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All about Pre-filled Syringe Systems Training Course

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Fill and Finish

Filling System Technologies



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Voices of our customers

I don't know which product we are going to fill.

We only have experience with piston pumps.

I would like to have the possibility to use disposables.

I want to be flexible in the future.

I don't like trolleys besides the machine.

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Overview of Bosch Filling Systems


- Rotary valve piston pumps
- Peristaltic pumps
- Time pressure filling system
- Mass flow filling system
- Rolling diaphragm pumps
- Combi filling station



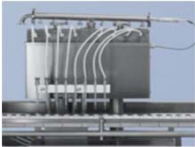
Rolling Diaphragm Pumps




Peristaltic Pumps




Piston Pumps



Time Pressure



Mass Flow




Combi Filling Station

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Rotary Valve Piston Pump Filling System


- Pumps available in either Stainless Steel or Ceramic
- Ceramic pumps fit in same pump stations as Stainless Steel



- Made of Al₂O₃ (99.7%) or ZrO₂
- High wear resistance
- Chemical resistance in acid and alkaline range




- Made of 316 L stainless steel
- Parts are manufactured from one piece, no welded seams
- Electropolished



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Rotary Valve Piston Pump Filling System

Benefits

- Accurate, repeatable fill volumes, also at high speed
- Most popular pump type, very well known
- No seals
- Simple assembly
- Easy to clean and sterilize


Points to consider

- Crystallising products
- Longer CIP/SIP cycle time than TPF (more steel)
- Not applicable for high temperature filling >35°C




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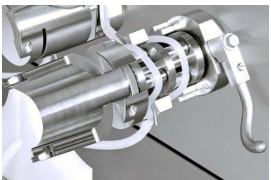


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Peristaltic Pumps Filling System

- Pump tubing (two parallel hoses) is compressed for product flow
- Pump tubing is a closed system from product supply up to the filling needle
- Accuracy is maintained between range of 0.5% to 1.5% of nominal fill volume, depending on tubing size and speed
- Two sizes available (up to 30ml, up to 500ml)
- Preferred solutions for single use applications







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Peristaltic Pumps Filling System


Benefits	Limitations
<ul style="list-style-type: none"> • First choice for shear sensitive products (protein) • First choice for single-use-filling systems • Easy handling (one hand operation) • Tubing is the only size part • Closed system 	<ul style="list-style-type: none"> • Viscous products



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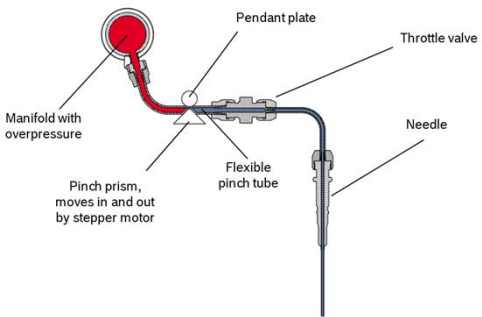
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Time Pressure Filling System

- Product path from manifold to container



Manifold with overpressure


Pinch prism, moves in and out by stepper motor

Pendant plate

Flexible pinch tube

Throttle valve


Needle



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Time Pressure Filling System

Benefits	Limitations
<ul style="list-style-type: none"> • Easy size changeover • Very simple mechanical set-up • Easy cleaning • Closed system • No problems with crystallising products • CIP/SIP handling, faster cycle 	<ul style="list-style-type: none"> • Accuracy if product viscosity is highly dependent on temperature • Oily products • Control system needs educated staff

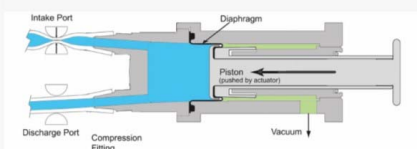
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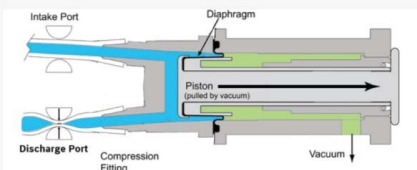

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Rolling Diaphragm Pump Filling System


Exhaust Stroke



Intake Stroke









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Rolling Diaphragm Pump Filling System


Benefits	Limitations
<ul style="list-style-type: none"> Accurate, repeatable fill volumes Low shear forces to product Easy to clean and sterilize Closed system Available in single-use version 	<ul style="list-style-type: none"> More parts to assemble No CIP/SIP Higher viscous products





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Filling System Comparison


		PRODUCT PROPERTIES							
		Similar to water	High viscosity	Protein / Biotech	Sus-pension	Warm / Cold filling	Crystallizing / Sugar containing	Minimum product loss	Repro-ducibility / Speed
FILLING SYSTEM	Piston Pump	++	++	0	0	0	0	0	++
	Peristaltic Pump	++	0	++	+	0	+	+	+
	Time Pressure	++	-	++	++	0	++	++	+
	Mass Flow Metering	++	0	+	0	++	+	0	+
	Rolling Diaphragm Pump	++	0	+	0	0	+	0	+

