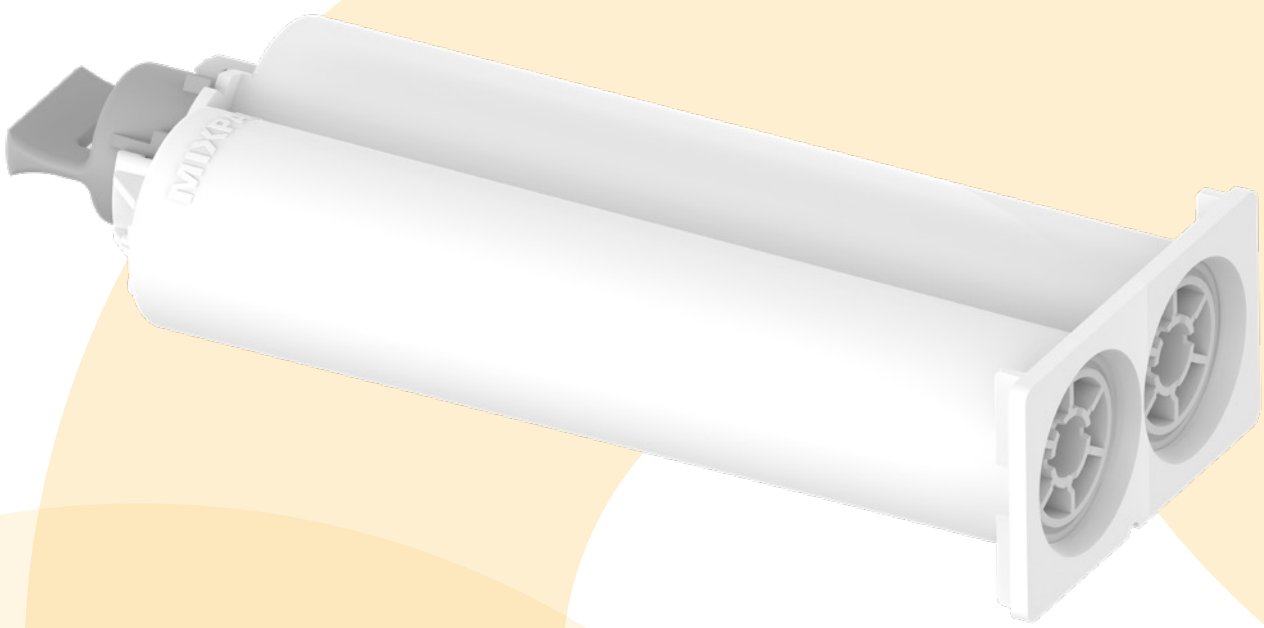
MIXPAC™
Multi Component Cartridge Systems
50 to 75mL



FILLING GUIDELINE
VERSION 1.2

medmix

INDUSTRY

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1 General

1.1 SCOPE OF CONTENT

This document is intended as a general guideline for the process of filling and piston insertion. The information within provides a solid foundation to achieve high quality results. The guideline is applicable to manual operation as well as automated filling lines but the result of the filling process must in either case be verified by the customer (storage and application).

medmix provides the system. The receiving party shall be responsible and liable for the usage of the system and the materials applied therewith .

NOTE

In case of system compatibility issues, please do not hesitate to contact your local Sales Manager.

We are grateful for any improvements suggestions and all constructive comments.

1.2 SYSTEM NAME

MIXPAC™ Multi Component Cartridge Systems 50 to 75 mL

1.3 SYSTEM PROVIDER

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E-Mail: sales.industry@medmix.com
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1.4 TERMINOLOGY

The following terms are used in this filling guideline:

Multicomponent Cartridge System; Cartridge with standard flange or BS flange, cap, lip seal pistons, piston insertion tool (PIDQ); piston insertion plate, insertion plunger, filling mandrel, filling nozzle, filling (material filled into the cartridge), filling adapter (front fill)

1.5 SYMBOLS

Please observe the meaning of the following symbols:

CAUTION
Topic Please be aware of possible system failure if instructions are not followed.

NOTE
Additional information for specific application

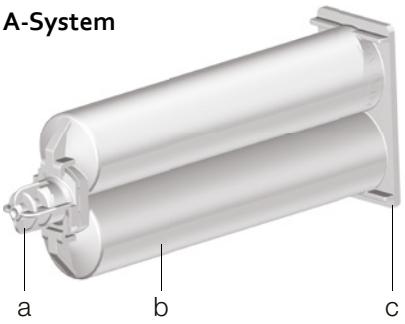
2 System Overview

The B-System consist of a cartridge body, cap and appropriate pistons for the A- and B-side. The cartridges are available in Polypropylene (PP), Polyamide (PA) or Polybutylene terephthalate (PBT).

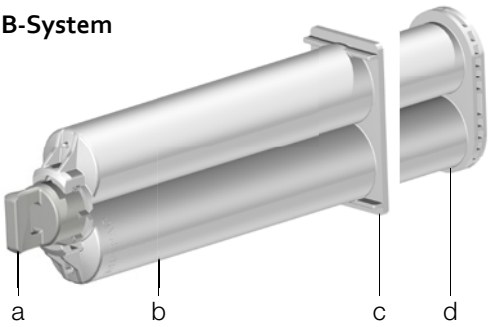
The cartridge systems also feature:

- Separated outlets (B-System)
- Full range of available mixers
- Fits into industry standard 50 mL medmix dispensing tools
  *except BS-flange, where special dispensers are available
- Sturdy one-piece design cartridge
- Vented pistons
- Retention feature (B-System)

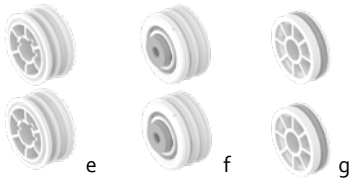
A-System



B-System



a) Cap
b) Cartridge Body
c) Standard Flange
d) BS Flange
e) AirFT Piston (vented)
f) MIXPAC Piston (vented)
g) Solid Piston (closed)



NOTE

Please refer to the medmix product catalog for detailed information or contact your local Sales Manager for support in choosing the right system for your application.

