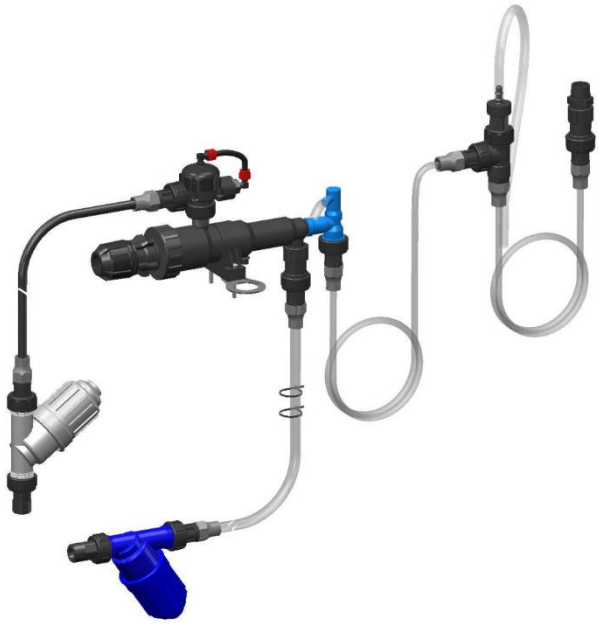
Installation, Operation & Maintenance Instructions



Injector pump for chemicals and fertilizers

Model - 4-02

(300001-000011)

This document describes the installation, operation and maintenance of the model 4-02 fertilizer pumps manufactured by Amiad Water Systems Ltd.

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Disclaimer:

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Technical data

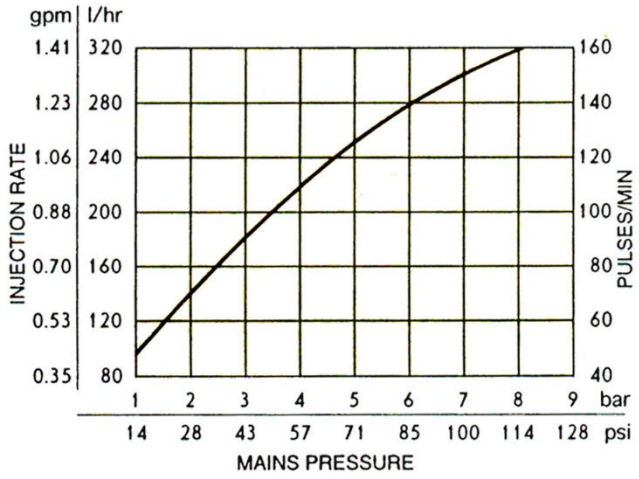
General

Operating medium	Water
Drive	Linear hydraulic motor
Minimum operating pressure	1 atm
Maximum operating pressure	8 atm
Fertilizer injection pressure	Double the operating water pressure
Fertilizer injection rate	Depends on the pressure of the operating water, see graph below (up to 320 L/h at 8 bar)
Water consumption during operation	3 liters of water per liter of fertilizer injected
Fertilizer pump weight (empty)	Approximately 5 kg including packaging
Maximum operating temperature	40°C

Structure materials

Pump body	Plastic Materials
Seals in contact with chemicals	Viton
Seals in contact with water only	Nitrile rubber, polyurethane

Graph of fertilizer injection rate by line water pressure



Fertilizer injection rate graph - Figure 1

Safety instructions

General

- Serious warning - under no circumstances should the fertilizer pump be connected to the drinking water system. Moreover, under no circumstances should a water system containing chemicals be connected directly to a drinking water system.
- Amiad Water Systems products always act as a component within larger systems. System designers, installers and operators must comply with all safety instructions relevant to the entire facility.
- Before installation, operation, maintenance and/or any other operation relating to the fertilizer pump, thoroughly read the safety, installation, operation and maintenance instructions.
- During any work or operation of the fertilizer pump, all required safety instructions must be followed in order to prevent risk to employees, the public or nearby property.
- Note that in water systems controlled by command systems, the pump may begin operating automatically, without any prior warning.
- It is strictly prohibited to make changes or repairs to the equipment without receiving prior written consent from the manufacturer or an official representative acting on its behalf.
- Make sure to comply with the standard safety instructions and accepted engineering procedures while working on or around the pump.
- The pump should only be used for its original intended purpose as designed by Amiad. Any improper or abnormal use of the pump, or incorrect connection, may lead to undesirable results and will void the manufacturer’s warranty and responsibility. Please consult Amiad before any unusual use of this equipment.

Hazardous materials

- Amiad's fertilizer pump injects fertilizers and chemicals that can be dangerous to people, the environment and equipment! Therefore, system designers, installers and operators must comply with all relevant safety instructions for the use of hazardous materials, including: wearing personal protective equipment such as safety glasses, gloves, a sealed coverall for hazardous materials, boots, etc. in accordance with the safety instructions of the chemicals used.
- Installers and operators of the system must read, be knowledge of and act in accordance with the safety instructions published by the manufacturer of the fertilizer and/or chemicals in use.
- The pump injects the materials into the line at high pressure. Do not operate the pump when the injection hose is not properly connected to the line.
- Under no circumstances should the pump be connected directly to the fertilizer or chemicals storage tank. The pump should only be connected to an intermediate tank containing the amount of material required for injection when operating the current irrigation cycle only. Avoid creating any possibility, for any reason, that may lead to an uncontrolled leakage of the fertilizer tank into the irrigation lines.
- Amiad Water Systems Ltd. will not be responsible in any case for the results caused by the injection of pesticides into the irrigation water system, both legally and in terms of the effect of the materials on the pump.

Installation

- Install the pump according to the manufacturer's instructions and the installation instructions in this manual.
- Make sure to leave enough room for easy access for handling and maintenance.
- The user must ensure adequate lighting in the area of the pump to allow safe operation and maintenance of the equipment.
- The user must ensure the installation of work surfaces, barriers and standard ladders to allow suitable access to the pump and its parts without the need to climb over pipes or other equipment. All such facilities must comply with applicable standards.
- All bolts should be inspected and tightened at the time of initial operation and immediately after the first week of operation.
- During installation, operation, and maintenance of the pump, only suitable and standard tools should be used, operated solely by certified operators.
- When installing the pump at dangerous installation sites, underground or at height, ensure that the design of the site, auxiliary systems, tools and installation procedures are suitable for all devices and installations relevant for work at such sites.
- Ensure the walking surfaces around the pump are anti-slip when wet.
- Ensure that the installation site floor is installed with a suitable slope that allows drainage and prevents accumulation of liquids on the floor.
- Delivery and transport: Ensure that pump delivery and transport are done securely and safely and in accordance with applicable procedures and standards.

Hydraulics

- The user must install manual shut-off valves, suitable for working with fertilizer, next to the water supply outlets, the fertilizer inlet and the injection port of the pump.
- The user must ensure that the system includes a pressure release and drainage valve that allows pressure release and drainage of the system before performing any maintenance on the pump.
- The user must ensure that the pump is not fed with water at a pressure higher than the maximum allowable pressure as determined by the manufacturer. If necessary, install a pressure-reducing valve on the supply line upstream of the operating water inlet to the pump.

Initial operation

- Please carefully read the initial operating instructions that appear in the initial operation section of this document before any attempt to operate the pump, to avoid damage and voiding the manufacturer's warranty.
- In order to achieve optimal system performance, the initial operation process must be performed exactly as described in this document.

Operation and control

- Do not operate the pump before carefully reading and understanding the operating instructions provided in this document.
- Refer to the safety labels located on the pump, follow them and never do anything that contradicts the instructions on the safety labels.
- Do not operate the pump for purposes that deviate from its original design and original operating parameters.
- After use, the pump should be rinsed by injecting water (5-8 liters) to prevent material from building up in the pump or on its parts.

Description and features

General description

The Amiad Model 4-02 fertilizer pump described in this user manual is designed to inject liquid fertilizer and chemicals in a regulated manner into irrigation lines during irrigation, thus making fertilization of a field, orchard or greenhouse simple and easy and greatly reducing the amount of work needed to do so.

The Amiad pump is water-powered and injects the fertilizer solution into the irrigation line at double the pressure of the water in the irrigation line. This way, the injected solution mixes with the irrigation water and the fertilizer is distributed equally in the irrigated plot.

Key features

- Operation of the pump does not require throttling of the irrigation line so it does not cause a loss of pressure in the irrigation system.
- There is no need for a pressure tank, fertilizer can be injected from any open or closed tank.
- The pump's operation does not depend on the diameter of the irrigation pipe.
- The pump has a wide injection flow range that can be easily regulated.
- The pump is made of plastic materials with high resistance to friction, wear and corrosion.
- The operation of the pump can be stopped automatically or manually.
- Most chemicals used in agriculture for fertilization, soil disinfection, weed control, insecticide, and fungicide purposes can be injected.
- The pump is small and easy to move. Provided with all accessories required for quick and easy operation.
- The pump stops immediately when the water pressure in the irrigation line is interrupted.
- The pump's structure is modular and enables the assembly of alternative accessories and accessories that enable integration in automatic irrigation control systems.
- Proper installation of the pump prevents the uncontrolled continued flow of fertilizer to the line when the water pressure in the main line is interrupted.

