



Gama Machinery USA



Master Gun

Service Manual
Ref # NR-00008-ENG

September 1, 2007
Issue 1.1

Gama Machinery USA, Inc.

55 LaFrance Ave
Bloomfield, NJ 07003
Phone: 973-429-5600
Fax: 973-429-5601

Copyright 2007, Gama-USA

<http://www.gama-usa.com>



Before installing the Master Gun and starting it up, carefully read all the technical and safety documentation included in this manual. Pay special attention to the information to know and understand the operation and the conditions of use of the gun. All of the information is aimed at enhancing User Safety and avoiding possible breakdowns derived from the incorrect use of the Gun.



Service Manual

WARRANTY

GARRAF MAQUINARIA, S. A. (hereinafter "GAMA") provides this **LIMITED WARRANTY** (hereinafter "Warranty") to the original purchaser (hereinafter "Customer") covering this equipment and the original GAMA manufactured accessories delivered with the equipment (hereinafter "Product") against defects in material or workmanship of the Product (hereinafter "Defect" or "Defective") for a period of two (2) years from the date of first purchase as shown on the original GAMA invoice (hereinafter "Warranty Period").

If during the Warranty Period under normal use, the Product is suspected by Customer to be Defective in material or workmanship, it is Customer's responsibility to contact GAMA and return the Product to GAMA as directed by GAMA, freight prepaid. If GAMA determines that the Product is Defective and that such Defect is covered by this Warranty, GAMA will credit Customer for the reasonable freight charges incurred by Customer in returning the Defective Product to GAMA, and GAMA (or its authorized agent) will, at GAMA's option, repair or replace the Product, subject to the following:

Original Invoice: The original invoice must be kept as proof of the date of first sale and the Product serial number. The Warranty does not cover any Product if the Original Invoice appears to have been modified or altered, or when the serial number on the Product appears to have been altered or defaced.

Product Maintenance: It is the Customer's responsibility to maintain the Product properly. See your maintenance schedule and owner's manual for details. The Warranty does not cover an improperly maintained Product.

Non-GAMA Components and Accessories: Non-GAMA manufactured components and accessories that are used in the operation of the Product are not covered by this Warranty. Such components and accessories shall be subject to the warranty offered to the Customer, if any, by the original manufacturer of such component or accessory.

Other Warranty Exclusions: The Warranty does not cover any Product that GAMA determines has been damaged or fails to operate properly due to misuse, negligence, abuse, carelessness, neglect, or accident. By way of example only, this includes:

- Normal wear and tear.
- Improper or unauthorized installation, repair, alteration, adjustment or modification of the Product.
- Use of heating devices, pumping equipment, dispensers, or other parts or accessories with the Product that have not been approved or manufactured by GAMA.
- Failure to follow the operating instructions and recommendations provided by GAMA.
- Cosmetic damage.
- Fire, flood, "acts of God," or other contingencies beyond the control of GAMA.

THE WARRANTY DESCRIBED HEREIN IS THE EXCLUSIVE REMEDY FOR THE CUSTOMER AND IS IN LIEU OF ALL OTHER WARRANTIES, EXPRESS, IMPLIED, STATUTORY OR OTHERWISE, AND THE IMPLIED WARRANTIES OF MERCHANTABILITY AND FITNESS FOR A PARTICULAR PURPOSE AND ALL OTHER WARRANTIES ARE HEREBY DISCLAIMED. TO THE FULLEST EXTENT PERMITTED BY LAW, GAMA SHALL NOT BE RESPONSIBLE, WHETHER BASED IN CONTRACT, TORT (INCLUDING, WITHOUT LIMITATION, NEGLIGENCE), WARRANTY OR ANY OTHER LEGAL OR EQUITABLE GROUNDS, FOR ANY CONSEQUENTIAL, INDIRECT, INCIDENTAL, LOST PROFITS, SPECIAL, PUNITIVE OR EXEMPLARY DAMAGES, WHETHER TO PERSON OR PROPERTY, ARISING FROM OR RELATING TO THE PRODUCT, EVEN IF GAMA HAS BEEN ADVISED OF THE POSSIBILITY OF SUCH LOSSES OR DAMAGES.