* see chapter 12

3 Basic Cartridge Filling Techniques

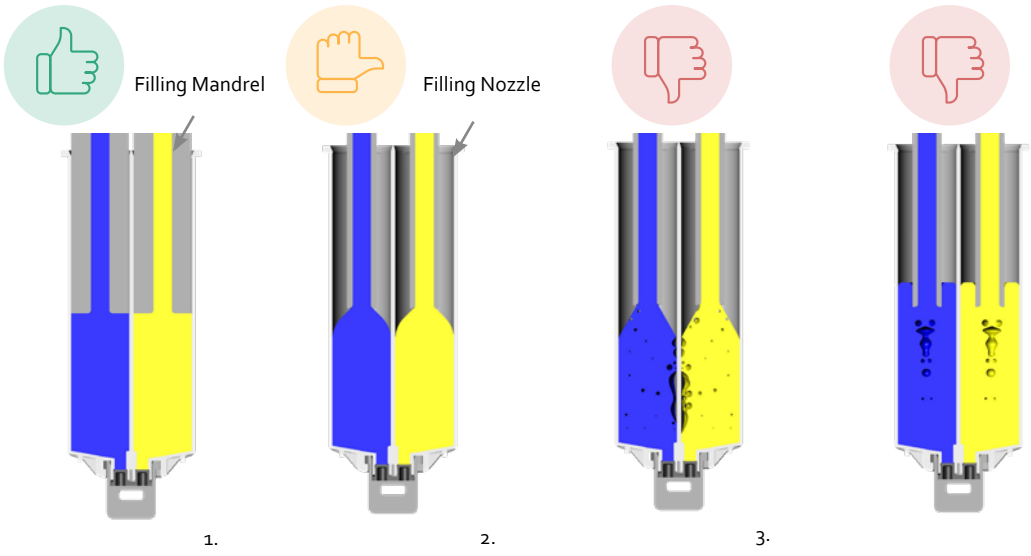
Air trapped within the cartridge system can drastically degrade the performance of the adhesive.

The air inhibits the ability of the cartridge to meter the A- and B-side materials accurately because the air behaves like a shock absorber leading to a few problems; lead lag issues, poor mixing in the static mixer, and cross contamination.

The difficulty inherent with filling a cartridge air free can be mitigated by using sound techniques and properly designed equipment. Some basic techniques and/or ideas are shown below.

CAUTION

Entrapped Air
Air trapped within the cartridge system can affect the performance of the adhesive.



1. A properly made filling mandrel fits tightly to the inner diameter of the cartridge and provides the most effective means of filling. It allows a small amount of air to escape from the side. The material is pumped through the mandrel and the cartridge is pushed off the mandrel. In this scenario it is easy to add a limit switch to control the filling height. Additionally, it takes the control away from the operator as you will see in scenarios below.
2. Using a standard size filling nozzle is OK but is not as reliable as the situation found using a filling mandrel. The speed at which the filling nozzle is removed must be timed with the flow rate to minimize the risk of air entrapment. This setup works best if one is using a premeasured shot based system to fill the cartridge.
3. In this scenario the filling nozzle is moving faster than the material is deposited. It often leads to a large air bubble trapped towards the wall of the cartridge tube. With lower viscosity materials this scenario will create many very small bubbles as the fluid entering the chamber is very turbulent and entraps air.
4. In this scenario the filling nozzle is moving slower than the material is deposited. The material engulfs the end of the filling nozzle and creates a void as the nozzle is pulled from the cartridge. It often leads to large air bubbles being trapped at the center of the tube.

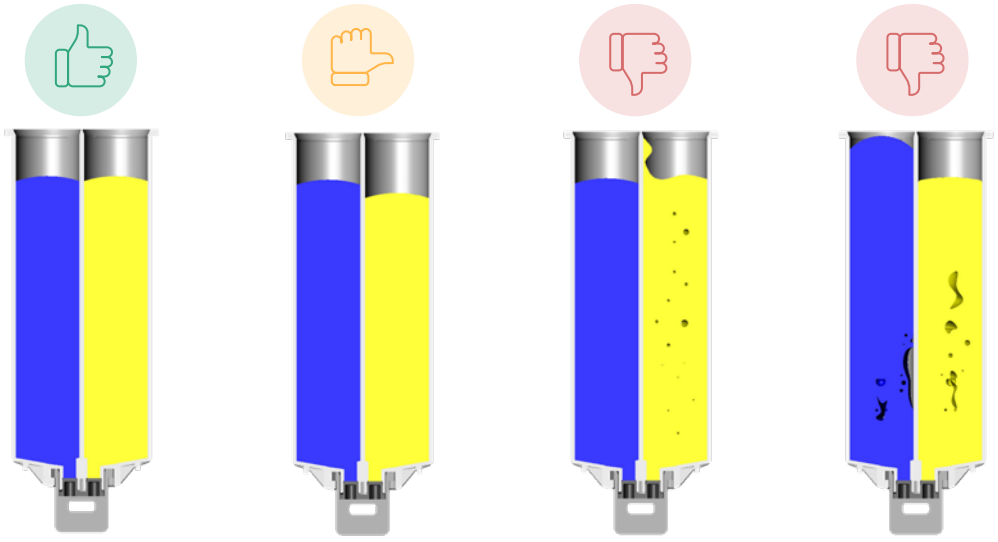
4 Quality of the Fill

It is very important that the A- and B-side materials are filled to equal levels to ensure the proper ratio can be achieved. If the materials are filled to different heights it drastically increases the likelihood of an off-ratio condition, cross contamination, disappointment from an end user, and possibly environmental waste.

