Hot Runner Systems
Use & Maintenance





THERMOPLAY®
HotRunnerSystems
A business of BARNES

© Copyright 2024 - Thermoplay S.p.A.

No part of this publication may be reproduced or transmitted in any form or by any means electronic or mechanical, including photocopy, recording, or any information storage and retrieval system, without permission in writing from the THERMOPLAY Company. The THERMOPLAY S.p.A. company reserves the right to make changes at any moment, in this publication, without notice.

Index

1 Foreword 3

1.1 Contacts 3

1.2 Symbols used in the manual 4

1.3 Identification codes and plates 5
1.3.1 Nozzle markings 5
1.3.2 Heater markings 5
1.3.3 Manifold markings 6
1.3.4 Identification plates 6

1.4 Precautions when using product Thermoplay 7
1.4.1 Hot runner systems 7
1.4.2 Valve gate groups 8
1.4.3 Temperature Controllers 9

1.5 Precautions to be taken for the disposal of our products Thermoplay 9

1.6 Use of the correct tools 9

1.7 Checks upon arrival 10

1.8 Safety 10

2 General rules 12

2.1 General notes for the design of a hot-runner mold 12

2.2 Recommendations for cooling 15

2.3 Electrical wiring 16
2.3.1 Grooves for the cables passage 16
2.3.2 Connectors 16
2.3.3 Electrical connections 17
2.3.4 Anti-rotation pins 18

2.4 Valve gate nozzles 18

3 Systems installation 19

3.1 Opening the packages 21
3.1.1 Mechanical/electrical dimensional checks to be carried out before assembling the hot runners system in the mold. 23

3.2 System introduction into mold plates 24
3.2.1 'Bolted down' systems 27
3.2.2 'Side gate' systems 28

3.3 Valve gate assembly 32

3.4 Electrical wiring 32

3.5 Electrical checks 33
3.5.1 Thermocouple electric continuity 33
3.5.2 Heaters check 34

3.6 Wiring of commands and conditioning of the valve gate groups for threaded nozzles 35

4 Hot halves installation 36

5 Start up 38

5.1 Firts start up 38

5.1.1 Warnings 38
5.1.2 Control procedure 38

6 Transformation 41

6.1 Colour change 41
6.1.1 Systems without shutter 41
6.1.2 Systems with shutter 41

6.2 End of production 42

7 Failures and solutions 43

7.1 List of failures 43
7.1.1 Electrical failures 43
7.1.2 Thermoregulator failures 43
7.1.3 Injection failures 43
7.1.4 Failures on molded parts 44

7.2 Electrical failures 45
7.2.1 The system doesn't operate / does not allow injection 45
7.2.2 Simultaneous loss of many heated zones 46
7.2.3 Loss of one heated zone 46

7.3 Thermo-regulator failures 47
7.3.1 Loss of set temperature 47
7.3.2 Unstable setting 47
7.3.3 Deviation between displayed/real temperature 48

7.4 Injection failures 48
7.4.1 A nozzle doesn't inject 48
7.4.2 Injection difficulty 49
7.4.3 Unbalanced filling 49
7.4.4 Material decomposition 50
7.4.5 Injection point too high 50
7.4.6 Loss of plastic material around hot runner 51

7.5 Failures on the molded parts 51
7.5.1 Jetting 51
7.5.2 Moisture streaking 52
7.5.3 Burns 52
7.5.4 Suck-back 53
7.5.5 Sealing lines 53
7.5.6 Colour streaks 54
7.5.7 Differences in brilliance 54
7.5.8 Filling difficulties 55
7.5.9 Flashes 55
7.5.10 Gas or air bubbles 56
7.5.11 Black spots 56
7.5.12 Strands at injection point 57
7.5.13 Concentric signs near injection point 57
7.5.14 Ejector marks 57
7.5.15 Deformation during ejection 58
7.5.16 Peeling 58

8 Maintenance 60

8.1 Maintenance nozzles TD, TF, FN, FT, and TH 61
8.1.1 Maintenance kit 61
8.1.1.1 TF-TF6 / FN – FNH6 Nozzles 61
8.1.1.2 TD-TD6 / DN – DN6 Nozzles 62
8.1.1.3 TH / TH6 Nozzles 63

8.1.2 Extracting the nozzle body from the core (only for TD nozzles) 64
8.1.3 Replacing TF, TD and TH nozzle tips 65
8.1.4 Heater and thermocouple replacement 70
8.1.5 Heater and Thermocouple replacement TH nozzle 72
8.1.6 Tip and heater replacement on type "M" nozzles with open mold 75

8.2 DN/DL nozzle maintenance 77
8.2.1 Maintenance kit for DN / DN6 (Ø44), DL 77
8.2.2 Replacing the DN / DN6 tip (Ø44) 78
8.2.3 Replacing the heater and thermocouple of DN44 – DL nozzles (all diameters) 80
8.2.3.1 Nozzles DN/DL18 80
8.2.3.2 Nozzles DN44 – DL 22-30-44 82
8.2.4 Replacing the tip (Nozzle DL90) 84

8.3 Valve gate groups maintenance codes K32-PN, K40-PN, S60-PN, S20-HY, S32-PN/HY 86
8.3.1 Maintenance kit 86
8.3.2 Assembly of the pin guide bushing 87
8.3.3 Valve gate mounted on the manifold. 87
8.3.4 Valve gate mounted on the bottom plate. 89
8.3.4.1 Assembling the S20-HY valve gate group (bore 20 mm) 89
8.3.4.2 Assembling the S60-PN, S32-PN/NY valve gate group 91
8.3.4.3 Assembly of the pin /contrast bushing unit (valve gate groups S60-PN, S32-PN/HY) 92
8.3.4.4 Valve gates adjustment (valve gate groups S60-PN, S32-PN/HY) 93
8.3.4.5 Valve gates adjustment S20-HY (bore 20 mm) 94
8.3.4.6 8.4.4.5 Pins replacement and maintenance 94
8.3.5 Replacing the gaskets 95
8.3.5.1 Valve gate group mounted on the distributor 95
8.3.5.2 Valve gate groups mounted on the back plate 96

8.4 Single nozzles maintenance 97
8.4.1 Single nozzles TD6 - DN6 Ø44 -TF612 97
8.4.2 Single nozzles series TF6 Ø17-23-32-46 / TH6 Ø18-24 98
8.4.3 Valve gate single nozzles pneumatic, types "MO-MG" and "MO-TH" 99
8.4.3.1 Maintenance kit "MO-MG" 99
8.4.3.2 Maintenance kit "MO-TH" 100

Maintenance theaded nozzle systems 106

8.5 Description of the components 106

8.6 Tools for threaded nozzle maintenance 109

8.7 Valve gate group disassembly 110

8.8 Valve gate group assembly 114

8.9 Nozzles maintenance 115
8.9.1 Tip replacement and maintenance 115
8.9.2 Replacement of the heater and the thermocouple in the threaded nozzles 115
8.9.3 Pin position adjustment 116
8.9.4 Piston gaskets replacement 117

8.10 Replacing the thermocouples in the manifold 120

9 General Sales and Guarantee conditions 122

9.1 General Conditions of Sale 122

9.2 General Conditions of Guarantee 125

1 Foreword

Dear Valued Customer,

while thanking you for choosing our products, we take this opportunity to indicate some precautions so that you find the products user-friendly and safe.

1.1 Contacts

If you should require technical assistance, please contact the technical after-sales service or your local dealer. Make sure you have on hand the number of the internal order or your order number for the product requiring assistance.
The list of the area dealers and the Thermoplay branches can be found on the internet site www.thermoplay.com.

1.2 Symbols used in the manual



Used to indicate that the operator is in contact with devices or machines where electric current with high voltage is passing and therefore careful attention is necessary to avoid exposure to the electrical fields and to avoid injuries.



Indicates a generic danger or potentially dangerous situation that could cause damage to persons or objects.



Indicates the presence of very hot surfaces or devices with which the operator could come into contact, with exposure to serious burning risks.



Indicates the presence of harmful or corrosive substances that could be inhaled causing intoxication or poisoning of the persons.



Indicates an explosion risk that could occur due to the presence of harmful gases caused by overheating of plastic materials.



Indicates that the operator is to wear all the necessary personal protection devices.



Indicates that the operator is to wear the head protection devices.

1.3 Identification codes and plates

All Thermoplay products are identified by laser marking to ensure traceability. The information indicated on the product is useful for the customer when requiring technical information, technical assistance or to order spare parts.

1.3.1 Nozzle markings

On the nozzles, the marking is on the core head and the information indicated is the following:
- Product code
- Order number
- **Sequential number** of the nozzle within the same order



Figure 1 – Nozzle marking

1.3.2 Heater markings

On the nozzle resistors the code of the actual heater is indicated.



Figure 2 - Heater marking

1.3.3 Manifold markings

On the distribution plates the code of the system reference order is indicated.

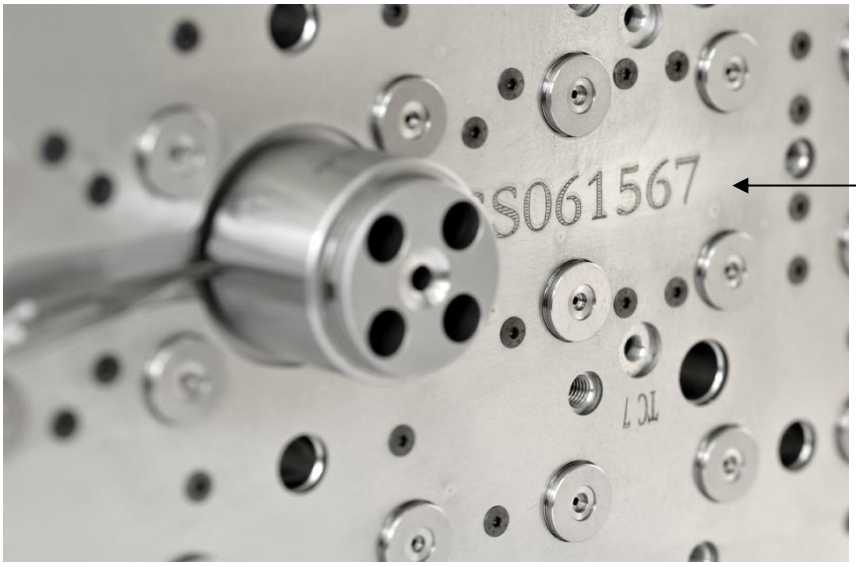


Figure 3 - Manifolds marking

1.3.4 Identification plates

With the hot runner systems an identification plate is supplied, that besides the product code, also contains the electrical data of the nozzles and the date of manufacture.

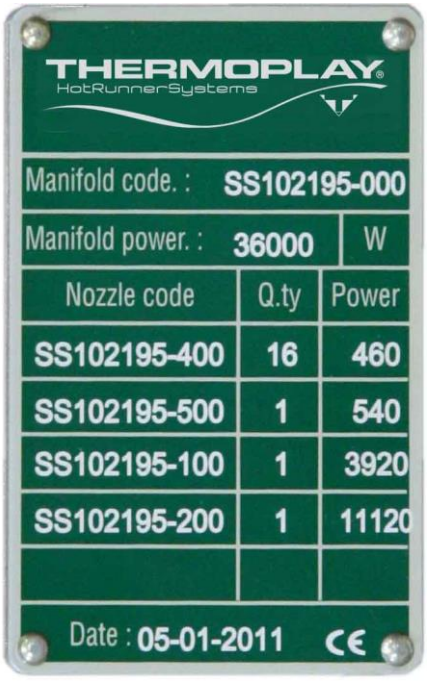


Figure 4 - Identification plate

On request, the plates with wiring diagrams and conditioning systems can also be supplied on the systems, as in the examples given below.

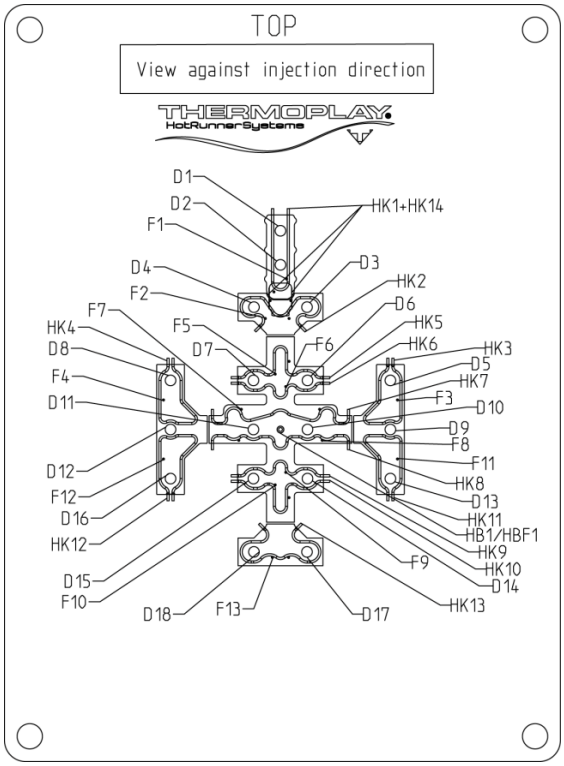


Figure 5 – Hot runner wiring diagram

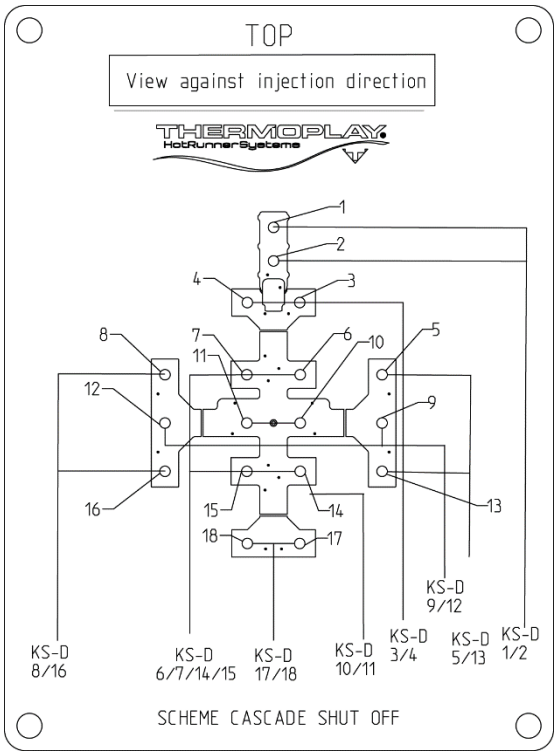


Figure 6 – Valve gate groups conditioning layout

1.4 Precautions when using product Thermoplay

1.4.1 Hot runner systems

The hot runner manifold and the nozzles have been built to maintain the required temperature of the thermoplastic material to be injected into the mold, any other use different to this purpose is to be avoided at all costs; Thermoplay S.p.A. shall not be held in any way liable in the case of improper use of its products.



Our products are to be used connecting them to an electrical system that conforms with the laws in force, protected by differential magneto-thermal device with 30 mA tripping current.



Before starting up, always make sure that the ground connection of your system is present and effective, so as to avoid hazards for the operator in the event of electrical failures; also the hot runner is to be connected to ground, using the specific threaded hole on the side of the manifold for the electrical connection.

Only electrically power-on the nozzles when they are correctly inserted in the mold; do not carry out any “on the bench” operations, where the correct ground contact cannot be fully guaranteed.

When cleaning plastic incrustations from the hot runners and the nozzles, do not use tools that could cause damage (scoring, denting, etc.); if necessary, for these operations we recommend the use of copper or brass tools. If cleaning "while hot" set the temperature so that it does not exceed that recommended for the molding of the material used, this will avoid the degradation of the material still in the runners.



Always use the appropriate safety equipment (gloves, goggles, etc.).



Particolare attenzione deve essere posta alle alte temperature raggiunte dai ns. sistemi durante l'esercizio, che possono anche superare i 400 gradi centigradi.

1.4.2 Valve gate groups



Normally all pins must be closed when the hot runner is not operating. If the injection system or the hot half must be removed from the mold, for particular maintenance requirements, take the pins to the open position, before removing the mold from the injection machine.

If the Thermoplay sequential control unit is used, follow this procedure:

1. Set the control unit in MANUAL mode.
2. Press the enabling button positioned under the mobile panel.
3. Open the shut off valves as described in the control unit panel.
4. Disconnect the main air supply from the valve unit.
5. Release the enabling button.

Remember that activating the valve gates when the injection system is cold, can seriously damage the system.
When cleaning the hot runner and nozzles, do not use tools that could damage the same (scratches, dents); it is recommended to use brass or copper tools for these types of operations.
If the "hot" system is cleaned, set the temperature not exceeding the one recommended for the type of thermoplastic used, in order to prevent deterioration of left over material.



During these operations, the operator must always use health and safety equipment (gloves, goggles, etc…).



Pay special attention to the high temperatures reached by our systems when running, that may reach over 400 degrees Celsius.

1.4.3 Temperature Controllers

The control unit has been built to control the hot runner systems (distribution manifold, nozzles, heater bands) during the molding operations to ensure the correct temperature of the melted plastic mass up to the mold



Any other use different to this purpose is to be avoided at all costs; Thermoplay S.p.A. shall not be held in any way liable in the case of improper use of its products.

The Thermoplay control unit, that is provided with all the electrical safeties required by current standards in force, in particular the prescriptions of directives 2006/95/CE e 2004/108/CE, is to be connected (also in the case of bench tests) to an electrical system in conformity with these directives, protected by differential magneto-thermal device with 30 mA tripping current.



Before starting up, make sure that the ground connection of your electrical system is present and effective, so as to avoid hazards for the operator in the event of electrical failures.

Any maintenance required on the control unit (for example just changing a fuse) is to be carried out with electric power off. Always make sure that the connection socket to the electrical system is disconnected before starting any type of operation that could cause harm to the operator.
For any problems that should arise when using our products, contact the local dealer or Thermoplay S.p.A.

1.5 Precautions to be taken for the disposal of our products Thermoplay

To facilitate the disposal of our products at the end of their operating life in a manner that is ecologically compatible with the protection of the environment, please take note of the information regarding the materials they are composed of.
Manifolds and Hot Runners: steel, brass, electric resistor (copper, mineral oxide), ceramic, titanium (if there are washers).
Nozzles: steel, copper, brass, electric resistor (copper, mineral oxide, electric wires) with or without thermocouple, titanium (washer), aluminium (only for K type nozzles), plastic packing.
Control units: painted iron bodywork, electrical and electronic components, electric wires, terminal boards, plastic packing.

1.6 Use of the correct tools

In order to proceed with a correct assembly of our hot runner systems, Thermoplay recommends the use of the tools indicated in the following list:

- Set of wrenches;
- Torque wrench to check that the screws are tightened with the correct torque value;
- Cutting pliers;
- “Prussian blue” paste to check the couplings;

- Cross tip and flat tip screwdrivers of appropriate size (for the electrical wiring connection operations);
- Pliers to crimp the cables on the terminals (if connections are specified that require crimped terminals) ;
- Wire stripper pliers;
- Insulating tape;
- Micrometer gauges to measure the thickness of the components (0-25, 25-50, ….);
- Depth micrometer gauge ;
- Anti-seize liquid to prevent possible oxidation of threads causing difficulty in the removal of screws;
- Synthetic thinner or turpentine, or spray degreaser to remove the protective rustproof oils, to be used taking care not to damage the electric cables;

1.7 Checks upon arrival

When the case arrives containing the Thermoplay material, the Customer is asked to check that the contents of the container correspond to that indicated on the documents (bills and invoice) that are handed over upon delivery.
To help the Customer in these operations, the case contains:

- If the system was not configured online the system drawing and spare parts list is enclosed;
- Assembly drawing of the '"Hot half" if this has been ordered.

These drawings always indicate the threaded seats for the eyebolts needed for handling;

The present Use and Maintenance Manual, is available in electronic format, in the www.thermoplay.com website, in the section **Services->Manuals**, which can be accessed by using the same login as the online configurator.

1.8 Safety

Always scrupulously observe safety standards when assembling the mold, during the production process and during maintenance operations:

- During normal running, the hot runner systems (and the adjacent parts) operate with fluids and materials at high temperatures and high pressure.
- The safety devices are never to be deactivated.
- Check that the control unit switch is off, before accessing electrically powered system parts.
- Check that the temperature of the system is not higher than the environment temperature before accessing parts of the hot runner system.
- Never mix power cables with those of thermocouples when making connections: the system cannot be put into operation or in any case would suffer serious damage that would prevent further functioning.
- If water or oil leaks from the mold are detected, promptly search for the leakage point and repair. Avoid that these fluids reach the system that is powered or at a high temperature.
- Check and make sure there are no interferences between electric cables and that the tubes do not interfere with mold moving parts or the related automation, to avoid failures.

- The oil and the water connection tubes are to be of a type appropriate to support high temperatures and pressures (-60° ≤ t ≥ +260°; P ≥ 100BAR).
- For our conditioned nozzle-holders and nozzles and for our “Hot half” device, use appropriate conditioning liquids for the temperature of use and that are not chemically aggressive

2 General rules

The Thermoplay hot runners are designed and built for an optimal functioning under stabilised operating conditions, that is to say, at the correct temperature: considering the values involved, the distributors dilate considerably, both on the thickness and on the centre distances of the injection points, in comparison to their condition when cold. Therefore, be very careful to follow the indications and the dimensions shown on the drawings supplied by Thermoplay (both at the time of approval and upon delivery with the hard copies contained in the case). As a guideline, remember that the dilation coefficient of steel is 0.0000125 mm/mm per °C.
To guarantee the seal between the hot runner and the nozzles, it is important, for the construction of the restraining straight edges of the hot runner, to follow the system drawing sent by Thermoplay (contained in the package). If the required specifications are not observed the following problems could occur: too much clearance, causing leaks; too much compression causing crushing.

2.1 General notes for the design of a hot-runner mold

- The structure: the manifolds sustaining the nozzles and the hot runner are to have compression resistance of ≈1100N/MPa and it is recommended to use stainless steel type AISI 420.
- Use a separate conditioning circuit to maintain the mold injection section at the required temperature.
- The seat provided to house the hot runner block in the mold should follow as far as possible the external contour of the system to ensure maximum stiffness of the cavity holder manifold (≈6 mm radial clearance).
- This seat must never be in the bottom manifold (this solution has the great disadvantage of obliging a “blind” assembly): Thermoplay suggests the application of an intermediate spacer manifold, closed on the 4 sides to avoid a chimney effect, and having a shaped through seat.

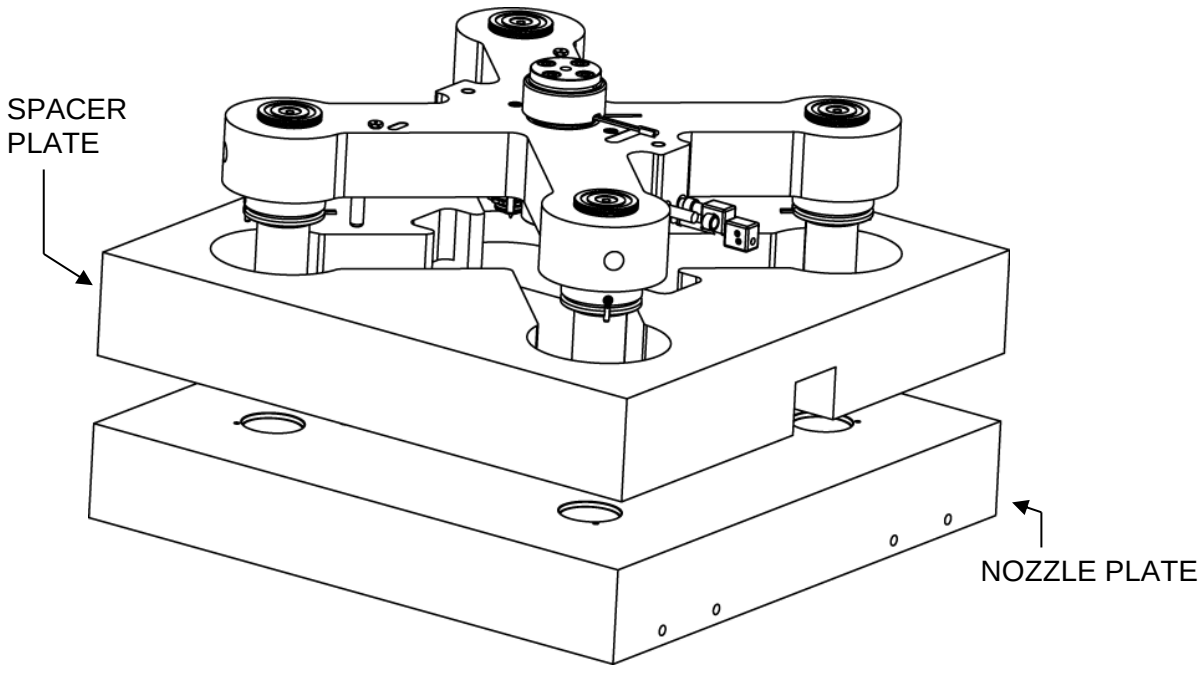


Figure 7 – Structure of a hot runner system

- Provide a number of sufficiently long screws near the hot runner block and at a regular distance from each other to keep the stress caused by the injection and the heat dilation under control.

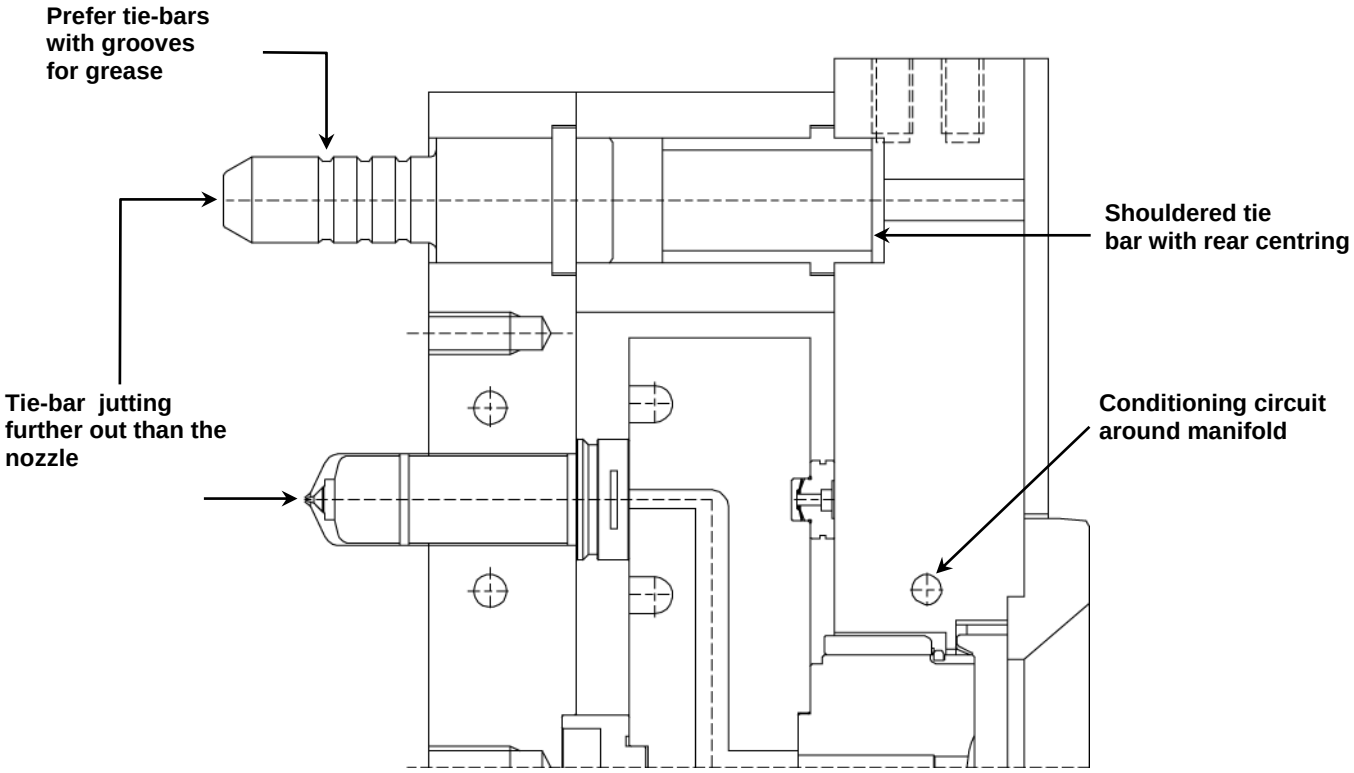


Figure 8 – Section of Hot Runner System

- The minimum diameter advised for these screws is M16; we advise against spacers and fastening screws that pass through the hot runner, since it is impossible to control the heat dilation in the lengthening stage caused by the dilation.
- It is recommended to line up the mold from the bottom manifold by means of 4 tie-bars (additional rear shouldering and centring tie-bar in Figure 8). Do not install only 2 diagonal tie-bars.
- It is recommended to provide guiding tie-bars (see Figure 8 and Figure 9) with a protrusion from the nozzle holder manifold that is more than the protrusion of the nozzles, to avoid damage to the latter.
- Design the mold facilitating access to the nozzle tips: the need to clean various impurities from the zone of the tips is quite common.



If it is necessary to clean the nozzles to remove impurities or due to change of colour, never remove the slugs with the mold open.
.

- Avoid the use of matrix fastening screws with the head positioned between the distributor and the nozzle-holding plate. For the correct positioning of the screws see Figure 10.

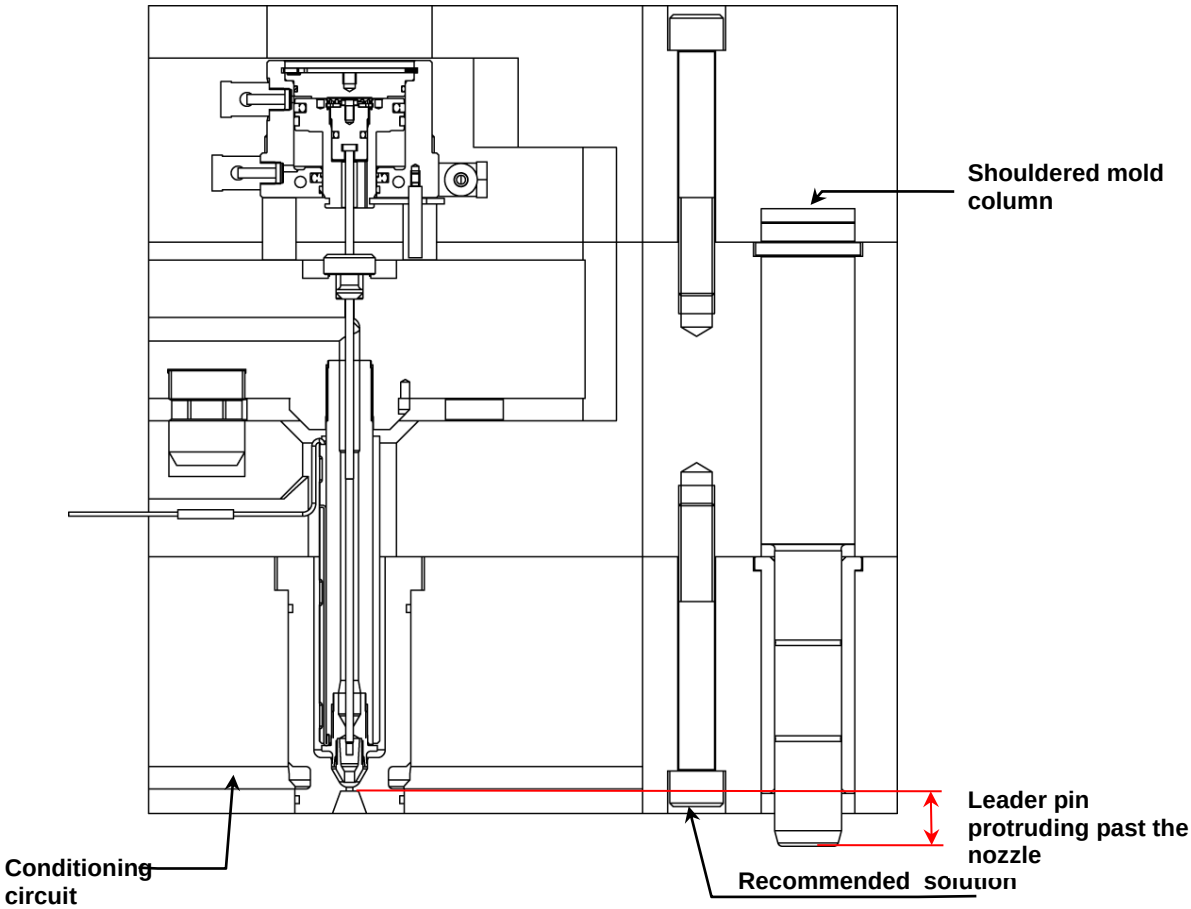


Figure 9 – Reference section of a hot runner system with threaded-in nozzles

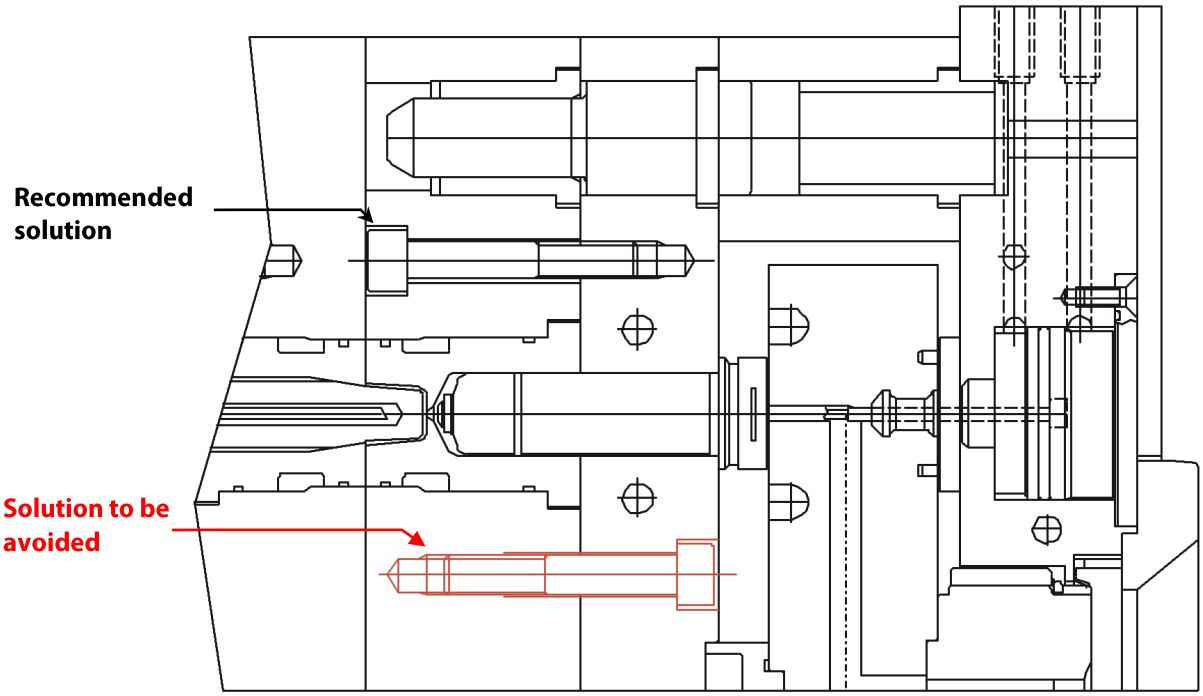


Figure 10 – Positioning fastening screws

It is advised to assemble a fixed insulation manifold on the mold to confine the heat dispersion toward the molding machine surface.

.

2.2 Recommendations for cooling

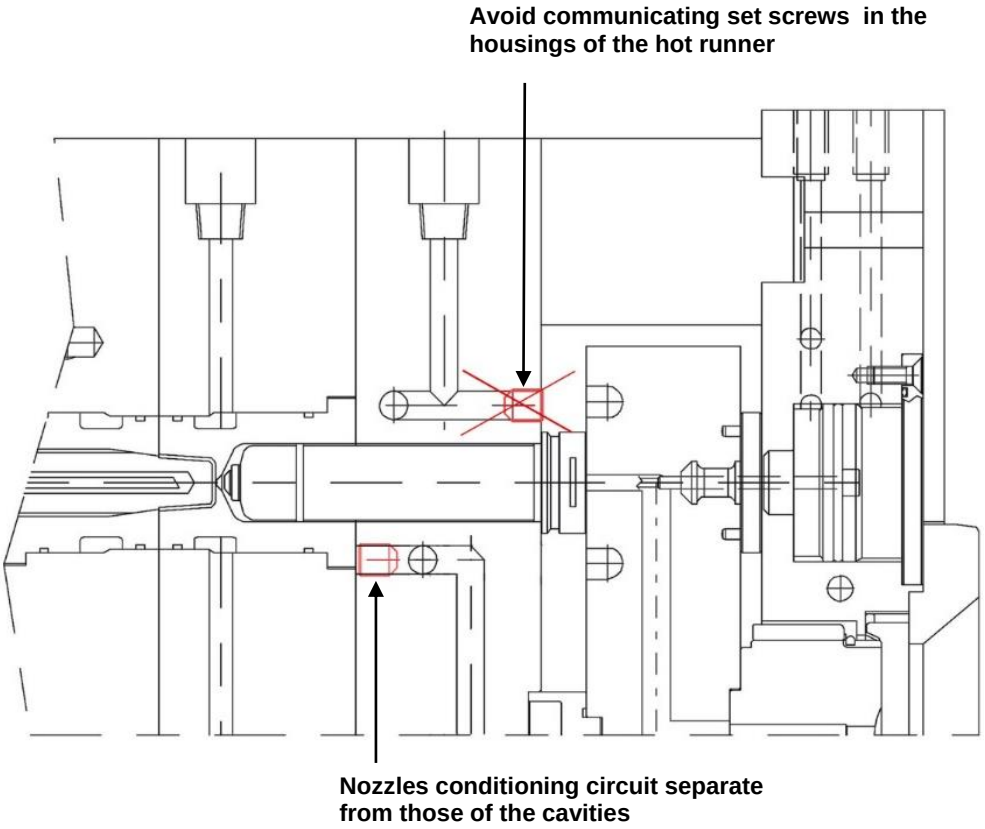


Figure 11 – Cooling system

Thermoplay recommends the use of a nozzles conditioning circuit separate from that of the cavities (use “OR” or “Viton” gaskets), but without exaggerating in the other direction, with a cooling that is too strong around the nozzles, that could cause too quick solidification of the injection point, which is not always an advantage, especially if the parts are large and require a long holding time. .
All the fixed parts of the mold MUST be kept at the temperature established by the dilatation clearance calculation to obtain correct functioning.
If possible, avoid installing on the manifolds surrounding the hot runner the circuit that passes from one manifold to another with flat contact joints between the manifolds. If there should be a leak in this circuit, it is not always visible, and very often the liquid that flows out wets the live hot runner. It is therefore recommended to provide a drainage hole Ø 6-10 mm on the lower part of the mold, which can also serve to bleed off any condensation.



Warning: do not position the water inlet near electric sockets!

2.3 Electrical wiring

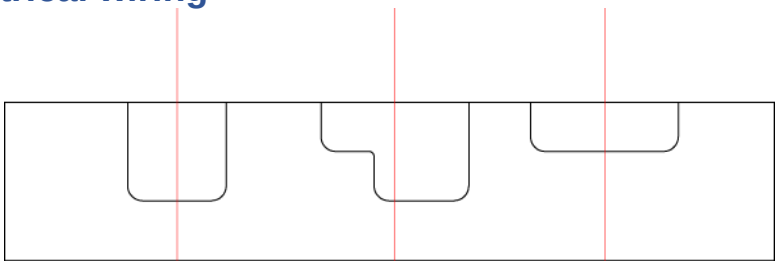


Figure 12 – Channelling to lay the electrical wires



Whatever the profile, the section of the channelling to lay the cables must always be 80 mm2 for each nozzle.

2.3.1 Grooves for the cables passage

The basic ruling is as follows: a nozzle must have 80 mm² section for the wire passage (2 nozzles = 160 mm²; 3 nozzles = 240 mm² etc.). The shape of the section to pass the wire is decided by the Customer. If the system is used to inject materials that require the mold heating at temperatures over 100°, it is better to further increase the section of the channelling to lay the wires (see Figure 13).

Avoid channelling with passage of the cables on different levels (for example: between manifolds 1 and 2 then, between manifolds 2 and 3) Always pay attention that intervention is facilitated. When defining the channelling for the wires, it is also important that they are designed so that the system can be disassembled without the need to disconnect the cables from the electric connectors.

2.3.2 Connectors

Do not assemble electric connectors directly on the mold structure, but use aluminium boxes (this solution allows a longer wire to facilitate any operations on the wiring). In the case of a mold heated to a high temperature, raise the box and isolate it from the structure. The installation is to be defined with precision right from the mold study stage.

