer drawing).
2) Bend the cable at the rear heater (3) corresponding to the opening at the head ring (2).

3) Slide the rear heating element (3), onto the nozzle body (1) up to the surface of the hexagon.
4) Fit the retaining ring (4) into the groove at the nozzle body (1).

**NOTICE**

The opening from the retaining ring (4) has to match with the opening from rear heating element (3).

### Mounting the Nozzle Front Heater

1) Assemble the nozzle body (1) on the manifold, as described on page 315.
2) Assemble the rear heater (3) on the nozzle body (1), as described on page 316.
3) Lead the cable of the front heater (6) through the cover tube (5).
4) Hold the cover tube (5) to the front heater (6).
5) Bend the cable at the front heater (6) corresponding to the opening at the head ring (2), about 90 degrees.
6) Slide the cover tube (5) together with the front heater (6) over the nozzle body (1).

**NOTICE**
The wire from the front heater (6) has to be at the opening from the rear heater (3).

7) Push the front heater (6) onto the nozzle body (1).
8) Fix the front heater (6) with two set screws at the nozzle body (1).
Assembling the Nozzle Tips TTW, TTP, TFP

TTW Nozzle Tip Assembly

1) Place the tip nut (a) into the tool (T2).
2) Using the tool (T1) to push the tip insert (b) into the tip nut (a).
3) Place the torpedo (c) on the tip insert (b).
4) Using the tool (T1) to push the torpedo (c) and the tip insert (b) into the tip nut (a).

TTP Nozzle Tip Assembly

1) Place the tip nut (a) on the tool (T2).
2) Using the tool (T1) to push the tip insert (b) into the tip nut (a).
3) Place the torpedo (c) on the tip insert (b).
4) Using the tool (T1) to push the torpedo (c) and the tip insert (b) into the tip nut (a).

TFP Nozzle Tip Assembly

1) Place the tip nut on the tool (T2).
2) Using the tool (T1) to push the tip insert (b) into the tip nut (a).
Shown are the tip nuts, for checking the correct seating of the tip inserts

**NOTICE**

See examples of good and incorrect insert installations.
Make sure the insert must not exceed the height of the nozzle tip head.
Incorrect items should not be further processed.

Assemble the Seal Cap on VSW, VTW, TTW Nozzle Tips

1) Place the tip nut (a) on the tool (T2).
2) Place the seal cap (b) on the tip nut (a).
3) Using the tool (T1) to push the seal cap (b) on the tip nut (a).

Mounting the Nozzle Tip on the Nozzle Body

1) Assemble the nozzle body (1) on the manifold (12), as described on page 315.
2) Assemble the rear heater (3) on the nozzle body (1), as described on page 316.
3) Assemble the front heater (6) on the nozzle body (1), as described on page 317.
4) Apply spotting ink on the nozzle tip (9) bottom surface (SF1).
5) Screw in the nozzle tip (9) hand-tight into the nozzle body (1) until seated.
6) Unscrew the nozzle tip (9) from the nozzle body (1).
7) Check the matching between the nozzle body (1) surface (SF2) and the nozzle tip (9) surface (SF1).

**NOTICE**

The nozzle must bear uniformly on the outer surfaces (SF2) (SF1) uniformly and flatly, in particular on the nozzle body contact face (SF1).

**NOTICE**

In case of any uncertainty, clean the surfaces with a cleaning cloth. If the next ink test is still unsatisfactory - please contact Synventive Customer Service or Technical Support.

8) With a positive ink test clean the surfaces and proceed to the next step.

9) Lubricate the thread (not the face) of the nozzle tip (9) body with high-temperature assembly paste (antiseize compound).

**NOTICE**

This is an important measure to prevent thread corrosion due to aggressive gases, which could be released during plastics processing.

10) Screw in the nozzle tip (9) into the nozzle body hand-tight.
11) Tighten the nozzle tip (9) into the nozzle.

**NOTICE**

Use torque wrench with wrench insert and the torque specified in the respective table in section 13.
12) Place the component ring (7) on the nozzle body (1).

⚠️ WARNING
Contact between the skin and the hot nozzle could result in burns.
Cool the nozzle to approximately 25 °C (77 °F).

13) Mount the retaining ring (8) on nozzle tip (9).
10.1.5 Nozzle 12EX16 / 16EX22 Series

**NOTICE**

Always tighten the screws to the torque specified in the respective table in section 13.

---

**WARNING**

**Hot Surfaces Hazard**

Contact between the skin and hot surfaces could result in burns.

- Use personal protective equipment, such as gloves, apron, sleeves and face protection, to guard against burns.
- When servicing or handling the hot runner system outside the manifold plates or the injection molding machine, care must be taken to heed the hot surface exposure warnings.
- For first aid contact your medical / safety representing.

---

**Hazard of Pressurized Air**

Pressurized air blow can result in hot plastic or foreign bodies entering the eyes, causing vision damage.

- Following work must be carried out by qualified and experienced persons.
- Use personal protective equipment: Face protection, hearing protection and gloves.

---

**NOTICE**

**Hazard of Material Damage**

Without consulting Synventive it is not permitted to do modifications to the hot runner system e.g. geometrical changes to the nozzle tip, except the part shape adjustment in the area of material allowance.
### Technical Data - Threaded Nozzle 12EX16 / 16EX22 Series

#### Threaded Nozzle 12EX16

<table>
<thead>
<tr>
<th>Specification</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Flow bore (J)</td>
<td>Ø 16 mm (Ø 18 mm)</td>
</tr>
<tr>
<td>Nozzle length, flexible (L)</td>
<td>200 – 650 mm</td>
</tr>
<tr>
<td>Nozzle cutout (D)</td>
<td>Ø35 / Ø 50 mm (Ln &lt;400 mm)</td>
</tr>
<tr>
<td></td>
<td>Ø35 / Ø 50 / Ø 60 mm (Ln ≥400 mm)</td>
</tr>
<tr>
<td></td>
<td>Ø35 / Ø 50 / Ø 60 mm / Ø 80 (Ln ≥650 mm)</td>
</tr>
<tr>
<td>Thermocouple</td>
<td>Type J, Type K</td>
</tr>
<tr>
<td>Nozzle tips</td>
<td>VSP, VTP, VSW, VTW, TFP, TTP, TTW</td>
</tr>
</tbody>
</table>

#### Threaded Nozzle 16EX22

<table>
<thead>
<tr>
<th>Specification</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Flow bore (J)</td>
<td>Ø 22 mm (Ø 20 mm / Ø 24 mm)</td>
</tr>
<tr>
<td>Nozzle length (L)</td>
<td>200 – 650 mm</td>
</tr>
<tr>
<td>Nozzle cutout (D)</td>
<td>Ø43 / Ø 60 mm (Ln &lt;450 mm)</td>
</tr>
<tr>
<td></td>
<td>Ø43 / Ø 60 / Ø 70 mm (Ln ≥450 mm)</td>
</tr>
<tr>
<td></td>
<td>Ø43 / Ø 60 / Ø 70 mm / Ø 95 (Ln ≥650 mm)</td>
</tr>
<tr>
<td>Thermocouple</td>
<td>Type J, Type K</td>
</tr>
<tr>
<td>Nozzle tips</td>
<td>VSP, VTP, VSW, VTW, TFP, TTP, TTW</td>
</tr>
</tbody>
</table>
Parts of the Nozzles 12EX16 / 16EX22

In this section the nozzle parts are identified with the numbers indicated in the following figure.

**NOTICE**
Always tighten the screws to the torque specified in the respective table in section 13.

<table>
<thead>
<tr>
<th>Pos.</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Nozzle body</td>
</tr>
<tr>
<td>2</td>
<td>Head ring</td>
</tr>
<tr>
<td>3</td>
<td>Cover tube</td>
</tr>
<tr>
<td>4</td>
<td>Rear heating element</td>
</tr>
<tr>
<td>5</td>
<td>Retaining ring</td>
</tr>
<tr>
<td>6</td>
<td>Front ring</td>
</tr>
<tr>
<td>7</td>
<td>Component ring version=2</td>
</tr>
<tr>
<td>8</td>
<td>Front heater</td>
</tr>
<tr>
<td>9</td>
<td>Nozzle tip</td>
</tr>
<tr>
<td>10</td>
<td>Component ring version=1</td>
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<tr>
<td>11</td>
<td>Circlip</td>
</tr>
<tr>
<td>12</td>
<td>Wear insert (optional)</td>
</tr>
<tr>
<td>13</td>
<td>Cooling bushing (optional)</td>
</tr>
</tbody>
</table>
Disassembly- Assembly Tools 12EX16 / 16EX22

In this section the Stripping and Mounting Tool parts are identified with the numbers indicated in the following figure.

### Disassembly- Assembly Tools 12EX16

<table>
<thead>
<tr>
<th>Part No.</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>AT12E-010101</td>
<td>Heater Disassembly Tool Type 01 for Nozzle 12EX16</td>
</tr>
<tr>
<td>AT12E-010102</td>
<td>Heater Disassembly Tool Type 02 for Nozzle 12EX16</td>
</tr>
<tr>
<td>AT12E-010103</td>
<td>Heater Disassembly Tool Type 03 for Nozzle 12EX16</td>
</tr>
</tbody>
</table>

**Front Heater Disassembly Tool Complete AT12E-0101**

- **T1.1** AT12E-010101 Heater Disassembly Tool Type 01 for Nozzle 12EX16
- **T1.2** AT12E-010102 Heater Disassembly Tool Type 02 for Nozzle 12EX16
- **T1.3** AT12E-010103 Heater Disassembly Tool Type 03 for Nozzle 12EX16

**T1) Front Heater Assembly Tool AT12E-0102**

**T2) Nozzle Tip Assembly tool AT12E-0103**

**T1) Nozzle Tip Assembly tool AT12E-0104**

**T3) Seal Cap Assembly tool AT12E-0105**

**T2** AT12E-0103 Nozzle Tip Assembly tool

**T3** AT12E-0105 Seal Cap Assembly tool
Disassembly - Assembly Tools 16EX22

Front Heater Disassembly Tool Complete
AT-HT-032-0101

<table>
<thead>
<tr>
<th>Pos.</th>
<th>Part No.</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>T1.1</td>
<td>AT-HT-032-010101</td>
<td>Heater Disassembly Tool Type 01 for Nozzle 16EX22</td>
</tr>
<tr>
<td>T1.2</td>
<td>AT-HT-032-010102</td>
<td>Heater Disassembly Tool Type 02 for Nozzle 16EX22</td>
</tr>
<tr>
<td>T1.3</td>
<td>AT-HT-032-010103</td>
<td>Heater Disassembly Tool Type 03 for Nozzle 16EX22</td>
</tr>
</tbody>
</table>

T1) Front Heater Assembly Tool
AT-HT-032-0102

Also used for the assembly of seal caps.

T2) Nozzle Tip - Assembly Tool
AT-16-040102
Also used for the assembly of seal caps.
10.1.5.1 Nozzle Thermocouple 12EX16 / 16EX22

Heaters with J-type and K-type thermocouples are available.

- The heating and the thermocouple of the front heating (8) are independent heating elements and can be replaced individually.
- The heating and the thermocouple of the rear heating element (4) are not separate, which means that the thermocouple must be replaced together with the rear heating element.

Dismounting Thermocouple of the Front Heating

**NOTICE**

For dismounting of the thermocouple from nozzle heater, the nozzle heater must be dismantled from the nozzle.

1) Lever the clamp (b) of the heating element with a screwdriver and pull the thermocouple (a) from its seat.
2) Pull the top of the thermocouple (a) from the bracket of the nozzle heater (b).

**NOTICE**

The thermocouple is pressed in.

Mounting Nozzle the Thermocouple of the Front Heating

**NOTICE**

Color Coding of Thermocouples

Take notice of the production and color identification of thermocouple cables. Synventive uses J and K type thermocouples. Their color coding is given in the following table.

<table>
<thead>
<tr>
<th>Type</th>
<th>International standard IEC 584-3</th>
</tr>
</thead>
<tbody>
<tr>
<td>J</td>
<td>Black</td>
</tr>
<tr>
<td>K</td>
<td>Green</td>
</tr>
</tbody>
</table>

1) Push the thermocouple (a) under the bracket on the nozzle heater (b).

**NOTICE**

The fixing is needed to secure the position. A thermocouple (a) well-fixed in the holder (b) causes correct measured values.

2) Lever the clamp of the heating element with a screwdriver and fix the thermocouple (a) below the clamp (b) at the nozzle heater.
10.1.5.2 Disassembly the Nozzle 12EX16 / 16EX22 Series

Disassembling the Nozzle Front Heater

1) Remove the circlip (11) from the nozzle tip (9).
2) Remove the component ring (10).

3) Unscrew and remove the socket set screws from the front ring (6).
4) Remove the front ring (6).

5) Mount the heater disassembly tool Type 01 (T1.1) on the front heater.

**NOTICE**
The lower edge of the heater removal tool type 01 (T1.1) must be set below the nozzle front heater (8).
6) Slide disassembly tool Type 02 (T1.2) along the disassembly tool Type 03 (T1.3).

7) Screw disassembly tool Type 03 (T1.3) onto disassembly tool Type 01 (T1.1).

8) To remove the nozzle front heater (8), slide the disassembly tool Type 02 (T1.2) against the disassembly tool Type 03 (T1.3) repeatedly until the nozzle front heater (8) is released.
Disassembling the Nozzle Rear Heater

**NOTICE**

Depending on the nozzle length is a rear heating element (3) used.

1) The nozzle front heater (8) must be dismounted from the nozzle body (1), as described in the above section.

2) Remove the cover tube (3).
3) Remove the retaining ring (5).
4) Pull the rear heating element (4) from the nozzle body (1).
5) Remove the head ring (2) from the nozzle body (1).
Disassembling the Nozzle and the Nozzle Tip

**WARNING**

**Hazard of Pressurized Air**
Pressurized air blow can result in hot plastic or foreign bodies entering the eyes, causing vision damage.
Following work must be carried out by qualified and experienced persons.
Use personal protective equipment: Face protection, hearing protection and gloves.

**Hot Surfaces Hazard**
Contact between the skin and the hot nozzle could result in burns.
Use personal protective equipment: Face protection, hearing protection and gloves.

1) The nozzle has to be screwed into the manifold.

1) Remove the circlip (11) from the nozzle tip (9).
2) Remove the component ring (10).
**WARNING**

Hot Surfaces Hazard

Contact between the skin and the hot nozzle could result in burns.

Following works must be carried out by qualified persons.

Use personal protective equipment, such as gloves, apron, sleeves and face protection, to guard against burns.

---

**NOTICE**

To dismount the nozzle tip (9) from the nozzle, if there is plastic material in the nozzle, the tip (9) must be heated-up.

Never use an acetylene or welding torch, as severe nozzle damage can occur from over-heating.

1) Heat the nozzle tip (9) using a heat gun to the maximum temperature of 200 °C (392 °F).

2) Fix the nozzle body (1) with a wrench and loosen the nozzle tip (9) from the nozzle body (counter clockwise).

---

**WARNING**

Hazard of Pressurized Air

Pressurized air blow can result in hot plastic parts or foreign bodies entering the eyes, causing vision damage.

3) Clean the nozzle tip using pressurized air to remove as much residual plastic as possible.
Disassembling the Nozzle Body

### WARNING

<table>
<thead>
<tr>
<th>Hazard of Pressurized Air</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pressurized air blow can result in hot plastic or foreign bodies entering the eyes, causing vision damage.</td>
</tr>
<tr>
<td>Following work must be carried out by qualified and experienced persons.</td>
</tr>
<tr>
<td>Use personal protective equipment: Face protection, hearing protection and gloves.</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Hot Surfaces Hazard</th>
</tr>
</thead>
<tbody>
<tr>
<td>Contact between the skin and the hot nozzle could result in burns.</td>
</tr>
<tr>
<td>Use personal protective equipment: Face protection, hearing protection and gloves.</td>
</tr>
</tbody>
</table>

1) Cool the nozzle body (1) to approximately 25 °C (77 °F).
2) Dismount the nozzle front heater (8) and rear heater (4), as described in the above page 329.
3) Dismount the nozzle tip (9) from the nozzle body (1), as described in the above page 332.

4) Use a wrench to loosen the nozzle body (1) from the manifold by rotation (counter clockwise).
10.1.5.3 Assembling the Nozzles 12EX16 / 16EX22 Series

In this section the nozzle parts are identified with the numbers indicated in the following figure.

**NOTICE**

Always tighten the screws to the torque specified in the respective table in section 13.

<table>
<thead>
<tr>
<th>Pos.</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Nozzle body</td>
</tr>
<tr>
<td>2</td>
<td>Head ring</td>
</tr>
<tr>
<td>3</td>
<td>Cover tube</td>
</tr>
<tr>
<td>4</td>
<td>Rear heating element</td>
</tr>
<tr>
<td>5</td>
<td>Retaining ring</td>
</tr>
<tr>
<td>6</td>
<td>Front ring</td>
</tr>
<tr>
<td>7</td>
<td>Component ring version=2</td>
</tr>
<tr>
<td>8</td>
<td>Front heater</td>
</tr>
<tr>
<td>9</td>
<td>Nozzle tip</td>
</tr>
<tr>
<td>10</td>
<td>Component ring version=1</td>
</tr>
<tr>
<td>11</td>
<td>Circlip</td>
</tr>
<tr>
<td>12</td>
<td>Wear insert (optional)</td>
</tr>
<tr>
<td>13</td>
<td>Cooling bushing (optional)</td>
</tr>
</tbody>
</table>
Assembling the Nozzle Body

1) Apply spotting ink on the nozzle body (1) bottom surface (SF1).

2) Screw in the nozzle body (1) hand-tight into the manifold thread until seated.

3) Unscrew the nozzle body (1) from the manifold.

4) Check the matching between the manifold bottom surfaces (SF2) and the nozzle body surface (SF1).

   **NOTICE**
   
   The surfaces must bear on all surfaces uniformly and flatly, in particular on the manifold contact face.
   
   In case of any uncertainty, clean the surfaces with a cleaning cloth. If the next ink test is still unsatisfactory, please - contact Synventive Customer Service or Technical Support.

5) With a positive ink test, clean the surfaces and proceed to the next step.
6) Lubricate the thread (not the face) of the nozzle body with high-temperature assembly paste (antiseize compound).

**NOTICE**

This is an important measure to prevent thread corrosion due to aggressive gases, which could be released during plastics processing.

7) Tighten the nozzle body (1) to the manifold.

**NOTICE**

Use torque wrench with wrench insert and the torque specified in the torque table in section 13.
Mounting the Nozzle Rear Heater and Front Heater

1) Slide the head ring (2), onto the nozzle body (1) up to the surface of the hexagon of the head ring (2).

**NOTICE**

The opening of the head ring (2) has to match with the cable connections (see customer drawing).

2) Bend the cable at the rear heater (3) corresponding to the opening at the head ring (2).

3) Slide the rear heating element (4), onto the nozzle body (1) up to the surface of the hexagon.

4) Fit the retaining ring (5) into the groove at the nozzle body (1).

**NOTICE**

The opening from the retaining ring (5) has to match with the opening from rear heating element (4).

Depending at the length of the nozzle, perform step 2-4 more times.
5) Slide component ring version=2 (7) (heater locating ring), onto the nozzle body (1).

**NOTICE**
Check the correct position and fixation of the thermocouple (TC).

6) Bend the heater and thermocouple (ex) leads.

**NOTICE**
Use round-nosed pliers only.

7) Push the front heater (8) onto the nozzle (1). Use a soft faced hammer to drive the nozzle heater (8), with the assembly tool (AT) into the right position.

**NOTICE**
To avoid damage to the heater use the hammer softly, the part number of assembly tool (AT) is AT12E-0102 (12EX16-00) AT-HT-032-0102 (16EX22-00).
Check the correct position and fixation of the thermocouple (TC).
The wire from the front heater (8) has to be at the opening from the rear heater (4).

8) Fix the front heater with the component ring and socket screw DIN914-M3x3.

**NOTICE**
The opening of the component ring (heater locating), must be line up with the opening from the rear heater.

9) Slide the cover tube (3) over the nozzle up to the stop at the head ring (2).

10) Slide the front ring at the pre nozzle with position on the cover tube (3) and fix it with socket set screw Din914-M3x3.

**NOTICE**
Please note the position at the wire from the heaters.
Assemble the Nozzle Tips TTW, TTP, TFP for 12EX16 Nozzle Series

**TTW Nozzle Tip Assembly**

1) Place the tip nut (a) into the tool (T2).
2) Using the tool (T1) to push the tip insert (b) into the tip nut (a).
3) Place the torpedo (c) on the tip insert (b).
4) Using the tool (T1) to push the torpedo (c) and the tip insert (b) into the tip nut (a).

**TTP Nozzle Tip Assembly**

1) Place the tip nut (a) on the tool (T2).
2) Using the tool (T1) to push the tip insert (b) into the tip nut (a).
3) Place the torpedo (c) on the tip insert (b).
4) Using the tool (T1) to push the torpedo (c) and the tip insert (b) into the tip nut (a).

**TFP Nozzle Tip Assembly**

1) Place the tip nut (a) on the tool (T2).
2) Using the tool (T1) to push the tip insert (b) into the tip nut (a).
Assemble the Seal Cap on VSW, VTW, TTW Nozzle Tips for 12EX16 Nozzle Series

VSW, VTW

1) Place the tip nut (a) on the tool (T1).
2) Place the seal cap (b) on the tip nut (a).
3) Using the tool (T3) to push the seal cap (b) on the tip nut (a).

TTW

NOTICE
The assembly tool (T3) has an engraved note on both sides, on the front side, for use with VSW, VTW bzw. TTW tip nut (sign on assembly tool T3 is VW or TW).

Assemble the Nozzle Tips TTW, TTP, TFP for 16EX22 Nozzle Series

1) 2) 3) 4) TTW Nozzle Tip Assembly

1) Place the tip nut (a) into the tool (T2).
2) Using the tool (T1) to push the tip insert (b) into the tip nut (a).
3) Place the torpedo (c) on the tip insert (b).
4) Using the tool (T1) to push the torpedo (c) and the tip insert (b) into the tip nut (a).

1) 2) 3) 4) TTP Nozzle Tip Assembly

1) Place the tip nut (a) on the tool (T2).
2) Using the tool (T1) to push the tip insert (b) into the tip nut (a).
3) Place the torpedo (c) on the tip insert (b).
4) Using the tool (T1) to push the torpedo (c) and the tip insert (b) into the tip nut (a).
Service and Maintenance / Nozzle 12EX16 / 16EX22 Series

TFP Nozzle Tip Assembly

1) Place the tip nut on the tool (T2).
2) Using the tool (T1) to push the tip insert (b) into the tip nut (a).

Shown are the tip nuts, for checking the correct seating of the tip inserts

| good      | good      | good      | incorrect |

NOTICE
See examples of good and incorrect insert installations.
Make sure the insert must not exceed the height of the nozzle tip head.
Incorrect items should not be further processed.

Assemble the Seal Cap on VSW, VTW, TTW Nozzle Tips for 12EX16 Nozzle Series

1) Place the tip nut (a) on the tool (T2).
2) Place the seal cap (b) on the tip nut (a).
3) Using the tool (T1) to push the seal cap (b) on the tip nut (a).
Assembling the Nozzle Tip on the Nozzle

1) Apply spotting ink on the nozzle tip (9) bottom surface (SF1).
2) Screw in the nozzle tip (9) hand-tight into the nozzle body (1) until seated.
3) Unscrew the nozzle tip (9) from the nozzle body (1).
4) Check the matching between the nozzle body surface (SF2) and the nozzle tip surface (SF1).

**NOTICE**
The nozzle must bear uniformly on the outer surfaces uniformly and flatly, in particular on the nozzle tip contact face.

**NOTICE**
In case of any uncertainty, clean the surfaces with a cleaning cloth. If the next ink test is still unsatisfactory - please contact Synventive Customer Service or Technical Support.

5) With a positive ink test, clean the surfaces and proceed to the next step.

6) Lubricate the thread (not the face) of the nozzle tip body with high-temperature assembly paste (antiseize compound).

**NOTICE**
This is an important measure to prevent thread corrosion due to aggressive gases, which could be released during plastics processing.
7) Screw in the nozzle tip (9) into the nozzle body hand-tight.
8) Tighten the nozzle tip (9) at the nozzle by room temperature.

**NOTICE**
Use torque wrench with wrench insert (HEX21) and a torque of 100 Nm.

9) Place the component ring version 01 (10) on the nozzle body (1).

**WARNING**
Contact between the skin and the hot nozzle could result in burns.
Cool the nozzle to approximately 25°C (77°F).
10) Mount the retaining ring (11) on nozzle tip (9).
10.2 Nozzles (APT)

**NOTICE**

Always tighten the screws to the torque specified in the respective table in section 13.

<table>
<thead>
<tr>
<th><strong>WARNING</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Hot Surfaces Hazard</strong></td>
</tr>
<tr>
<td>Contact between the skin and hot surfaces could result in burns.</td>
</tr>
<tr>
<td>Use personal protective equipment, such as gloves, apron, sleeves and face protection, to guard against burns.</td>
</tr>
<tr>
<td>When servicing or handling the hot runner system outside the manifold plates or the injection molding machine, care must be taken to heed the hot surface exposure warnings.</td>
</tr>
<tr>
<td>For first aid contact your medical / safety representing.</td>
</tr>
</tbody>
</table>

| **Hazard of Pressurized Air** |
| Pressurized air blow can result in hot plastic or foreign bodies entering the eyes, causing vision damage. |
| Following work must be carried out by qualified and experienced persons. |
| Use personal protective equipment: Face protection, hearing protection and gloves. |

**NOTICE**

| **Hazard of Material Damage** |
| Without consulting Synventive it is not permitted to do modifications to the hot runner system e.g. geometrical changes to the nozzle tip, except the part shape adjustment in the area of material allowance. |
10.2.1 Replacing Nozzle Tips, Inserts and Nozzle Tip Seals (APT)

10.2.1.1 Dismounting of the Nozzle parts

Removing the Nozzle Tip

**NOTICE**
The Removal of the nozzle tip should be done at room temperature 20 °C (68 °F).

1) Unscrew the nozzle tip with a six point deep socket wrench and the split wrench if applicable.

**WARNING**
Hot Surfaces Hazard
Contact between the skin and the hot nozzle could result in burns.

2) If the nozzle tip is frozen, heat the Hot Runner System up to operating temperature and unscrew the nozzle tip.

3) Remove the plastic from the seal and from the inside sealing diameter on the nozzle tip.

**NOTICE**
Do not damage the seal.
Removing the Nozzle Tip Seal

1) The nozzle tip has to be removed before removal of the seal.  

2) Ensure no plastic has leaked past the seal.
3) Ensure no scratches or dents on the outside diameter of the insert.

**NOTICE**

Thermal operation of the gate may be adversely affected by any damage or plastic leakage.

4) Gently remove the damaged seal by lifting it out using pliers.

**NOTICE**

To avoid scratching the insert with pliers, only contact the seal not the insert.

5) If the insert is damaged, ascertain the cause and resolve it.

**NOTICE**

If this is not possible please contact our Synventive Customer Service or Technical Support.
Removing the Tip Insert

The BeCu (Beryllium Copper) insert should only be removed if it is going to be replaced by a new one.

NOTICE

Hazard of Material Damage

After renewed installation of an insert the optimum heat transfer can not be.

After disassembly of an insert do not install it a second time.

Do not drill deeper as described in the table below (thread depth) otherwise the nozzle can get damaged.

1) Counterbore the insert with a drill for depth of 10 mm and tap a thread into it. Determine the drill size from the table below. 

Abb. 7

2) After the insert is tapped, thread in a rod.
3) Place the insert removal tool over the rod.

NOTICE

The rod has to be so long that it dominates the insert removal tool.

Abb. 8

4) Place the insert removal tool over the rod.
5) Using a nut, screw the nut against the removal tool to pull out the insert.

Abb. 9
10.2.1.2 Installing Nozzle Tips, Inserts and Nozzle Tip Seals (APT)

Installing the Tip Insert

1) Clean all plastic from the insert counter bore and from the insert press diameter.

2) Measure the insert counter bore diameter and the insert press diameter. 

3) The diameter of the insert must be minimum 0.013 mm (0.0005") – 0.030 mm (0.0012") bigger than the diameter of the insert counter bore.

   NOTICE

   This is necessary to ensure proper heat transfer to the insert.

4) The insert must be pressed so that the insert shoulder is flush with the nozzle tip seat +/- 0.005 mm (+/- 0.0002").

   NOTICE

   This is achieved by using the insert installation tool with a small arbor press.
Installing the Nozzle Tip Seal

**NOTICE**
The seal has to be installed into the nozzle tip before the nozzle tip gets installed into the nozzle.

1) Make sure the area where the seal seats are smooth and free of plastic.  
   *Abb. 13*

2) Inspect the seal when replacing the nozzle tip.
   **NOTICE**
   No plastic should have leaked past the seal, and there should be no scratches or dents on the outside diameter of the insert. Thermal operation of the gate may be adversely affected by any damage or plastic leakage.  
   *Abb. 14*

3) Use a special installation tool to install the new seal.
   **NOTICE**
   This tool is available when a new seal is factory installed or when ordering a complete new insert.  
   *Abb. 15*

4) You must first place the new seal over the installation tool so the groove on the seal fits over the ribbing on the tool.  
   *Abb. 16*

5) Set the bushing vertically in a light arbor press and slide down to seat the seal on the insert shoulder.  
6) Remove the tool and verify seal is seated properly.
Installing the Nozzle Tip

**NOTICE**

**Hazard of Material Damage**

While spotting ink the nozzle tip the seal has not yet to be installed into the nozzle tip also do not use high-temperature assembly paste.

The seal and the high-temperature assembly paste have to be applied after the spotting ink of the nozzle tip.

**Before Installing the nozzle tip ensure the seal is installed into the nozzle tip.**

1) Using spotting paste, check if the nozzle tip properly bears on the insert press diameter.

**NOTICE**

Proceed as described in 3) and 4).

Note the nozzle tip seal has not yet to been installed into the nozzle tip.

Do not use high-temperature assembly paste.

2) Install the seal (see “Installing the Nozzle Tip Seal”).

3) Screw the nozzle tip into the nozzle as follows.

**NOTICE**

Use high-temperature assembly paste for the thread.

This is an important measure to prevent thread corrosion due to aggressive gases, which could be released during plastics processing.
4) Screw the nozzle tip into the nozzle with a six point deep socket wrench and the split wrench.

NOTICE

Use torque wrench with wrench insert and the torque specified in the respective table in section 13.

10.2.1.3 Nozzle Tip Insert Removal (SR16)

Example of SR16 nozzle tip insert removal.

NOTICE

The conductive BeCu insert should only be removed if it is to be replaced by a new insert. Reinstallation of the same insert may affect the heat transfer from the steel body to the BeCu insert.

1) Using an Ø 8.9 mm drill, machine into the center of the insert for a depth of 15 mm.
2) Add a thread into the borehole, using a M10 tap.
3) After the insert is tapped, thread in an M10 rod (a).
4) Place the insert removal tool over the M10 rod.

Insert removal tool - Doc003272
5) Using a M10 nut (b), thread the nut against the removal tool to pull out the insert.

**NOTICE**

Hazard of Material Damage

Do not exceed thread depth of nozzle tip insert or damage to the nozzle will occur.