Below are some examples of filled cartridges ranging from ideal to poor. These examples are intended to be used as a general guideline to achieve high results with your filling challenges.

CAUTION

Filling Level Equilibrium
Uneven filling levels and/or filling surface might lead to air entrapment at the piston.



1. 2. 3. 4.

1. Both of the filling levels in scenario 1 are equal, there is no air trapped within the material and the profile at the top of both A- and B-sides filling is slightly domed upwards.
2. In this scenario it can be seen that the filling heights are not equal as there is more blue material than yellow. This indicates that the process is neither accurate nor repeatable. It will create a risk for cross contamination and lead lag problems at the start. However, there are no air bubbles trapped in the material and is therefore rated OK.
3. In this scenario the material is littered with small air bubbles that may not collect (dependent on filling viscosity). The presence of the air bubbles will cause metering problems. The filling profile for the yellow side is very poor and material at the upper left edge of the cartridge could inhibit the sealing function of the piston lips. Users are advised to avoid this.
4. In this scenario there are large air bubbles trapped in the cartridge which will cause metering problems. Also, A-side is overfilled which makes it impossible to properly set the piston. Again, this type of scenario will produce poor metering results and should be avoided.

NOTE

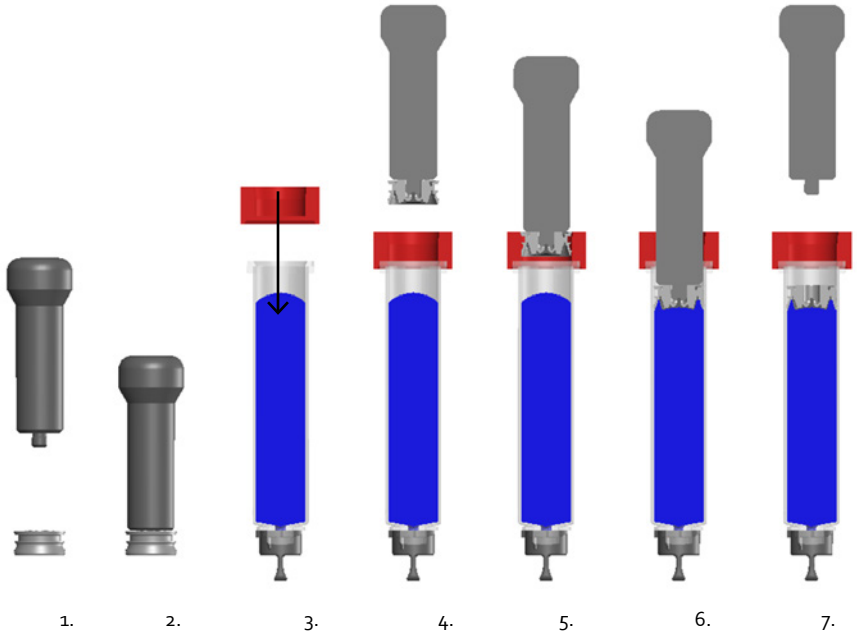
See also separate document
"Multicomponent cartridge system Effects of air inclusions"

5 Inserting Piston with Airfree* Technology (AirFT Piston)

An ideal piston insertion technique will minimize the risk of piston damage and assure that the maximum amount of air can be removed from the system. Some basic techniques and ideas are shown below.

CAUTION

Piston friction
The forces applied to A- and B-side for piston insertion may vary strongly. Pushing the pistons in too strong or fast might damage the sealing features or the venting mechanism.



1. Align piston insertion tool (PIDQ) with piston
2. Pick piston up with PIDQ (exact tooling geometry required)
3. Optionally use a guide plate and preplace the piston at the back of the cartridge
4. Align PIDQ with piston and/or guide with cartridge tube
5. Use a continuous force to push the piston into the cartridge tube. The insertion force/ piston friction is highly dependent on the cartridge tube diameter and material. The force at initial insertion might be elevated due to piston retention features at the end of the cartridge (see separate section).
6. A pin on the PIDQ actuates the valve mechanism of the piston and allows air to escape through the piston (self-venting). Upon contact with the filling the valve is closed automatically. Be careful not to push too hard or long as it is possible to push filling material out through the venting mechanism (valve).
7. Remove the PIDQ from the cartridge. No filling should be found at the back of the piston or on the pin. The right geometry of the valve actuation pin is crucial