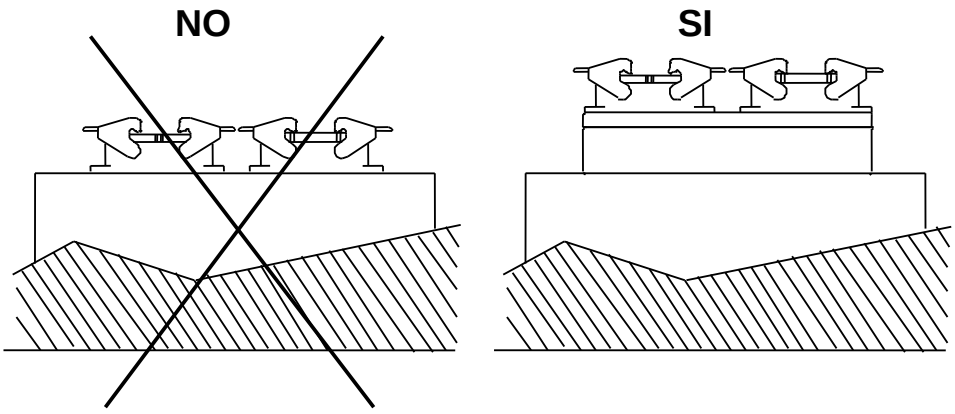


Figure 13 – Connectors positioning

2.3.3 Electrical connections

Location of the sockets: the overall dimensions are to be borne in mind for the handling of the clamping levers. Between these levers and all the other obstacles (for example the molding machine surface) there must be a minimum space of 20 mm.

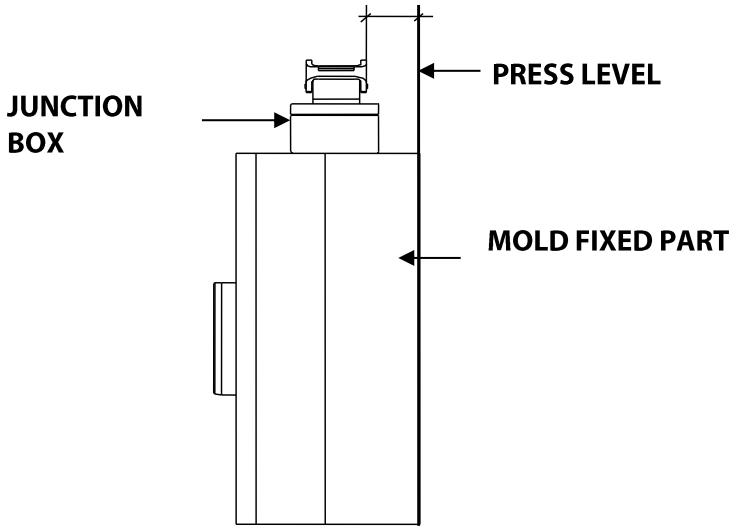


Figure 14 – Positioning of the electrical connectors

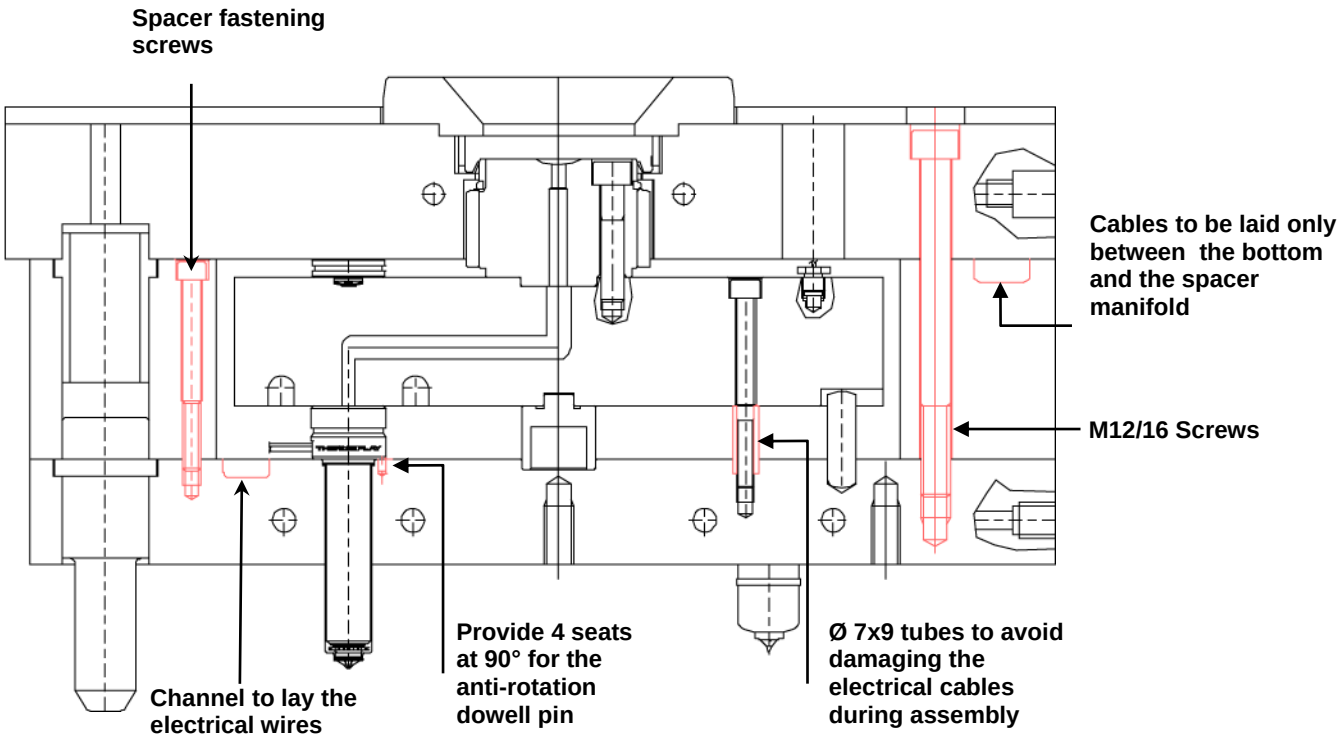


Figure 15 – Rules for laying the electrical wires

All Thermoplay hot runners are fastened to the mold using two M6 screws. On multi-cavity systems, these screws should be protected with a Ø 7 x 9 tube inserted into the manifold, placing them 0.50 mm lower from the upper end of the nozzle heads in order to facilitate the laying of the wires without the risk of pinching them. To obtain gaps for the passage of larger

cables, it is possible to execute milling, channelling on the nozzle holder manifold away from the zone where the heads rest.

2.3.4 Anti-rotation pins

The assembly of all the nozzles F, requires the installation of a pin (on the part opposite the cables outlet) with an anti-rotation function; this allows easy removal of the tip-assemblies without the need to withdraw the nozzle from the nozzle holder manifold. Provide 4 seats for this pin in the mold for each nozzle (one every 90°), so as to have, when assembling the system, 4 choices for the orientation of the wire outlets. In any case, it should be remembered that the positioning of the nozzle orientation pin on the part opposite the cables outlet facilitates the system wiring and with a favourable orientation to the cables outlet, tight bends of the cables are avoided.

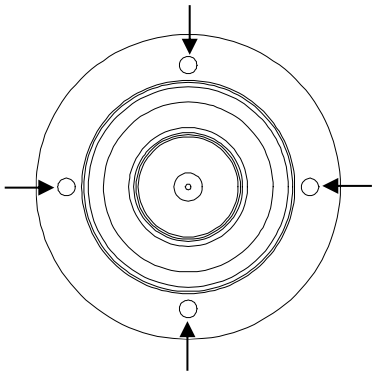


Figure 16 – Anti-rotation pin seat (top view)

2.4 Valve gate nozzles

On molds with shuttered nozzles, the use of a pressure gauge on the pin closing circuit enables a quick detection of any operating faults.
Mark the connections of the circuits to close and open the valve gate by applying a stamp or attaching a plate. On all the molds fitted with hydraulic shutters apply a discharge system to be able to empty the oil from the circuits before every group or block disassembly operation.
The provision of a plate fastened on the mold with the wiring diagram engraved on it is always an advantage during the entire life of the fixture.

3 Systems installation

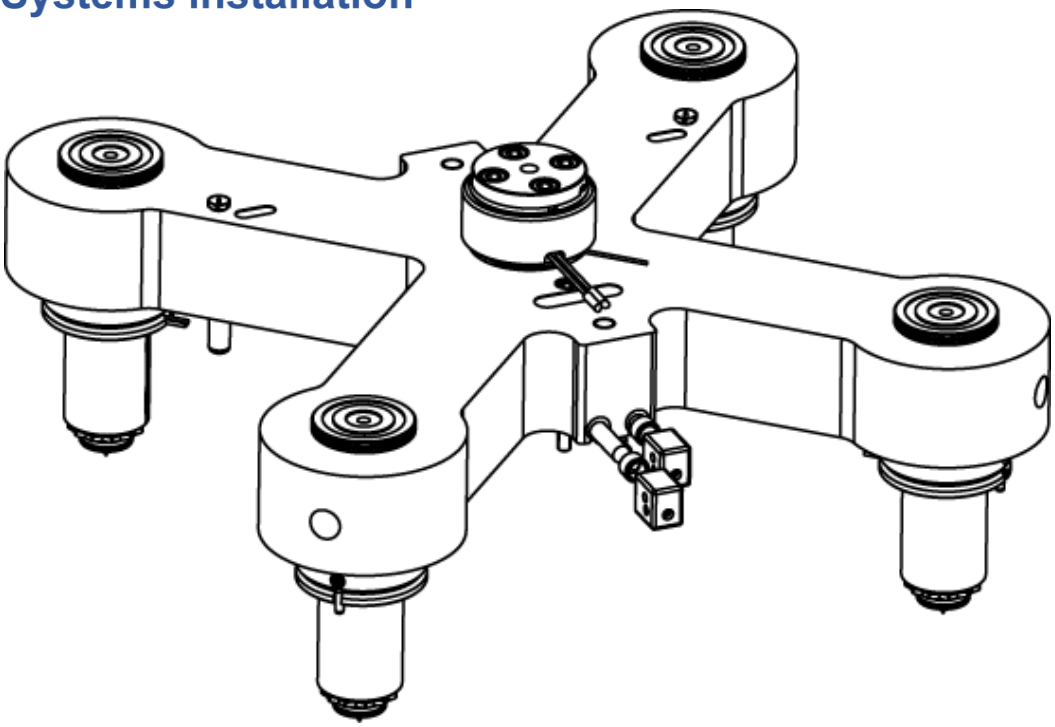


Figure 17 – Thermal gate systems (without valve gate)

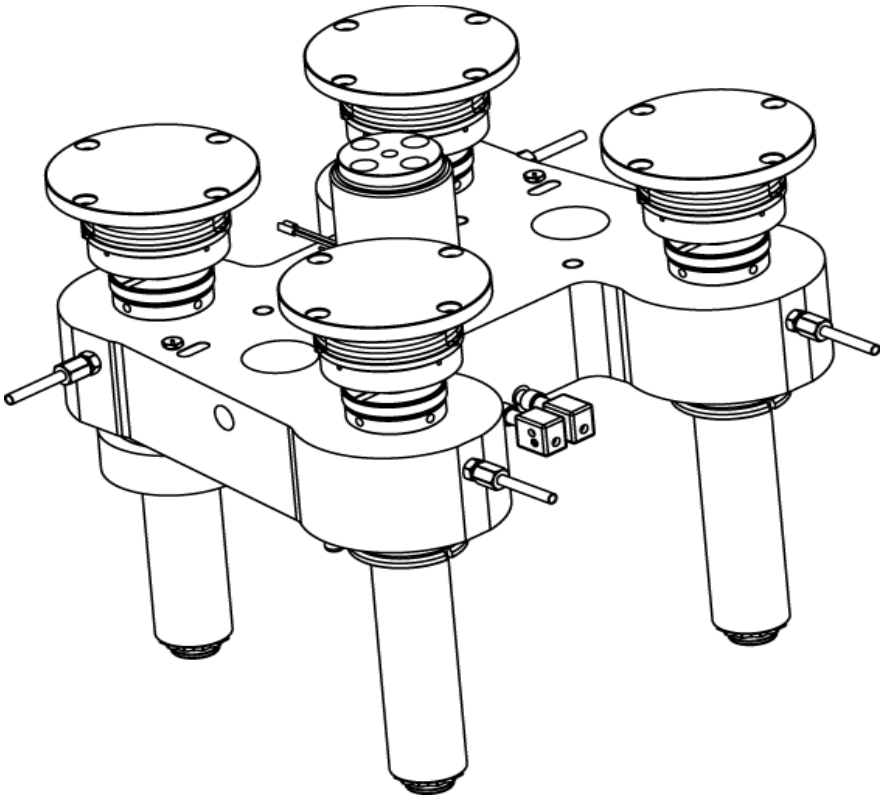


Figure 18 – System with valve gates (pneumatic or hydraulic)

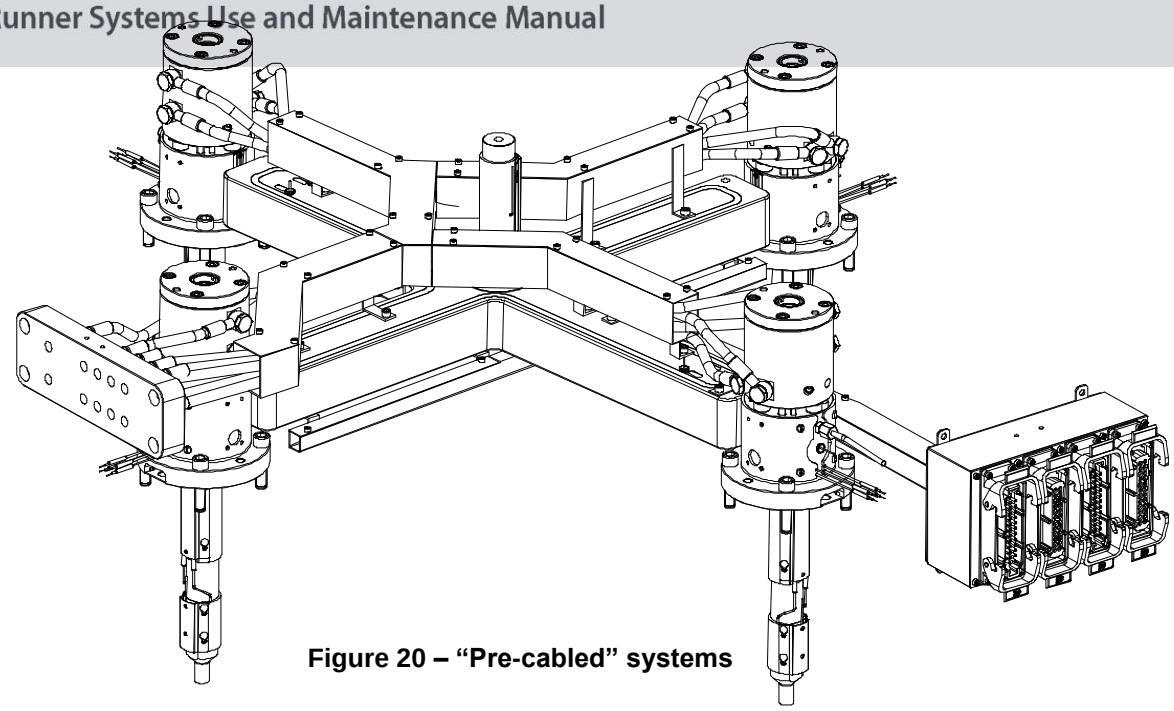


Figure 20 – "Pre-cabled" systems

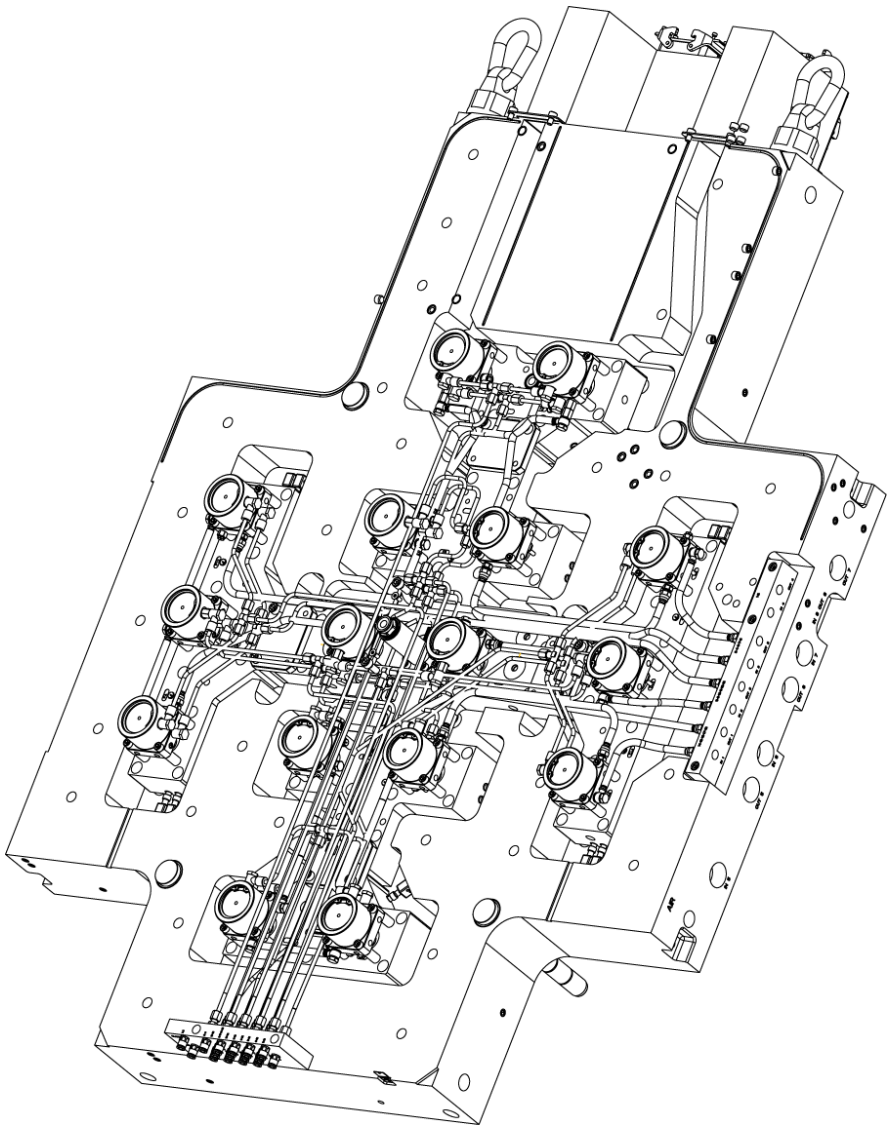


Figure 19 – "Pre-cabled" systems with valve gate nozzles

3.1 Opening the packages

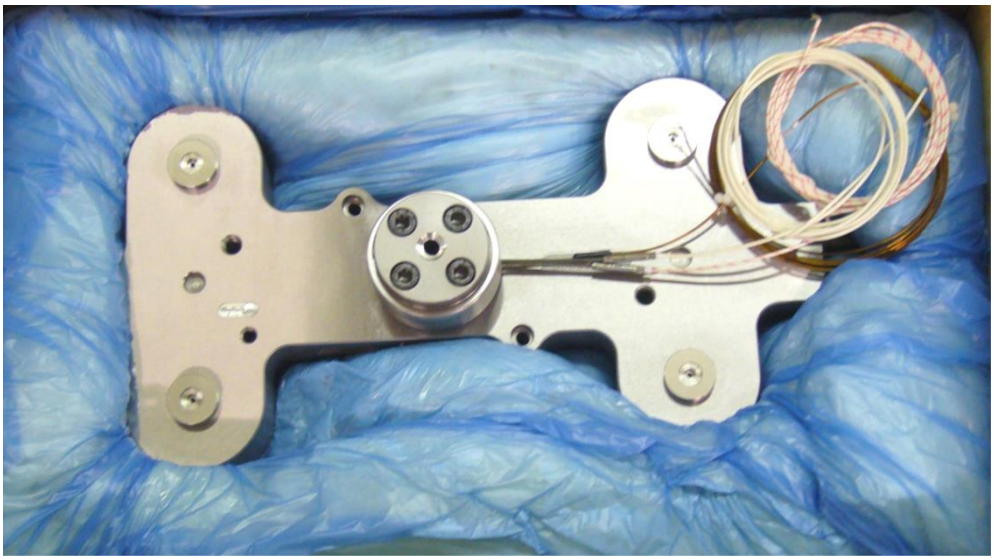


Figure 21 – Packaging

Before starting the assembly, Thermoplay recommends that all the system components are first removed from the case, check that the indications on the transport documents are consistent with the bills of materials on the assembly drawing.



Figure 22 – Components in their protective packaging



Figure 23 – Check the packaging/bill - Bill checking

This is most important for complex systems (for example dual-material with several manifolds and different nozzles), where there may be similar components that must not be confused and mixed.

It is also important, once the components have been unpacked, to check the main dimensions with their seats on the mold plates and in conformity with the indications on the Thermoplay drawing.

It is strongly recommended to execute all the controls described at the paragraph 3.1.1

Remove the protective corrosion-proof/rustproof oil from the components, using small rags and/or similar to clean threaded holes, grooves,… Any degreasing liquids are to be left to evaporate.

Be very careful when handling the components, so as not to damage the surfaces. The nozzles are supplied with incorporated thermocouple: handle them with care.

3.1.1 Mechanical/electrical dimensional checks to be carried out before assembling the hot runners system in the mold.

Nozzle seats: On the attached drawing or in the Thermoplay catalogue, check the perfect geometry of the nozzle seat on the mold, the related tolerances and roughness.

Spacer straight edges: On the attached drawing or in the Thermoplay catalogue, check the correct shape dimension and height, with the related tolerances.

Steels: On the attached drawing or in the Thermoplay catalogue, check that the type of steels used to construct platens and spacers that contain the hot runners system are compatible with requirements.

Molding machine nozzle: Check that the thermoplastic material inlet diameter on the injection nozzle of the hot runners system supplied by Thermoplay corresponds to the outlet diameter of the molding machine nozzle.

Electric wiring: On the attached drawing, check that the electric wiring supplied by Thermoplay corresponds and is perfectly compatible with the control unit used to supply and control the system.

3.2 System introduction into mold plates

Before starting this operation, the mold has to be assembled so as to have the nozzle –holder manifold with the nozzle location seats facing upwards.

1. Insert the location washer and the orientation pin into the nozzle-holder manifold, warning: check that the negative allowance dimension of the pin does not interfere with the hot runner. Check that the protrusion of the location washer from the manifold edge is (≈) 0.02 mm less that the height of the nozzle heads to ensure the best resting position.

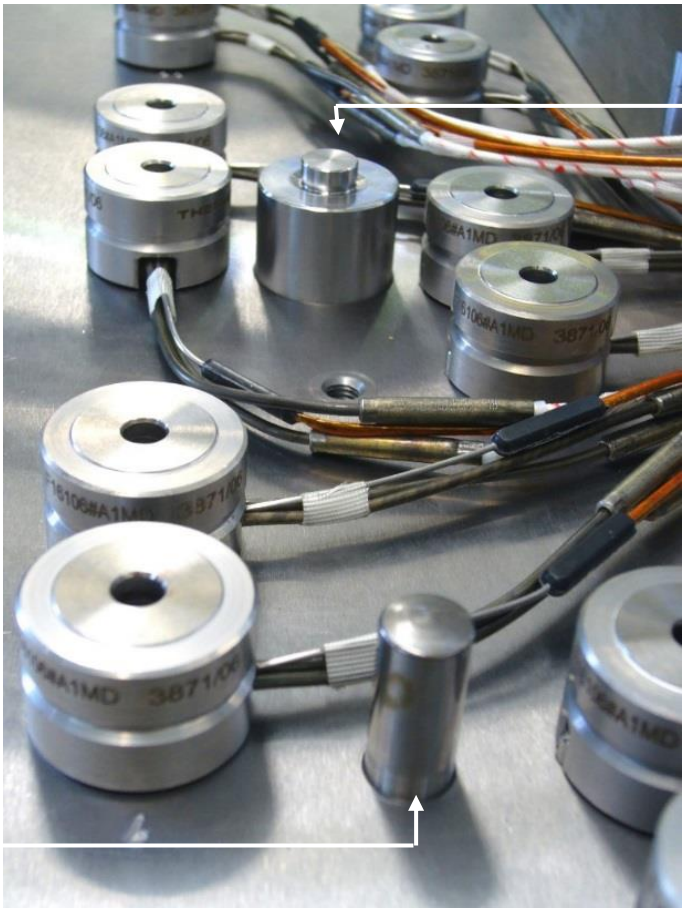


Figure 24 – Example of location washer and orientation

2. If the Customer has purchased the nozzle holder bushes, clean them carefully, removing all oily residue, and insert them in the mold. If the bushings are the conditioned type, insert the “OR” gaskets in the relevant grooves, taking care to first spread lubricating grease on the surface.



Figure 25 – Conditioned nozzle-holder bushing

3. Insert the nozzle orientation pins (Not for D and DN type nozzles) and gently lower the nozzles into their seats, taking care to insert the centring (male) on each nozzle in the appropriate seat on the mold. Remember that the nozzle cables outlet is always on the opposite side to the orientation pin (not for the D and DN type nozzles).
   In case of type 'M' nozzles, the ones with half body cable exit, insert the nozzles without heater into their seats. After assembling the manifold rotate the mold so that the nozzle tips are pointed up and fit the heaters on the nozzles following the instructions in chapter 8.1.6.
   Group together and protect the cables coming out from the nozzles with the heat resistant sheath supplied by Thermoplay. Do not bend the cables near the transition joint.

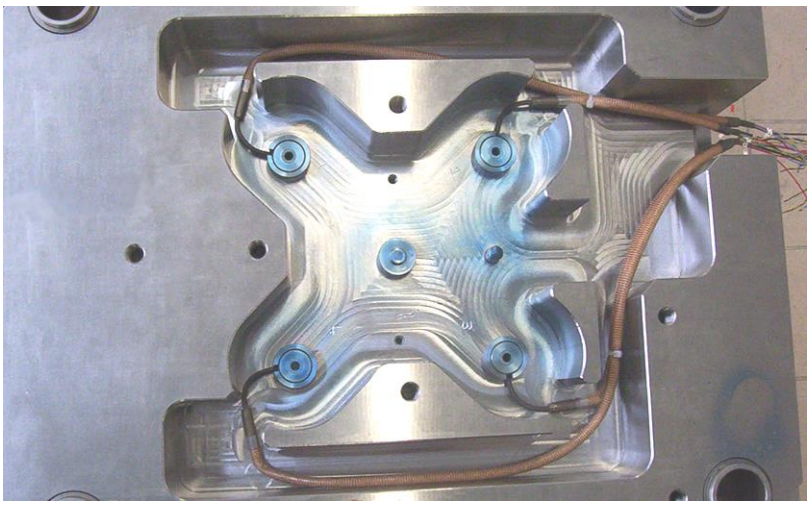


Figure 26 – Assembling nozzles in the mold plates

4. Position the hot runner system in the mold plates (see Figure 26), taking care to:
   - refer it correctly on the location washer and on the pin;
   - avoid pinching of the nozzle wires underneath. To carry out this activity correctly. Thermoplay always provides at least 2 holes for eyebolts on the upper surface of the distributor. Therefore, it is recommended to use eyebolts to work with more care.

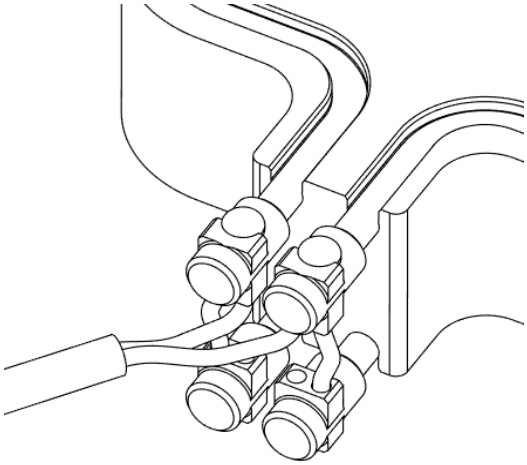


Figure 27 – Ceramic connectors

5. Apply the ceramic connectors (for the electric power cables) to the terminals of the heaters.
6. It is suggested to provide plates screwed to the nozzle holder manifold that restrain the cables and prevent contact with the heated part of the distributor (Figure 28).

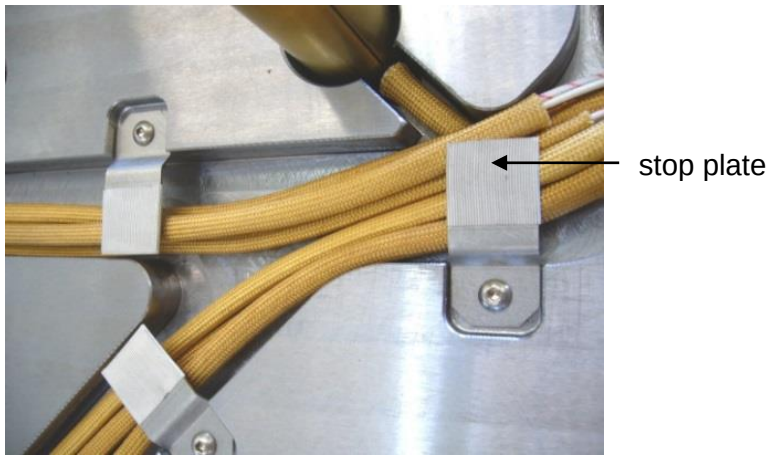


Figure 28 – Example of stop plates

7. Tighten the 2 screws that clamp the distributor to the nozzle holder manifold, first applying high temperature lubrication grease under the heads (check the planarity of the runner in relation to the spacer straight edges). Do not use high torques (the screws only serve to keep the distributor in position during the mold assembly and do not have any other function). If it should be deemed necessary for the distributor conformation, Thermoplay supplies a pair of spacers to insert around these 2 M6 screws, under the distributor.
8. For systems without shutter, the system can now be closed, resting the upper mounting plate on the spacers. It is recommended to check once more that all the heights/thicknesses of the mold plates conform with the Thermoplay specifications indicated on the drawings; if they do not conform, make the necessary corrections. If everything has been prepared correctly, there should be clearance between the opposing washers supplied by Thermoplay and the lower surface of the mounting plate.

Above the mounting plate, Thermoplay strongly recommends applying an isolating manifold at least 6 mm thick, as an alternative it is necessary to condition the bottom manifold.

3.2.1 'Bolted down' systems

For the 'bolted down' systems follow the passages 1 to 6 in the paragraph 3.2. During the execution of the first passage mind to insert the provided guide tubes in their seats on the bottom plate. If it should be deemed necessary for the distributor conformation, Thermoplay also supplies a set of spacers to insert around these guide tubes, under the distributor.

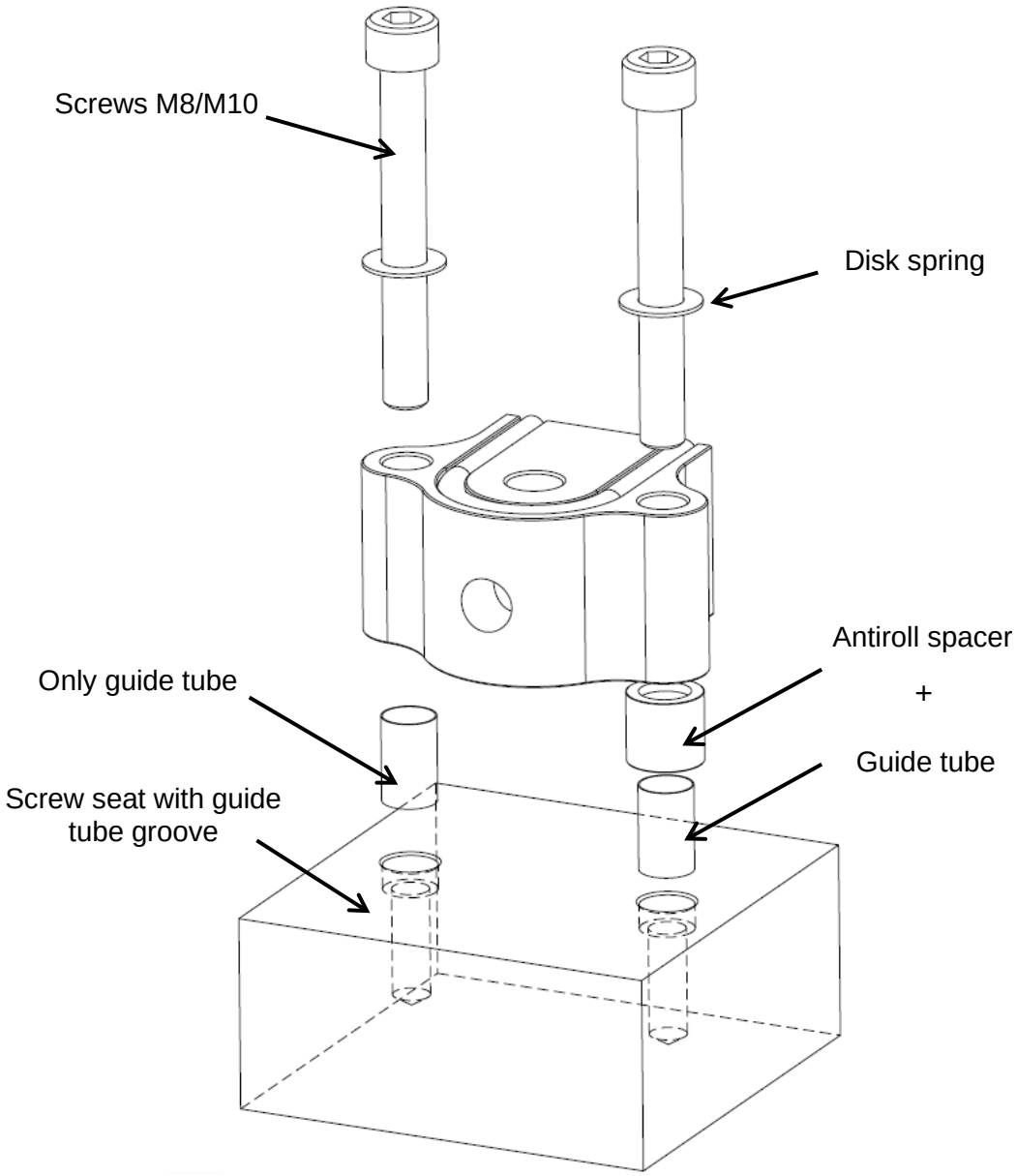


Figure 29 – Example of a 'bolted down' system

After carrying out the first 6 passages follow as written below:

7. Fix the distributor using M8/M10 screws: tighten the screws that clamp the distributor to the nozzle-holder manifold, first applying high temperature lubrication grease beneath the heads. Insert the disk springs under screws head. Follow the sequence and tighten the screws as indicated on the drawing (Figure 30).

8. For systems without shutter, the system can now be closed with the upper mounting plate. It is recommended to check once more that all the heights/thicknesses of the mold plates conform with the Thermoplay specifications indicated on the drawings; if they do not conform, make the necessary corrections.

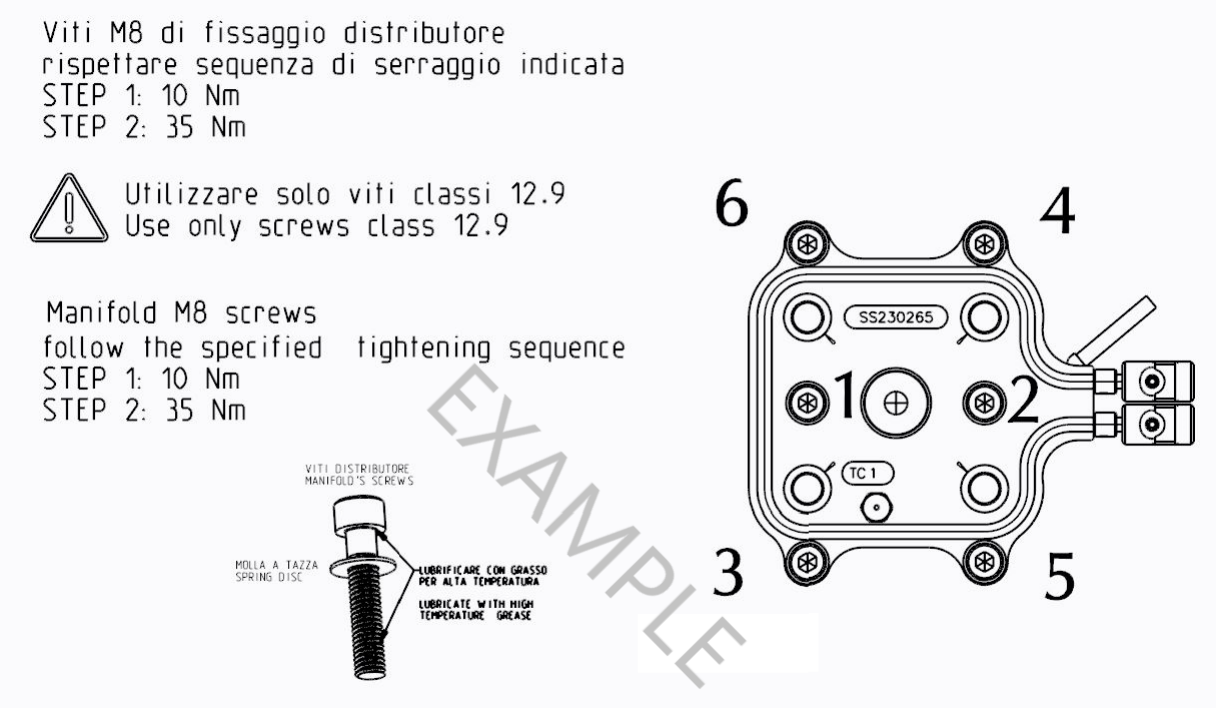


Figure 30 – Example of the sequence and screws torque on the specific drawing

3.2.2 'Side gate' systems

If the purchased system consists of side gate nozzles, the installation instructions are as follows:

1. Make sure the nozzle holder plate has the nozzle housings facing upward and insert the side gate nozzle cores without the tip group assembled. Bring the pins to a stop in the appropriate slots.

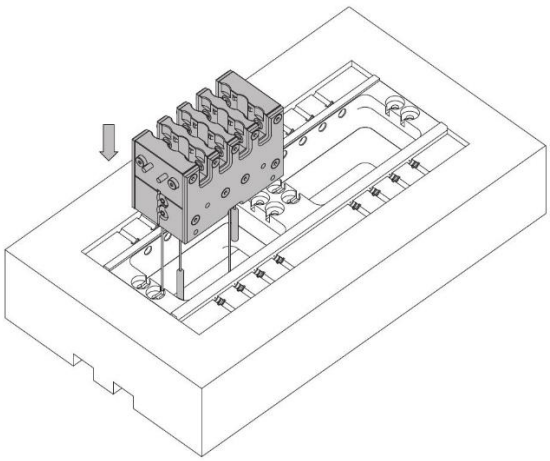


Figure 31 – Linear side gate nozzle

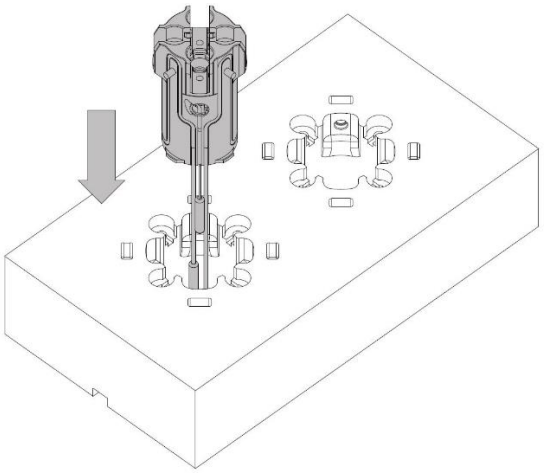


Figure 32 – Radial side gate nozzle

2. Fix the nozzles using the spacers provided: in case of radial Side gate fix the spacers over the pins with the tightening torque on the specific installation sheet, in case of linear Side gate set the spacers with the appropriate screws without tightening them.

For the nozzle version without cover insert all spacers, instead, for the version with cover insert only the spacers whose screws are not through the cover.

3. Rotate the nozzle holder plate and bend the heater and thermocouple cables so that they are fitted in the appropriate grooves.

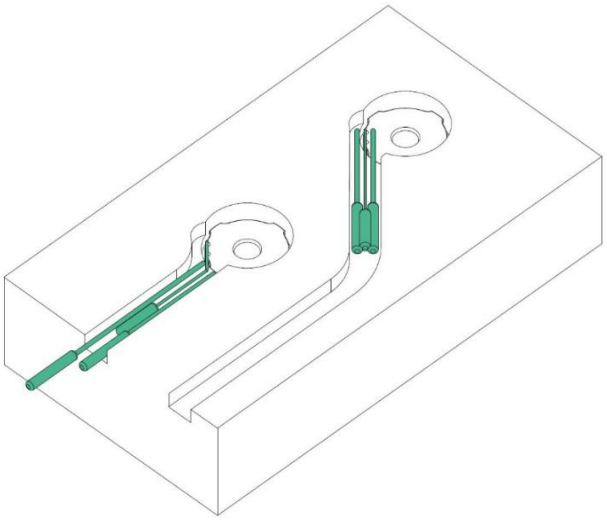


Figure 33 – Heater and thermocouple cables

4. Assemble the plate with the hot chamber housing over the nozzle holder plate, install the transfer nozzles and the manifold following the instructions in chapter 3.2. Pay attention that the sliding joint on the transfer nozzle mates properly with the nozzle core.
   When the manifold installation is complete, close the system with the top mounting plate.