Models

The pump described in this document, Model 4-02 Cat. No. 300001-000011 is designed for gravity-fed suction in a fertilizer tank. The fertilizer suction line connects to the bottom of the fertilizer tank. Fertilization is started / finished either manually or by an irrigation controller/computer.

In addition to this model, the following Amiad fertilizer pump models are available – please consult Amiad to find the model that best suits your needs:

- Model 4-01 Cat. No. 300000-000011 for drawing the fertilizer solution from a tank.
- Model 4-92 Cat. No. 300001-000012 – fertilizer injector, for gravity-fed suction of the fertilizer solution from a valve installed at the bottom of the fertilizer tank. This model is designed mainly for manual operation and control of fertilization.
- Model 4-03 Cat. No. 300002-000012 (gravity) 300002-000011 (suction from a tank) – twin pump, designed for injection of fertilizer at high flow rates and in large quantities.
- Model 4-02-10 Cat. No. 300001-000004 designed for automatic operation using an irrigation computer. This model is based on model 4-02 plus output transmitter Cat. No. 300000-000007.

The operating principle of the pump

The pump operates using a linear hydraulic motor that operates on the principle of differential areas. The water supply to the motor causes cyclical action, the speed of which depends on the supply pressure.

When the linear motor (18) moves to the suction stroke, the injection valve (4) closes, the suction valve (8) opens, and fertilizer is pumped into the pump body.

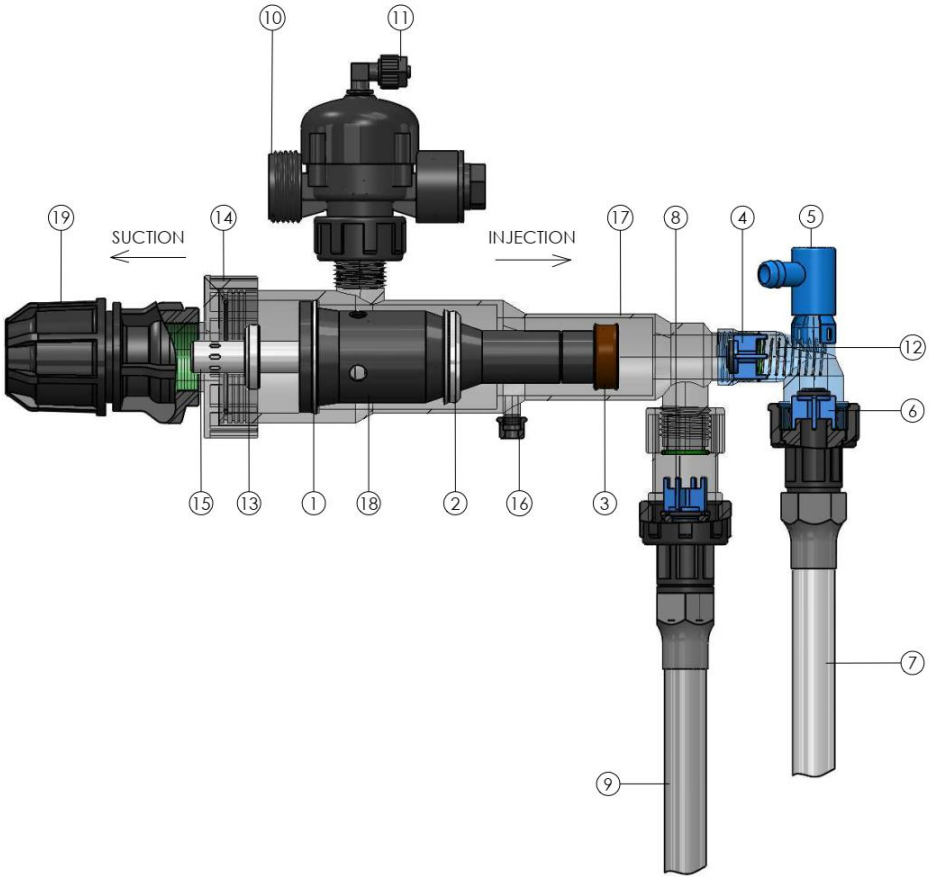
When the linear motor (18) moves toward the injection stroke, the fertilizer pressure in the pump rises, the suction valve (8) closes, the injection valve (4) and the check valve (6) open and fertilizer is injected into the irrigation line. At the end of the injection stroke, the water check valve (6) is closed by the water pressure in the line.

Important note

How to start and stop this pump model appears later in the document. Note that this depends on the specific pump model. If you have another pump model, please refer to the operation section corresponding to your model.

Legend:

1. Large motor seal
2. Small motor seal
3. Pump seal
4. Injection valve
5. Injection valve assembly
6. Non-return valve
7. Fertilizer injection hose
8. Suction valve
9. Fertilizer suction hose
10. Inlet for water feed line to motor
11. ¾" N.C. valve
12. Air vent
13. Reversal disc
14. Body cover
15. Main motor valve
16. Breather valve opening
17. Motor body
18. Linear motor
19. Water outlet



Operation principle Figure 2

Installation

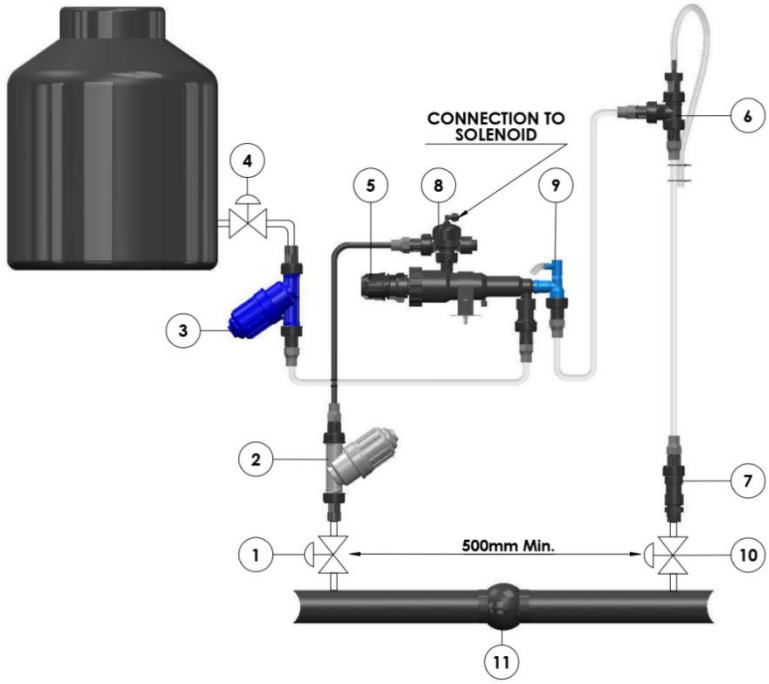
Preparation for installation (Figure 3)
Before installing the fertilizer pump, re-read the Safety Instructions section.

- Before connecting the pump to the system, install two 3/4" manual valves on the main water line, preferably after the filtration system. These valves should be installed at a distance of at least 50 cm from each other. The valve upstream (1) supplies the water needed to power the linear motor. The chemical solution will be injected into the system through the fertilizer injection valve (10) downstream. This valve must be compatible with the chemicals involved.
- Attachment of the filter (2) supplied with the pump is extremely important for protecting the linear motor.
- The gray 1" model C filter (2) with 100-micron filtration is installed on the operating water line and prevents dirt and sand from getting into the motor, thus allowing for smooth operation over time.
- Connect a thin wall plastic hose with an external diameter of 25 mm to the water outlet (6) in order to transport the water from the pump to a convenient location. The discharge hose should be open and installed in a horizontal line or sloped downward. The hose length should not exceed 1 meter. Insert it into a 40 mm hose, to prevent resistance on the pump.