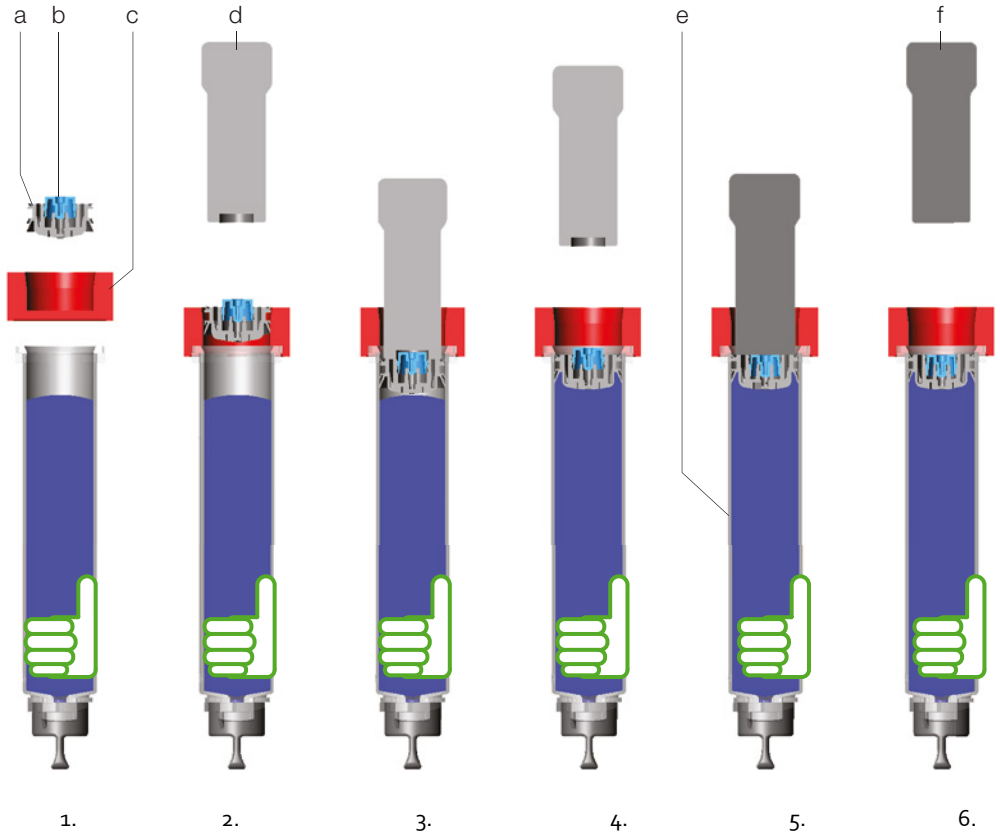
NOTE

Piston insertion tools (PIDQ's) are available at medmix. Please refer to the system drawing to identify the right tool geometry for your system in use

* see chapter 12

6 Inserting MIXPAC Piston

Below is a representation of an ideal piston insertion technique for MIXPAC pistons. Compared to the latest generation these pistons require a two-step process of setting the piston onto the filling and subsequent closing of the venting plug.



a) Piston
b) Venting Plug
c) Piston Insertion Plate
d) Piston Insertion Tool
e) Cartridge
f) Venting Plug Closure Tool

1. Install cartridge into a properly designed guide block and then place piston into said block so that the blue plug is up.
2. The piston should fit down into the block and be square with the cartridge.
3. Press the piston into the cartridge with a properly designed piston insertion tool (diameter of venting plug caved out). Take care not to close the bleed plug prematurely.
4. Continue pushing the piston insertion tool until all of the air is evacuated from underneath the piston. Care must be taken not to force material out through the bleed valve during this operation.
5. Now the venting plug needs to be closed by a second tool (covers full area of piston backside). Care must be taken not to force material out through the venting valve during this operation.
6. The plunger is removed. A well designed process should not show any filling on the backside of the piston after the setting process.

7 Inserting Solid Piston

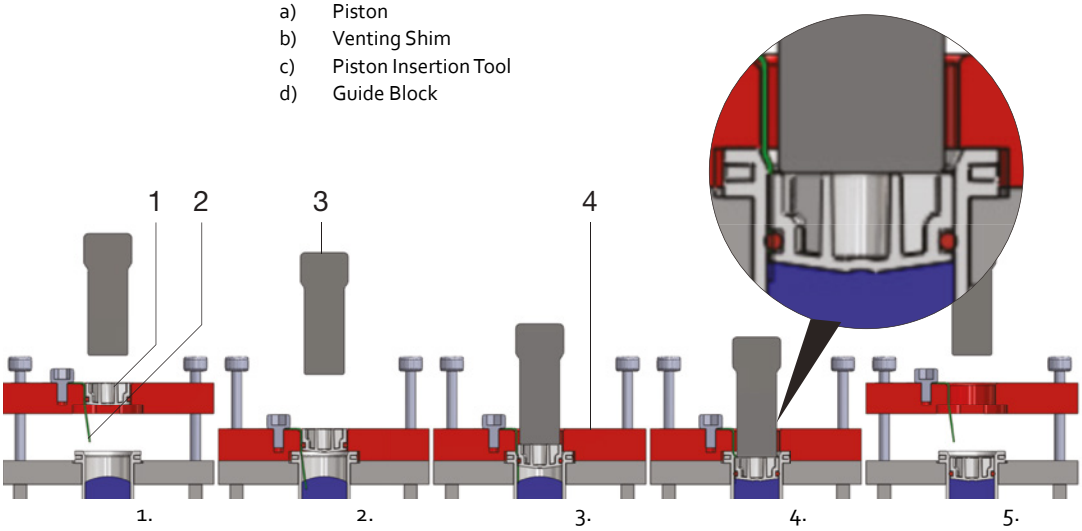
50 to 75 mL cartridge systems can be filled from the front as well from the back. Influencing factors are piston design, filling media viscosity as well as process capabilities/ degree of automation. In each case it must be ensured to fully evacuate the air trapped between the piston and the filling.

The sections below lists the factors to be considered for an air-free filling process, without contaminating and/or damaging the sealing features. The illustrations show a generic multicomponent system 50 mL cartridge system.

CAUTION

Sealing features
Damage to or contamination of the sealing features will subsequently lead to leakage during transportation or storage of the filled cartridges and/or system failure upon usage.

a) Piston
b) Venting Shim
c) Piston Insertion Tool
d) Guide Block



1. Install cartridge into a properly designed guide block and then place piston into said block so that it's rib structure can be seen from the top. The piston should fit down into the block and be square with the cartridge.
2. The guide block will press down onto the cartridge clamping it into place. Additionally, a venting shim will be guided into the cartridge. The shim must be thin, with no edges and burrs.
3. Push the insertion plunger down forcing the piston into the cartridge.
4. Carefully keep pushing the plunger until all of the air is evacuated. No material should leak along the shim.
5. The PIDQ returns back to the home position. The guide block also returns and pulls the venting shim from between the cartridge and the piston.