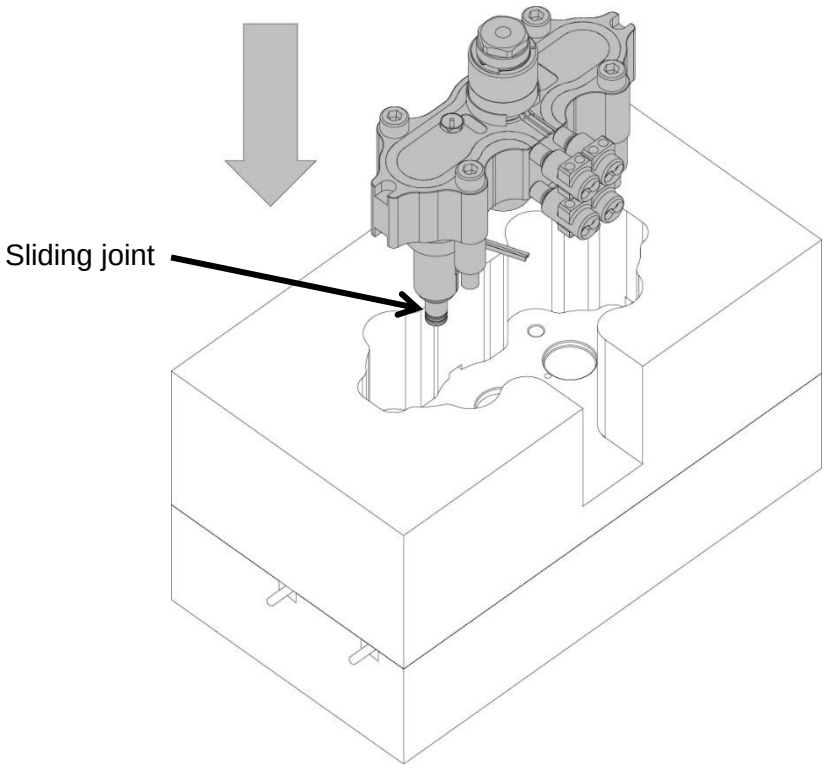


Figure 34 – Manifold assembly

5. Rotate the mold so that the nozzle body is accessible and proceed with the assembly of the tip groups: using the threaded hole in the block, with the help of a screw, slide the tip group inside the seat in the nozzle core and make sure that the sealing collar mates properly with the cavity.

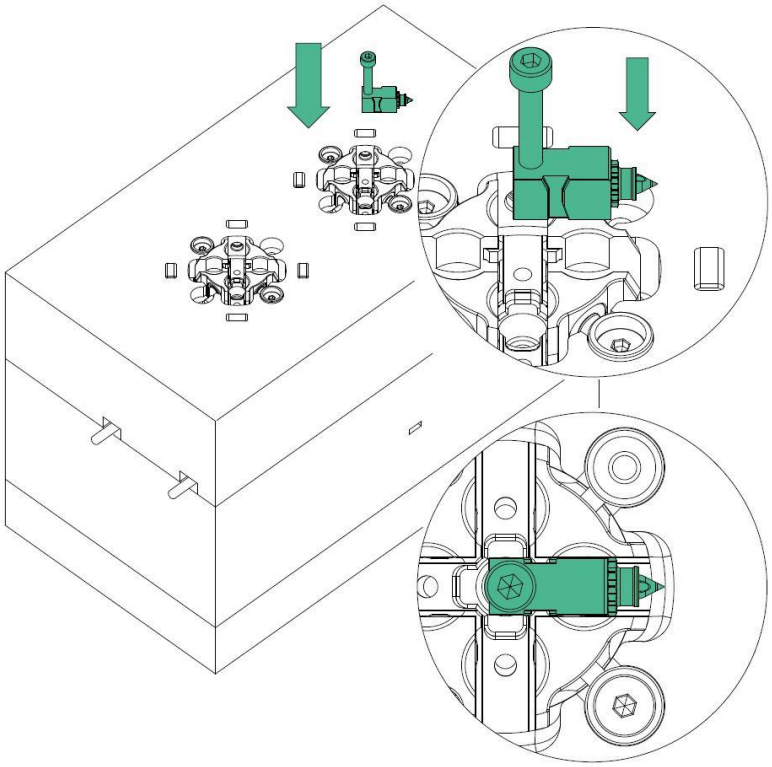


Figure 35 – Tip group assembly

6. Insert the tapered contrasts in the back of the tip groups and tighten to the torque recommended on the specific data sheet. If provided, insert the metal sheet plate cover between the screw head and the tapered contrast. Lubricate the threaded parts with high-temperature grease before tightening.

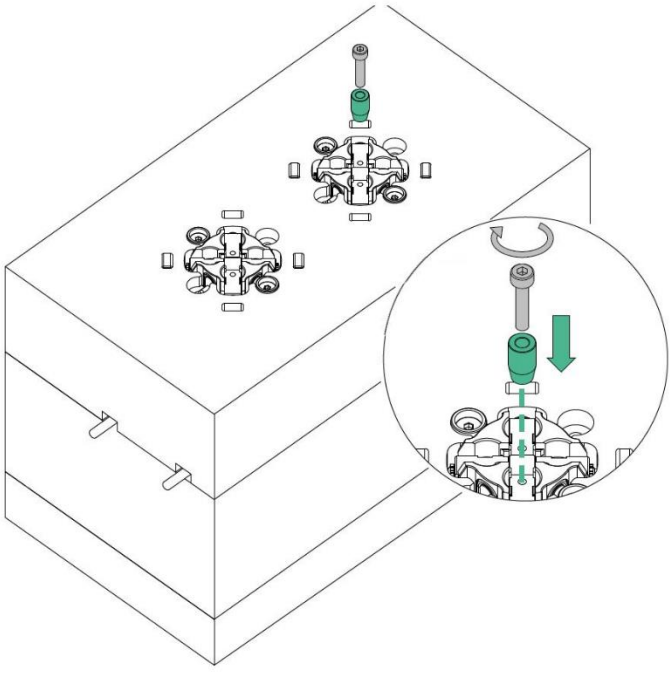


Figure 36 – Tapered contrast assembly

7. Tighten the set screws by proceeding in cross sequence following the steps and torques included in the specific data sheet. This step is performed after heating the system to the specified temperature. Lubricate the threaded parts with high temperature grease before tightening. In the case of linear Side gate nozzle during this step also tighten the spacer screws with the torque provided on the specific data sheet.

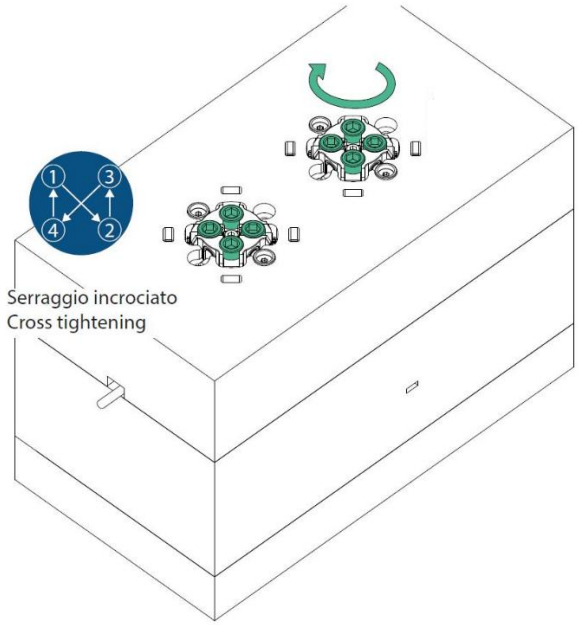


Figure 37 – Grub screws tightening

8. If purchased, assemble the covers by tightening the remaining screws and spacers with the torque value on the specific data sheet.

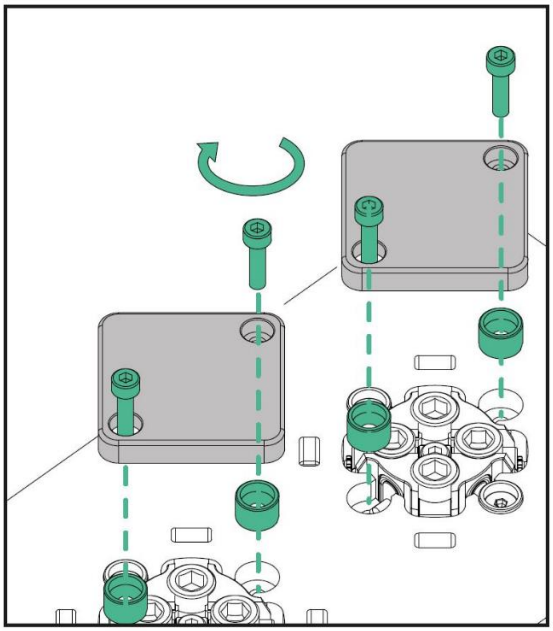


Figure 38 – Nozzle cover assembly

3.3 Valve gate assembly

Thermoplay shutters differ as follows:

1. Mounted on the distributor (with air operation only).
2. Mounted on the back plate (with air or oil operation).
3. Valve gates groups for threaded nozzles, mounted on the distributor (with air or oil operation)

The valve gate group installation procedure is described in chapter 8

3.4 Electrical wiring

Before starting the electric wiring, check the multi-pole sockets that will be used on the hot runner system.

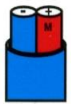


The connectors on the molds where the power cables are connected must be "male" regardless of the wiring standard applied.

The connectors on the molds where the power cables are connected must be "male" regardless of the wiring standard applied (the female terminals are wired on the cable coming from the thermoregulator).
It is recommended to mark the wires coming from the different nozzles and the distributor with appropriate numbering; it is best to follow the numbering on the multi-pole sockets to facilitate the wiring operations and to avoid problems when starting up, so that the complete wiring in the sockets on the mold plates is easier.

As already stated, the wire passage slots on all the mold manifolds are to be sufficiently wide so as to reduce the risk of pinching them during assembly to a minimum and so they can easily convey them outside.
The control of each heated zone is by means of “J” type thermocouples. It is most important to observe the polarity.
Thermoplay follows this standard: red wire is positive (+), blue wire is negative (-) (DIN 43710 standard). If in doubt, for the “J” type thermocouples it is easy to identify the positive terminal, because it is in a Fe alloy and therefore the only one that is attracted by a magnet.

Table 1: standard colors of Thermoplay thermocouple

	ANSI/ASTM	DIN 43710
J		
K		

1. Insert the thermocouples in their holes: for systems with several thermocouples, be careful to insert them in the holes with the corresponding length.
2. After the thermocouples have been tightened, acting on the upper hexagon, carefully bend the cables so they are parallel with the upper surface of the manifold, check that the overall dimensions are within 6 mm of the manifold upper surface.



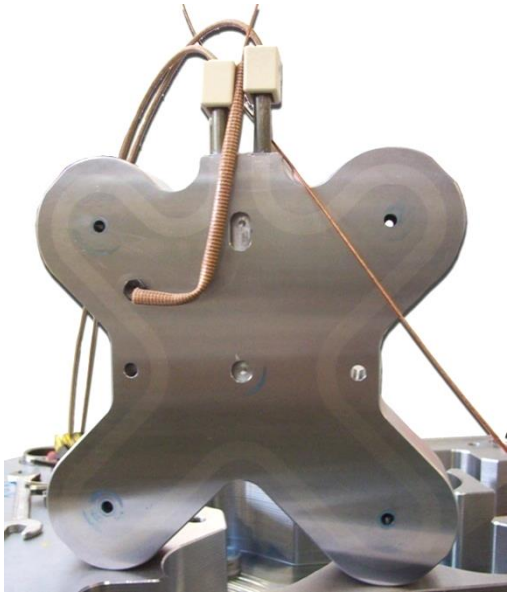
Figure 39 – Example of bent thermocouples

3. It is suggested to insert the distributor thermocouple cables in a thermo-isolating sheath (as those used for power cables) to insulate them from the heat emitted by the distributor.
4. Check that the task has been carried out correctly using a universal multimeter.



Before to power the mold, check that the ground system is present and operating.

9. Prepare a wiring diagram that indicates very clearly the position of each mold nozzle and the number of the corresponding zone.



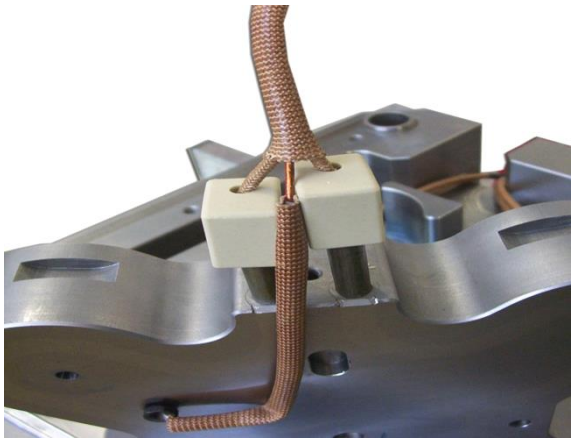


Figure 41 – Bending the thermocouple wires **r**

3.5 Electrical checks

3.5.1 Thermocouple electric continuity

Use a universal multimeter to check the electric continuity and integrity of all thermocouples.

The measurement made on the 2 connector poles must give a positive value; this value does not have a reference value because the length of the cables and the temperature of the thermocouple at the time of the check cause variation in the value indicated.

3.5.2 Heaters check

This test, to be done when cold, with a universal multimeter, checks that the circuit is not interrupted, nor grounded.
The calculated value of the resistor:
R = V2/P is to correspond with the reading on the instrument, set on the ohmic scale.
V = mains voltage (240V); **P** = power (W) of the individual heater indicated on the drawing.

3.6 Wiring of commands and conditioning of the valve gate groups for threaded nozzles

1. Connect valve gate groups opening and closing (air or oil) to the main air or oil circuit.
   Recommended air pressure: **1 MPa**
   Maximum oil pressure: **3 MPa**

2. Connect system conditioning inlet and outlet to the planned conditioning circuit.

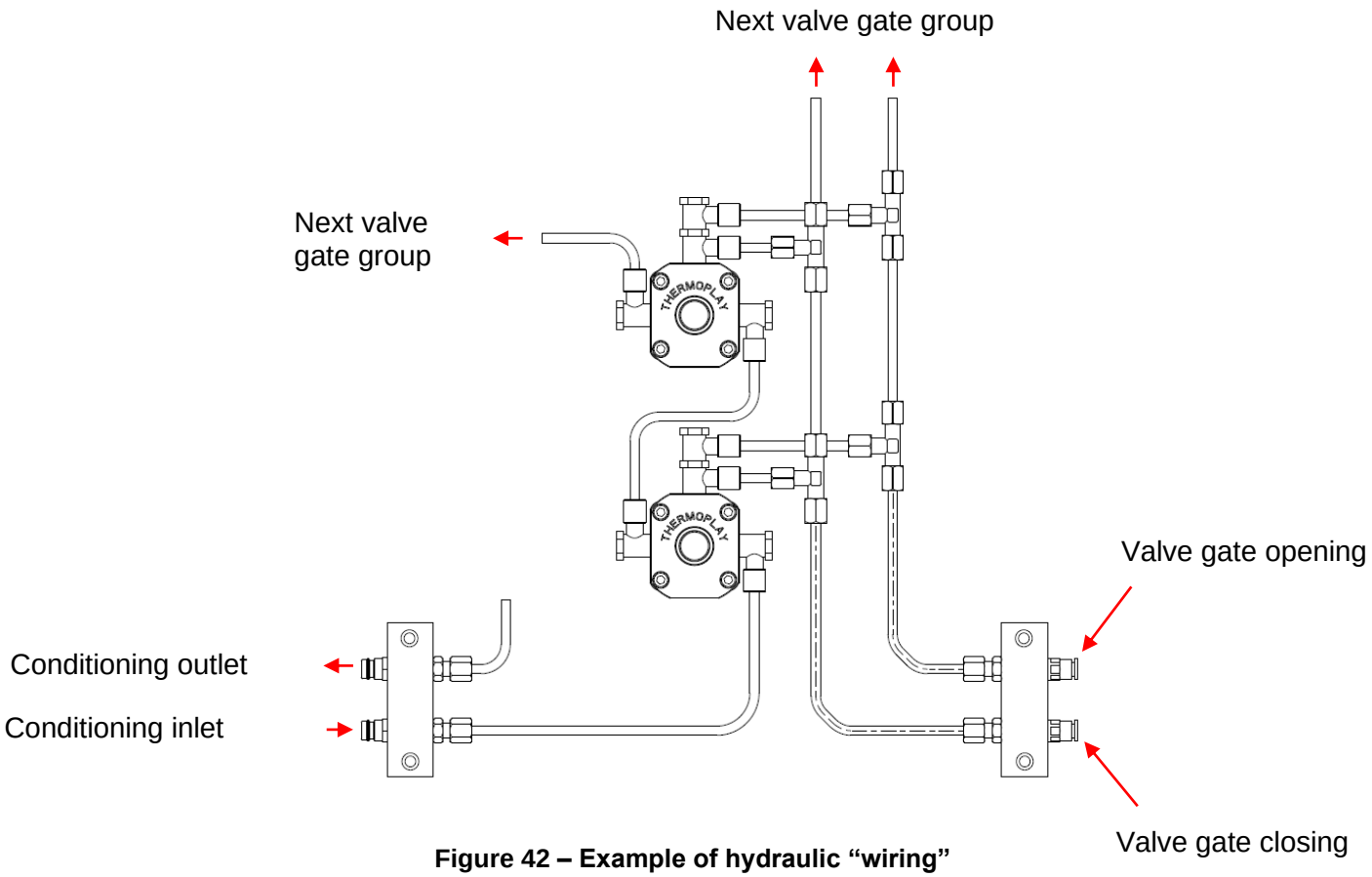


Figure 42 – Example of hydraulic "wiring"

4 Hot halves installation

1. Remove the material delivered from the case or from the pallet with care and check that it is consistent with the drawings supplied and the shipment documents.

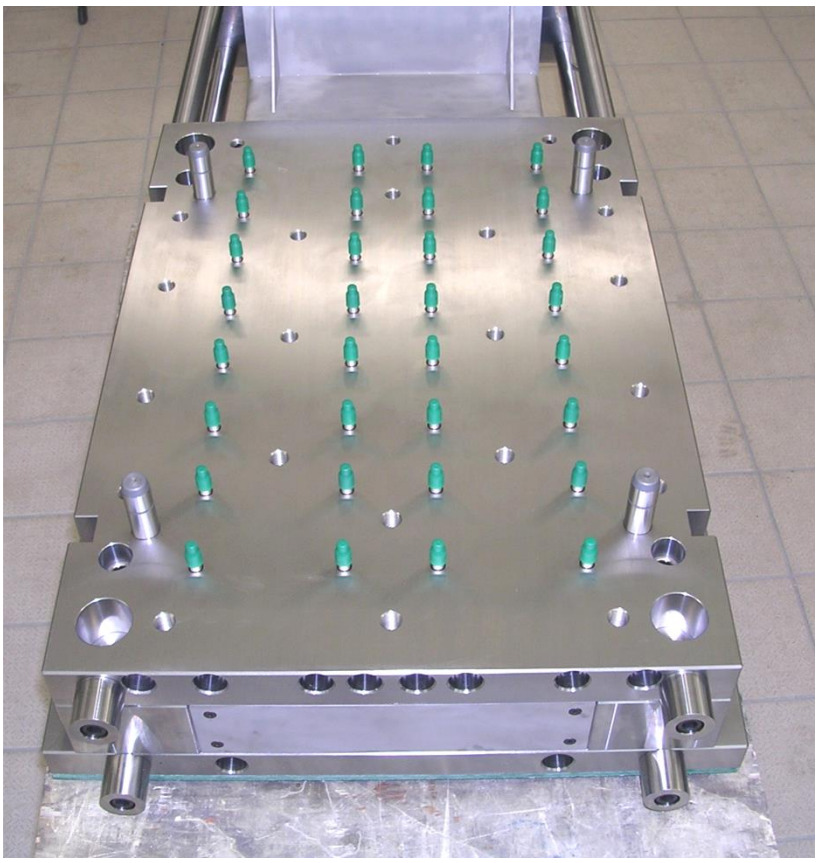


Figure 43 – Hot half extracted from the case

2. Check that the nozzle seats on the manifolds not built by Thermoplay correspond to the Thermoplay specification dimensions.
3. Check the consistency between the material supplied by Thermoplay and the rest of the mold plates: sliding guides and fastenings (screws). The “Hot halves” constructed by Thermoplay always have the guiding tie-bars that protrude more than the nozzles, so as to protect the integrity of the nozzles and facilitate the mold fitting.
4. Heat the distribution plates up to the process temperature of the polymer. In this way, the nozzles are blocked in the correct position. It is advisable to connect and activate conditioning of the injection system containment plate. Align and assemble the mold manifolds. The reciprocal sliding is to take place without difficulty and/or seizing.
5. Align and assemble the plates and components that complete the fixed part of the mold.
6. Now tighten the fastening screws between the manifolds. A torque wrench should be used to obtain an even pre-load that conforms to the requirements of the screw used.
7. For valve gate assembly, see section 8 in this manual.

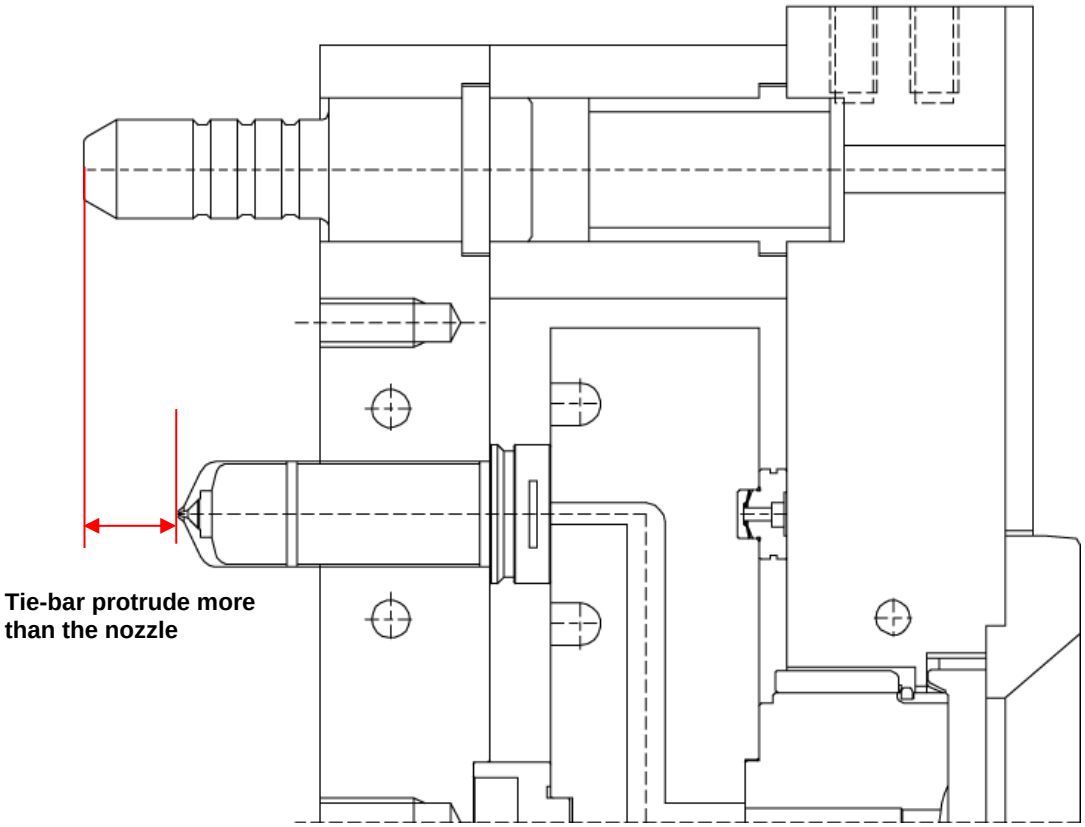


Figure 44 – Tie-bars/nozzles protrusion

8. After these operations, assemble the 2 parts of the mold (fixed and moving), complete the electrical, hydraulic and any oil pressure connections; the mold can then be fitted on the molding machine

The “Hot half” systems supplied by Thermoplay use a thermo-insulating manifold that is shaped so that the screws that tighten all the manifolds in a single block cannot be unscrewed. The scope of this is to ensure that the user follows a correct disassembly sequence, avoiding stretching/breaking the electrical connection wires that are housed just underneath the thermo-insulating manifold.

5 Start up

5.1 Firts start up

5.1.1 Warnings



To facilitate your work and to make it safer, we remind you that Thermoplay power supply systems are designed to bring the thermo-plastic material to be injected into the mold to the required temperature. Any other type of use is to be considered incorrect, and therefore is not allowed.



Thermoplay S.p.A shall not be held liable for any damage caused by incorrect use of its products. It is obligatory that our systems are connected to electric mains that are in conformity with the standards in force in the country where they are installed and are protected by a differential magneto-thermal circuit breaker with 300 mA. tripping current.



Before starting to make any type of connection, make sure that the electrical network is provided with a perfectly functioning ground system, that it can supply the control unit with the voltage indicated on the identification plate and that the cable supplied by Thermoplay to connect the system to the ground system is correctly installed.



We remind you that Thermoplay hot runners and nozzles can reach operating temperatures of over 400°C. Many types of thermo-plastic materials are not able to support these temperature values without decomposition.





The chemical transformation caused by this decomposition will produce harmful gases, and, in some cases explosion risks. Therefore the regulation of the heating temperature is to be determined within the molding parameters supplied by the manufacturer of the plastic material to be injected.

5.1.2 Control procedure

1. Before any connection, carefully study the wiring diagram of the system to be started up.
2. Check that the electrical connectors of the mold are perfectly compatible with the temperature controller used (position of the thermocouples and connector power).
3. Connect all conditioning circuit inputs and outputs.
4. In case of valve gate group systems, connect the pins opening/closing commands (air or oil)
5. Check the cables.
6. Check that the shape of the machine nozzle is compatible with the profile obtained on the injection bushing. Take advantage of this test to check the diameters of the resin path between these two components: very often the machine nozzles are undersized in relation to the hot runner. Therefore in this point it is easy to find and eliminate a load loss.



Warning: the holes of the machine nozzle and of the injection bushing must have the same diameter!

7. Open the conditioning circuits and bring the mold to the hot runner working temperature (See specifications of the plastic materials supplier).
8. Only connect the thermocouples connecting cable.
9. Start the control unit. All the zones are to indicate a heating value that corresponds to the environment temperature.
10. Switch off all the zones and connect the control unit-mold power cable.
11. Switch the first zone on again and set the temperature (set point) at 150°; check on the display that the temperature rises properly. If the temperature rises on another zone, this signifies there is an exchange of cables; if instead the temperature rises correctly on this zone, it signifies that the wiring is correct; it can therefore be switched off again and the same procedure can be carried out on the 2nd zone. In this way the correct functioning of all the zones can be checked in sequence, through to the last one.
12. After all the zones have been checked, the system can be brought to the required temperature, with the certainty that there are no failures present.
13. When the block has reached ≈¾ of the set value, bring all the nozzles to temperature, carefully watching the rise in temperature. Usually, all the nozzles in the mold should have more or less the same pace in the temperature rising.
14. Once the working temperature has been reached, check that the set value is stable.
15. The next step is to inject the resin in the distributor. After clamping the mold with an appropriate force controlled by the molding machine, bring the injection head into contact with the bushing on the mold and command a work cycle with a strong back pressure: the resin will then enter into the system without effort. During the first molding, avoid, if possible, the use of strongly charged plastic materials or with a high quantity of additives, in the same way, avoid material that is very sensitive to heat. Consider that the first start-up of the hot runner block is also the first commissioning of the mold, and it can happen quite often during the tests that several minor problems have to be dealt with that will cause very long inter-cycle times; as a consequence the times that charged resins and/or with high additive content remain in the barrel and in the system could be hazardous .
16. Before running the first injection cycle, check that the holding pressure is set at 0 bar and that the dose applied is less than the volume to be injected. It is advised to make incomplete moldings during the first injections.
17. If there are no problems, continue the test until the correct pace is found with acceptable parts. Store all the injection settings, the temperatures of the block and the mold nozzles. Measure also the power consumed by each zone; these values should appear systematically on the settings chart for 2 essential reasons.

6 Transformation

6.1 Colour change

6.1.1 Systems without shutter

When the production has been completed with colour (A) proceed as follows:

1. Bring back the plasticizing barrel, bleed by loading the hopper with neutral colour material, suitable for cleaning.
2. Bring the system to the correct temperature for this material and start the molding, until the traces of colour (A) have practically disappeared from the parts.
3. Bring back the plasticizing barrel, bleed and load the hopper with the new material / colour (B).
4. Bring the system to the correct temperature for the material / colour (B).
5. Start the molding again until the colour change is complete (without flaws).
6. Continue running normally

6.1.2 Systems with shutter

When the production has been completed with colour (A) proceed as follows:

1. Bring back the plasticizing barrel, bleed by loading the hopper with neutral colour material, suitable for cleaning.
2. Bring the system to the correct temperature for this material.
3. Start molding with this material until the traces of colour (A) have completely disappeared from the parts.



Do not open/close pins while the material is being bled if the system has not reached the running temperature.

4. Bring back the plasticizing barrel, bleed and load the hopper with the new material / colour (B).
5. Bring the system to the correct temperature for the material / colour (B).
6. Start molding with colour (B) at a high injection speed, until the traces of the neutral colour have completely disappeared from the parts.
7. Return to normal operating conditions.



The reader should note that plastic materials, especially some (for example acetal resin, PVC, material change from POM to PA) can develop corrosive gases that are hazardous for health. Therefore, scrupulously follow the indications of the resin supplier and make sure that the rooms are adequately ventilated

6.2 End of production

Deactivate heating to the entire system.
Leave the mold conditioning active until the temperature lowers below 80 – 90°C
If the plastic resin molded is a type that is not thermally stable (material that easily degrades, such as POM, PVC...), mold a few parts with a resin with a low degrading risk, such as LDPE (low density polyethylene).

7 Failures and solutions

This chapter deals with two topics. First of all, failures that are exclusively connected to the heating system, the symptoms the consequences and the solutions; it will deal with how to eliminate flaws from the molded parts (par. 7.5).

7.1 List of failures

This chapter describes the possible failures which can occur in the system, in the injection system and in the molded parts, divided in different sections, depending on the possible causes. The detailed description of all the causes and the possible solutions is described in the indicated table paragraph

7.1.1 Electrical failures

	Parag.
The system doesn't operate / does not allow injection	7.2.1
Simultaneous loss of many heated zones	7.2.2
Loss of one heated zone	7.2.3

7.1.2 Thermoregulator failures

	Parag.
Loss of set temperature	7.3.1
Unstable setting	7.3.2
Deviation between displayed/real temperature	7.3.3

7.1.3 Injection failures

	Parag.
A nozzle doesn't inject	7.4.1
Injection difficulty	7.4.2
Unbalanced filling	7.4.3
Material decomposition	7.4.4
Injection point too high	7.4.5
Loss of plastic material around hot runner	7.4.6

7.1.4 Failures on molded parts

	Parag.
Jetting	7.5.1
Moisture streaking	7.5.2
Burns	7.5.3
Suck-back	7.5.4
Sealing lines	7.5.5
Colour streaks	7.5.6
Differences in brilliance	7.5.7
Filling difficulties	7.5.8
Flashes	7.5.9
Gas or air bubbles	7.5.10
Black spots	7.5.11
Strands at injection point	7.5.12
Concentric signs near injection point	7.5.13
Ejector marks	7.5.14
Deformation during ejection	7.5.15
Peeling	7.5.16

7.2 Electrical failures

7.2.1 The system doesn't operate / does not allow injection

POSSIBLE CAUSES	CORRECTIVE ACTIONS
• Interrupted heater tube. • Cables pinched between manifold and plate • Deteriorated power supply cable insulating sheath. • Multi-pole socket faulty contact. • Water leak or presence on electrical components. • The plastic material has flowed into the system due to a leak.	1. Using a universal multimeter, check that no heated zone is grounded. 2. After finding the faulty zone, check whether the failure is just a disconnected cable. If it is not contact the after sales service. 3. If no failure is found on the mold, check the power supply cables, the regulation control unit and the other components up to the electric socket where the control unit is connected.

If several zones are involved, the possible causes and related corrective actions are:

POSSIBLE CAUSES	CORRECTIVE ACTIONS
The cable insulating sheaths are burnt.	Disassembly the system and send to Thermoplay for maintenance.
There has been a water leakage around the system or in the multi-pole sockets.	Verify where the leakage occurred and eliminate it.
The plastic material has flowed into the system due to a leak.	Disassembly the system and send to Thermoplay for maintenance.

7.2.2 Simultaneous loss of many heated zones

POSSIBLE CAUSES	CORRECTIVE ACTIONS
• Loss of a phase on the power supply line. • Broken fuse. • Cable disconnected from multi-pole socket or in the power supply cable	1. Using a universal multimeter, check all the zones involved. 2. If no resistor fault is found on these zones, it is certainly a loss of phase on the power supply line. Check there is a voltage of 240V (±10%) between the neutral and all the phases on supply socket in the regulation box. 3. If no fault is found on the mold or on one of the phases, check the fuses corresponding to the failed zones in the regulation box; then inspect the multi-pole socket.

7.2.3 Loss of one heated zone

POSSIBLE CAUSES	CORRECTIVE ACTIONS
• Broken fuse. • Heater failure. • Thermocouple failure • Cable disconnected from the multi-pole socket or in the power supply cable	1. Using a universal multimeter, check that there is a resistor value of >0 on the faulty zone 2. If no resistor value is shown on the zone and the cables are neither broken nor disconnected, replace the resistor. 3. If no failure is found on the mold, check the fuse for this zone in the regulation box.

7.3 Thermo-regulator failures

7.3.1 Loss of set temperature

POSSIBLE CAUSES	CORRECTIVE ACTIONS
• Thermo regulator failure. • Thermocouple failure. • Cable disconnected from the multi-pole socket or in the power supply cable	Check the operation of the thermo regulator. Using a universal multimeter, check the thermocouple related to the faulty zone. In case an interruption is detected in the circuit (resistance value= “∞”), check that the fault is simply due to a disconnected cable. Otherwise set the control unit checking zone to "Manual”. Compare the value set in % of the output power measured on a similar zone. It will be possible to terminate the production and the faulty thermocouple will be replaced the next time the mold is removed.

7.3.2 Unstable setting

POSSIBLE CAUSES	CORRECTIVE ACTIONS
• Thermal contact caused by too fast cooling. • Regulator broken or parameters not set correctly • Thermal contact caused by plastic material that has infiltrated into the system.	Reduce the cooling around the mold nozzles, deactivating the liquid circulation, then watch the reaction of the device. If the temperature stabilises, the problem is solved, otherwise proceed with the following instructions. Verify that the temperature control system has been optimised for the load connected. Position the regulator on Manual. Carefully watch the reactions of the device. The displayed values should stabilise. Observe the power consumed to obtain the required temperature. Check there is no smoke coming from the upper part of the mold



WARNING: if there is the characteristic odour of the injected plastic material, take seriously into consideration the probability of material infiltration into the system. In this case remove the mold immediately.

7.3.3 Deviation between displayed/real temperature

POSSIBLE CAUSES	CORRECTIVE ACTIONS
• Pinched or crushed thermocouple. • Regulator broken or parameters not set correctly • Polarity inversion in the thermocouple cables	1. If the thermocouple is pinched or crushed or not perfectly inserted, this will always cause a deviation in the reading. 2. If the regulation control unit has been replaced, check that each regulator has been set correctly with the parameters for use of J type thermocouples. 3. Check that the polarity of the connecting cables in output from the control system is correct.

7.4 Injection failures

7.4.1 A nozzle doesn't inject

POSSIBLE CAUSES	CORRECTIVE ACTIONS
• Cable disconnected from the multi-pole socket or in the power supply cable. • Heater failure • Wrong nozzle seat • The nozzle injection hole is obstructed. • Impurities in the supply channel. • Worn nozzle tip. • Degraded material.	1. Make sure that the failure is not just a disconnected cable. 2. Inspect the injection tip and remove the plug if present. Check that the nozzle tip does not obstruct the injection point and check the dimensions of the nozzle seat, which is to be as indicated in the Thermoplay catalogue. 3. Measure the temperature in the zone near the injection point. A temperature that is too low may cause premature solidifying of the injection point. It could also be the consequence of a heating problem on the nozzle. 4. Check the resistance value of the faulty nozzle with a universal multimeter; if the output value is infinite ("∞"), replace the heater. 5. If no fault is found, they may be some impurity or degraded material has clogged the channel.

7.4.2 Injection difficulty

POSSIBLE CAUSES	CORRECTIVE ACTIONS
• Injection point too small or wrongly positioned. • Hot runner or nozzles temperature too low • On a hot runner with shutter the pin could be worn or damaged • The hydraulic or pneumatic system is not operating properly. • Wrong nozzle seat • Worn nozzle tip.	1. On a system with shutter, check that the pins are in the correct open position. 2. Inspect the injection point and remove the plug if present. Check that the nozzle seat dimension is correct. 3. On a system with shutter, check there are no obstructions / restrictions in the pins closing/opening travel. 4. Verify the pneumatic or hydraulic system of the shutters. 5. Measure the temperature in the zone near the injection point. A temperature that is too low may cause premature solidifying in the injection point. 6. Replace the nozzle tips if they are worn or damaged

7.4.3 Unbalanced filling

POSSIBLE CAUSES	CORRECTIVE ACTIONS
• Injection points diameters not uniforms • Wrong nozzle seat dimensions. • Thermal unbalance. • Impurities in the feeding channel. • Difference in thickness of parts. • Missing or obstructed air vents. • Uneven matrices conditioning	1. Check the uniformity of the injection point diameters. The nozzle tips are not to have uneven tightening between the different seats. 2. Check the uniformity of the temperature in zones near the injection point. 3. Increase the hot runner temperature. 4. Clean the vents on the cavities. 5. Measure the different thicknesses on the injected part: if they are uneven, take the required action.

7.4.4 Material decomposition

POSSIBLE CAUSES	CORRECTIVE ACTIONS
• Injection points diameter too small. • Hot runner or nozzles temperature too high • Wrong nozzle or seat dimensions. • Thermocouple reading error. • Heat dispersion near thermocouples. • Plastic resin remains too long in the system. • Colouring or additive very sensitive to temperature. • Dimension or temperature of the plasticising cylinder too high..	1. Reduce the temperature of the nozzles and the hot runner. 2. Verify that the material stay time in the channel is not excessive. 3. Reduce the cooling around the mold nozzles. 4. Check the thermocouples. 5. Check the diameter of the injection points. Check that the nozzle seats have the dimensions specified in the Thermoplay catalogue. 6. Run a test with neutral plastic material. 7. Verify the plasticising cylinder operation.

7.4.5 Injection point too high

POSSIBLE CAUSES	CORRECTIVE ACTIONS
• Injection points temperature too low. • Nozzles temperature too low. • Excessive cooling. • Injection points diameter too large. • Wrong nozzle seat position. • Unsuitable holding pressure and time. • Back pressure too weak	1. Increase the nozzles temperature. 2. Reduce the cooling in the matrices at the injection point. 3. Check the diameter of the injection points. 4. Check that the nozzle seat is correct. 5. Increase the backpressure and the press screw rotation speed. 6. Increase the holding time.

7.4.6 Loss of plastic material around hot runner

POSSIBLE CAUSES	CORRECTIVE ACTIONS
• Non-observance of values specified by Thermoplay to compensate thermal dilation. • Small particles infiltrated between the manifolds that prevent correct coupling of the mold. • Loosen plate screws. • Yielding of the plates that surround the system or of the manifold. • Imperfections in the injection system level.	1. Inspect the flow of the leakage. 2. Send the system to Thermoplay for maintenance.

7.5 Failures on the molded parts

The following table lists the most common failures that could occur on molded plastic parts, and the possible causes. The corrective actions described are to be carried out in the sequence indicated. After each action, restart the molding cycle, and if the error persists continue with the next step.
The corrective actions are also accompanied by schematic drawings in the table 2. In this table the corrective actions are indicated concerning modification of parameters and not the operating conditions of molding machine maintenance.

7.5.1 Jetting

DEFECT	CAUSE	CORRECTIVE ACTION
There are curved or twisted lines on the surface of the molded part, at times similar to grooves. During filling the melted material has started to cool in the cavity and as a consequence the gate is not homogeneous	Plastic material too cold. Mold too cold. Injection speed too fast, that causes too fast cooling of the material or the mold. Injection pressures too high. Injection point badly located: it is necessary to break the incoming jet on a perpendicular wall. Injection point too small. Humidity in plastic material.	Check the mold parameters and if necessary try changing them as follows: Reduce the injection speed Increase the mold temperature. Increase the flow temperature Check the position of the injection point. If filling is from above to below, interrupt the inlet flow horizontally. Increase the injection point diameter.

7.5.2 Moisture streaking

DEFECT	CAUSE	CORRECTIVE ACTION
There are large white or silvery opaque areas on the surface of the molded part, formed by streaks distributed in rays in the opposite direction to the material flow.	• Moisture in the plastic material • Moisture in the mold	Check for moisture in the thermoplastic material and find the cause • check the packaging and the warehouse • dry the plastic material properly Check the mold parameters and if necessary try changing as follows: 1. Check the mold cooling system. 2. Increase backpressure 3. Decrease screw speed.