Installation of model 4-02 pump for suction from the tank bottom

Before installing this model of fertilizer pump, ensure that all the actions stated in the Preparation for Installation section above have been performed in full. An installation diagram of this model follows: (diagram for information purposes only)

1. Operating water valve
2. Operating water filter (gray)
3. Fertilizer suction filter
4. Fertilizer suction valve
5. Water outlet
6. Automatic air vent
7. Connection of union fitting to check valve
8. N.C. valve
9. Manual air release
10. Fertilizer injection valve to line



Installation by gravity – Figure 3

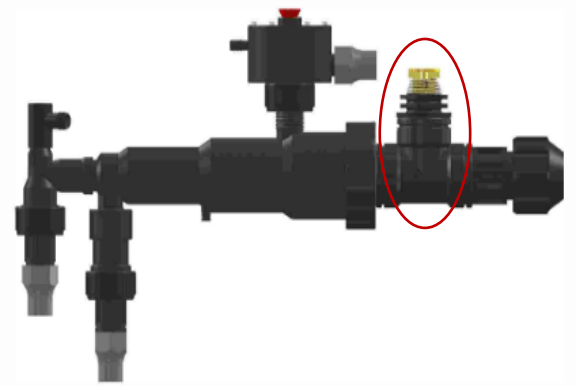
Installation of model 4-02 pump

Figure 3 Page 10:

1. Install the pump on a 1" support pipe, at the height of the fertilizer's discharge from the tank. This will prevent air from getting into the system between operations.
2. Hang the automatic air vent (6) above the fertilizer tank height.
3. Connect the operating water hose with a gray 1"C filter (2) upstream of the water line using a union fitting (attached) to the operating water valve (1).
4. Connect the fertilizer injection hose (which comes out of the automatic air vent) to the fertilizer injection valve (10) downstream with a union fitting and water line connection fitting (11).
5. Connect the blue fertilizer filter (3) to the bottom of the fertilizer tank. After fertilizer suction valve (4)
6. Use of Amiad N.C. switch (8).
   a. For operation without a computer, the pump is supplied with a bypass (8 mm tube) at the gate valve, which provides for operation without a computer command or doser, by opening and closing the operation valve (1)
   b. Operation with a computer or doser – remove the bypass and install the attached stopper. Connect the command inlet (8 mm Tefen coupler) on the N.C. valve to the command line connected to the solenoid controlled by the controller.

Attention:

Please note: Installation of the filter supplied with the pump is crucial for maintaining the valves and the pump motor in good condition, do not remove it!
If the water outlet (5) is connected to a drain hose that is more than 1.5 m long, it is recommended to add an anti-vacuum, (Cat. No. – 700190-006733) to prevent a vacuum in the discharge hose.



Operation of model 4-02 fertilizer pump

Figure 3 page 10

Carefully read the operating instructions before starting work.
The pump is simple to operate and maintain as described in this manual.

Make sure that the automatic air vent (6) above the tank height. This prevents the fertilizer from draining through the pump to the empty water line.

1. Open the valve at the fertilizer outlet. (10)
2. Open fertilizer injection valve. (4)
3. Open the operation water valve (1)
   a. During the first operation, air must be purged from the lines by pressing the air release cap (9) until all air is purged from the system, fertilizer will start emerging from the transparent (air release) line, and the pump activity rate will be slowed down significantly.
4. It is important for the pump to be installed as low as possible, so that it is lower than or at the height of the fertilizer suction valve in the tank. In this state, no air will enter the system and no additional air release will be needed.
5. The flow rate of the injected fertilizer can be controlled by either throttling the water feed valve (1) or by using the flow regulators as described in the flow regulators section later in this document.
6. The pump will automatically stop when the operating water flow stops:
   6.1. By manually closing the operating water valve.
   6.2. By a command to the N.C. valve.

Control, adjustment, and monitoring

Pump flow rate

The pump flow rate is directly proportional to the water pressure in the irrigation line according to the fertilizer flow rate curve that appears in the technical data section.
The fertilizer flow rate can be determined, and the desired quantity can be obtained by throttling the operating water valve. In addition, it is possible to install a flow regulator produced by Amiad that determines the flow rate of fertilizer injected into the line.

Flow rate calculations

Doubling the number of pump strokes per minute gives the fertilizer flow rate in liters per hour.
In other words: 2 x number of strokes per minute = liters of fertilizer per hour
For example:
The desired flow rate is 100 liters of fertilizer per hour. Since doubling the number of strokes per minute is equal to the pump's flow rate in liters per hour, 50 strokes per minute = 100 liters per hour (the desired flow rate). To achieve this, the operating water valve must be throttled until the pump beats at a rate of 50 beats per minute. The fertilizer flow rate will be 100 liters per hour.

Fertilizer flow rate

There are a few options for distributing the fertilizer dose throughout the irrigation time.

1. Using a suitable flow regulator. It is recommended to use Amiad flow regulators (see page 26).
2. A water doser can be installed to dose the water entering the pump at a ratio of 3 liters of water per liter of injected fertilizer. Example – for 50 liters of fertilizer, the water doser should be set to 150 liters.
3. Amiad output transmitter connected to irrigation controller.

Relative dose

To maintain a constant ratio between the water dose and the fertilizer dose:
The relative dose is determined by using an appropriate fertilizer flow regulator.

Maintenance

Ongoing maintenance of the fertilizer pump is critical to ensure proper and efficient operation of the system. Proper maintenance can prevent malfunctions, extend the life of the pump and improve its performance. The maintenance operations specified in this document should be carried out regularly.

Before performing any maintenance or non-routine pump operation, read and follow the following safety instructions:

- Disconnect the pump from the water system by closing and locking the shutoff valves at the pump inlet, fertilizer inlet and injection point.
- Release the pressure trapped in the pump by opening the pressure release/drain valve of the pump.
- Drain the water from the pump by opening the drain valve.
- When working on the pump, use only the appropriate and standard tools.
- Open and close the valves slowly and gradually.
- Wear a protective hat, safety glasses, gloves and other personal safety equipment required to perform the work according to standards and local regulations.
- Manual cleaning of the pump components using hot water or steam should be carried out in accordance with the system cleaning instructions, without endangering the operator or their environment and while complying with all safety instructions, standards and local regulations.
- Manual cleaning of the pump components using acid or other chemicals should be carried out in accordance with the safety instructions of the relevant substances, without endangering the operator or their environment and while complying with all safety instructions, standards and local regulations.

Restoring the pump to operation must be done according to the initial operating instructions provided in this document.

Ongoing maintenance and tips on preventing malfunctions

- Check the operating water filter and fertilizer suction filter regularly and ensure they are clean. A clogged filter is the main cause of faulty pump operation.
- After each use, rinse the pump by injecting clean water (approx. 5-8 liters). This prevents chemicals from building up inside the pump, which can scratch the cylinder body.
- Lubrication - see instructions on the next page.

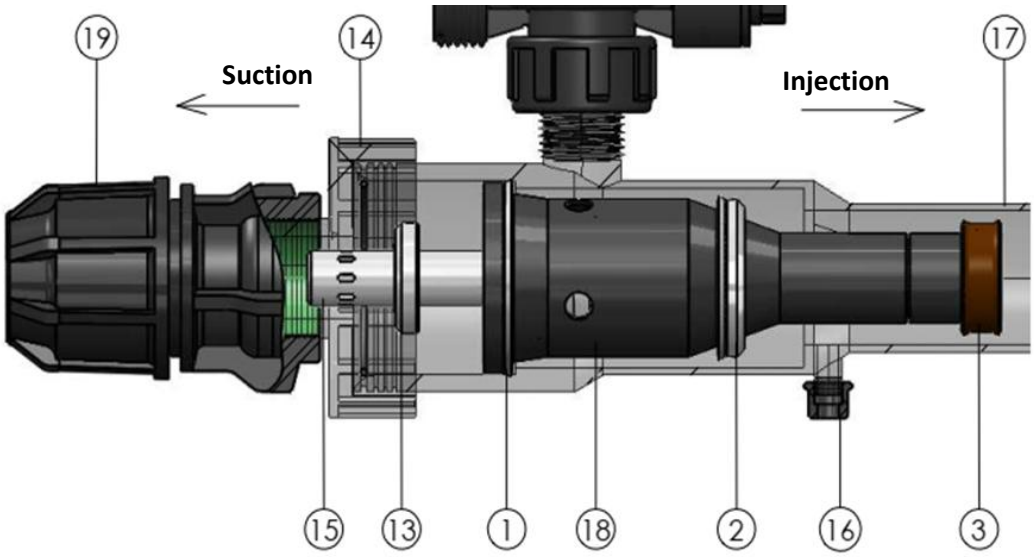
Lubricating the pump

The pump and motor seals should be lubricated every 200 working hours or depending on the frequency of use and water pressure.
Only use Amiad-approved grease.

Lubrication instructions (Figure 4)

1. Turn the pump off by closing the operating water valve.
2. Disconnect the discharge water hose from the coupler on the cylinder housing cover (19).
3. Remove the cylinder housing cover (14) by screwing it counterclockwise.
4. When the cover is removed, the main valve (15) will be revealed (a round rod with 8 grooves at its end).
5. Pull the valve outward. If it is difficult to remove the motor (18), it can be helped by briefly turning on the operating water. In any case, do not pull the motor with pliers or another tool that could damage the main valve.
6. Before lubricating, clean and dry the motor thoroughly. Apply lubricant to the three motor seals (1), (2) and (3). Use MOLYKOTE PG-21 grease.
7. Remove the water from the cylinder housing.
8. Slide the motor (18) into the cylinder housing. Ensure that the reversal disc (13) is located on the main valve (with the white side toward the cylinder body). Ensure the large motor seal (1) does not fold when inserting the motor.
9. Screw the cylinder housing cover (14) into place and connect the discharge water hose to the pump. The pump is ready for operation.