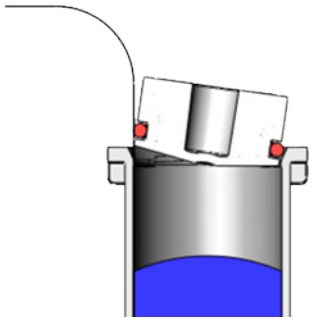
Some highly automated equipment use vacuum technology to evacuate the air below the piston. This makes the use of a shim redundant and eases the process.

NOTE

Please refer to your local Sales representative for the recommendation of filling machine manufacturers.

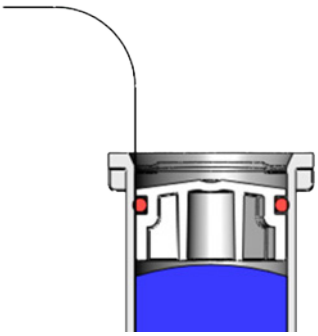
8 Common Piston Insertion Problems

Below are some further examples of common filling scenarios (illustrated with the solid piston) that will be encountered in any organization. Even further below there are explanations of each scenario and how to possibly rectify and/or avoid the situation as they are not ideal.



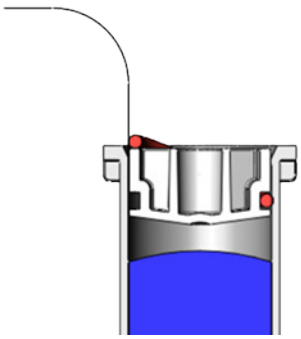
Leaking cartridge

Never try and insert the piston at an angle as it can lead to damage to the sealing features. If the O-ring becomes damaged the cartridge will likely leak either in storage or during dispensing. It is always best to use a guide block and/or setting device.



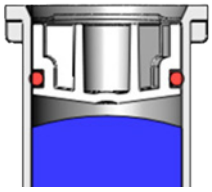
Piston not functioning correctly

The piston in this scenario is upside down. The piston will not function correctly if oriented in this direction. The correct orientation can be identified by checking for the pistons rib structure.



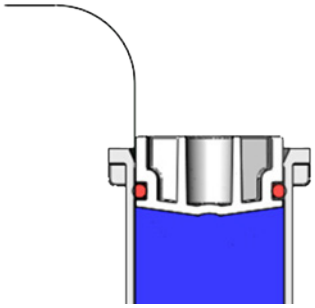
O-ring disengages from original groove

The O-ring has rolled out of the original groove during insertion. Normally this will result in a leak. The piston should be removed and replaced with a new one.



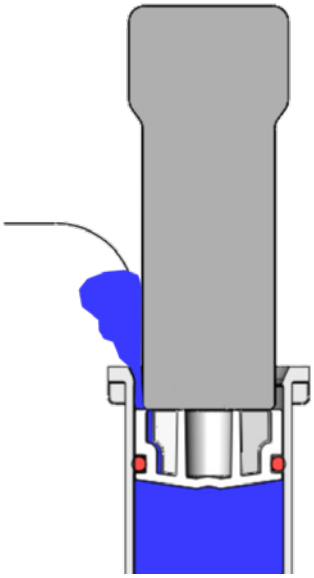
Air is not able to escape

This scenario shows that the piston has been inserted into the cartridge such that not all air was allowed to escape from underneath the piston. This cartridge will likely not meter accurately leading to poor performance of the adhesive. See also separate document "Multicomponent systems - Effects of air inclusion"



Overfilling cartridge

Do not overfill the cartridge as it may leak and/or not fit into the dispensing tool.



Filling material leakage beyond the O-ring seal

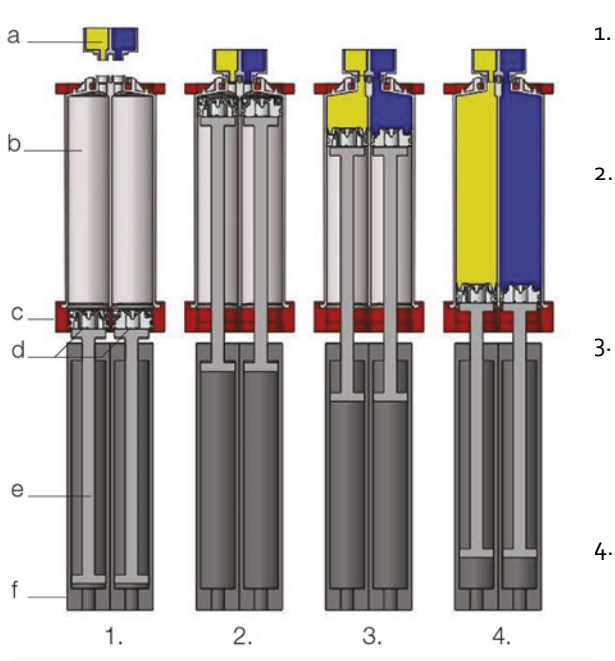
In this scenario the plunger pushes too long and/or with too much force on the material such that it pushes up beyond the O-ring seal. Some fillings will tolerate small amounts of material getting past the seal but others will not.

9 Front Filling

Due to the confined space inside the tubes (e.g. 10to1 ratio) or for low viscous fillings, front filling may be a more viable technology. Below is a representation of a well-designed front filling process.