Table 8: Thread depth

<table>
<thead>
<tr>
<th>Nozzle Style</th>
<th>Recommended drill diameter</th>
<th>Depth</th>
<th>Tap</th>
</tr>
</thead>
<tbody>
<tr>
<td>SR-16</td>
<td>8.9 mm (0.35&quot;)</td>
<td>15 mm (0.59&quot;)</td>
<td>M10</td>
</tr>
<tr>
<td>SR-20</td>
<td>8.9 mm (0.35&quot;)</td>
<td>15 mm (0.59&quot;)</td>
<td>M10</td>
</tr>
<tr>
<td>SR-24</td>
<td>11.1 mm (0.44&quot;)</td>
<td>15 mm (0.59&quot;)</td>
<td>M12</td>
</tr>
</tbody>
</table>

**Thread depth for D-2 Inserts**

<table>
<thead>
<tr>
<th>Nozzle Style</th>
<th>Recommended drill diameter</th>
<th>Depth</th>
<th>Tap</th>
</tr>
</thead>
<tbody>
<tr>
<td>SR-16</td>
<td>8.9 mm (0.35&quot;)</td>
<td>15 mm (0.59&quot;)</td>
<td>M10</td>
</tr>
<tr>
<td>SR-20</td>
<td>10.2 mm (0.4&quot;)</td>
<td>20 mm (0.79&quot;)</td>
<td>M12 x 1.75</td>
</tr>
<tr>
<td>SR-24</td>
<td>14 mm (0.55&quot;)</td>
<td>20 mm (0.79&quot;)</td>
<td>M16 x 2</td>
</tr>
</tbody>
</table>
10.3 Single Axis Valve Gate Nozzles

10.3.1 Single Axis Valve Gate Nozzle 12SVH

**Technical Data**

<table>
<thead>
<tr>
<th>Valve pin operation</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Operation medium</td>
<td>hydraulic</td>
</tr>
<tr>
<td>Pressure range</td>
<td>40 - 60 bar (580 - 870 psi)</td>
</tr>
<tr>
<td>Flowrate</td>
<td>2.5 l/min</td>
</tr>
<tr>
<td>Reaction time</td>
<td>~0.5 s</td>
</tr>
<tr>
<td>Valve pin stroke</td>
<td>13 mm</td>
</tr>
<tr>
<td>Adjustment</td>
<td>± 1 mm Via adjustment threads from outside.</td>
</tr>
<tr>
<td>Closing force</td>
<td>3770 N / 40 bar (580 psi)</td>
</tr>
<tr>
<td>Opening force</td>
<td>2825 N / 40 bar (580 psi)</td>
</tr>
<tr>
<td>Connection</td>
<td>M12x1.5 (8-L)</td>
</tr>
</tbody>
</table>

**Valve pin**

<table>
<thead>
<tr>
<th>Valve pin diameter</th>
<th>Ø 6 mm</th>
</tr>
</thead>
<tbody>
<tr>
<td>Attachment</td>
<td>Quick coupling, anti-rotation</td>
</tr>
</tbody>
</table>

**Heating Power**

The numbering of the heating zones starts at the nozzle tip and ends at the nozzle head.

<table>
<thead>
<tr>
<th>Zone 1</th>
<th>300 - 417 Watt</th>
</tr>
</thead>
<tbody>
<tr>
<td>(From a nozzle length of 50 mm)</td>
<td></td>
</tr>
<tr>
<td>Zone 2</td>
<td>530 - 770 Watt</td>
</tr>
<tr>
<td>(From a nozzle length of &gt;215 mm)</td>
<td></td>
</tr>
<tr>
<td>Head</td>
<td>630 plus 650 Watt</td>
</tr>
</tbody>
</table>

**NOTICE**

To ensure long life and continued flawless operation of the actuator, we recommend using a service medium that complies with the requirements of classification 21/18/13 pursuant to ISO 4406.
Technical Data / Exploded View - Cooling Unit CU12SVH01

**NOTICE**

If the mold temperature is 80 °C (176 °F) or more, the Cooling Unit CU12SVH01 is required.

**Technical Data CU12SVH01**

- **Method:** Cooling water
- **Temperature:** min. 30 °C / max. 60 °C
- **Temp. difference IN/OUT:** max. 5 °C
- **Flow rate per unit:** 4 l/min
- **Pressure:** max. 8 bar (116 psi)
- **Connections:** M14x1.5 (10-L)

<table>
<thead>
<tr>
<th>Pos.</th>
<th>Qty.</th>
<th>Part Number</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>01</td>
<td>2</td>
<td>CU12SVHCS01</td>
<td>Cooling Sleeve</td>
</tr>
<tr>
<td>02</td>
<td>1</td>
<td>CU12SVHCT01</td>
<td>Connecting Tube</td>
</tr>
<tr>
<td>03</td>
<td>2</td>
<td>Z942/6</td>
<td>Sealing Plug</td>
</tr>
<tr>
<td>04</td>
<td>4</td>
<td>GE08LMEDVITOMDCF</td>
<td>Straight Coupling</td>
</tr>
<tr>
<td>05</td>
<td>2</td>
<td>EW08LVITOMDCF</td>
<td>Elbow Coupling</td>
</tr>
<tr>
<td>06</td>
<td>2</td>
<td>PSR08LX</td>
<td>Cutting Ring</td>
</tr>
<tr>
<td>07</td>
<td>2</td>
<td>M08LCFX</td>
<td>Nut</td>
</tr>
<tr>
<td>08</td>
<td>3</td>
<td>DIN912-M6x120-12.9</td>
<td>Hexagon Socket Cap Screw</td>
</tr>
<tr>
<td>09</td>
<td>2</td>
<td>XAA01201401</td>
<td>Straight Coupling</td>
</tr>
<tr>
<td>10</td>
<td>2</td>
<td>12.7X18X1.5USSFPM</td>
<td>Bonded Seal</td>
</tr>
</tbody>
</table>

Position of the cooling unit on the nozzle head.

CU12SVH01 mounted on Single Axis Valve Gate Nozzle 12SVH
### 10.3.1.1 Single Axis Valve Gate Nozzle 12SVH Parts List

In this section the nozzle parts are identified with the numbers indicated in the following figure.

**NOTICE**

Always tighten the screws to the torque specified in the respective table in section 13.

<table>
<thead>
<tr>
<th>Pos.</th>
<th>Qty.</th>
<th>Description</th>
<th>Part Number</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>1</td>
<td>Isolation nut</td>
<td>GAN0010S</td>
</tr>
<tr>
<td>2</td>
<td>1</td>
<td>Isolation ring</td>
<td>GAN0020S</td>
</tr>
<tr>
<td>3</td>
<td>1</td>
<td>Nozzle head top</td>
<td>GAN0030S###</td>
</tr>
<tr>
<td>4</td>
<td>1</td>
<td>Bridge</td>
<td>GAN0040S</td>
</tr>
<tr>
<td>5</td>
<td>2</td>
<td>Sealing sleeve</td>
<td>GAN0050S</td>
</tr>
<tr>
<td>6</td>
<td>1</td>
<td>Cooling bar</td>
<td>GAN0060S</td>
</tr>
<tr>
<td>7</td>
<td>1</td>
<td>Nozzle head bottom</td>
<td>GAN0072S</td>
</tr>
<tr>
<td>8</td>
<td>1</td>
<td>Actuator</td>
<td>HYC2013S01</td>
</tr>
<tr>
<td>9</td>
<td>1</td>
<td>Guide sleeve</td>
<td>12SVP-S-01</td>
</tr>
<tr>
<td>10</td>
<td>1</td>
<td>Heater band</td>
<td>HT-045-022-01</td>
</tr>
<tr>
<td>11</td>
<td></td>
<td>Nozzle body complete</td>
<td>12E04 (varied)</td>
</tr>
<tr>
<td>12</td>
<td>1</td>
<td>Shutoff nozzle tip</td>
<td>(varied)</td>
</tr>
<tr>
<td>13</td>
<td>1</td>
<td>Shutoff valve pin</td>
<td>(varied)</td>
</tr>
<tr>
<td>14</td>
<td>1</td>
<td>Heater band</td>
<td>HB450941</td>
</tr>
<tr>
<td>15</td>
<td>4</td>
<td>Hexagon socket cap screw</td>
<td>DIN912-M3X14-12.9</td>
</tr>
<tr>
<td>16</td>
<td>1</td>
<td>Hexagon socket cap screw</td>
<td>DIN912-M4X12-12.9</td>
</tr>
<tr>
<td>17</td>
<td>4</td>
<td>Hexagon socket cap screw</td>
<td>DIN912-M5X90-12.9</td>
</tr>
<tr>
<td>18</td>
<td>2</td>
<td>Hexagon socket cap screw</td>
<td>DIN912-M6X10-12.9</td>
</tr>
<tr>
<td>19</td>
<td>1</td>
<td>Hexagon socket set screw</td>
<td>DIN915-M6X10-45H</td>
</tr>
<tr>
<td>20</td>
<td>1</td>
<td>Parallel pin</td>
<td>DIN6325-4M6X16</td>
</tr>
<tr>
<td>21</td>
<td>1</td>
<td>Parallel pin</td>
<td>DIN6325-3M6X8</td>
</tr>
<tr>
<td>22</td>
<td>2</td>
<td>Thermo couple</td>
<td>XTA00115001</td>
</tr>
<tr>
<td>23</td>
<td>1</td>
<td>Head body</td>
<td>12SVPHB-01</td>
</tr>
<tr>
<td>24</td>
<td>1</td>
<td>Hexagon socket cap screw</td>
<td>DIN912-M3X10-12.9</td>
</tr>
<tr>
<td>25</td>
<td>1</td>
<td>Clamping device</td>
<td>GAN0170S</td>
</tr>
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</table>
Actuator HYC2013S01 Parts List

<table>
<thead>
<tr>
<th>Pos.</th>
<th>Qty.</th>
<th>Description</th>
<th>Part Number</th>
</tr>
</thead>
<tbody>
<tr>
<td>01</td>
<td>1</td>
<td>Actuator housing</td>
<td>HYC2013CH01</td>
</tr>
<tr>
<td>02</td>
<td>3</td>
<td>Piston D23</td>
<td>HYC2013PI01</td>
</tr>
<tr>
<td>03</td>
<td>3</td>
<td>Gasket locator</td>
<td>HYC2013GL01</td>
</tr>
<tr>
<td>04</td>
<td>3</td>
<td>Gasket locator cover</td>
<td>HYC2013GC01</td>
</tr>
<tr>
<td>05</td>
<td>1</td>
<td>Suspension ring</td>
<td>HYC2013SR01</td>
</tr>
<tr>
<td>06</td>
<td>1</td>
<td>Adjustment bushing</td>
<td>HYC2013AB01</td>
</tr>
<tr>
<td>07</td>
<td>1</td>
<td>Protection ring</td>
<td>HYC2013PR01</td>
</tr>
<tr>
<td>08</td>
<td>1</td>
<td>Seal kit complete</td>
<td>HYC2013SK01</td>
</tr>
<tr>
<td>8.1</td>
<td>3</td>
<td>Back up ring 10x15x2</td>
<td>Y21015PS030</td>
</tr>
<tr>
<td>8.2</td>
<td>3</td>
<td>Rod seal</td>
<td>C1-1005-V3664</td>
</tr>
<tr>
<td>8.3</td>
<td>3</td>
<td>O-ring seal</td>
<td>VIOR17.12X2.62FPM80</td>
</tr>
<tr>
<td>8.4</td>
<td>3</td>
<td>Piston seal (Compact sealing ring consist of an O-ring and a sealing element)</td>
<td>2G0-20X14X2.85</td>
</tr>
<tr>
<td>8.5</td>
<td>3</td>
<td>Guiding element</td>
<td>FB2.3-1.5L33</td>
</tr>
<tr>
<td>09</td>
<td>13</td>
<td>Sealing plug</td>
<td>MB600060</td>
</tr>
<tr>
<td>10</td>
<td>2</td>
<td>Hexagon socket cap screw</td>
<td>DIN912-M4X16-12.9</td>
</tr>
<tr>
<td>11</td>
<td>2</td>
<td>Hexagon socket cap screw</td>
<td>DIN912-M4X25-12.9</td>
</tr>
<tr>
<td>12</td>
<td>3</td>
<td>Set screw</td>
<td>DIN915-M4X6-45H</td>
</tr>
<tr>
<td>13</td>
<td>3</td>
<td>Parallel pin</td>
<td>DIN6325-4M6X28</td>
</tr>
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</table>
Assembly Tools

In this section the Stripping and Mounting Tool parts are identified with the numbers indicated in the following figure.

Seal Cap Assemble Tools for VSW Nozzle Tip

<table>
<thead>
<tr>
<th>Pos.</th>
<th>Part No.</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>T1</td>
<td>AT12E-0104</td>
<td>Seal cap assemble tool for VSW nozzle tip</td>
</tr>
<tr>
<td>T3</td>
<td>AT12E-0105</td>
<td></td>
</tr>
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</table>

Heater Disassembly Tool Compl. AT12E-0101

<table>
<thead>
<tr>
<th>Pos.</th>
<th>Part No.</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>T1.1</td>
<td>AT12E-010101</td>
<td>Heater Disassembly Tool 12E Type 01</td>
</tr>
<tr>
<td>T1.2</td>
<td>AT12E-010102</td>
<td>Heater Disassembly Tool 12E Type 02</td>
</tr>
<tr>
<td>T1.3</td>
<td>AT12E-010103</td>
<td>Heater Disassembly Tool 12E Type 03</td>
</tr>
</tbody>
</table>

10.3.1.2 Nozzle Disassembly Tool

<table>
<thead>
<tr>
<th>Pos.</th>
<th>Part No.</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>T3</td>
<td>AT12S-01</td>
<td>Nut</td>
</tr>
</tbody>
</table>

Tools for Disassembling the Actuators - ATCYL10

Mounting Tool for Piston Seals

<table>
<thead>
<tr>
<th>Pos.</th>
<th>Part No.</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>T1</td>
<td>ATCYL1001</td>
<td>Calibration sleeve</td>
</tr>
<tr>
<td>T2</td>
<td>ATCYL1002</td>
<td>Mounting tool</td>
</tr>
<tr>
<td>T3</td>
<td>ATCYL1003</td>
<td>Installation cone</td>
</tr>
<tr>
<td>T4</td>
<td>ATCYL1004</td>
<td>Spread tube</td>
</tr>
<tr>
<td>T5</td>
<td>ATCYL1005</td>
<td>Wrench complete</td>
</tr>
</tbody>
</table>
Safety Instructions for the Service at the Single Axis Valve Gate Nozzle 12SVH

**WARNING**

**Hot Surfaces Hazard**

Contact between the skin and hot surfaces could result in burns.

Use personal protective equipment, such as gloves, apron, sleeves and face protection, to guard against burns.

When servicing or handling the hot runner system outside the manifold plates or the injection molding machine, care must be taken to heed the hot surface exposure warnings.

For first aid contact your medical / safety representing.

**Hazard of Pressurized Air**

Pressurized air blow can result in hot plastic or foreign bodies entering the eyes, causing vision damage.

Following work must be carried out by qualified and experienced persons.

Use personal protective equipment: Face protection, hearing protection and gloves.

---

**NOTICE**

**Hazard of Material Damage**

Without consulting Synventive it is not permitted to do modifications to the hot runner system e.g. geometrical changes to the nozzle tip, except the part shape adjustment in the area of material allowance.

Any impact against the nozzle tip may result in its damage.

Never hammer or impact the nozzle tip from the front (i.e. from the side of the mold).

Twisting could damage the nozzle tip.

When replacing the nozzles, the sealing rings must always be replaced.
10.3.1.3 Dismounting the Hydraulic Cylinder Housing and Sealing

1) Remove the socket head cap screw (16).
2) Remove the dasher and grounding cable.
3) Unlocked the Hexagon socket cap screws.
4) Remove the parallel pins.
5) Fasten the isolation nut (1) in a vice.
6) Losen the isolation nut (1) at the nozzle tip (12).
7) Remove the isolation nut (1).
8) Lift the complete actuator housing (8) from the guide sleeve (9).

9) Unscrew the suspension ring (HYC2013SR01) from the adjustment bushing (HYC2013AB01).

10) Loosen and remove the socket cap screws (10, Part of HYC2013S01) and (11, Part of HYC2013S01).
11) Remove the protection ring (07, Part of HYC2013S01) from the cylinder housing (01, Part of HYC2013S01).
12) At the 3 pistons (02) loosen and remove the gasket locators (03) with the wrench ATCYL1005 (T5).

13) Pull the pistons (02) out of the cylinder housing (01).

14) Dismount the seals from the gasket locators (03).
   - 8.1 Back up ring
   - 8.2 Rod seal
   - 8.3 O-ring seal

15) Dismount the guiding elements (8.5) out of the inner groove of the gasket locator covers (04).

16) Dismount the piston seals (8.4) out of the inner grooves at the pistons (02).

**NOTICE**

The piston seal is a compact seal consisting of:
- O-ring (a)
- Sealing element (b)
10.3.1.4 Assembly of the Cylinder Housing HYC2013S01 on the Nozzle

Assembly of the Pistons into the Actuator HYC2013S01

**NOTICE**

After disassembly of the sealing elements, the original seals should be replaced as required by Synventive.

1) Fit the mounting cone (T3) on the piston (02).

2) Lubricate the piston seal elements (8.4) with hydraulic oil or white grease.
   - O-ring (8.4) (a)
   - Sealing element (8.4) (b)

3) Mount the O-ring (8.4) (a) into the seal groove of the piston (02).
4) Using the spreader sleeve (T4) and the mounting cone (T3) to push the sealing element (8.4) (b) into the seal groove of the piston (02).

**NOTICE**

In the seal groove of the piston (02) the sealing element (8.4) (b) is placed above the O-ring (8.4) (a).
5) Fit the shaft of the piston (02) into the mounting tool (T2).
6) Place the calibration sleeve (T1) into the bore in the cylinder housing (01).
7) Insert the piston (02) with the mounting tool (T2) through the calibration sleeve (T1) into the cylinder housing (01).

8) Insert the guiding element (8.5) into the groove of the gasket locator cover (04).

9) Install the seals of the gasket locators (03).
   8.1 Back up ring
   8.2 Rod seal
   8.3 O-ring seal

10) Install the gasket locator covers (04) into the gasket locators (03).
11) Place the gasket locator (03) (04) on the shaft of the piston (02).

12) Turn the gasket locator (03) (04) into the cylinder housing (01) thread with the wrench ATCYL1005 (T5) up to the mechanical stop.

**NOTICE**
The top of the gasket locator (03) must not exceed (01) the lower edge of the cylinder housing.

13) Pull the piston (02) until it reaches the gasket locator cover (04).

**NOTICE**
In this position, the top of the piston shaft protrudes 24 mm above the cylinder housing (01).

14) The following components are provided for mounting on the nozzle (not screwed together):

1. Cylinder housing (pre assembled)
2. Suspension ring
3. Adjustment bushing
4. Protection ring
5. Hexagon socket cap screw DIN912-M4X16-12.9
6. Hexagon socket cap screw DIN912-M4X25-12.9
7. Set screw DIN915-M4X6-45H
8. Parallel pin DIN6325-4m6X28
Mounting the Actuator Housing HYC2013S01 on the Single Axis Valve Gate Nozzle 12SVH

1) Mount the actuator housing (1, part of HYC2013S01) with the pistons (2, part of HYC2013S01) into the related holes of the suspension ring (5, part of HYC2013S01).

2) Turn the pistons (2, part of HYC2013S01) to align the holes (a) at the pistons (2, part of HYC2013S01) regarding the holes at the suspension ring (5, part of HYC2013S01).

3) Take the actuator housing (1, part of HYC2013S01) away from the suspension ring (5, part of HYC2013S01).

4) Attach the Protection ring (07, part of HYC2013S01) with hexagon socket cap screws (10 and 11, part of HYC2013S01) at the actuator housing (01, Part of HYC2013S01).

5) Check the fit of the adjustment bushing (HYC2013AB01).

**NOTICE**
The adjustment bushing (HYC2013AB01) has to be positioned 20 mm to the upper edge of the guide sleeve and fixed with the hexagon socket set screw (19).

**NOTICE**
The inside thread of the suspension ring (HYC2013SR01) is a left-hand thread.

6) Screw the suspension ring (HYC2013SR01) at the adjustment bushing (HYC2013AB01).

**NOTICE**
The suspension ring (HYC2013SR01) has to be positioned 42 mm to the upper edge of the guide sleeve.
7) Keep the suspension ring (HYC2013SR01) shown like right.

**NOTICE**
If the suspension ring is not exactly aligned with the large recess to the cooling strip, place the bearing ring (HYC2013SR01) in the shortest path to the position shown in figure Doc007289.png.

**NOTICE**
Examine whether the isolation ring (2) at the nozzle head top (3) is placed in the right position.

8) Mount the actuator (8) at the nozzle.
9) Screw in the isolation nut (1) at the nozzle head top (3).
10) Check the clearance of the cooling bar (6).

11) Fix the nozzle at the isolation nut (1) in a vice.
12) Fasten the isolation nut (1) at the nozzle tip (12).

**NOTICE**
Torque value - 40 Nm
13) Mount the parallel pin and lock it with the socket head cap screw.

14) Check the position of the cooling bar (6) on the actuator (8).

**NOTICE**

The cooling bar (6) must be easily movable to be positioned on the actuator (8). If this is not possible, contact Synventive customer service.

15) Tighten the ground wire with a socket cap screw (16) on the cooling bar (6).

**NOTICE**

Note the arrangement of the components shown in the figure (Doc007414.png) on the right side.
10.3.1.5 Dismounting and Mounting of the Nozzle 12SVH

Dismounting of the Nozzle and Heater from the Head Body

1) Remove the socket head cap screw (16).
2) Remove the dasher and grounding cable.
3) Unlocked the Hexagon socket cap screws.
4) Remove the parallel pins.
5) Fix the nozzle at the isolation nut (1) in a vice.
6) Loosen the isolation nut (1) at the nozzle tip (12).

7) Remove the isolation nut (1).
8) Lift the complete actuator housing (8) from the guide sleeve (9).
9) Screw the 2 hexagon socket screws (18) out of the guide sleeve (9), heater band (14) and bridge (4).

10) Take off the guide sleeve (9) from the heater band (14).
11) Fix the nozzle (11) at the head body (23) in a vice.

**NOTICE**

Refer to the procedure page 370 Disassembly Nozzle 12E including „Disassembling the Nozzle Heater“ and „Disassembling the Nozzle Tip and Nozzle Body“.

The difference is as follow:

- The 12SVH nozzle is fixed in a vice.
- The 12E is screwed into the manifold.

### Mounting of the Nozzle and Heater

**NOTICE**

For the assembly procedure follow the section 10.1.3.3 „Assembling Nozzle 12E“.

The difference is as follow:

- The 12SVH nozzle is fixed in a vice
- The 12E is screwed into the manifold.

For Mounting the Actuator Housing HYC2013S01 on the Single Axis Valve Gate Nozzle 12SVH, see the page 366 above.

**NOTICE**

The torque value for fastening the nozzle body on the head body (23) is 175 Nm.

### Setup for the Disassembly and Assembly of the Nozzle from / to the Head body

(T3) - Nozzle Disassembly Tool AT12S-01
(23) - Head body
10.3.1.6 Dismounting and Mounting of the Thermocouple

Dismounting of the Thermocouple

**NOTICE**

For dismounting and mounting the thermocouple there is not a need to have the cylinder housing dismounted.

1) Loosen the hexagon socket cap screw (24).
2) Move the clamping device (25) to the side, away from the thermocouple (22).

3) Pull the thermocouple (22) out of the bore of the heater band (14) and nozzle head bottom (7).

4) Dismount the 12E-04 nozzle heater.

**NOTICE**

Follow the heater dismounting procedure of the nozzle 12E-04 Series.

5) Move the heater band (10).
6) Pull the thermocouple (22) out of the bore of the head body (23).
Mounting of the Thermocouple

**NOTICE**
For dismounting and mounting the thermocouple there is not a need to have the cylinder housing dismounted.

1) Guide the thermocouple (22) through the heater band (14) into the thermocouple hole on the nozzle head bottom (7).

2) Bring the clamping device (25) to vertical position.
3) Fix the thermocouple (22) with the hexagon socket cap screw (24).

4) Align the thermocouple (22) in the nozzle heater (14) direction.
5) Fix the thermocouple (22) with heat resistant adhesive tape at the outlet of the nozzle heater (14).
6) Guide the thermocouple (22) into the thermocouple hole of the head body (23).
7) Mount the heater band (10).
8) Complete the nozzle 12E-04.

**NOTICE**
Follow the mounting procedure of the nozzle 12E-04 Series.

---

### 10.3.1.7 Grounding of the Single Axis Valve Gate Nozzle

**DANGER**

**Danger to Life by Electric Shock**

The Single Axis Valve Gate Nozzle has to be properly grounded to prevent serious personal injury or death.

- Electrical work must be carried out by qualified persons.
- Verify that all power source connections are properly grounded.
- **In Emergency case - Switch all systems off.**
- For first aid contact your medical / safety representing.

1) Check the position of the cooling bar (6) on the actuator (8).

**NOTICE**
The cooling bar (6) must be easily movable to be positioned on the actuator (8). If this is not possible, contact Synventive customer service.

2) Tighten the ground wire with a socket cap screw (16) on the cooling bar (6).

**NOTICE**
See the order of the components in the image of the right side Doc007414.png
10.3.1.8 Valve Pin Height Adjustment

1) Unscrew the socket set screw (19).
2) Drive valve pin in closed position with reduced pressurized air of approx. 2.76 bar (40 psi).
3) Adjust valve pin position with a suitable pin in holes of the adjustment bushing (HYC2013AB01).
4) Turn the adjustment bushing (HYC2013AB01) by using a pin to get the valve pin front into basic position 0.3 mm.

**NOTICE**

Turning one hole forward results in a height adjustment of 0.25 mm at the valve pin.

5) Tighten the socket set screw (19).
10.3.1.9 Disassembling the Single Axis Valve Gate Nozzle out of the Mold

**NOTICE**
The Single Axis Valve Gate Nozzle is located on the fit diameters of the nozzle tip and the lower part of the cylinder housing in the mold.

![Diagram of Single Axis Valve Gate Nozzle](Doc007297.png)

- (1) Isolation nut
- (8) Actuator
- (12) Nozzle tip

**Disassembling the Single Axis Valve Gate Nozzle out of the mold**

1) Cool down the Single Axis Valve Gate Nozzle and the mold to room temperature.
2) Lift the Single Axis Valve Gate Nozzle inclusive of actuator out of the mold.

**NOTICE**
If it is not possible to lift the Single Axis Valve Gate Nozzle inclusive of actuator out of the mold, please contact the Synventive Customer Service or Technical Support.
10.3.2 Single Axis Valve Gate Nozzle 16SVH

### Technical Data

<table>
<thead>
<tr>
<th><strong>Valve pin operation</strong></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Operation medium</td>
<td>hydraulic</td>
</tr>
<tr>
<td>Pressure range</td>
<td>40 - 60 bar (580 - 870 psi)</td>
</tr>
<tr>
<td>Flowrate</td>
<td>2.5 l/min</td>
</tr>
<tr>
<td>Reaction time</td>
<td>~0.5 s</td>
</tr>
<tr>
<td>Valve pin stroke:</td>
<td>14 mm</td>
</tr>
<tr>
<td>Adjustment</td>
<td>± 1 mm</td>
</tr>
<tr>
<td></td>
<td>Via adjustment threads from outside.</td>
</tr>
<tr>
<td>Closing force</td>
<td>4984 N / 40 bar (580 psi)</td>
</tr>
<tr>
<td>Opening force</td>
<td>4043 N / 40 bar (580 psi)</td>
</tr>
<tr>
<td>Connection</td>
<td>M12x1,5 (8-L)</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th><strong>Valve pin</strong></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Valve pin diameter</td>
<td>Ø 8 mm</td>
</tr>
<tr>
<td>Attachment</td>
<td>Quick coupling, anti-rotation</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th><strong>Heating Power</strong></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>The numbering of the heating zones starts at the nozzle tip and ends at the nozzle head.</td>
<td></td>
</tr>
<tr>
<td>Zone 1 (From a nozzle length of 100 mm)</td>
<td>400 Watt</td>
</tr>
<tr>
<td>Zone 2 (From a nozzle length of 120 mm)</td>
<td>558 - 1030 Watt</td>
</tr>
<tr>
<td>Zone 3 (From a nozzle length of 370 mm)</td>
<td>1188 - 1230 Watt</td>
</tr>
<tr>
<td>Head</td>
<td>800 plus 680 Watt</td>
</tr>
</tbody>
</table>

**NOTICE**

To ensure long life and continued flawless operation of the actuator, we recommend using a service medium that complies with the requirements of classification 21/18/13 pursuant to ISO 4406.
Technical Data / Exploded View - Cooling Unit CU16SVH01

NOTICE

If the mold temperature is 80 °C (176 °F) or more, the Cooling Unit CU16SVH01 is required.

Technical Data CU16SVH01

- Method: Cooling water
- Temperature: min. 30 °C / max. 60 °C
  Temp. difference IN/OUT max. 5 °C
- Flow rate per unit: 4 l/min
- Pressure: max. 8 bar (116 psi)
- Connections: M14x1.5 (10-L)

<table>
<thead>
<tr>
<th>Pos.</th>
<th>Qty.</th>
<th>Part Number</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>01</td>
<td>2</td>
<td>CU16SVHCS01</td>
<td>Cooling Sleeve</td>
</tr>
<tr>
<td>02</td>
<td>1</td>
<td>CU16SVHCT01</td>
<td>Connecting Tube</td>
</tr>
<tr>
<td>03</td>
<td>2</td>
<td>Z942/6</td>
<td>Sealing Plug</td>
</tr>
<tr>
<td>04</td>
<td>4</td>
<td>GE08LMEDVITOMDCF</td>
<td>Straight Coupling</td>
</tr>
<tr>
<td>05</td>
<td>2</td>
<td>EW08LVITOMDCF</td>
<td>Elbow Coupling</td>
</tr>
<tr>
<td>06</td>
<td>2</td>
<td>PSR08LX</td>
<td>Cutting Ring</td>
</tr>
<tr>
<td>07</td>
<td>2</td>
<td>M08LCFX</td>
<td>Nut</td>
</tr>
<tr>
<td>08</td>
<td>3</td>
<td>DIN912-M6x120-12.9</td>
<td>Hexagon Socket Cap Screw</td>
</tr>
<tr>
<td>09</td>
<td>2</td>
<td>XAA01201401</td>
<td>Straight Coupling</td>
</tr>
<tr>
<td>10</td>
<td>2</td>
<td>12.7X18X1.5USSFPM</td>
<td>Bonded Seal</td>
</tr>
</tbody>
</table>

Position of the cooling unit on the nozzle head.

CU16SVH01 mounted on Single Axis Valve Gate Nozzle 16SVH
10.3.2.1 Single Axis Valve Gate Nozzle 16SVH Parts List

In this section the nozzle parts are identified with the numbers indicated in the following figure.

**NOTICE**

Always tighten the screws to the torque specified in the respective table in section 13.