How to open the cylinder housing cover



Opening the cylinder housing cover – Figure 4

Lubrication notes

- Ensure that the pump never operates without grease.

- The frequency of lubrication depends on the number of operating hours and pressure of the operating water. Make sure to check the condition of the grease frequently.
- It is important to thoroughly dry all places to be lubricated, otherwise the grease will not stick and will quickly be washed away.
- Note: use MOLYKOTE PG-21 grease, which is approved by Amiad.

Schematic diagram - pump motor

Pump motor - Figure 5

Annual maintenance kit

The annual maintenance kit contains all the parts and materials needed to carry out comprehensive maintenance on the pump. Using this kit ensures that the pump will continue to operate optimally over time. The kit includes grease and a set of motor seals - Cat. No.: 700194-000135

Order of operations

- Thoroughly rinse the pump of any fertilizer and chemical residues, inside and out.
- Visually inspect the motor and pump body for cracks or wear. Replace it if necessary.
- Replace the motor seals and the pump seal. This ensures that the pump will continue to operate properly and without malfunctions.
- The pump seals must be lubricated.
- Only use Amiad-approved grease.

Benefits of the annual maintenance kit

1. **Ensuring proper operation**: The annual maintenance kit contains all the parts and materials needed to perform comprehensive maintenance of the pump, ensuring that the pump continues to operate properly and without malfunctions.
2. **Extending the life of the pump**: Ongoing maintenance and use of the annual maintenance kit can extend the life of the pump and prevent premature wear and tear of critical parts.
3. **Improved performance**: Proper maintenance and use of the annual maintenance kit can improve pump performance and ensure it runs at maximum efficiency.
4. **Prevention of malfunctions**: Ongoing maintenance and use of the annual maintenance kit can prevent unexpected malfunctions and reduce the need for urgent and expensive repairs.
5. **Saving time and money**: Ongoing maintenance and use of the annual maintenance kit can save time and money in the long run by preventing malfunctions and prolonging the life of the pump.

Flow regulators

Installation of flow regulator - general

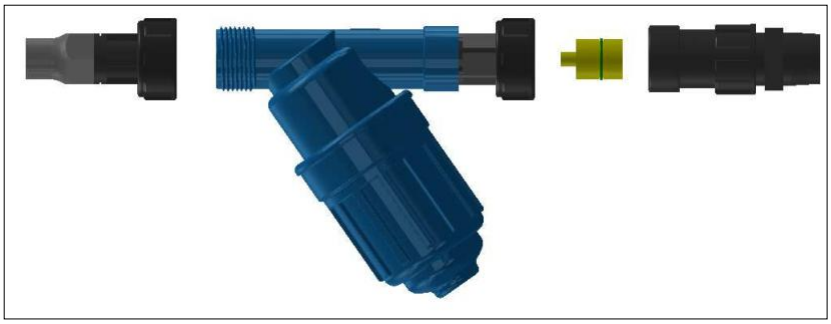
To maintain a constant fertilizer flow rate and to distribute it evenly throughout the duration of the irrigation, it is advisable to use a flow regulator suitable for the required fertilizer flow rate.
The flow regulator is made of materials that are resistant to most fertilizers and chemicals, and it is located at the end of the fertilizer injection hose to the irrigation line.
It is important to use the filter supplied with the regulator, particularly in regulators with low flow rates.

The following regulators are available:

Color	Flow rate
Red	10 liters per hour
Yellow	20 liters per hour
Green	40 liters per hour
Blue	60 liters per hour
Brown	80 liters per hour

Below is a schematic drawing of an assembly of regulators and filter

→ Fertilizer flow direction



Assembly of regulators - Figure 6

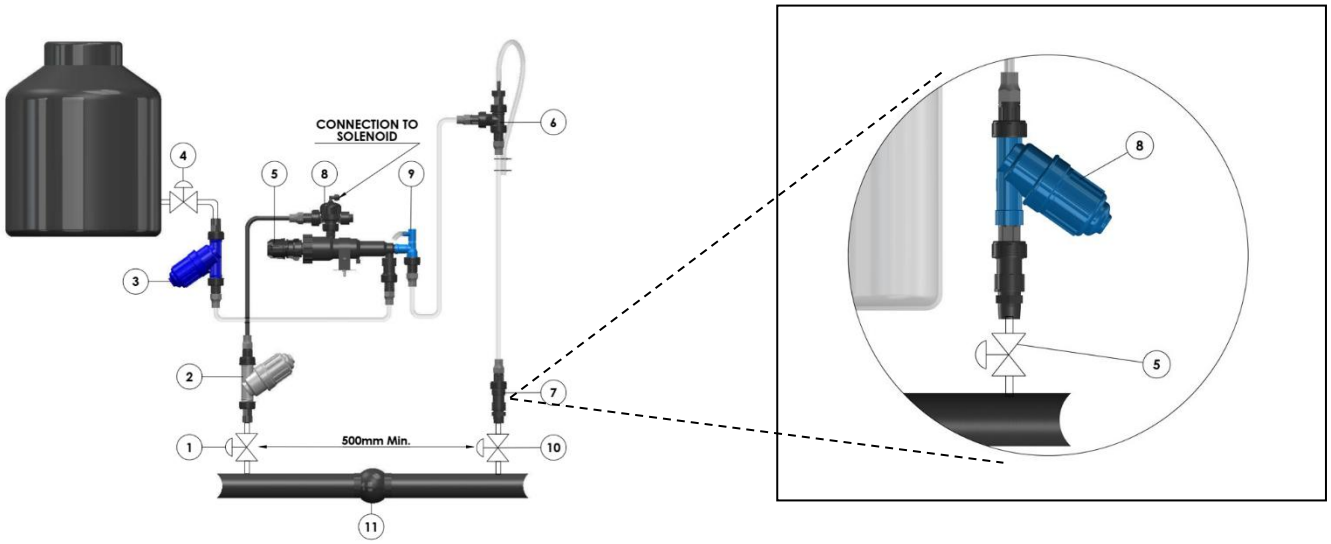
Warning: Plastic couplers should not be forcefully tightened. Tightening by ordinary hand pressure is sufficient.

Notes:

1. To remove the regulator from its holder, do not use hard devices such as a screwdriver, knife, etc. Open the water valve. The water pressure in the line will push the regulator out.
2. A filter must be installed before the flow regulator.

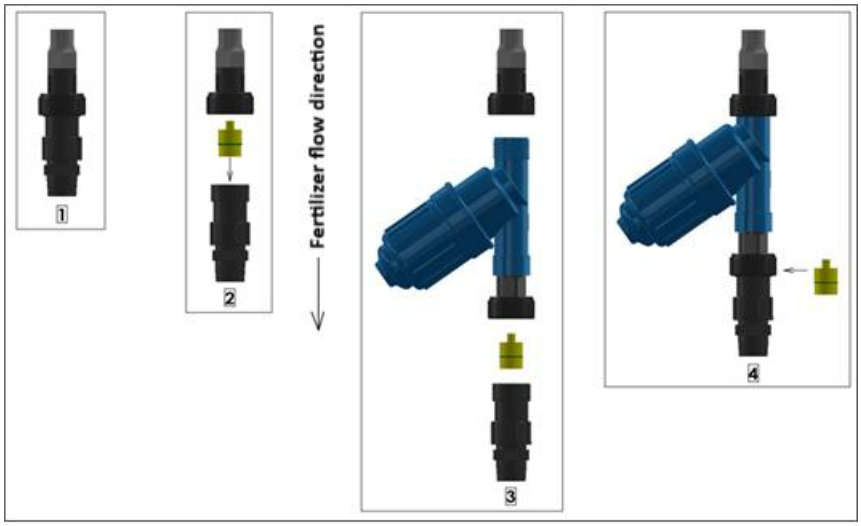
Installation of flow regulator in model 4-02 fertilizer pump

The location of the regulator assembly is at the end of the fertilizer injection hose at the connection to the irrigation line.



Installation of regulator - Figure 7

Below is an installation diagram for a regulator + filter:



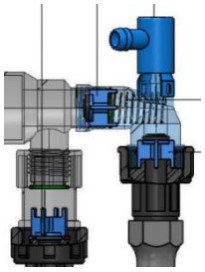
Installation of regulator and filter - Figure 8

1. Open the union nut at the end of the injection hose (2).
2. Insert the regulator into the union fitting with the protrusion and the label of the regulator facing against the direction of the fertilizer flow (3).
3. Screw the filter into the injection hose by tightening the union nut at the end of the injection hose (according to the direction of the arrow on the filter) (3).
4. Connect the injection hose with the filter to the irrigation line by screwing the union nut on the filter into the union fitting with the regulator that are on the line (4).

