**ISX**

**Machine diagram / Overview**

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# **ISX MACHINE VARIANTS**

The machine can be made with different number of sections. The number of sections is mostly even and ranges from four (ISX4) to twelve (ISX12).

According to the request, the machine is modified to a one-drop, two-drop, three-drop, four-drop or five-drop (GOBs) production regime. This is the number of batches of glass (drops respectively GOBs) simultaneously processed in one section of the ISX machine.

Among manufacturers and machine operators, the following designation of sections and moulds has been established and is used worldwide.

The number for each of the IS section of the machine is always assigned in ascending order from the left to the right side when looking at the machine from the end side (from the conveyor). Numbers of sections are indicated in Arabic numerals.

According to the direction of the conveyor, we divide the versions of the IS machine into a left-hand version and a right-hand version. The left variant has the direction of movement of the products on the conveyor to the left when looking at the machine from the end side. The right variant has the direction of movement of the products to the right.

Front (blank) mould designations are alphabetically from nearest to farthest mould when looking at the section from the front side. The designation of final moulds or Blow Moulds is identical, but we look at the section from the final side (Blow Mould side).



Figure 1 - ISX machine - left variant



Figure 2 - ISX machine - right variant

# **MECHANISMS AND NOMENCLATURE OF AN ISX MACHINE SECTION**



Figure 3 - Mechanisms of the ISX machine section

List of mechanisms of the section

1. Plunger mechanism
2. Blank moulds + mechanism for closing blank side MOC
3. Baffle head mechanism
4. Inverting mechanism (invert mechanism)
5. Neckring mechanism
6. Neckrings
7. Blow moulds + closing mechanism of blow mould side MOC
8. Bottom mechanism
9. Blow head mechanism
10. Takeout mechanism
11. Dead plate
12. Pusher mechanism (pusher)
13. Conveyor
14. Valve block (module) of the section
15. Valve block (module) of the beam
16. Valve block (module) in the front platform
17. Vacuum valve block (module)
18. Conveyor valve block (module)

Nomenclature of the (machine) section:

* Front side (blank side)
* Final side (blow side)
* Left side
* Right side

# **TECHNOLOGICAL PROCESS OF PRODUCTION**

The shaping (moulding) of products is carried out by three basic technological processes. The oldest process is called double-blowing (“BB” in English) and it is mainly used for bottles up to a mouth diameter of 48 mm. Another process is called press-blowing (“PB” in English) and it is used for glass cups. The youngest process is called “narrow-neck press-blowing” (“ÚHLF” in Czech respectively “NNPB” in English) and it is used for bottles similarly as in the double-blowing method, but with the possibility of producing lightweight products thanks to the guaranteed more even thickness of the product walls. In principle, all other production processes are always based on these three basic processes supplemented by other functions, e.g. vacuum assistance in the blank mould, etc.



Figure 4 - Preform piece and product for the BB, NNPB and PB processes

**BB moulding process**

A molten glass drop (GOB) falls into the closed blank moulds. The baffle head partially fits on the top of the blank moulds and blows the drop down to the neck to form the neck of the bottle. Then the baffle head moves down and fully closes the upper part of the blank mould and the parison (preform) piece is blown. Blank moulds and neckring moulds are continuously cooled.

The baffle head moves to the waiting position and the blank moulds open. The invert mechanism transfers the parisons from the blank moulds to the blow moulds, where by opening the neckring moulds it releases the parisons and returns back to the blank moulds.

The blow head moves onto the blow moulds and the bottle is shaped by final blowing and vacuum. After the moulding is finished, the blow head moves to the waiting position and a takeout mechanism arrives at the blow moulds, which grabs the bottles by the necks and passes them to the dead plate, from where the products are moved to the conveyor belt via the pusher mechanism.



Figure 5 - BB moulding process

**NNPB moulding process**

A molten glass drop (GOB) falls into the closed blank moulds onto the plunger in the filling position. The baffle head closes the upper part of the blank mould and the plunger is used to press an opening into the parison (preform). Then the plunger moves to the down position. The blank moulds, the neckring moulds and the plunger are continuously cooled.

The baffle head moves to the waiting position and the blank moulds open. The invert mechanism transfers the parisons from the blank moulds to the blow moulds, where by opening the neckring moulds it releases the parisons and returns back to the blank moulds.

The blow head sits onto the blow moulds and the product is shaped by final blowing and vacuum. After the moulding is finished, the blow head moves to the waiting position and a takeout mechanism arrives at the blow moulds, which grabs the products by the necks and passes them to the dead plate, where the products are moved to the conveyor belt via the pusher mechanism.



Figure 6 - NNPB moulding process

**PB moulding process**

A molten glass GOB is delivered into the closed blank moulds onto the Plunger in the filling position. The baffle head closes the upper part of the blank mould and the plunger is used to press an opening into the glass GOB. Then the Plunger moves to its down position. The blank moulds, the neckring moulds and the Plunger are continuously cooled.

The baffle head moves away to the waiting position and the blank moulds open. The inverting mechanism transfers the parison (semi finished jar) pieces from the blank moulds to the blow moulds, where by opening the neckring moulds it releases the parisons and returns back to the blank moulds.

The blow head moves onto the blow moulds and the product is shaped by final blowing and vacuum. After the moulding is finished, the blow head moves to the waiting position and a takeout mechanism arrives at the blow moulds, which grabs the jars by the necks and passes them to the dead plate, where the jars are moved to the conveyor belt via the Pusher (Sweep Out) mechanism.



Figure 7 - PB moulding process

# **SECTION TIMING**

The production cycle of the machine is defined in angle degrees. Each cycle is divided into 360°. This unit of control and measuring was created historically. The timing of the machine was ensured by a rotating cylinder, which had thumbs located around the circumference, which switched the control valves of the mechanisms. One rotation of the cylinder corresponded to a production cycle, and the position of the control thumbs was defined in the range of 0° to 360°. This control unit has been preserved even today, when the machine is controlled electronically.

Figure 8 - Timing of an ISX section