- not possible / not reasonable
 0 possible with restrictions
 + possible solution
 ++ preferred solution




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PreVAS – Single-Use Filling System

- Available for
 - peristaltic pump (fully validated)
 - RDP
- No cleaning and sterilizing validation necessary
- Low risk of cross-contamination
- Lower waste volume at end of production
- No / less aseptic connections necessary
- Complete Validation Guide with information about
 - sterility
 - leachable / extractables
 - particles
 - Shelf life testing
 - filling performance and accuracy





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Combi Filling Station “Performance”



Rotary valve piston pump



Peristaltic pump




Rolling diaphragm pump



Time-pressure-filling





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Filling Laboratory – Content of typical test protocol

- Customer name
- Product name
- Filling Volume
- Filling size parts (needle, tubing, ...)
- Output
- Design of filling system and product header
- Parameters of filling system (e.g. speed of peristaltic pump, acceleration)
- Parameters of filling needle movement

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Fill and Finish

Stopper Insertion Principles



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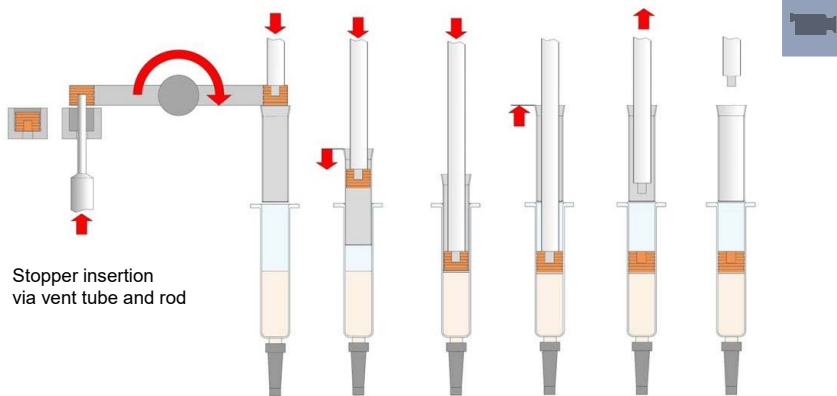
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Stopper insertion principles



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Stopper insertion principles

Stopper insertion via vent tube and rod + gassing

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Stopper insertion principles

Stopper insertion by vacuum

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Stopper insertion principles

Stopper insertion by vacuum + gassing

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Stopper insertion principles

Stopper insertion by vacuum + fractional gassing

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Vacuum filling / stoppering

Animation Video



Pump station, reinforced for vacuum filling

Rods for stoppering

Filling needles

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Detailed description: This slide shows a photograph of a pharmaceutical filling machine. The machine is a complex assembly of stainless steel components. On the left, there is a large cylindrical pump station. A series of white Teflon hoses are connected to the machine. In the center, there are vertical rods used for stoppering. On the right, there are filling needles. The machine is processing syringes on a transport carrier. The background is a clean, industrial environment.

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Vacuum filling / stoppering



Teflon hoses for filling hyaluron acid

Suction cups (silicone) for sealing the syringes, combined for filling and stoppering

Transport carriers

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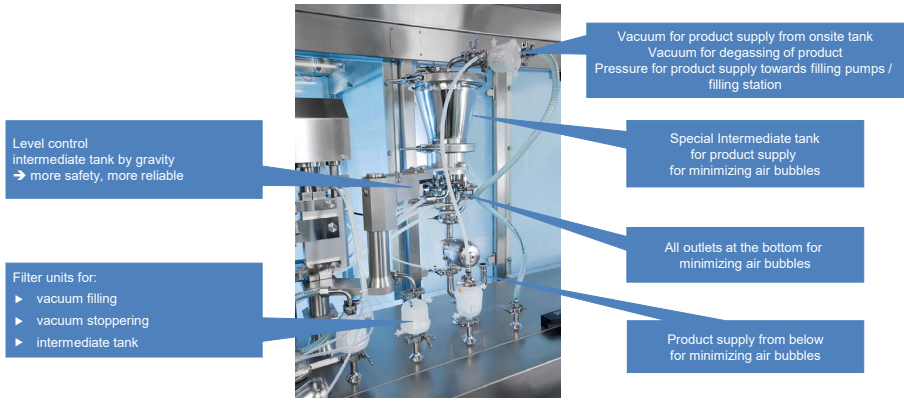
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Detailed description: This slide provides a closer view of the machine's internal components. It highlights the Teflon hoses used for filling hyaluron acid. It also shows the suction cups (silicone) used for sealing the syringes, which are combined for both filling and stoppering. The transport carriers are visible at the bottom of the machine, holding the syringes. The machine is a complex assembly of stainless steel components.



Vacuum filling / stoppering



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