Installation of valves

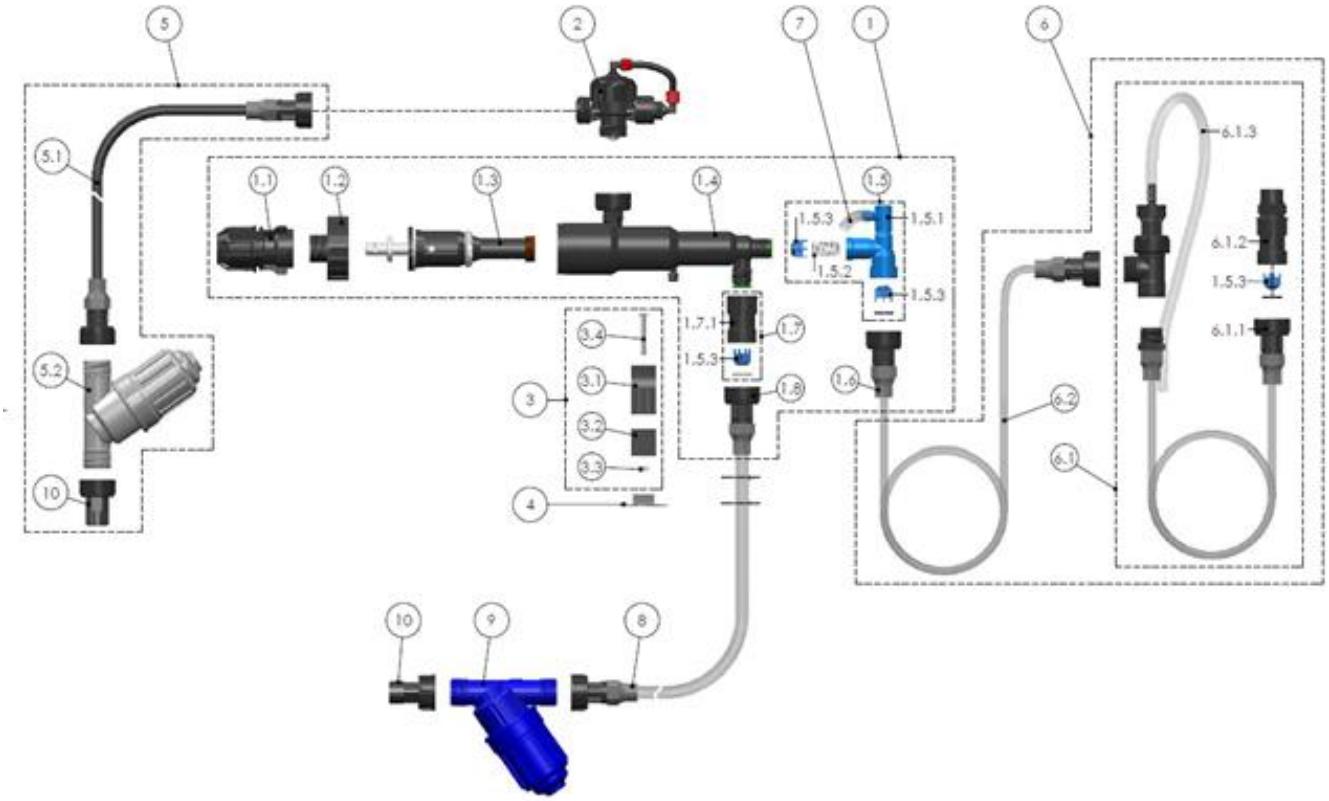
1. Ensure the correct orientation of the valve in suction and injection according to the markings stamped on the pump body. A valve installed backward will cause the pump to not operate properly.
2. The spring (1.5.2) must be properly seated within the legs, with the legs enclosing the spring and the spring not protruding beyond the legs. An improperly placed spring will cause the pump to not work well.

Prevent disruptions in pump operation by ensuring the valves are correctly oriented, if you have removed them, as well as correct installation of the spring.



Description of pump parts

Exploded view of pump parts - Figure 9



Exploded view of pump parts - Figure 9

Parts list – pump

No.	CAT. NO.	Description	Structure material	Quantity
1	700190-005802	Cylinder housing assembly + motor + pump assembly	Miscellaneous	1
1.1	780104-001604	Adapter, 1"F 25 mm, PE, Plassim	PP	1
1.2	710103-004196	Cylinder housing cover (machined)	PBT	1
1.3	700190-003249	Linear motor for fertilizer pump	Miscellaneous	1
1.4	700190-003258	Cylinder housing assembly	Miscellaneous	1
1.5	700190-005158	Injection valve housing assembly - blue - suction pump	Miscellaneous	1
1.5.1	700190-003306	Injection valve assembly 02 - 4	PP	1
1.5.2	760107-000060	0.7 spring for injection valve	316L stainless steel	1
1.5.3	700190-003318	Valve with Viton seal	PP	2
1.6	700190-003255	16 mm integrated coupler	Miscellaneous	1
1.7	700190-005782	Suction valve assembly	Miscellaneous	1
1.7.1	710101-000985	Suction valve housing	RPP	1
1.8	700190-003256	20 mm integrated coupler	Miscellaneous	1
2	700190-003248	¾ N.C. valve	Miscellaneous	1
3	700190-003298	Clamps assembly without mount	Miscellaneous	1
3.1	710101-000971	Top clamp for fertilizer pump	RPP	1
3.2	710101-000972	Bottom clamp for fertilizer pump	RPP	1
3.3	760102-000078	1/4" UNC 316 stainless steel nut	316 stainless steel	2
3.4	760101-000419	1/4" UNC stainless steel bolt	316 stainless steel	2
4	710103-004425	Stainless steel mount for fertilizer pump	316 stainless steel	1
5	700190-005713	Operating water hose assembly 02 - 4, black 3/8" with filter	Miscellaneous	1
5.1	700190-003294	Operating water hose assembly 02 - 4, black 3/8"	Miscellaneous	1
5.2	011001-000001	Gray 1" PP Tagline filter, polyester 100 micron mesh, NBR seals	PP	1
6	700190-003299	Automatic air vent assembly	Miscellaneous	1
6.1	700190-005796	Automatic air vent	Miscellaneous	1
6.1.1	700190-003286	3/8" transparent automatic air vent hose assembly	Miscellaneous	1
6.1.2	700190-003310	Water ingress prevention valve	Miscellaneous	1
6.1.3	700190-003304	Anti-vacuum valve	RPP	1
6.2	700190-003287	3/8" transparent injection hose assembly, 4 meters	Miscellaneous	1
7	700190-003300	Hose for automatic air vent	PVC	1
8	700190-003292	4-02 Suction hose assembly (PP filter)	Miscellaneous	1
9	010001-000050	Blue PP 1" C filter, 300 micron Viton seals BSPT	Miscellaneous	1
10	700190-003257	Union nipple with seal + union nut	Miscellaneous	2

Assemblies

4-02 pump assembly - Figure 10

CAT. NO. 700190-005802

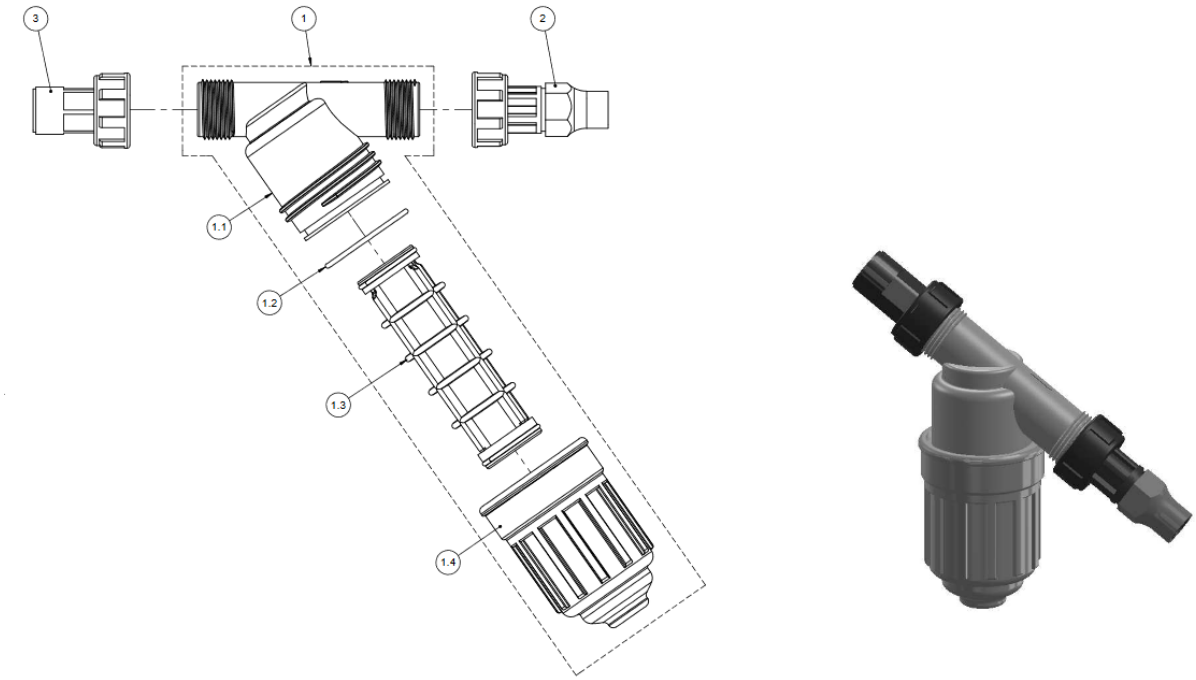
No.	CAT. NO.	Description	Quantity
1	700190-003258	Cylinder housing assembly	1
2	700190-003249	Linear motor for fertilizer pump	1
3	710103-004196	Cylinder housing cover (machined)	1
4	780104-001604	Adapter, 1"F 25 mm, PE, Plassim	1
5	700190-005795	Blue injection valves housing assembly.	1
6	700190-003255	16 mm integrated coupler	1
7	700190-005782	Suction valve assembly	1
8	700190-003256	20 mm integrated coupler	1