<table>
<thead>
<tr>
<th>Pos.</th>
<th>Qty.</th>
<th>Description</th>
<th>Part Number</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>1</td>
<td>Isolation nut</td>
<td>GBN0010S</td>
</tr>
<tr>
<td>2</td>
<td>1</td>
<td>Isolation ring</td>
<td>GBN0020S</td>
</tr>
<tr>
<td>3</td>
<td>1</td>
<td>Nozzle head top</td>
<td>GBN0031S###</td>
</tr>
<tr>
<td>4</td>
<td>1</td>
<td>Bridge</td>
<td>GBN0041S</td>
</tr>
<tr>
<td>5</td>
<td>2</td>
<td>Sealing sleeve</td>
<td>GBN0050S</td>
</tr>
<tr>
<td>6</td>
<td>1</td>
<td>Cooling bar</td>
<td>GBN0060S</td>
</tr>
<tr>
<td>7</td>
<td>1</td>
<td>Nozzle head bottom</td>
<td>GBN0071S</td>
</tr>
<tr>
<td>8</td>
<td>1</td>
<td>Actuator</td>
<td>HYC2314S01</td>
</tr>
<tr>
<td>9</td>
<td>1</td>
<td>Guide sleeve</td>
<td>16SVP-S-01</td>
</tr>
<tr>
<td>10</td>
<td>1</td>
<td>Heater band</td>
<td>HT-060-025-01</td>
</tr>
<tr>
<td>11</td>
<td></td>
<td>Nozzle body complete</td>
<td>16E04 (varied)</td>
</tr>
<tr>
<td>12</td>
<td>1</td>
<td>Shut off nozzle tip</td>
<td>(varied)</td>
</tr>
<tr>
<td>13</td>
<td>1</td>
<td>Shut off valve pin</td>
<td>(varied)</td>
</tr>
<tr>
<td>14</td>
<td>1</td>
<td>Heater band</td>
<td>HB571071</td>
</tr>
<tr>
<td>15</td>
<td>4</td>
<td>Hexagon socket cap screw</td>
<td>DIN912-M3X14-12.9</td>
</tr>
<tr>
<td>16</td>
<td>1</td>
<td>Hexagon socket cap screw</td>
<td>DIN912-M4X12-12.9</td>
</tr>
<tr>
<td>17</td>
<td>4</td>
<td>Hexagon socket cap screw</td>
<td>DIN912-M6X110-12.9</td>
</tr>
<tr>
<td>18</td>
<td>2</td>
<td>Hexagon socket cap screw</td>
<td>DIN912-M6X10-12.9</td>
</tr>
<tr>
<td>19</td>
<td>1</td>
<td>Hexagon socket set screw</td>
<td>DIN915-M6X10-45H</td>
</tr>
<tr>
<td>20</td>
<td>1</td>
<td>Parallel pin</td>
<td>DIN6325-5M6X16</td>
</tr>
<tr>
<td>21</td>
<td>1</td>
<td>Parallel pin</td>
<td>DIN6325-3M6X8</td>
</tr>
<tr>
<td>22</td>
<td>2</td>
<td>Thermo couple</td>
<td>XTA00115001</td>
</tr>
<tr>
<td>23</td>
<td>1</td>
<td>Head body</td>
<td>16SVPHB-01</td>
</tr>
<tr>
<td>24</td>
<td>1</td>
<td>Hexagon socket cap screw</td>
<td>DIN912-M3X10-12.9</td>
</tr>
<tr>
<td>25</td>
<td>1</td>
<td>Clamping device</td>
<td>GAN0170S</td>
</tr>
</tbody>
</table>
# Actuator HYC2314S01 Parts List

<table>
<thead>
<tr>
<th>Pos.</th>
<th>Qty.</th>
<th>Description</th>
<th>Part Number</th>
</tr>
</thead>
<tbody>
<tr>
<td>01</td>
<td>1</td>
<td>Actuator housing</td>
<td>HYC2314CH01</td>
</tr>
<tr>
<td>02</td>
<td>3</td>
<td>Piston D23</td>
<td>HYC2314PI01</td>
</tr>
<tr>
<td>03</td>
<td>3</td>
<td>Gasket locator</td>
<td>HYC2314GL01</td>
</tr>
<tr>
<td>04</td>
<td>3</td>
<td>Gasket locator cover</td>
<td>HYC2314GC01</td>
</tr>
<tr>
<td>05</td>
<td>1</td>
<td>Suspension ring</td>
<td>HYC2314SR01</td>
</tr>
<tr>
<td>06</td>
<td>1</td>
<td>Adjustment bushing</td>
<td>HYC2314AB01</td>
</tr>
<tr>
<td>07</td>
<td>1</td>
<td>Protection ring</td>
<td>HYC2314PR01</td>
</tr>
<tr>
<td>08</td>
<td>1</td>
<td>Seal kit complete</td>
<td>HYC2314SK01</td>
</tr>
<tr>
<td>8.1</td>
<td>3</td>
<td>Back up ring 10x15x2</td>
<td>Y21015PS030</td>
</tr>
<tr>
<td>8.2</td>
<td>3</td>
<td>Rod seal</td>
<td>C1-1005-V3664</td>
</tr>
<tr>
<td>8.3</td>
<td>3</td>
<td>O-ring seal</td>
<td>VIOR20.29X2.62FPM80</td>
</tr>
<tr>
<td>8.4</td>
<td>3</td>
<td>Piston seal (Compact sealing ring consist of an O-ring and a sealing element).</td>
<td>2G0-23X17X2.85</td>
</tr>
<tr>
<td>8.5</td>
<td>3</td>
<td>Guiding element</td>
<td>FB2.3-1.5L33</td>
</tr>
<tr>
<td>09</td>
<td>13</td>
<td>Sealing plug</td>
<td>MB600060</td>
</tr>
<tr>
<td>10</td>
<td>2</td>
<td>Hexagon socket cap screw</td>
<td>DIN912-M4X16-12.9</td>
</tr>
<tr>
<td>11</td>
<td>2</td>
<td>Hexagon socket cap screw</td>
<td>DIN912-M4X25-12.9</td>
</tr>
<tr>
<td>12</td>
<td>3</td>
<td>Set screw</td>
<td>DIN915-M4X6-45H</td>
</tr>
<tr>
<td>13</td>
<td>3</td>
<td>Parallel pin</td>
<td>DIN6325-4M6X28</td>
</tr>
</tbody>
</table>
Assembly Tools

In this section the Stripping and Mounting Tool parts are identified with the numbers indicated in the following figure.

<table>
<thead>
<tr>
<th>Pos.</th>
<th>Part No.</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>T1</td>
<td>AT16S-01</td>
<td>Adapter</td>
</tr>
<tr>
<td>T2</td>
<td>AT-16-040102</td>
<td>Assemble Tool for Seal Cap VSW</td>
</tr>
<tr>
<td>T1.1</td>
<td>ATCYL0104</td>
<td>Stop bolt</td>
</tr>
<tr>
<td>T1.2</td>
<td>ATCYL0102</td>
<td>Guide</td>
</tr>
<tr>
<td>T1.3</td>
<td>ATCYL0101</td>
<td>Slide Hammer</td>
</tr>
<tr>
<td>T1.4</td>
<td>AT16E010201</td>
<td>Disassembly tube 16E</td>
</tr>
<tr>
<td>T1.5</td>
<td>DIN6325-6M6X30</td>
<td>Parallel pin</td>
</tr>
<tr>
<td>T1.6</td>
<td>AT16E010202</td>
<td>Clamping jaws</td>
</tr>
<tr>
<td>T1.7</td>
<td>AT16E010203</td>
<td>Clamping ring</td>
</tr>
<tr>
<td>T1.8</td>
<td>DIN6325-6M6X20</td>
<td>Parallel pin</td>
</tr>
<tr>
<td>T1.9</td>
<td>DIN916-M4X6-45H</td>
<td>Set screw</td>
</tr>
</tbody>
</table>

Heater Disassembly Tool Compl. AT16E-0102

Heater Stripping Tool for 16E / 16S Nozzle AT16E0102

<table>
<thead>
<tr>
<th>Pos.</th>
<th>Qty.</th>
<th>Part No.</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>T1.1</td>
<td>1</td>
<td>ATCYL0104</td>
<td>Stop bolt</td>
</tr>
<tr>
<td>T1.2</td>
<td>1</td>
<td>ATCYL0102</td>
<td>Guide</td>
</tr>
<tr>
<td>T1.3</td>
<td>1</td>
<td>ATCYL0101</td>
<td>Slide Hammer</td>
</tr>
<tr>
<td>T1.4</td>
<td>1</td>
<td>AT16E010201</td>
<td>Disassembly tube 16E</td>
</tr>
<tr>
<td>T1.5</td>
<td>2</td>
<td>DIN6325-6M6X30</td>
<td>Parallel pin</td>
</tr>
<tr>
<td>T1.6</td>
<td>2</td>
<td>AT16E010202</td>
<td>Clamping jaws</td>
</tr>
<tr>
<td>T1.7</td>
<td>1</td>
<td>AT16E010203</td>
<td>Clamping ring</td>
</tr>
<tr>
<td>T1.8</td>
<td>2</td>
<td>DIN6325-6M6X20</td>
<td>Parallel pin</td>
</tr>
<tr>
<td>T1.9</td>
<td>2</td>
<td>DIN916-M4X6-45H</td>
<td>Set screw</td>
</tr>
</tbody>
</table>
Safety Instructions for the Service at the Single Axis Valve Gate Nozzle 16SVH

**WARNING**

**Hot Surfaces Hazard**

Contact between the skin and hot surfaces could result in burns.

- Use personal protective equipment, such as gloves, apron, sleeves and face protection, to guard against burns.
- When servicing or handling the hot runner system outside the manifold plates or the injection molding machine, care must be taken to heed the hot surface exposure warnings.
- For first aid contact your medical / safety representing.

**Hazard of Pressurized Air**

Pressurized air blow can result in hot plastic or foreign bodies entering the eyes, causing vision damage.

- Following work must be carried out by qualified and experienced persons.
- Use personal protective equipment: Face protection, hearing protection and gloves.

**NOTICE**

**Hazard of Material Damage**

Without consulting Synventive it is not permitted to do modifications to the hot runner system e.g. geometrical changes to the nozzle tip, except the part shape adjustment in the area of material allowance.

- Any impact against the nozzle tip may result in its damage.
- Never hammer or impact the nozzle tip from the front (i.e. from the side of the mold).
- Twisting could damage the nozzle tip.
- When replacing the nozzles, the sealing rings must always be replaced.
10.3.2.2 Dismounting the Hydraulic Cylinder Housing and Sealing

1) Remove the socket head cap screw (16).
2) Remove the dasher and grounding cable.

3) Unlocked the Hexagon socket cap screws.
4) Remove the parallel pins.

5) Fix the nozzle at the isolation nut (1) in a vice.
6) Loosen the isolation nut (1) at the nozzle tip (12).
7) Remove the isolation nut (1).

8) Lift the complete actuator housing (8) from the guide sleeve (9).

9) Unscrew the suspension ring (HYC2314SR01).

10) Loosen and remove the socket cap screws (10, Part of HYC2314S01) and (11, Part of HYC2314S01).

11) Remove the protection ring (07, Part of HYC2314S01) from the cylinder housing (01, Part of HYC2314S01).
12) At the 3 pistons (02) loosen and remove the gasket locators (03) with the wrench ATCYL1005 (T5).
13) Pull the pistons (02) out of the cylinder housing (01).

14) Dismount the seals from the gasket locators (03).
   - 8.1 Back up ring
   - 8.2 Rod seal
   - 8.3 O-ring seal

15) Dismount the guiding elements (8.5) out of the inner groove of the gasket locator covers (04).

16) Dismount the piston seals (8.4) out of the inner grooves at the pistons (02).

**NOTICE**
The piston seal is a compact seal consisting of:
- O-ring (a)
- Sealing element (b)
10.3.2.3 Assembly of the Cylinder Housing HYC2314S01 on the Nozzle

Assembly of the Pistons into the Actuator HYC2314S01

1) Fit the mounting cone (T3) on the piston (02).

2) Lubricate the piston seal elements (8.4) with hydraulic oil or white grease.
   - O-ring (8.4) (a)
   - Sealing element (8.4) (b)

3) Mount the O-ring (8.4) (a) into the seal groove of the piston (02).
4) Using the spreader sleeve (T4) and the mounting cone (T3) to push the sealing element (8.4) (b) into the seal groove of the piston (02).

   NOTICE
   In the seal groove of the piston (02) the sealing element (8.4) (b) is placed above the O-ring (8.4) (a).
5) Fit the shaft of the piston (02) into the mounting tool (T2).

6) Place the calibration sleeve (T1) into the bore in the cylinder housing (01).

7) Insert the piston (02) with the mounting tool (T2) through the calibration sleeve (T1) into the cylinder housing (01).

8) Insert the guiding element (8.5) into the groove of the gasket locator cover (4).

9) Install the seals of the gasket locators (03).
   8.1 Back up ring
   8.2 Rod seal
   8.3 O-ring seal

10) Install the gasket locator covers (04) into the gasket locators (03).
11) Place the gasket locator (03) (04) on the shaft of the piston (02).

12) Turn the gasket locator (03) into the cylinder housing (01) thread with the wrench ATCYL1005 (T5) up to the mechanical stop.

**NOTICE**
The top of the gasket locator (03) must not exceed (01) the lower edge of the cylinder housing.

13) Pull the piston (02) until it reaches the gasket locator cover (04).

**NOTICE**
In this position, the top of the piston shaft protrudes 24 mm above the cylinder housing (01).

14) The following components are provided for mounting on the nozzle (not screwed together):

1. Cylinder housing (pre assembled)
2. Suspension ring
3. Adjustment bushing
4. Protection ring
5. Hexagon socket cap screw DIN912-M4X16-12.9
6. Hexagon socket cap screw DIN912-M4X25-12.9
7. Set screw DIN915-M4X6-45H
8. Parallel pin DIN6325-4m6X28
Mounting the Actuator Housing HYC2314S01 on the Single Axis Valve Gate 16SVH

1) Mount the actuator housing (1, Part of HYC2314S01) with the pistons (2, Part of HYC2314S01) into the related holes of the suspension ring (5, Part of HYC2314S01).

2) Turn the pistons (2, Part of HYC2314S01) to align the holes (a) at the pistons (2, Part of HYC2314S01) regarding the holes at the suspension ring (5, Part of HYC2314S01).

3) Take the actuator housing (1, Part of HYC2314S01) away from the suspension ring (5, Part of HYC2314S01).

4) Attach the Protection ring (07, Part of HYC2314S01) with hexagon socket cap screws (10 and 11, Part of HYC2314S01) at the actuator housing (01, Part of HYC2314S01).

5) Check the fit of the adjustment bushing HYC2314AB01).

**NOTICE**
The adjustment bushing HYC2314AB01 has to be positioned 20 mm to the upper edge of the guide sleeve and fixed with the hexagon socket set screw (19).

**NOTICE**
The inside thread of the suspension ring (HYC2314SR01) is a left-hand thread.

6) Screw the suspension ring (HYC2314SR01) at the adjustment bushing (HYC2314AB01).

**NOTICE**
The suspension ring (HYC2314SR01) has to be positioned 44 mm to the upper edge of the guide sleeve (N9).
7) Keep the suspension ring shown like the right side figure (Doc007377.png).

**NOTICE**

If the suspension ring is not exactly aligned with the large recess to the cooling strip, place the bearing ring (HYC2314SR01) in the shortest path to the position shown in figure Doc007377.png.

8) Mount the actuator (8) at the nozzle.

**NOTICE**

Examine whether the isolation ring (2) at the nozzle head top (3) is placed in the right position.
9) Screw in the isolation nut (1) at the nozzle head top (3).
10) Check the clearance of the cooling bar (6).

11) Fix the nozzle at the isolation nut (1) in a vice.
12) Fasten the isolation nut (1) at the nozzle tip (12).

**NOTICE**
Torque value - 40 Nm
13) Mount the parallel pin and lock it with the socket head cap screw.

14) Check the position of the cooling bar (6) on the actuator (8).

**NOTICE**

The cooling bar (6) must be easily movable to be positioned on the actuator (8). If this is not possible, contact Synventive customer service.

15) Tighten the ground wire with a socket cap screw (16) on the cooling bar (6).

**NOTICE**

Note the arrangement of the components shown in the figure (Doc007414.png) on the right side.
10.3.2.4 Dismounting and Mounting of the Nozzle

Dismounting of the Nozzle and Heater from the Head Body

1) Remove the socket head cap screw (16).
2) Remove the dasher and grounding cable.

3) Unlocked the Hexagon socket cap screws.
4) Remove the parallel pins.

5) Fix the nozzle at the isolation nut (1) in a vice.
6) Loosen the isolation nut (1) at the nozzle tip (12).
7) Remove the isolation nut (1).
8) Lift the complete actuator housing (8) from the guide sleeve (9).

9) Screw the 2 hexagon socket screws (18) out of the guide sleeve (9), heater band and bridge (4).

10) Take off the guide sleeve (9) from the heater band (14).
11) Fix the nozzle (11) at the head body (23) in a vice.

**NOTICE**

Refer to the procedure section 10.1.4.2 Disassembly Nozzle 16E including „Disassembling the Nozzle Heater“ and „Disassembling the Nozzle Tip and Nozzle Body“

The difference is as follow:

- The 16SVH nozzle is fixed in a vice.
- The 16E is screwed into the manifold.

---

**Mounting of the Nozzle and Heater**

**NOTICE**

For the assembly procedure follow the section 10.1.4.3 Assembling Nozzle 16E.

The difference is as follow:

- The 16SVH nozzle is fixed in a vice
- The 16E is screwed into the manifold.

For Mounting the Actuator Housing HYC2314S01 on the Single Axis Valve Gate Nozzle 16SVH, see the 10.3.2.3 above.

**NOTICE**

The torque value for fastening the nozzle body on the head body (23) is 340 Nm.
10.3.2.5 Dismounting and Mounting of the Thermocouple

Dismounting of the Thermocouple

NOTICE
For dismounting and mounting the thermocouple there is not a need to have the cylinder housing dismounted.

1) Loosen the hexagon socket cap screw (24).
2) Move the clamping device (25) to the side, away from the thermocouple (22).

3) Pull the thermocouple (22) out of the bore of the heater band (14) and nozzle head bottom (7).

4) Dismount the 16E-04 nozzle heater.

NOTICE
Follow the heater dismounting procedure of the nozzle 16E-04.

5) Move the heater band (10).
6) Pull the thermocouple (22) out of the bore of the head body (23).
Mounting of the Thermocouple

**NOTICE**

For dismounting and mounting the thermocouple there is not a need to have the cylinder housing dismounted.

1) Guide the thermocouple (22) through the heater band (14) into the thermocouple hole of the head body (23).

2) Bring the clamping device (25) to vertical position.
3) Fix the thermocouple (22) with the hexagon socket cap screw (24).

4) Align the thermocouple (22) in the nozzle heater (14) direction.
5) Fix the thermocouple (22) with heat resistant adhesive tape at the outlet of the nozzle heater (14).

6) Guide the thermocouple (22) into the thermocouple hole of the head body (23).
7) Mount the heater band (10).
8) Complete the nozzle 16E-04.

**NOTICE**

Follow the heater mounting procedure of the nozzle 16E-04.
10.3.2.6 Grounding of the Single Axis Valve Gate Nozzle

**DANGER**

**Danger to Life by Electric Shock**

The Single Axis Valve Gate Nozzle has to be properly grounded to prevent serious personal injury or death.
- Electrical work must be carried out by qualified persons.
- Verify that all power source connections are properly grounded.
- In Emergency case - Switch all systems off.
- For first aid contact your medical / safety representing.

1) Check the position of the cooling bar (6) on the actuator (8).

**NOTICE**

The cooling bar (6) must be easily movable to be positioned on the actuator (8). If this is not possible, contact Synventive customer service.

2) Tighten the ground wire with a socket cap screw (16) on the cooling bar (6).

**NOTICE**

See the order of the components in the image of the right side Doc007414.png
### 10.3.2.7 Valve Pin Height Adjustment

1) Unscrew the socket set screw (19).
2) Close the valve guide by pressure on the hydraulic connection (A).
3) Adjust valve pin position with a suitable pin in holes of the adjustment bushing (HYC2314AB01).
4) Turn the adjustment bushing (HYC2314AB01) by using a pin to get the valve pin front into basic position 0,3 mm.

**NOTICE**

Turning one hole forward results in a height adjustment of 0,25 mm at the valve pin.

5) Tighten the socket set screw (19).
10.3.2.8 Disassembling the Single Axis Valve Gate Nozzle out of the Mold

**NOTICE**
The Single Axis Valve Gate Nozzle is located on the fit diameters of the nozzle tip and the lower part of the cylinder housing in the mold.

Disassembling the Single Axis Valve Gate Nozzle inclusive of actuator out of the mold

1) Cool down the Single Axis Valve Gate Nozzle and the mold to room temperature.
2) Lift the Single Axis Valve Gate Nozzle inclusive of actuator out of the mold.

**NOTICE**
If it is not possible to lift the Single Axis Valve Gate Nozzle inclusive of actuator out of the mold, please contact the Synventive Customer Service or Technical Support.
10.3.3 Single Axis Valve Gate Nozzle 09SVP

**Technical Data**

<table>
<thead>
<tr>
<th>Valve pin operation</th>
</tr>
</thead>
<tbody>
<tr>
<td>Operation medium</td>
</tr>
<tr>
<td>Pressure range</td>
</tr>
<tr>
<td>Flowrate</td>
</tr>
<tr>
<td>Reaction time</td>
</tr>
<tr>
<td>Valve pin stroke</td>
</tr>
<tr>
<td>Adjustment</td>
</tr>
<tr>
<td>Closing force</td>
</tr>
<tr>
<td>Opening force</td>
</tr>
<tr>
<td>Connection</td>
</tr>
</tbody>
</table>

**Valve pin**

- Valve pin diameter: Ø 3.8 mm
- Attachment: Quick coupling, anti-rotation

**Heating Power**

- The numbering of the heating zones starts at the nozzle tip and ends at the nozzle head.
- Zone 1 (From a nozzle length of 50 mm): 150 - 250 Watt
- Zone 2 (From a nozzle length of 170 mm): 270 - 490 Watt
- Head: 500 plus 500 Watt

---

**NOTICE**

To ensure long life and continued flawless operation of the actuator, we recommend using filtered compressed air.
Technical Data / Exploded View - Cooling Unit CU07SVP01

**NOTICE**
If the mold temperature is 80 °C or more, the Cooling Unit CU07SVP01 is required.

**Technical Data CU07SVP01**

<table>
<thead>
<tr>
<th>Method</th>
<th>Cooling water</th>
</tr>
</thead>
<tbody>
<tr>
<td>Temperature:</td>
<td>min. 30 °C / max. 60 °C</td>
</tr>
<tr>
<td>Temp. difference IN/OUT</td>
<td>max. 5 °C</td>
</tr>
<tr>
<td>Flow rate per unit</td>
<td>4 l/min</td>
</tr>
<tr>
<td>Pressure:</td>
<td>max. 8 bar</td>
</tr>
<tr>
<td>Connections:</td>
<td>M14x1.5 (10-L)</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Pos</th>
<th>Qty</th>
<th>Part Number</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>01</td>
<td>2</td>
<td>CU07SVPCS01</td>
<td>Cooling Sleeve</td>
</tr>
<tr>
<td>02</td>
<td>1</td>
<td>CU07SVPCT01</td>
<td>Connecting Tube</td>
</tr>
<tr>
<td>03</td>
<td>2</td>
<td>Z942/6</td>
<td>Sealing Plug</td>
</tr>
<tr>
<td>04</td>
<td>4</td>
<td>GE08LME-DVITOMDCF</td>
<td>Straight Coupling</td>
</tr>
<tr>
<td>05</td>
<td>2</td>
<td>EW08LME-DVITOMDCF</td>
<td>Elbow Coupling</td>
</tr>
<tr>
<td>06</td>
<td>2</td>
<td>PSR08LX</td>
<td>Cutting Ring</td>
</tr>
<tr>
<td>07</td>
<td>2</td>
<td>M08LCFX</td>
<td>Nut</td>
</tr>
<tr>
<td>08</td>
<td>3</td>
<td>DIN912-M6x95-12.9</td>
<td>Hexagon Socket Cap Screw</td>
</tr>
</tbody>
</table>

Position of the cooling unit on the nozzle head.

CU07SVP01 mounted on Single Axis Valve Gate Nozzle 09SVP
### 10.3.3.1 Single Axis Valve Gate Nozzle 09SVP Parts List

In this section the nozzle parts are identified with the numbers indicated in the following figure.

**NOTICE**

Always tighten the screws to the torque specified in the respective table in section 13.

<table>
<thead>
<tr>
<th>Pos.</th>
<th>Qty</th>
<th>Description</th>
<th>Part Number</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>1</td>
<td>Isolation nut</td>
<td>CBN0010S</td>
</tr>
<tr>
<td>2</td>
<td>1</td>
<td>Isolation ring</td>
<td>CBN0020S</td>
</tr>
<tr>
<td>3</td>
<td>1</td>
<td>Nozzle head top</td>
<td>CBN0030S### (varied)</td>
</tr>
<tr>
<td>4</td>
<td>1</td>
<td>Bridge</td>
<td>CBN0040S</td>
</tr>
<tr>
<td>5</td>
<td>2</td>
<td>Sealing sleeve</td>
<td>CBN0050S</td>
</tr>
<tr>
<td>6</td>
<td>1</td>
<td>Cooling bar</td>
<td>CBN0060S</td>
</tr>
<tr>
<td>7</td>
<td>1</td>
<td>Nozzle head bottom</td>
<td>CBN0071S</td>
</tr>
<tr>
<td>8</td>
<td>1</td>
<td>Pneumatic cylinder housing top</td>
<td>CBN0081S</td>
</tr>
<tr>
<td>9</td>
<td>2</td>
<td>Piston sealing</td>
<td>CBN0090S</td>
</tr>
<tr>
<td>10</td>
<td>1</td>
<td>Threaded ring</td>
<td>CBN0100S</td>
</tr>
<tr>
<td>11</td>
<td>1</td>
<td>Pneumatic cylinder housing bottom</td>
<td>CBN0111S</td>
</tr>
<tr>
<td>12</td>
<td>1</td>
<td>Guide sleeve</td>
<td>CBN120S</td>
</tr>
<tr>
<td>13</td>
<td>1</td>
<td>Sleeve nut</td>
<td>CBN0160S</td>
</tr>
<tr>
<td>14</td>
<td>1</td>
<td>Head body ring</td>
<td>09SVPHB-R-01</td>
</tr>
<tr>
<td>15</td>
<td>1</td>
<td>Shutoff nozzle tip</td>
<td>(varied)</td>
</tr>
<tr>
<td>16</td>
<td>1</td>
<td>Shutoff valve pin</td>
<td>(varied)</td>
</tr>
<tr>
<td>17</td>
<td>1</td>
<td>Heater band</td>
<td>HB320691</td>
</tr>
<tr>
<td>18</td>
<td>4</td>
<td>Hexagon socket cap screw</td>
<td>DIN912-M3X14-12.9</td>
</tr>
<tr>
<td>19</td>
<td>1</td>
<td>Hexagon socket cap screw</td>
<td>DIN912-M4X12-12.9</td>
</tr>
<tr>
<td>20</td>
<td>4</td>
<td>Hexagon socket cap screw</td>
<td>DIN7984-M5X40-10.9</td>
</tr>
<tr>
<td>21</td>
<td>2</td>
<td>Hexagon socket cap screw</td>
<td>DIN912-M5X6-12.9</td>
</tr>
<tr>
<td>22</td>
<td>4</td>
<td>Hexagon socket cap screw</td>
<td>DIN7984-M4X40-8.8</td>
</tr>
<tr>
<td>23</td>
<td>1</td>
<td>Hexagon socket set screw</td>
<td>DIN915-M5X10-45H</td>
</tr>
<tr>
<td>24</td>
<td>1</td>
<td>Parallel pin</td>
<td>DIN6325-4m6X12</td>
</tr>
<tr>
<td>25</td>
<td>2</td>
<td>Hexagon socket set screw</td>
<td>DIN914-M3X5-45H</td>
</tr>
<tr>
<td>26</td>
<td>2</td>
<td>Thermocouple</td>
<td>XTA00115001</td>
</tr>
<tr>
<td>27</td>
<td>1</td>
<td>Nozzle body complete</td>
<td>09E01 (varied)</td>
</tr>
<tr>
<td>28</td>
<td>1</td>
<td>Head body</td>
<td>09SVPHB-01</td>
</tr>
<tr>
<td>29</td>
<td>1</td>
<td>Hexagon socket cap screw</td>
<td>DIN912-M3X10-12.9</td>
</tr>
<tr>
<td>30</td>
<td>1</td>
<td>Clamping device</td>
<td>GAN0170S</td>
</tr>
<tr>
<td>31</td>
<td>1</td>
<td>Heater band</td>
<td>IB32H-022-01</td>
</tr>
<tr>
<td>32</td>
<td>1</td>
<td>Hexagon socket cap screw</td>
<td>DIN6325-3M6X8</td>
</tr>
</tbody>
</table>
Assembly Tools

In this section the Stripping and Mounting Tool parts are identified with the numbers indicated in the following figure.

Nozzle Disassembly Tool

<table>
<thead>
<tr>
<th>Pos.</th>
<th>Part No.</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>T1</td>
<td>AT09SVP-01</td>
<td>Nut</td>
</tr>
</tbody>
</table>

Heater Disassembly Tool Compl. 09E AT09E03

<table>
<thead>
<tr>
<th>Pos.</th>
<th>Part No.</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>T1.1</td>
<td>AT09E0301</td>
<td>Heater Disassembly Tool 09E Type 01</td>
</tr>
<tr>
<td>T1.2</td>
<td>AT09E0302</td>
<td>Heater Disassembly Tool 09E Type 02</td>
</tr>
<tr>
<td>T1.3</td>
<td>AT09E0303</td>
<td>Heater Disassembly Tool 09E Type 03</td>
</tr>
</tbody>
</table>
Safety Instructions for the Service at the Single Axis Valve Gate Nozzle 09SVP

**WARNING**

**Hot Surfaces Hazard**

Contact between the skin and hot surfaces could result in burns.

Use personal protective equipment, such as gloves, apron, sleeves and face protection, to guard against burns.

When servicing or handling the hot runner system outside the manifold plates or the injection molding machine, care must be taken to heed the hot surface exposure warnings.

For first aid contact your medical / safety representing.

**Hazard of Pressurized Air**

Pressurized air blow can result in hot plastic or foreign bodies entering the eyes, causing vision damage.

Use personal protective equipment: Face protection, hearing protection and gloves.

For first aid contact your medical / safety representing.

**NOTICE**

**Hazard of Material Damage**

Without consulting Synventive it is not permitted to do modifications to the hot runner system e.g. geometrical changes to the nozzle tip, except the part shape adjustment in the area of material allowance.

Any impact against the nozzle tip may result in its damage.

Never hammer or impact the nozzle tip from the front (i.e. from the side of the mold).

Twisting could damage the nozzle tip.

When replacing the nozzles, the sealing rings must always be replaced.
10.3.3.2 Dismounting the Pneumatic Cylinder Housing and Sealing

1) Remove the socket head cap screw (19).
2) Remove the dasher and grounding cable.
3) Solve the hexagon socket set screws (25).
4) Lower the head body ring (14).
5) Tension the nozzle on the flanks of the head body (28) in a vice.
6) Remove the isolation nut (1).
7) Loosen the hexagon socket set screw (23).
8) Uncrew the complete actuator housing (11) (8) from the guide sleeve (12).

9) Remove the 4 socket head cap screws (22).

10) Lift the cylinder housing top (8) from the cylinder housing bottom (11).

11) Lift the threaded ring (10) out of the cylinder housing bottom (11).
Disassembly Nozzle 09E from the Head Body

1) Fix the nozzle (27) at the head body (28) in a vice.

**NOTICE**
Refer to the procedure section 10.1.2.2 including „Disassembling the Nozzle Heater“ and „Disassembling the Nozzle Tip“

The difference is as follow:
- The 09SVP nozzle is fixed in a vice
- The 09E is fixed in the manifold.

**NOTICE**
Using the tool “at09svp-01”

2) Place the tool nut (T1) over the nozzle body (1.1) at the hexagonal shape.

3) Use a wrench to loosen the nozzle (1.1) from the nozzle head (2.1) via the tool nut (T1) by rotation (counter clockwise).
10.3.3.3 Assembly of the Pneumatic Actuator on the Nozzle

Assembly of the Threaded Ring into the Cylinder Housing

**NOTICE**
After disassembly of the sealing elements, the original seals should be replaced as required by Synventive.

1) Lubricate the piston sealing (9) with hydraulic oil or white grease.
2) Mount the piston sealing (9) into the seal groove of the threaded ring (10).

