Installation, operation and maintenance instructions

Injector pump for chemicals and fertilizers

Model - 4-01

(300000-000011)

This document describes the installation, operation and maintenance of the model 4-01 fertilizer pumps manufactured by Amiad Water Systems Ltd.

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Disclaimer:

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Technical data

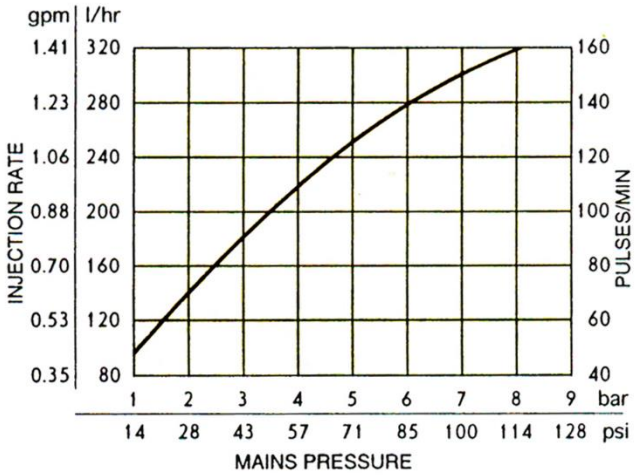
General

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

Materials Construction

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

Graph of fertilizer injection rate as a function of water line pressure



Fertilizer injection rate graph - Figure 1

Safety instructions

Applicable local or national safety regulations and rules for the prevention of accidents must be applied in all work procedures in addition to the following 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 installation, operation or maintenance of the fertilizer pump, all conventional safety instructions should be observed to avoid danger to the workers, the public or to property in the vicinity.
- Note that in water systems controlled by command systems, the pump may begin operating automatically, without any warning.
- No change or modification to the equipment is permitted without a written notification given in advance by the manufacturer or by its representative, on the manufacturer's behalf.
- Always observe standard safety instructions and good engineering practices whilst working in the pump's vicinity.
- The pump should only be used for its original intended purpose as designed by Amiad. Any misuse of the pump, or incorrect connection, may lead to undesired damage and may affect your warranty coverage. Please consult with Amiad prior to any non-regular 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 goggles, gloves, overalls sealed to 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 pipe 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 bear any responsibility 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 detailed Installation Instructions provided with the pump by the manufacturer and according to the description given in this manual.
- Make sure to leave enough clearance to enable easy access for future treatments and safe maintenance operations.
- The user must ensure adequate lighting in the area of the pump to allow safe operation and maintenance of the equipment.
- The user should arrange suitable platforms, ladders, and safety barriers to enable easy and safe access to the pump without climbing on pipes and other equipment. The user should verify that any platform, barrier, ladder or other such equipment is built, installed and used in accordance with the relevant local authorized standards.
- All bolts should be inspected and tightened at the time of the initial operation and immediately after the first week of operation.
- During installation, operation, and maintenance of the pump, only appropriate suitable and standard tools should be used, operated solely by certified operators.
- When installation is required in hazardous environmental sites, underground or high above ground, make sure that the site design and the auxiliary equipment are appropriate for installation at such sites, and that installation procedures are carried out in accordance with the relevant standards and regulations.
- Ensure the walking surfaces around the pump are slip free when wet.
- Ensure that the installation site floor has a suitable slope that allows drainage and prevents accumulation of liquids on the floor.
- Shipping and transporting the pump must be done in a safe and stable manner and in accordance with the relevant standards and regulations.

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, it is imperative to perform the initial operation process 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 the settling of material in the pump or on its parts.

Description and features

General description

The Amiad Model 4-01 fertilizer pump presented in this user manual, is designed to inject liquid fertilizer and chemicals in a controlled manner into irrigation lines during the irrigation, thus making fertilization of the field, orchard or greenhouse simple and easy while greatly reducing the amount of work invested in it.

The Amiad pump is powered by water and injects the fertilizer solution into the irrigation line at double the pressure of the water pressure in the irrigation line. In this way, the injected solution mixes with the irrigation water and an equal distribution of the fertilizer are obtained 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-rate 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 stops.
- The pump's structure is modular and enables the assembly of replacement 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 stops.