4-02 pump assembly - Figure 10

Operating water filter assembly - Figure 11

Cat. No. - 700190-005712

No.	CAT. NO.	Description	Quantity
1	011001-000001	1" gray PP Tagline filter 130 micron polyester mesh, NBR seals	1
1.1	710101-000478	1" filter body compact PP gray BSPT	1
1.2	770102-000099	2-136 NBR seal	1
1.3	700101-000275	3/4" polyester cylinder 100 micron	1
1.4	710101-000452	3/4" closed cover PP gray	1
2	700190-003256	20 mm integrated coupler	1
3	700190-003257	Union nipple with seal + union nut	1

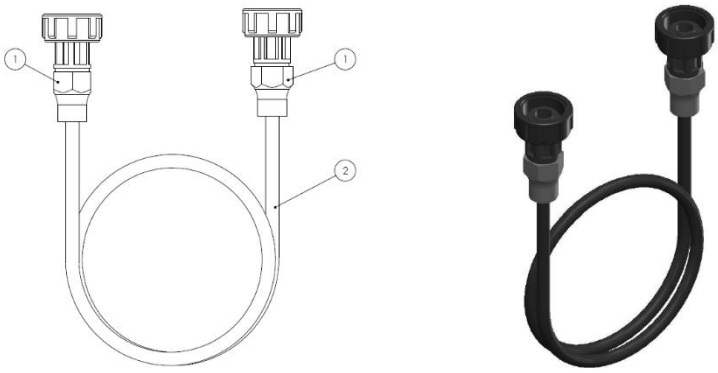


Operating water filter assembly - Figure 11

Operating water hose assembly - Figure 12

Cat. No. - 700190-003294

No.	CAT. NO.	Description	Quantity
1	700190-003255	16 mm integrated coupler	2
2	790208-000004	Black 3/8" hose, injection (price per 1 m)	2 m

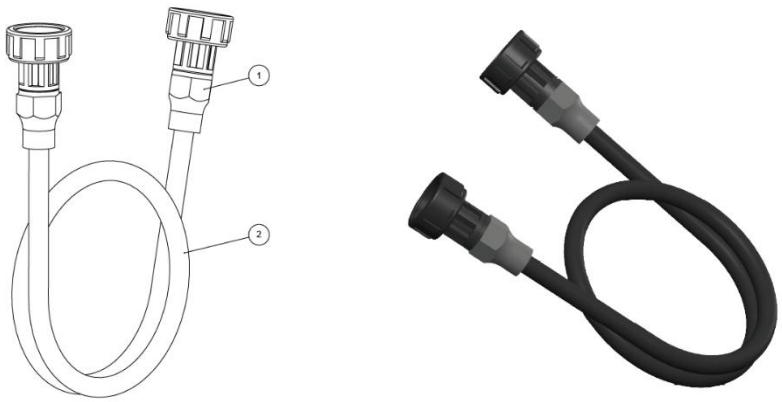


Operating water hose assembly - Figure 12

Fertilizer suction hose assembly - Figure 13

Cat. No. - 700190-003292

No.	CAT. NO.	Description	Quantity
1	003256-700190	20 mm integrated coupler	2
2	000030-790208	Black 1/2" hose with white strip, injection (price per 1 m)	2 m

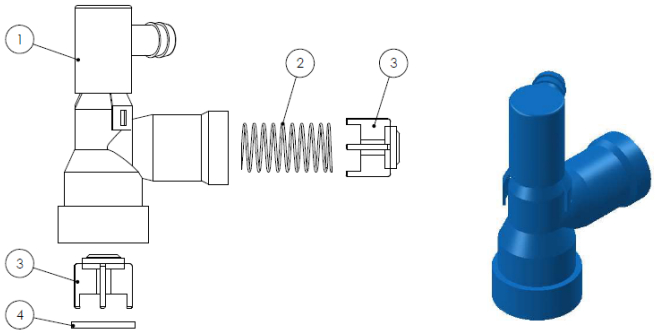


Fertilizer suction hose assembly - Figure 13

Blue air release assembly - Figure 14

Cat. No. - 700190-005795

No.	CAT. NO.	Description	Quantity
1	003306-700190	Injection valve assembly 02 - 4	1
2	000060-760107	0.7 spring 0 for injection valve	1
3	003318-700190	Valve with Viton seal	2
4	000987-710101	Valve-positioning ring	1

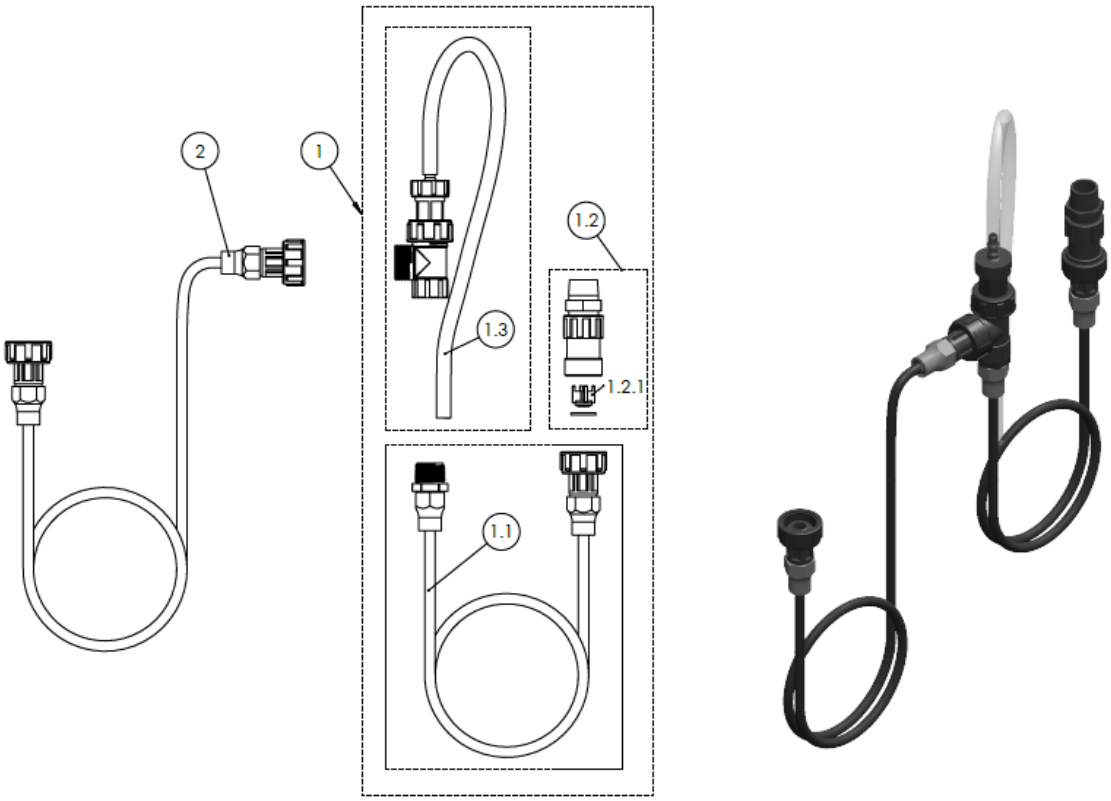


Blue air release assembly - Figure 14

Fertilizer injection hose assembly - Figure 15

Cat. No. - 700190-003299

~~No.~~	~~CAT. NO.~~	~~Description~~	~~Quantity~~
1	005796-700190	Automatic air release assembly	1
1.1	003286-700190	3/8" black air vent hose assembly	1
1.2	003310-700190	Water ingress prevention valve	1
1.2.1	003318-700190	Valve with Viton seal	1
1.3	003304-700190	Anti-vacuum valve	1
2	003287-700190	3/8" black injection hose assembly, 4 meters	1