**NOTICE**
Avoid damage of the piston sealing and check the correct fit. Damaged piston sealing (9) has to be replaced.

3) Assemble the cylinder housing top (8) on cylinder housing bottom (11).

4) Attach the 4 hexagon socket cap screws (22).

**NOTICE**
Tighten the hexagon socket cap screws (22) crosswise.
Use torque wrench with wrench insert and the torques indicated in the torque table (Section 13).
Mounting the Nozzle 09E on the Head Body

1) Check the matching between the head body surfaces and the nozzle body surface.

**NOTICE**
The head body must bear on all surfaces uniformly and flatly, in particular on the head body contact face.

In case of any uncertainty, clean the surfaces with a cleaning cloth. If the next ink test is still unsatisfactory, please - contact Synventive Customer Service or Technical Support.

With a positive ink test clean the surfaces and proceed to the next step.

2) Lubricate the thread (not the face) of the nozzle body with high-temperature assembly paste (antiseize compound).

**NOTICE**
This is an important measure to prevent thread corrosion due to aggressive gases, which could be released during plastics processing.

Setup for the Disassembly and Assembly of the Nozzle from / to the Head body

3) Fix the nozzle (27) at the head body (28) in a vice.

4) Tighten the nozzle body

**NOTE**
Using the tool “at09svp-01”
Torque value – 100 Nm

**NOTICE**
To complete the nozzle refer to the procedure section “Assembling Nozzle 09E-02” on page 287 including „Assembling the Nozzle Heater“ and „Assembling the Nozzle Tip and Nozzle Body“

The difference is as follow:

- The 09SVP nozzle is fixed in a vice
- The 09E is fixed in the manifold
Mounting the Pneumatic Cylinder Housing on the Nozzle Assembly

1) Screw the hexagon socket set screw (23) into the guide sleeve (12).

2) Sleeve the guide sleeve (12) over the heater band (17).

3) Solve the hexagon socket set screws (25).
4) Lower the head body ring (14).
5) Tension the nozzle on the flanks of the head body (28) in a vice.
**NOTICE**

Examine whether the isolation ring (2) at the nozzle head top (3) is placed in the right position.

6) Screw in the pneumatic cylinder housing (11) (8) at the guide sleeve (12).

---

7) Orientate the housing within parallel pin (24) and press up the pneumatic cylinder housing to the limit stop.

---

8) Check the movement of the cooling bar (6).

**NOTICE**

If the movement of the cooling bar (6) is restricted, contact the Synventive Customer Service or Technical Support.
9) Screw in the isolation nut (1) at the nozzle head top (3) and tighten the isolation nut (1).

**NOTICE**
Torque value - 40 Nm

10) Tighten the hexagon socket set screw (23).

11) Remove the nozzle, which is fixed in a vise at the nozzle head base body (28), out of this fixing and fix it now, if necessary at the isolation nut (1).

12) Slide the head body ring (14) over the head body (28).

13) Tighten the head body ring (14) with the two hexagon socket set screws (25).

14) Check the position of the cooling bar (6) on the pneumatic cylinder housing bottom (11).

**NOTICE**
The cooling bar (6) must be easily movable to be positioned on the pneumatic cylinder housing bottom (11). If this is not possible, contact Synventive customer service.

15) Tighten the cooling bar (6) and ground wire with a socket cap screw (19) on the cylinder housing bottom (11).

**NOTICE**
See the order of the components in the image of the right side Doc007413.png
10.3.3.4 Dismounting and Mounting of the Thermocouple

Dismounting of the Thermocouple

**NOTICE**

For dismounting and mounting the thermocouple there is not a need to have the cylinder housing dismounted.

1) Loosen the hexagon socket cap screw (29).
2) Move the clamping device (30) to the side, away from the thermocouple (26).
3) Pull the thermocouple (26) out of the bore of the heater band (17).
4) Loosen the hexagon socket set screws (25).
5) Move the head body ring (14), then move the heater band (31).
6) Pull the thermocouple (26) out of the bore of the head body (28).
Mounting of the Thermocouple

**NOTICE**

For dismounting and mounting the thermocouple there is not a need to have the cylinder housing dismounted.

1) Guide the thermocouple (26) through the heater band (17) into the thermocouple hole on the nozzle head bottom (7).

2) Bring the clamping device (30) to vertical position.
3) Fix the thermocouple (26) with the hexagon socket cap screw (29).

4) Align the thermocouple (26) in the nozzle heater (17) direction.
5) Fix the thermocouple (26) with heat resistant adhesive tape at the outlet of the nozzle heater (17).
6) Guide the thermocouple (26) into the thermocouple hole of the head body (28).
7) Mount the heater band (31).
8) Slide the head body ring (14) over the head body (28).
9) Tighten the head body ring (14) with the two hexagon socket set screws (25).

10.3.3.5 Grounding of the Single Axis Valve Gate Nozzle

DANGER

Danger to Life by Electric Shock

The Single Axis Valve Gate Nozzle has to be properly grounded to prevent serious personal injury or death.

Electrical work must be carried out by qualified persons.
Verify that all power source connections are properly grounded. In Emergency case - Switch all systems off.
For first aid contact your medical / safety representing.

1) Check the position of the cooling bar (6) on the pneumatic cylinder housing bottom (11).

NOTICE

The cooling bar (6) must be easily movable to be positioned on the pneumatic cylinder housing bottom (11). If this is not possible, contact Synventive customer service.

2) Tighten the cooling bar (6) and ground wire with a socket cap screw (19) on the cylinder housing bottom (11).

NOTICE

See the order of the components in the image of the right side Doc007413.png
10.3.3.6 Valve Pin Height Adjustment

1) Use pneumatic pressure with reduced pressurized air of approx. 2.76 bar (40 psi) on connection (A) to drive the valve pin in valve gate closed position.

2) Unscrew the socket set screw (23).

3) Adjust valve pin position with an pin Ø 5 mm in holes of the threaded ring (10).

4) Turn the threaded ring (10) by using a pin (Ø 5) to get the valve pin front into basic position 0,15 mm.

**NOTICE**

Turning one hole forward results in a height adjustment of 0,25 mm at the valve pin.

5) Tighten the socket set screw (23) - screw up to stop and then turn 90° degree to tying up.

(A) Pneumatic access “CLOSE”
(B) Pneumatic access “OPEN”
10.3.3.7 Disassembling the Single Axis Valve Gate Nozzle out of the Mold

**NOTICE**

The Single Axis Valve Gate Nozzle is located on the fit diameters of the nozzle tip and the lower part of the cylinder housing in the mold.

Disassembling the Single Axis Valve Gate Nozzle inclusive of actuator out of the mold

1) Cool down the Single Axis Valve Gate Nozzle and the mold to room temperature.
2) Lift the Single Axis Valve Gate Nozzle inclusive of actuator out of the mold.

**NOTICE**

If it is not possible to lift the Single Axis Valve Gate Nozzle inclusive of actuator out of the mold, please contact the Synventive Customer Service or Technical Support.
10.3.4 Single Axis Valve Gate Nozzle 12SVP

Technical Data

<table>
<thead>
<tr>
<th>Valve pin operation</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Operation medium</td>
<td>pneumatic</td>
</tr>
<tr>
<td>Pressure range</td>
<td>5 - 10 bar (72.5 - 145 psi)</td>
</tr>
<tr>
<td>Flowrate</td>
<td>5.4 l/min / 5 bar (72.5 psi)</td>
</tr>
<tr>
<td>Reaction time</td>
<td>~1,2 s</td>
</tr>
<tr>
<td>Valve pin stroke:</td>
<td>13 mm</td>
</tr>
<tr>
<td>Adjustment</td>
<td>± 1.5 mm Via adjustment threads from outside.</td>
</tr>
<tr>
<td>Closing force</td>
<td>2081 N / 6 bar (87 psi)</td>
</tr>
<tr>
<td>Opening force</td>
<td>2081 N / 6 bar (87 psi)</td>
</tr>
<tr>
<td>Connection</td>
<td>M12x1.5</td>
</tr>
</tbody>
</table>

Valve pin

<table>
<thead>
<tr>
<th>Valve pin diameter</th>
<th>Ø 6 mm</th>
</tr>
</thead>
<tbody>
<tr>
<td>Attachment</td>
<td>Quick coupling, anti-rotation</td>
</tr>
</tbody>
</table>

Heating Power

The numbering of the heating zones starts at the nozzle tip and ends at the nozzle head.

| Zone 1 (From a nozzle length of 50 mm) | 300 - 417 Watt |
| Zone 2 (From a nozzle length of >215 mm) | 530 - 770 Watt |
| Head                               | 630 plus 650 Watt |

**NOTICE**

To ensure long life and continued flawless operation of the actuator, we recommend using filtered compressed air.
Technical Data / Exploded View - Cooling Unit CU12SVP01

**NOTICE**

If the mold temperature is 80 °C or more, the Cooling Unit CU12SVP01 is required.

### Technical Data

**Method:** Cooling water  
**Temperature:** min. 30 °C / max. 60 °C  
Temp. difference IN/OUT max. 5 °C  
**Flow rate per unit:** 4 l/min  
**Pressure:** max. 8 bar  
**Connections:** M14x1.5 (10-L)

<table>
<thead>
<tr>
<th>Pos.</th>
<th>Qty.</th>
<th>Part Number</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>01</td>
<td>2</td>
<td>CU12SVPCS01</td>
<td>Cooling Sleeve</td>
</tr>
<tr>
<td>02</td>
<td>1</td>
<td>CU12SVPCT01</td>
<td>Connecting Tube</td>
</tr>
<tr>
<td>03</td>
<td>2</td>
<td>Z942/6</td>
<td>Sealing Plug</td>
</tr>
<tr>
<td>04</td>
<td>4</td>
<td>GE08LMEDVITOMDCF</td>
<td>Straight Coupling</td>
</tr>
<tr>
<td>05</td>
<td>2</td>
<td>EW08LVITOMDCF</td>
<td>Elbow Coupling</td>
</tr>
<tr>
<td>06</td>
<td>2</td>
<td>PSR08LX</td>
<td>Cutting Ring</td>
</tr>
<tr>
<td>07</td>
<td>2</td>
<td>M08LCFX</td>
<td>Nut</td>
</tr>
<tr>
<td>08</td>
<td>3</td>
<td>DIN912-M6x110-12.9</td>
<td>Hexagon Socket Cap Screw</td>
</tr>
</tbody>
</table>

Position of the cooling unit on the nozzle head.

CU12SVP01 mounted on Single Axis Valve Gate Nozzle 12SVP
### 10.3.4.1 Single Axis Valve Gate Nozzle 12SVP Parts List

In this section the nozzle parts are identified with the numbers indicated in the following figure.

**NOTICE**

Always tighten the screws to the torque specified in the respective table in section 13.

<table>
<thead>
<tr>
<th>Pos.</th>
<th>Qty.</th>
<th>Description</th>
<th>Part Number</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>1</td>
<td>Isolation nut</td>
<td>GAN0010S</td>
</tr>
<tr>
<td>2</td>
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<td>Isolation ring</td>
<td>GAN0020S</td>
</tr>
<tr>
<td>3</td>
<td>1</td>
<td>Nozzle head top</td>
<td>GAN0030S### (varied)</td>
</tr>
<tr>
<td>4</td>
<td>1</td>
<td>Bridge</td>
<td>GAN0040S</td>
</tr>
<tr>
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<td>Guide sleeve</td>
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<td>Heater band</td>
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<td>12E04 (varied)</td>
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<td>Shutoff nozzle tip</td>
<td>(varied)</td>
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<td>16</td>
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<td>2</td>
<td>Thermo couple</td>
<td>XTA00115001</td>
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<tr>
<td>27</td>
<td>1</td>
<td>Head body</td>
<td>12SVPHB-01</td>
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<td>28</td>
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<td>29</td>
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<td>Clamping device</td>
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Assembly Tools

In this section the Stripping and Mounting Tool parts are identified with the numbers indicated in the following figure.

Assembly Tools for TTP, TFP TTW Nozzle Tips

<table>
<thead>
<tr>
<th>Pos.</th>
<th>Part No.</th>
<th>Description</th>
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<tr>
<td>T1</td>
<td>AT12E-0104</td>
<td>Nozzle Tip</td>
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<tr>
<td>T2</td>
<td>AT12E-0103</td>
<td>TTP, TFP TTW Assembly Tool</td>
</tr>
<tr>
<td>T3</td>
<td>AT12E-0105</td>
<td>Seal Cap TTW Assembly Tool</td>
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</table>

Nozzle Disassembly Tool

<table>
<thead>
<tr>
<th>Pos.</th>
<th>Part No.</th>
<th>Description</th>
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</thead>
<tbody>
<tr>
<td>T1</td>
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Heater Disassembly Tool Compl. AT12E-0101

<table>
<thead>
<tr>
<th>Pos.</th>
<th>Part No.</th>
<th>Description</th>
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</thead>
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<tr>
<td>T1.1</td>
<td>AT12E-010101</td>
<td>Heater Disassembly Tool 12E Type 01</td>
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<tr>
<td>T1.2</td>
<td>AT12E-010102</td>
<td>Heater Disassembly Tool 12E Type 02</td>
</tr>
<tr>
<td>T1.3</td>
<td>AT12E-010103</td>
<td>Heater Disassembly Tool 12E Type 03</td>
</tr>
</tbody>
</table>
## Safety Instructions for the Service at the Single Axis Valve Gate Nozzle 12SVP

### WARNING

#### Hot Surfaces Hazard
- **Contact between the skin and hot surfaces could result in burns.**
- Use personal protective equipment, such as gloves, apron, sleeves and face protection, to guard against burns.
- When servicing or handling the hot runner system outside the manifold plates or the injection molding machine, care must be taken to heed the hot surface exposure warnings.
- For first aid contact your medical / safety representing.

#### Hazard of Pressurized Air
- **Pressurized air blow can result in hot plastic or foreign bodies entering the eyes, causing vision damage.**
- Use personal protective equipment: Face protection, hearing protection and gloves.
- For first aid contact your medical / safety representing.

### NOTICE

#### Hazard of Material Damage
- **Without consulting Synventive it is not permitted to do modifications to the hot runner system e.g. geometrical changes to the nozzle tip, except the part shape adjustment in the area of material allowance.**
- **Any impact against the nozzle tip may result in its damage.**
- Never hammer or impact the nozzle tip from the front (i.e. from the side of the mold).
- **Twisting could damage the nozzle tip.**
- When replacing the nozzles, the sealing rings must always be replaced.
10.3.4.2 Dismounting the Pneumatic Cylinder Housing and Sealing

1) Remove the socket head cap screw (19).
2) Remove the dasher and grounding cable.

3) Fix the nozzle at the flanks of the isolation nut (1) in a vice.
4) Loosen the isolation nut (1) at the nozzle tip (15).
5) Remove the isolation nut (1).
6) Loosen the hexagon socket set screw (23).

7) Uncrew the complete cylinder housing (11) (8) from the guide sleeve (12).

8) Remove the 4 socket head cap screws (22).

9) Lift the cylinder housing top (8) from the cylinder housing bottom (11).
10) Lift the threaded ring (10) out of the cylinder housing bottom (11).

11) Dismount the piston sealing (9) out of the threaded ring (10).
10.3.4.3 Assembly of the Pneumatic Actuator on the Nozzle

Assembly of the Threaded Ring into the Cylinder Housing

**NOTICE**

After disassembly of the sealing elements, the original seals should be replaced as required by Synventive.

1) Lubricate the piston sealing (9) with hydraulic oil or white grease.
2) Mount the piston sealing (9) into the seal groove of the threaded ring (10).

**NOTICE**

Avoid damage of the piston sealing and check the correct fit. Damaged piston sealing (9) has to be replaced.

1) Lubricate the piston sealing (9) with hydraulic oil or white grease.
2) Mount the piston sealing (9) into the seal groove of the threaded ring (10).

**NOTICE**

The groove at the threaded ring follows the direction of machine nozzle (A).

3) Guide the threaded ring (10) into the cylinder housing (11).

4) Assemble the cylinder housing top (8) on cylinder housing bottom (11).
5) Attach the 4 hexagon socket cap screws (22).

**NOTICE**
Tighten the hexagon socket cap screws (22) crosswise. Use torque wrench with wrench insert and the torques indicated in the torque table (Section 13).

Mounting the Pneumatic Cylinder Housing on the Nozzle

**NOTICE**
Examine whether the isolation ring (2) at the nozzle head top (3) is placed in the right position.

1) Screw in the pneumatic cylinder housing (11) (8) at the guide sleeve (12).

2) Orientate the housing within parallel pin (24) and press up the pneumatic cylinder housing to the limit stop.
3) Check the movement of the cooling bar (6).

**NOTICE**

If the movement of the cooling bar (6) is restricted, contact the Synventive Customer Service or Technical Support.

4) Screw in the isolation nut (1) at the nozzle head top (3).
5) Fix the nozzle at the flanks of the isolation nut (1) in a vice.
6) Tighten the isolation nut (1) at the nozzle tip (15).

**NOTICE**
Torque value - 40 Nm

7) Tighten the hexagon socket set screw (23).

8) Check the position of the cooling bar (6) on the pneumatic cylinder housing bottom (11).

**NOTICE**
The cooling bar (6) must be easily movable to be positioned on the pneumatic cylinder housing bottom (11). If this is not possible, contact Synventive customer service.

9) Tighten the cooling bar (6) and ground wire with a socket cap screw (19) on the cylinder housing bottom (11).

**NOTICE**
See the order of the components in the image of the right side Doc007413.png
10.3.4.4 Dismounting and Mounting of the Nozzle

Dismounting of the Nozzle and Heater from the Head Body

1) Dismount the cylinder housing (8) (11) as described in the above section 10.3.4.2.

2) Screw out 2 hexagon socket set cap screws (21).

3) Take off the guide sleeve (12) from the heater band (17).
4) Fix the nozzle (14) at the head body (27) in a vice.

**NOTICE**

Refer to the procedure section 10.1.3.2 Disassembly Nozzle 12E including „Disassembling the Nozzle Heater“ and „Disassembling the Nozzle Tip and Nozzle Body“

The difference is as follow:
- The 12SVP nozzle is fixed in a vice
- The 12E is fixed in the manifold.

**Mounting of the Nozzle and Heater**

**NOTICE**

For the assembly procedure follow the section 10.1.3.3 Assembly Nozzle 12E.

The difference is as follow:
- The 12SVP nozzle is fixed in a vice
- The 12E is fixed in the manifold.

For Mounting the Actuator Housing on the Single Axis Valve Gate Nozzle 12SVP, see the section 10.3.4.3 above.

**NOTICE**

The torque value for fastening the nozzle body on the head body (27) is 175 Nm.
10.3.4.5 Dismounting and Mounting of the Thermocouple

Dismounting of the Thermocouple

**NOTICE**
For dismounting and mounting the thermocouple there is not a need to have the cylinder housing dismounted.

1) Loosen the hexagon socket cap screw (28).
2) Move the clamping device (29) to the side, away from the thermocouple (26).

3) Pull the thermocouple (26) out of the bore of the heater band (17) and nozzle head bottom (7).

4) Dismount the 12E-04 nozzle heater.

**NOTICE**
Follow the heater dismounting procedure of the nozzle 12E-04 Series.

5) Move the heater band (13).
6) Pull the thermocouple (26) out of the bore of the head body (27).
Mounting of the Thermocouple

**NOTICE**
For dismounting and mounting the thermocouple there is not a need to have the cylinder housing dismounted.

1) Guide the thermocouple (26) through the heater band (17) into the thermocouple hole of the nozzle head bottom (7).

2) Bring the clamping device (29) to vertical position.
3) Fix the thermocouple (26) with the hexagon socket cap screw (28).
4) Align the thermocouple (26) in the nozzle heater (17) direction.
5) Fix the thermocouple (26) with heat resistant adhesive tape at the outlet of the nozzle heater (17).

6) Guide the thermocouple (26) into the thermocouple hole of the head body (27).
7) Mount the heater band (13).
8) Complete the nozzle 12E-04.

**NOTICE**
Follow the mounting procedure of the nozzle 12E-04 Series.
10.3.4.6 Grounding of the Single Axis Valve Gate Nozzle

**DANGER**

**Danger to Life by Electric Shock**

The Single Axis Valve Gate Nozzle has to be properly grounded to prevent serious personal injury or death.

- Electrical work must be carried out by qualified persons.
- Verify that all power source connections are properly grounded.
- In Emergency case - Switch all systems off.
- For first aid contact your medical / safety representing.

1) Check the position of the cooling bar (6) on the pneumatic cylinder housing bottom (11).

**NOTICE**

The cooling bar (6) must be easily movable to be positioned on the pneumatic cylinder housing bottom (11). If this is not possible, contact Synventive customer service.

2) Tighten the cooling bar (6) and ground wire with a socket cap screw (19) on the cylinder housing bottom (11).

**NOTICE**

See the order of the components in the image of the right side Doc007413.png
10.3.4.7 Valve Pin Height Adjustment

1) Use pneumatic pressure with reduced pressurized air of approx. 2.76 bar (40 psi) on connection (A) to drive the valve pin in valve gate closed position.

2) Unscrew the socket set screw (23).

3) Adjust valve pin position with an pin Ø 5 mm in holes of the threaded ring (10).

4) Turn the threaded ring (10) to get the valve pin front into basic position 0.3 mm.

NOTICE

Turning one hole forward results in a height adjustment of 0.25 mm at the valve pin.

5) Tighten the socket set screw (23) - screw up to stop and then turn 90° degree to tying up.
10.3.4.8 Disassembling the Single Axis Valve Gate Nozzle out of the Mold

**NOTICE**
The Single Axis Valve Gate Nozzle is located on the fit diameters of the nozzle tip and the lower part of the cylinder housing in the mold.

Disassembling the Single Axis Valve Gate Nozzle inclusive of actuator out of the mold

1) Cool down the Single Axis Valve Gate Nozzle and the mold to room temperature.
2) Lift the Single Axis Valve Gate Nozzle inclusive of actuator out of the mold.

**NOTICE**
If it is not possible to lift the Single Axis Valve Gate Nozzle inclusive of actuator out of the mold, please contact the Synventive Customer Service or Technical Support.
10.3.5 Single Axis Valve Gate Nozzle 16SVP

**Technical Data**

<table>
<thead>
<tr>
<th>Operation medium</th>
<th>pneumatic</th>
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</thead>
<tbody>
<tr>
<td>Pressure range</td>
<td>5 - 10 bar (72.5 - 145 psi)</td>
</tr>
<tr>
<td>Flowrate</td>
<td>5.4 l/min / 5 bar (72.5 psi)</td>
</tr>
<tr>
<td>Reaction time</td>
<td>~1.4 s</td>
</tr>
<tr>
<td>Valve pin stroke</td>
<td>14 mm</td>
</tr>
<tr>
<td>Adjustment</td>
<td>± 1.5 mm Via adjustment threads from outside.</td>
</tr>
<tr>
<td>Closing force</td>
<td>3579 N / 6 bar (87 psi)</td>
</tr>
<tr>
<td>Opening force</td>
<td>3579 N / 6 bar (87 psi)</td>
</tr>
<tr>
<td>Connection</td>
<td>M12x1,5 (8-L)</td>
</tr>
</tbody>
</table>

**Valve pin**

- Valve pin diameter: Ø 8 mm
- Attachment: Quick coupling, anti-rotation

**Heating Power**

- The numbering of the heating zones starts at the nozzle tip and ends at the nozzle head.
- Zone 1 (From a nozzle length of 100 mm): 400 Watt
- Zone 2 (From a nozzle length of 120 mm): 558 - 1030 Watt
- Zone 3 (From a nozzle length of 370 mm): 1188 - 1230 Watt
- Head: 800 plus 680 Watt

**NOTICE**

To ensure long life and continued flawless operation of the actuator, we recommend using filtered compressed air.
**NOTICE**

If the mold temperature is 80 °C or more, the Cooling Unit CU16SVP01 is required.

### Technical Data CU16SVP01

**Method:** Cooling water

**Temperature:**
- Min. 30 °C / Max. 60 °C
- Temp. difference IN/OUT max. 5 °C

**Flow rate per unit:** 4 l/min

**Pressure:** Max. 8 bar

**Connections:** M14x1.5 (10-L)

<table>
<thead>
<tr>
<th>Pos.</th>
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<th>Part Number</th>
<th>Description</th>
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<tbody>
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<td>CU16SVPCS01</td>
<td>Cooling Sleeve</td>
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<td>02</td>
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<td>CU16SVPCT01</td>
<td>Connecting Tube</td>
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<tr>
<td>03</td>
<td>2</td>
<td>Z942/6</td>
<td>Sealing Plug</td>
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<tr>
<td>04</td>
<td>4</td>
<td>GE08LMEDVITOMDCF</td>
<td>Straight Coupling</td>
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<tr>
<td>05</td>
<td>2</td>
<td>EW08LVITOMDCF</td>
<td>Elbow Coupling</td>
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<tr>
<td>06</td>
<td>2</td>
<td>PSR08LX</td>
<td>Cutting Ring</td>
</tr>
<tr>
<td>07</td>
<td>2</td>
<td>M08LCFX</td>
<td>Nut</td>
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<td>08</td>
<td>3</td>
<td>DIN912-M6x110-12.9 Hexagon Socket Cap Screw</td>
<td></td>
</tr>
</tbody>
</table>

Position of the cooling unit on the nozzle head.

**CU16SVP01 mounted on Single Axis Valve Gate Nozzle 16SVP**

[Image of CU16SVP01 mounted on Single Axis Valve Gate Nozzle 16SVP]
### Single Axis Valve Gate Nozzle 16SVP Parts List

In this section, the nozzle parts are identified with the numbers indicated in the following figure.

#### NOTICE

Always tighten the screws to the torque specified in the respective table in section 13.

<table>
<thead>
<tr>
<th>Pos.</th>
<th>Qty.</th>
<th>Description</th>
<th>Part Number</th>
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<tbody>
<tr>
<td>1</td>
<td>1</td>
<td>Isolation nut</td>
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<td>Isolation ring</td>
<td>GBN0020S</td>
</tr>
<tr>
<td>3</td>
<td>1</td>
<td>Nozzle head top</td>
<td>GBN0031S###</td>
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<tr>
<td>4</td>
<td>1</td>
<td>Bridge</td>
<td>GBN0041S</td>
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<td>5</td>
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<td>Sealing sleeve</td>
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<td>6</td>
<td>1</td>
<td>Cooling bar</td>
<td>GBN0060S</td>
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<tr>
<td>7</td>
<td>1</td>
<td>Nozzle head bottom</td>
<td>GBN0071S</td>
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<tr>
<td>8</td>
<td>1</td>
<td>Pneumatic cylinder housing top</td>
<td>GBN0081S</td>
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<tr>
<td>9</td>
<td>2</td>
<td>Piston sealing</td>
<td>GBN0090S</td>
</tr>
<tr>
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<td>1</td>
<td>Threaded ring</td>
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<tr>
<td>12</td>
<td>1</td>
<td>Guide sleeve</td>
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<tr>
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<td>Nozzle body complete</td>
<td>16E04 (varied)</td>
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<td>Shutoff nozzle tip</td>
<td>(varied)</td>
</tr>
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<td>16</td>
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<td>Shutoff valve pin</td>
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<td>23</td>
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<td>Hexagon socket set screw</td>
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<td>Parallel pin</td>
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<td>2</td>
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<td>Head body</td>
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<td>29</td>
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10.3.5.2 Assembly Tools

In this section the Stripping and Mounting Tool parts are identified with the numbers indicated in the following figure.

Mounting Tool for Nozzle

<table>
<thead>
<tr>
<th>Pos.</th>
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<th>Description</th>
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<tbody>
<tr>
<td>T2</td>
<td>AT-16-040102</td>
<td>Nozzle Tip TTP, TFP TTW Assembly Tool.*</td>
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*The Nozzle Tip Assembly Tool is also used for the TTW Seal Cap assembly.

Heater Disassembly Tool Compl. AT16E-0102

<table>
<thead>
<tr>
<th>Pos. Qty</th>
<th>Part No.</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>T1.1</td>
<td>ATCYL0104</td>
<td>Stop bolt</td>
</tr>
<tr>
<td>T1.2</td>
<td>ATCYL0102</td>
<td>Guide</td>
</tr>
<tr>
<td>T1.3</td>
<td>ATCYL0101</td>
<td>Slide Hammer</td>
</tr>
<tr>
<td>T1.4</td>
<td>AT16E010201</td>
<td>Disassembly tube 16E</td>
</tr>
<tr>
<td>T1.5</td>
<td>DIN6325-6M6X30</td>
<td>Parallel pin</td>
</tr>
<tr>
<td>T1.6</td>
<td>AT16E010202</td>
<td>Clamping jaws</td>
</tr>
<tr>
<td>T1.7</td>
<td>AT16E010203</td>
<td>Clamping ring</td>
</tr>
<tr>
<td>T1.8</td>
<td>DIN6325-6M6X20</td>
<td>Parallel pin</td>
</tr>
<tr>
<td>T1.9</td>
<td>DIN916-M4X6-45H</td>
<td>Set screw</td>
</tr>
</tbody>
</table>

Heater Stripping Tool for 16E / 16S Nozzle AT16E0102

<table>
<thead>
<tr>
<th>Pos. Qty</th>
<th>Part No.</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>T1.1</td>
<td>ATCYL0104</td>
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<tr>
<td>T1.9</td>
<td>DIN916-M4X6-45H</td>
<td>Set screw</td>
</tr>
</tbody>
</table>
Safety Instructions for the Service at the Single Axis Valve Gate Nozzle 16SVP

**WARNING**

**Hot Surfaces Hazard**

Contact between the skin and hot surfaces could result in burns.

- Use personal protective equipment, such as gloves, apron, sleeves and face protection, to guard against burns.
- When servicing or handling the hot runner system outside the manifold plates or the injection molding machine, care must be taken to heed the hot surface exposure warnings.
- For first aid contact your medical / safety representing.

**Hazard of Pressurized Air**

Pressurized air blow can result in hot plastic or foreign bodies entering the eyes, causing vision damage.

- Use personal protective equipment: Face protection, hearing protection and gloves.
- For first aid contact your medical / safety representing.

**NOTICE**

**Hazard of Material Damage**

Without consulting Synventive it is not permitted to do modifications to the hot runner system e.g. geometrical changes to the nozzle tip, except the part shape adjustment in the area of material allowance.

- Any impact against the nozzle tip may result in its damage.
- Never hammer or impact the nozzle tip from the front (i.e. from the side of the mold).
- Twisting could damage the nozzle tip.
- When replacing the nozzles, the sealing rings must always be replaced.
10.3.5.3 Dismounting the Single Axis Valve Gate Nozzle 16SVP

Dismounting the Pneumatic Cylinder Housing and Sealing

1) Remove the socket head cap screw (19).
2) Remove the dasher and grounding cable.

3) Fix the nozzle at the flanks of the isolation nut (1) in a vice.
4) Loosen the isolation nut (1) via the nozzle tip (15).
5) Remove the isolation nut (1).
6) Loosen the hexagon socket set screw (23).

7) Uncrew the complete actuator housing (11) (8) from the guide sleeve (12).

8) Remove the 4 socket head cap screws (22).

9) Lift the cylinder housing top (8) from the cylinder housing bottom (11).
10) Lift the threaded ring (10) out of the cylinder housing bottom (11).

11) Dismount the piston sealing (9) out of the threaded ring (10).

### 10.3.5.4 Assembly of the Pneumatic Actuator on the Nozzle

#### Assembly of the Threaded Ring into the Cylinder Housing

**NOTICE**
After disassembly of the sealing elements, the original seals should be replaced as required by Synventive.

1) Lubricate the piston sealing (9) with hydraulic oil or white grease.
2) Mount the piston sealing (9) into the seal groove of the threaded ring (10).

**NOTICE**
Avoid damage of the piston sealing and check the correct fit. Damaged piston sealing (9) has to be replaced.
3) Guide the threaded ring (10) into the cylinder housing (11).