Models

The pump described in this document, Model 4-01 Cat. No. 300000-000011 is designed for suction from the bottom of a fertilizer tank. The pump has a suction head that is inserted into the fertilizer tank and fixed inside the tank at the desired height. When the fertilizer solution reaches this height, the fertilizer injection stops automatically.

In addition to this model, the following models of fertilizer pumps manufactured by Amiad can also be obtained – please consult Amiad to find the model that best suits your needs:

- Model 4-02 Cat. No. 300001-000011 designed 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 operation and control using an irrigation controller/computer.
- Model 4-92 Cat. No. 300001-000012 – Fertilizer injector, designed 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 with pulse 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, where the speed of which depends on the supply pressure.

When the linear motor (19) moves to the suction stroke, the injection valve (4) closes, the suction valve (8) opens, and fertilizer is pumped into the cylinder body (20).

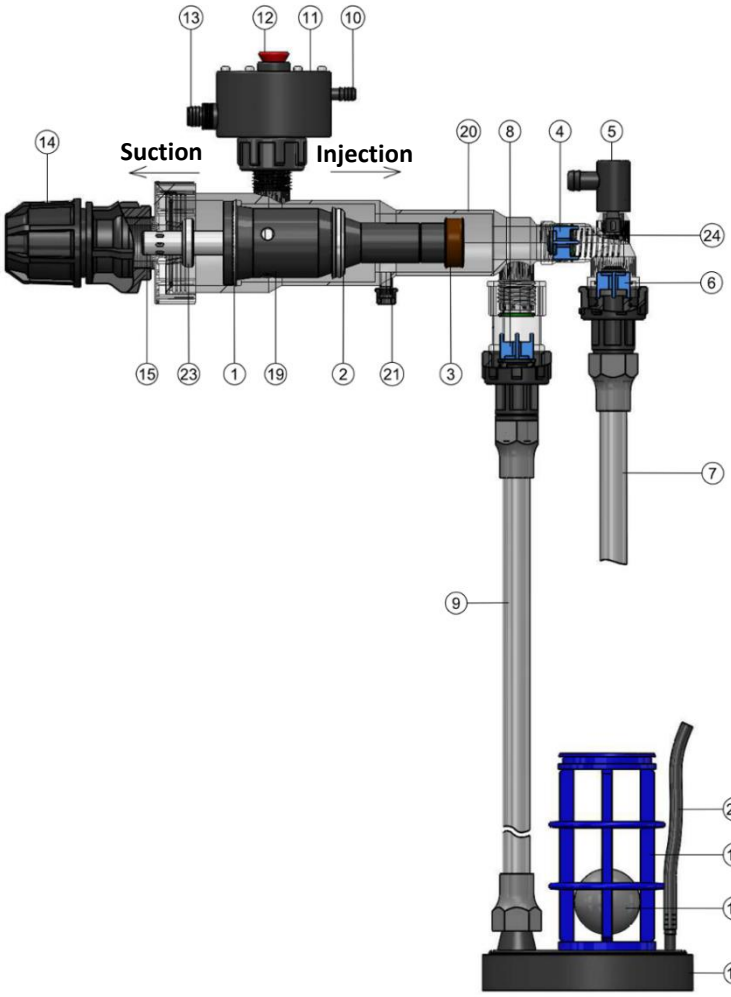
When the linear motor (19) moves toward the injection stroke, the fertilizer pressure in the pump rises, the suction valve (8) closes, the injection valve (4) and the non-return valve (6) open, and fertilizer is injected into the irrigation line. At the end of the injection stroke, the water non-return valve (6) is closed by the water pressure in the line.