7.5.3 Burns

DEFECT	CAUSE	CORRECTIVE ACTION
Burnished or silvery streaks on the surface of the molded part, with areas of decomposed material that appear as decolouration.	• Melting temperature too high. • Excessive material permanence in the plasticising barrel. • Mold screw too fast • Mold cycle interruption with no cooling of the barrel and the hot channel. • No vents, encrusted or badly positioned vents.	Check the mold parameters and if necessary try changing them: 1. Purge the plasticising barrel. 2. Reduce the melting temperature if it is too high 3. Reduce the injection speed 4. Decrease the screw speed 5. Reduce the backpressure 6. Check the air or gas vents. 7. Avoid areas that impede the flow in the injection system and in the plasticising barrel

7.5.4 Suck-back

DEFECT	CAUSE	CORRECTIVE ACTION
Flaws that seem a shrinkage of material on the surface of the molded part where there is an accumulation of material.	• Thickness differences in the molded part • Injection pressure too low • Temperature too high	1. Perfect the ratio between part zones with different thicknesses. If the defect remains, move the injection point to the thickest zone. 2. If the suck-backs are far from the injection point, increase the pressure and the hold time. If the defect remains, increase also the temperature of the material and of the mold. 3. If the suck-back is near the injection point, lower the temperature of the material, the speed of injection and of the mold

7.5.5 Sealing lines

DEFECT	CAUSE	CORRECTIVE ACTION
Incision marks on the surface of the molded part, which may be combined with differences in colour. They are more visible on transparent parts or dark coloured parts with a smooth surface.	These are caused by the union of two material flows that meet. The possible cause of the incomplete bonding may be: • Temperature too low • Insufficient air or gas vents	Check the mold parameters in sequence and if necessary try changing them: 1. Check the air or gas vents and if necessary improve them 2. Increase the injection speed 3. Increase the temperature of the mold and the material 4. Increase the hold pressure

7.5.6 Colour streaks

DEFECT	CAUSE	CORRECTIVE ACTION
Signs of different colour tones. Particularly visible on materials with metalised or fluorescent pigments.	These are caused by an uneven distribution of the material that could be due to: • Uneven gate • High speed screw rotation. • Material temperature too low. • Incompatible mixture of materials	Check the mold parameters in sequence and if necessary try changing them: 1. Increase backpressure 2. Reduce screw rotation speed 3. Increase material temperature 4. Decrease injection point 5. Check the material and colouring mixture 6. Use specific type of nozzles to obtain a more even distribution of material

7.5.7 Differences in brilliance

DEFECT	CAUSE	CORRECTIVE ACTION
Zones with difference in brilliance on the surface of the molded part.	They may be caused by: • Uneven cooling • Deformation of already cooled material • Poor mold finish	In the case of lack of brilliance on parts with shiny surfaces: 1. Increase hold pressure 2. Increase hold time 3. Check and if necessary polish the mold 4. Increase mold and material temperatures 5. Increase the injection speed 6. Check air vents 7. For parts with structured surface: • decrease injection speed • decrease screw speed

7.5.8 Filling difficulties

DEFECT	CAUSE	CORRECTIVE ACTION
In some zones the molded parts show lack of material.	If the part lacking in material is far from the injection point, the cause may be: • Insufficient volume of injected material • Insufficient air or gas vents • Insufficient injection pressure • Poor injection speed • Temperature of mold or material is insufficient • Check valve fault	Check the mold parameters in sequence and if necessary try changing them: 1. Check and if necessary increase the volume of material to be injected 2. Check functioning of check valve 3. Increase injection speed 4. Increase injection pressure 5. Increase the hold point 6. Increase mold temperature 7. Increase gate temperature 8. Check dimensions of channels and injection point

7.5.9 Flashes

DEFECT	CAUSE	CORRECTIVE ACTION
The molded parts have excess material, often near openings between mold surfaces	The tightness of the mold components is not sufficient to oppose the mold internal pressure. Possible causes: • Mold tolerances too high • Insufficient mold clamping force • Mold internal pressure too high • Deformed mold platens • Injection speed too high	Check the following parameters and if necessary change them in sequence: Increase mold clamping pressure 1. Check for deformation on clamping surfaces 2. Check and if necessary change conversion parameters 3. Reduce the injection speed 4. Reduce gate and mold temperatures 5. Reduce pressure inside cavities

7.5.10 Gas or air bubbles

DEFECT	CAUSE	CORRECTIVE ACTION
The molded parts have bubbles or cavities inside or on the surface.	• Trapped air or gas • Poor mold internal pressure • Injection point badly positioned • Injection hole too small • Suck-back • Molding machine screw speed too high	Check the following parameters and if necessary change them in sequence: 1. Increase mold internal pressure 2. Check diameter and injection hole of nozzles 3. Reduce gate temperature 4. Check and if necessary reduce screw speed 5. Check for moisture in material granules 6. Check and if necessary change the injection point position 7. Check whether suck-back is caused by material shrinkage (par. 7.5.4) 8. Check air or gas vents

7.5.11 Black spots

DEFECT	CAUSE	CORRECTIVE ACTION
There are dark spots or marks on the molded parts	• Gate temperature too high and has caused material degrading • Contaminated material • Worn plasticising unit • Screw speed too high • Too much backpressure • Impurities in plasticising system	1. Check granules 2. Clean plasticising unit 3. Check wear and cleanliness of plasticising unit components and injection system 4. Reduce gate temperature 5. Reduce cycle time 6. Check and if necessary reduce screw speed 7. Reduce backpressure

7.5.12 Strands at injection point

DEFECT	CAUSE	CORRECTIVE ACTION
The molded parts have strands of material at the injection point	• Injection point temperature too high. • Nozzles temperature too high. • Inadequate conditioning. • Injection point diameter too big. • Backpressure too strong. • Unsuitable hold pressure and time.	1. Try adjusting the nozzles temperature according to the material used. 2. Increase cooling in matrixes. 3. Check diameter of injection points. 4. Check nozzle seats. 5. Decrease backpressure and molding machine screw rotation speed. 6. Increase the hold time.

7.5.13 Concentric signs near injection point

DEFECT	CAUSE	CORRECTIVE ACTION
The molded parts have opaque concentric rings at injection point	• Injection point too small • Injection speed too low • Gate or mold temperature too low	1. Increase the injection speed 2. Increase mold temperature 3. Increase gate temperature 4. Increase backpressure 5. Check and if necessary change dimensions or position of injection point

7.5.14 Ejector marks

DEFECT	CAUSE	CORRECTIVE ACTION
The molded parts have irregularities in the ejector zone	• Ejector defects • Too much ejector pressure • Wrong ejector position • Insufficient cooling time • Too much mold internal pressure • Mold temperature too high	Check the following parameters and if necessary change them in sequence: 1. Reduce ejection pressure 2. Reduce mold internal pressure 3. Check and if necessary change ejection system 4. Increase cooling time 5. Reduce mold temperature

7.5.15 Deformation during ejection

DEFECT	CAUSE	CORRECTIVE ACTION
The molded parts are deformed on the ejection side	• Ejection system faults • Excessive ejector pressure • Ejector wrongly positioned • Insufficient cooling time • Excessive pressure inside mold • Mold temperature too high	Check the following parameters and if necessary change them in sequence: 1. Reduce ejector pressure 2. Reduce pressure inside mold 3. Check and if necessary change ejection system 4. Polish and treat cavity surfaces with release agents 5. Increase cooling time 6. Reduce mold temperature

7.5.16 Peeling

DEFECT	CAUSE	CORRECTIVE ACTION
The molded parts have layers on surface. The layers of material have been caused by different flows that do not adhere to each other	• Injection speed too high • Low gate temperature • Uneven conditioning • Impurities in material • Wrong mixture • Moisture in material	Check the following parameters and if necessary change them in sequence: 1. Reduce injection speed 2. Reduce screw speed 3. Increase mold temperature 4. Increase gate temperature 5. Check that granules do not contain moisture or impurities 6. Check mixture compatibility

Table 2: Table of defects and corrective actions on moulded parts

DEFECT \ PARAMETER	Hold pressure	Purge	Melted mass temperature	Gradual injection speed	Injection section	Clamping force	Hold time	Mold temperature	Injection speed	Material humidity	Backpressure	Screw return	Screw speed	Hold point	Ejection pressure	Cooling time
Turbulence			⇑2	⇓1												
Burning		⇑1	⇓2						⇓3		⇓5	⇓4		⇓6		
Part too big			⇑4		⇓1			⇑3					⇓2			
Moisture streaks										⇓1	⇑2		⇓3			
Hollow points	⇑1		⇓4		⇑5		⇑2	⇓3								
Difference in brilliance	⇑1		⇑3				⇑2	⇑4	⇑5							
Part over-injected	⇓3		⇓5			⇑4			⇓1					⇓2		
Part too fragile	⇓4		⇓3		⇑5			⇑3		⇓2						
Joints	⇑4		⇑3					⇑2	⇑1							
Glass fibre streaks	⇑4		⇑3				⇑5	⇑2	⇑1							
Air bubbles	⇑1		⇓3		⇓2					⇓5			⇓4			
Flashes	⇓5		⇓3			⇑1		⇓4	⇓2							
Ejection flaws	⇓2							⇓4							⇓1	⇑3
Mass not melted			⇑3								⇑1		⇓2			
Black spots			⇓1								⇓3		⇓2			
Part not full	⇑2	⇑7	⇑5		⇑6			⇑4	⇑1					⇑3		
Part too small	⇑1		⇓4		⇑5		⇑2	⇓3								
Suck back	⇑1		⇓5		⇑3		⇑2	⇑4	⇓6							
Coloured streaks			⇑3						⇑4		⇑1		⇓2			
Cold front			⇑3	⇓1	⇑4			⇑2								
Black streaks			⇓3								⇑1	⇓4	⇓2			
Concentric marks			⇑3		⇑5			⇑2	⇑1		⇑4					
Cols slug			⇑1					⇑2								
Peeling			⇑4	⇓1				⇑3		⇓5			⇓2			

Legend: ⇑ increase parameter ⇓ decrease parameter

Note: The numbers indicate the sequence of operations. Modify a parameter a time, following the correct number sequence.
EXAMPLE: If the defect is “Mass not melted” the “Backpressure” parameter must be increased. If the defect persists, then increase the “Screw speed” parameter. If the defect still persists, increase the “Melted mass temperature” parameter.

8 Maintenance

This page contains all the necessary information to remove the nozzles from the platen and to replace the heaters that could become accidentally damaged. All the nozzles have a groove in the head so a puller can be used to remove them from the platen. The nozzle has to be extracted perpendicular to the bearing surface to avoid damaging the nozzle seats or the centring diameters. Incorrect handling could make the nozzle unusable or cause outflow of material due to nozzle seat damage.
Before starting to describe the nozzles maintenance, it is deemed necessary to underline that these must never be removed from their manifold using screwdrivers, levers and/or similar tools.

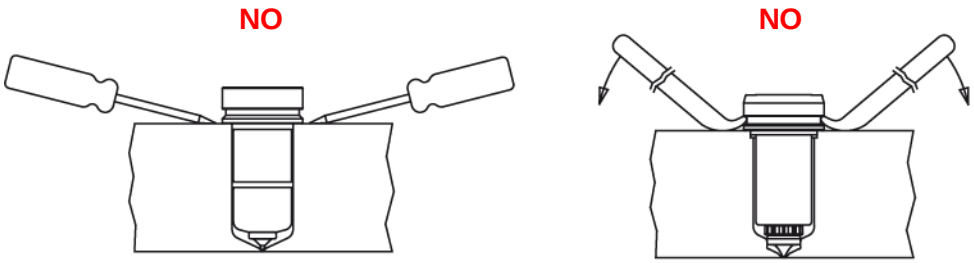


Figure 45 – Do not use screwdrivers, punches or levers

For this operation always use the Thermoplay extraction tools (codes E04197 and E04198 according to the size of the nozzle), with the correct extraction bushing. In this way the intactness of the nozzle and its components is ensured. Thermoplay does not guarantee the correct functioning of the nozzle if the nozzles are removed from their seats without the use of the above-mentioned extractors.
Consult the Thermoplay General Catalogue (chapter Accessories) for the correct tool codes and for the correct maintenance procedure.

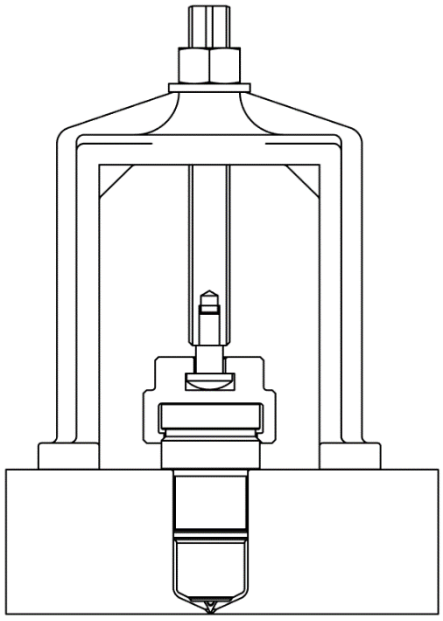


Figure 46 – Thermoplay extraction tool

8.1 Maintenance nozzles TD, TF, FN, FT, and TH

8.1.1 Maintenance kit

For all maintenance tasks you need to have the maintenance kit.
The kit is typically made up of the following:

8.1.1.1 TF-TF6 / FN – FNH6 Nozzles

1. Wrench for assembly/disassembly of the tip (without lever)
2. Tool for thermocouple adaptation
3. Tip housing cleaning brush
4. Resistor retractors
5. Anti-seize grease



Figure 47 – Maintenance kit TF-TF6 / FN-FNH6 nozzles

FN/FNH TF/TF6	1	1B15	1B50	1GLT	1D	1DSLA	1DSLU	2	2P	2D	2DSLA	2DSLU	3	3B	3D
TF12	E21202	--	--	--	--	--	--	--	--	--	--	--	E15781	--	--
TF17	E19424	E19424	E19425	E19424	E19424	E19425	E19425	E19424	E19424	E19424	E19425	E19425	E19424	E19425	E19424
TF23	E19428	E19428	E19429	E19428	E19429	E19429	E19429	E19428	E19428	E19428	E19429	E19429	E19428	E19429	E19428
TF32	E19432	--	--	--	E19433	E19433	E19433	E19432	E19432	E19433	E19433	E19433	E19432	E19433	E19433
TF46	E19436	--	--	--	E19437	E19437	E19437	E19436	E19436	E19437	E19437	E19437	E19436	E19437	E19437

Table 3: codes of TF-TF6 / FN-FNH6 nozzle maintenance kits

8.1.1.2 TD-TD6 / DN – DN6 Nozzles

1. Wrench for assembly/disassembly of the tip (without lever)
2. Core extraction tool
3. Tip housing cleaning brush
4. Resistor retractors
5. Anti-seize grease

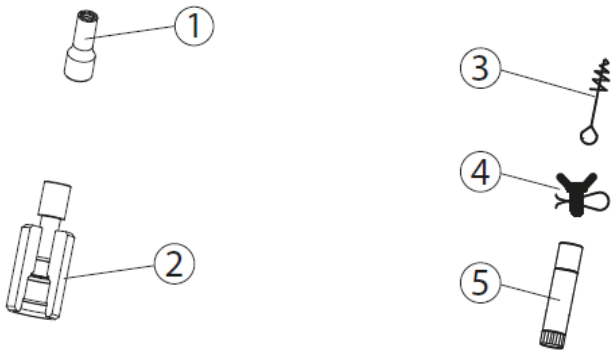


Figure 48 – Maintenance kit TD – TD6 / DN – DN6 Nozzles

DN/DN6 TD/TD6	1	1B35	1GLT	2	3
TD18	E21204	E21207	E21204	E21204	E21204
TD22	E21205	E21208	E21205	E21205	E21205
TD30	E21206	E21209	E21206	E21206	E21206
TD44	E21808	E21809	E21808	E21808	E21808

Table 4: codes of TD – TD6 / DN – DN6 nozzle maintenance kits

8.1.1.3 TH / TH6 Nozzles

1. Seeger extraction tool
2. Heater extraction tool
3. Bi-hexagon socket
4. Tip housing cleaning brush
5. Anti-seize grease
6. Heater introduction tool

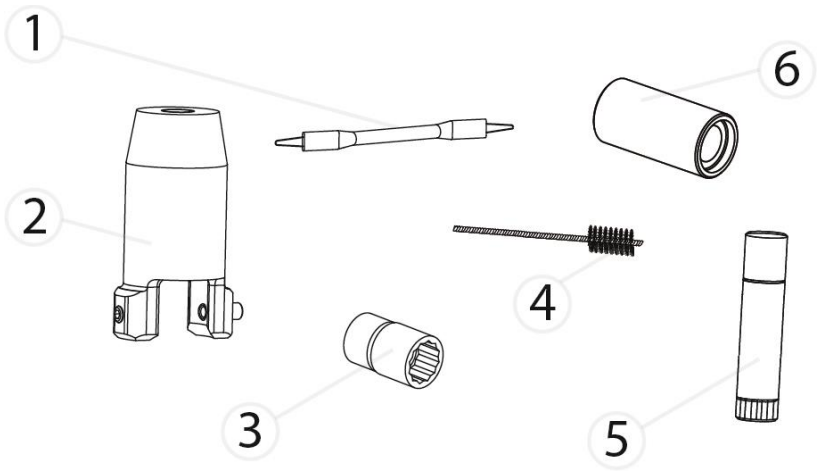


Figura 49 – TH nozzle maintenance kit TH / TH6

TH/TH6	1PK	1B15-PK	1B50-PK	1GLT-PK	3PK	3B15-PK	3DP
TH18	E21889	E21889	E22210	E21889	E21889	E21889	E21889
TH24	E21890	E21890	E22211	E21890	E21890	E21890	E21890

Tabella 5: kit maintenance codes for TH and TH6 nozzles

8.1.2 Extracting the nozzle body from the core (only for TD nozzles)

1. Remove the pin blocking the body with the core (Figure 50).
2. Insert the nozzle into the assembly/disassembly support.
3. Insert the core extraction tool as shown in Figure 51.
4. Use a hammer to tap the upper surface of the tool until the body is extracted.

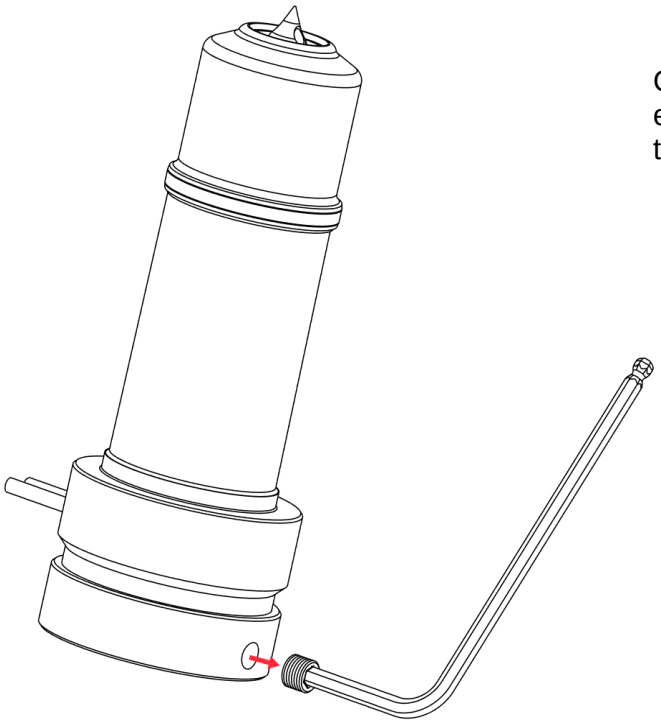


Figure 50 - TD NOZZLE: Extracting the pin in the head

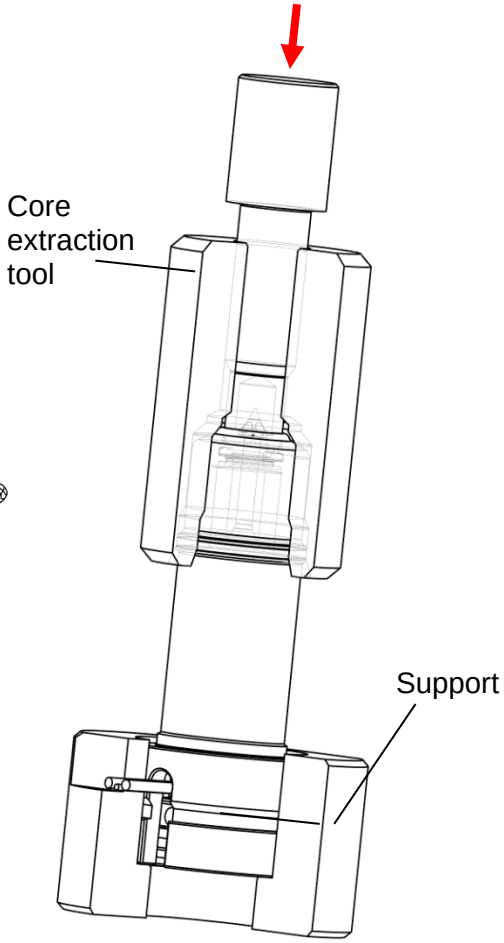


Figure 51 - Body extractor / TD nozzle core

8.1.3 Replacing TF, TD and TH nozzle tips

Carry out the procedure described in the paragraph below to extract the nozzle from the core and replace the TD nozzle tip. At this point, the TD, TF and TH nozzles are similar and the same procedure applies.

1. Close the nozzle head in the vice. Use aluminum jaws protections to prevent damage.

2. Unscrew the tip using the polygonal wrench provided with the maintenance kit and using a lever with the proper insert.

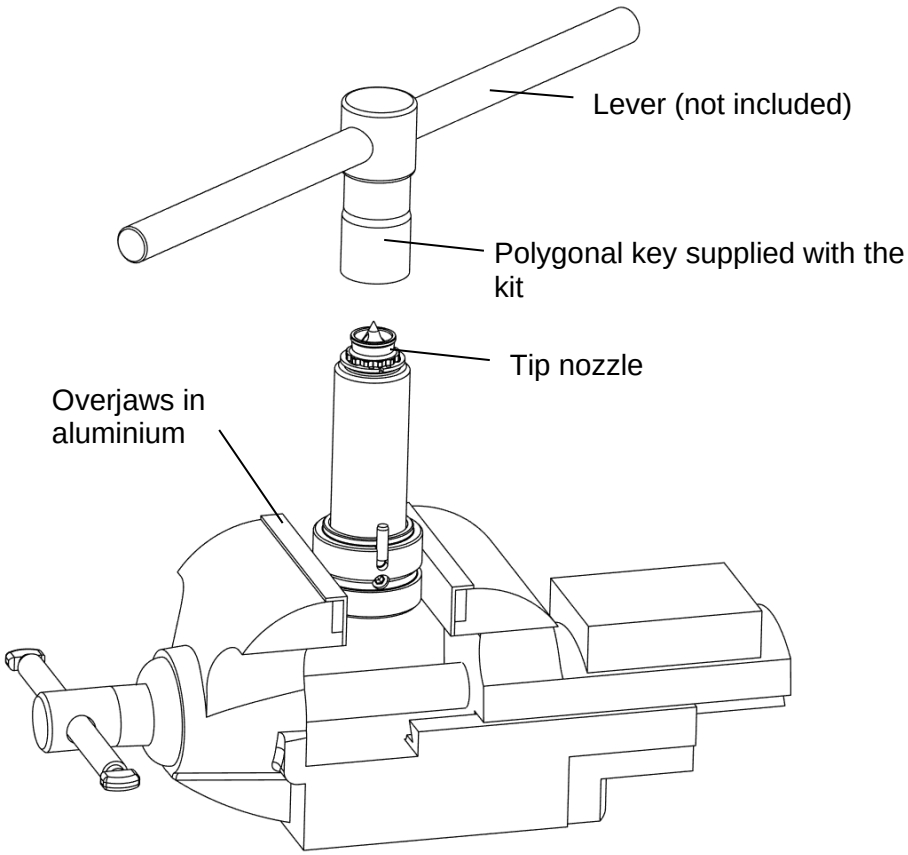


Figure 52 – Tip nozzle disassembly

3. Before installing a new tip, clean carefully the inner sealing surfaces of the nozzle with the brush provided with the kit (Figure 53).

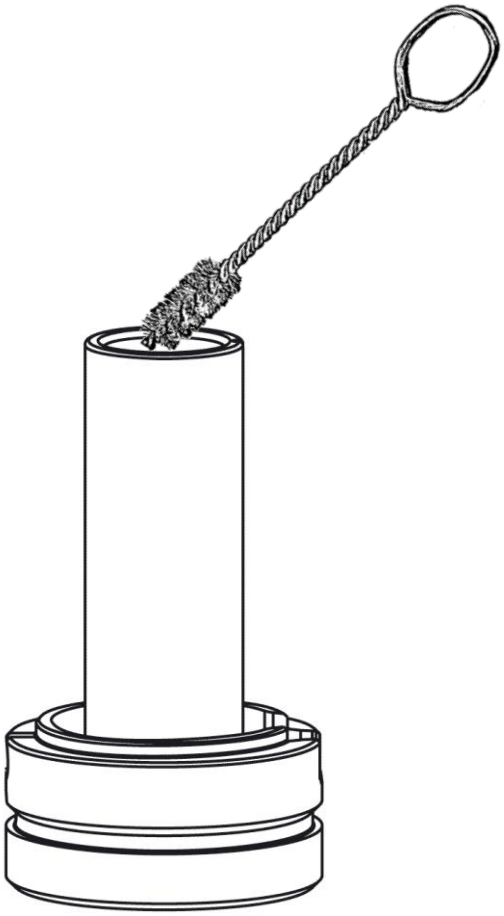


Figure 53 – Nozzle core cleaning

4. Consult Table 6, Table 7, Table 8 to identify the type of tightening required (“hot ”or “cold”).
5. Lubricate the thread of the new tip with anti-seize grease and re-assemble the tip.
6. When "hot" tightening of the tip is required, heat the nozzle to the process temperature and wait for 5 minutes.
7. Using a torque wrench and relevant assembly tool, tighten the tip to the torque indicated in the table in Table 6, Table 7, Table 8.
8. If it is possible to "cool" tighten the tip, skip step 6.

Table 6: nozzle type TH and TD wrench codes and tightening torque

TH								
Ø ug.	Ø18				Ø24			
tipo puntale	tipo/type	coppia torque	chiave wrench	codice chiave wrench code	tipo/type	coppia torque	chiave wrench	codice chiave wrench code
1	TH18-1PK	18 Nm	CH10	E18757	TH24-1PK	28 Nm	CH13	E18758
1B	TH18-1B-PK				TH24-1B-PK			E18763
1GLT	TH18-1GLT-PK				TH24-1GLT-PK			E18758
3	TH18-3-PK				TH24-3PK			E18757
	TH18-3RPET	15 Nm	CH10	E18757	TH24-3RPET	25 Nm	CH13	E18757
3B	TH18-3B-PK	18 Nm	CH10	E18757	TH24-3PK	28 Nm	CH13	E18757
3D	TH18-3DP				TH24-3DP			E18758

TD																
Ø ug.	Ø 18				Ø 22				Ø 30				Ø 44			
tipo puntale	tipo type	coppia torque	chiave wrench	codice code	tipo type	coppia torque	chiave wrench	codice code	tipo type	coppia torque	chiave wrench	codice code	tipo type	coppia torque	chiave wrench	codice code
1	TD18-1	15 Nm	CH9	E21122	TD22-1	15 Nm	CH10	E18757	TD30-1	25 Nm	CH13	E18758	TD44-1	40 Nm	CH18	E18759
1B	TD18-1B			E21210	TD22-1B			E18762	TD30-1B			E18763				
1GLT					TD22-1GLT	11 Nm	CH10	E18757	TD30-1GLT	20 Nm	CH13	E18758	TD44-1GLT	40Nm	CH18	E18759
2	TD18-2	15 Nm	CH9	E21122	TD22-2	15 Nm	CH10	E18757	TD30-2	25 Nm	CH13	E18758	TD44-2	40 Nm	CH18	E17859
3	TD18-3				TD22-3	18 Nm			TD30-3				TD44-3			

"Hot" clamping
"Cool "clamping ("hot "clamping is always possible and preferable when the seal surface between the core and the tip is not perfectly free from plastic residue)

Table 7: nozzle type TF wrench codes and tightening torque

TF											
Ø ug.	Ø12			Ø17				Ø23			
tipo puntale	coppia torque	chiave wrench	codice code	tipo/type	coppia torque	chiave wrench	codice chiave wrench code	tipo/type	coppia torque	chiave wrench	codice chiave wrench code
1	5 Nm	CH7	E20913	TF17-1	15 Nm	CH10	E18757	TF23-1	25 Nm	CH13	E18758
1B				TF17-1B			E18762	TF24-1B			E18763
1GLT				TF17-1GLT	11 Nm	CH10	E18757	TF23-1GLT	20 Nm	CH13	E18758
1D				TF17-1DSLA 1DSLU	18Nm	CH10	E18762	TF17-1DSLA 1DSLU	25Nm	CH13	E18763
2-2P				TF17-2	15 Nm	CH10	E18757	TF23-2	25 Nm	CH13	E18758
2D				TF17-2D 2DSLA/2DSLU			E18762	TF17-2D 2DSLA/2DSLU			E18763
3	5 Nm	CH8	E06798	TF17-3	18 Nm		E18757	TF23-3			E18758
3B				TF17-3B				TF23-3B			E18763
3D				TF17-3D 3DSLA/3DSLU			E18762	TF17-3D 3DSLA/3DSLU			

TF							
Ø ug.	Ø32				Ø46			
tipo puntale	tipo/type	coppia torque	chiave wrench	codice chiave wrench code	tipo/type	coppia torque	chiave wrench	codice chiave wrench code
1	TF32-1	40Nm	CH18	E18759	TF46-1	85Nm	CH27	E18760
1B								
1GLT	TF32-1GLT	40Nm	CH18	E18759				
1D	TF17-1DSLA 1DSLU			E18764	TF17-1DSLA 1DSLU	85Nm	CH27	E18765
2-2P	TF32-2	40Nm	CH18	E18759	TF46-2	85Nm	CH27	E18760
2D	TF17-2D 2DSLA/2DSLU				TF17-2D 2DSLA/2DSLU			
3	TF32-3				TF46-3			
3B	TF32-3B				TF46-3B			E18765
3D	TF17-3D 3DSLA/3DSLU			E18764	TF17-3D 3DSLA/3DSLU			

"Hot" clamping

"Cool "clamping ("hot "clamping is always possible and preferable when the seal surface between the core and the tip is not perfectly free from plastic residue)

Table 8: nozzle type FN and DN wrench codes and tightening torque

	FN											
Ø ug.	Ø11				Ø16				Ø24			
tipo puntale	tipo type	coppia torque	chiave wrench	codice code	tipo type	coppia torque	chiave wrench	codice code	tipo type	coppia torque	chiave wrench	codice code
1	F11-1	4 Nm	CH8	E06798	FN16-1T	18Nm	CH10	E18757	FN16-1T	25Nm	CH13	E18758
1B					FN16-1BT			E18762	FN16-1BT			
1GLT					FN/FT16-1GLTT	18Nm	CH10	E18757	FN/FT16-1GLTT	25Nm	CH13	E18758
1D					TF17-1DSLA 1DSLU			E18762	TF17-1DSLA 1DSLU			E18763
2-2P					FN16-2T	18Nm	CH10	E18757	FN16-2T	25Nm	CH13	E18758
2D					FN16-2D 2DSLA/2DSLU			E18762	FN16-2D 2DSLA/2DSLU			E18763
3	F11-3	5 Nm	CH8	E06798	FN/FT16-3T			E18757	FN/FT16-3T			E18758
3B					FN/FT16-3BT			E18762	FN/FT16-3BT			E18758
3D					FN16-3D 3DSLA/3DSLU			E18762	FN16-3D 3DSLA/3DSLU			E18763

	FN											
Ø ug.	Ø32				Ø46				Ø60			
tipo puntale	tipo type	coppia torque	chiave wrench	codice code	tipo type	coppia torque	chiave wrench	codice code	tipo type	coppia torque	chiave wrench	codice code
1	FN16-1T	40Nm	CH18	E18759	FN46-1	85Nm	CH27	E18760	FN60-1	150Nm	CH36	E18761
1B												
1GLT	FN/FT16-1GLTT	40Nm	CH18	E18759								
1D	TF17-1DSLA 1DSLU			E18764	FN46-1D/1DSLA 1DSLU	85Nm	CH27	E18765	FN60-1D 1DSLA/1DSLU	150Nm	CH36	E18761
2-2P	FN16-2T	40Nm	CH18	E18759	FN46-2	85Nm	CH27	E18760				
2D	FN16-2D 2DSLA/2DSLU			E18764	FN46-2D 2DSLA/2DSLU			E18765	FN60-2D 2DSLA/2DSLU	150Nm	CH36	E18761
3	FN/FT16-3T			E18759	FN46-3			E18760				
3B	FN/FT16-3BT			E18764	FN46-3B			E18760				
3D	FN16-3D 3DSLA/3DSLU			E18764	FN46-3D 3DSLA/3DSLU			E18765				

	DN															
Ø ug.	Ø18				Ø22				Ø30				Ø44			
tipo puntale	tipo/type	coppia torque	chiave wrench	codice code	tipo/type	coppia torque	chiave wrench	codice code	tipo/type	coppia torque	chiave wrench	codice code	tipo/type	coppia torque	chiave wrench	codice code
1	DN18-1	18 Nm	CH8	E17824	DN22-1	20 Nm	CH8	E17825	DN30-1	30 Nm	CH11	E17827	DN44-1	40 Nm	CH18	E17828
1B	DN18-1B				DN22-1B			E16099	DN30-1B			E17826	DN44-1B			E09623
2	DN18-2				DN22-2			E17825	DN30-2			E17827	DN44-2			E17828
3	DN18-3				DN22-3			E17825	DN30-3			E17827	DN44-3			E17828

"Hot" clamping
"Cool "clamping ("hot "clamping is always possible and preferable when the seal surface between the core and the tip is not perfectly free from plastic residue)

8.1.4 Heater and thermocouple replacement

1. Use how many of the special heater removal tools as it is necessary, depending on the nozzle length.
2. If the heater wire exit is in the nozzle middle position, the heater can be disassembled while the nozzle is mounted in the mold. In this case, proceed as explained at par. 8.1.6.
3. If the heater wire exit is at the nozzle head, first disassembly the nozzle from the mold, before to remove the heater.
4. Remove the circlip (Figure 54).
5. Insert the retractors in the resistor groove (Figure 56).
6. Tighten all the thumb screws of the retractors at the same time, until the resistor runs freely in the nozzle core.
7. Remove the resistor from the nozzle with the retractors inserted, being careful not to move the thermocouple (Figure 56).
8. Remove the thermocouple (Figure 55).

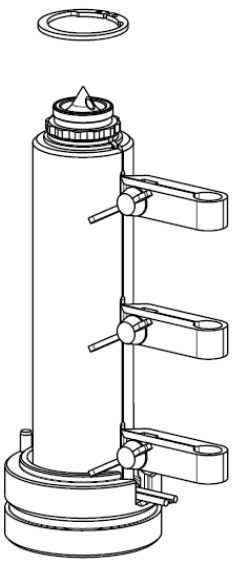


Figure 54 –Gasket ring disassembly

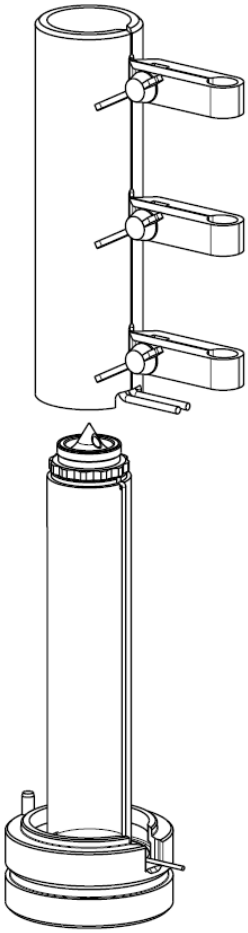


Figure 56 – Heater disassembly

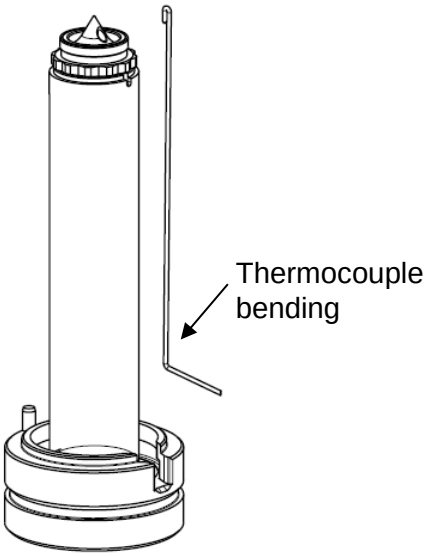


Figure 55 – Thermocouple disassembly

9. Introduce the thermocouple supplied by Thermoplay with the tip bent to a hook. Carefully bend at the nozzle head taking care not to damage the thermocouple (Figure 55).
10. If the thermocouple is not already bent, proceed with bending it by using the special tool provided in the kit (Figure 57).

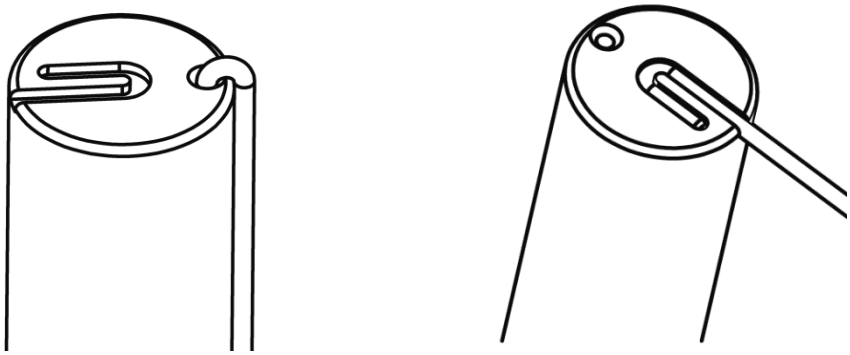


Figure 57 – Thermocouple bending and check

11. The thermocouple of TD18, TF12 and TF14 nozzles is different in that it has a circular support. During maintenance the support can be removed together with the resistor; when assembling, make sure that the thermocouple correctly fits the resistor groove.

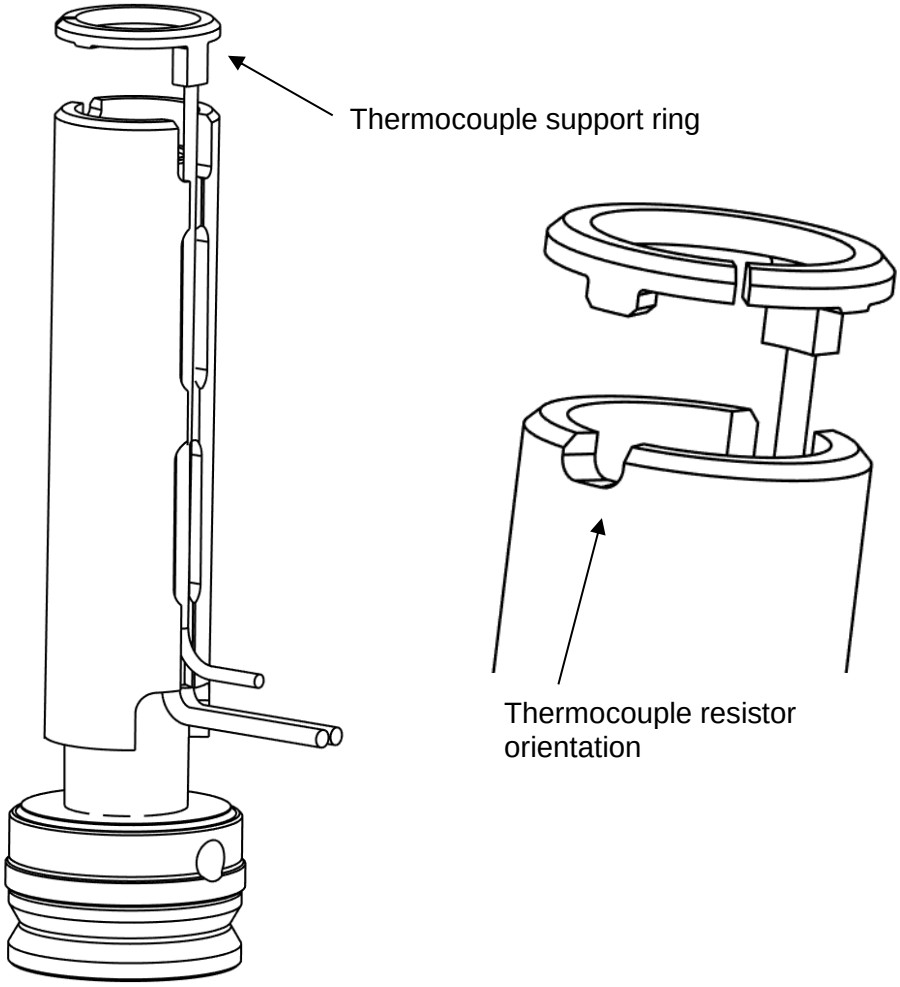


Figure 58 – TD18 –TF12 –TF14 Thermocouple

12. Replace the resistor and proceed with the assembly with the help of the retractors used previously.
13. Insert the body into the support (clamped) as shown in Figure 59.