4) Assemble the cylinder housing top (8) on cylinder housing bottom (11).

5) Attach the 4 hexagon socket cap screws (22).

**NOTICE**

Tighten the hexagon socket cap screws (22) crosswise.

Use torque wrench with wrench insert and the torques indicated in the torque table (Section 13).
10.3.5.5 Mounting the Pneumatic Cylinder Housing on the Nozzle

**NOTICE**

Examine whether the isolation ring (2) at the nozzle head top (3) is placed in the right position.

1) Screw in the pneumatic cylinder housing (11) (8) at the guide sleeve (12).

2) Orientate the housing within parallel pin (24) and press up the pneumatic cylinder housing to the limit stop.
3) Check the movement of the cooling bar (6).

**NOTICE**

If the movement of the cooling bar (6) is restricted, contact the Synventive Customer Service or Technical Support.

4) Screw in the isolation nut (1) at the nozzle head top (3).
5) Fix the nozzle at the flanks of the isolation nut (1) in a vice.
6) Tighten the isolation nut (1) at the nozzle tip (15).

**NOTICE**

Torque value - 40 Nm

7) Tighten the hexagon socket set screw (23).

8) Check the position of the cooling bar (6) on the pneumatic cylinder housing bottom (11).

**NOTICE**

The cooling bar (6) must be easily movable to be positioned on the pneumatic cylinder housing bottom (11). If this is not possible, contact Synventive customer service.

9) Tighten the cooling bar (6) and ground wire with a socket cap screw (19) on the cylinder housing bottom (11).

**NOTICE**

See the order of the components in the image of the right side Doc007413.png.
10.3.5.6 Dismounting and Mounting of the Nozzle

Dismounting of the Nozzle and Heater from the Head Body

1) Dismount the cylinder housing (8) (11) as described in the above section page 445.

2) Screw out 2 hexagon socket screws (21).

3) Take off the guide sleeve (12) from the heater band (17).
4) Fix the nozzle (14) at the head body (27) in a vice.

**NOTICE**

Refer to the procedure section 10.1.4.2 Disassembly Nozzle 16E including „Disassembling the Nozzle Heater“ and „Disassembling the Nozzle Tip and Nozzle Body“

The difference is as follow:

- The 16SVP nozzle is fixed in a vice
- The 16E is fixed in the manifold

10.3.5.7 Mounting of the Nozzle and Heater on the Nozzle Housing

**NOTICE**

For the assembly procedure follow the section 10.1.4.3 Assembling Nozzle 16E.

The difference is as follow:

- The 16SVP nozzle is fixed in a vice
- The 16E is fixed in the manifold

For Mounting the Actuator Housing on the Single Axis Valve Gate Nozzle 16SVP, see the section 10.3.5.5 above.

**NOTICE**

The torque value for fastening the nozzle body on the head body (27) is 340 Nm.
10.3.5.8 Dismounting and Mounting of the Thermocouple

Dismounting of the Thermocouple

**NOTICE**
For dismounting and mounting the thermocouple there is not a need to have the cylinder housing dismounted.

1) Loosen the hexagon socket cap screw (29).
2) Move the clamping device (30) to the side, away from the thermocouple (26).

3) Pull the thermocouple (26) out of the bore of the heater band (17).

4) Dismount the 16E-04 nozzle heater.

**NOTICE**
Follow the heater dismounting procedure of the nozzle 16E-04.

5) Move the heater band (13).
6) Pull the thermocouple (26) out of the bore of the head body (27).
Mounting of the Thermocouple

1) Guide the thermocouple (26) through the heater band (17) into the thermocouple hole on the nozzle head bottom (7).

2) Bring the clamping device (29) to vertical position.
3) Fix the thermocouple (26) with the hexagon socket cap screw (28).
4) Align the thermocouple (26) in the nozzle heater (17) direction.
5) Fix the thermocouple (26) with heat resistant adhesive tape at the outlet of the nozzle heater (17).
6) Guide the thermocouple (26) into the thermocouple hole of the head body (27).
7) Mount the heater band (13).
8) Complete the nozzle 16E-04.

Follow the heater mounting procedure of the nozzle 16E-04.
10.3.5.9 Grounding of the Single Axis Valve Gate Nozzle

**DANGER**

**Danger to Life by Electric Shock**

The Single Axis Valve Gate Nozzle has to be properly grounded to prevent serious personal injury or death.

Electrical work must be carried out by qualified persons.

Verify that all power source connections are properly grounded. **In Emergency case - Switch all systems off.**

For first aid contact your medical / safety representing.

---

1) Check the position of the cooling bar (6) on the pneumatic cylinder housing bottom (11).

**NOTICE**

The cooling bar (6) must be easily movable to be positioned on the pneumatic cylinder housing bottom (11). If this is not possible, contact Synventive customer service.

2) Tighten the cooling bar (6) and ground wire with a socket cap screw (19) on the cylinder housing bottom (11).

**NOTICE**

See the order of the components in the image on the right side Doc007413.png

---

[Image of cooling bar and ground wire]
10.3.5.10 Valve Pin Height Adjustment

1) Use pneumatic pressure with reduced pressurized air of approx. 2.76 bar (40 psi) on connection (A) to drive the valve pin in valve gate closed position.

2) Unscrew the socket set screw (23).

3) Adjust valve pin position with an pin Ø 5 mm in holes of the threaded ring (10).

4) Turn the threaded ring (10) by using a pin (Ø 5) to get the valve pin front into basic position 0,3 mm.

**NOTICE**

Turning one hole forward results in a height adjustment of 0,25 mm at the valve pin.

5) Tighten the socket set screw (23) - screw up to stop and then turn 90° degree to tying up.

(A) Pneumatic access “CLOSE”

(B) Pneumatic access “OPEN”
10.3.5.11 Disassembling the Single Axis Valve Gate Nozzle out of the Mold

NOTICE

The Single Axis Valve Gate Nozzle is located on the fit diameters of the nozzle tip and the lower part of the cylinder housing in the mold.

Disassembling the Single Axis Valve Gate Nozzle inclusive of actuator out of the mold

1) Cool down the Single Axis Valve Gate Nozzle and the mold to room temperature.
2) Lift the Single Axis Valve Gate Nozzle inclusive of actuator out of the mold.

NOTICE

If it is not possible to lift the Single Axis Valve Gate Nozzle inclusive of actuator out of the mold, please contact the Synventive Customer Service or Technical Support.
### 10.4 Sprue Bushings

#### 10.4.1 Sprue Bushing 06S Series

**NOTICE**

Always tighten the screws to the torque specified in the respective table in section 13.

<table>
<thead>
<tr>
<th>WARNING</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Hot Surfaces Hazard</strong></td>
</tr>
<tr>
<td>Contact between the skin and hot surfaces could result in burns.</td>
</tr>
<tr>
<td>Use personal protective equipment, such as gloves, apron, sleeves and face protection, to guard against burns.</td>
</tr>
<tr>
<td>When servicing or handling the hot runner system outside the manifold plates or the injection molding machine, care must be taken to heed the hot surface exposure warnings.</td>
</tr>
<tr>
<td>For first aid contact your medical / safety representing.</td>
</tr>
</tbody>
</table>

| Hazard of Pressurized Air  |
| Pressurized air blow can result in hot plastic or foreign bodies entering the eyes, causing vision damage.  |
| Use personal protective equipment: Face protection, hearing protection and gloves.  |
| For first aid contact your medical / safety representing.  |

**NOTICE**

| Hazard of Material Damage  |
| Without consulting Synventive it is not permitted to do modifications to the hot runner system e.g. geometrical changes to the nozzle tip, except the part shape adjustment in the area of material allowance.  |
Technical Data - Sprue Bushing 06S

<table>
<thead>
<tr>
<th>Description</th>
<th>Pos.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Nozzle body</td>
<td>1</td>
</tr>
<tr>
<td>Component Ring</td>
<td>2</td>
</tr>
<tr>
<td>Version 01</td>
<td></td>
</tr>
<tr>
<td>Heating element</td>
<td>3</td>
</tr>
<tr>
<td>Component Ring</td>
<td>4</td>
</tr>
<tr>
<td>Version 02</td>
<td></td>
</tr>
<tr>
<td>Nozzle circlip</td>
<td>5</td>
</tr>
<tr>
<td>Nozzle tip</td>
<td>6</td>
</tr>
<tr>
<td>Wear insert</td>
<td>7</td>
</tr>
<tr>
<td>Single head</td>
<td>8</td>
</tr>
<tr>
<td>Thermocouple</td>
<td>9</td>
</tr>
<tr>
<td>Head heater</td>
<td>10</td>
</tr>
<tr>
<td>Retaining Ring</td>
<td>11</td>
</tr>
<tr>
<td>Parallel Pin</td>
<td>12</td>
</tr>
</tbody>
</table>

Flow Bore (J)  Ø 6 mm
Nozzle Length (L SB)  50 - 190 mm
Thermocouple  Type J, Type K
Nozzle Tips  TTP, TTW, TFP

*NOTICE*

Always tighten the screws to the torque specified in the respective table in section 13.
Disassembly / Assembly Tools

Nozzle Disassembly / Assembly Tools

In this section the Stripping and Mounting Tool parts are identified with the numbers indicated in the following figure.

<table>
<thead>
<tr>
<th>Pos.</th>
<th>Item</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>T1</td>
<td>AT06S-01</td>
<td>Nut</td>
</tr>
<tr>
<td>T2</td>
<td>AT06S-02</td>
<td>Holder</td>
</tr>
</tbody>
</table>

Nozzle Heater Disassembly / Assembly Tool

In this section the Stripping and Mounting Tool parts are identified with the numbers indicated in the following figure.

<table>
<thead>
<tr>
<th>Pos.</th>
<th>Item</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>T1.1</td>
<td>ATCYL0104</td>
<td>Stop bolt</td>
</tr>
<tr>
<td>T1.2</td>
<td>ATCYL0102</td>
<td>Guide</td>
</tr>
<tr>
<td>T1.3</td>
<td>ATCYL0101</td>
<td>Slide Hammer</td>
</tr>
<tr>
<td>T1.4</td>
<td>AT06E0101</td>
<td>Adapter</td>
</tr>
<tr>
<td>T1.5</td>
<td>Socket head cap screw M4</td>
<td></td>
</tr>
</tbody>
</table>
10.4.1.1 Dismounting and Mounting Nozzle Thermocouple

Dismounting Nozzle Thermocouple

1) Lift the thermocouple (3.1) at the retainer clip (a) out of the heating element (3) slot and pull it off the heating element.

**NOTICE**
The thermocouple (3.1) is clamped at the top of the heater element (3).

Mounting Nozzle Thermocouple

**NOTICE**
For mounting of the thermocouple to the nozzle heater, the nozzle heater must be dismantled from the nozzle.

Color coding of Thermocouples

**NOTICE**
Take notice of the production and color identification of thermocouple cables.

Synventive uses J and K type thermocouples. Their color coding is given in the following table.

<table>
<thead>
<tr>
<th>Type</th>
<th>International standard IEC 584-3</th>
</tr>
</thead>
<tbody>
<tr>
<td>J</td>
<td>Black + Black</td>
</tr>
<tr>
<td></td>
<td>Black - White</td>
</tr>
<tr>
<td>K</td>
<td>Green + Green</td>
</tr>
<tr>
<td></td>
<td>Green - White</td>
</tr>
</tbody>
</table>

1) Slide the thermocouple (3.1) in leadership of the heating element (3) until it stops.
2) Increase the pressure until the top of the thermocouple (3.1) completely is clamped in to the final position.
3) Check the position of the thermocouple (3.1).
4) Press the retainer clip (a) into the slot at the heating element (3).

**10.4.1.2 Disassembly the Nozzle 06S**

**NOTICE**

For work on the nozzle (with assembled nozzle head), the nozzle must be clamped in a vice via using the tool holder (T2). It is not allowed to clamp the nozzle in a vice directly.

**Disassembling Nozzle Head Heater**

1) Dismount the retaining ring (11) from the nozzle head (8).

2) Pull the nozzle head heater (10) from the nozzle head (8).
Disassembling the Nozzle Heater

1) Dismount the nozzle head heater (10) from the nozzle head (8), as described in the above page 463.

2) Remove the circlip (5) from the nozzle tip (6).

3) Remove the component ring version 02 (4).
NOTICE

To pull the nozzle heater (3), the nozzle has to be clamped on the round nozzle head (8) surface on a vice by using protective caps. A clamping of the flats would deform the nozzle head (8).

4) Fix the nozzle head (8) in a vice.
5) Move the adapter of the dismantling tool (T1.4) over the heater (3).
6) Fix the heater (3) with 2 socket head cap screws M4 (T1.5).
7) Screw the guide (T1.2) together with the stop bolt (T1.1) and the slide hammer (T1.3) into the adapter (T1.4).
8) To remove the nozzle heater (3) slide the hammer (T1.3) against the stop bolt (T1.1) repeatedly until the nozzle heater is released.
Disassembling the Nozzle and the Nozzle Tip

**WARNING**

**Hazard of Pressurized Air**

Pressurized air blow can result in hot plastic or foreign bodies entering the eyes, causing vision damage.

Following work must be carried out by qualified and experienced persons.

Use personal protective equipment: Face protection, hearing protection and gloves.

For first aid contact your medical / safety representing.

1) Dismount the nozzle head heater (10) from the nozzle head (8), as described in the above page 463.

2) Dismount the nozzle heater (3) from the nozzle (1), as described in the above page 464.

3) Fix the holder (T2) in a vice.

**NOTICE**

For work on the nozzle (with assembled nozzle head), the nozzle must be clamped in a vice via using the tool holder (T2). It is not allowed to clamp the nozzle in a vice directly.

4) Place the nozzle (1) with the head side (8) in the holder (T2) to fix the nozzle against rotation.

5) Place the tool nut (T1) along the nozzle body (1) at their hexagonal shape.

6) Use a wrench to loosen the nozzle (1) from the nozzle head (8) via the tool nut (T1) by rotation (counter clockwise).
7) Fix the dismounted nozzle body (1) on the hexagonal shape in a vice.

8) To remove cold plastic in melt consistence, heat the nozzle (6) by using a heat gun, to the maximum temperature of 200 °C (392 °F).

9) Unscrew the nozzle tip (6) from the nozzle body (1) using a ring wrench.

10) Clean the nozzle body (1) and nozzle tip (6) using pressurized air to remove as much residual plastic as possible.
10.4.1.3 Assembling the Nozzle 06S

NOTICE

For work on the nozzle (with assembled nozzle head), the nozzle must be clamped in a vice via using the tool holder (T2). It is not allowed to clamp the nozzle in a vice directly.

<table>
<thead>
<tr>
<th>Pos.</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Nozzle body</td>
</tr>
<tr>
<td>2</td>
<td>Component Ring Version 01</td>
</tr>
<tr>
<td>3</td>
<td>Heating element</td>
</tr>
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<td>4</td>
<td>Component Ring Version 02</td>
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</tr>
<tr>
<td>12</td>
<td>Parallel Pin</td>
</tr>
</tbody>
</table>

Assembling the Nozzle Body

NOTICE

For work on the nozzle (with assembled nozzle head), the nozzle must be clamped in a vice via using the tool holder (T2). It is not allowed to clamp the nozzle in a vice directly.

1) Fix the holder (T2) in a vice.
2) Place the nozzle head (8) in the holder (T2).

3) Apply spotting ink on the nozzle body (1) bottom surface (SF1)

4) Screw in the nozzle body (1) hand-tight into the nozzle head thread until seated.
5) Unscrew the nozzle body (1) from the nozzle head (8).

6) Check the matching between the nozzle head (8) bottom surfaces (SF2) and the nozzle body (1) surface (SF1).
   
   **NOTICE**

   The nozzle head must bear on all surfaces uniformly and flatly, in particular on the nozzle head contact face.

   In case of any uncertainty, clean the surfaces with a cleaning cloth. If the next ink test is still unsatisfactory, please contact Synventive Customer Service or Technical Support.

7) With a positive ink test, clean the surfaces and proceed to the next step.
8) Lubricate the thread (not the face) of the nozzle body with high-temperature assembly paste (antiseize compound).

**NOTICE**

This is an important measure to prevent thread corrosion due to aggressive gases, which could be released during plastics processing.

9) Tighten the nozzle body (1.1) to the nozzle head.

**NOTICE**

Use torque wrench with wrench insert and the torque specified in the torque table in section 13.

Mount the Nozzle Heater

**NOTICE**

For work on the nozzle (with assembled nozzle head), the nozzle must be clamped in a vice via using the tool holder (T2). It is not allowed to clamp the nozzle in a vice directly.

1) Slide the component ring version 01 (2), onto the nozzle body (1) up to the surface of the hexagon.

**NOTICE**

The component ring version 01 (2), is not assembled in all configurations. Reference system bill of materials.
**NOTICE**

Ensure the orientation of the wire leads matches opening in nozzle head (8).

2) Push the nozzle heater (3) onto the nozzle (1).

**NOTICE**

To ensure the temperature control of the nozzle tip, the heater must be flush with the nozzle body.

3) Control the position of the heater.
4) Bend the heater and thermocouple (ex) leads.

**NOTICE**
Use round-nosed pliers only.

Assembling the Nozzle Tip

1) The nozzle heater (3) must be mounted on the nozzle, and the nozzle inserted with the head side in the holder (T2), as described in the above page 470.
2) The holder (T2) is fixed in a vice.

**NOTICE**
The Nozzle head is still placed in the holder, fixed in a vice.

3) Apply spotting ink on the nozzle tip (6) bottom surface (SF1).
4) Screw in the nozzle tip (6) hand-tight into the nozzle body (1) until seated.
5) Unscrew the nozzle tip (6) from the nozzle body (1).
6) Check the matching between the nozzle body surface (SF2) and the nozzle tip surface (SF1).

**NOTICE**
The nozzle must bear uniformly on the outer surfaces uniformly and flatly, in particular on the nozzle tip contact face.

**NOTICE**
In case of any uncertainty, clean the surfaces with a cleaning cloth. If the next ink test is still unsatisfactory - please contact Synventive Customer Service or Technical Support.

7) With a positive ink test clean the surfaces and proceed to the next step.

8) Lubricate the thread (not the face) of the nozzle tip body with high-temperature assembly paste (antiseize compound).

**NOTICE**
This is an important measure to prevent thread corrosion due to aggressive gases, which could be released during plastics processing.

9) Screw in the nozzle tip (6) into the nozzle body (1) hand-tight.

10) Tighten the nozzle tip (6) to nozzle body(1) at room temperature.

**NOTICE**
Use torque wrench with wrench insert and the torque specified in the respective table in section 13.
11) Add the component ring version 02 (4) on the nozzle body (1).

---

**WARNING**

Hot Surfaces Hazard

Contact between the skin and the hot nozzle could result in burns.

12) Cool the nozzle to approximately 25 °C (77 °F).
13) Mount the circlip (5) on nozzle tip (6).

---

**Mount the Nozzle Head Heater**

1) Align the nozzle head thermocouple and supply line in the same direction as the heater wire leads.
2) Install the thermocouple, ensuring it is seated correctly in the internal nozzle head groove.
3) Place the nozzle head heater (10) on the nozzle head (8).

**NOTICE**

The nozzle head heater secures the thermocouple by covering it in the vertical groove.

The heating wire must exit through the central recess of the nozzle head.

4) Mount the retaining ring (11) on the nozzle head (8).
### 10.4.1.4 Grounding of the Sprue Bushing

**DANGER**

**Danger to Life by Electric Shock**

- The Sprue Bushing has to be properly grounded to prevent serious personal injury or death.
- Electrical work must be carried out by qualified persons.
- Verify that all power source connections are properly grounded.
- In Emergency case - Switch all systems off.
- For first aid contact your medical / safety representing.

1. Guide the ground wire into the hole of the single head (8).
2. Tighten the ground wire with a socket set screw (DIN 913).
10.4.2 Sprue Bushing 09S-02 Series

**NOTICE**
Always tighten the screws to the torque specified in the respective table in section 13.

---

**WARNING**

**Hazard of Pressurized Air**
Pressurized air blow can result in hot plastic or foreign bodies entering the eyes, causing vision damage.

Following work must be carried out by qualified and experienced persons.
Use personal protective equipment: Face protection, hearing protection and gloves.

---

**NOTICE**

**Hazard of Material Damage**
Without consulting Synventive it is not permitted to do modifications to the hot runner system e.g. geometrical changes to the nozzle tip, except the part shape adjustment in the area of material allowance.
Technical Data - Sprue Bushing 09S-02

<table>
<thead>
<tr>
<th>Part No.</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>09E###-NB-01</td>
<td>Nozzle body</td>
</tr>
<tr>
<td>09NH-###-04</td>
<td>Nozzle heater - Brass heater</td>
</tr>
<tr>
<td>09NC-R-04</td>
<td>Nozzle component ring version=4 (Front ring)</td>
</tr>
<tr>
<td>09NC-R-02</td>
<td>Nozzle component ring version=2 (Heater locating ring)</td>
</tr>
<tr>
<td>DIN471-16X1</td>
<td>Retaining Ring</td>
</tr>
<tr>
<td>DIN914-M3x3-45H</td>
<td>Socket set screw</td>
</tr>
<tr>
<td>09NT_####-20</td>
<td>Nozzle tip (Example S10T)</td>
</tr>
<tr>
<td>09TN-S-##-03</td>
<td>Tip nut</td>
</tr>
<tr>
<td>09TI-N-02</td>
<td>Full flow insert</td>
</tr>
<tr>
<td>09TI-T-01</td>
<td>Torpedo</td>
</tr>
<tr>
<td>09SHB-##-01-####</td>
<td>Nozzle Head 09shb-01</td>
</tr>
<tr>
<td>iB32H-022-01</td>
<td>Nozzle Head Heating</td>
</tr>
<tr>
<td>XTA00115001</td>
<td>Thermocouple Type J</td>
</tr>
<tr>
<td>XTA00130003-150</td>
<td>Thermocouple Type K</td>
</tr>
<tr>
<td>M1800H35</td>
<td>Retaining Ring</td>
</tr>
<tr>
<td>DIN6325-3M6X8</td>
<td>Parallel Pin DIN6325 03m6x8</td>
</tr>
<tr>
<td>09NC-T-####-###-0#</td>
<td>Nozzle - Thermocouple                  (Part of nozzle, not shown)</td>
</tr>
</tbody>
</table>

NOTICE
Always tighten the screws to the torque specified in the respective table in section 13.
Assembly Tools

In this section the Stripping and Mounting Tool parts are identified with the numbers indicated in the following figure.

**Nozzle Disassembly Tool**

<table>
<thead>
<tr>
<th>Pos.</th>
<th>Part No.</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>T1</td>
<td>AT09S-01</td>
<td>Nut</td>
</tr>
<tr>
<td>T2</td>
<td>AT06S-02</td>
<td>Holder</td>
</tr>
</tbody>
</table>

**Heater Disassembly Tool Compl. 09E AT09E03**

<table>
<thead>
<tr>
<th>Pos.</th>
<th>Part No.</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>T1.1</td>
<td>AT09E0301</td>
<td>Heater Disassembly Tool 09E Type 01</td>
</tr>
<tr>
<td>T1.2</td>
<td>AT09E0302</td>
<td>Heater Disassembly Tool 09E Type 02</td>
</tr>
<tr>
<td>T1.3</td>
<td>AT09E0303</td>
<td>Heater Disassembly Tool 09E Type 03</td>
</tr>
</tbody>
</table>

**Wire Bending Tool For Heater Exit**

| T3   |
10.4.2.1 Nozzle Thermocouple

Dismounting Nozzle Thermocouple

**NOTICE**
For dismounting of the thermocouple the nozzle heater must be dismantled from the nozzle.

1) Lever the clamp of the nozzle heater with a screwdriver and pull the nozzle thermocouple (NC-T) from its seat.
2) Pull the top of the thermocouple (NC-T) from the bracket of the nozzle heater (1.2.1).

**NOTICE**
The thermocouple is pressed in.

Mounting Nozzle Thermocouple

**NOTICE**
For assembly of the thermocouple the nozzle heater must be dismantled from the nozzle.

**Color Coding of Thermocouples**
Take notice of the production and color identification of thermocouple cables.
Synventive uses J and K type thermocouples Their color coding is given in the following table.

<table>
<thead>
<tr>
<th>Type</th>
<th>International standard IEC 584-3</th>
</tr>
</thead>
<tbody>
<tr>
<td>J</td>
<td>Black + Black</td>
</tr>
<tr>
<td></td>
<td>- White</td>
</tr>
<tr>
<td>K</td>
<td>Green + Green</td>
</tr>
<tr>
<td></td>
<td>- White</td>
</tr>
</tbody>
</table>

1) Push the nozzle thermocouple (NC-T) under the bracket of the nozzle heater (1.2.1).

**NOTICE**
The fixing is needed to secure the position. A thermocouple (well-fixed in the holder) causes correct measured values.

2) Lever the clamp of the nozzle heater with a screwdriver and fix the thermocouple (NC-T) below the clamp at the nozzle heater.
### 10.4.2.2 Disassembly the Nozzle 09S-02

**NOTICE**

For work on the nozzle (with assembled nozzle head), the nozzle must be clamped in a vice via using the tool holder (T2). It is not allowed to clamp the nozzle in a vice directly.

#### Disassembling Nozzle Head Heater

1. Dismount the retaining ring (5) from the nozzle head (2.1).

2. Pull the nozzle head heater (3) from the nozzle head (2.1)

3. Pull the thermocouple (4.1) out of the nozzle head (2.1)
Disassembling the Nozzle Heater

1) Dismount the head heater (3) from the nozzle head (2.1), as described in the above page 480.

2) Remove the retaining ring (1.5) from the nozzle tip (1.7.1).
3) Remove the nozzle component ring - frontring (1.3).

4) Unscrew and remove the socket set screw (1.6) from the nozzle heater locating ring (1.4).

**NOTICE**
To pull the nozzle heater (1.2.1), the nozzle has to be clamped on the round nozzle head (2.1) surface on a vice by using protective caps. A clamping of the flats would deform the head (2.1).

5) Fix the nozzle head (2.1) in a vice.
6) Mount the heater disassembly tool Type 01 (T1.1).

**NOTICE**
The lower edge of the heater removal tool type 01 (T1.1) must be set below the nozzle heater (1.2.1)
7) Slide disassembly tool Type 02 (T1.2) along the disassembly tool Type 03 (T1.3).

8) Screw disassembly tool Type 03 (T1.3) onto disassembly tool Type 01 (T1.1).

9) To remove the nozzle heater (2), slide the disassembly tool Type 02 (T1.2) against the disassembly tool Type 03 (T1.3) repeatedly until the nozzle heater (1.2.1) is released.
Disassembling the Nozzle and the Nozzle Tip

**WARNING**

**Hazard of Pressurized Air**
Pressurized air blow can result in hot plastic or foreign bodies entering the eyes, causing vision damage.

Following work must be carried out by qualified and experienced persons.
Use personal protective equipment: Face protection, hearing protection and gloves.

1) Dismount the nozzle head heater (3) from the nozzle head (2.1), as described in the above page 284.
2) Dismount the nozzle heater (1.2.1) from the nozzle (1.1), as described in the above page 287
3) Fix the holder (T2) in a vice.

**NOTICE**

For work on the nozzle (with assembled nozzle head), the nozzle must be clamped in a vice via using the tool holder (T2). It is not allowed to clamp the nozzle in a vice directly.

4) Place the nozzle (1.1) with the head side in the holder (T2) to fix the nozzle against rotation.

5) Place the tool nut (T1) over the nozzle body (1.1) at the hexagonal shape.
6) Use a wrench to loosen the nozzle (1.1) from the nozzle head (2.1) via the tool nut (T1) by rotation (counter clockwise).
**WARNING**

**Hot Surfaces Hazard and Hot Surfaces**

Following work must be carried out by qualified and experienced persons.
Use personal protective equipment: Face protection, hearing protection and gloves.

7) Fix the dismounted nozzle body on the hexagonal shape in a vise.

**WARNING**

**Hot Surfaces Hazard**

Contact between the skin and the hot nozzle could result in burns.

**NOTICE**

Never use an acetylene or welding torch, as severe nozzle damage can occur from over-heating.

8) To remove cold plastic in melt consistence, heat the nozzle tip (1.7.1) and nozzle body (1.1) by using a heat gun, to the maximum temperature of 200 °C (392 °F).

9) Unscrew the nozzle tip (1.7.1) from the nozzle body (1.1) using a ring wrench.

**WARNING**

**Hazard of Pressurized Air**

Pressurized air blow can result in hot plastic parts or foreign bodies entering the eyes, causing vision damage.

10) Clean the nozzle body (1.1) and nozzle tip (1.7.1) using pressurized air to remove as much residual plastic as possible.
Assembling the Nozzle 09S-02

**NOTICE**

For work on the nozzle (with assembled nozzle head), the nozzle must be clamped in a vice via using the tool holder (T2). It is not allowed to clamp the nozzle in a vice directly.

<table>
<thead>
<tr>
<th>Pos.</th>
<th>Part No.</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.1</td>
<td>09E###-NB-01</td>
<td>Nozzle Body</td>
</tr>
<tr>
<td>1.2.1</td>
<td>09NH-###-04</td>
<td>Nozzle heater (Brass heater)</td>
</tr>
<tr>
<td>1.3</td>
<td>09NC-R-04</td>
<td>Nozzle component ring version=4 (Front ring)</td>
</tr>
<tr>
<td>1.4</td>
<td>09NC-R-02</td>
<td>Nozzle component ring version=2 (Heater locating ring)</td>
</tr>
<tr>
<td>1.5</td>
<td>DIN471-16X1</td>
<td>Retaining Ring</td>
</tr>
<tr>
<td>1.6</td>
<td>DIN914-M3X3-45H</td>
<td>Socket Set Screw DIN914-M3x3-45-H</td>
</tr>
<tr>
<td>1.7.1</td>
<td>09NT_####-20</td>
<td>Nozzle Tip (Example S10T)</td>
</tr>
<tr>
<td>1.7.1.1</td>
<td>09TN-S-##-03</td>
<td>Tip nut</td>
</tr>
<tr>
<td>1.7.1.2</td>
<td>09TI-N-02</td>
<td>Full flow insert</td>
</tr>
<tr>
<td>1.7.1.3</td>
<td>09TI-T-01</td>
<td>Torpedo</td>
</tr>
<tr>
<td>2.1</td>
<td>09SHB-##-01-##</td>
<td>Nozzle Head 09shb-01</td>
</tr>
<tr>
<td>3</td>
<td>IB32H-022-01</td>
<td>Nozzle Head Heating</td>
</tr>
<tr>
<td>3</td>
<td>XTA00115001</td>
<td>Thermocouple Type J</td>
</tr>
<tr>
<td>4.1</td>
<td>XTA00130003-150</td>
<td>Thermocouple Type K</td>
</tr>
<tr>
<td>5</td>
<td>M1800H35</td>
<td>Retaining Ring</td>
</tr>
<tr>
<td>6</td>
<td>DIN6325-3M6X8 03m6x08</td>
<td>Parallel Pin DIN6325 03m6x08</td>
</tr>
<tr>
<td>6</td>
<td>09NC-T-####-####-0#</td>
<td>Nozzle -Thermocouple (Part of nozzle, not shown)</td>
</tr>
</tbody>
</table>

Assembling the Nozzle Tip

1) Fix the nozzle body on the hexagonal shape in a vice.
2) Apply spotting ink on the nozzle tip (1.7.1) bottom surface (SF1).
3) Screw in the nozzle tip (1.7.1) hand-tight into the nozzle body (1.1) until seated.
4) Unscrew the nozzle tip (1.7.1) from the nozzle body (1.1).

5) Check the matching between the nozzle body (1.1) surface (SF2) and the nozzle tip (1.7.1) surface (SF1).