Non-Warranty Service by GAMA: If GAMA determines that the suspected Defect of the Product is not covered by this Warranty, disposition of the Product will be made pursuant to the terms and conditions of GAMA's written estimate on a time and materials basis.

Continuing Warranty for Products Repaired or Replaced under Warranty: Following the repair or replacement of a Product covered by this Warranty, such Product will continue to be subject to the original Warranty for the remainder of original Warranty Period or for three (3) months from the repair or replacement date, whichever is longer.

No Rights Implied: Nothing in the sale, lease or rental of any Product by GAMA shall be construed to grant any right, interest or license in or under any patent, trademark, copyright, trade secret or other proprietary right or material owned by anyone; nor does GAMA encourage the infringement of same.

Exclusive Warranty: This writing is the final, complete, and exclusive expression of the Warranty covering the Product. Any statements made by GAMA, its employees or agents that differ from the terms of this Warranty shall have no effect. It is expressly understood that Customer's acceptance of this Warranty, by performance or otherwise, is upon and subject solely



Service Manual

to the terms and conditions hereof, and any additional or different terms and conditions proposed or expressed by Customer or anyone, whether in writing or otherwise, are null and void unless specifically agreed to in writing by an Officer of GAMA.



SAFETY AND HANDLING

This chapter contains important information on the safety, handling and use of your **GAMA MASTER** series gun.



Before installing the Master gun and starting it up, carefully read all the technical and safety documentation included in this manual. Pay special attention to the information to know and understand the operation and the conditions of use of the unit. All of the information is aimed at enhancing User Safety and avoiding possible breakdowns derived from the incorrect use of the gun.

WARNING! establishes information to alert on a situation that might cause serious injuries if the instructions are not followed.

PRECAUTION! establishes information that indicates how to avoid damage to the gun or how to avoid a situation that could cause minor injuries.

NOTE is relevant information on a procedure being carried out.

Careful study of this manual will enable the operator to know the characteristics of the gun and the operating procedures. By following the instructions and recommendations contained herein, you will reduce the potential risk of accidents in the installation, use or maintenance of the gun; you will provide a better opportunity for incident-free operation for a longer time, greater output and the possibility of detecting and resolving problems fast and simply.

Keep this Service Manual for future consultation of useful information at all times. If you lose this manual, ask for a new copy from your GAMA local distributor or directly contact Gama Machinery USA, INC.

Important Safety Information

The master gun has been designed and built for the application of polyurea chemical systems, polyurethane foam chemical systems and some two-component epoxy systems.

WARNING: *The design and configuration of the gun do not allow its use in potentially explosive atmospheres or the pressure and temperature limits described in the technical specifications of this manual to be exceeded.*

Always use liquids and solvents that are compatible with the unit. In the event of doubt, consult the **GAMA** technical service.

When working with the gun, it is recommended that the operator wear suitable clothing and elements of personal protection, including, without limitation, gloves, protective goggles, safety footwear and face masks. Use breathing equipment when working with the gun in enclosed spaces or in areas with insufficient ventilation. The introduction and follow-up of safety measures must not be limited to those described in this manual. Before starting up the gun, a comprehensive analysis must be made of the risks derived from the products to be dispensed, the type of application and the working environment.

Service Manual



To prevent possible injury caused by incorrect handling of the raw materials and solvents used in the process, carefully read the safety data sheet provided by your supplier.

Deal with the waste caused according to current regulations.



To avoid damage caused by the impact of pressurized fluids, do not open any connection or perform maintenance work on components subject to pressure until the pressure has been completely eliminated.

Use suitable protection when operating, maintaining or being present in the area where the equipment is functioning. This includes, but is not limited to, the use of protective goggles, gloves, shoes and safety clothing and breathing equipment.



The equipment includes components that reach high temperatures and can cause burns. Hot parts of the equipment must not be handled or touched until they have cooled completely.