CAUTION

Piston friction
The forces applied to A- and B-side for insertion may vary. Pushing the pistons in too fast might damage the sealing features

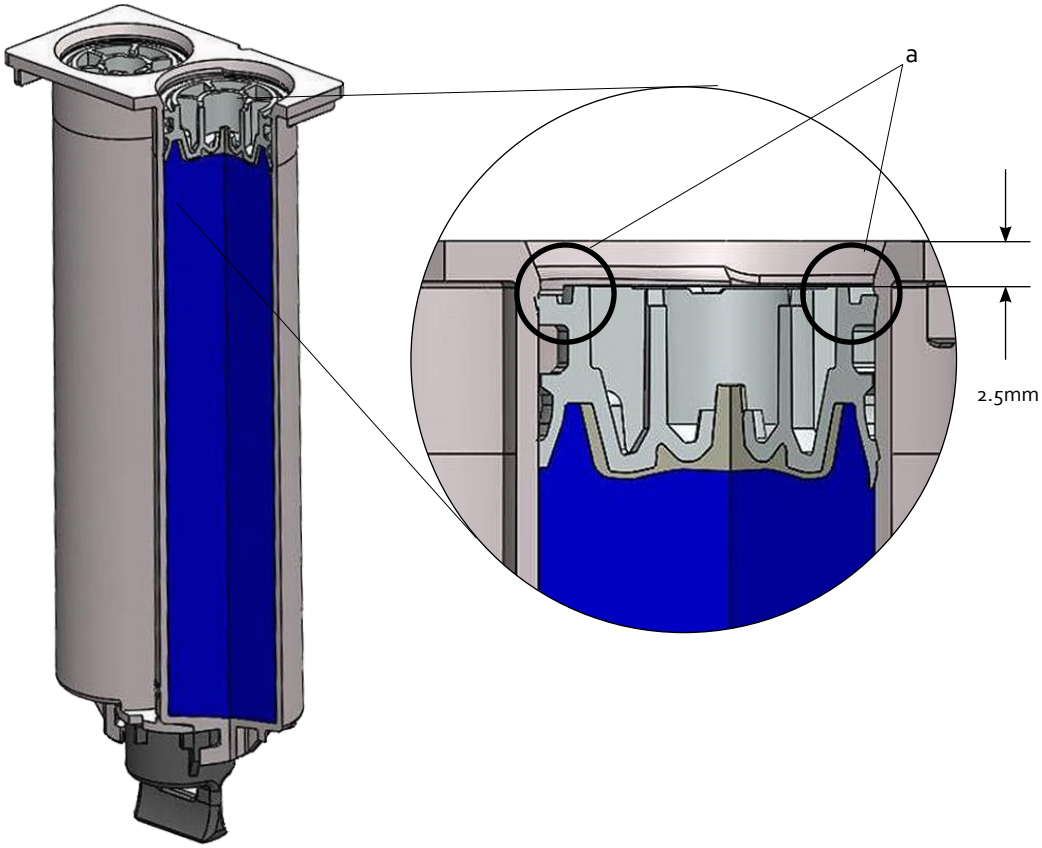


1. The cartridge is held securely in place with an appropriate alignment fixture. The pistons are carefully placed in the guide plate and the cycle is initiated.
2. The pistons are driven with the plungers to the front of the cartridge tubes. At the bottom the blue piston plugs are closed with pin cylinders or equivalent. Alternatively a solid piston can be used.
3. The materials are then forced into the A and B cartridge chambers. A small amount of back pressure is applied to the pistons using the A and B Side cylinders (e.g. 20N). The material forces the A and B plungers back towards the home position.
4. The cartridge is now full. The filling volume should be limited with a dosing pump or some type of limit switch. The cartridge is removed and the cap is installed.

a) Filling Adapter (Front Fill)
b) Cartridge
c) Guide Plate
d) Pistons
e) Plunger
f) Air Cylinder

10 Piston Retention

The B-system cartridge has an integral piston retention feature that prevents the pistons from becoming dislodged during transportation, and storage. Please check and verify it's functionality by physical testing against the applicable specifications for transport and storage security for the filling.



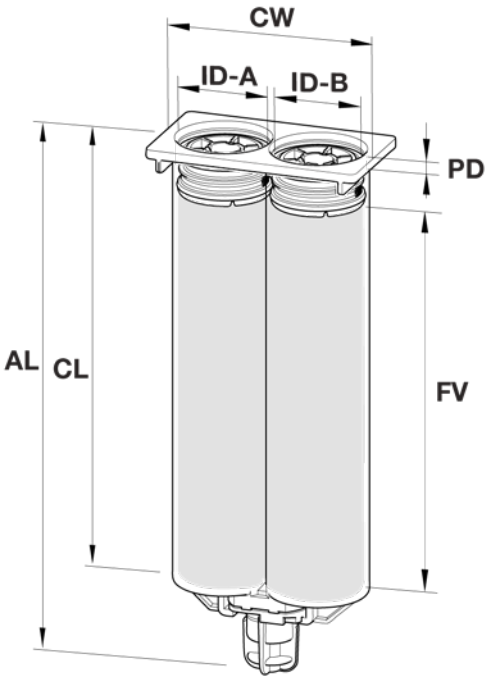
a) Built in retention feature

NOTE

In order to achieve the maximum benefit of the piston retention feature the piston must have a minimum depth shown above

11 Filling Volume

11.1 A-SYSTEM



AL	Assembly length
CL	Cartridge length
CW	Cartridge width
ID-A	Inner diameter A-side
ID-B	Inner diameter B-side
PD	Piston depth
FV max**	Filling volume