**NOTICE**
The nozzle must bear uniformly on the outer surfaces uniformly and flatly, in particular on the nozzle body contact face.

**NOTICE**
In case of any uncertainty, clean the surfaces with a cleaning cloth. If the next ink test is still unsatisfactory - please contact Synventive Customer Service or Technical Support.

6) With a positive ink test clean the surfaces and proceed to the next step.

7) Lubricate the thread (not the face) of the nozzle tip body with high-temperature assembly paste (antiseize compound).

**NOTICE**
This is an important measure to prevent thread corrosion due to aggressive gases, which could be released during plastics processing.
8) Tighten the nozzle tip (1.7.1) at the nozzle by room temperature.

**NOTICE**

Use torque wrench with wrench insert and the torque specified in the respective table in section 13.

---

**Assembling the Nozzle Body**

**NOTICE**

For work on the nozzle (with assembled nozzle head), the nozzle must be clamped in a vice via using the tool holder (T2). It is not allowed to clamp the nozzle in a vice directly.

1) Fix the holder (T2) in a vice.

2) Place the nozzle head (2.1) in the holder (T2).

3) Apply spotting ink on the nozzle body (1.1) bottom surface (SF1)
Service and Maintenance / Sprue Bushing 09S-02 Series

4) Screw in the nozzle body (1.1) hand-tight into the nozzle head thread until seated.

5) Unscrew the nozzle body (1.1) from the nozzle head (2.1).

6) Check the matching between the nozzle head (2.1) bottom surfaces (SF2) and the nozzle body (1.1) surface (SF1).

**NOTICE**

The nozzle head must bear on all surfaces uniformly and flatly, in particular on the nozzle head contact face.

In case of any uncertainty, clean the surfaces with a cleaning cloth. If the next ink test is still unsatisfactory, please contact Synventive Customer Service or Technical Support.

7) With a positive ink test, clean the surfaces and proceed to the next step.

8) Lubricate the thread (not the face) of the nozzle body with high-temperature assembly paste (antiseize compound).

**NOTICE**

This is an important measure to prevent thread corrosion due to aggressive gases, which could be released during plastics processing.

9) Tighten the nozzle body (1.1) to the nozzle head.

**NOTICE**

Use torque wrench with wrench insert and the torque specified in the torque table in section 13.
Mounting the Nozzle Head Heater

NOTICE
Align the nozzle head thermocouple and supply line in the same direction as the heater wire leads.

1) Bend the heater (3) wire with the tool (T3) to about 45°.
2) Install the thermocouple, ensuring it is seated correctly in the internal heater groove and nozzle head groove.
3) Place the nozzle head heater (3) on the nozzle head (2.1).

NOTICE
The nozzle head heater secures the thermocouple by covering it in the vertical groove.
The heating wire must exit through the central recess of the nozzle head.

4) Mount the retaining ring (5) on the nozzle head (2.1).

Mounting the Nozzle Heater

NOTICE
For work on the nozzle (with assembled nozzle head), the nozzle must be clamped in a vice via using the tool holder (T2). It is not allowed to clamp the nozzle in a vice directly.

1) Slide component ring version 02 (1.4), onto the nozzle body (1.1) up to the surface of the hexagon.

NOTICE
The opening of the component ring version 02 (1.4), must be line up with the cable connections (see customer drawing).

2) Bend the leads of the nozzle heater about 90 degrees.

NOTICE
Use round-nosed pliers only.
3) Push the nozzle heater (1.2.1) onto the nozzle (1.1).

**NOTICE**

Ensure the orientation of the wire leads matches opening in component ring version 02 (1.4) and nozzle head (2.1).

4) Place the component ring - front ring (1.3) on the nozzle heater (1.2.1).
5) Mount the retaining ring (1.5) at the nozzle tip (1.7.1).

6) Move the nozzle component ring version 02 (1.4) and nozzle heater (1.2.1) tight to the nozzle component ring version 04 - front ring (1.3).
7) Fix the nozzle component ring version 02 (1.4) with the socket set screw (1.6) by a ½ up to ¾ turn.

8) Unit the heater and thermocouple (ex) leads.
10.4.2.3 Grounding of the Sprue Bushing

**Danger to Life by Electric Shock**

The Sprue Bushing has to be properly grounded to prevent serious personal injury or death.

- Electrical work must be carried out by qualified persons.
- Verify that all power source connections are properly grounded.
- In Emergency case - Switch all systems off.
- For first aid contact your medical / safety representing.

1) Guide the ground wire into the hole of the single head (2.1).
2) Tighten the ground wire with a socket set screw (DIN 913).
10.4.3 Sprue Bushing 12S Series  

**NOTICE**

Always tighten the screws to the torque specified in the respective table in section 13.

---

**WARNING**

**Hot Surfaces Hazard**  
Contact between the skin and hot surfaces could result in burns.  
Use personal protective equipment, such as gloves, apron, sleeves and face protection, to guard against burns.  
When servicing or handling the hot runner system outside the manifold plates or the injection molding machine, care must be taken to heed the hot surface exposure warnings.  
For first aid contact your medical / safety representing.

---

**Hazard of Pressurized Air**  
Pressurized air blow can result in hot plastic or foreign bodies entering the eyes, causing vision damage.  
Use personal protective equipment: Face protection, hearing protection and gloves.  
For first aid contact your medical / safety representing.

---

**NOTICE**

**Hazard of Material Damage**  
Without consulting Synventive it is not permitted to do modifications to the hot runner system e.g. geometrical changes to the nozzle tip, except the part shape adjustment in the area of material allowance.
Technical Data - Sprue Bushing 12S

<table>
<thead>
<tr>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Flow Bore (J)</td>
</tr>
<tr>
<td>Nozzle Length (LSB)</td>
</tr>
<tr>
<td>Nozzle Cutout (D)</td>
</tr>
<tr>
<td>Thermocouple</td>
</tr>
<tr>
<td>Nozzle Tips</td>
</tr>
</tbody>
</table>

Parts of the Sprue Bushing 12S

In this section the nozzle parts are identified with the numbers indicated in the following figure.

**NOTICE**

Always tighten the screws to the torque specified in the respective table in section 13.

<table>
<thead>
<tr>
<th>Pos.</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.1</td>
<td>Nozzle body</td>
</tr>
<tr>
<td>1.2.1</td>
<td>Nozzle heater</td>
</tr>
<tr>
<td>1.3</td>
<td>Nozzle component ring version=1 (Heater locating ring)</td>
</tr>
<tr>
<td>1.4</td>
<td>Nozzle component ring version=2 (Heater locating ring)</td>
</tr>
<tr>
<td>1.5</td>
<td>DIN471</td>
</tr>
<tr>
<td>1.6</td>
<td>Socket set screw DIN914-M3x3-45-H</td>
</tr>
<tr>
<td>1.7.1</td>
<td>Nozzle tip (Example TTW)</td>
</tr>
<tr>
<td>1.7.1.1</td>
<td>Tip nut</td>
</tr>
<tr>
<td>1.7.1.2</td>
<td>Full flow insert</td>
</tr>
<tr>
<td>1.7.1.3</td>
<td>Torpedo</td>
</tr>
<tr>
<td>2.1</td>
<td>Nozzle Head</td>
</tr>
<tr>
<td>3</td>
<td>Nozzle Head Heating</td>
</tr>
<tr>
<td>4.1</td>
<td>Thermocouple Type J</td>
</tr>
<tr>
<td>4.1</td>
<td>Thermocouple Type K</td>
</tr>
<tr>
<td>5</td>
<td>Parallel Pin DIN6325 03m6x08</td>
</tr>
</tbody>
</table>
Assembly Tools

In this section the Stripping and Mounting Tool parts are identified with the numbers indicated in the following figure.

### Assembly Tools for TTP, TFP TTW Nozzle Tips

<table>
<thead>
<tr>
<th>Pos.</th>
<th>Part No.</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>T1</td>
<td>AT12E-0104</td>
<td>Nozzle Tip</td>
</tr>
<tr>
<td>T2</td>
<td>AT12E-0103</td>
<td>TTP, TFP TTW Assembly Tool</td>
</tr>
<tr>
<td>T3</td>
<td>AT12E-0105</td>
<td>Seal Cap TTW Assembly Tool</td>
</tr>
</tbody>
</table>

### Heater Disassembly Tool Compl. AT12E-0101

<table>
<thead>
<tr>
<th>Pos.</th>
<th>Part No.</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>T1.1</td>
<td>AT12E-010101</td>
<td>Heater Disassembly Tool 12E Type 01</td>
</tr>
<tr>
<td>T1.2</td>
<td>AT12E-010102</td>
<td>Heater Disassembly Tool 12E Type 02</td>
</tr>
<tr>
<td>T1.3</td>
<td>AT12E-010103</td>
<td>Heater Disassembly Tool 12E Type 03</td>
</tr>
</tbody>
</table>

### Nozzle Disassembly Tool

<table>
<thead>
<tr>
<th>Pos.</th>
<th>Part No.</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>T3</td>
<td>AT12S-01</td>
<td>Nut</td>
</tr>
<tr>
<td>T4</td>
<td>AT06S-02</td>
<td>Holder</td>
</tr>
</tbody>
</table>
10.4.3.1 Nozzle Thermocouple

Dismounting Nozzle Thermocouple

**NOTICE**

For dismounting of the thermocouple the nozzle heater must be dismantled from the nozzle.

1) Lever the clamp of the nozzle heater with a screwdriver and pull the thermocouple (x) from its seat.

2) Pull the top of the thermocouple (x) from the bracket of the nozzle heater (1.2.1).

**NOTICE**

The thermocouple is pressed in.

Mounting Nozzle Thermocouple

**NOTICE**

For assembly of the thermocouple the nozzle heater must be dismantled from the nozzle.

**Color Coding of Thermocouples**

Take notice of the production and color identification of thermocouple cables. Synventive uses J and K type thermocouples. Their color coding is given in the following table.

<table>
<thead>
<tr>
<th>Type</th>
<th>International standard IEC 584-3</th>
</tr>
</thead>
<tbody>
<tr>
<td>J</td>
<td>Black + Black</td>
</tr>
<tr>
<td></td>
<td>- White</td>
</tr>
<tr>
<td>K</td>
<td>Green + Green</td>
</tr>
<tr>
<td></td>
<td>- White</td>
</tr>
</tbody>
</table>

1) Push the thermocouple (x) under the bracket of the nozzle heater (1.2.1).

**NOTICE**

The fixing is needed to secure the position. A thermocouple (well-fixed in the holder) causes correct measured values.

2) Lever the clamp of the nozzle heater with a screwdriver and fix the thermocouple (x) below the clamp at the nozzle heater.
10.4.3.2 Disassembly the Nozzle 12S

**NOTICE**
For work on the nozzle (with assembled nozzle head), the nozzle must be clamped in a vice via using the tool holder (T4). It is not allowed to clamp the nozzle in a vice directly.

**Disassembling Nozzle Head Heater**

1) Loosen the screws Head heater (3) clamp band.

2) Pull the nozzle head heater (3) from the nozzle head (2.1)

3) Pull the thermocouple (4.1) out of the nozzle head (2.1)
Disassembling the Nozzle Heater

1) Dismount the head heater (3) from the nozzle head (2.1), as described in the above page 496.

2) Remove the retaining ring (1.5) from the nozzle tip (1.7.1).
3) Remove the component ring version 1 (1.3) - Heater locating ring.

4) Unscrew and remove the socket set screw (1.6) from the nozzle heater locating ring (1.4).

**NOTICE**
To pull the nozzle heater (1.2.1), the nozzle has to be clamped on the round nozzle head (2.1) surface on a vice by using protective caps. A clamping of the flats would deform the head (2.1).

5) Fix the nozzle head (2.1) in a vice.
6) Mount the heater disassembly tool Type 01 (T1.1).

**NOTICE**
The lower edge of the heater removal tool type 01 (T1.1) must be set below the nozzle heater (1.2.1).
7) Slide disassembly tool Type 02 (T1.2) along the disassembly tool Type 03 (T1.3).

8) Screw disassembly tool Type 03 (T1.3) onto disassembly tool Type 01 (T1.1).

9) To remove the nozzle heater (1.2.1), slide the disassembly tool Type 02 (T1.2) against the disassembly tool Type 03 (T1.3) repeatedly until the nozzle heater (1.2.1) is released.
10.4.3.3 Disassembling the Nozzle and the Nozzle Tip

**WARNING**

**Hazard of Pressurized Air**

Pressurized air blow can result in hot plastic or foreign bodies entering the eyes, causing vision damage.

Following work must be carried out by qualified and experienced persons.

Use personal protective equipment: Face protection, hearing protection and gloves.

1) Dismount the nozzle head heater (3) from the nozzle head (2.1), as described in the above page 496.
2) Dismount the nozzle heater (1.2.1) from the nozzle (1.1), as described in the above page 497.
3) Fix the holder (T4) in a vice.

**NOTICE**

For work on the nozzle (with assembled nozzle head), the nozzle must be clamped in a vice via using the tool holder (T4). It is not allowed to clamp the nozzle in a vice directly.

4) Place the nozzle (1.1) with the head side in the holder (T4) to fix the nozzle against rotation.

5) Place the tool nut (T3) over the nozzle body (1.1) at the hexagonal shape.
6) Use a wrench to loosen the nozzle (1.1) from the nozzle head (2.1) via the tool nut (T3) by rotation (counter clockwise).
WARNING

Hot Surfaces Hazard and Pressurized Air
Following work must be carried out by qualified and experienced persons.
Use personal protective equipment: Face protection, hearing protection
and gloves.

7) Fix the dismounted nozzle body (1.1) on the hexagonal shape in a vise.

WARNING

Hot Surfaces Hazard
Contact between the skin and the hot nozzle could result in burns.

NOTICE

Never use an acetylene or welding torch, as severe nozzle
damage can occur from over-heating.

8) To remove cold plastic in melt consistence, heat the nozzle tip (1.7.1) by
using a heat gun, to the maximum temperature of 200 °C (392 °F).

9) Unscrew the nozzle tip (1.7.1) from the nozzle body (1.1) using a
wrench.

WARNING

Hazard of Pressurized Air
Pressurized air blow can result in hot plastic parts or foreign bodies
entering the eyes, causing vision damage.
Use personal protective equipment: Face protection, hearing protection
and gloves.

10) Clean the nozzle body (1.1) and nozzle tip (1.7.1) using pressurized air
to remove as much residual plastic as possible.
10.4.3.4 Assembling Nozzle 12S

**NOTICE**

For work on the nozzle (with assembled nozzle head), the nozzle must be clamped in a vice via using the tool holder (T2). It is not allowed to clamp the nozzle in a vice directly.

<table>
<thead>
<tr>
<th>Pos.</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.1</td>
<td>Nozzle body</td>
</tr>
<tr>
<td>1.2.1</td>
<td>Nozzle heater</td>
</tr>
<tr>
<td>1.3</td>
<td>Nozzle component ring version=1 (Heater locating ring)</td>
</tr>
<tr>
<td>1.4</td>
<td>Nozzle component ring version=2 (Heater locating ring)</td>
</tr>
<tr>
<td>1.5</td>
<td>DIN471</td>
</tr>
<tr>
<td>1.6</td>
<td>Socket set screw DIN914-M3x3-45-H</td>
</tr>
<tr>
<td>1.7.1</td>
<td>Nozzle tip (Example TTW)</td>
</tr>
<tr>
<td>1.7.1.1</td>
<td>Tip nut</td>
</tr>
<tr>
<td>1.7.1.2</td>
<td>Full flow insert</td>
</tr>
<tr>
<td>1.7.1.3</td>
<td>Torpedo</td>
</tr>
<tr>
<td>2.1</td>
<td>Nozzle Head</td>
</tr>
<tr>
<td>3</td>
<td>Nozzle Head Heating</td>
</tr>
<tr>
<td>4.1</td>
<td>Thermocouple Type J</td>
</tr>
<tr>
<td>4.1</td>
<td>Thermocouple Type K</td>
</tr>
<tr>
<td>5</td>
<td>Parallel Pin DIN6325 03m6x08</td>
</tr>
</tbody>
</table>
Assembling the Nozzle Tip

**TTW Nozzle Tip Assembly**

1) Place the tip nut (a) into the tool (T2).
2) Using the tool (T1) to push the tip insert (b) into the tip nut (a).
3) Place the torpedo (c) on the tip insert (b).
4) Using the tool (T1) to push the torpedo (c) and the tip insert (b) into the tip nut (a).

**TTP Nozzle Tip Assembly**

1) Place the tip nut (a) on the tool (T2).
2) Using the tool (T1) to push the tip insert (b) into the tip nut (a).
3) Place the torpedo (c) on the tip insert (b).
4) Using the tool (T1) to push the torpedo (c) and the tip insert (b) into the tip nut (a).

**TFP Nozzle Tip Assembly**

1) Place the tip nut on the tool (T2).
2) Using the tool (T1) to push the tip insert (b) into the tip nut (a).
Shown are the tip nuts, for checking the correct seating of the tip inserts

![Image showing correct and incorrect tip nut seating.]

**NOTICE**
See examples of good and incorrect insert installations.
Make sure the insert must not exceed the height of the nozzle tip head.
Incorrect items should not be further processed.

---

**Assemble the Seal Cap on TTW Nozzle Tip**

![Assembly diagram of seal cap on nozzle tip.]

1) Place the tip nut (a) on the tool (T1).
2) Place the seal cap (b) on the tip nut (a).
3) Using the tool (T3) to push the seal cap (b) on the tip nut (a).

**NOTICE**
The assembly tool (T3) has an engraved note on both front sides.
Use the side, signed with TW against the seal cap.

---

**Assembling the Nozzle Tip on the Nozzle**

![Diagram of nozzle tip assembly.]

1) Fix the nozzle body on the hexagonal shape in a vice.
2) Apply spotting ink on the nozzle tip (1.7.1) bottom surface (SF1).
3) Screw in the nozzle tip (1.7.1) hand-tight into the nozzle body (1.1) until seated.
4) Unscrew the nozzle tip (1.7.1) from the nozzle body (1.1).

5) Check the matching between the nozzle body (1.1) surface (SF2) and the nozzle tip (1.7.1) surface (SF1).

**NOTICE**
The nozzle must bear uniformly on the outer surfaces uniformly and flatly, in particular on the nozzle body contact face.

**NOTICE**
In case of any uncertainty, clean the surfaces with a cleaning cloth. If the next ink test is still unsatisfactory - please contact Synventive Customer Service or Technical Support.

6) With a positive ink test clean the surfaces and proceed to the next step.

7) Lubricate the thread (not the face) of the nozzle tip body with high-temperature assembly paste (antiseize compound).

**NOTICE**
This is an important measure to prevent thread corrosion due to aggressive gases, which could be released during plastics processing.

8) Tighten the nozzle tip (1.7.1) at the nozzle by room temperature.

**NOTICE**
Use torque wrench with wrench insert (HEX21) and a torque of 100 Nm.
Assembling the Nozzle Body

**NOTICE**
For work on the nozzle (with assembled nozzle head), the nozzle must be clamped in a vice via using the tool holder (T4). It is not allowed to clamp the nozzle in a vice directly.

1) Fix the holder (T4) in a vice.

2) Place the nozzle head (2.1) in the holder (T4).

3) Apply spotting ink on the nozzle body (1.1) bottom surface (SF1)

4) Screw in the nozzle body (1.1) hand-tight into the nozzle head thread until seated.

5) Unscrew the nozzle body (1.1) from the nozzle head (2.1).
6) Check the matching between the nozzle head (2.1) bottom surfaces (SF2) and the nozzle body (1.1) surface (SF1).

**NOTICE**

The nozzle head must bear on all surfaces uniformly and flatly, in particular on the nozzle head contact face. In case of any uncertainty, clean the surfaces with a cleaning cloth. If the next ink test is still unsatisfactory, please - contact Synventive Customer Service or Technical Support.

7) With a positive ink test, clean the surfaces and proceed to the next step.

8) Lubricate the thread (not the face) of the nozzle body with high-temperature assembly paste (antiseize compound).

**NOTICE**

This is an important measure to prevent thread corrosion due to aggressive gases, which could be released during plastics processing.

9) Tighten the nozzle body (1.1) to the nozzle head.

**NOTICE**

Use torque wrench with wrench insert and the torque specified in the torque table in section 13.
Mounting the Nozzle Head Heater

1) Install the thermocouple, ensuring it is seated correctly in the internal heater groove and nozzle head groove.
2) Place the nozzle head heater (3) on the nozzle head (2.1).

**NOTICE**

The nozzle head heater secures the thermocouple by covering it in the vertical groove.
The heating wire must exit through the central recess of the nozzle head.
3) Attach the head heater (4.1) with the socket set screw (x).

Mounting the Nozzle Heater

**NOTICE**

For work on the nozzle (with assembled nozzle head), the nozzle must be clamped in a vice via using the tool holder (T2). It is not allowed to clamp the nozzle in a vice directly.

1) Slide heater locating, ring (1.4), onto the nozzle body (1.1) up to the surface of the hexagon.

**NOTICE**

The opening of the component ring version 2 (1.4), must be line up with the cable connections (see customer drawing).

2) Bend the leads of the nozzle heater about 90 degrees.

**NOTICE**

Use round-nosed pliers only.
3) Push the nozzle heater (1.2.1) onto the nozzle (1.1).

**NOTICE**

Ensure the orientation of the wire leads (y) matches opening in component ring version 2 (1.4) and nozzle head (2.1).

4) Place the pre centering ring version 1 (1.3) on the nozzle heater (1.2.1).

**NOTICE**

The component ring version 1 (1.3) is for pre centering of the nozzle in the cutout.

5) Mount the retaining ring (1.5) at the nozzle tip (1.7.1).

6) Move the nozzle component ring version 2 (1.4) and nozzle heater (1.2.1) tight to the nozzle component ring version 1 (1.3).

7) Fix the nozzle component ring version 2 (1.4) with the socket set screw (1.6) by a ½ up to ¾ turn.

8) Unit the heater and thermocouple (ex) leads.
10.4.3.5 Grounding of the Sprue Bushing

DANGER

Danger to Life by Electric Shock

The Sprue Bushing has to be properly grounded to prevent serious personal injury or death.

Electrical work must be carried out by qualified persons.

Verify that all power source connections are properly grounded.

In Emergency case - Switch all systems off.

For first aid contact your medical / safety representing.

1) Guide the ground wire into the hole of the single head (2.1).
2) Tighten the ground wire with a socket set screw (DIN 913).
10.4.4 Sprue Bushing 16S-04 / 22S-04 Series

**NOTICE**
Always tighten the screws to the torque specified in the respective table in section 13.

---

**WARNING**

**Hot Surfaces Hazard**

*Contact between the skin and hot surfaces could result in burns.*

Use personal protective equipment, such as gloves, apron, sleeves and face protection, to guard against burns.

When servicing or handling the hot runner system outside the manifold plates or the injection molding machine, care must be taken to heed the hot surface exposure warnings.

*For first aid contact your medical / safety representing.*

**Hazard of Pressurized Air**

*Pressurized air blow can result in hot plastic or foreign bodies entering the eyes, causing vision damage.*

Use personal protective equipment: Face protection, hearing protection and gloves.

*For first aid contact your medical / safety representing.*

---

**NOTICE**

**Hazard of Material Damage**

*Without consulting Synventive it is not permitted to do modifications to the hot runner system e.g. geometrical changes to the nozzle tip, except the part shape adjustment in the area of material allowance.*
Technical Data - Sprue Bushing 16S-04 / 22S-04 Series

Sprue Bushing 16S-04

<table>
<thead>
<tr>
<th>Description</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Flow Bore (J)</td>
<td>Ø 16 mm</td>
</tr>
<tr>
<td>Nozzle Length (L SB)</td>
<td>100 - 640 mm</td>
</tr>
<tr>
<td>Nozzle Cutout (D)</td>
<td>Ø 50 mm</td>
</tr>
<tr>
<td>Thermocouple</td>
<td>Type J, Type K</td>
</tr>
<tr>
<td>Nozzle Tips</td>
<td>TFP, TTP, TTW</td>
</tr>
</tbody>
</table>

Sprue Bushing 22S-04

<table>
<thead>
<tr>
<th>Description</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Flow Bore (J)</td>
<td>Ø 22 mm</td>
</tr>
<tr>
<td>Nozzle Length (L SB)</td>
<td>100 - 640 mm</td>
</tr>
<tr>
<td>Nozzle Cutout (D)</td>
<td>Ø 60 mm</td>
</tr>
<tr>
<td>Thermocouple</td>
<td>Type J, Type K</td>
</tr>
<tr>
<td>Nozzle Tips</td>
<td>TFP, TTP, TTW</td>
</tr>
</tbody>
</table>

Parts of the Sprue Bushing 16S-04 / 22S-04

In this section the nozzle parts are identified with the numbers indicated in the following figure.

**NOTICE**

Always tighten the screws to the torque specified in the respective table in section 13.

<table>
<thead>
<tr>
<th>Pos.</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Nozzle body</td>
</tr>
<tr>
<td>2</td>
<td>Head ring</td>
</tr>
<tr>
<td>3</td>
<td>Rear heating element (optional)</td>
</tr>
<tr>
<td>4</td>
<td>Retaining ring</td>
</tr>
<tr>
<td>5</td>
<td>Cover tube</td>
</tr>
<tr>
<td>6</td>
<td>Front heater</td>
</tr>
<tr>
<td>7</td>
<td>Component ring</td>
</tr>
<tr>
<td>8</td>
<td>Retaining ring</td>
</tr>
<tr>
<td>9</td>
<td>Nozzle tip</td>
</tr>
<tr>
<td>10</td>
<td>Wear insert (optional)</td>
</tr>
<tr>
<td>11</td>
<td>Cooling bushing (optional)</td>
</tr>
<tr>
<td>12</td>
<td>Single Head</td>
</tr>
<tr>
<td>13</td>
<td>Thermocouple Type</td>
</tr>
<tr>
<td>14</td>
<td>Head heater</td>
</tr>
<tr>
<td>15</td>
<td>Parallel Pin</td>
</tr>
</tbody>
</table>
Assembly Tools

In this section the Stripping and Mounting Tool parts are identified with the numbers indicated in the following figure.

Nozzle Disassembly Tool

<table>
<thead>
<tr>
<th>Mounting Tool for 16S-04</th>
<th>Mounting Tool for 22S-04</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pos.</td>
<td>Part No.</td>
</tr>
<tr>
<td>T1</td>
<td>AT16S-01</td>
</tr>
<tr>
<td>T2</td>
<td>AT16S-03</td>
</tr>
</tbody>
</table>

Assembly Tools for TTP, TFP TTW Nozzle Tips

Assembly Tools for 16S-04 Nozzle Tips
(T2) AT-16-040102
(T1) AT-16-040101

Assembly Tools for 22S-04 Nozzle Tips
(T2) AT-22-040102
(T1) AT-22-040101

The Nozzle Tip Assembly Tool is also used for the TTW Seal Cap assembly.
Heater Disassembly Tool Compl. AT16E-0102, AT22E-0102

### Heater Stripping Tool for 16E / 16S Nozzle AT16E0102

<table>
<thead>
<tr>
<th>Pos.</th>
<th>Qty.</th>
<th>Part No.</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>T1.1</td>
<td>1</td>
<td>ATCYL0104</td>
<td>Stop bolt</td>
</tr>
<tr>
<td>T1.2</td>
<td>1</td>
<td>ATCYL0102</td>
<td>Guide</td>
</tr>
<tr>
<td>T1.3</td>
<td>1</td>
<td>ATCYL0101</td>
<td>Slide Hammer</td>
</tr>
<tr>
<td>T1.4</td>
<td>1</td>
<td>AT16E010201</td>
<td>Disassembly tube 16E</td>
</tr>
<tr>
<td>T1.5</td>
<td>2</td>
<td>DIN6325-6M6X30</td>
<td>Parallel pin</td>
</tr>
<tr>
<td>T1.6</td>
<td>2</td>
<td>AT16E010202</td>
<td>Clamping jaws</td>
</tr>
<tr>
<td>T1.7</td>
<td>1</td>
<td>AT16E010203</td>
<td>Clamping ring</td>
</tr>
<tr>
<td>T1.8</td>
<td>2</td>
<td>DIN6325-6M6X20</td>
<td>Parallel pin</td>
</tr>
<tr>
<td>T1.9</td>
<td>2</td>
<td>DIN916-M4X6-45H</td>
<td>Set screw</td>
</tr>
</tbody>
</table>

### Heater Stripping Tool for 22E / 22S Nozzle AT22E0102

<table>
<thead>
<tr>
<th>Pos.</th>
<th>Qty.</th>
<th>Part No.</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>T1.1</td>
<td>1</td>
<td>ATCYL0104</td>
<td>Stop bolt</td>
</tr>
<tr>
<td>T1.2</td>
<td>1</td>
<td>ATCYL0102</td>
<td>Guide</td>
</tr>
<tr>
<td>T1.3</td>
<td>1</td>
<td>ATCYL0101</td>
<td>Slide Hammer</td>
</tr>
<tr>
<td>T1.4</td>
<td>1</td>
<td>AT22E010201</td>
<td>Disassembly tube 16E</td>
</tr>
<tr>
<td>T1.5</td>
<td>2</td>
<td>DIN6325-6M6X30</td>
<td>Parallel pin</td>
</tr>
<tr>
<td>T1.6</td>
<td>2</td>
<td>AT22E010202</td>
<td>Clamping jaws</td>
</tr>
<tr>
<td>T1.7</td>
<td>1</td>
<td>AT22E010203</td>
<td>Clamping ring</td>
</tr>
<tr>
<td>T1.8</td>
<td>2</td>
<td>DIN6325-6M6X20</td>
<td>Parallel pin</td>
</tr>
<tr>
<td>T1.9</td>
<td>2</td>
<td>DIN916-M4X6-45H</td>
<td>Set screw</td>
</tr>
</tbody>
</table>
### 10.4.4.1 Nozzle Thermocouple

Heaters with J-type and K-type thermocouples are available.

The heater and the thermocouple are not separate, heater and thermocouple have to be replaced together.

Only the heater for the head have a separate thermocouple.

Part number for head thermocouple:
- J-type: XTA00115001
- K-type: XTA00130003-150

### Color Coding of Thermocouples

**NOTICE**

Take notice of the production and color identification of thermocouple cables.

Synventive uses J and K type thermocouples. Their color coding is given in the following table.

<table>
<thead>
<tr>
<th>Type</th>
<th>International standard IEC 584-3</th>
<th>Coating</th>
<th>Litz wire “+”</th>
<th>Litz wire “-”</th>
</tr>
</thead>
<tbody>
<tr>
<td>J</td>
<td>Black</td>
<td>+ Black</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>- White</td>
<td></td>
<td></td>
</tr>
<tr>
<td>K</td>
<td>Green</td>
<td>+ Green</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>- White</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
10.4.4.2 Disassembly the Nozzle 16S-04 / 22S-04 Series

**NOTICE**

For the following work on the nozzle (with assembled nozzle head), the nozzle must be clamped in a vice via using the tool holder (T2). It is not allowed to clamp the nozzle in a vice directly.

**Disassembling Nozzle Head Heater**

1) Loosen the screws head heater (14) clamp band.

2) Pull the nozzle head heater (14) from the nozzle head (12).

3) Pull the thermocouple (13) out of the nozzle head (12).
Disassembling the Nozzle Front Heater

1) Dismount the head heater (14) from the nozzle head (12), as described in the above page 515.

2) Remove the retaining ring (8) from the nozzle tip (9).

3) Remove the component ring (7).
NOTICE
To pull the front heater (6), the nozzle has to be clamped on the round nozzle head surface (12) on a vice by using protective caps. A clamping of the flats would deform the nozzle head (12).

4) Fix the nozzle with the head (12) in a vice by using protective caps.

5) Unscrew and remove the socket set screws from the front heater (6).
6) Take the heater stripping tool (AT16E0102) and open the clamping jaws (T1.6).