To prevent serious injury through crushing or amputation, do not work with the equipment without the safety guards installed on the moving parts. Make sure that all the safety guards are correctly reinstalled at the end of the repair or maintenance work of the equipment



CHARACTERISTICS

- * Internal mixture due to high pressure
- * Automatic cleaning with pressurised air
- * No solvents needed
- * Mechanical spraying
- * Exterior lubrication of the mix chamber

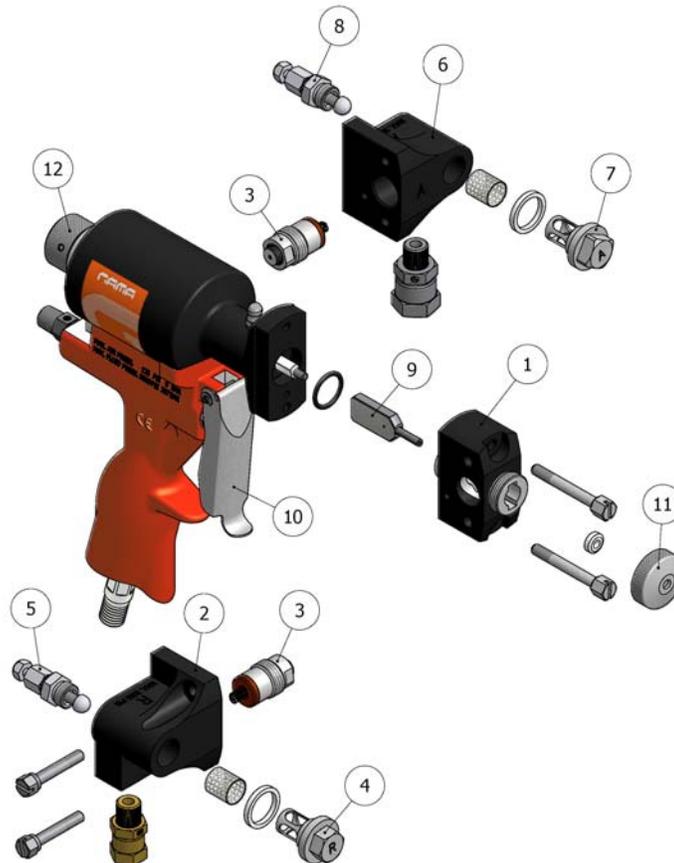
Approximate weight: 1 Kg / 2.2 lbs

Dimensions: H 19 cm / W 10 cm / L 19 cm

TECHNICAL SPECIFICATIONS

Maximum working pressure:	210 Kgf/cm ² (20.6 MPa) / 3000 psi
Air pressure required:	6-8 Kgf/cm ² (0.6-0.8 MPa) / 85-114 psi
Maximum production ratio 1:1:	18 Kg/min / 40 lb/min
Minimum production ratio 1:1:	1.5 Kg/min / 3.3 lb/min
Opening force @ 6 bar:	90 Kg / 200 lb
Closing force @ 6 bar:	93 Kg / 205 lb
Approximate air consumption @ 6 bar (50 cycles/min):	307 litres/minute

GENERAL DESCRIPTION



For better knowledge of the elements forming the **MASTER** series gun, the main components and their description are shown. For more precise identification, see the Components Manual ref. NR-00004-ENG

1. Gun block unit
2. Polyol input block unit
3. Plastic/metal sealing kit
4. Polyol filter body
5. Polyol manual valve
6. Isocyanate input block unit
7. Isocyanate filter body
8. Isocyanate manual valve
9. Mix chamber
10. Trigger



Service Manual

11. Diffuser
12. Blocking device



Service Manual

INSTALLATION AND START-UP

PRECAUTION: When working with the gun or performing maintenance work on it, wear suitable protection in accordance with the recommendations and specifications provided by the product suppliers.

GAMA provides a series of tools and accessories that are necessary for assembling the gun. The tool kit is made up of the following elements:

Metal brush, tube spanner, chuck, pliers for snap rings, spanner, set of allen keys, tube for extension of pneumatic connection, tube of grease, nozzle stopper, greasing stopper, grease gun, flexible pipe for air connection, fast plug, bits for cleaning, operations manual and component parts ID manual.

1. Close the manual valves by turning them to the full clockwise position. The manual valves control the flow of each product to the chamber and are located on the Isocyanate input block and the Polyol input block.
2. Press the safety stop and turn it clockwise to set it to the blocking position.
3. Fit the air supply pipe and connect it to the connector on the rear of the gun.
4. Connect the Isocyanate hose (red terminal) to the connection on the Isocyanate input block (letter A).
5. Connect the Polyol hose (blue terminal) to the connection on the Polyol input block. (letter R).