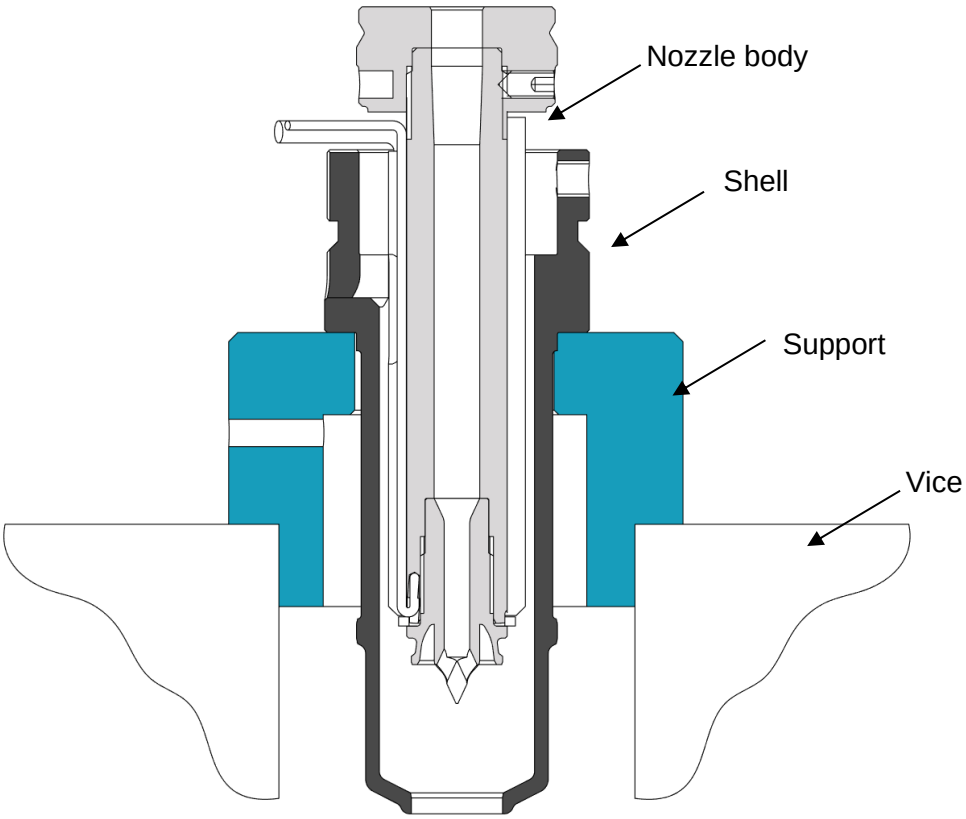


Figure 59 – Reassembling the body

14. Insert the nozzle body in the body.
15. Check the pre-centring of the tip inside the body.
16. Use a hammer (with plastic head) until assembly is complete.

8.1.5 Heater and Thermocouple replacement TH nozzle

TH series nozzles have the heater and thermocouple integrated into a single component and encapsulated in a metal casing; therefore, replacement of the heater and thermocouple coincide, and the two components cannot be replaced individually.

1. Use the heater extraction tool, provided in the kit, being careful to use the correct nozzle diameter tool set.

2. If the nozzle has the cable outlet in the middle of the body, the heater can be disassembled with the nozzle assembled in the mold. In this case, refer to paragraph 8.1.6.

3. If the nozzle has the cable outlet at the top, it will be necessary to remove the nozzle from the mold before disassembling the heating element.

4. Close the nozzle head in the vice. Use aluminium jaws protections to prevent damage.

5. Remove the circlip using tool 1 of the maintenance kit. (Figure 61).

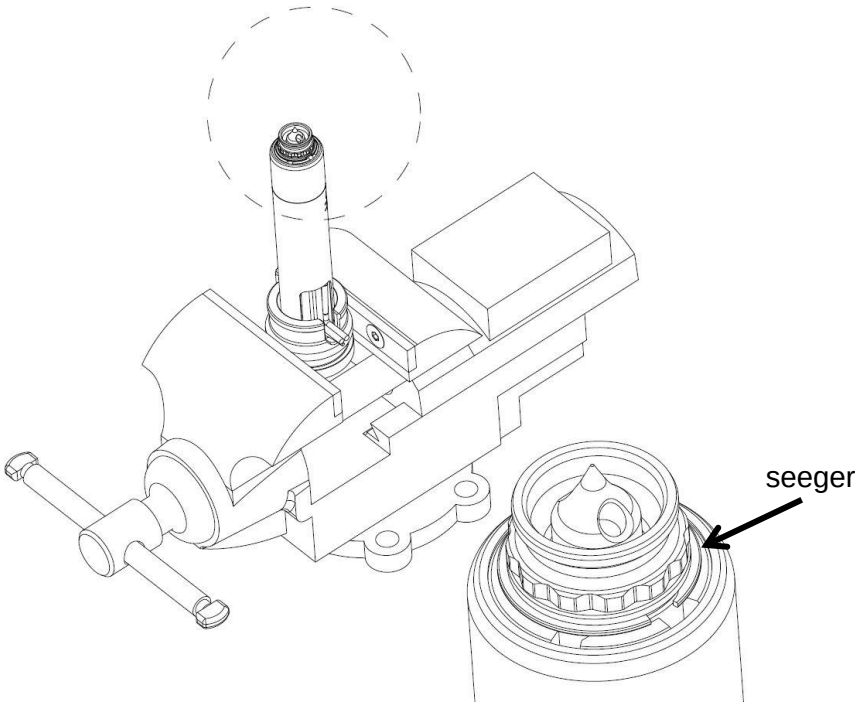


Figure 60 – Heater disassembling

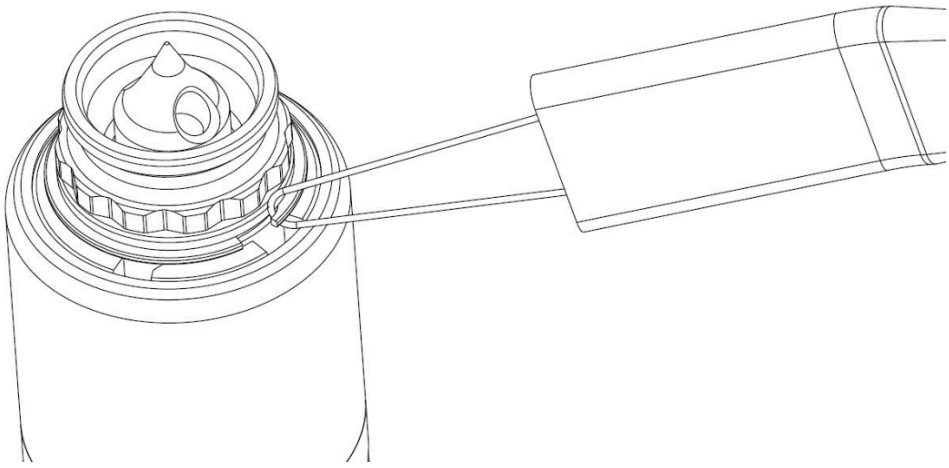


Figure 61 – Seeger extraction

6. Insert the heater extractor (tool number 2) onto the nozzle by aligning the set screws with the appropriate holes in the heater. Tighten the set screws so that their end fits into the holes. To extract the heater, exploit the thread on the top of the extraction tool by screwing an impact puller onto it (Figure 62). General lubricant can be used during this procedure and sprayed between the heater and core tube.

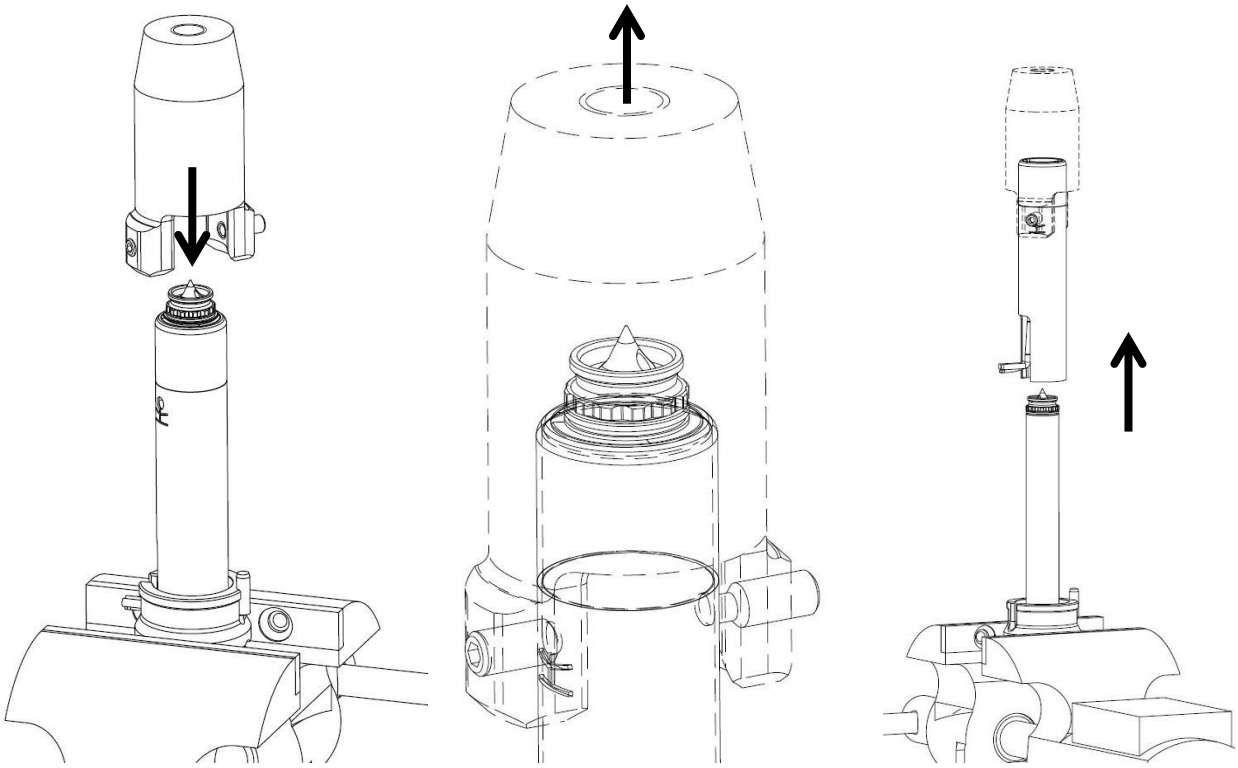


Figure 62 – Heater extraction

7. Once the heater to be replaced has been pulled out, the new one can be fitted onto the core tube. Apply pressure on it using the heater introduction tool until is fully pushed in (Figure 63). Pay attention to the orientation of the cables: they must coincide with the intended cable outlet. General lubricant can be used during this step to make it easier to slide.

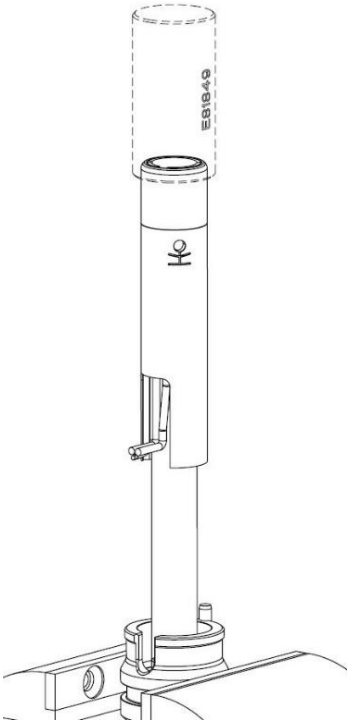


Figure 63 – New heater assembly

8. Reassemble the nozzle in its seat in the mold.

8.1.6 Tip and heater replacement on type “M” nozzles with open mold

A big advantage of the type “M” nozzles (heater with wires that comes out on the middle of nozzle body) is the possibility to carry out the maintenance directly on the mold, with no need to disassemble the parts that enclose and retain the manifold.

It is possible to replace the nozzle tip with the mold assembled using the unscrewing key provided with the maintenance kit. In order to perform this operation, the nozzle must be assembled with the anti-rotation pin in place.

NOTE: before installing a new tip, be sure that the seating surfaces are very well cleaned.

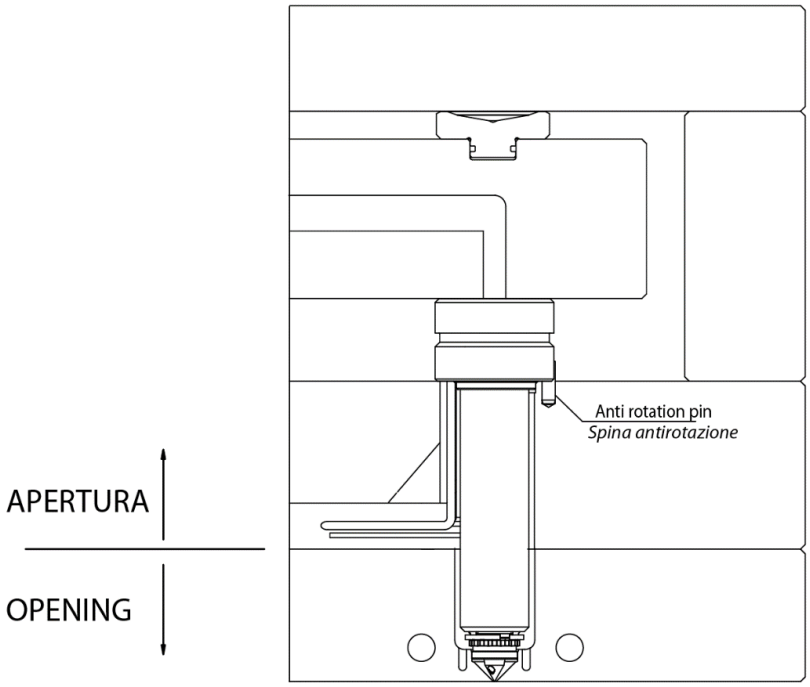


Figure 64 - Nozzle-holder plate opening

By loosening the screws that clamp the matrix holder manifold in position, it is possible to access the nozzle tips.
The heater and/or thermocouple can be replaced as described in above paragraph according to the nozzle type.

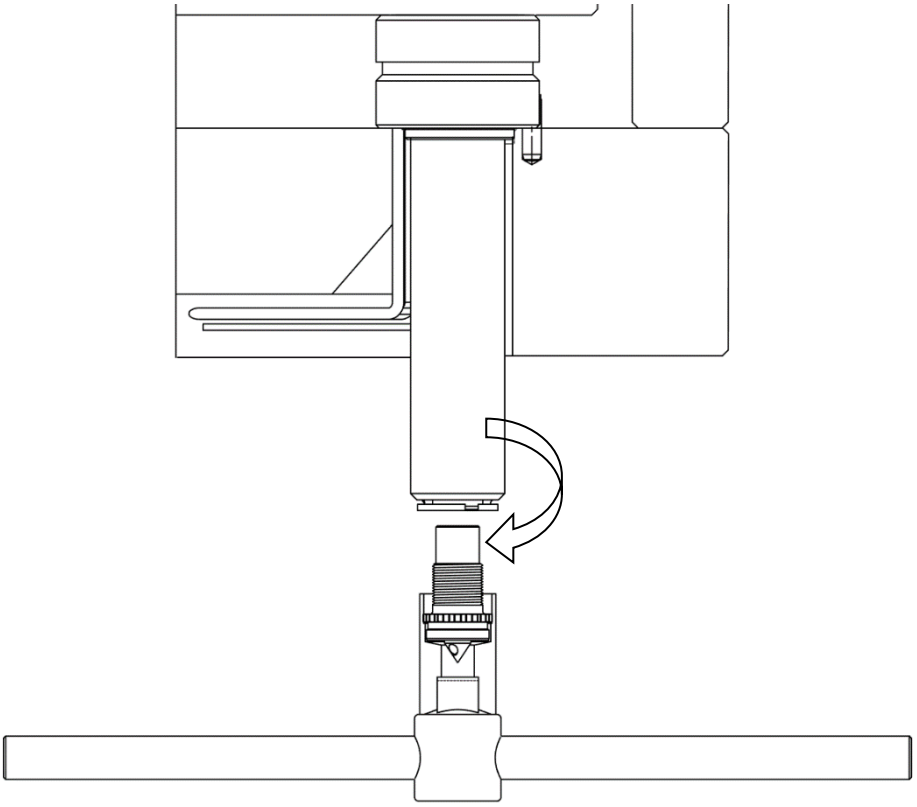


Figure 65 - Nozzle tip or heater replacement in the mold

8.2 DN/DL nozzle maintenance

With nozzles, DN5-DL-1 and DL-8 it is not possible to disassemble the tip.

8.2.1 Maintenance kit for DN / DN6 (Ø44), DL

When replacing the tip, take care of using the maintenance kit.

Maintenance kit:
1. Wrench for tip assembly/disassembly (only for DN/DN6Ø44)
2. Core disassembly tool
3. Tip housing cleaning brush
4. Resistor retractor
5. Anti-seize grease (only for DN/DN6Ø44)

Table 9: codes of DN/DN6 Ø44 nozzle maintenance kits

DN/DN6	Tip type			
	1	1B	2	3
Ø44	**E17974**	**E17978**	**E17974**	**E17984**

Table 10: codes of DL / DN5 nozzle maintenance kits

Nozzle type / *Tipo ugello*	KIT
DL1 Ø18	E19981
DL1 Ø22	E19982
DL1 Ø30	E19983
DL1 Ø44	E19984
DN5/2	E19985
DN5/3	E19986
DL8	E19987
DL90 Ø18	E19988
DL90 Ø22	E19989
DL90 Ø30	E19990
DL90 Ø44	E19991

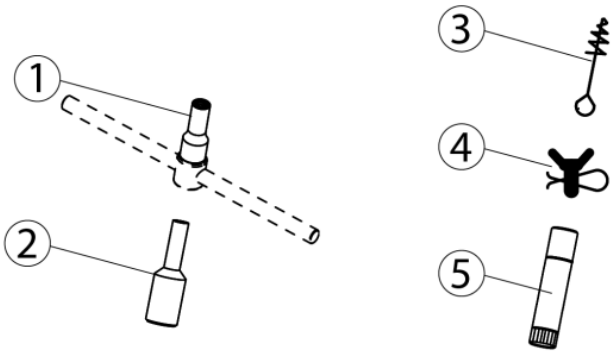


Figure 66 – Maintenance kit tool set

8.2.2 Replacing the DN / DN6 tip (Ø44)

1. Insert the nozzle on the support. Insert a Ø4x20 plug to block the rotation and a M4 pin to fasten the nozzle to the support.

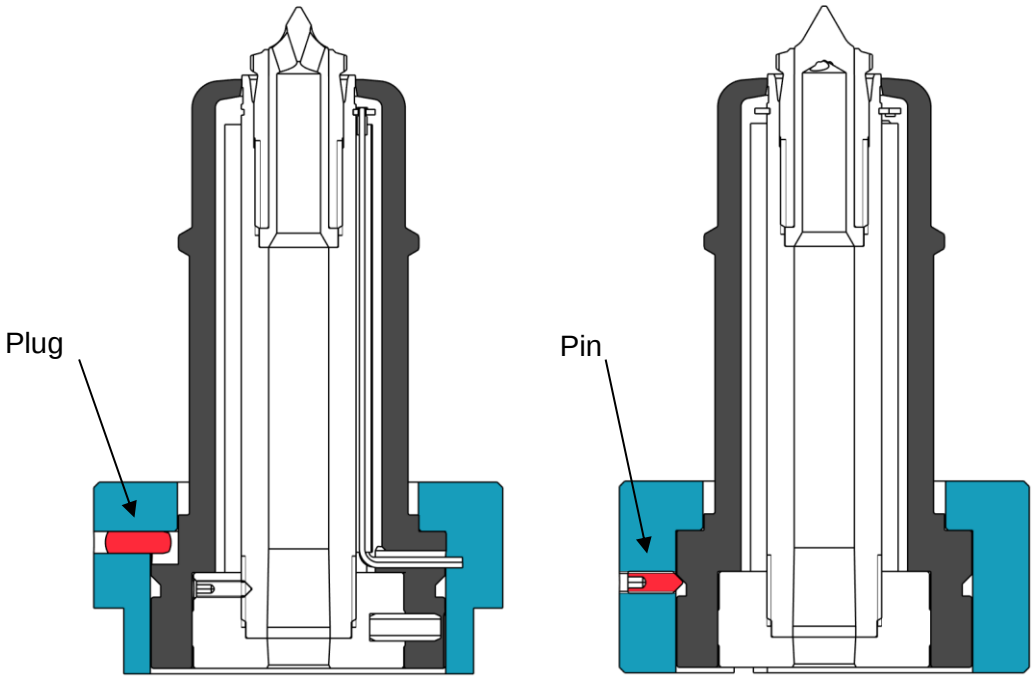


Figure 67

2. Position the support in the vice (Figure 68)
3. Unscrew the tip using the wrench provided (code indicated in Table 11).

Table 11: nozzle wrench codes and and tightening torque

NOZZLE		WRENCH CODE	ATTACHMENT	Torque
Ø	TYPE			
Ø44	DN/DN6 1-2-3	E17828	3/8”	40 Nm
	DN/DN6 1B-3B	E09623	3/8”	

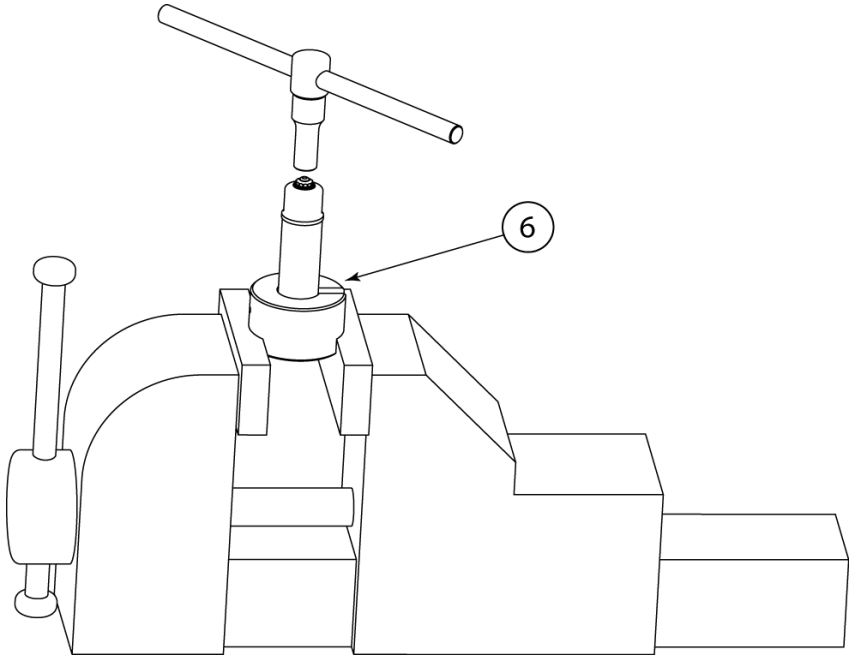


Figure 68 – DN44 nozzle tip disassembly

4. Carefully clean the inner sealing surfaces of the nozzle with the brush provided (Figure 69).
5. Lubricate the thread of the new tip with the anti-seize grease supplied and re-assemble the tip.
6. Using a torque wrench and the relative insert (tool 1 Figure 66) tighten the tip with the torque value indicated in Table 11.

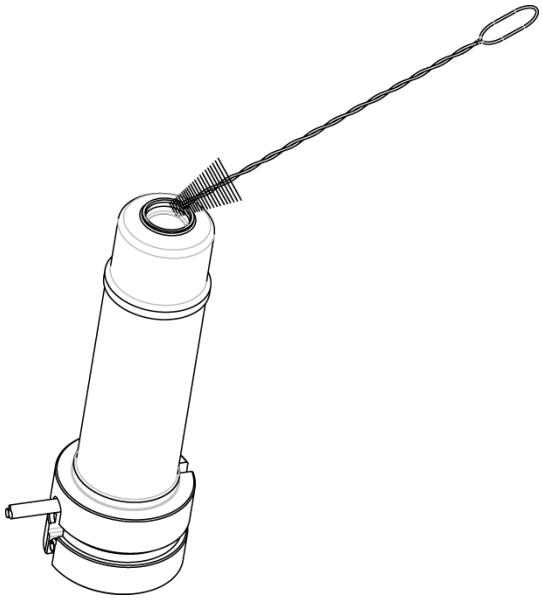


Figure 69 – Cleaning the inner sealing surfaces of the DN44 nozzle

8.2.3 Replacing the heater and thermocouple of DN44 – DL nozzles (all diameters)

8.2.3.1 Nozzles DN/DL18

1. Insert the nozzle into the support tool
2. Position the core disassembly copper tool as shown in the figure (tool 2 in Figure 66)
3. Use a hammer to tap the upper surface of the tool until the core is extracted.

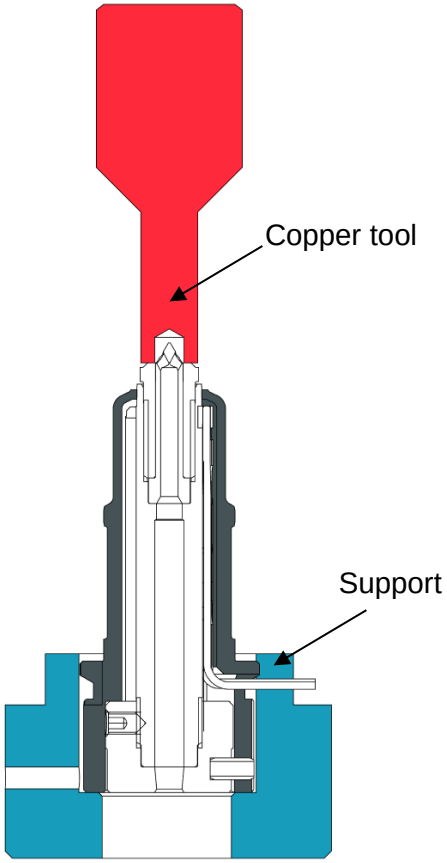


Figure 71 – Disassembling the body

4. Insert the retractors beneath the heater slot, as shown in Figure 70
5. Tighten the thumb screws until the heater runs freely.
6. Move the resistor out until its slot coincides with the end of the thermocouple (as shown in Figure 72)
7. Remove the retractors and thermocouple.
8. Complete extraction of the resistor using the retractors.

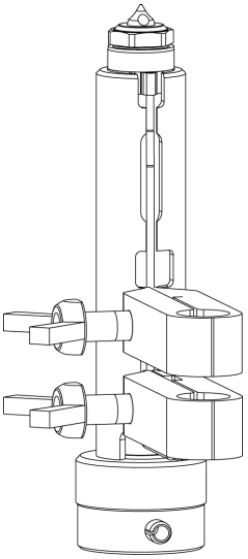


Figure 70 – Nozzle heater removal

9. Replace the heater and/or thermocouple and proceed with assembly.

10. Insert the heater until its slot coincides with the seat of the thermocouple present on the core, using retractors if necessary.

11. Place the thermocouple in its seat.

12. Carefully bend the new thermocouple at the nozzle head, taking care not to damage the thermocouple.

13. Complete the insertion of the resistor again using the retractors.

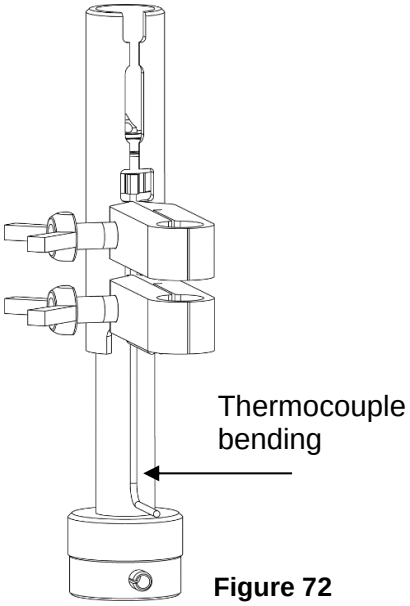


Figure 72

14. Insert the body into the support (clamped in the vice).

15. Insert the nozzle into the body.

16. Caution: check pre-centring of the front part of the core inside the body.

17. Tap with a hammer (with plastic head) until assembly is complete.

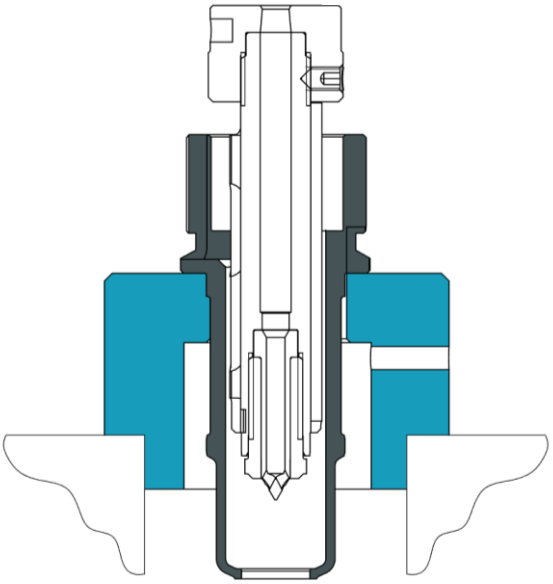


Figure 73

8.2.3.2 Nozzles DN44 – DL 22-30-44

1. Insert the nozzle into the support tool
2. Position the core disassembly copper tool as shown in the figure (tool 2 in Figure 66)
3. Use a hammer to tap the upper surface of the tool until the core is extracted.

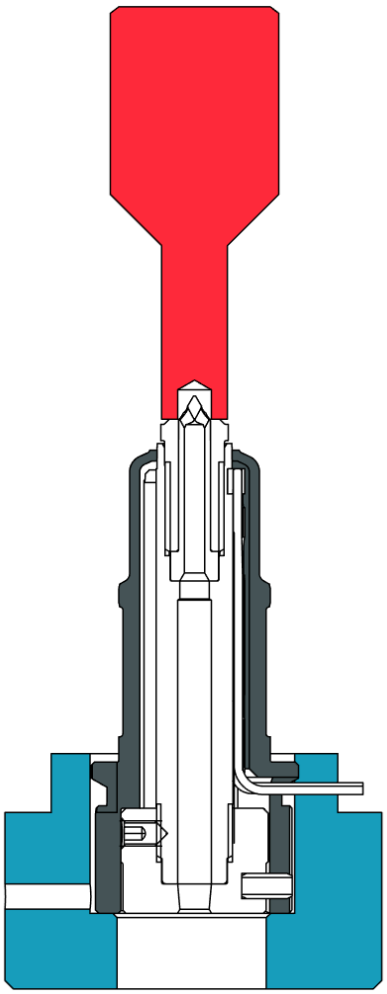


Figure 74 – Disassembling the body

4. Remove the thermocouple.

5. Insert the retractors and tighten the thumb screws until the heater runs freely (Figure 75).

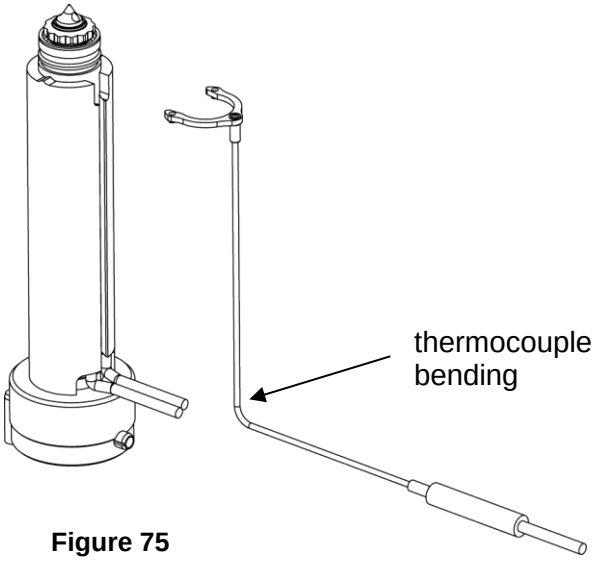


Figure 75

6. Gradually complete the extraction of the heater.

7. Replace the heater and/or thermocouple and proceed with assembly.

8. Carefully bend the new thermocouple at the nozzle head, taking care not to damage the thermocouple.

9. Insert the resistor using the retractors.

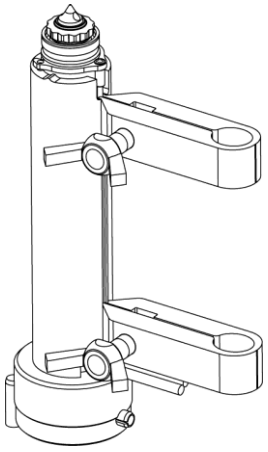


Figure 76

10. Insert the body into the support (clamped in the vice).
11. Insert the nozzle into the body.
12. Caution: check pre-centering of the front part of the core inside the body.
13. Tap with a hammer (with plastic head) until assembly is complete.

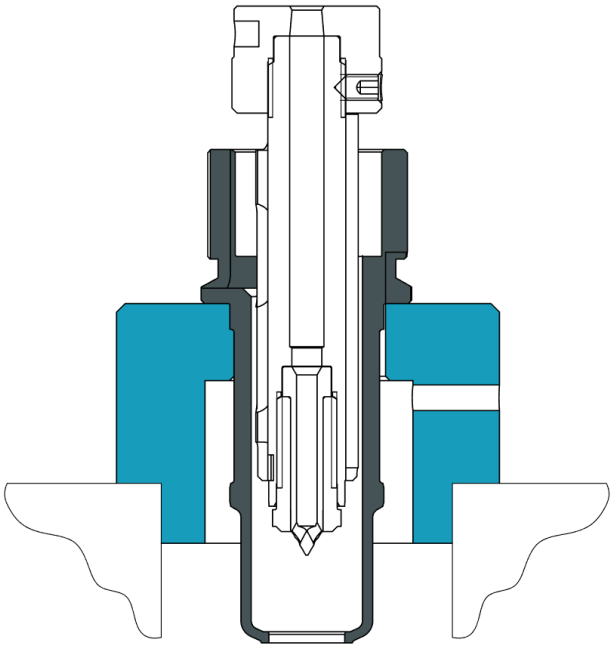


Figure 77

8.2.4 Replacing the tip (Nozzle DL90)

1. Open the matrix to gain access to the tip.

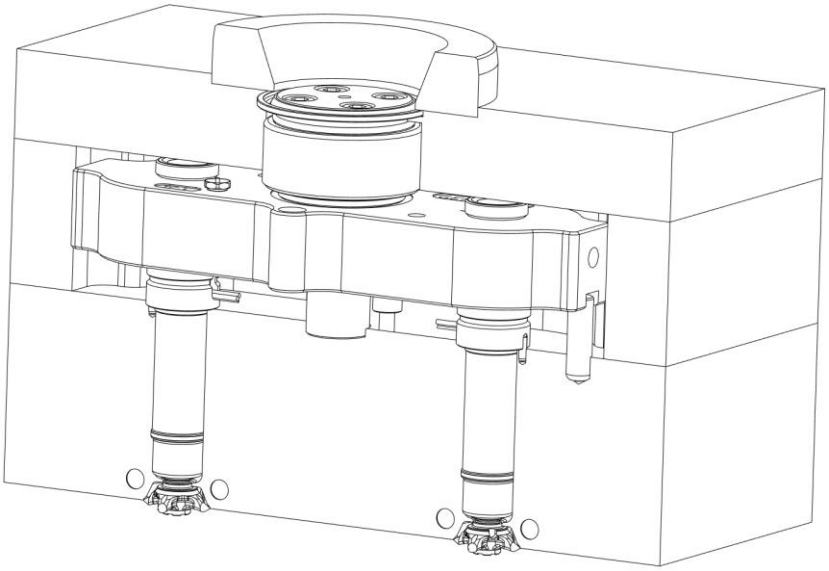


Figure 78 – Open the matrix

2. Remove the tip (unscrew the central annular blank and use the threaded hole for the extraction).
   In case of difficulty in removing the tip, remove the nozzle from the tip by using the special extractors as described in Figure 46.

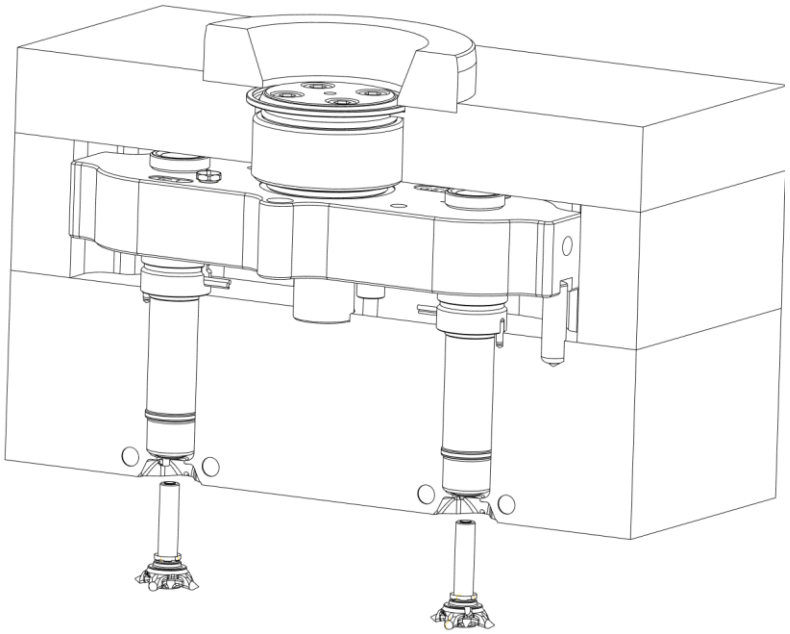


Figure 79 – Remove the tip

3. Insert the new tip paying attention toits orientation.

8.3 Valve gate groups maintenance codes K32-PN, K40-PN, S60-PN, S20-HY, S32-PN/HY

The Thermoplay valve gate groups differ as follows:

- Assembled on the distributor (air operation only): **K32-PN, K40-PN**
  The assembly and maintenance procedures for these nozzles are described in paragraph 8.3.3 and 8.3.5.1

- Mounted on the bottom plate (hydraulic operation): **S20-HY**
  The assembly and maintenance procedures for these nozzles are described in paragraphs 8.3.4.1, 8.3.4.5 and 8.3.5.2

- Mounted on the bottom plate (air operation): **S60-PN, S32-PN/HY**
  The assembly and maintenance procedures for these nozzles are described in paragraphs 8.3.4.2, 8.3.4.3, 8.3.4.4 and 8.3.5.2

- Valve gate groups for threaded nozzles, mounted on the distributor (air or hydraulic operation). The assembly and maintenance procedures for these nozzles and the relative shut-off groups are described in 8.5.

8.3.1 Maintenance kit

1. Ring nut opening/closing wrench
2. Pin guide bushing extraction tool
3. Pin position adjustment wrench
4. Complete gasket set

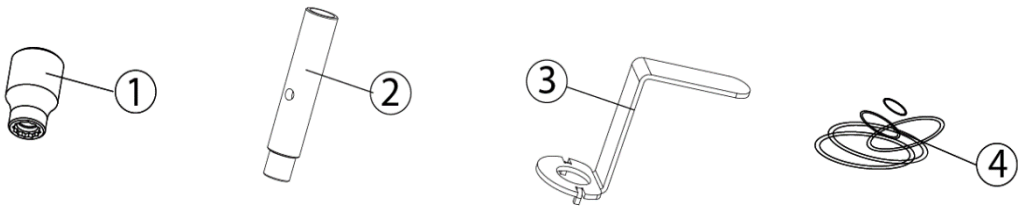


Figure 80 – Maintenance kit

Table 12: maintenance kit

Valve gate group	Maintenance kit code
E21105	**E18520**
E19399	**E18521***
E18327	**E18523**
E18326	**E18524***
E18329	**E18525**

* adjustment wrench not present

8.3.2 Assembly of the pin guide bushing

Valid for all types of shut-off groups, both in the initial assembly stage and for maintenance operations.
The pin guide bushing and the pins are supplied as an assembly in the pin group and cannot be interchanged. The two components have an identification number. It is recommended to insert the pins and the guide bushing following the numbering of the cavities and the nozzles (e.g. pin and guide bushing nr. 2, on impression nr. 2, with nozzle nr. 2), this will facilitate all operations and maintenance.

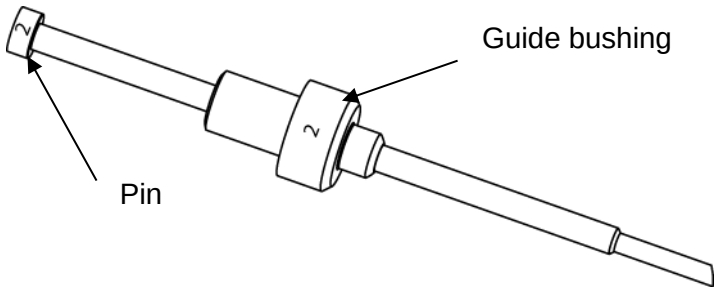


Figure 81 – Pin unit

1. Remove the safety seal from the pin and any residual glue remaining on the surface.
2. Introduce the pin guide bushing into the manifold.