7) Move the heater stripping tool (AT16E0102) over the front heater.

8) Close the clamping jaws (T1.6), by turning the clamping ring (T1.7).

**NOTICE**
The parallel pin (T1.8) has to be in the hole from the front heater (6).

9) To remove the nozzle front heater (6), slide the hammer (T1.3) against the stop bolt (T1.1) repeatedly until the nozzle heater is released.
Disassembling the Nozzle Rear Heater

**NOTICE**

Depending on the nozzle length is a rear heating element (3) used.

1) The nozzle front heater (6) must be dismounted from the nozzle body (1), as described in the above page 516

2) Remove the cover tube (5).

3) Remove the retaining ring (4).

4) Pull the heater (3) from the nozzle body (1).

5) Remove the head ring (2) from the nozzle body (1).
Disassembling the Nozzle and the Nozzle Tip

**WARNING**

**Hazard of Pressurized Air**

Pressurized air blow can result in hot plastic or foreign bodies entering the eyes, causing vision damage.

Following work must be carried out by qualified and experienced persons.

Use personal protective equipment: Face protection, hearing protection and gloves.

**NOTICE**

To install or remove the nozzle tip (9), the tool holder (T2) and adapter (T1) is required.

The nozzle head can get damaged when we not use these tools.

Only with the tools holder (T2) and adapter (T1) it is ensured that the nozzle body (1) is attached properly torqued to the hot runner manifold.

1) The nozzle head heater (14) must be dismounted from the nozzle head (12) in a vice, as described in the above page 515.

2) Fix the holder (T2) in a vice.

3) Place the nozzle with the head side (12) in the holder (T2) to fix the nozzle against rotation.
4) Remove the circlip (8) from the nozzle tip (9).
5) Remove the component ring (7).

NOTICE
To dismount the nozzle tip (9) from the nozzle, if there is plastic material in the nozzle, the tip (9) must be heated-up. Never use an acetylene or welding torch, as severe nozzle damage can occur from over-heating.

6) Heat the nozzle tip (9) using a heat gun to the maximum temperature of 200 °C (392 °F).

WARNING
Hot Surfaces Hazard
Contact between the skin and the hot nozzle could result in burns.
Following works must be carried out by qualified persons.
Use personal protective equipment, such as gloves, apron, sleeves and face protection, to guard against burns.

7) Fix the nozzle body (1) with a wrench and loosen the nozzle tip (9) from the nozzle body (counter clockwise).

WARNING
Hazard of Pressurized Air
Pressurized air blow can result in hot plastic parts or foreign bodies entering the eyes, causing vision damage.

8) Clean the nozzle tip (9) using pressurized air to remove as much residual plastic as possible.
Disassembling the Nozzle Body

**WARNING**

**Hazard of Pressurized Air**

Pressurized air blow can result in hot plastic or foreign bodies entering the eyes, causing vision damage.

Following work must be carried out by qualified and experienced persons.

Use personal protective equipment: Face protection, hearing protection and gloves.

**Hot Surfaces Hazard**

Contact between the skin and the hot nozzle could result in burns.

Use personal protective equipment, such as gloves, apron, sleeves and face protection, to guard against burns.

For first aid contact your medical / safety representing.

---

**NOTICE**

For disassembly and assembly of the nozzle body (1) of the holder (T2) and adapter (T1) is required.

The nozzle head can get damaged when we not use these tools.

Only with the holder (T2) and the nut (T1) we are able to torque the nozzle body (1) correctly.

1) Dismount the nozzle head heater (14) from the nozzle head (12), as described in the above page 515.

2) Dismount the nozzle front heater (6) and rear heater (3), as described in the above page 516.

3) Dismount the nozzle tip (9) from the nozzle body (1), as described in the above page 520.

---

**NOTICE**

The tool nut (T1) is only available for the 16E /16S nozzle.

4) Place the nozzle with the head side (12) in the holder (T2) to fix the nozzle against rotation.

5) Place the tool nut (T1) along the nozzle body (1) at their hexagonal shape.
**NOTICE**

The tool nut (T1) is only available for the 16E /16S nozzle.

6) Use a wrench to loosen the nozzle body (1) from the nozzle head (12) via the tool nut (T1) by rotation (counter clockwise).

7) Heat the nozzle body (1) using a heat gun to the maximum temperature of 200 °C (392 °F).

**WARNING**

Hazard of Pressurized Air

Pressurized air blow can result in hot plastic parts or foreign bodies entering the eyes, causing vision damage.

Use personal protective equipment: Face protection, hearing protection and gloves.

8) Clean the nozzle body (1) using pressurized air to remove as much residual plastic as possible.

### 10.4.4.3 Assembling the Nozzle 16S-04 / 22S-04 Series

**NOTICE**

For the following work on the nozzle (with assembled nozzle head), the nozzle must be clamped in a vice via using the tool holder (T2). It is not allowed to clamp the nozzle in a vice directly.

---

<table>
<thead>
<tr>
<th>Pos.</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Nozzle body</td>
</tr>
<tr>
<td>2</td>
<td>Head ring</td>
</tr>
<tr>
<td>3</td>
<td>Rear heating element (optional)</td>
</tr>
<tr>
<td>4</td>
<td>Retaining ring</td>
</tr>
<tr>
<td>5</td>
<td>Cover tube</td>
</tr>
<tr>
<td>6</td>
<td>Front heater</td>
</tr>
<tr>
<td>7</td>
<td>Component ring</td>
</tr>
<tr>
<td>8</td>
<td>Retaining ring</td>
</tr>
<tr>
<td>9</td>
<td>Nozzle tip</td>
</tr>
<tr>
<td>10</td>
<td>Wear insert (optional)</td>
</tr>
<tr>
<td>11</td>
<td>Cooling bushing (optional)</td>
</tr>
<tr>
<td>12</td>
<td>Single Head</td>
</tr>
<tr>
<td>13</td>
<td>Thermocouple Type</td>
</tr>
<tr>
<td>14</td>
<td>Head heater</td>
</tr>
<tr>
<td>15</td>
<td>Parallel Pin</td>
</tr>
</tbody>
</table>
Assembling the Nozzle Body

1) Fix the holder (T4) in a vice.

2) Place the nozzle head (12) in the holder (T2).

   NOTICE
   The position of the opening on the nozzle head (12) for the cable must coincide with the opening at the holder (T2).

3) Apply spotting ink on the nozzle body (1) bottom surface (SF1).
4) Screw in the nozzle body (1) hand-tight into the nozzle head thread until seated.
5) Unscrew the nozzle body (1) from the nozzle head (12).

6) Check the matching between the nozzle head (12) bottom surfaces (SF2) and the nozzle body (1) surface (SF1).

   **NOTICE**

   The nozzle head must bear on all surfaces uniformly and flatly, in particular on the nozzle head contact face.

   In case of any uncertainty, clean the surfaces with a cleaning cloth. If the next ink test is still unsatisfactory, please - contact Synventive Customer Service or Technical Support.

7) With a positive ink test, clean the surfaces and proceed to the next step.

8) Lubricate the thread (not the face) of the nozzle body with high-temperature assembly paste (antiseize compound).

   **NOTICE**

   This is an important measure to prevent thread corrosion due to aggressive gases, which could be released during plastics processing.
9) Tighten the nozzle body (1) to the nozzle head (12).

**NOTICE**
Use torque wrench with wrench insert and the torque specified in the torque table in section 13.

**Mounting the Nozzle Rear Heater**

**NOTICE**
For the following work on the nozzle (with assembled nozzle head), the nozzle must be clamped in a vice via using the tool holder (T2). It is not allowed to clamp the nozzle in a vice directly.

1) Assemble the nozzle body (1) on the nozzle head (12), as described in the above page 524.
2) Slide the head ring (2), onto the nozzle body (1) up to the surface of the hexagon.

**NOTICE**
The opening at head ring (2) (for the cable), must coincide with the opening at the nozzle head (12).
3) Bend the cable at the rear heater (3) corresponding to the opening at the nozzle head (12).

4) Slide the rear heating element (3), onto the nozzle body (1) up to the surface of the hexagon.
5) Fit the retaining ring (4) into the groove at the nozzle body (1).

**NOTICE**

The opening from the retaining ring (4) has to match with the opening from rear heating element (3).
Mounting the Nozzle Front Heater

1) Assemble the nozzle body (1) on the nozzle head (12), as described in the above page 524.
2) Assemble the rear heater (3) on the nozzle body (1), as described in the above page 526.
3) Lead the cable of the front heater (6) through the cover tube (5).
4) Hold the cover tube (5) to the front heater (6).
5) Bend the cable at the front heater (6) corresponding to the opening at the nozzle head (12) about 90 degrees.

6) Slide the cover tube (5) together with the front heater (6) over the nozzle body (1).

NOTICE
The wire from the front heater (6) has to be at the opening from the rear heater (3).

7) Push the front heater (6) onto the nozzle body (1).
8) Fix the front heater (6) with two screws at the nozzle body (1).
Assembling the Nozzle Tips TTW, TTP, TFP

**TTW Nozzle Tip Assembly**
1) Place the tip nut (a) into the tool (T2).
2) Using the tool (T1) to push the tip insert (b) into the tip nut (a).
3) Place the torpedo (c) on the tip insert (b).
4) Using the tool (T1) to push the torpedo (c) and the tip insert (b) into the tip nut (a).

**TTP Nozzle Tip Assembly**
1) Place the tip nut (a) on the tool (T2).
2) Using the tool (T1) to push the tip insert (b) into the tip nut (a).
3) Place the torpedo (c) on the tip insert (b).
4) Using the tool (T1) to push the torpedo (c) and the tip insert (b) into the tip nut (a).

**TFP Nozzle Tip Assembly**
1) Place the tip nut on the tool (T2).
2) Using the tool (T1) to push the tip insert (b) into the tip nut (a).
Shown are the tip nuts, for checking the correct seating of the tip inserts

![Correct and Incorrect Insert Installations]

**NOTICE**

See examples of good and incorrect insert installations. Make sure the insert must not exceed the height of the nozzle tip head. Incorrect items should not be further processed.

---

**Assembling the Seal Cap on TTW Nozzle Tip**

1. Place the tip nut (a) on the tool (T2).
2. Place the seal cap (b) on the tip nut (a).
3. Using the tool (T1) to push the seal cap (b) on the tip nut (a).

---

**Assembling the Nozzle Tip on the Nozzle Body**

1. Assemble the nozzle body (1) on the nozzle head (12), as described in the above page 524.
2. Assemble the rear heater (3) on the nozzle body (1), as described in the above page 526.
3. Assemble the front heater (6) on the nozzle body (1), as described in the above page 528.
4) Apply spotting ink on the nozzle tip (9) bottom surface (SF1).
5) Screw in the nozzle tip (9) hand-tight into the nozzle body (1) until seated.
6) Unscrew the nozzle tip (9) from the nozzle body (1).

7) Check the matching between the nozzle body (1) surface (SF2) and the nozzle tip (9) surface (SF1).

**NOTICE**
The nozzle must bear uniformly on the outer surfaces (SF2) (SF1) uniformly and flatly, in particular on the nozzle body contact face (SF1).

**NOTICE**
In case of any uncertainty, clean the surfaces with a cleaning cloth. If the next ink test is still unsatisfactory - please contact Synventive Customer Service or Technical Support.

8) With a positive ink test clean the surfaces and proceed to the next step.

9) Lubricate the thread (not the face) of the nozzle tip (9) body with high-temperature assembly paste (antiseize compound).

**NOTICE**
This is an important measure to prevent thread corrosion due to aggressive gases, which could be released during plastics processing.

10) Screw in the nozzle tip into the nozzle body (1) hand-tight.
11) Tighten the nozzle tip to nozzle.

**NOTICE**
Use torque wrench with wrench insert and the torque specified in the respective table in section 13.
12) Place the component ring (7) on the nozzle heating.


![Doc006734.png](Doc006734.png)

**WARNING**

Contact between the skin and the hot nozzle could result in burns.

Cool the nozzle to approximately 25 °C (77 °F).

13) Mount the retaining ring (8) on nozzle tip (9).

![Doc006733.png](Doc006733.png)
Mount the Nozzle Head Heater

1) Bend the thermocouple (13).
2) Install the thermocouple (13), ensuring it is seated correctly in the internal nozzle head (12) groove.

3) Slide the nozzle head heater (14) over the nozzle head (12).

**NOTICE**

The nozzle head heater secures the thermocouple by covering it in the vertical groove.

The heating wire must exit through the central recess of the nozzle head.

4) Tighten the screw from the head heater (14).
10.4.4.4 Grounding of the Sprue Bushing

**DANGER**

**Danger to Life by Electric Shock**

The Sprue Bushing has to be properly grounded to prevent serious personal injury or death.

- Electrical work must be carried out by qualified persons.
- Verify that all power source connections are properly grounded.
- In Emergency case - Switch all systems off.
- For first aid contact your medical / safety representing.

1) Guide the ground wire into the hole of the single head (12).
2) Tighten the ground wire with a socket set screw (DIN 913).
10.5 Inlet Bushings

10.5.1 Inlet Bushing IB-24 / IB-32 Series

**NOTICE**

Use torque wrench with wrench insert and the torques indicated in the torque table (section 13).

**WARNING**

**Hot Surfaces Hazard**

- Contact between the skin and hot surfaces could result in burns.
- Use personal protective equipment, such as gloves, apron, sleeves and face protection, to guard against burns.
- When servicing or handling the hot runner system outside the manifold plates or the injection molding machine, care must be taken to heed the hot surface exposure warnings.
- For first aid contact your medical / safety representing.

**Hazard of Pressurized Air**

- Pressurized air blow can result in hot plastic or foreign bodies entering the eyes, causing vision damage.
- Use personal protective equipment: Face protection, hearing protection and gloves.
- For first aid contact your medical / safety representing.

10.5.1.1 Thermocouple

**Color Coding of Thermocouples**

**NOTICE**

Take notice of the production and color identification of thermocouple cables.

Synventive uses J and K type thermocouples. Their color coding is given in the following table:

<table>
<thead>
<tr>
<th>Type</th>
<th>International standard IEC 584-3</th>
</tr>
</thead>
<tbody>
<tr>
<td>J</td>
<td>Black + Black</td>
</tr>
<tr>
<td></td>
<td>- White</td>
</tr>
<tr>
<td>K</td>
<td>Green + Green</td>
</tr>
<tr>
<td></td>
<td>- White</td>
</tr>
</tbody>
</table>

Coating: Litz wire “+”

Litz wire “-”
10.5.1.2 Dismounting and Mounting of the Inlet Bushing on the Manifold

In this section the inlet bushing parts are identified with the numbers indicated in the following figure.

**Technical Data IB-24, IB-32**

**Inlet Bushing Parts IB-24**

<table>
<thead>
<tr>
<th>Pos.</th>
<th>Qty.</th>
<th>Description</th>
<th>Item</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>1</td>
<td>Inlet bushing body</td>
<td>IB24-B-##-##-015-04-R##</td>
</tr>
<tr>
<td>2</td>
<td>1</td>
<td>Heater assembly with Thermocouple</td>
<td>HTJ-024-###-01 (J-Type)</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>HTK-024-###-01 (K-Type)</td>
</tr>
<tr>
<td>2.1</td>
<td>1</td>
<td>Thermocouple (TC) Spare part</td>
<td>TC#-RC-01-###-01</td>
</tr>
<tr>
<td>3</td>
<td>1</td>
<td>Retaining ring</td>
<td>M1800H25</td>
</tr>
<tr>
<td>4</td>
<td>1</td>
<td>12E nozzle component ring</td>
<td>12NC-R-02</td>
</tr>
<tr>
<td>5</td>
<td>1</td>
<td>Hexagon socket set screw</td>
<td>DIN914-M3X3-45H</td>
</tr>
</tbody>
</table>

**Inlet Bushing Parts IB-32**

<table>
<thead>
<tr>
<th>Pos.</th>
<th>Qty.</th>
<th>Description</th>
<th>Item</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>1</td>
<td>Inlet bushing body</td>
<td>IB32-B-##-##-015-04-R##</td>
</tr>
<tr>
<td>2</td>
<td>1</td>
<td>Heater assembly with Thermocouple</td>
<td>HTJ-032-###-01 (J-Type)</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>HTK-032-###-01 (K-Type)</td>
</tr>
<tr>
<td>2.1</td>
<td>1</td>
<td>Thermocouple (TC) without heater</td>
<td>TC#-RC-01-###-01</td>
</tr>
<tr>
<td>3</td>
<td>1</td>
<td>Retaining ring</td>
<td>M1800H35</td>
</tr>
<tr>
<td>4</td>
<td>1</td>
<td>16E nozzle component ring</td>
<td>16NC-R-02</td>
</tr>
<tr>
<td>5</td>
<td>1</td>
<td>Hexagon socket set screw</td>
<td>DIN914-M3X3-45H</td>
</tr>
</tbody>
</table>
Dismounting of the Inlet Bushing IB-24 / IB-32

1) Loosen the hexagon socket set screw (5).
2) Dismount the retaining ring (3).

3) Lift up the inlet bushing heater (2) from the inlet bushing body (1).
4) Lift up the component ring (4) from the inlet bushing body (1).

5) Unscrew the inlet bushing body (1) from the manifold.

**NOTICE**
Use torque wrench with wrench insert and the torques indicated in the torque table (section 13).
Mounting of the Inlet Bushing IB-24 / IB-32

1) Apply spotting ink on the inlet bushing body (1) bottom surface (SF1).
2) Screw in the inlet bushing body (1) hand-tight into the manifold thread until seated.
3) Unscrew the inlet bushing body (1) from the manifold.

4) Check the matching between the manifold bottom surfaces (SF2) and the inlet bushing body (1) surface (SF1).

   **NOTICE**
   The manifold must bear on all surfaces uniformly and flatly, in particular on the inlet bushing body contact face.
   In case of any uncertainty, clean the surfaces with a cleaning cloth. If the next ink test is still unsatisfactory, please - contact the Synventive Customer Service or Technical Support.

5) With a positive ink test clean the surfaces and proceed to the next step.

6) Lubricate the thread (not the face) of the nozzle body with high-temperature assembly paste (anti-seize compound).

   **NOTICE**
   This is an important measure to prevent thread corrosion due to aggressive gases, which could be released during plastics processing.

7) Tighten the inlet bushing body (1) on the manifold.

   **NOTICE**
   Use torque wrench with wrench insert and the torques indicated in the torque table (section 13).
8) Add nozzle component ring (4) on the inlet bushing body (1).
9) Tighten the component ring (4) with the Hexagon socket set screw (5).

10) Mount the Inlet bushing heater (2) on the inlet bushing body (1).

**NOTICE**
Check the correct position and fixation of the thermocouple (TC).

11) Fix with the retaining ring (3) the Inlet bushing heater (2) on the inlet bushing body (1).

12) Slide the Inlet bushing heater (2) up to the retaining ring (3).
13) Push the component ring (4) against the Inlet bushing heater (2).
14) Fix the component ring (4) by tighten it with the hexagon socket set screw (5).
10.5.2 Inlet Bushing IB-50 Series

**NOTICE**

Use torque wrench with wrench insert and the torques indicated in the torque table (section 13).

<table>
<thead>
<tr>
<th>WARNING</th>
</tr>
</thead>
</table>
| **Hot Surfaces Hazard**

Contact between the skin and hot surfaces could result in burns.

Use personal protective equipment, such as gloves, apron, sleeves and face protection, to guard against burns.

When servicing or handling the hot runner system outside the manifold plates or the injection molding machine, care must be taken to heed the hot surface exposure warnings.

For first aid contact your medical / safety representing.

| **Hazard of Pressurized Air**

Pressurized air blow can result in hot plastic or foreign bodies entering the eyes, causing vision damage.

Use personal protective equipment: Face protection, hearing protection and gloves.

For first aid contact your medical / safety representing. |
Technical Data IB-50

Inlet bushing, threaded to the Manifold

| Thread Inlet bushing / Manifold | M48x1,5 |
| Inlet bushing body              | Ø 50 mm |
| ØJib1                           | 10 mm   |
| ØJib2                           | 20 mm / 24 mm |
| R                               | 0 - 50 mm |
| AD                              | 90° - 120° |

Inlet Bushing Heater

<table>
<thead>
<tr>
<th>Type</th>
<th>E</th>
<th>A</th>
<th>Power</th>
</tr>
</thead>
<tbody>
<tr>
<td>IB50-025</td>
<td>25</td>
<td>40</td>
<td>400 W</td>
</tr>
<tr>
<td>IB50-050</td>
<td>50</td>
<td>65</td>
<td>650 W</td>
</tr>
<tr>
<td>IB50-075</td>
<td>75</td>
<td>90</td>
<td>450 W</td>
</tr>
<tr>
<td>IB50-100</td>
<td>100</td>
<td>115</td>
<td>500 W</td>
</tr>
<tr>
<td>IB50-140</td>
<td>140</td>
<td>155</td>
<td>630 W</td>
</tr>
</tbody>
</table>

Shown are standard dimensions.
For customer specific dimensions please contact Synventive.

10.5.2.1 Thermocouple

Color Coding of Thermocouples

**NOTICE**

Take notice of the production and color identification of thermocouple cables.

Synventive uses J and K type thermocouples. Their color coding is given in the following table:

Table 1: International color coding for thermocouples

<table>
<thead>
<tr>
<th>Type</th>
<th>International standard IEC 584-3</th>
</tr>
</thead>
<tbody>
<tr>
<td>J</td>
<td>Black</td>
</tr>
<tr>
<td></td>
<td>+ Black</td>
</tr>
<tr>
<td></td>
<td>- White</td>
</tr>
<tr>
<td>K</td>
<td>Green</td>
</tr>
<tr>
<td></td>
<td>+ Green</td>
</tr>
<tr>
<td></td>
<td>- White</td>
</tr>
</tbody>
</table>
10.5.2.2 Dismounting and Mounting of the Inlet Bushing on the Manifold

In this section the inlet bushing parts are identified with the numbers indicated in the following figure.

<table>
<thead>
<tr>
<th>Inlet Bushing Parts IB-50</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pos.</td>
</tr>
<tr>
<td>------</td>
</tr>
<tr>
<td>1</td>
</tr>
<tr>
<td>2</td>
</tr>
<tr>
<td>2.1</td>
</tr>
<tr>
<td>2.1</td>
</tr>
</tbody>
</table>

Dismounting of the Inlet Bushing IB-50

1) Loosen the socket cap screw from the inlet bushing heater (2.1).
2) Lift up the inlet bushing heater (2) from the inlet bushing body (1).

3) Unscrew the inlet bushing body (1) by using a wrench (HEX46) from the manifold.
Mounting of the Inlet Bushing IB-50

1) Apply spotting ink on the inlet bushing body (1) bottom surface (SF1).
2) Screw in the inlet bushing body (1) hand-tight into the manifold thread until seated.
3) Unscrew the inlet bushing body (1) from the manifold.

4) Check the matching between the manifold bottom surfaces (SF2) and the inlet bushing body (1) surface (SF1).

   **NOTICE**
   The manifold must bear on all surfaces uniformly and flatly, in particular on the inlet bushing body contact face.
   In case of any uncertainty, clean the surfaces with a cleaning cloth. If the next ink test is still unsatisfactory, please - contact the Synventive Customer Service or Technical Support.

5) With a positive ink test clean the surfaces and proceed to the next step.

6) Lubricate the thread (not the face) of the nozzle body with high-temperature assembly paste (anti-seize compound).

   **NOTICE**
   This is an important measure to prevent thread corrosion due to aggressive gases, which could be released during plastics processing.
7) Tighten the inlet bushing body (1) on the manifold.

**NOTICE**
Use torque wrench with wrench insert and the torques indicated in the torque table (section 13).

8) Push the inlet bushing heater (2) along the Inlet bushing body (1).
9) Tighten the heater (2) at the Inlet bushing body (1) with the socket cap screw.
11  Dismounting and Mounting Manifold Plugs

There are two kinds of manifold plugs from Synventive Hot Runner Systems:

- Standard manifold plugs which have to be replaced only by Synventive.
- Replaceable manifold plugs which the user can dismantle and install.

This chapter describes dismantling and installation of replaceable manifold plugs.

**NOTICE**

If your Hot Runner System has not replaceable manifold plugs, please contact Synventive Customer Services for dismantling and installing the manifold plugs.

11.1  Dismounting Manifold Plugs (APT)

1) Remove the heat shields if necessary.
2) Unscrew the set screw.

3) Using a slide hammer, thread into the head of the runner plug.
4) Remove the plug
   (according to size use a M5, M6, M8 or M12 screw).

**NOTICE**

Be careful not to misplace the dowel.
11.1.1 Cleaning the Flow Bores

1) Damages at the Hot Runner System’s flow bores can cause material degradation and leakage.

NOTICE
To prevent this do not damage the contact surface between nozzle and manifold. Use a brass brush or Scotch-Brite ®.

11.2 Mounting Manifold Plugs (APT)

1) Set the manifold plug into the bore.

2) Set the dowel into the appropriate bore.

3) Lubricate the set screw with high-temperature assembly paste (anti-seize compound).

NOTICE
This is an important measure to prevent thread corrosion due to aggressive gases, which could be released during plastics processing.

4) Screw the set screw into the thread.

NOTICE
Use torque wrench with wrench insert and the torques indicated in the torque table (section 13).
12 Accessories and Tools

This section describes the disassembly and assembly process to replace accessories.

Position Sensor

HESASSY03 (with 3 m cable)
HESASSY05 (with 5 m cable)
12.1 Service for the Position Sensor

**DANGER**

Danger to Life by Electric Shock

Electrical work must be carried out by qualified persons.

For any work on the Hot Runner System, check that the system is properly grounded.

For first aid contact your medical / safety representing.

12.1.1 Tools for the Position Sensor Service

Use the Position Sensor Tester Kit - HESTK01, each toolkit contains:

- Magnetic polarity indicator - EPID
- Position Sensor Tester - HESTU01
- incl. DC power supply - 490-SM16-12-V-P5
- Position Sensor Assembly, 1 m Cable - HESASSY01
- Carrying Case - 2340406C5

The Position Sensor Service Toolkit is used by Synventive Service Technicians to confirm that system wiring is correct and all signals are working. Contact Synventive to determine if the Toolkit can be purchased or borrowed for your application.

---

Magnetic polarity indicator

Used to search for a magnet and detect magnet polarity.

---

Position Sensor Tester

Basic Position Sensor

Operation can be confirmed with the Position Sensor Tester
12.1.2 Basic Position Sensor Information

Position Sensor - Part Number

HESASSY03 (with 3 m Cable)
HESASSY05 (with 5 m Cable)

Position Sensor Temperature Rating

- Sensor: 150 °C
- Cable: 200 °C

Position Sensor has internal temperature change compensation

12.1.3 Installing the Position Sensor

NOTICE

Danger of Material Defects
Do not pinch signal wire

NOTICE

Keep surfaces in contact with the Position Sensor clean.
1) Wipe down surface where Position Sensor is to be attached

2) Attach Position Sensor (7) with four DIN7985-M3x3 screws (8) to the actuator housing (1.1).

NOTICE

Torque value is 1.5 Nm
Do not touch the printed circuit board, instead handle the steel enclosure.
Check the Operation of the Position Sensor

**NOTICE**
Connect the Position Sensor to the tester.
The output should be within the range of 0.0 v to 5.0 v.
The voltage should be high when the valve gate is in the closed position and low when the valve gate is open.

Basic sensor operation can be confirmed with

- Position Sensor Tester powered up by either
  - Switching to the battery setting (A) to the left.
  - or switching to the outlet setting (B) on the right and plugging in DC Power supply (C)
- Attach Position Sensor (H) into the H Tester (I)
- and to a cylinder mounted sensor (K)

**NOTICE**
The output of the sensor as read by the tester should change at every position.
The output should be high when the valve gate is closed and low when the valve gate is open.
12.1.4 Installing of the Actuator with Position Sensor on the Hot Runner

1) The sensor cable must be routed to the wire-guard.

**NOTICE**

An awareness of the cutout in the top clamp plate is necessary to avoid the cable being damaged during assembly. Wire ties or fiberglass tape can be used to secure the cable to a safe path.

**NOTICE**

The Position Sensor should be used with water cooling while the manifold heater is in operation and requires SynCool® to protect it during shut-down. The temperature rating of the Position Sensor is 150 °C.

**NOTICE**

The Synflow system must be calibrated in the hot condition, allow hot runner system to reach temperature set point before calibrating. An additional calibration 1 hour after operation is recommended for improved sensor accuracy. Refer to Synflow user manual for further detail about the overall operation of the Synflow system with the Position Sensor actuator.
12.1.5 Position Sensor Troubleshooting Guide

Use the Position Sensor Service Toolkit, each toolkit contains a magnetic polarity indicator, a Position Sensor tester and spare Position Sensor.

1) Turn on the tester by switch to the battery setting (A) or outlet setting 12V (B) and plugging in DC Power supply (C)
2) Connect the Position Sensor dSub (D) to the tester.
3) Read the voltage on the Tester Readout (E).
4) Red LED (F) indicates a short in the sensor and should be replaced with a new sensor.
5) Green LED (G) indicates proper operation of the sensor and testing can continue.

**NOTICE**

The output of the sensor as read by the tester should change at every position.
The output should be high when the valve gate is closed and low when the valve gate is open.

Some Potential Issues may be:

1) **Issue**

   **Sensor output is not changing with any piston move.**
   a) Check that sensor cable for obvious damage.
   b) Use Magnetic polarity indicator to confirm that a magnet is present and correct magnet polarity is aimed towards the sensor assembly (North in the actuator).

   After Position Sensor removal have the Magnetic polarity indicator touch the cylinder and scan the surface facing the sensor position.
   i) If magnet is incorrect or missing, replace piston with magnetized piston.
   ii) If magnet is present, use the spare sensor in the service toolkit to confirm bad sensor.
2) **Issue**

Sensor output changes for some of the stroke but not the whole stroke. There is a “dead band.”

a) Confirm the position of the sensor and that sensor is properly torqued into position.

b) Cycle the actuator assembly with top clamp plate removed. If it is still not performing, confirm with the magnetic polarity indicator that a magnet is present and correct magnet polarity (North in the actuator) is aimed towards the sensor assembly.

3) **Issue**

Sensor voltage output is reversed

a) The sensor may have been flipped mounted at the actuator housing, verify that the sensor is not rotated 180°.

   i) If it is not flipped, try the spare sensor.

b) Confirm that the magnet polarity is correct by using the magnet tester.

   i) If magnet polarity is incorrect, replace the piston.
12.2 **W Gate Detail Inspection Procedure & Tools**

The tools for inspecting the mold cutout at the front of the nozzle for "W" gate to make sure the accurate dimension, get the expect result for molding.

### 12.2.1 Inspection Tool Introduction

1. Extension Bar
2. Fix Disk
3. Inspection tips

### 12.2.2 Extension Bar

<table>
<thead>
<tr>
<th>Item</th>
<th>L</th>
</tr>
</thead>
<tbody>
<tr>
<td>ITOOL-BAR-16-200</td>
<td>200</td>
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<tr>
<td>ITOOL-BAR-16-300</td>
<td>300</td>
</tr>
</tbody>
</table>

Used for lapping the injection gate on mold
12.2.3 Fix Disk

Fix disk with the tapered shape to fix the extension bar on the mold.