NB.: The product hoses are identified in red and blue, allowing the user to rapidly recognise them. The red corresponds to the Isocyanate hose and the blue to the Polyol hose. To avoid connection errors, the coupling connections of the Isocyanate and Polyol hoses are different sizes, which makes it impossible to swap connections.

6. Connect the air supply to the gun.
7. Pressurise the gun and make sure there are no leaks.
8. Pull the trigger several times to check the correct movement of the mixing chamber.
9. Check that the pressure in the machine and the temperature of the heaters and the hoses is correct (see the Machine Service Manual).
10. Open the manual valves of each product by turning them to the full counter clockwise position.
11. Press the safety stop and turn it counter clockwise to set it to the spray position.
12. Perform a test projection in a vessel

WARNING: Before performing maintenance, repair or cleaning work, press the safety stop and turn it clockwise to set it to the blocking position, close the manual valves completely and disconnect the air supply to avoid possible accidents.



Service Manual

The gun is designed with the flexibility to have the air input in the rear or at the base of the gun handle. To make the change, do the following:

13. Disconnect the air pipe from the rear.
14. Unscrew the fitting at the rear of the gun.
15. Unscrew the existing plug at the base of the handle.
16. Screw the plug into the rear of the gun. Use Teflon tape or sealing paste to prevent air leaks.
17. Fit the air connection extension (optional) to the base of the handle. Use Teflon tape or sealing paste to prevent air leaks.
18. Connect the air pipe.





Service Manual

SHUTDOWN PROCEDURES

1. Close the manual valves of each product by turning them to the full clockwise position.
2. To eliminate the pressure from the gun, pull the trigger and project the gun until the projection fan starts to reduce.
3. Press the safety stop and turn it clockwise to set it to the blocking position
4. Disconnect the air supply from the gun.
5. Remove the cap and lubricate the mixing chamber with the grease gun supplied in the tool kit; this action will prevent the cleaning air of the gun from reacting with the ISOCYANATE product and avoiding crystallization which may damage the chamber and cap.



NB.: *The use of injecting lubrication into the gun at the end of the day will avoid maintenance time, as it will not be necessary to remove the chamber each day to clean it.*

PRECAUTION: *To avoid possible contamination by the product remains deposited in the components of the gun, do not exchange the Isocyanate parts with the Polyol parts. The gun has the Isocyanate side identified with the letter A.*



If the product hoses are pressurized, follow the Shutdown Procedures indicated in the Machine Service Manual.



MAINTENANCE

To obtain maximum output from your **MASTER** gun, it is necessary to periodically perform certain maintenance operations.



To prevent possible injury caused by incorrect handling of the raw materials and solvents used in the process, carefully read the safety data sheet provided by your supplier.

Deal with the waste caused according to current regulations.



To prevent serious damage caused by the impact of pressurised fluids, never open a connection or perform maintenance work on components subject to pressure until all pressure has been eliminated.

Use suitable protection when operating, maintaining or being present in the area where the equipment is functioning. This includes, but is not limited to, the use of protective goggles, gloves, shoes and safety clothing and breathing equipment.



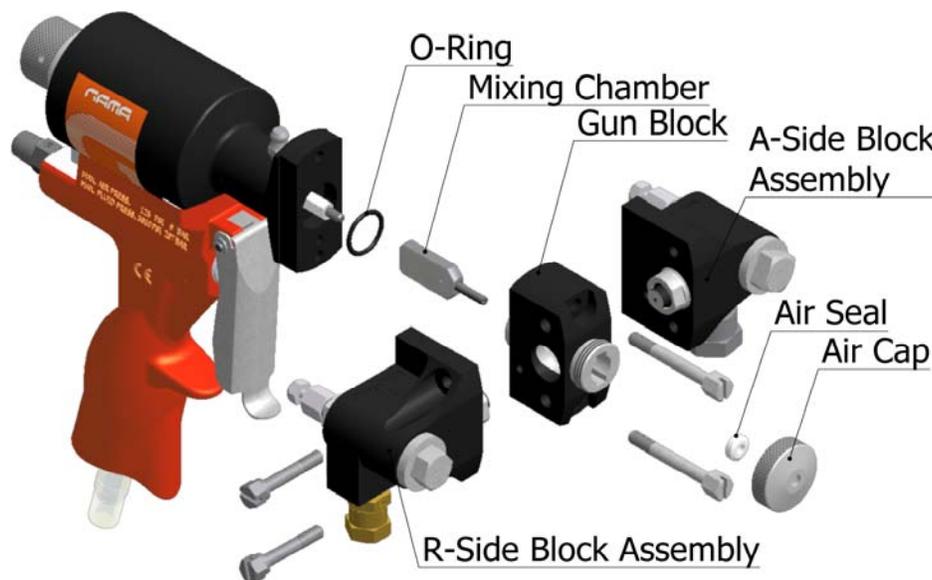
The equipment includes components that reach high temperatures and can cause burns. Hot parts of the equipment must not be handled or touched until they have cooled completely.