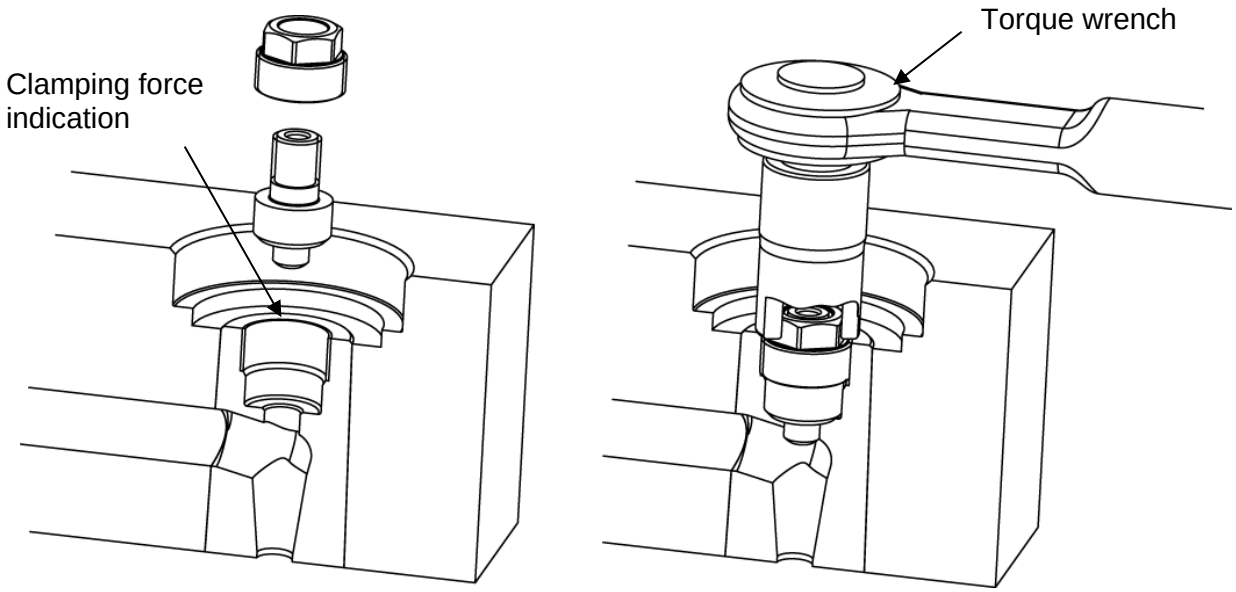


Figure 82 – Bushing insertion and blocking

8.3.3 Valve gate mounted on the manifold.

1. Introduce the pin guide bushing (paragraph 8.3.2).

2. Insert the pin spacer washer thoroughly in the seat present on the manifold.

3. If necessary, rectify the pin spacer washer to increase pin stroke.
4. Insert the pin into the guide bushing.

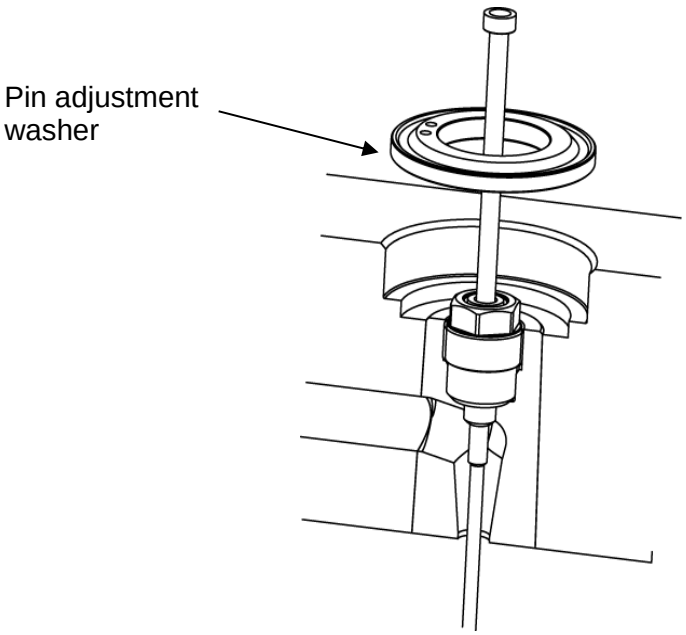


Figure 83 - Washer and pin insertion

5. Lubricate the piston gaskets with dynamic gaskets grease. Insert the piston into the external cylinder body, operating carefully so as not to damage the gaskets.
6. Via the bayonet coupling, tie the pin to the body/piston unit.
7. Spread grease over the upper gasket to prevent it being removed from its seat during assembly of the upper plate and thus not ensuring correct sealing.
8. Assemble the upper plate, checking that the values correspond to the specifications indicated on the Thermoplay drawings supplied with the system.
9. Activate mold conditioning.
10. Bring the hot runner to temperature and, with the aid of compressed air, check the correct activation of the pin/piston in the command valve.

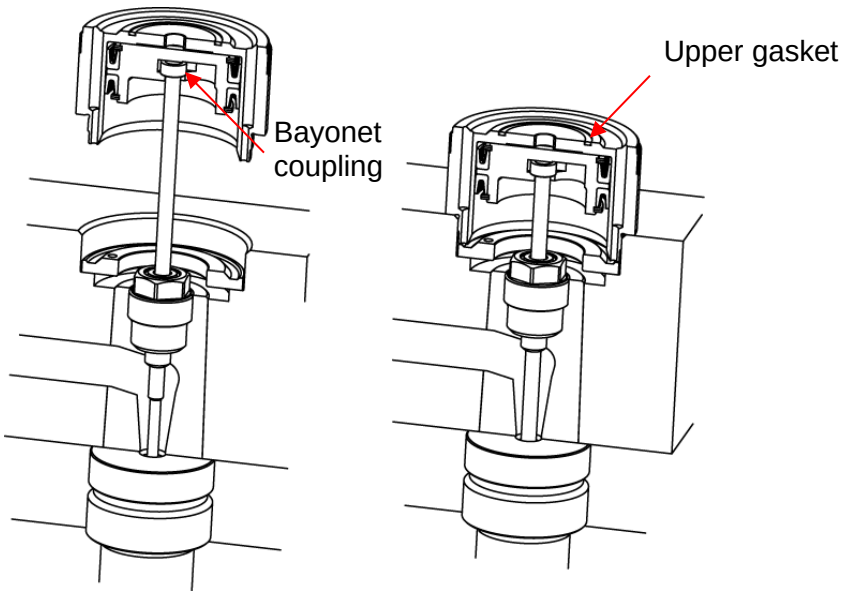


Figure 84 - Piston and valve gate group external body insertion

Warning: air sealing for the pneumatic movement is only guaranteed with the hot runner at temperature.



When testing at the bench, do not use pressures over 0,5 MPa.



Never action the pins with the hot runner COLD.
To calculate and prepare the length of the pin, see the Thermoplay catalogue.

8.3.4 Valve gate mounted on the bottom plate.

8.3.4.1 Assembling the S20-HY valve gate group (bore 20 mm)

1. Introduce the pin guide bushing (paragraph 8.3.2).
2. Insert the assembled contrast group. This group comes in 2 different variations, depending on the application:

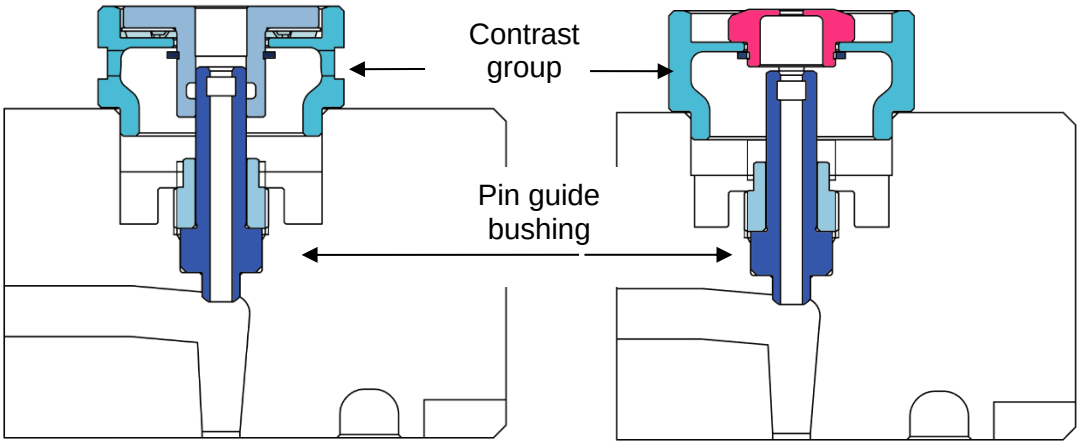


Figure 85 – Contrast group

3. Assemble the valve gate holder plate, checking that the height values correspond with the specifications contained in the Thermoplay drawings supplied with the system.
4. Insert the shut-off body into the upper plate seat being careful not to damage the gaskets; previously spread them with grease to prevent this.
5. Insert piston.
6. Insert the pin checking that the number engraved on the same corresponds to that of the pin guide bushing (see Figure 81).
7. Insert the contrast bushing complete with gasket and stop it with the circlip.
8. Assemble the bottom plate and lubricate the upper gasket to prevent it from being removed from its seat during assembly of the upper plate, thus ensuring correct sealing.
9. Bring the hot runner to temperature and, with the aid of compressed air, check the correct activation of the pin/piston in the command valve.

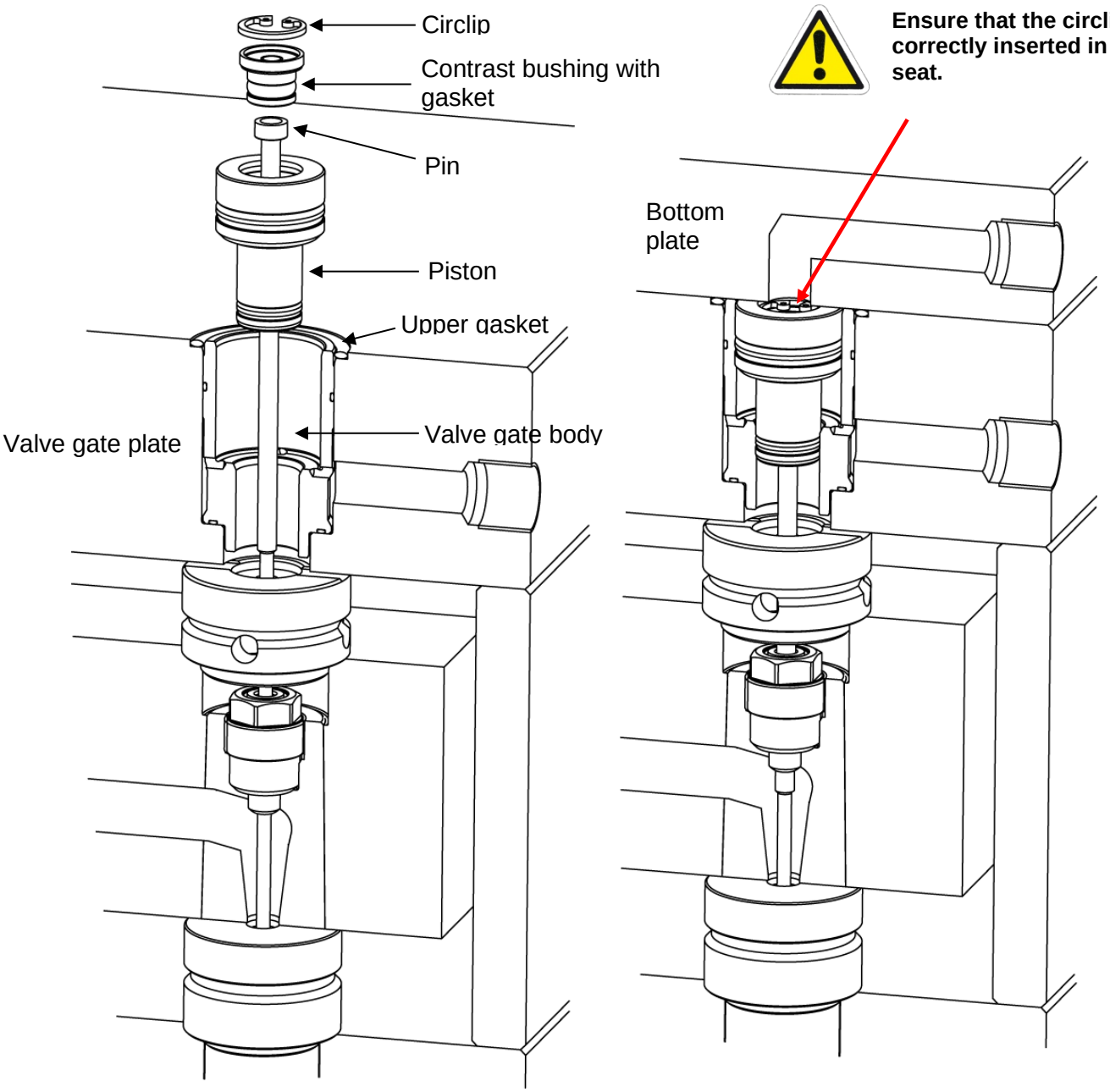


Figure 86 - Piston and pin unit assembly

When testing at the bench, do not use pressures over 5 bar.
Never action the pins with the hot runner COLD.
To calculate and prepare the length of the pin, see the formula in the technical documentation.

8.3.4.2 Assembling the S60-PN, S32-PN/NY valve gate group

1. Introduce the pin guide bushing (paragraph 8.3.2).
2. Insert the assembled contrast group. This group comes in 2 different variations, depending on the application:

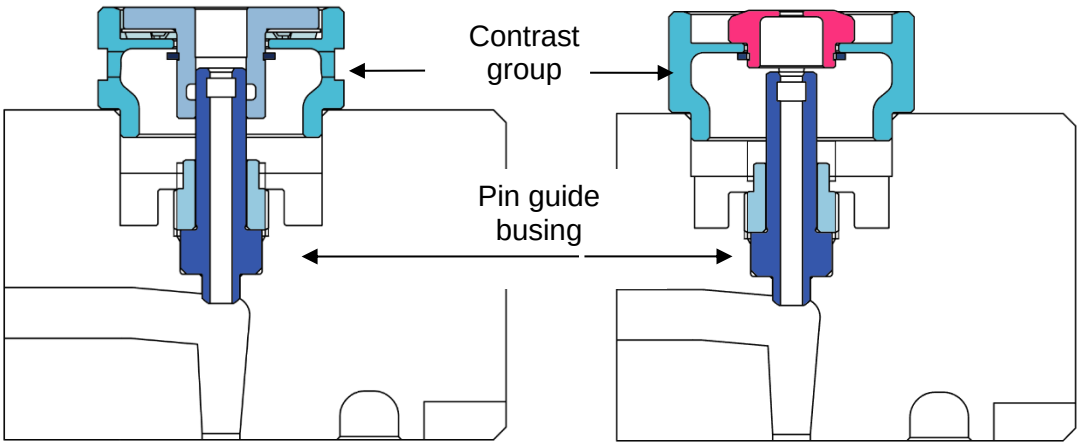


Figure 87 – Contrast group

3. Assemble the shutter holder plate, checking that all heights correspond to the specifications contained in the Thermoplay drawings supplied.
4. Insert the shut-off body into the upper plate seat being careful not to damage the gaskets; previously spread coat them with grease to prevent this.
5. Insert piston.
6. Insert the pin/contrast bushing unit checking that the number engraved on the pin corresponds to that of the pin guide bushing (see Figure 81 – Pin unitFigure 81).
7. For assembly of the pin/piston/bushing, see paragraph 8.3.4.3

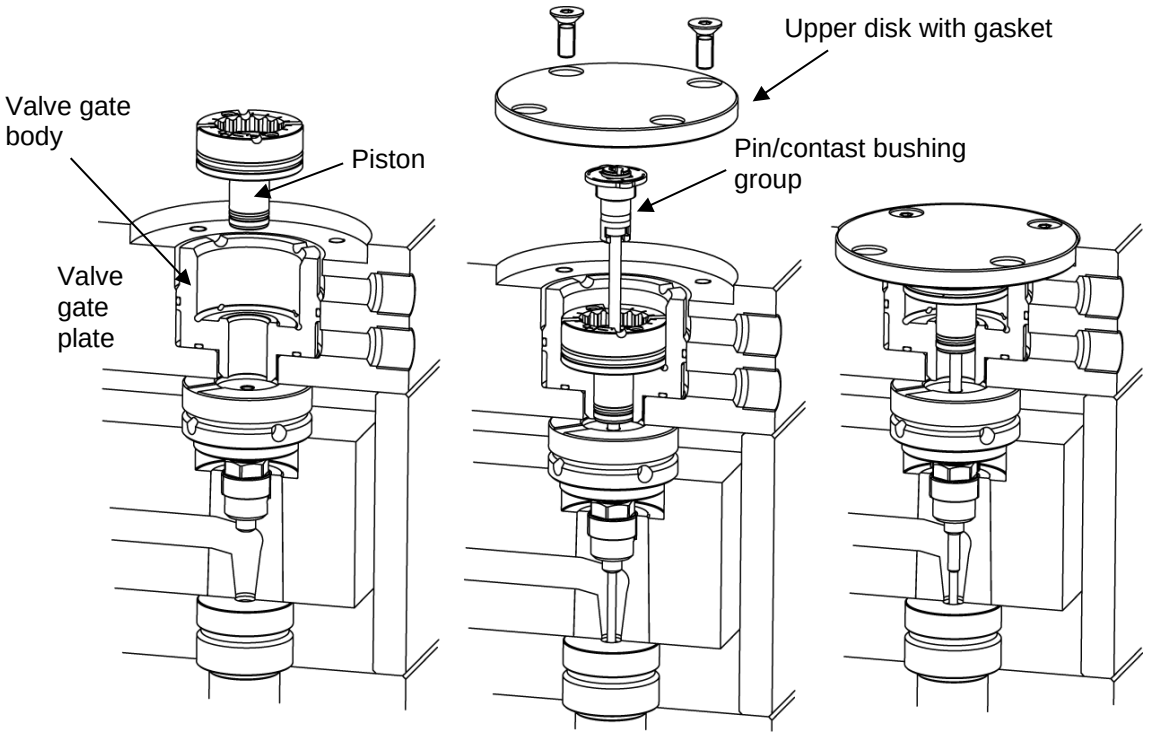


Figure 88 – Piston and pin unit assembly

8. Insert the upper disk into the seat and fix it to the upper plate using the 4 screws. It is recommended to spread a small amount of grease on the gasket so that it does not move from its own seat, thus no longer guaranteeing sealing from liquids.
9. Bring the hot runner to temperature and, with the aid of compressed air, check the correct movement of the pin/piston in the command valve and in the nozzle.



When testing at the bench, do not use pressures over 5 bar.
Never action the pins with the hot runner COLD.
To calculate and prepare the length of the pin, see the formula in the technical documentation.

8.3.4.3 Assembly of the pin /contrast bushing unit (valve gate groups S60-PN, S32-PN/HY)

Proceed as follows to assemble the pin in the piston:
1. Attach the pin to the contrast bushing through the relative bayonet coupling.
2. After having lubricated the bushing gasket, insert the unit into the piston and tighten thoroughly.
3. Make a complete turn (16 clicks) to adjust the pin in the correct position.
4. Assemble the mold components.

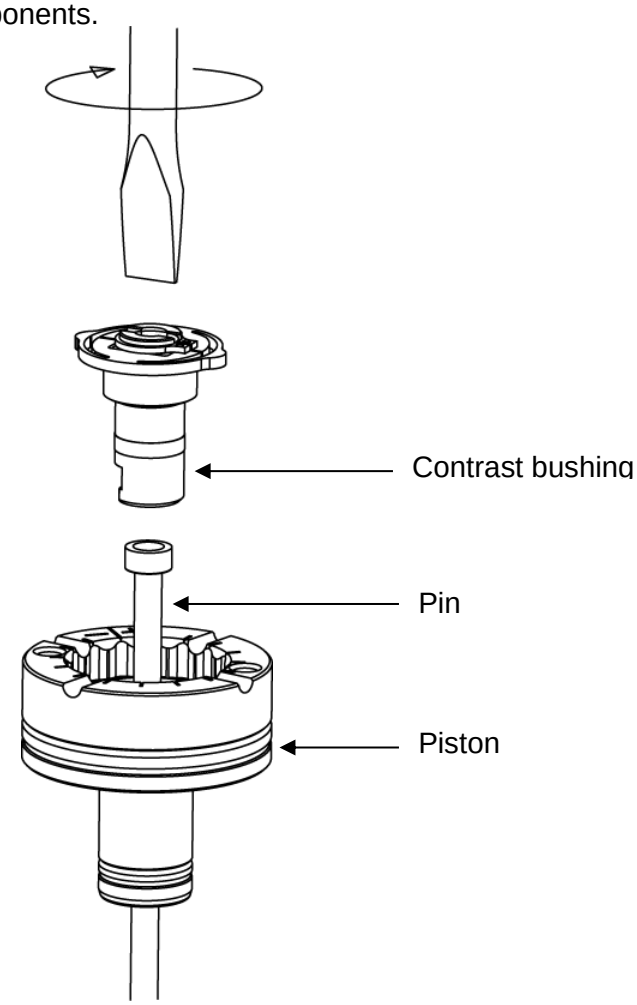


Figure 89 – Pin/piston/contrast bushing unit assembly

8.3.4.4 Valve gates adjustment (valve gate groups S60-PN, S32-PN/HY)

After having carried out several molding trials, if anomalies occur in correspondence with the closing point, the pin stroke must be adjusted.
The pins of the valve gates scan be adjusted with a stroke of ±0.75 mm.
The piston must be kept fastened during adjustment using the lock tool provided in the kit.
The wrench supplied in the maintenance kit allows the pin to be adjusted easily. Every click means a movement of 0.05 mm. By turning clockwise in the closure phase, pin advancement is obtained, while by turning anti-clockwise it retracts.

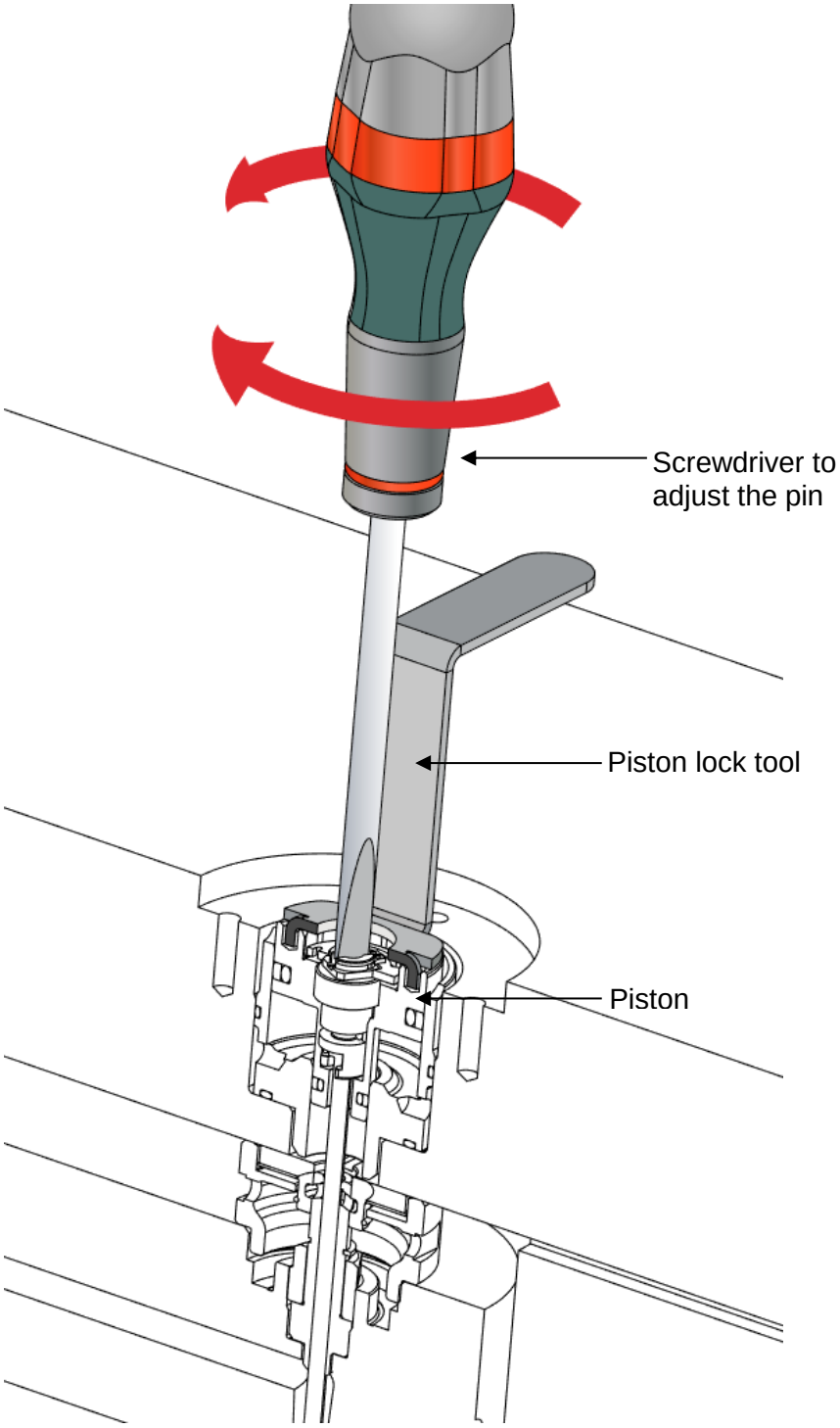


Figure 90 – Valve gate group adjustment key

8.3.4.5 Valve gates adjustment S20-HY (bore 20 mm)

In order to set the pin back (with pin in closed position), proceed as follows:

1. Tighten an M4 screw on the contrast bushing and extract the piston.
2. Remove the Ø 12 circlip.
3. Extract the contrast bushing.
4. The pin is therefore free to escape. Pay attention not to damage the running surface of the pin.
5. Shorten the pin by the measurement necessary and reassemble everything.
6. Assemble the piston into the body, operating carefully so as not to damage the gaskets.

In order to advance the pin (with pin in closed position), proceed as follows:

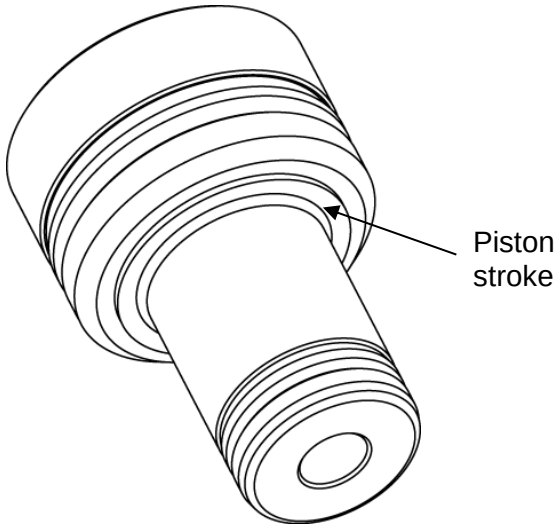


Figura 91 - Piston stroke zone

8.3.4.6 8.4.4.5 Pins replacement and maintenance

The pins are supplied along with their guide bushing and are engraved with the identification number.

This means both components must be replaced at the same time.

Bushing with threaded tip:
Use the extractor (see paragraph 8.3.1) to remove the guide bushing after having unscrewed the nut.

Bushing with gasket ring:
The bushing is automatically extracted when the lock nut is unscrewed.

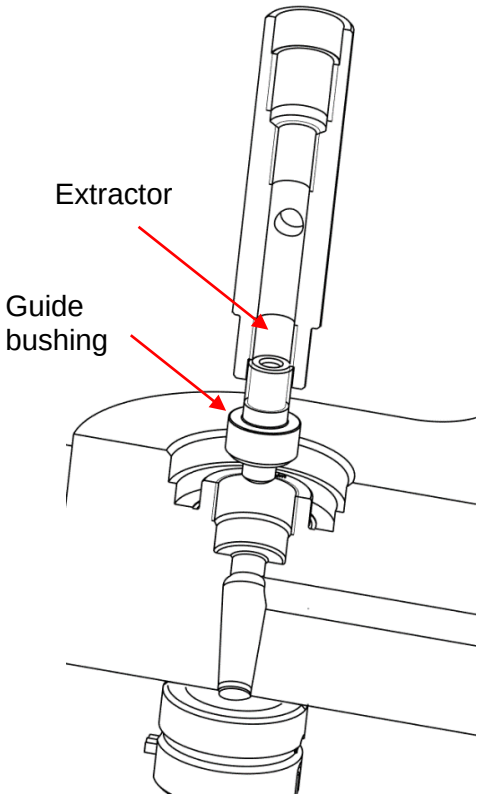


Figure 92 - Bushing with threaded tip

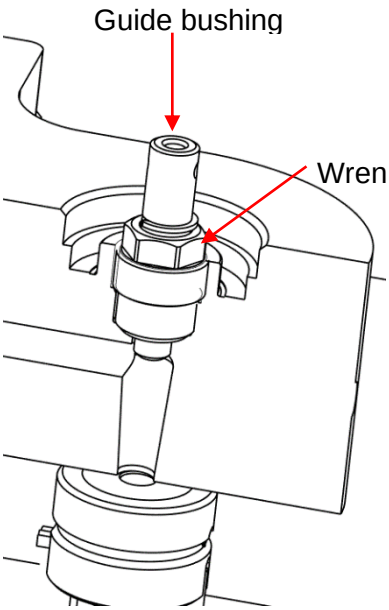


Figure 93 - Bushing with gasket ring

8.3.5 Replacing the gaskets

The instructions for replacing the gaskets on the valve gate groups and adjusting the valve gates are described in the following. For the replacement of pins and of the entire valve gate group, follow the procedures in the previous paragraphs, depending on the type indicated.

8.3.5.1 Valve gate group mounted on the distributor

1. Remove the spiral metal rings using a flat tip screwdriver. Pay attention not to damage the surfaces of the pistons.
2. Remove the gaskets to be replaced.
3. Insert the new gaskets after having lubricated them with a small amount of appropriate grease. Make sure they are positioned correctly.
4. Re-position the spiral metal rings in their seat on the piston.

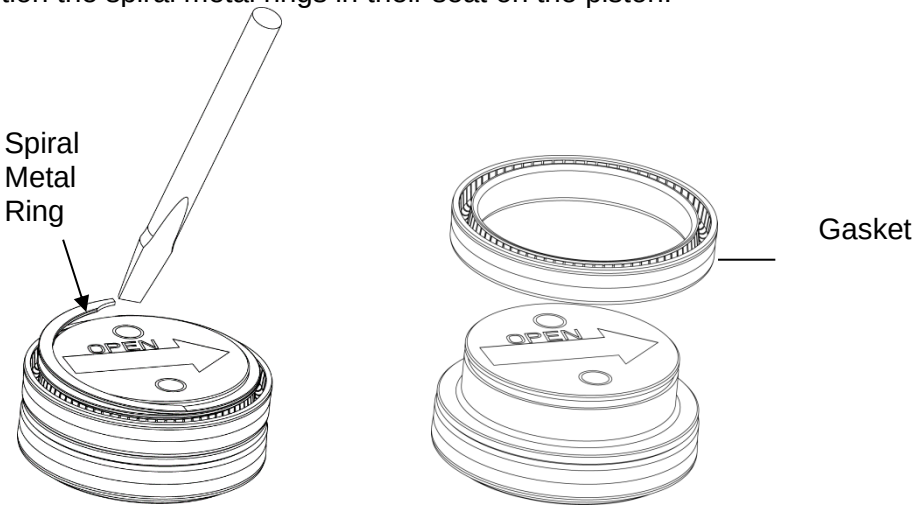


Figure 94 – Removing the gaskets

8.3.5.2 Valve gate groups mounted on the back plate

1. Remove the gaskets from their seats using a flat tip screwdriver, taking care not to damage the surfaces of the piston.
2. Introduce the new gasket into the seat.
3. Insert the ring with the aid of the tapered tools supplied on request.
4. Adapt the gaskets just inserted using the relevant tool, in order to take them to the correct work conditions.
5. Lubricate the new gaskets using the appropriate grease and insert the pistons into the cylindrical bodies. Below find the codes of the tools:

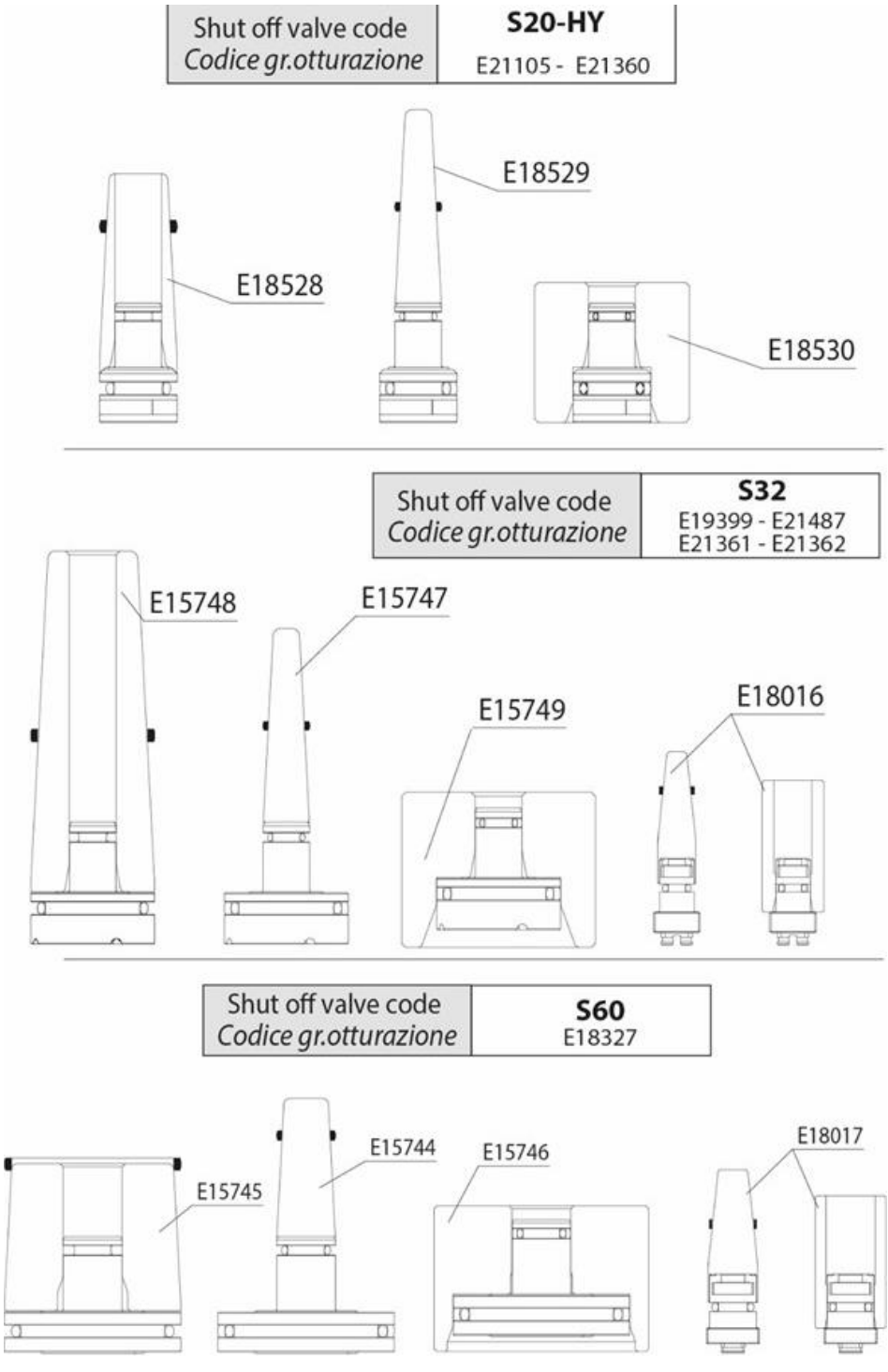


Figure 95 – Gaskets assembly tools

8.4 Single nozzles maintenance

8.4.1 Single nozzles TD6 - DN6 Ø44 -TF612

Insert the tip of a flat tip screwdriver in the slot on the upper part of the head (red arrow Figure 96) and remove the spring washer from its seat.
Withdraw the band heater from the head (Figure 97)

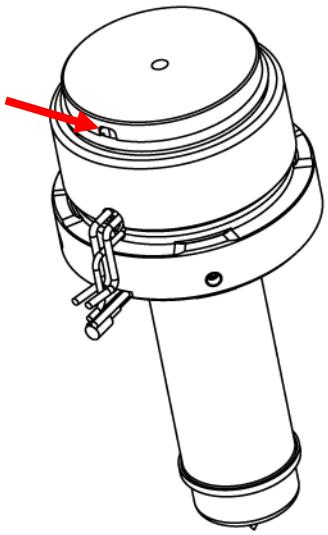


Figure 96 – Slot to insert the screwdriver tip

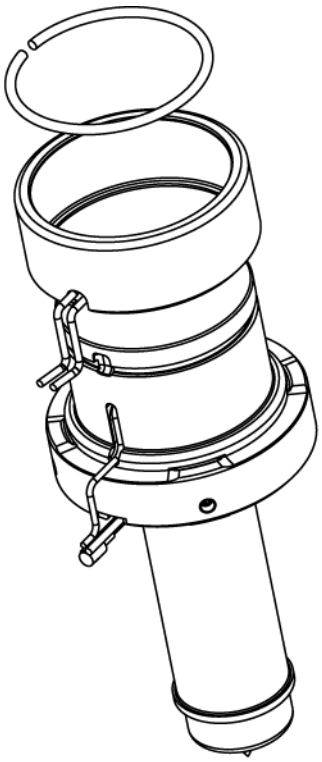


Figure 97 – Band heater removal

Remove the thermocouple from its seat (Figure 99)

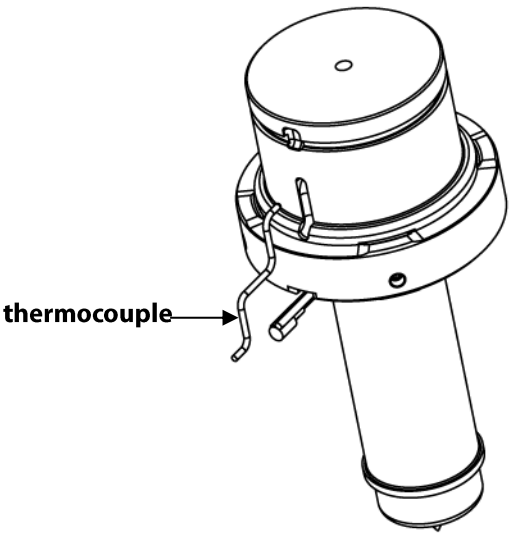


Figure 98 – Thermocouple removal

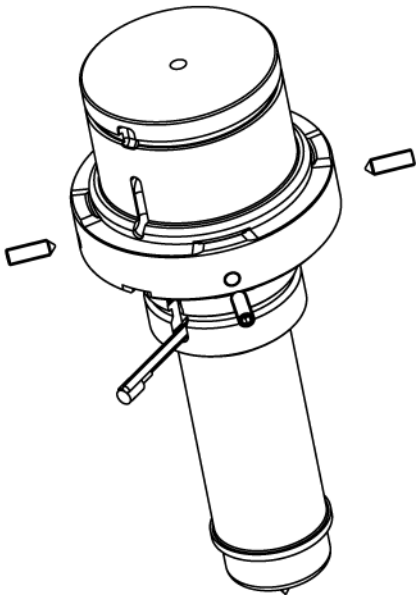


Figure 99 – Head separation from body

Completely unscrew the 4 threaded M4 set screws on the nozzle head flange; separate the head from the nozzle body (Figure 98).
Continue following the instructions in paragraph 8.1 to complete maintenance, on the basis of the type of nozzle.
To re-assemble the single nozzle, perform the operations in reverse order.

8.4.2 Single nozzles series TF6 Ø17-23-32-46 / TH6 Ø18-24

The operation described in this paragraph refers to F and TH type single nozzles with head heaters. If the single nozzle requiring maintenance does not have a head resistor, or if the maintenance regard the nozzle tip, resistor, and thermocouple, see paragraph 8.1 (TF and TH nozzle maintenance).

Withdraw the band resistor from the head (Figure 100)

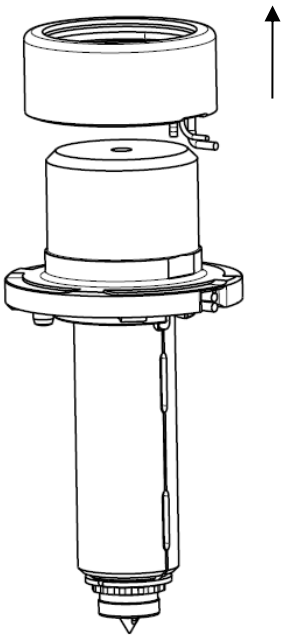


Figure 100 – Band heater removal

The thermocouple can be replaced after removing it from the heater band (Figure 101).
To re-assemble the single nozzle, perform the operations in reverse order.

