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

| Specification                  | 16S-04
<table>
<thead>
<tr>
<th></th>
<th></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

| Specification                  | 22S-04
<table>
<thead>
<tr>
<th></th>
<th></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>Pos.</th>
<th>Part No.</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>T1</td>
<td>AT16S-01</td>
<td>Nut</td>
</tr>
<tr>
<td>T2</td>
<td>AT16S-03</td>
<td>Holder</td>
</tr>
</tbody>
</table>

Mounting Tool for 16S-04

<table>
<thead>
<tr>
<th>Pos.</th>
<th>Part No.</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>T1</td>
<td>AT22S-01</td>
<td>Holder</td>
</tr>
</tbody>
</table>

Assembly Tools for TTP, TFP TTW Nozzle Tips

Assembly Tools for 16S-04 Nozzle Tips

| (T2) AT-16-040102 |

Assembly Tools for 22S-04 Nozzle Tips

| (T2) AT-22-040102 |

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>
</tr>
</thead>
<tbody>
<tr>
<td>J</td>
<td>Black</td>
<td>+ Black</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>- White</td>
<td></td>
</tr>
<tr>
<td>K</td>
<td>Green</td>
<td>+ Green</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>- White</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

**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 (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](Doc004668.png)

**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).

![Seal Cap Assembly](Doc007734.png)

**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.

**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).
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).