To prevent serious injury through crushing or amputation, do not work with the equipment without the safety guards installed on the moving parts. Make sure that all the safety guards are correctly reinstalled at the end of the repair or maintenance work of the equipment

Gun block unit and mixing chamber

WARNING: Before proceeding to carry out maintenance work on the gun, make sure that the unit is at a complete standstill, that all the buttons and the general switch are turned off and that the unit is disconnected from the main power supply. The gun is a component that works under pressure; no connection must be opened and maintenance work must not be performed on components subject to pressure until the pressure has been totally eliminated.



- Unscrew the air cap. Remove the bolts fixing the side blocks to the gun block and carefully separate both blocks from the gun. Clean the contact surfaces using a cloth dampened in gun-cleaning solvent.

PRECAUTION: Use wooden or plastic utensils or a brass brush for cleaning. Do not use metal utensils that can scratch the contact surfaces.

- Remove the gun block mounting bolts and separate the gun block by sliding it over the chamber. To eliminate the residual product, clean the gun block unit using a cloth dampened with gun cleaning solvent and a brass brush. Remove the o-ring.
- Use a spanner to lock the end of the pneumatic cylinder shaft and unthread the mixing chamber. Clean the mix chamber and, if necessary, use a brush to go over the product passage holes. Make sure that the chamber is not scratched or marked.
- Replace the chamber if there are any small faults.
- Screw the chamber back onto the end of the pneumatic cylinder shaft.
- Fit the gun block unit by sliding it over the chamber and fix it to the gun with the bolts. Make sure to fit the o-ring between the block and the fixing plate. Replace the o-ring if it is damaged. Tighten alternately to avoid possible leaks.
-



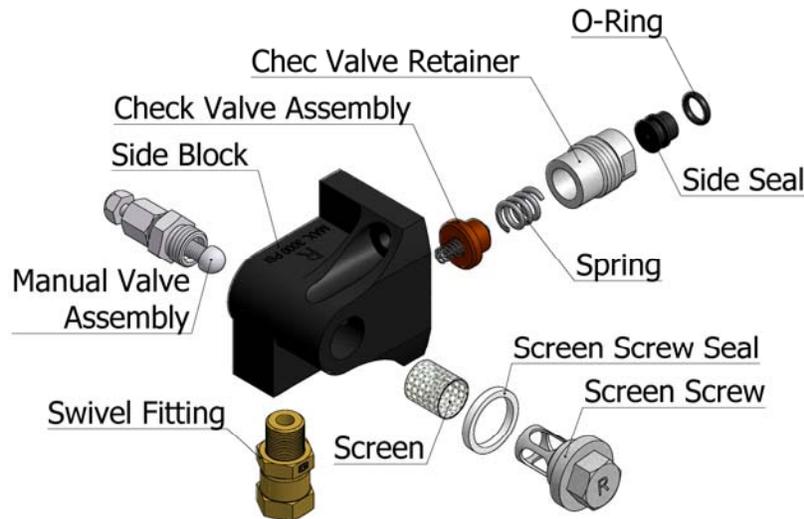
Service Manual

- Fit the side blocks to the gun block with the corresponding bolts. Tighten alternately to avoid possible leaks. Screw on the Air Cap. The gun is now ready for service.

Side block unit

WARNING: Before performing maintenance work on the gun, make sure that the unit is at a complete standstill, that all of the buttons and the main switch are turned off and that the unit is disconnected from the main power supply. The gun is a component that works under pressure; no connection must be opened and no maintenance work must be done on components subject to pressure until the pressure has been completely eliminated.