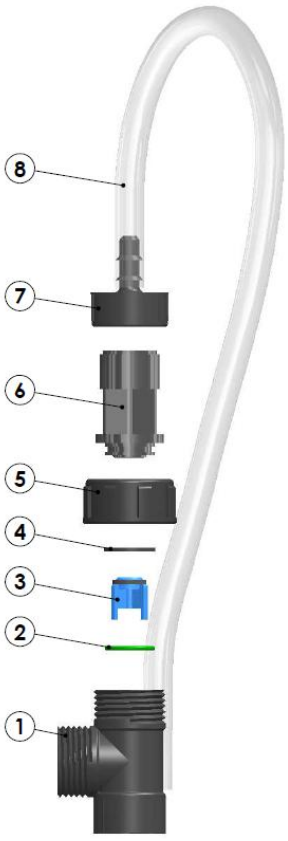


Fertilizer injection hose assembly - Figure 15

Automatic air vent assembly - Figure No. 16

Cat. No. - 700190-003304

No.	CAT. NO.	Description	Quantity
1	000997-710101	3/4" T branch for air vent	1
2	000225-770102	P2 - 018 union Viton seal	1
3	003318-700190	Valve with Viton seal	1
4	000987-710101	Valve-positioning ring	1
5	000986-710101	Union nut	1
6	000988-710101	Union nipple	1
7	000669-710101	12 mm coupler for rinse valve	1
8	003300-700190	Hose for automatic air vent	1

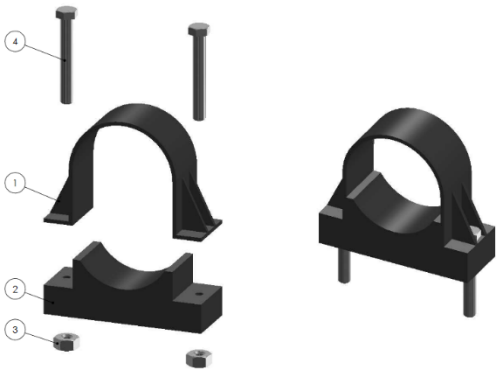


Automatic air vent assembly - Figure No. 16

Rod bracket assembly - Figure 17

Cat. No. - 700190-003298

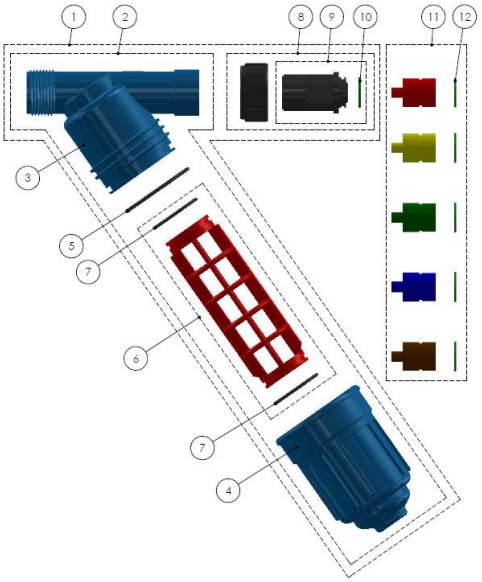
No.	CAT. NO.	Description	Quantity
1	000971-710101	Top clamp for fertilizer pump	1
2	000972-710101	Bottom clamp for fertilizer pump	1
3	000097-760102	1/4" UNC 316 stainless steel nut	2
4	000419-710101	1/4" UNC stainless steel bolt	2



Rod bracket assembly - Figure 16

Filter + flow regulators - Figure 18

No.	CAT. NO.	Description	Quantity
1	700190-003269	Filter kit for flow regulators	1
2	010000-000106	1"-¾" filter, blue PBT, 130 micron polyester mesh, Viton seals	1
3	700190-001169	1"-¾" PBT filter body, blue, BSPT	1
4	710101-000450	¾" PBT cap, blue	1
5	770102-000237	Viton seal 2-136	1
6	700101-000284	¾" polyester mesh, 130 micron	1
7	770101-000068	Viton seal for filter body	2
8	700190-003257	Union nipple with seal + union nut	1
9	700190-003316	Union nipple with seal	1
10	770102-000225	Viton union seal P2-018	1
11	Table below	Flow regulator capsule / assembly	1
12	770102-000224	Viton seal for regulator P2-017	1



Filter + flow regulators – Figure 18

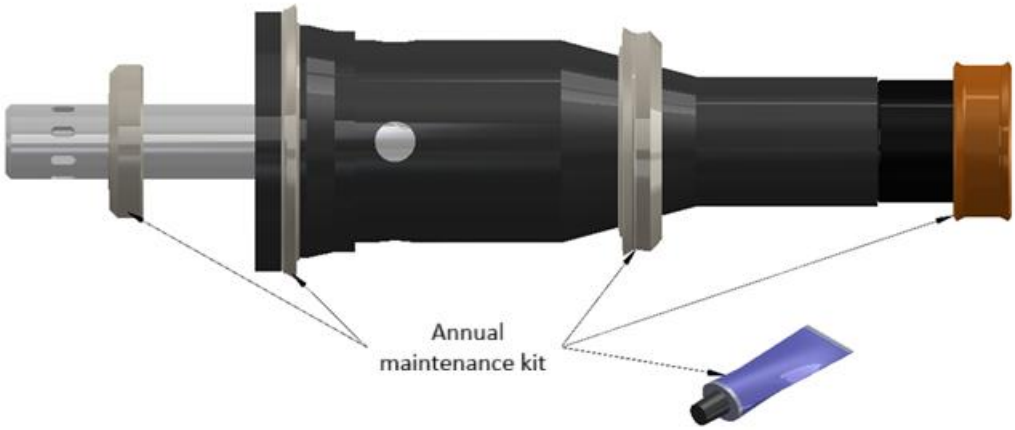
Capsule color	Red	Yellow	Green	Blue	Brown
Flow rate (liters/hour)	10	20	40	60	80
Fertilizer quantity (grams)	2.6	5.3	10.6	15.9	21.1
Capsule Cat. No. Flow regulator	700190-003263	700190-003264	700190-003265	700190-003266	700190-003267
Assembly Cat. No. Flow regulator	700190-003271	700190-003272	700190-003273	700190-003274	700190-003275

Add-ons + Annual Maintenance Kit

Set of O-rings
Cat. No. - 700190-003254

Anti-vacuum Assembly
Cat. No. - 700190-006733

Annual Maintenance Kit
Cat. No. - 700194-000135



Troubleshooting

A - Linear motor

Signs of malfunction		Possible cause		Order of inspection, detection and repair of malfunctions
1	Motor not operating	1	Problem with the supply of operating water into the pump	1. Make sure water enters the cylinder housing (Figure 9 part 1.4) 2. Make sure that the water inlet valve (Figure 3 part 1), water doser (if there is one). N.C. valve (Figure 9 part 2) is all in the open position 3. Make sure the filter is not clogged. (Figure 9 part 5.2) 4. Verify that N.C. valve is closed (Figure 9 Part 2) 5. Open the cylinder housing cover (Figure 9 part 1.2) 6. Pull the main motor valve to the rear position (pull lightly) and hold it in this position (Figure 4 part 15) 7. Give a command (water) to N.C. vlave (Figure 9 part 2) to the open position; the water will push the pump motor (Figure 9 part 1.3) out 8. After the motor is removed, the water will flow freely out 9. If there is no flow, look for the cause on the main line or in the water inlet hose (Figure 9 part 5) to the pump
		2	Motor seals (Figure 4 parts 1 and 2) damaged or reversal disc (Figure 4 part 13) backward	1. Take out the motor (Figure 9 part 1.3) 2. Visually inspect for any defects or tears. Check if the edges of the seals are worn or flat (the lips of a functioning seal will be upright at an angle of about 45 degrees from the motor body) 3. Ensure that the reversal disc (Figure 4 part 13) is positioned so that its white side is toward the inside of the motor
		3	Fractures or cracks in the motor assembly	1. Ensure by visual inspection that there are no fractures or cracks in the motor body (Figure 9 part 1.3) or its parts. If there are, replace it.
		4	Main motor valve stuck	1. Take out the motor (Figure 9 part 1.3) 2. Hold the motor in your hand and gently move the main motor valve (Figure 4 part 15) forward and backward. The valve should move about half a centimeter back and forth very easily. 3. If the valve is stuck or difficult to move, order a service technician
		5	Blockage or clog in the fertilizer injection line	Pressing the air release valve (Figure 9 part 1.5) will activate the pump and discharge the fertilizer through it. Release of the air release valve will cause the pump to stop. 1. Look for a blockage in the fertilizer injection hose (Figure 9 part 6), in the flow regulator (if there is one), in the valve (Figure 3 part 10) or in other passages along the injection line.