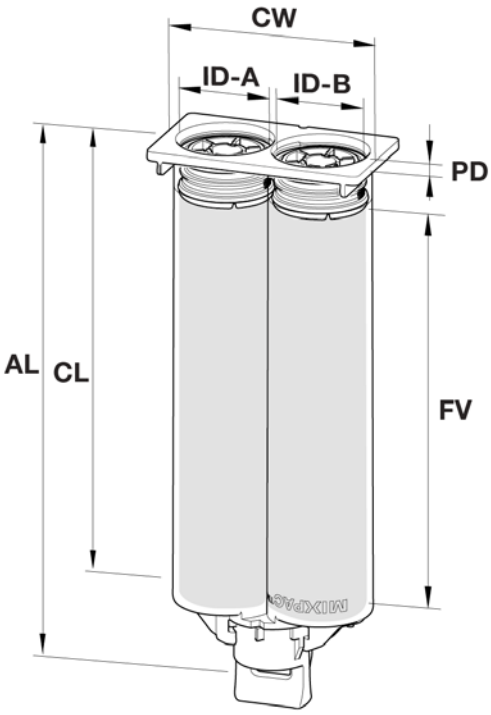
Size [mL]	Ratio	AL [mm]	CL [mm]	CW [mm]	ID-A [mm]	ID-B [mm]	PD	FV max** [mL]		
								AirFT Piston	Solid Piston	MIXPAC Piston
50	1:1	115.0	103.2	46.1	19.1	19.1	2.5	49.8	50.5	-
	2:1	116.5	104.7		22.3	15.75		51.7	52.1	-
	4:1		105.7			11.15	1.5	-	44.0	43.4
	10:1				22.4	7.15	2.5	-	39.0	38.2
75	1:1	160.0	148.2		19.1	19.1	1.5	76.2	77.1	-

source: internal data

The dimensional information contained within this table is meant as a guideline. Valid information for the specific system in use (system drawing) can be requested from your local Sales Manager.

** This value indicates the maximum filling volume due to the minimum piston depth required to ensure proper functionality of our systems. Specific data can be requested through your local Sales representative.

11.2 B-SYSTEM



AL	Assembly length
CL	Cartridge length
CW	Cartridge width
ID-A	Inner diameter A-side
ID-B	Inner diameter B-side
PD	Piston depth
FV max**	Filling volume

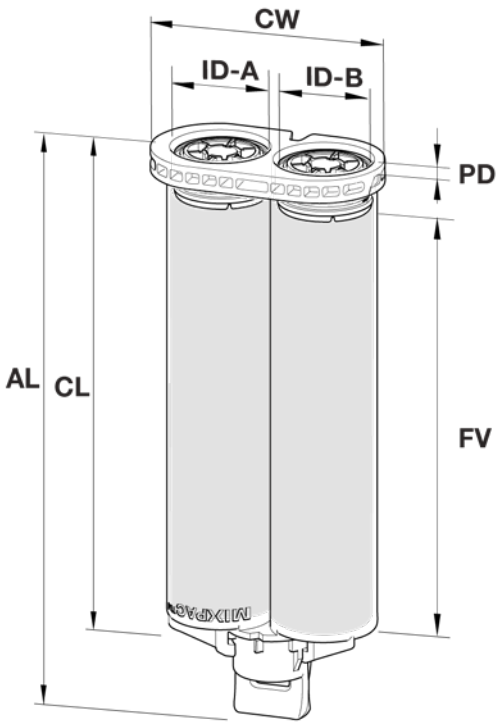
Size [mL]	Ratio	AL [mm]	CL [mm]	CW [mm]	ID-A [mm]	ID-B [mm]	PD [mm]	FV max** [mL]		
								AirFT Piston	Solid Piston	MIXPAC Piston
50	1:1	120.8	107.2	46.1	19.1	19.1	2.5	51.2	-	-
	2:1	119.5	105.9		22.2	15.7		50.9	-	-
	4:1	140.5	126.5			11.1	3.0	-	52.3	52.3
	10:1					7.0		-	46.0	46.0

source: internal data

The dimensional information contained within this table is meant as a guideline. Valid information for the specific system in use (system drawing) can be requested from your local Sales Manager.

** This value indicates the maximum filling volume due to the minimum piston depth required to ensure proper functionality of our systems. Specific data can be requested through your local Sales representative.

11.3 B-SYSTEM, S FLANGE



AL	Assembly length
CL	Cartridge length
CW	Cartridge width
ID-A	Inner diameter A-side
ID-B	Inner diameter B-side
PD	Piston depth
FV max**	Filling volume

Size [mL]	Ratio	AL [mm]	CL [mm]	CW [mm]	ID-A [mm]	ID-B [mm]	PD [mm]	FV max** [mL]		
								AirFT Piston	Solid Piston	MIXPAC Piston
50	1:1	122.6	109.0	49.7	19.1	19.1	2.8	52.0	-	-
	2:1				22.2	15.7	2.5	52.6	-	-
	10:1			46.6	25.9	8.2	3.0	-	51.0	51.6
75	1:1	168.6	155.0	49.7	19.1	19.1		78.4	-	-
	10:1		155.5	46.6	25.9	8.2		-	78.2	78.6