- Remove the side block mounting bolts on the Polyol side and carefully separate it from the gun block. Clean the contact surfaces using a cloth dampened in gun-cleaning solvent.
- Unscrew the filter housing and remove the seal and the filter screen. Carefully clean the filter with gun cleaning solvent and check that the mesh is completely free from contaminants. Replace the filter screen as required.
- Remove the check valve retainer from the side block.
- Remove the parts and clean with gun cleaning solvent or replace them as required.
- Clean all of the components meticulously to eliminate the remains of product using a cloth dampened with gun cleaning solvent and a brass brush.



PRECAUTION: Use wooden or plastic utensils or a brass brush for cleaning. Do not use metal utensils that can scratch the contact surfaces.



Service Manual

- Reassemble the check valve and side seal assembly. For the model with the plastic seal, fit the plastic seal cap in the retainer; fit the spring and then the check valve assembly.
- In the model with a metal seal, you must fit the spring and the check valve into the retainer. To facilitate assembly, use a little grease to fit the o-ring in the metal seal cap; make sure that it is not damaged and replace it if necessary. Press the metal seal cap into the retainer until the o-ring is fitted in its groove.
- Hand-tighten the plastic/metal seal and retainer into the side block. If you use a spanner, do not over tighten the retainer more than 1/4 of a turn.

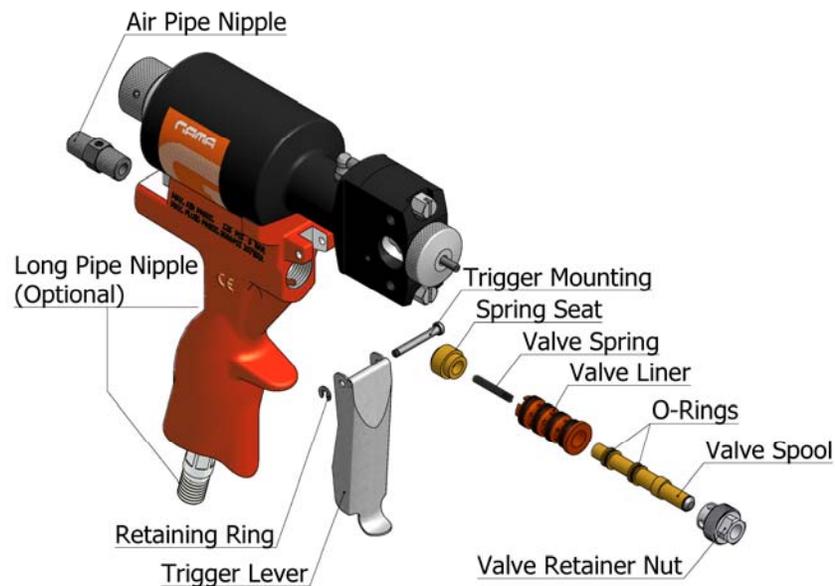
PRECAUTION: *Do not tighten the check valve retainer excessively. Tightening more than 1/4 of a turn can damage the plastic/metal check valve and cause leaks.*

- Check the wear on the plastic/metal seal, by measuring the distance that it stands out from the cap housing. If the seal is worn, knocked or scratched, it can cause leaks. Replace the seal if it stands out less than 1.65 mm / 1/16 inch.
- To check whether the plastic/metal check valve is damaged as a result of excessive tightening, make sure the separation between the support face of the side block and the bottom of the cap housing, once fitted, is 0.46 mm / 1/64 inch. If the separation is smaller, the check valve must be replaced.
- Assemble the screen screw and screw it into the side block.
- Fix the Polyol side block onto to the gun block with the corresponding bolts. Tighten alternately to avoid possible leaks.
- Perform the same steps with the side block on the Isocyanate side.
- The gun is now ready for service.



Trigger and valve

WARNING: Before performing maintenance work on the gun, make sure that the unit is at a complete standstill, that all of the buttons and the main switch are turned off and that the unit is disconnected from the main power supply. The gun is a component that works under pressure; no connection must be opened or maintenance work done on components subject to pressure until the pressure has been completely eliminated.