<table>
<thead>
<tr>
<th>ITEM</th>
<th>D1</th>
<th>D2</th>
<th>M</th>
<th>L</th>
</tr>
</thead>
<tbody>
<tr>
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<td>19</td>
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<tr>
<td>ITOOL-DISK-27</td>
<td>26</td>
<td>28.1</td>
<td>-</td>
<td>-</td>
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<tr>
<td>ITOOL-DISK-35</td>
<td>34</td>
<td>36.1</td>
<td>M6</td>
<td>25</td>
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<tr>
<td>ITOOL-DISK-40</td>
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<td>41.1</td>
<td>M6</td>
<td>28</td>
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<tr>
<td>ITOOL-DISK-42</td>
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<td>43.1</td>
<td>M6</td>
<td>30</td>
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<tr>
<td>ITOOL-DISK-50</td>
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<td>51.1</td>
<td>M8</td>
<td>35</td>
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<tr>
<td>ITOOL-DISK-60</td>
<td>59</td>
<td>61.1</td>
<td>M8</td>
<td>40</td>
</tr>
</tbody>
</table>

For example: ITOOL-DISK-27 can be fixed in the mold with the 09E nozzle cutout.
### 12.2.4 Inspection Tools for Gate Checking

<table>
<thead>
<tr>
<th>Gate Type</th>
<th>Sealing Diameter Check</th>
<th>Taper Shape Check</th>
</tr>
</thead>
<tbody>
<tr>
<td>06E-VSW / VTW</td>
<td><img src="image1" alt="Sealing Diameter" /></td>
<td><img src="image2" alt="Taper Shape" /></td>
</tr>
<tr>
<td>09E-W10V / W25V / W10T</td>
<td><img src="image3" alt="Sealing Diameter" /></td>
<td><img src="image4" alt="Taper Shape" /></td>
</tr>
<tr>
<td>12E-VTW / VSW</td>
<td><img src="image5" alt="Sealing Diameter" /></td>
<td><img src="image6" alt="Taper Shape" /></td>
</tr>
<tr>
<td>12E-TTW</td>
<td><img src="image7" alt="Sealing Diameter" /></td>
<td><img src="image8" alt="Taper Shape" /></td>
</tr>
<tr>
<td>16E-W10V / W25V / W10T</td>
<td><img src="image9" alt="Sealing Diameter" /></td>
<td><img src="image10" alt="Taper Shape" /></td>
</tr>
<tr>
<td>22E-VTW / VSW</td>
<td><img src="image11" alt="Sealing Diameter" /></td>
<td><img src="image12" alt="Taper Shape" /></td>
</tr>
</tbody>
</table>
12.2.5 Inspection Procedure

12.2.5.1 Preparation

1) Prepare the tools which you need, add the check blue on the checking face for the tips.

2) Remove the mold back plate and hot runner system from the mold, remove the manifold plate also if possible.

3) Put the tools into the nozzle cutout and rotate the bar to the end of the seat.
12.2.5.2 Sealing Diameter Check

**GO gauge**

**NOGO gauge**

**Expected result:**
- GO gauge can touch the face of the cylindrical counter bore.
- NOGO can't insert into the sealing cylindrical counter bore.

**Defective result:**
- GO gauge can't insert into the counter bore.
- NOGO can insert into the counter bore.

**NOTICE**

Depth check can refer 12.2.5.5

Clean the Check Blue off the all surfaces of the mold and the tools.
12.2.5.3 Taper Shape Check

**GO gauge**

![Image of GO gauge and taper counter bore](Doc006942.png)

**Expected result:**
GO gauge can touch the end of the taper counter bore.

**Defective result:**
GO gauge can't touch the end of the taper counter bore.

**NOTICE**
Depth check can refer 12.2.5.5
**NOGO gauge**

Expected result:
NOGO gauge can’t touch the end of the taper counter bore, but can touch most of the taper surface.

Defective result:
NOGO gauge can touch the end of the taper counter bore, and can’t touch the taper surface.

**NOTICE**

Depth check can refer 12.2.5.5

Clean the Check Blue off the all surfaces of the mold and the tools.
12.2.5.4 Gate Taper Check

Measure the protruding part of the inspection tool to verify the conical gate dimension.

![Gate Taper Check Diagram]

**ITOOL-W25V-30**

![ITOOL-W25V-30](Doc006949.png)

**ITOOL-W25V-40**

![ITOOL-W25V-40](Doc006950.png)
12.2.5.5 Depth Check

You can calculate the K dimension to check the nozzle tip cutout depth, B and L value can be found on the customer hot runner 2D drawing.

Sealing Diameter Check

![Sealing Diameter Check Diagram]

Taper Shape Check

![Taper Shape Check Diagram]
12.2.6 Valve Pin Verification

The valve pin can work with the guide bushing for verification or lapping the gate.

**NOGO gauge**

Valve Pin Guide bushing

\[ D = \text{Valve pin diameter} \]

<table>
<thead>
<tr>
<th>Item</th>
<th>D</th>
</tr>
</thead>
<tbody>
<tr>
<td>ITOOL-GB-30-01</td>
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<tr>
<td>ITOOL-GB-38-01</td>
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<tr>
<td>ITOOL-GB-50-01</td>
<td>5.0</td>
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<tr>
<td>ITOOL-GB-60-01</td>
<td>6.0</td>
</tr>
<tr>
<td>ITOOL-GB-80-01</td>
<td>8.0</td>
</tr>
</tbody>
</table>
13 Torques

All Synventive parts are to be tightened to the prescribed torques specified in the following table.

13.1 Relevant Parts attached with Screws pursuant to ISO 4762 (DIN 912)

- All screw connections of the actuators with socket head cap screws.
- All screw connections on the manifold and the mold.
- All screw connections of the A series inlet bushings (e.g. ABK etc.).
- All other components, such as protective heat shields, tie-down straps etc. are not deemed to be the subject of this manual, and therefore are not included. Information on these torques, not specified herein, shall be given to the workers by qualified professional personnel as needed.

NOTICE

A list of torque values is contained on each customer drawing and is binding upon all departments using the drawing.

13.2 Tool Specifications

A properly calibrated torque wrench must be used for the components in the list on the next page.
13.3 Instructions on Torques for Synventive parts

Table 9: List of torques for Synventive part

<table>
<thead>
<tr>
<th>Torques – Nozzles</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>API</strong></td>
</tr>
<tr>
<td>Parts</td>
</tr>
<tr>
<td>03C</td>
</tr>
<tr>
<td>04C</td>
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<td>CB</td>
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<td>06E</td>
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<td>09S</td>
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<td>16E02</td>
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<td>22E03</td>
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<td>22E-04</td>
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<table>
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<th><strong>APT</strong></th>
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<tbody>
<tr>
<td>Parts</td>
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<td>T-16</td>
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<td>T-16</td>
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<td>SR-16</td>
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<td>T-20</td>
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<td>T-20</td>
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<td>SR-20</td>
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<td>T-24</td>
</tr>
<tr>
<td>T-24</td>
</tr>
<tr>
<td>SR-24</td>
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</table>
### Torques

**APT - Asia**

<table>
<thead>
<tr>
<th>Parts</th>
<th>Thread size</th>
<th>Wrench size</th>
<th>Nm</th>
<th>ft-lbs</th>
</tr>
</thead>
<tbody>
<tr>
<td>Nozzle tip for CP01T, FFN, FFT, VG, W25V</td>
<td>M14x1</td>
<td>HEX10</td>
<td>20</td>
<td>15</td>
</tr>
<tr>
<td>Nozzle tip for K01N</td>
<td>M14x1</td>
<td>HEX10</td>
<td>47</td>
<td>35</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Parts</th>
<th>Thread size</th>
<th>Wrench size</th>
<th>Nm</th>
<th>ft-lbs</th>
</tr>
</thead>
<tbody>
<tr>
<td>Nozzle tip for CP02N</td>
<td>M14x1</td>
<td>HEX11</td>
<td>47</td>
<td>35</td>
</tr>
<tr>
<td>Nozzle tip for CP01T, FFN, FFT, VG, W25V</td>
<td>M18x1</td>
<td>HEX13</td>
<td>30</td>
<td>22</td>
</tr>
<tr>
<td>Nozzle tip for K01N</td>
<td>M18x1</td>
<td>HEX13</td>
<td>90</td>
<td>67</td>
</tr>
<tr>
<td>Nozzle tip for CP02N</td>
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<td>HEX15</td>
<td>90</td>
<td>67</td>
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<tr>
<td>Nozzle tip for CP01T, FFN, FFT, VG, W25V</td>
<td>M22x1.5</td>
<td>HEX17</td>
<td>60</td>
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<tr>
<td>Nozzle tip for K01N</td>
<td>M25x1.5</td>
<td>HEX18</td>
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</table>

<table>
<thead>
<tr>
<th>Parts</th>
<th>Thread size</th>
<th>Wrench size</th>
<th>Nm</th>
<th>ft-lbs</th>
</tr>
</thead>
<tbody>
<tr>
<td>Nozzle tip for W01T, W01V, K01N</td>
<td>M14x1</td>
<td>HEX16</td>
<td>65</td>
<td>48</td>
</tr>
<tr>
<td>Inner part for W01T, W01V</td>
<td>M12x1</td>
<td>HEX9</td>
<td>17</td>
<td>13</td>
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</tbody>
</table>

**Torques – Manifold Parts and Others**

<table>
<thead>
<tr>
<th>Parts</th>
<th>Thread size</th>
<th>Wrench size</th>
<th>Nm</th>
<th>ft-lbs</th>
</tr>
</thead>
<tbody>
<tr>
<td>Inlet bushing</td>
<td>M24x1.5</td>
<td>HEX21</td>
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<tr>
<td>Inlet bushing</td>
<td>M32x1.5</td>
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<tr>
<td>Inlet bushing</td>
<td>M42x1.5</td>
<td>HEX41/46(2012)</td>
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<td>Inlet bushing</td>
<td>M48x1.5</td>
<td>HEX46</td>
<td>400</td>
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<td>Inlet bushing 09CP</td>
<td>M48x2</td>
<td>HEX41</td>
<td>460</td>
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<tr>
<td>Inlet bushing 12CP</td>
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<tr>
<td>Inlet bushing 16CP</td>
<td>M36x1.5</td>
<td>HEX36</td>
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<td>237</td>
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<tr>
<td>Valve pin guide NG20 / NG30 / NG38</td>
<td>M14x1</td>
<td>HEX16</td>
<td>30</td>
<td>22</td>
</tr>
<tr>
<td>Valve pin guide NG05 / NG06 / NG08 / VPG - M22</td>
<td>M22x1</td>
<td>HEX27</td>
<td>100</td>
<td>74</td>
</tr>
<tr>
<td>Valve pin guide nut 47-85-101</td>
<td>M27x1</td>
<td>HEX27</td>
<td>170</td>
<td>125</td>
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<tr>
<td>Screw connections cylinder housing PNC7518M</td>
<td>M6</td>
<td>HEX5</td>
<td>9</td>
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</table>

**Torques – Dynamic Feed® Components**

<table>
<thead>
<tr>
<th>Parts</th>
<th>Thread size</th>
<th>Wrench size</th>
<th>Nm</th>
<th>ft-lbs</th>
</tr>
</thead>
<tbody>
<tr>
<td>Transducer block DFTB12</td>
<td>M10</td>
<td>HEX8</td>
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<tr>
<td>Transducer block DFTB16</td>
<td>M16</td>
<td>HEX14</td>
<td>180</td>
<td>133</td>
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<tr>
<td>Transducer block DFTB22</td>
<td>M16</td>
<td>HEX14</td>
<td>180</td>
<td>133</td>
</tr>
<tr>
<td>Melt pressure sensor DFMPS</td>
<td>1/2”-20 UNF</td>
<td>HEX13</td>
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</tbody>
</table>

**Torques for Screws and Nuts**

<table>
<thead>
<tr>
<th>Parts</th>
<th>Thread size</th>
<th>Wrench size</th>
<th>Nm</th>
<th>ft-lbs</th>
</tr>
</thead>
<tbody>
<tr>
<td>Socket head cap screw ISO 4762 - 12.9 (DIN912)</td>
<td>M4</td>
<td>HEX3</td>
<td>4</td>
<td>3</td>
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<tr>
<td>Socket head cap screw ISO 4762 - 12.9 (DIN912)</td>
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<td>HEX4</td>
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<td>HEX5</td>
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<tr>
<td>Socket head cap screw ISO 4762 - 12.9 (DIN912)</td>
<td>M8</td>
<td>HEX6</td>
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<tr>
<td>Socket head cap screw ISO 4762 - 12.9 (DIN912)</td>
<td>M10</td>
<td>HEX8</td>
<td>67</td>
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<tr>
<td>Socket head cap screw ISO 4762 - 12.9 (DIN912)</td>
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<td>HEX10</td>
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<td>HEX14</td>
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</tbody>
</table>

**NOTICE**

Torque values for screws and nuts < M4 are not specified in the torque list.
## Torques

### Torques - Manifold Plug Set Screw

#### for APT Manifolds

<table>
<thead>
<tr>
<th>Parts</th>
<th>Thread size</th>
<th>Wrench size</th>
<th>Nm</th>
<th>ft-lbs</th>
</tr>
</thead>
<tbody>
<tr>
<td>62-PD-002 Removable manifold plug</td>
<td>M12</td>
<td>40</td>
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</tr>
<tr>
<td></td>
<td>M14</td>
<td>60</td>
<td>45</td>
<td></td>
</tr>
<tr>
<td></td>
<td>M16</td>
<td>100</td>
<td>75</td>
<td></td>
</tr>
<tr>
<td></td>
<td>M20</td>
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<td></td>
</tr>
<tr>
<td></td>
<td>M22</td>
<td>230</td>
<td>170</td>
<td></td>
</tr>
<tr>
<td></td>
<td>M24</td>
<td>245</td>
<td>180</td>
<td></td>
</tr>
<tr>
<td></td>
<td>M27</td>
<td>270</td>
<td>200</td>
<td></td>
</tr>
<tr>
<td></td>
<td>M33</td>
<td>475</td>
<td>350</td>
<td></td>
</tr>
<tr>
<td>62-PD-006 Removable manifold plug</td>
<td>M16</td>
<td>100</td>
<td>75</td>
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</tr>
<tr>
<td></td>
<td>M20</td>
<td>175</td>
<td>130</td>
<td></td>
</tr>
<tr>
<td></td>
<td>M24</td>
<td>300</td>
<td>220</td>
<td></td>
</tr>
<tr>
<td></td>
<td>M27</td>
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<td></td>
</tr>
<tr>
<td></td>
<td>M33</td>
<td>475</td>
<td>350</td>
<td></td>
</tr>
<tr>
<td>62-PD-007 Removable manifold plug</td>
<td>M16</td>
<td>100</td>
<td>75</td>
<td></td>
</tr>
<tr>
<td></td>
<td>M20</td>
<td>175</td>
<td>130</td>
<td></td>
</tr>
<tr>
<td></td>
<td>M24</td>
<td>300</td>
<td>220</td>
<td></td>
</tr>
<tr>
<td></td>
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<td></td>
</tr>
<tr>
<td></td>
<td>M33</td>
<td>475</td>
<td>350</td>
<td></td>
</tr>
</tbody>
</table>

Indicates torque specification provided for special oversized endwork that does not appear in 62-PD-002, 62-PD-006 or 62-PD-007.

<table>
<thead>
<tr>
<th>Parts</th>
<th>Thread size</th>
<th>Wrench size</th>
<th>Nm</th>
<th>ft-lbs</th>
</tr>
</thead>
<tbody>
<tr>
<td>62-PD-002 Removable manifold plug</td>
<td>M24</td>
<td>125</td>
<td>92</td>
<td></td>
</tr>
<tr>
<td></td>
<td>M27</td>
<td>165</td>
<td>122</td>
<td></td>
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<td></td>
<td>M33</td>
<td>225</td>
<td>165</td>
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#### for API Manifolds

<table>
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<tr>
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<th>Nm</th>
<th>ft-lbs</th>
</tr>
</thead>
<tbody>
<tr>
<td>MP02 Removable manifold plug (Thread bold MPT141502)</td>
<td>M14x1</td>
<td>SW6</td>
<td>15</td>
<td>11</td>
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<td>MP02 Removable manifold plug (Thread bold MPT161502)</td>
<td>M16x1</td>
<td>SW8</td>
<td>25</td>
<td>18.5</td>
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<tr>
<td>MP02 Removable manifold plug (Thread bold MPT181502)</td>
<td>M18x1</td>
<td>SW10</td>
<td>45</td>
<td>33</td>
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<tr>
<td>MP02 Removable manifold plug (Thread bold MPT201502)</td>
<td>M20x1</td>
<td>SW10</td>
<td>65</td>
<td>48</td>
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<td>MP02 Removable manifold plug (Thread bold MPT222002)</td>
<td>M22x1</td>
<td>SW12</td>
<td>90</td>
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<tr>
<td>MP02 Removable manifold plug (Thread bold MPT242002)</td>
<td>M24x1</td>
<td>SW12</td>
<td>125</td>
<td>92</td>
</tr>
<tr>
<td>MP02 Removable manifold plug (Thread bold MPT262002)</td>
<td>M26x1</td>
<td>SW14</td>
<td>165</td>
<td>122</td>
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<td>MP02 Removable manifold plug (Thread bold MPT282002)</td>
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<td>MP02 Removable manifold plug (Thread bold MPT302002)</td>
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#### Torques - No Current Series

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<th>Thread size</th>
<th>Wrench size</th>
<th>Nm</th>
<th>ft-lbs</th>
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<tbody>
<tr>
<td>C Outside body</td>
<td>M27x1,5</td>
<td>HEX22</td>
<td>80</td>
<td>59</td>
</tr>
<tr>
<td>C (CW00) Outside body</td>
<td>M27x1,5</td>
<td>HEX22</td>
<td>50</td>
<td>37</td>
</tr>
<tr>
<td>EA Nozzle body</td>
<td>M27x1</td>
<td>HEX24</td>
<td>120</td>
<td>89</td>
</tr>
<tr>
<td>T-5, HT-5, T-10, HT-10 Nozzle body</td>
<td></td>
<td></td>
<td>135</td>
<td>100</td>
</tr>
<tr>
<td>T-5, HT 5 Nozzle tip</td>
<td></td>
<td></td>
<td>65</td>
<td>50</td>
</tr>
<tr>
<td>T-10, HT-10 Nozzle tip</td>
<td></td>
<td></td>
<td>120</td>
<td>90</td>
</tr>
<tr>
<td>SRP-20, TP-20 Nozzle tip</td>
<td></td>
<td></td>
<td>200</td>
<td>150</td>
</tr>
<tr>
<td>SRP-24, TP-24 Nozzle tip</td>
<td></td>
<td></td>
<td>270</td>
<td>200</td>
</tr>
<tr>
<td>EG-10 Nozzle tip</td>
<td></td>
<td></td>
<td>65</td>
<td>50</td>
</tr>
<tr>
<td>HTP-10 Nozzle tip</td>
<td></td>
<td></td>
<td>120</td>
<td>90</td>
</tr>
</tbody>
</table>
14 Shutdown

14.1 Returning the Hot Runner System

Certain requirements have to be met when the Hot Runner System is returned. If these requirements are not met, all warranty claims will cease to exist. The requirements related to the dispatch of the Hot Runner System are set as follows:

- When shipping overseas, the manifolds shall be treated with a protective anti-corrosion agent.

**NOTICE**

Spray the anti-corrosion agent on the Hot Runner System or the injection mold.
We recommend the multipurpose spray CC80 by Metaflux as an anti-corrosion agent.

- Manifold heavier than 15 kg must be packed in foam before transport.
- Specify gross weight (total package weight pursuant to EU rules).
- Use assembly pillars, to protect against damage e.g. of the actuator.
- If a Hot Runner System was received in a wooden box, it must be returned to Synventive in a wooden box.
- Disassemble the nozzles and actuators from Hot Runner Systems with support ring / face fit nozzles and pack them separately.
- Secure actuators and nozzles from Hot Runner Systems with support ring / face fit nozzles against movement.
14.2 Disposal

Disposal of hot runner manifold systems should involve the recycling of basic materials. Synventive rejects any responsibility for health and safety risks to personnel or other damages caused by the re-use of individual parts for a purpose other than the originally specified purpose.

1) Disconnect the system from supply sources.

2) Release oil from distribution systems and actuators in the hydraulic system.

   NOTICE
   Dispose the oil in accordance with local environmental regulations.

3) Remove electrical components (heating, temperature sensors) and process through your recycling program.

4) Dismantle cables and dispose of them in accordance with local environmental regulations.

   NOTICE
   Metal parts must be separated for recycling (scraping, collection points).
   It is necessary to comply with the instructions from competent firms authorized to dispose of the specific materials.
15 Annex

15.1 Units used

<table>
<thead>
<tr>
<th>Symbol</th>
<th>Name</th>
<th>Physical quantity</th>
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</thead>
<tbody>
<tr>
<td>Ω</td>
<td>Ohm</td>
<td>Resistance</td>
</tr>
<tr>
<td>kΩ</td>
<td>Kiloohm</td>
<td>Resistance</td>
</tr>
<tr>
<td>MΩ</td>
<td>Megaohm</td>
<td>Resistance</td>
</tr>
<tr>
<td>W</td>
<td>Watt</td>
<td>Power</td>
</tr>
<tr>
<td>min.</td>
<td>Minute</td>
<td>Time</td>
</tr>
<tr>
<td>s</td>
<td>Second</td>
<td>Time</td>
</tr>
<tr>
<td>°C</td>
<td>Degree Celsius</td>
<td>Temperature</td>
</tr>
<tr>
<td>K</td>
<td>Kelvin</td>
<td>Temperature</td>
</tr>
<tr>
<td>°F</td>
<td>Fahrenheit</td>
<td>Temperature</td>
</tr>
<tr>
<td>mm</td>
<td>Millimeter</td>
<td>Length</td>
</tr>
<tr>
<td>m</td>
<td>Meter</td>
<td>Length</td>
</tr>
<tr>
<td>&quot;</td>
<td>Inch</td>
<td>Length</td>
</tr>
<tr>
<td>psi</td>
<td>Pounds per square inch</td>
<td>Pressure</td>
</tr>
<tr>
<td>bar</td>
<td>Bar</td>
<td>Pressure</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Symbol</th>
<th>Name</th>
<th>Physical quantity</th>
</tr>
</thead>
<tbody>
<tr>
<td>Nm</td>
<td>Newton meter</td>
<td>Torque</td>
</tr>
<tr>
<td>foot-pounds</td>
<td>foot pounds</td>
<td>Torque</td>
</tr>
</tbody>
</table>

Glossary and List of Abbreviations

A

activeGate® technologies are designed to facilitate perfect surface quality, stability and repeatability of injected molded parts by precisely controlling the flow. Elements of the activeGate® Control Systems are synflow, eGate, DynamicFeed, hGate, nuGate, VMI Monitoring.

Actuator cooling

See Temperature control of the Hot Runner System

A - Dimension

Distance between the top of the spacer plate and the top of the manifold

API nozzles

See section 2.1.1

APT nozzles

See section 2.1.2

B

Balancing

Processing optimization, consisting in the determination of optimum parameters for the Hot Runner System and the injection molding machine.

C

Cavity

Hollow space in the injection mold in the shape of the molded parts. It is filled with plastics during the injection process.

Cavity plate

Internal space of the injection mold in which the cavity is located.

Clamping plate

Steel plate used to attach the mold to the injection molding machine. The QCVG actuator is placed inside the clamping plate.

Coolant

Cooling fluid used to cool down the actuator. The coolant used should be properly modified, e.g. filtered water with an anti-corrosion and frostproof agent.

Cutout / cavity

Cutout (matrix) into which the Hot Runner System is incorporated. Also mold cavity, or cutout for the nozzle.
## Annex

### D
**Dimension A**
See A-dimension

### E
**eGate®**
Equipment for valve gate systems to realize and control electrically a defined open/closing and motion/position profile for each nozzle.

**ELA series**
Electric operated actuators for valve gate systems

**EVOH**
Ethylene vinyl alcohol copolymer

**Expansion gap Z**
See dimension Z

### F
**F0 point**
F0 point is the nozzle reference point. The nozzle tip may be cut to this point, but not beyond.

### G

### H
**HB Hydraulic Actuator series**
The HB Hydraulic Actuator series is available with optional thermocouple, valve pin position sensor and SynCool3.

**Heated inlet bushing**
(see: Inlet bushing, heated)

**Heater**
Resistor element heating the Hot Runner System.

**High-temperature assembly paste**
Temperature resistant assembly paste which enables resolvability of all threads.

**Hot half**
Hot Runner System including the applicable cavity plates. They are already complete with cables, or hoses, fully assembled and ready for mounting.

**Hot Runner manifold**
Steel block distributing the plastic. It forms the Hot Runner System together with nozzles, actuators, supply hoses and heating.

**Hot Runner System**
Hot runner system, see section 2

**HR manifold**
Hot manifold

**HRC**
The HB Hydraulic Actuator series is available with optional thermocouple, valve pin position sensor and SynCool3.

**Hydraulic operating fluid**
Operating fluid for hydraulic actuators that complies with requirements under classification 21/18/13 pursuant to ISO 4406.

**HYC series**
Hydraulic operated actuators for valve gate systems

### I
**Inlet bushing, heated**
Hot runner nozzles where the contact surface for the machine nozzle is located directly on the nozzle head – either as a manifold or as a single nozzle.

**Inlet bushing, unheated**
Short inlet bushing – in some cases heating is not necessary.

### J
**J-Type temperature sensor (thermocouple)**
Temperature sensor (thermocouple), type J.

### K

### L
**List of adjustment values**
Sheet with values for the optimum setting of the injection molding machine and the Hot Runner System.

**Dimension L**
The nominal dimension between the nozzle face (support ring nozzles) respectively the bottom of the manifold (threaded nozzles) and the F0 point.

**Dimension Lc**
Depth of center support in mold plate

**Dimension Lcs**
Length of center support

**Dimension Lsp**
Spacer ring length

**Dimension Lms**
Support pad length

### M
**Machine**
Injection molding machine

**Manifold V-37**
Manifold 37 mm (1.46") thickness and a width of 36 mm (1.42")

**Manifold V-42**
Manifold 42 mm (1.65") thickness and a width of 50 mm (1.97")

**Manifold V-45**
Manifold 45 mm (1.77") thickness and a width of 50 mm (1.97")

**Manifold V-50**
Manifold 50 mm (1.97") thickness and a width of 60 mm (2.36")

**Manifold V-55**
Manifold 55 mm (1.97") thickness and a width of 80 mm (3.15")

**Manifold V-65**
Manifold 65 mm (2.56") thickness and a width of 80 mm (3.15")
**Annex**

<table>
<thead>
<tr>
<th>Term</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Manifold VH</td>
<td>Manifold 80 mm (3.15&quot;) thickness and a width of 87 mm (3.43&quot;)</td>
</tr>
<tr>
<td>Manifold VI</td>
<td>Manifold 85 mm (3.35&quot;) thickness and a width of 97 mm (3.82&quot;)</td>
</tr>
<tr>
<td>Manifold channel</td>
<td>Drilled channel in the manifold that conveys the melt.</td>
</tr>
<tr>
<td>Mold temperature control</td>
<td>Mold heating or cooling using a fluid pump or similar control unit.</td>
</tr>
<tr>
<td>Material safety data sheet (MSDS)</td>
<td>Contains data typical for a specific plastic, such as processing temperature, specified health and safety information etc.</td>
</tr>
</tbody>
</table>

**N**

| Nominal dimension           | See Dimension L                                                             |

**O**

| Open (thermal gate) system  | System without a moving valve pin, with thermally controlled gate.          |

**P**

| PB Pneumatic Actuator series | The PB Pneumatic Actuator series is available with optional thermocouple, valve pin position sensor and SynCool3. |
| Plastification unit          | Screw and barrel of the injection molding machine.                          |
| Plate actuation              | Plate actuation is a synchronized needle opening and is ideal for high cavitation molds.          |
| PLUG’N PLAY® Hot Runner System | The PLUG’N PLAY® hot runner system is supported by the thrust pads, center support and positioning dowels. It is not screwed to the cavity plate. The system can be assembled without adjustment. |
| PNC series                  | Pneumatic operated actuators for valve gate systems.                        |
| PPE                         | Personal protective equipment                                              |
| Pre-chamber isolation       | The nozzle tip does not pass through the cavity plate and is located in a pre-chamber. The plastic in the pre-chamber isolates the melt flow. |

**Q**

| QCVG                        | "Quickcouple valve gate" actuator, placed inside mold plate.                |

**R**

| Ra                          | Mean roughness value, surface roughness after machining                    |

**S**

| Screwed (threaded) manifold nozzles | Hot runner nozzles screwed into the manifold.                                      |
| Single valve gate nozzles        | Single valve gate nozzles are hot runner nozzles with the inlet bushing directly mounted on the nozzle head. The Single Valve Gate System closes the nozzle tip using a moving valve pin. |
| Sprue bushing                   | Hot runner nozzles sprue bushing are hot runner nozzles with the inlet bushing directly mounted on the nozzle head. |
| Support ring nozzles            | Support ring nozzles are hot runner nozzles whose connection to the manifold consists of a face fit, so that during heating the thermally expanding manifold can "slide" over the nozzle heads. |
| Spacer plate                    | Steel plate in which a cutout for the Hot Runner System is located.          |
| SynCool®                       | The SynCool® technology provides passive actuator cooling which may eliminate the need for dedicated cooling lines. It also allows the operator on certain applications at <280°C operating & <80°C mold temperature, to switch off the complete system including the mold and actuator cooling without the risk of decomposing the hydraulic oil. |
| synflow®                       | synflow® equipment enables valve pin opening velocity and intermediate pin holding control for hydraulic valve gate hot runner systems. |

**T**

| Temperature control of the Hot Runner System | Cooling and heating of the Hot Runner System, maintaining temperature within a specified range. |
| Temperature controller              | Temperature control of the machine.                                          |
| Temperature sensor (thermocouple)   | Sensor that measures temperature in specific heated zones of the Hot Runner System, allowing temperature control. Syventive Hot Runner Systems use almost exclusively J type sensors, unless specifically requested by the customer. |
| Temperature sensor (thermocouple), type J | Temperature sensor whose (+) cable is made of ferrous metal and (-) cable of copper and nickel. |
| Torque table                        | List of torques for Syventive parts. See section 13                         |

**U**

| Valve gate system              | System that closes the nozzle tip using a moving valve pin.                  |
| VP series                      | Pneumatically controlled actuators located in mold plate.                    |
15.2 **Patents**

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**U.S. Patents:** 6683283, 6712600, 6729871, 6746228, 7029268, 7270537, 7597928, 8091202, 8282388, 8297836, 8328549, 8349244, 8562336, 8728378, 9005509, 9011736, 9144929, 9205587, 9427905, 9440389, 9623598, 9636858, 9604399, 9492960, 9498909, 9662820, 9682504, 9724861, 9738024, 9827701, 9873216, 9873219, 9878477, 9908273, 9937648, 9944006, 9987783, 10005215, 10005216, 10046496, 10046497, 10052801, 10160150, 10166709, 10166710, 10173356, 10245772

**EU Patents:** 1218161, 1223018, 1223019, 1223020, 1295693, 1810812, 2326735, 2501533, 2504145, 2519392, 2550144, 2620266, 2631059, 2744636, 2888091, 2900449, 2925503, 2931491, 2996432, 2996858, 3013549, 3003680, 3003681, 3092115, 3019323, 3148767, 3209476, 3271129, 3326777, 3271130, 3240666, 3247545

**CN Patents:** CN100406232C, CN102149528B, CN1205013C, CN102770257B, CN1391512A, ZL200510072806.2, ZL201080030322.0, ZL201080060140.8, ZL201180040206.1, ZL201180040565.7, ZL201280075053.9, ZL201280075135.3, ZL201380056480.0, ZL201380056483.8, ZL201380066463.2, ZL201380069040.5, ZL201410693084.1, ZL201480009037.9, ZL201480034175.2, ZL201480039036.9, ZL201480039033.5, ZL201410424996.9, ZL201510005814.9, ZL201480049316.8, ZL201480034180.3, ZL201480016087.x, ZL201480077490.3

**CA Patents:** 2385016, 2390267, 2663872, 2671300

**JP Patents:** 5615975
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**HOT RUNNER TECHNOLOGY**
Hot Runner System Installation Guide

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