A - Linear motor (continued)

Signs of malfunction		Possible cause		Order of inspection, detection and repair of malfunctions
				2. If there is a blockage, make sure to release it (if possible, it is recommended to release a blockage with reverse pressure). Check if the water shutoff valve (Figure 9, part 1.5.3/6) is backward; ensure its legs are facing downward.
2	Motor is not operating, and water is continuously discharged from the discharge vent	1	Reversal disk missing	1. Check and ensure that the reversal disk is present (Figure 4, part 13) 2. Make sure to insert the reversal disk with the white side toward the inside of the motor
3	Slow and difficult motor operation	1	Damaged motor seals or reversal disk backward	Check according to the explanation in section 2/1
		2	Obstruction of main valve movement	Check according to the explanation in section 4/1
		3	Water supply obstruction	Check according to the explanation in section 1/1
		4	Motor seals backward	Check that the motor seals are positioned so that their openings are facing each other. If their openings are not facing each other, reverse them (Figure 4, parts 1+2)
		5	Insufficient grease on motor seals	Check and ensure presence of grease on motor seals and pump seal. If lacking, grease the motor (see lubrication instructions on page 15)
		6	Obstruction and wear in the cylinder housing	1. Visually inspect the interior of the cylinder housing (Figure 9 part 1.4) by turning the opening toward a bright light. 2. See if it is scratched or worn. If so, have it replaced
4	Motor vibrating irregularly	1	Obstruction in the suction system	1. Check the suction filter for cleanliness (Figure 9 Part 9) 2. Ensure the free movement of the suction valve (Figure 9 part 1.5.3/1.7) by moving it up and down 3. Make sure the suction valve is mounted in the correct direction with its legs facing upward
		2	Breather valve opening is blocked	Make sure the breather valve port (Figure 4 part 16) is released to the atmosphere and is not blocked (by blowing through it when the motor is out)
		3	Reversal disc stuck	Make sure the reversal disc (Figure 4 part 13) is not stuck on the main motor valve (Figure 4 part 15). The disc should move freely throughout the length of the main valve

A - Linear motor (continued)

Signs of malfunction		Possible cause		Order of inspection, detection and repair of malfunctions
5	Breather valve leak (part 16)	1	Water under pressure is discharged from the breather valve port	A small motor seal is torn, or the bracket of this seal (Figure 4 Part 2) is worn and cracked. Replace seal or motor.
		2	Fertilizer is discharged from the breather valve port	Brown pump seal (Figure 4 or 3) is torn and should be replaced
		3	Fertilizer and water dripping from the breather valve	Worn cylinder body. Replace the body of the pump

B - Pump and valve system (general)

Signs of malfunction		Possible cause		Order of inspection, detection and repair of malfunctions
6	The motor is working well but there is no pumping of fertilizer after air discharge from the air release valve	1	Pump seal damaged	Remove the motor (Figure 9 part 1.3), Visually inspect the pump seal (Figure 4 part 3) for any tears or wear. Replace it if necessary.
		2	Suction valve stuck or damaged	1. Open the suction valve (Figure 9, part 1.7) and ensure the valve (Figure 9 part 1.5.3) moves smoothly up and down 2. Remove the valve-positioning ring of the suction valve (Figure 14 part 4) by pulling it out with a screwdriver 3. Remove the suction valve (Figure 9 part 1.5.3/1.7) 4. Visually inspect the valve seal for damage or tears 5. Check the valve housing for any fertilizer buildup 6. Visually inspect the sealing lips on the valve bracket at the top of the union nipple (Figure 9, part 1.8) in the suction hose 7. Replace any faulty parts 8. Put the valve back in place. Make sure to return it in the correct direction (Figure 9 part 1.5.3/1.7) 9. Return positioning ring (Figure 14 part 4)
		3	Injection valve stuck or damaged (Figure 9 part 1.5.3/1.5)	Rotate the injection valve housing (Figure 9, part 1.5) a quarter turn in the opening direction and return it to its previous position. Repeat 3-4 times.
		4	Obstructions in the suction system	Check according to the explanation in Section 1/4

C – Automatic air vent (model 4-02/92)

Signs of malfunction			Possible cause	Order of inspection, detection and repair of malfunctions
7	Pump is running but is not discharging through automatic vent.	1	There is no check valve at the end of the injection line or valve is out of order.	1. Verify that check valve is present (Figure 15 Part No. 1.2.1) is at the end of the injection line. (prevents water flow from the line to injection hose) a. Remove the union coupler (Figure 15, Part 1.2) b. Verify that check valve is present and in good condition (Figure 15 Part No. 1.2.1) c. Verify that check valve moves freely and is attached in the correct direction – head towards the pump and legs towards the irrigation line. d. If necessary, check the valve housing for any fertilizer buildup
		2	Automatic air vent valve jammed in the closed position.	1. Remove the union coupler at the end of the T junction of the air vent (Figure 16 Part 5) 2. Verify that check valve (Figure 16 Part 3) is free and attached correctly as in Figure 16.

Amiad Limited Warranty

1. This certificate is valid and relates to products purchased directly by you (hereinafter: "the Customer") from Amiad Water Systems Ltd. ("Amiad"), unless otherwise agreed in writing by Amiad. This warranty is granted and valid only to the Customer, the original purchaser, and is not transferable to anyone who purchased, rented or otherwise received the products from the Customer.

2. Products have no defect in their hardware and/or performance and will remain so as long as their use and operation is reasonable. Subject to the warranty conditions listed above and below, Amiad undertakes to repair manufacturing defects in the products.

3. The warranty period is for 12 months from the date of supply of the products (hereinafter: "**the Warranty Period**").

4. If, during the Warranty Period, the Customer discovers a defect in the hardware and/or performance of the products or some of them (hereinafter: "the Defective Product"), the Customer will submit a written complaint to Amiad, using Amiad's standard customer complaint form. To receive the standard customer complaint form, file a complaint or for any questions, please contact the customer service representative.

5. In accordance with a written request from Amiad, the Customer will return the Defective Product to Amiad - or a sample of it - at Amiad's expense. If the Customer sends this product, Amiad offers to safely pack the product and insure it according to its value, as Amiad does not bear any liability for any loss or damage caused during delivery. If Amiad determines that the warranty does not apply to that part, the Customer will immediately compensate Amiad for the cost related to the above (including transport and customs fees). Any product or part thereof that is returned to Amiad will be accompanied by the warranty certificate and the purchase invoice. It is hereby clarified that the Customer will not return the Defective Product unless the return is coordinated and approved in advance by Amiad.

6. Amiad's obligation under this warranty certificate will be limited, at its discretion, to repair or replacement, free of charge, of the products or part thereof which can be proven to have been damaged during the Warranty Period under reasonable use and operation. Repair or replacement of the products or part thereof during the Warranty Period shall extend the Warranty Period of those products or parts that have been replaced or repaired by an additional 12 months, provided that the extension period together with the Warranty Period shall not exceed 18 months from the date of delivery of the products.

7. This warranty will take effect if the products have been installed in accordance with Amiad's instructions specified, inter alia, in Amiad's operating manuals and in accordance with the technical limitations specified, inter alia, in Amiad's brochures or specified by Amiad's representative.

8. This warranty will not apply to products that have been damaged or broken as a result of the following incidents and/or in a manner that relates to such incidents:

    8.1. Fire, flooding, power network failure, power outage or any other disaster and/or unforeseen circumstances, including, but not limited to, those customers tend to insure against, or in any case of force majeure;

    8.2. Malice, misuse or negligence of the Customer;

    8.3. Failure in water entry according to the agreed standards, as specified in writing in a document approved by Amiad;

    8.4. Improper or unauthorized use of products or related parts by the Customer, including operating the products not in accordance with the recommendations and instructions of Amiad specified in the operating manuals and other written materials of Amiad, operation of the products by someone who is not a skilled and qualified operator or installation of the products by a third party not authorized by Amiad;

    8.5. Maintenance and other services performed by the Customer and not by a skilled and qualified operator or not in accordance with the recommendations and instructions of Amiad or not in accordance with the processes specified in the written information provided with the products (including in cases of periodic replacement of parts); or

    8.6. Any modification, adjustment, repair or foreign connection to the products not by Amiad or an authorized technical representative on its behalf.

9. Amiad shall not be liable in any case for any damage to property, intangible damage, economic damage, including loss of profits, loss of customers or damage to reputation or any other damage, caused to the Customer or to a third party, whether direct or indirect, special, punitive, or consequential, as a result of this warranty certificate or in a manner relating to it, or as a result of the performance of the product, or its inability to perform, or in a manner related to this, including in situations where such damage was known.

10. Amiad shall be exempt from liability if, as a result of events beyond its control and/or as a result of force majeure, it is unable to carry out what is required under this certificate or to perform them with delay.

11. The warranty described in this certificate is the only and exclusive contractual warranty provided by Amiad and replaces any other warranty created in the document, packaging or otherwise.

12. Amiad is not responsible for accessories or parts that were not provided by it. In cases where Amiad is asked to repair a defective product or part that is not covered by this warranty, it will require an additional fee for such repairs.

13. The parties shall strive to resolve any disputes that may arise between them regarding the warranty certificate. In the event that the parties fail to resolve the disputes, the sole jurisdiction will be the competent courts in Tel Aviv, and this Agreement will be governed by the law of the State of Israel.