- Remove the side blocks and carefully separate them from the gun block. Clean the contact surfaces using a cloth dampened in gun cleaning solvent.
- If the gun has the air inlet on the rear (standard) disconnect the air pipe and the connection.
- If the inlet is at the base of the handle (optional), unscrew the cap from the rear of the gun.
- Remove the retention ring and take out the pin fixing the trigger.
- Unscrew the nut of the trigger valve.
- Remove the trigger valve and carefully hold the end of the trigger shaft with pliers to remove it from its housing. The trigger shaft has a spring inside it; make sure you don't lose it.
- Check the o-rings of the trigger valve and the trigger shaft. Replace them if they are damaged. Apply a little grease to facilitate the fitting.
- Remove the existing cap at the bottom of the housing at the rear of the gun.
- The trigger valve seat is housed at the bottom. Insert a punch with a maximum diameter of 6 millimetres in the rear, and use a hammer to tap on the base of the seat until it is completely out of the housing.
- Make sure the housing is clean, and apply a layer of grease on the inside.

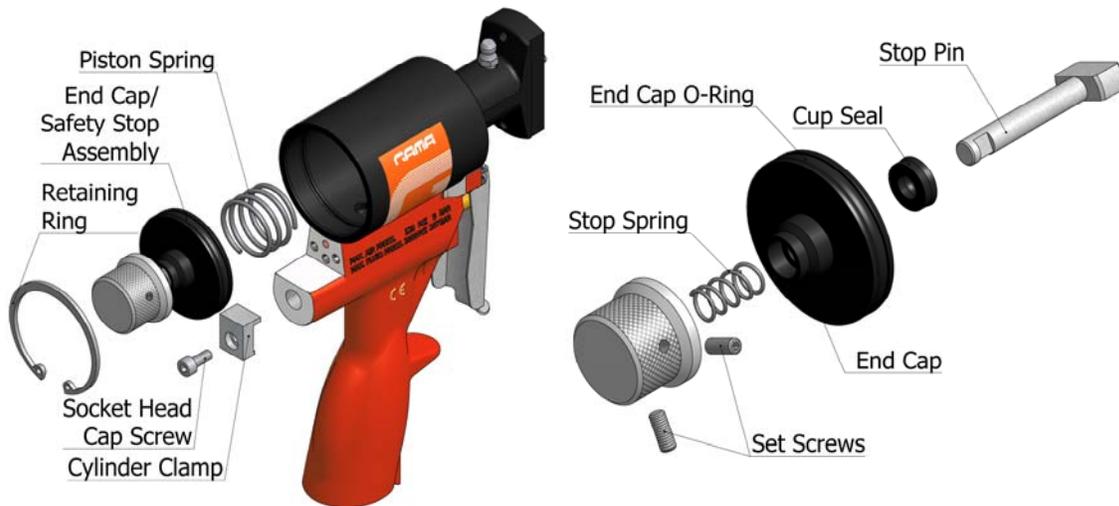


Service Manual

- Slide the seat of the trigger valve in the housing, make sure that the edge is on the outside.
- Insert the trigger valve in the housing, taking special care not to damage the o-rings. You will note a certain resistance caused by the interference of the seals with the wall of the housing. Insert it until you see the first lines of the thread.
- Screw in the cap, using sealing paste to prevent air leaks.
- Fit the air connection and hose on the rear of the gun. If the gun has the air inlet on the base of the handle, screw the cap into the inlet on the rear, using sealing paste to prevent air leaks.
- Insert the spring on the trigger shaft and insert this inside the trigger valve.
- Tighten the trigger valve nut until it is fitted. Do not tighten excessively.
- Fit the trigger with the pin and fix it with the retention ring.
- Fix the product input blocks to the gun block with the corresponding bolts. Tighten alternately to avoid possible leaks.
- The gun is now ready for service.

Cylinder block and blocking device

WARNING: Before performing maintenance work on the gun, make sure that the unit is at a complete standstill, that all of the buttons and the main switch are turned off and that the unit is disconnected from the main power supply. The gun is a component that works under pressure; no connection must be opened or maintenance work done on components subject to pressure until the pressure has been completely eliminated.