source: internal data

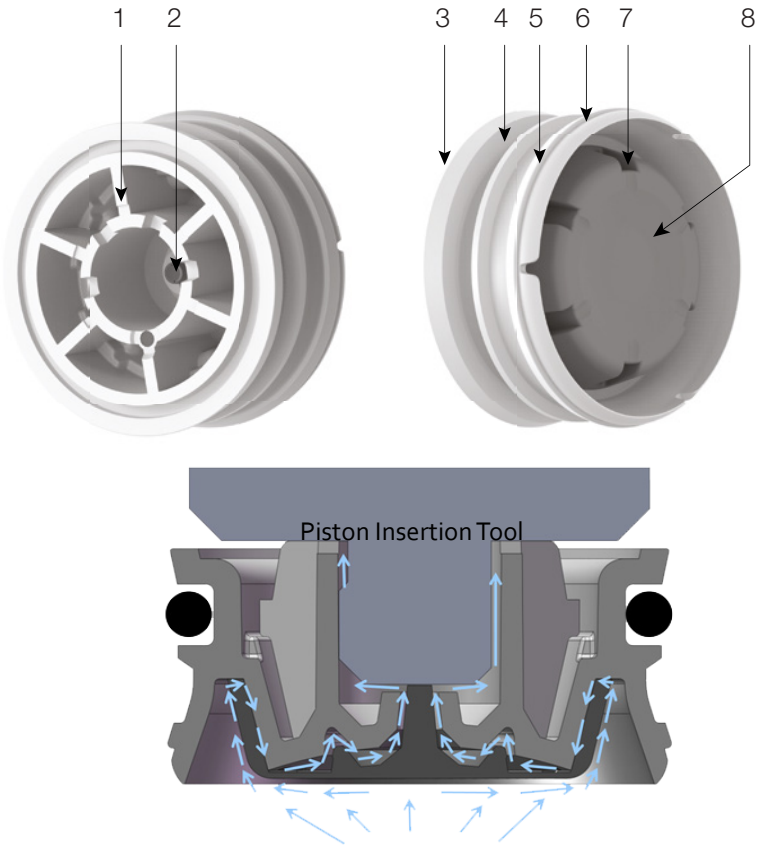
The dimensional information contained within this table is meant as a guideline. Valid information for the specific system in use (system drawing) can be requested from your local Sales Manager.

** This value indicates the maximum filling volume due to the minimum piston depth required to ensure proper functionality of our systems. Specific data can be requested through your local Sales representative.

12 Piston with Airfree* Technology (AirFT Piston)

* The piston is optimally designed to vent air that is entrapped between the piston and fluid. With ideal boundary conditions, air free cartridge filling is possible. In specific applications, venting can be negatively influenced by material rheology, air/gas content of the fluid, filling parameters or filling equipment, environmental conditions, other system components used during the filling process. These and other factors must be verified and optimized for specific applications by the filler.

The AirFT piston allows one-step piston setting. The venting pin is activated by a special tool geometry and allows high venting volumes for quick processing times.



1. Sturdy rib support structure
2. Venting pin remains closed until activated during piston insertion
3. Piston retention flange
4. Optional O-ring groove
5. Sealing lip
6. Self centering geometry
7. Deep venting channels for maximum air removal
8. PBT cover plate for chemical resistance

13 Piston Insertion Tool

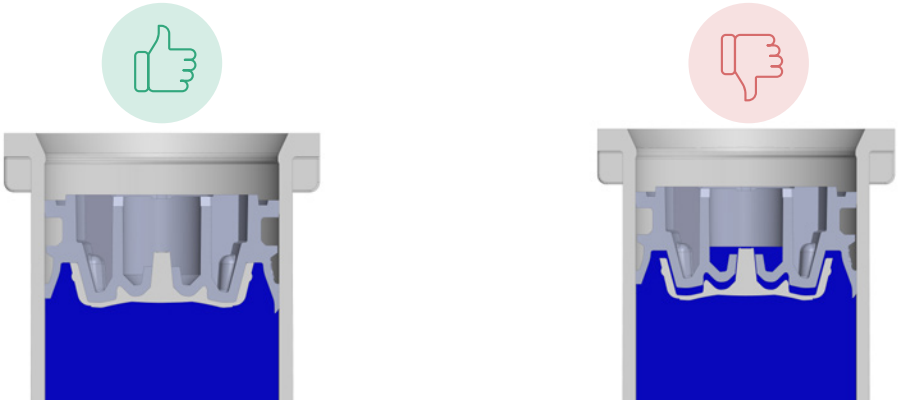
Ideally plunger position, force and idle time are controlled during the setting process. Thereby these parameters can be adapted to different viscosities of the filling media.

The lower the viscosity of the filling media is, the lower the insertion force and shorter the idle time need to be set.

If the setting process doesn't allow the adjustment of the parameters mentioned above, the valve activation can be adjusted instead.

For middle to high viscous media, the maximum valve activation is recommended as it ensures the maximum venting rate and minimizes the risk of air inclusions.

If the media viscosity is low and material is potentially pushed through the venting channel it is recommended to reduce the activation length in steps of 0.1mm until the desired result is achieved – maximum venting speed without material leakage.



Example of a simple PIDQ, where the valve activation is infinitely adjustable



Note: It's not possible to exceed the maximum length of the valve activation as this might damage the piston. Shorten the activation length is directly connected to the venting rate and increases the risk of air inclusions.

See also separate document
"Multicomponent cartridge system Effects of air inclusions"

14 Large Air Inclusions

Air trapped within the cartridge system can drastically reduce the performance of an adhesive. The air inhibits the ability of the cartridge to deliver an accurate ratio between the A- and B-side materials. As the air behaves like a shock absorber, it can cause one or several of the following problems; lead lag issues, poor mixing, cross contamination and hence, potential degradation of the adhesive.

Please refer to the separate info sheet for an illustrated description of the mechanics. The customer has to verify the amount of air entrapped in the system by his filling process as well as the effects of the latter on the mixing quality.

15 Technical Data

The technical data needed for your cartridge system might differ due to filling material specific needs. Please contact your local Sales Manager in order to provide you the necessary information for your application.

16 Applicable Documents

Multicomponent cartridge system Effects of air inclusions.

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All of our MIXPAC cartridges may be recognized by their well-known unique and pleasing visual appearances.

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