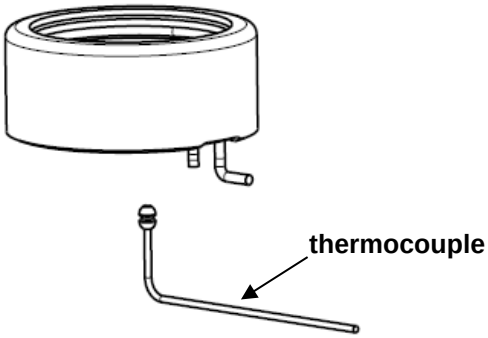


Figure 101 – Head thermocouple removal

8.4.3 Valve gate single nozzles pneumatic, types “MO-MG” and “MO-TH”

8.4.3.1 Maintenance kit “MO-MG”

1. Wrench for assembly/disassembly of the tip (without lever)
2. Tool for thermocouple adaptation
3. Tip housing cleaning brush
4. Resistor retractors
5. Anti-seize grease
6. Wrench for assembly/disassembly ring
7. Pin guide extractor
8. OR set

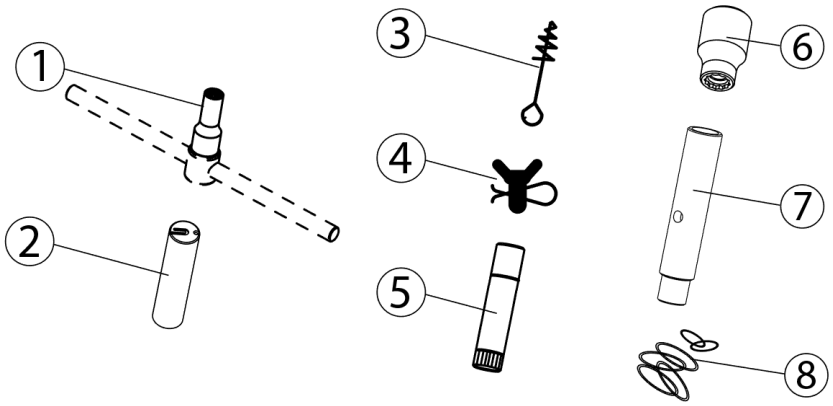


Figure 102 maintenance kit valve gate single nozzle codes

MO/MG	3	3B	3D
MO17	E19426	E19427	E19426
MO23	E19430	E19431	E19430
MO32	E19434	E19457	E19457
MG46	E20198	E21214	E21214

Table 13 – Maintenance kit valve gate single nozzle codes MO - MG

8.4.3.2 Maintenance kit “MO-TH”

1. Seeger extraction tool
2. Heater extraction tool
3. Bi-hexagon socket
4. Tip housing cleaning brush
5. Anti-seize grease
6. Heater introduction tool
7. Wrench for assembly/disassembly ring
8. Pin guide extractor
9. OR set

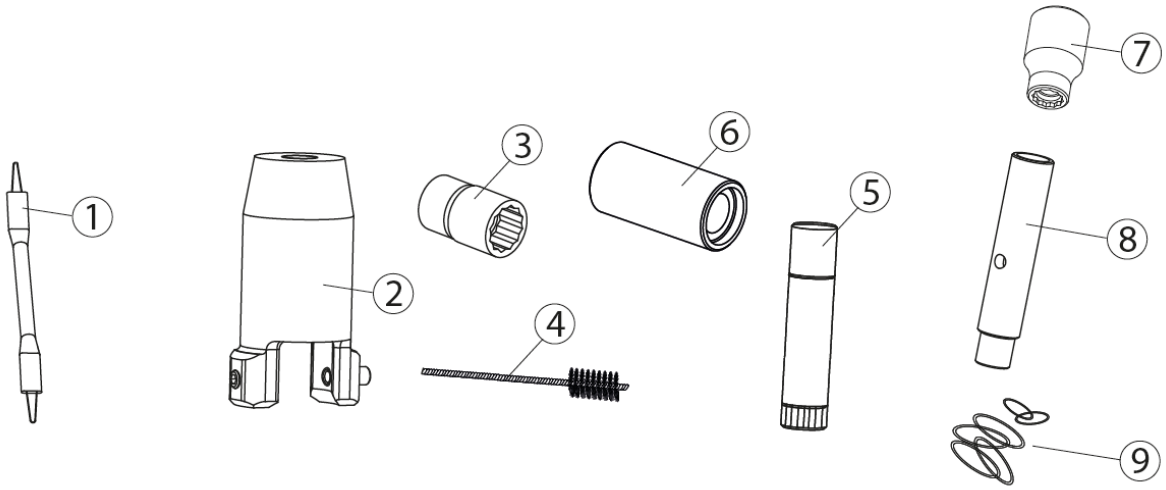


Figure 103 maintenance kit valve gate single nozzle codes MO-TH

MOTH	3PK	3B15-PK	3DP
MOTH18	E22212	E22212	E22212
MOTH24	E22213	E22213	E22213

Table 14 - Maintenance kit valve gate single nozzle codes MO-TH

For maintenance of the nozzle body, refer to Chapter 8.1, especially Chapter 8.1.4 for "MO-MG" nozzle bodies and Chapter 8.1.5 for "MOTH” nozzle bodies. Regarding maintenance of the head of the single nozzles, the instructions are as follows.

1. Remove the upper plate and the centring ring by unscrewing the fastening screws.

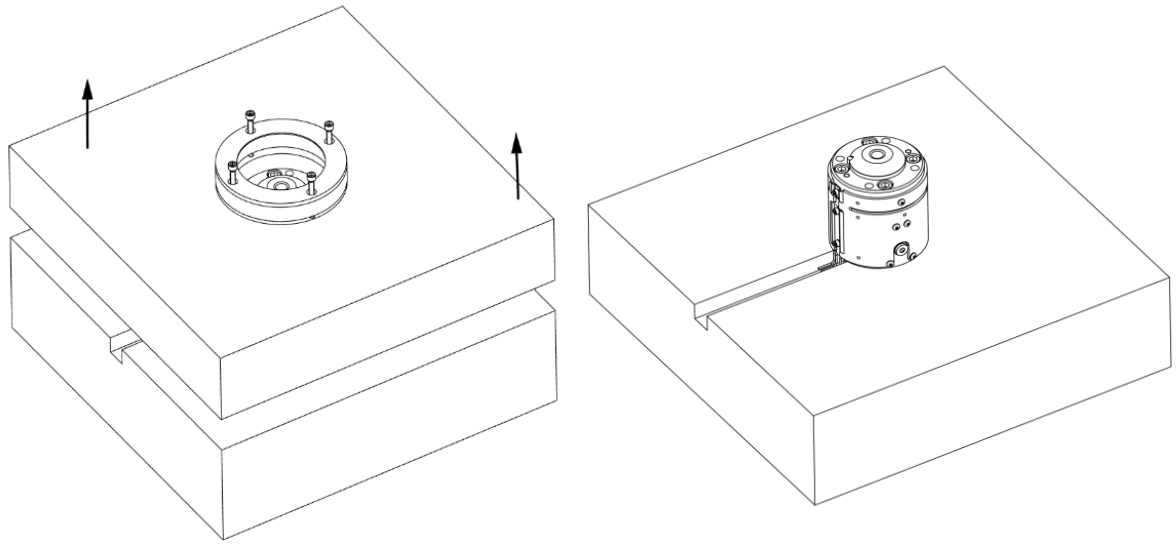


Figure 104

2. Unscrew the 4 screws which hold the head of single nozzle (Figure 105)

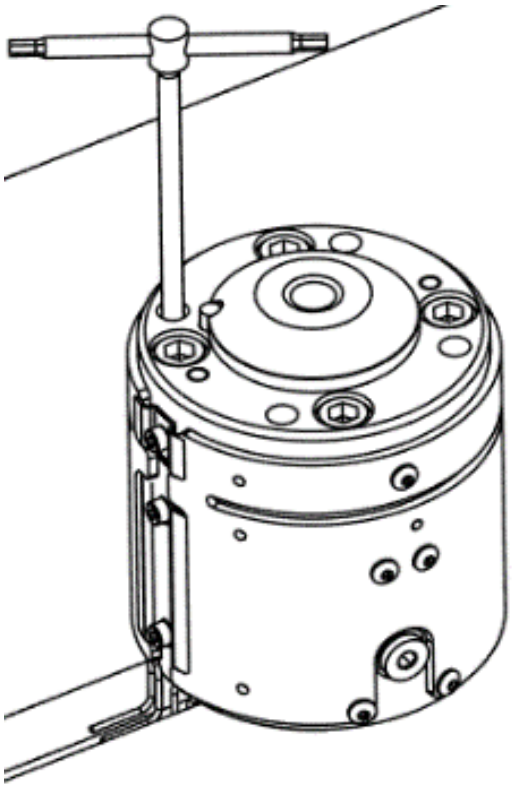


Figure 105

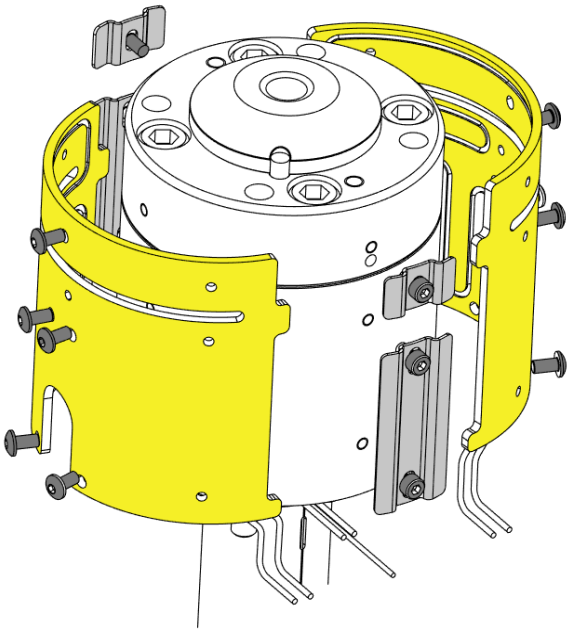


Figure 106

3. Unscrew the 8 screws which hold the heater fixing plates and the 8 countersunk ones which hold the heater (Figure 106)

4. If necessary, replace the thermocouple beneath the head by unscrewing it.

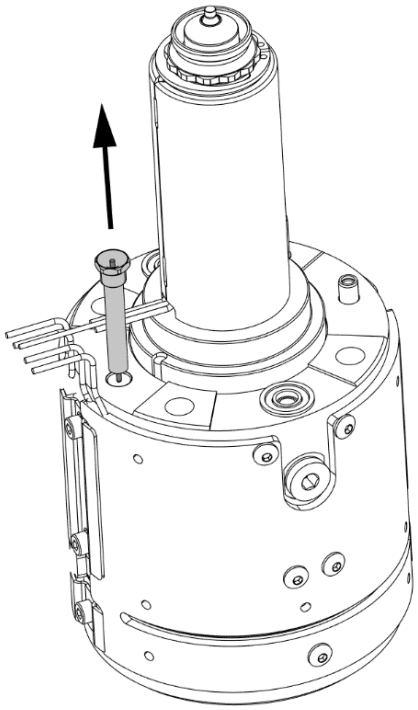


Figure 107

5. Unscrew the 4 M10x30 screws and lift the head, then remove the gasket and carefully clean any impurities from all surfaces.

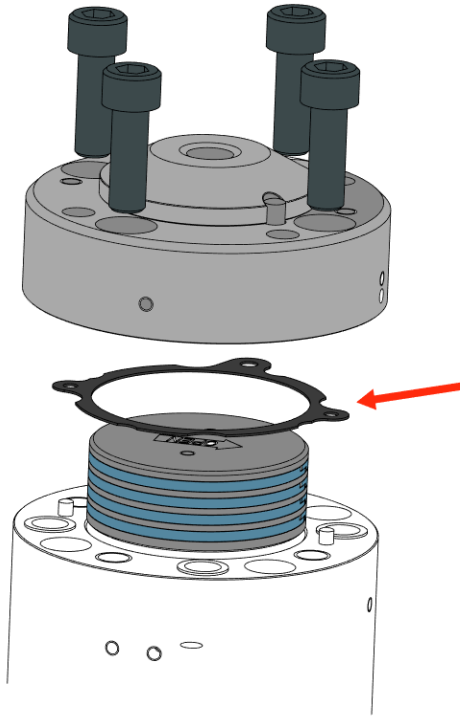


Figure 108

6. If necessary, remove the piston with two M4x16 screws and the extraction disk (cod. E19619, not in the maintenance kit). Using a M8 threaded bar, extract the piston and the pin from the body.

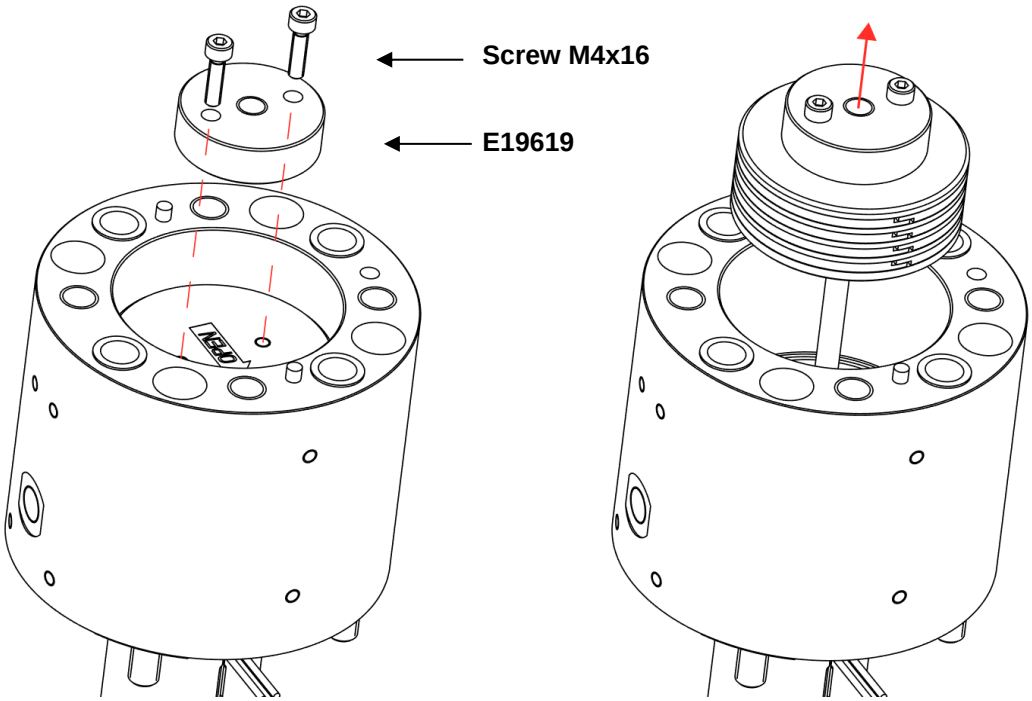


Figure 109 – Piston extraction

7. To remove the piston from the pin, move it in the direction indicated by the arrow.

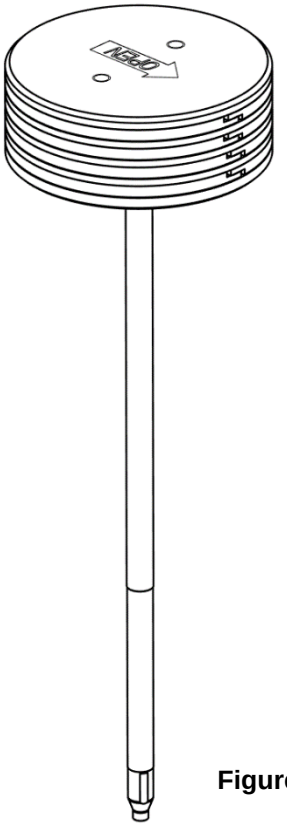


Figure 110

8. Clean the piston housing in the body (especially the groove where impurities can accumulate).

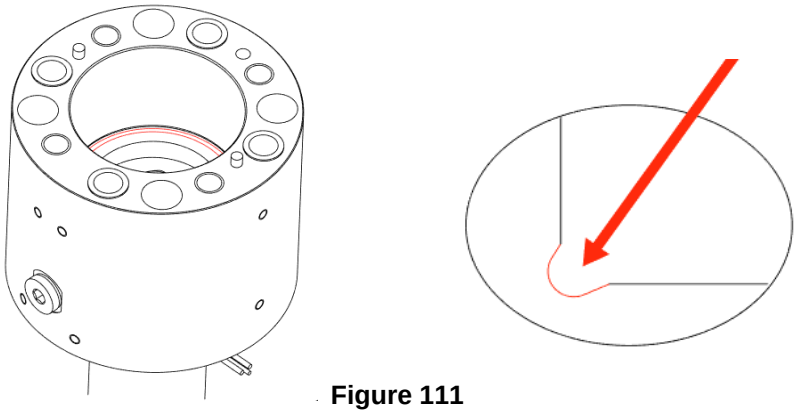


Figure 111

9. With the piston disassembled, it is possible to proceed to check the integrity of the cylindrical lateral surface and if necessary, replace the sealing gaskets. **In case of pin replacement, note that the pin must be replaced together with the pin guide bushing; each pin is supplied assembled with its pin guide bushing and they are not interchangeable**.

10. To remove the pin guide bushing unscrew the bushing lock nut and remove the bushing by tightening the specific tool (cod. E18394).

11. Position the new pin guide bushing and tighten applying the torque shown in the table:

Table 15: torque values

Hex wrench	Torque value
CH 12	40 Nm
CH 16	60 Nm

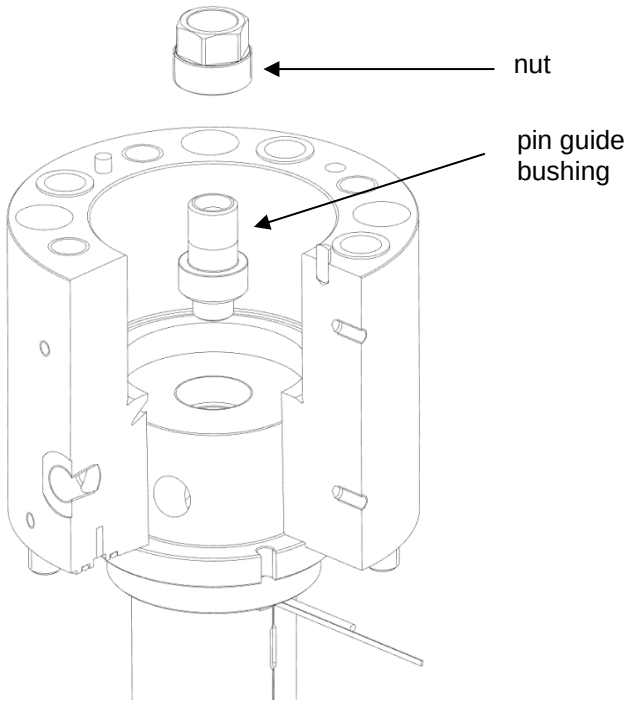


Figure 112 - Pin guide bushing and nut

12. Insert the pin and piston in the body. Position the gasket (see Figure 108), insert the head and tighten the screws according to the schematic shown at side, applying the torque value shown in the following table.

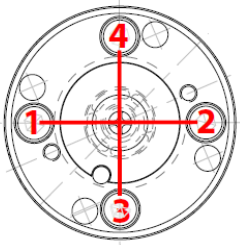


Figure 113

Table 16: torque values

Single nozzle type	torque value
MO	15 Nm
MG	40 Nm

13. Unscrew the screws again, remove the head and clean any impurities from the upper chamber of the piston.
14. 14-Check that the polymer sealing surfaces (indicated in red in the figure below) are completely clean and that the gasket has not been pinched.

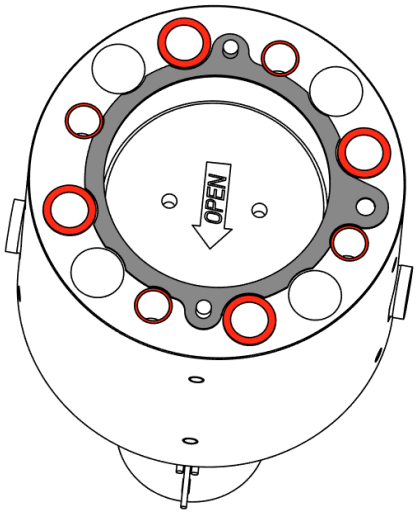


Figure 114

15. Re-position the head and retighten the screws in two steps according to the following cross pattern applying the torque value indicated in the table.

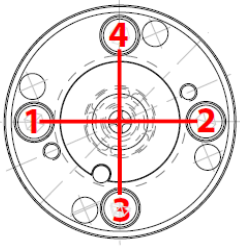


Figure 115

Table 17: torque values

	Torque values		
	1° step	2° step	3 step
MO	15 Nm	40 Nm	
MG	15 Nm	40 Nm	80 Nm

Maintenance theaded nozzle systems

8.5 Description of the components

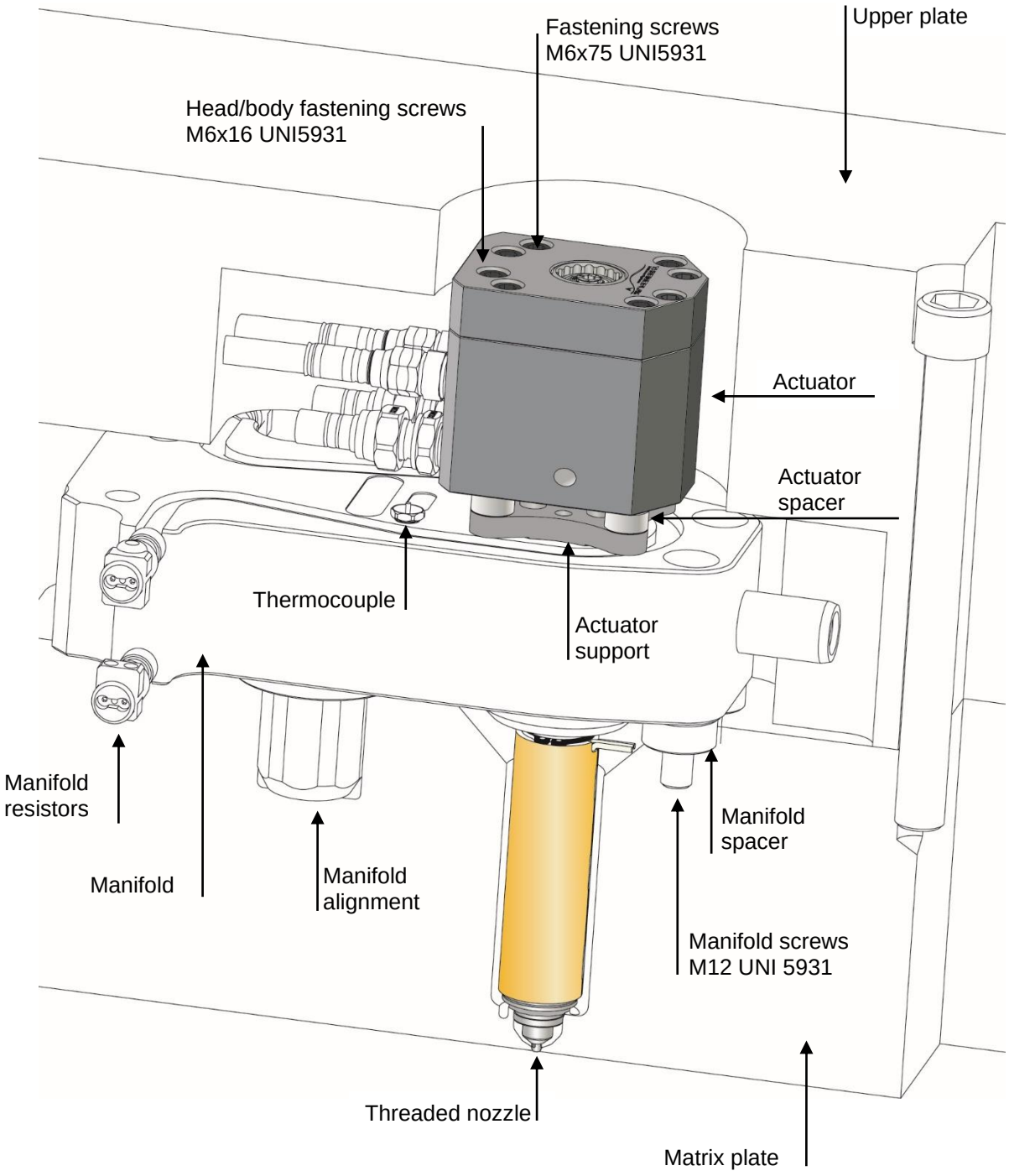


Figure 116

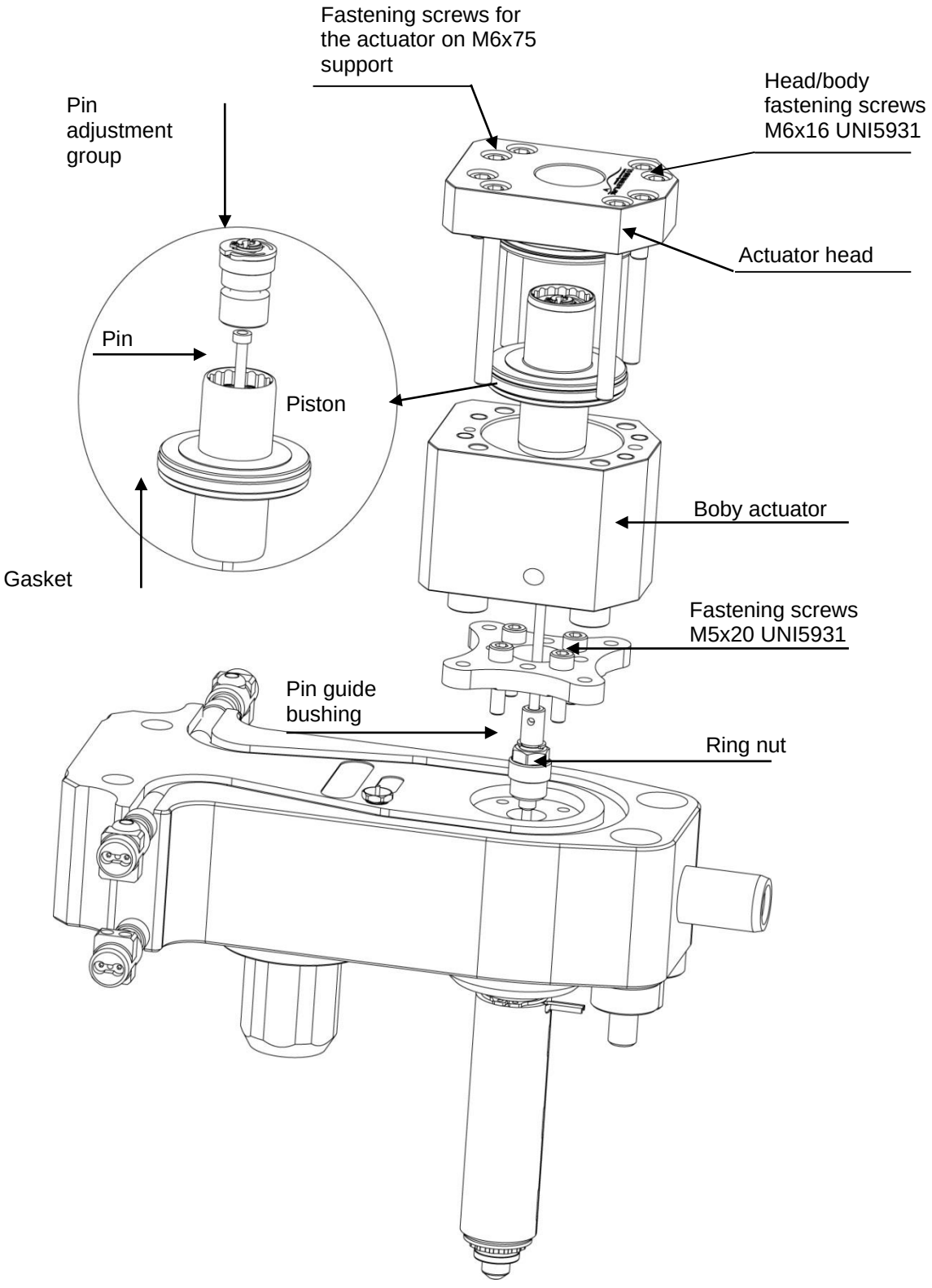

Fastening screws for the actuator on M6x75 support
Pin adjustment group
Head/body fastening screws M6x16 UNI5931
Actuator head
Pin
Piston
Boby actuator
Gasket
Fastening screws M5x20 UNI5931
Pin guide bushing
Ring nut

Figure 117

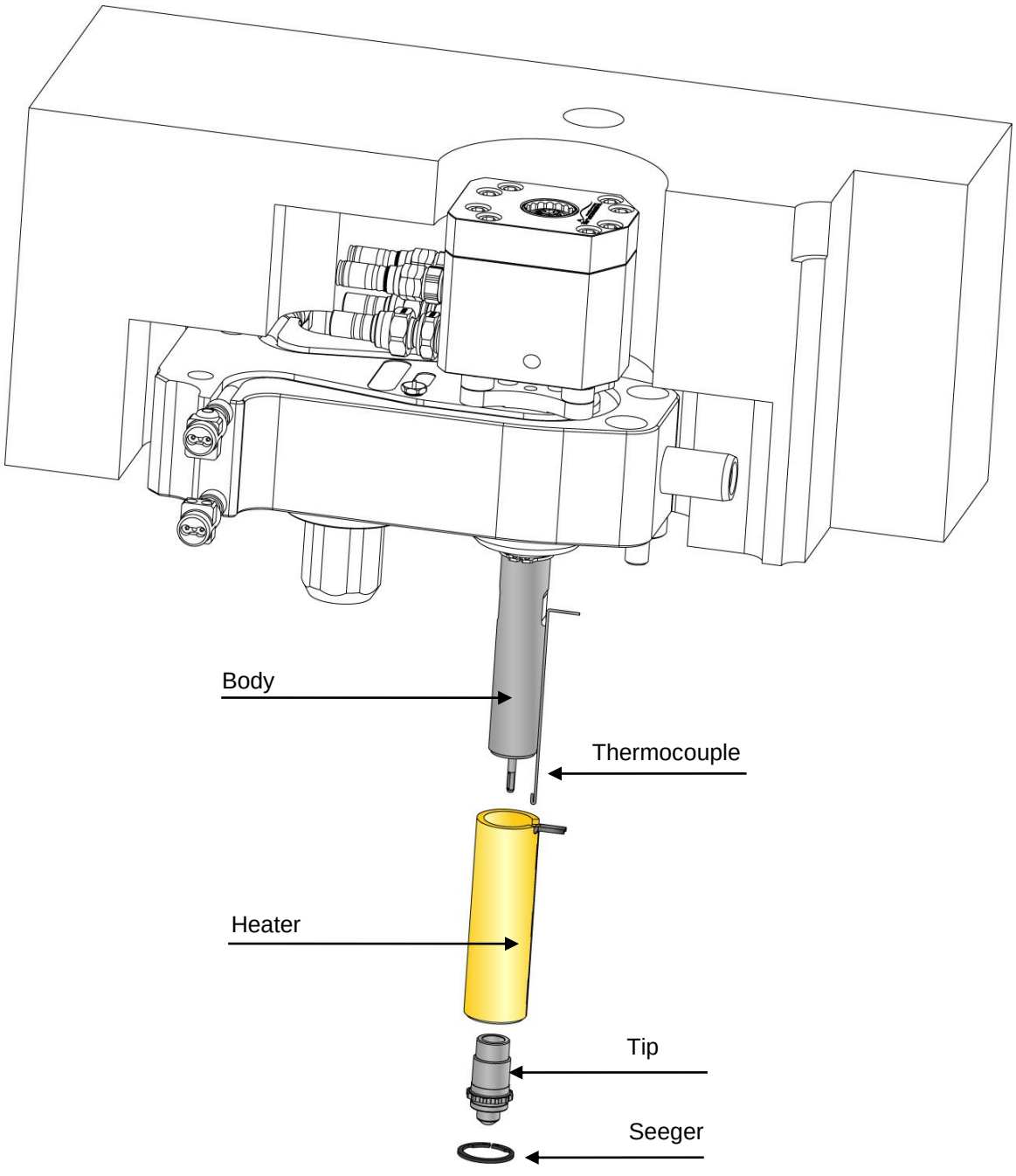


Figure 118

8.6 Tools for threaded nozzle maintenance

The nozzle maintenance kits are the same as the ones for the sliding nozzles. The code is indicated in paragraph 8.1.1.

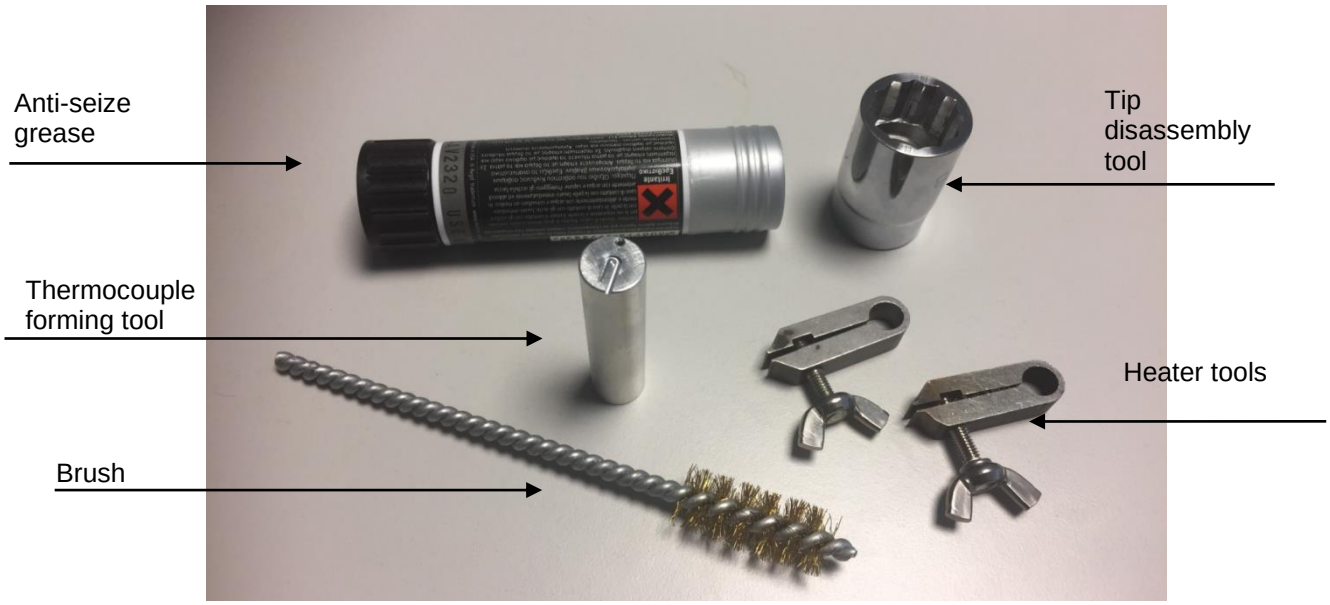


Figure 119

See the figure below for the codes of the tools to be used for the insertion and adaptation of the shut-off group gaskets (bore 50 mm).

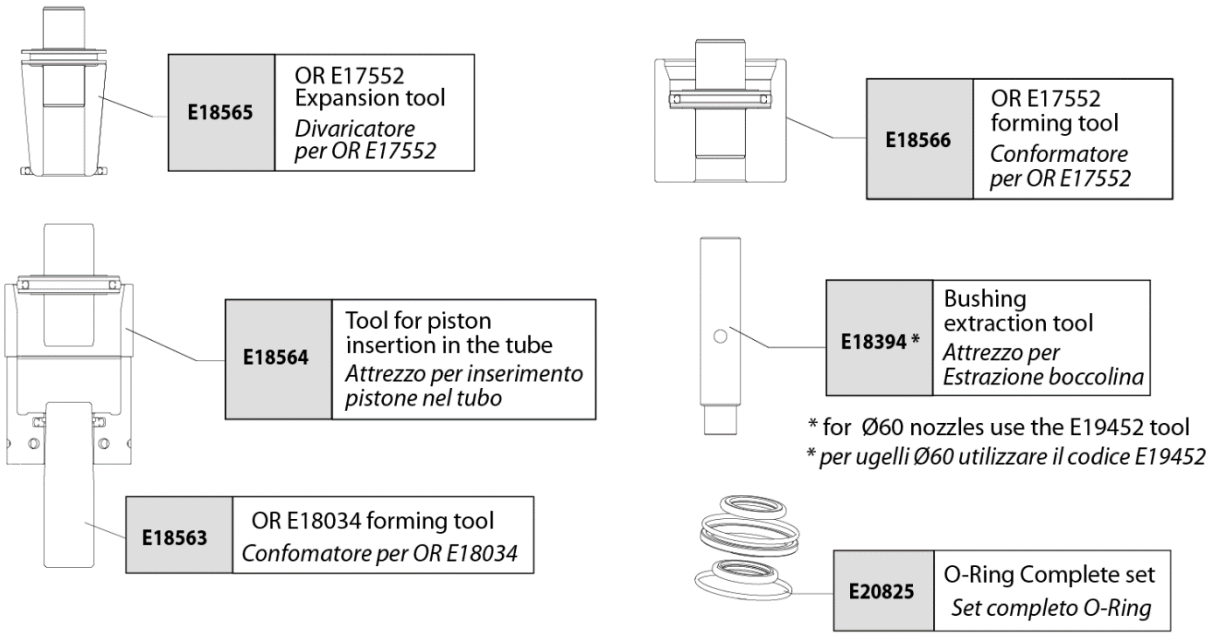


Figure 120

8.7 Valve gate group disassembly

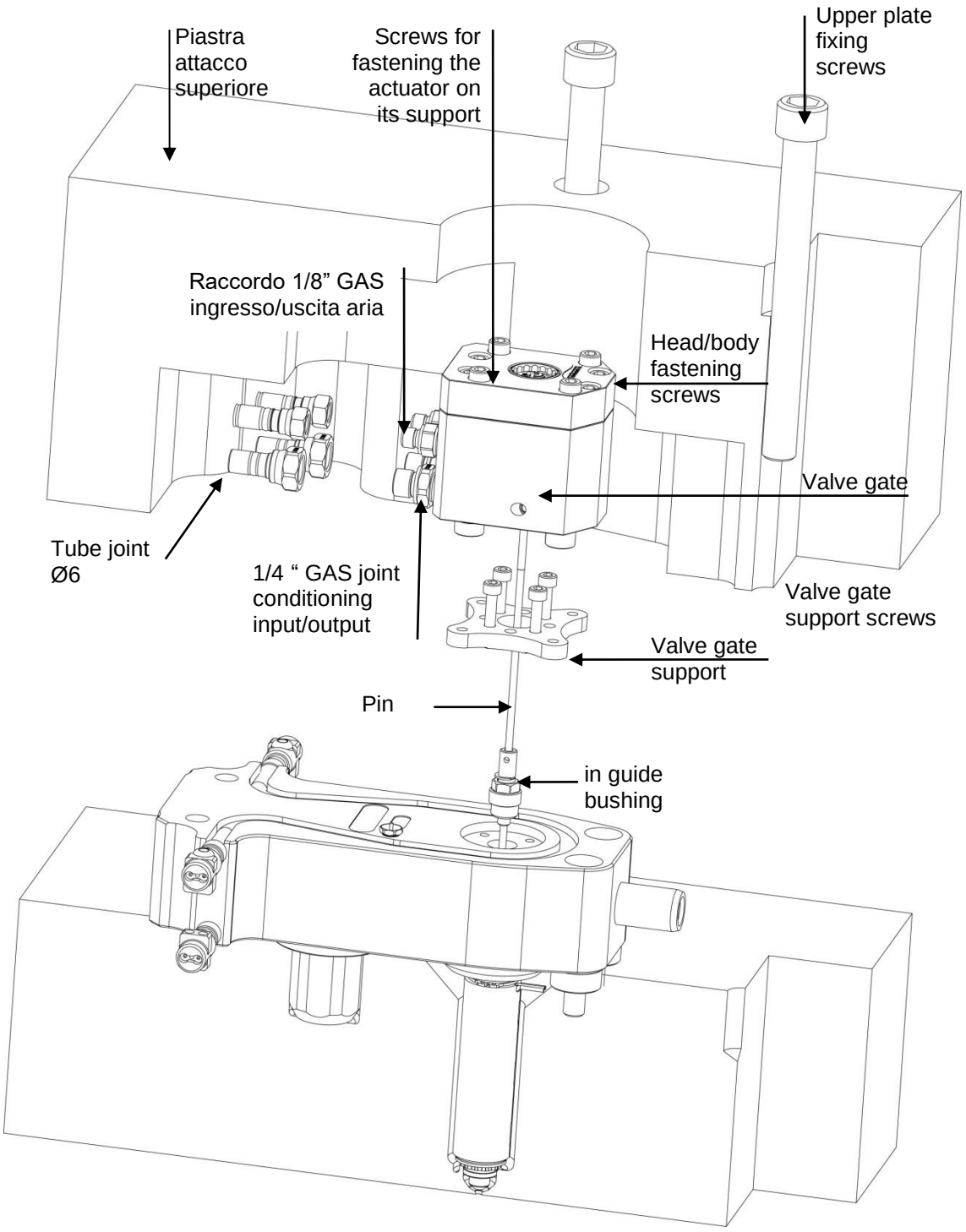


Figure 121

1. Remove the upper plate screws
2. Extract the upper plate
3. Unscrew the pipe fittings
4. Remove the valve gate group fixing screws

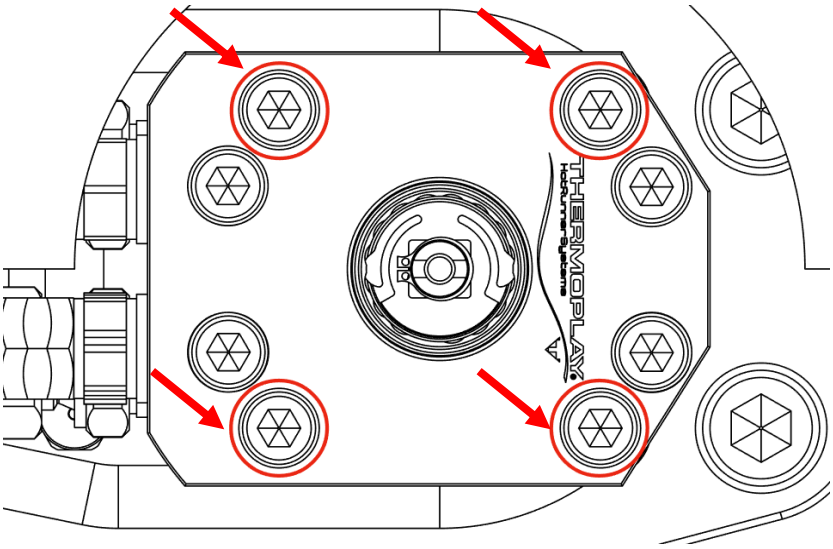


Figure 122

5. Heat the system, setting the temperature controller to approximately 50°C below the polymer process temperature
6. Extract the valve gate group with the pin
7. If necessary, loosen the 4 fastening screws to remove the support



Figure 123

8. Unscrew the pin guide bushing nut using a standard hex wrench



Figura 124

9. Extract the pin guide bushing by using the specific tool (Figure 92)
10. Unscrew the 4 screws on the upper side of the actuator.