- Remove the side blocks and carefully separate them from the gun block.
- Clean the contact surfaces with a cloth dampened in gun cleaning solvent.
- Unscrew the bolt fixing the clamp on the rear of the gun.
- Remove the retaining ring from the cylinder using the snap ring pliers.
- Pull hard on the safety stop to remove the whole unit from the cylinder. Also remove the plunger spring.
- Check the state of the o-ring seal on the end cap. Replace it if it is damaged.
- Apply a little grease to facilitate the placement of the o-ring.
- Loosen the two set screws on the safety stop. Remove the stop pin and the stop spring from the device.
- Remove the end cap from the stop pin.
- Remove the lip seal from the end cap and replace it if it is damaged. Apply a little grease to facilitate the fitting.
- Pay attention to the correct installation of the lip seal: **The seal lips must face forward.**
- Fit the end cap onto the stop pin. Slide the spring and the safety stop onto the stop pin. Tighten the two set screws making sure that they are perfectly aligned with the flats on the end of the stop pin. Make sure that the blocking device is well-fitted.



Service Manual

- Insert the spring in the rear housing of the plunger. Insert the end cap into the cylinder bore by pressing until it passes the insertion groove of the retention ring.
- Fit the retention ring using snap ring pliers.

WARNING: *To assure that the end cap is well-fitted, make sure that the retention ring is perfectly fitted in the fixing groove. To avoid possible errors in assembly, avoid approaching the cylinder block when applying pressure to the gun after cleaning, repair or maintenance operations.*

- Fit the clamp and fix it with the bolt to the rear of the gun.
- Fix the side blocks to the gun block with the corresponding bolts.
- Tighten alternately to avoid possible leaks.
- The gun is now ready for service.

Pneumatic cylinder

WARNING: Before performing maintenance work on the gun, make sure that the unit is at a complete standstill, that all of the buttons and the main switch are turned off and that the unit is disconnected from the main power supply. The gun is a component that works under pressure; no connection must be opened or maintenance work done on components subject to pressure until the pressure has been completely eliminated.



- Unscrew the air cap. Remove the side blocks from the gun block. Clean the contact surfaces using a cloth dampened with gun cleaning solvent.
- Remove the gun block from the gun by sliding it over the chamber. To eliminate the remains of product, clean the gun block unit using a cloth dampened with gun cleaning solvent. Remove the o-ring.
- Use a spanner to lock the end of the pneumatic cylinder shaft and unthread the mixing chamber. Clean the mixing chamber and, if you consider it necessary, use a brush to go over the passage holes.
- Remove the cylinder clamp.
- Using the snap ring pliers, remove the retaining ring holding the end cap.
- Pull hard on the blocking device to remove the whole unit from the cylinder bore. Also remove the spring and the piston assembly from inside the cylinder.
- Using the snap ring pliers, remove the snap ring from the piston shaft and separate it from the piston.
- Check the state of the o-rings of the shaft and piston. Replace them if they are damaged. Apply a little grease to facilitate the fitting.
- Fit the piston by sliding it onto the shaft taking special care not to damage the o-rings. Fit the retention ring.
- Fit the piston assembly into the cylinder bore.
- Insert safety stop assembly into the cylinder bore until it passes the insertion groove of the retention ring.



Service Manual

- Fit the retention ring using the snap ring pliers.

WARNING: *To Warranty that the cylinder block is well-fitted, make sure that the retention ring is perfectly fitted in the fixing groove. To avoid possible errors in assembly, avoid approaching the end cap when applying pressure to the gun after cleaning, repair or maintenance operations.*

- Install the cylinder clamp.
- Hand-tighten the mix chamber while holding the end of the pneumatic cylinder with a spanner.
- Assemble the gun block by sliding it over the chamber and fix it to the gun with the bolts. Make sure to fit the o-ring between the block and the fixing plate and replace it if it is damaged. Tighten alternately to avoid possible leaks.
- Assemble the side blocks to the gun block with the corresponding bolts. Tighten alternately to avoid possible leaks. Screw on the diffuser.
- The gun is now ready for service.



Service Manual

CONTENT

Important Safety Information _____	4
Gun block unit and mixing chamber _____	13
Side block unit _____	15
Trigger and valve _____	17
Cylinder block and blocking device _____	19
Pneumatic cylinder _____	21