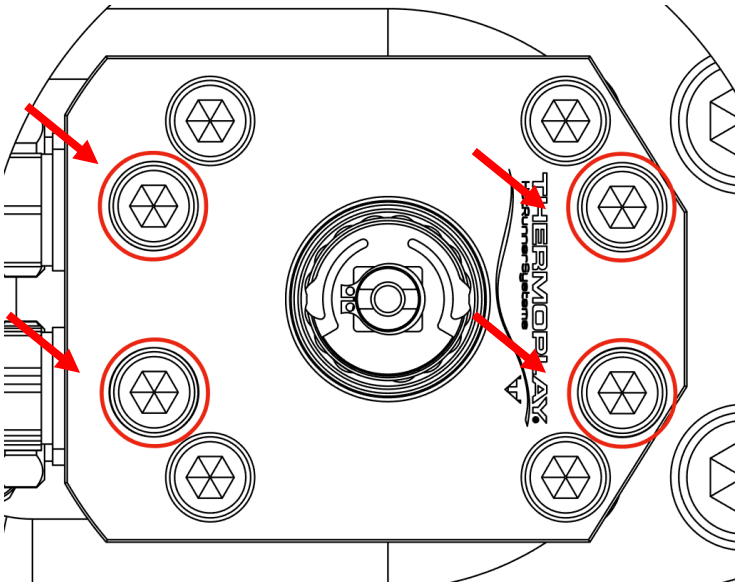


Figure 125

11. Remove the head from the valve gate group and extract the piston
12. Using a flat tip screwdriver, unscrew the pin adjustment tool and extract the piston from the pin
13. Extract the pin from its housing (Figure 126)

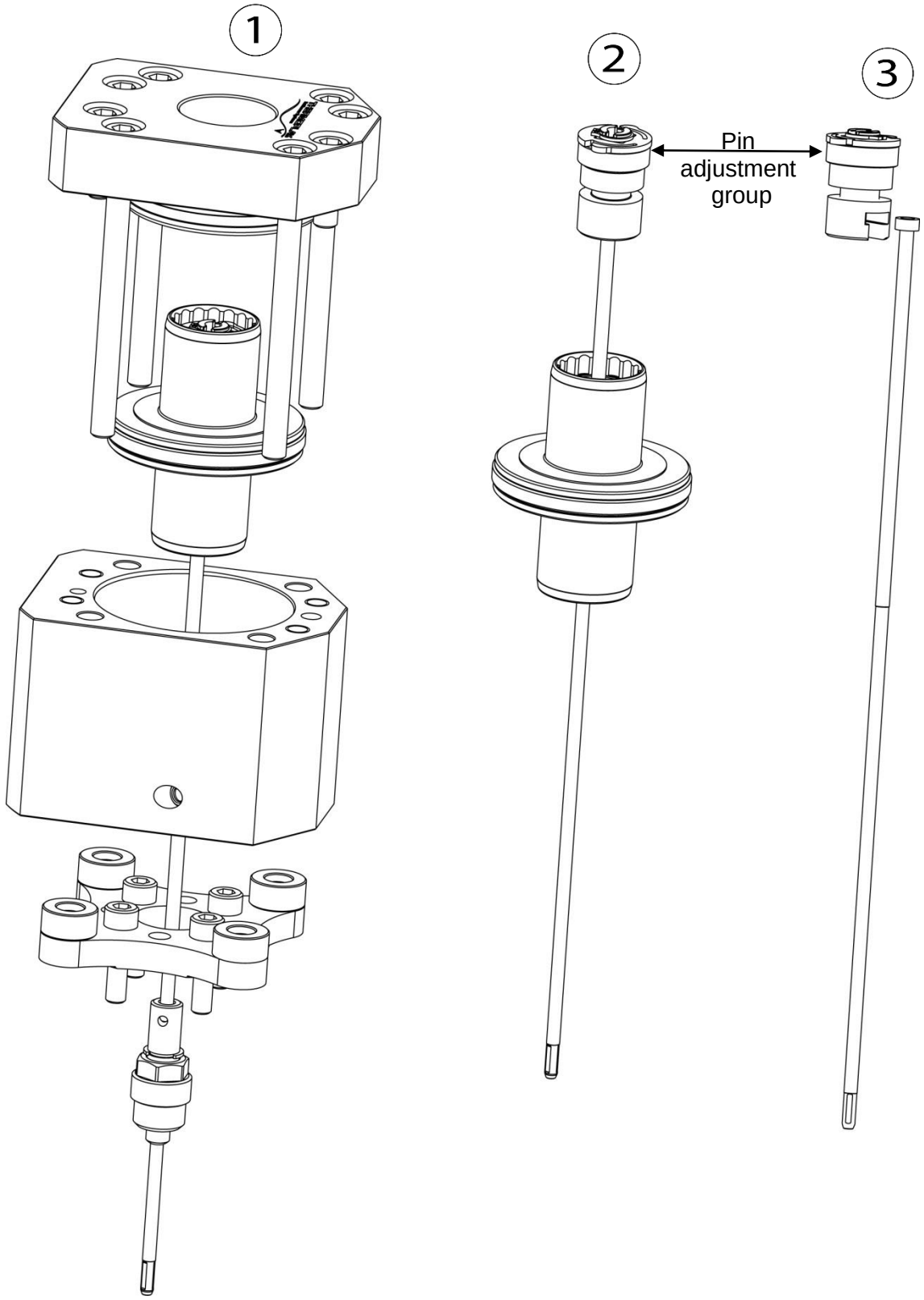


Figure 126 - Extraction of the pin from the valve gate group

8.8 Valve gate group assembly

The pin and pin guide bushing must to be replaced together, each pin is supplied assembled with its pin guide bushing and they are not interchangeable. The two components have the same identification number.

1. The system must be at room temperature to assemble the valve gate group
2. Insert the pin guide bushing into its seat in the manifold
3. Screw the nut into the manifold using a standard socket wrench. The clamping force is indicated on the manifold.
4. Insert the pin in the pin adjustment group
5. Insert the pin and pin adjustment group assembled previously into the piston
6. Screw the pin adjustment group on the piston using a flat screwdriver
7. Insert the piston with the pin into the actuator body and fasten the actuator head on the actuator body using 4 M6x12 screws
8. Position the actuator support on the distributor and fasten it with the special screws provided
9. Heat the system, setting the temperature controller to approximately 50°C below the polymer process temperature
10. Insert the actuator with the pin into the distributor
11. Tighten the M6x75 screws of the actuator and connect the hose fittings.
12. Insert the cover to the adjustment unit
13. Insert and fix the upper plate with its own screws

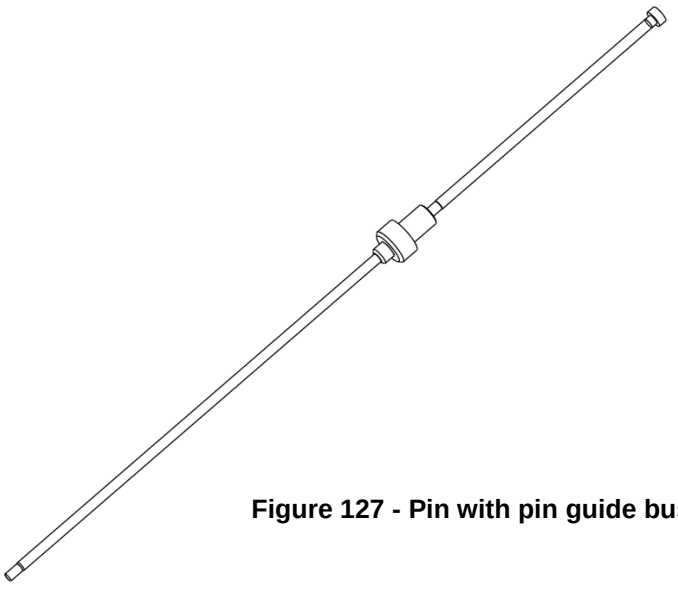


Figure 127 - Pin with pin guide bushing



Do not use a clamping force greater than the value indicated on the manifold.
The serial number indicated on the pin must always correspond to the number indicated on the pin bushing!

8.9 Nozzles maintenance

The following pages contain the information necessary for disassembling the nozzles and replacing the components that may be accidentally damaged.
The nozzle must not be extracted from the manifold in order to prevent possible damage. Improper handling could make the nozzle unusable or cause material to escape due to damage of its seat.



Warning: never unscrew the nozzle core from the manifold plate.
If the nozzle core requires maintenance, contact Thermoplay technical after-sales service.

8.9.1 Tip replacement and maintenance

About the tip replacement procedures refer to the paragraph 8.1.3

8.9.2 Replacement of the heater and the thermocouple in the threaded nozzles

About the heater and thermocouple repair and replacement procedures of the screw in nozzles, refer to the paragraph 8.1.4.

8.9.3 Pin position adjustment

Carry out the following operations in sequence, referring to Figure 128 and Figure 129. he pin can be adjusted without removing the upper plate and the valve gate group, and without heating the system.

1. The pin is adjusted by rotating the screw on the piston with a flat tip screwdriver. Clockwise the pin advances, while anti-clockwise the pin retracts (Figure 129).
2. The pin can also be adjusted at room temperature. The maximum adjustment stroke is equal to 0.75 mm forwards or backwards.
3. The piston head has marks on the surface. Every click is equal to a pin movement of 0.05mm.

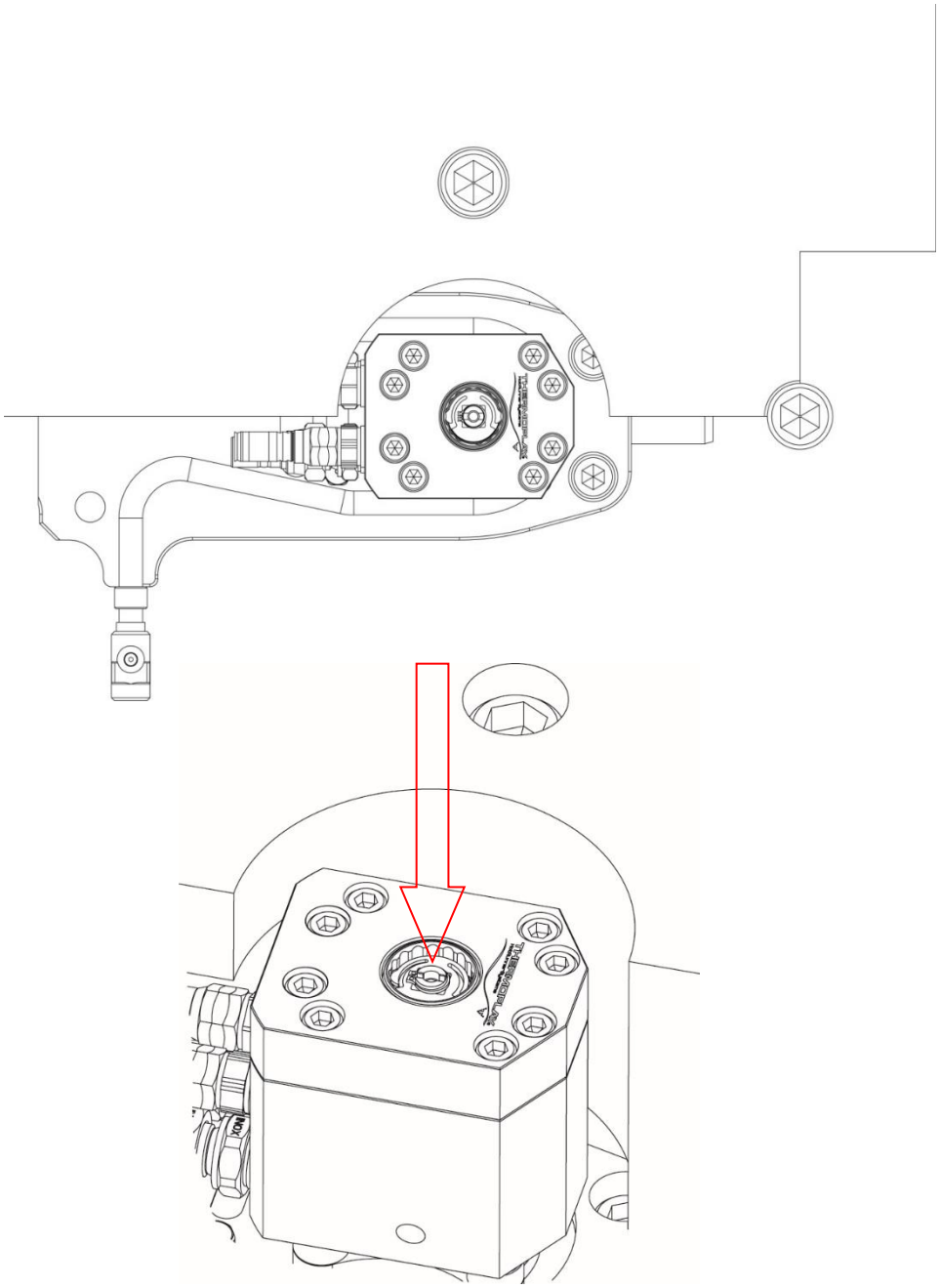


Figure 128 - Pin stroke adjustment



Figure 129 - Pin stroke adjustment detail

8.9.4 Piston gaskets replacement

Use the specific tools for replacement, according to the following procedure:

1. Disassembly the valve gate group as indicated at paragraph 8.7.

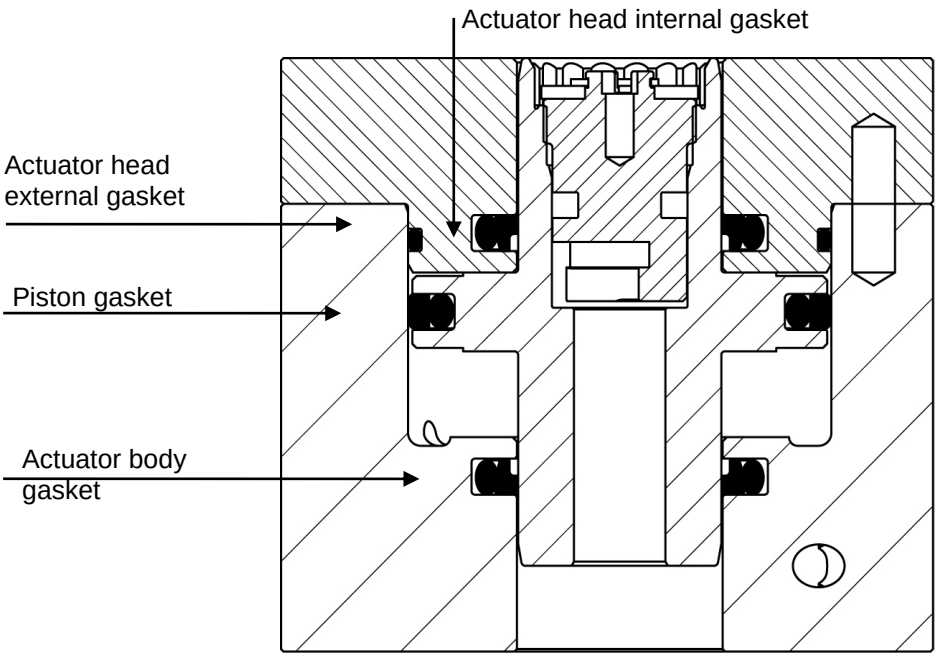


Figure 130 - Actuator gaskets

2. The gaskets can be removed from their seats using a tool without sharp cutting edges (e.g. a flat tip screwdriver)
3. Insert a small quantity of grease for gaskets in the empty seats.

4. Insert the new gaskets using the specific tools to widen the diameter to the appropriate size so they can be inserted, according to the following instructions. Always use grease on the surfaces of the tools.
5. After the gaskets have been fitted on the piston, use the specific tools to adapt them.

Actuator head external OR: no specific tools are required.

Piston gasket: Use the expansion tool shown in Figure 131 to insert the gasket and the gasket adaptation tool to fit it into the seat. To insert the piston into the actuator body without damaging the piston gasket, use the special tool provided.

Caution: always always check the conditions of the gaskets.
Some gaskets are not symmetrical, check the correct direction.

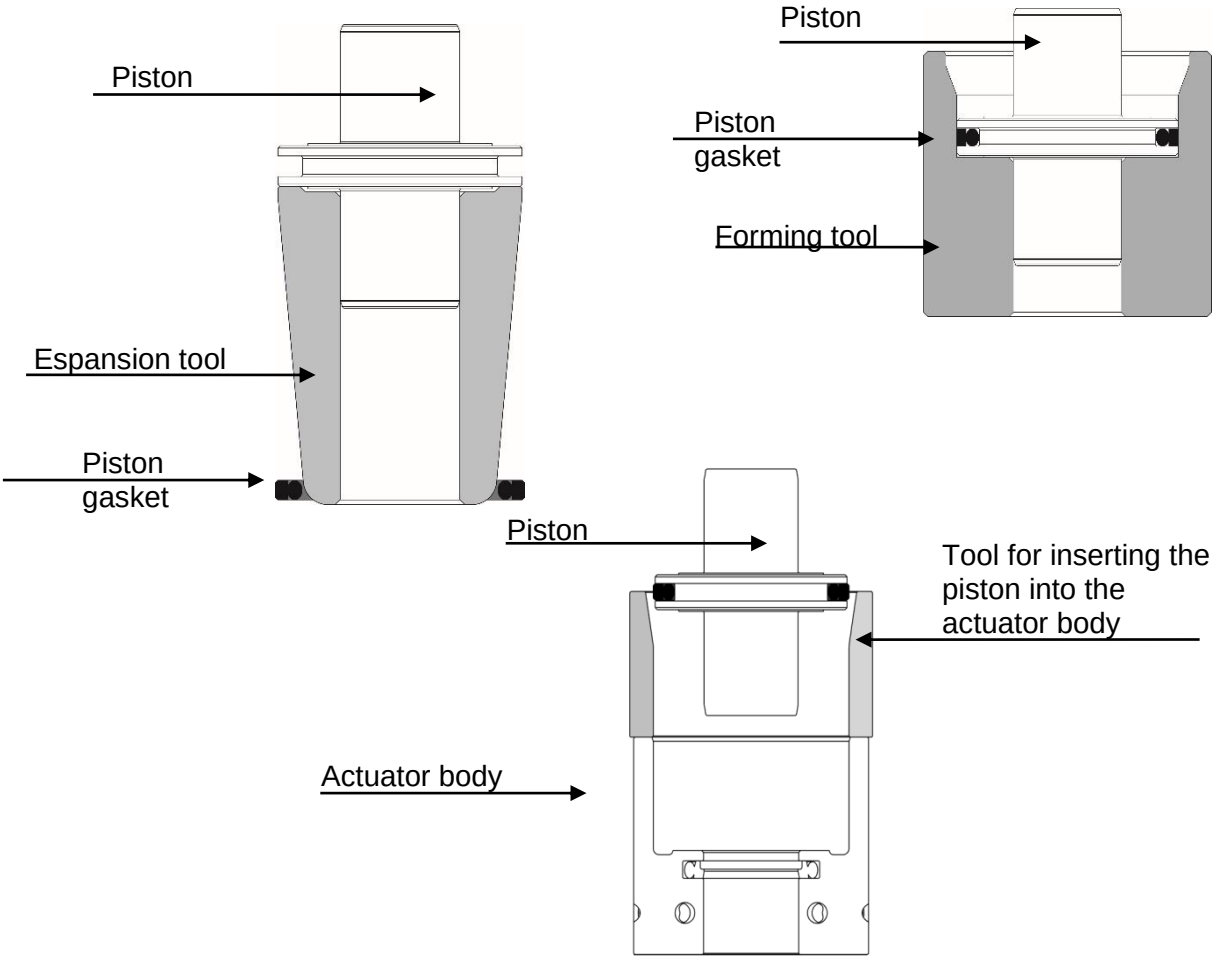


Figure 131 - Tools for replacing piston gaskets

Actuator head Internal gasket and actuator body gasket: no specific tools are required. For assembly, adapt manually the external block as shown in the figure and place it into its seat.

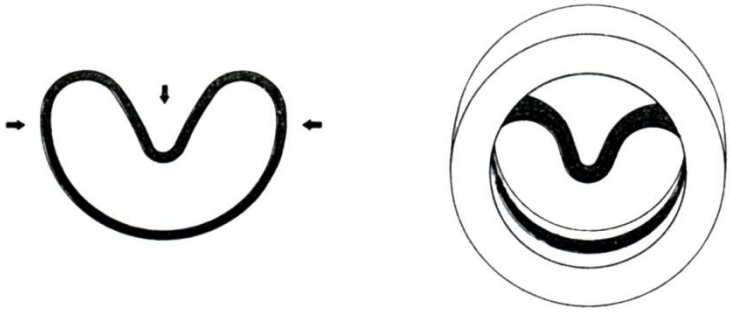


Figure 132 - Guide ring adaptation

Use the gasket adaptation tool to fit it into the seat. To prevent damage, make sure that the gasket does not come into contact with sharp edges or threaded parts.

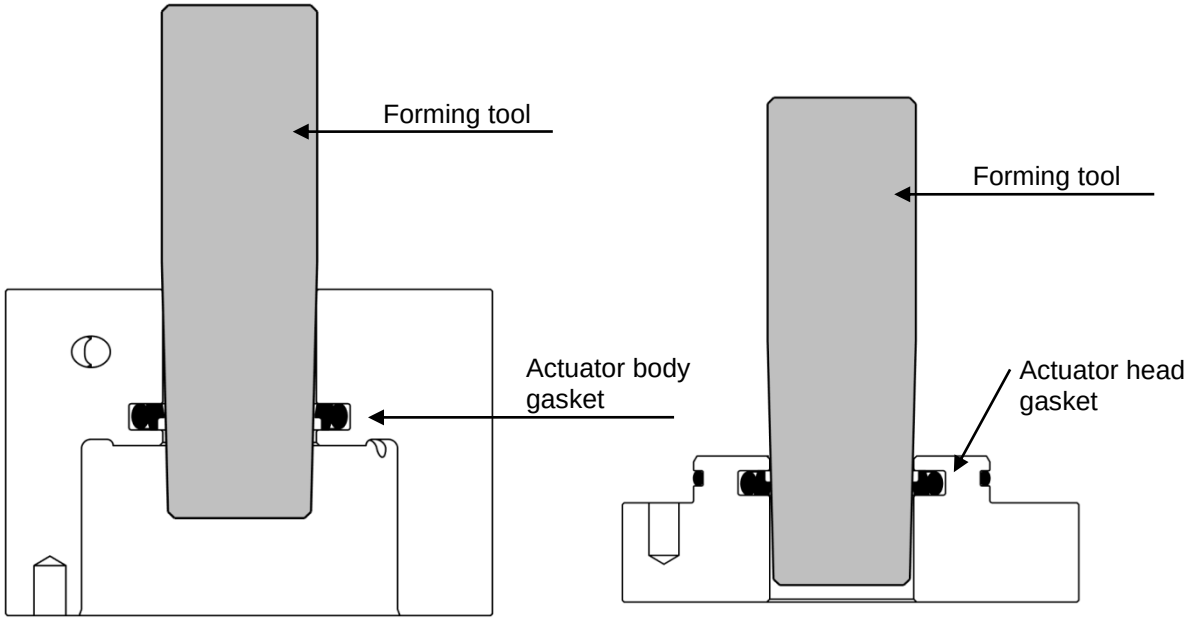


Figure 133 - Conformation of head and body gaskets

New replacement gaskets can be ordered as a complete replacement set.

6. Spread specific grease on the external surfaces of the gaskets and reassemble the entire unit as described in the paragraph 8.7.

8.10 Replacing the thermocouples in the manifold

1. Remove the upper plate fixing screws.
2. Extract the upper plate.
3. Disconnect the conductors of the thermocouple to be replaced from the connector
4. Unscrew the thermocouple to be replaced using a 10 mm face spanner.
5. Screw in the new thermocouple until it makes contact.
6. Connect the new thermocouple to the connector.
7. Insert and fix the upper plate with its own screws.

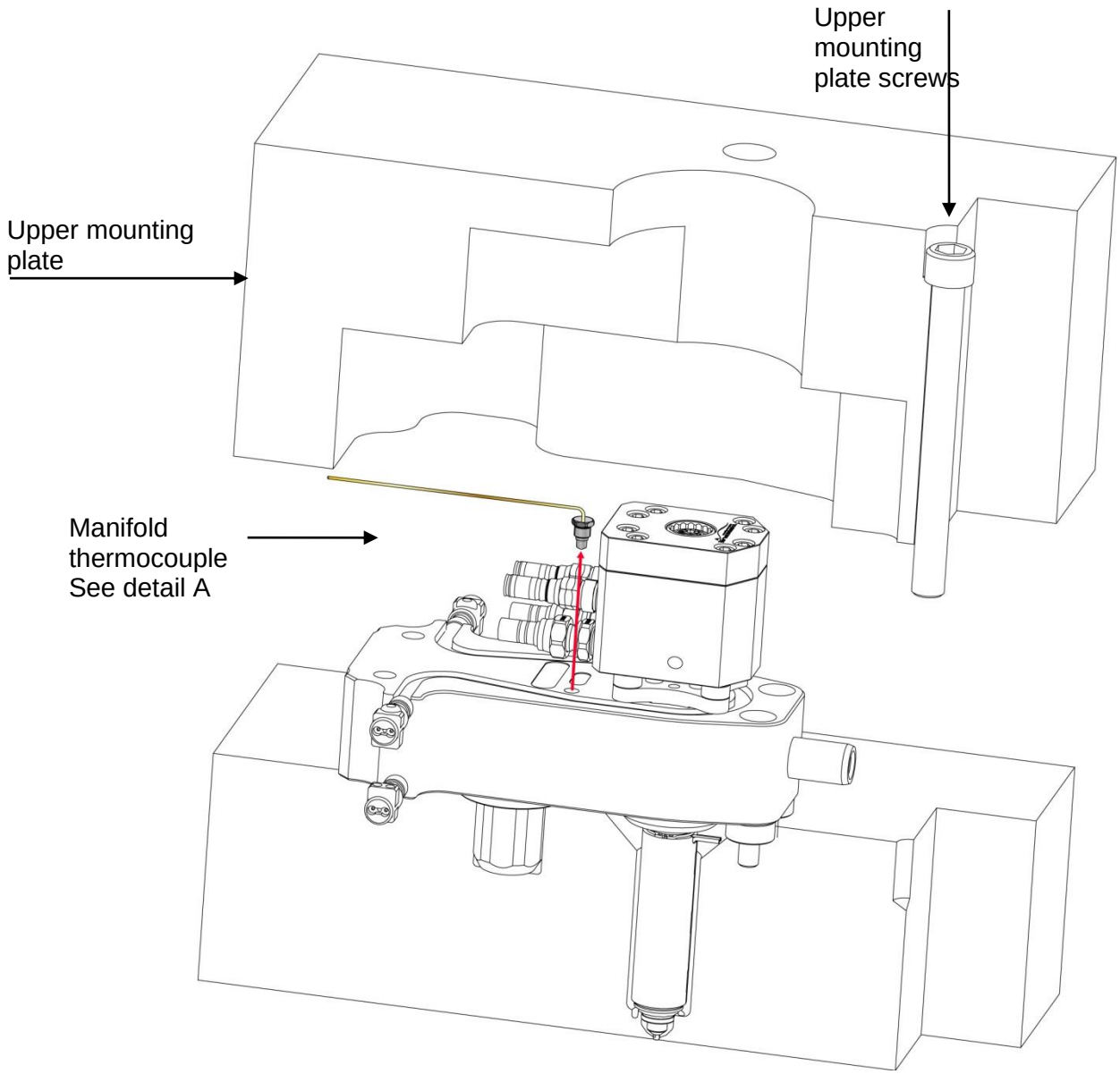


Figure 134

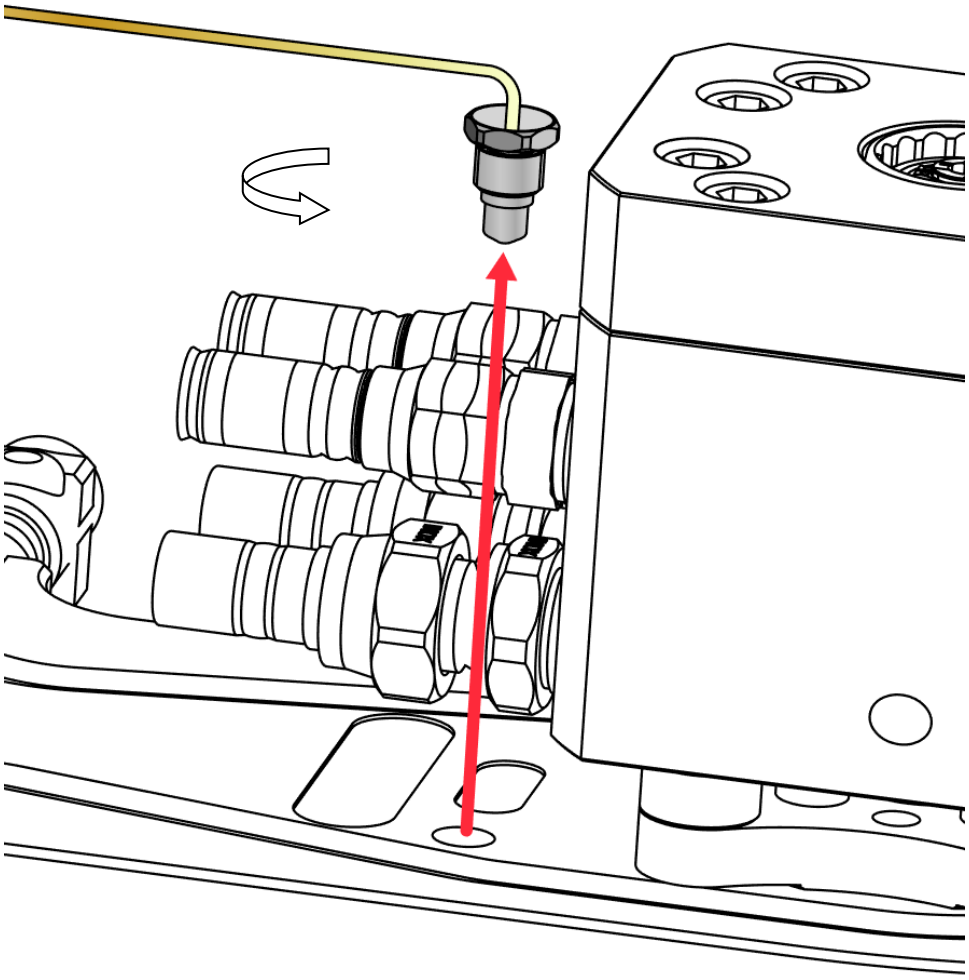


Figure 135 – Thermocouple replacement, detail A

9 General Sales and Guarantee conditions

9.1 General Conditions of Sale

Art. 1. Recitals:
1.1 The present General Conditions of Sale shall regulate all present and future contracts of sale between the Seller and the Purchaser provided that the Purchaser has its legal office outside Italy. When the General Conditions apply to a specific contract, modifications or deviations from them must be agreed in writing.

Art. 2. Conclusion of Sale Contracts:
2.1 The purchase orders collected by the Seller or by its agents and commercial intermediaries become binding only when the Purchaser receives the express written acceptance from the Seller. In case of offer by the Seller, the offer becomes binding only when the Purchaser sends the express written acceptance to the Seller by order confirmation. In this case the offer will have a validity of only 120 days from its confirmation and will be ineffective after this date.

Art.3. Prices:
3.1 The prices are those indicated in the price list as in force at the moment of the order acceptance. The prices are expressed in Euro and they exclude any national or foreign taxes and duties. The prices do not include any transport, postage or insurance costs related to the chosen Incoterm conditions.
3.2 Any specific modification of the products requested by the Purchaser shall be charged separately and added to the price list or offer.

Art.4. Payment:
4.1 Payment terms shall be those indicated in the Purchase Order Confirmation.
4.2 Any payments made to agents, representatives, or commercial intermediaries of the Seller shall not be deemed to have been carried out until the relevant sums are collected by the Seller. In this case the Seller will have right to the payment of any interest starting from the date on which the sum becomes collectible.
4.3 In case of late payment the Seller may, after having notified the Purchaser in writing, suspend its performance of the contract until payment is received. If the Purchaser does not pay the amount due within three months, the Seller will have the right, with previous written communication to the Purchaser, to terminate the contract and to obtain from the Purchaser compensation for its damages.
4.4 In case of instalment payment, the lack of payment of even one instalment will automatically authorize the Seller to immediately demand the full balance.

Art.5. Reservation of title:
5.1 The Products shall remain the property of the Seller until the complete payment of the purchase price. The Purchaser shall at the request of the Seller assist Seller in taking any necessary measures to protect the Seller's title to its own Products. The retention of ownership will not modify the transfer of risk of loss as provided in art. 6 hereafter.

Art.6. Delivery:
6.1 The delivery shall be Ex-works (EXW) care of Seller’s premises in PONT ST MARTIN (AO), Italy (ICC INCOTERMS 2010).
6.2 If not specified in the order confirmation, the Seller shall supply the Products within 60 days from the date of order acceptance. Partial deliveries are allowed unless not otherwise agreed.

6.3 If the products are not delivered by the agreed due date, the Purchaser has the right to claim damages after the expiration of a 15 (fifteen) working day period after the agreed delivery time; this term is suspended during the whole month of August, which is industrial vacation in Italy, and/or due to force majeure. Such damages shall be due in the measure of 0,5% (zero point five percent) of the purchase price of the portion of undelivered products, calculated per each whole week of delay, but cannot exceed the maximum percentage of 5% (five percent) of the purchase price.
6.4 The above mentioned compensation shall exclude any right to claim any additional expenses and damages due to a delay of the Seller, except if the Seller should be found guilty of gross negligence
6.5 In case of no collection of goods at the agreed delivery date, the Purchaser shall pay the whole purchase price as if the collection has occurred. The Seller shall store the Products at the Purchaser’s risk and expense.

Art.7. Claims and Warranty:
7.1 The Seller shall remedy any defect, attributable to him, resulting from a failure to meet the project specifications, defect of material or manufacturing error which appear within a period of 12 (twelve) months from delivery date.
7.2 The Purchaser shall examine the drawings, the drafts, the samples and the final products to verify their compliance with the specifications hereafter reported.
7.3 The Purchaser shall notify in writing the Seller of any alleged defect within 8 (eight) days of its discovery or immediately if the defect is so to cause damages. If the Purchaser fails to comply with these procedures, then the Purchaser loses all rights to have the defect remedied. The notification shall contain a description of the defect and be transmitted to the Seller by means of registered letter with return receipt.
7.4 On receipt of the registered letter, and if it is determined that the defect is the result of defective material or to a manufacturing error attributable to Seller, then the Seller shall, at its option, either repair the defective Products or replace them. The Seller may ask for the defective products to be returned, at the Purchaser's expense, which products will become Seller's property. In any case the return of products has to be previously accepted by the Seller.
7.5 If it is determined that the defect is not covered by this warranty, then the repair or replacement costs will be charged to and will be the responsibility of the Purchaser, including all shipment costs.
7.6 This warranty replaces and supersedes any other legal guarantee with respect to the products, including due to defects and non-compliance, whether express or implied, and it excludes any other Seller's liability. The Purchaser, in particular, shall have no right to claim damages, including loss of production, loss of profit or revenues, loss of use, loss of contracts or for any consequential, economic or indirect loss whatsoever, including reduction of price or breach of contract.

Art.8. Technical regulations and responsibility for damages caused by the Products:
8.1 The Seller declares that the Products are manufactured following Italian legislation and technical regulation.
8.2 The Seller, despite its proven negligence, shall not be responsible for, and the Purchaser will indemnify and defend Seller for claims for, any damage to people or property caused by the Products.

Art.9. Force majeure and hardship:
9.1 Each party shall be excused from performing any of its obligations under these general conditions of sale for a period no longer than 45 days due to the following circumstances: commercial disputes, events of Force Majeure, such as wars (both declared and undeclared), fires, general military mobilisations, insurrections, seizures, requisitions, energy use restrictions, transport disturbances strikes, lock out, stop of production due to technical causes, delays and defects in the delivery by suppliers and any other events which could not reasonably be expected, avoided and overcome. If the event of force majeure that lasts for more than 45 days, the other party shall be authorized to terminate the contract notifying the party facing this hindrance of such termination by means of registered letter with return receipt. This latter part will not be obliged to compensate any damage in this case.
9.2 If the Seller's performance of its obligations becomes excessively burdensome as to modify the contract for more than 20% (twenty percent), the Seller shall have the right to, at its option, demand the modification of the contractual conditions or, to terminate the contract.

Art. 10 – Miscellaneous:
10.1 The Seller has the right to suspend its performance, in the event of a change in the financial or operating conditions of the Purchaser that make Seller think that the Purchaser will not fulfill its payment obligations. In such cases, the Purchaser, on Seller's written request, will pay the purchase price in before Seller commences or continues its performance to supply the Contractual Products or, alternatively, will supply adequate guarantees of the performance (for example, bank warranty or bank insurance). Failing the advance payment or any proper guarantee, the Seller has the right to withdraw from the contract through a written communication to Purchaser by registered letter with return receipt. If the Purchaser is subject to bankruptcy procedures, the Seller may suspend its performance by written communication.
10.2 The Purchaser is fully responsible for keeping the Seller protected against any breach of third parties' rights, including intellectual property rights, deriving from the order being performed by the Seller.

Art.11 Arbitration and Applicable Law:

11.1 Any dispute relating to or in connection with the contracts governed by the present general conditions of sale, whether contractual or in tort, shall be finally settled under the Rules and Arbitration of the International Chamber of Commerce of Paris by one arbitrator appointed in accordance with the said Rules. Place of Arbitration shall be Geneva. Language of Arbitration shall be English. The contracts governed by the present general conditions of sale shall be interpreted in accordance with Italian law.

9.2 General Conditions of Guarantee

The Thermoplay S.p.A. warranty on products manufactured by it has the following duration, starting from the delivery date:

Definition of warranty period
5 years: For Hot Half supplies complete with Thermoplay controller, the warranty is intended for controller, manifolds and relevant shaped resistors. All thermocouples and nozzle resistors, manifold thermocouples fuses, ssrs, and controller lamps are excluded from warranty.
3 years: For manifold supplies and relevant shaped resistors.
2 years: For temperature controller supplies. Fuses, ssrs and lamps are excluded from control unit warranty.
1 year: All the other products.

The warranty does not apply in the following cases:
- If the Purchaser decides to directly repair the product or to involve third parties in repair activities, without written approval from Thermoplay S.p.A.;
- If the Purchaser does not operate and/or keep the Thermoplay S.p.A. product following the prescriptions provided by the instruction manual or the instructions indicated on catalogues;
- If the defect is related to a Thermoplay S.p.A. project developed upon specific Purchaser instructions;
- If the product is no longer identifiable;
- If the Purchaser does not comply with technical rules, technical standards, or laws or regulations, or it does not inform Thermoplay S.p.A. about the failure;
- If the Purchaser treats the product with corrosive agents, such as, for example, abrasive /aggressive resins; or
- If the defect is caused by short circuits due to an abnormal electrical power supply or to a power voltage subject to excessive fluctuation.

The warranty claim shall comply with the following procedure:
- The Purchaser must notify Thermoplay S.p.A. in writing with all relevant details regarding the alleged defects within eight (8) days from their occurrence; provided, that if the defect causes damages, then the notification must be given within 24 hours from the occurrence. If the Purchaser fails to comply with these procedures, then it loses all rights to have the defect remedied.
- Upon receipt of the above mentioned written notification, and if it is determined that the defect is the result of defective material or to a manufacturing error attributable to Thermoplay S.p.A., then Thermoplay S.p.A. shall, at its option, either replace or repair the defective products at its expense. Thermoplay S.p.A. may ask for the defective products to be returned at the Purchaser's expense, which products will become the property of Thermoplay S.p.A.
- If it is determined that the defect appears to not fall under Thermoplay S.p.A.'s responsibility, then the repair or replacement costs will be charged to and will be the responsibility of the Purchaser, including all shipment expenses.

All warranty repairs will be carried out exclusively at the Thermoplay S.p.A manufacturing plant. Possible costs due to technician allowances will be counted by Thermoplay S.p.A. and shall be paid by the customer.
This warranty supersedes and replaces any other legal guarantee with respect to the products, including due to defects and non-compliances, whether express or implied, and it excludes any other Thermoplay S.p.A. responsibility, in particular for direct or indirect damages, including for example transportation costs, loss of use, loss of profits or revenues, and loss of contract.

Issued document in date 04/04/2024