Important note

Starting and stopping this pump model appears later in this document. Note that it depends on the specific pump model. If you have another pump model, please check 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. Control pipe opening
11. Automatic switch assembly
12. On/off button
13. Operating water inlet
14. Water outlet
15. Main motor valve
16. Suction Head Base
17. Suction head filter
18. Suction head ball
19. Linear motor
20. Cylinder body
21. Breather valve opening
22. Control hose for automatic switch
23. Reversal disc
24. Injection valve spring



Operating principle Figure 2

Installation

Preparation for installation (Figure 3)

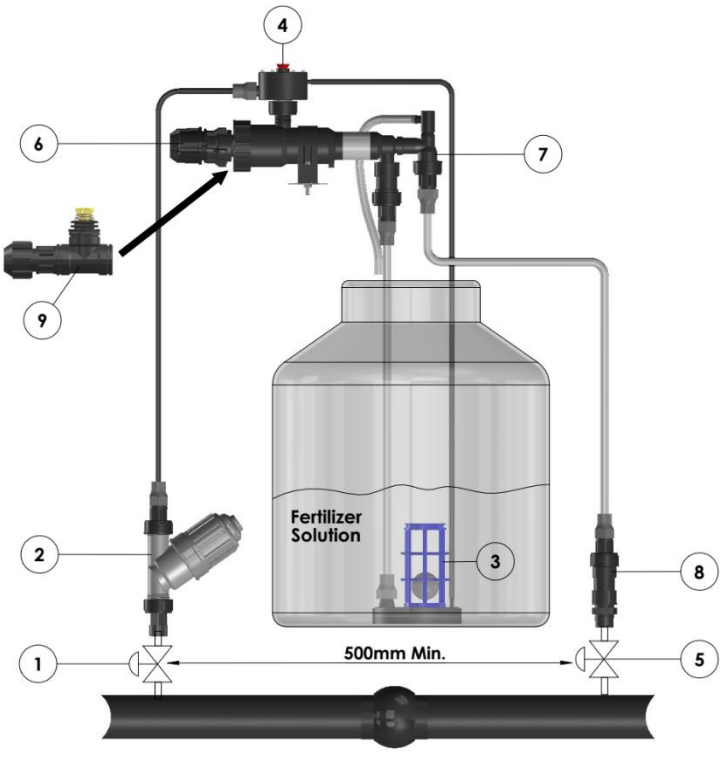
Before installing the fertilizer pump, re-read the Safety Instructions section.

- Before connecting the pump to the system, install two 3/4” manual valves on the main water line, preferably downstream of the filtration system. These valves should be installed at a distance of at least 50 cm from each other. The upstream valve (1) provides the water needed to operate the linear motor. The chemical solution is injected into the system through the fertilizer injection valve (5) downstream of the line. This valve must be suitable for use with chemicals.
- Installation of the filter (2) supplied with the pump is crucial for protecting the injection valves and the linear motor:
- The gray filter model C1 (2), with filtration degree of 100 microns, is installed on the operating water line and prevents dirt and sand from entering the motor, thus enabling smooth operation over time.
- Connect a thin wall plastic pipe with an external diameter of 25 mm to the water outlet (6), in order to discharge the water from the pump to a suitable location. The discharge pipe should be open and installed in a horizontal line or downward slope. The pipe length should not exceed 1 meter, then it should be inserted into a 40 mm pipe, to prevent back-pressure resistance to the pump.

Installation of a model 4-01 pump for suction from deep in the tank

Before installing this model of fertilizer pump, ensure that all the actions indicated above in the "Preparation for installation" section have been performed in full. The following is an installation drawing of this model: (the drawing is for information only)

1. Operating water valve
2. Operating water filter (gray)
3. Suction head
4. Automatic switch
5. Fertilizer injection valve
6. Water outlet
7. Air release valve
8. End fitting
9. Anti-vacuum (option)



Installation from tank bottom – Figure 3

Installation of model 4-01 pump

Figure 3 Page 10:

1. Secure the pump using the hook at an appropriate height on a mounting pole (use a 1" metal pipe) so that the pump is positioned higher than the fertilizer level in the fertilizer tank.
2. Connect the operating water pipe with a gray 1"C filter (2) upstream of the water line with a Raccord fitting (included with the pump package) to the operating water valve (1).
3. Connect the fertilizer injection pipe to the fertilizer injection water valve (5) downstream of the line with a Raccord fitting and water line connection accessory (8) (included).
4. Insert the suction head into the fertilizer tank and ensure that it is positioned upright inside the tank.
5. Open the fertilizer injection valve (5).

Please note: Installation of the filter provided with the pump is crucial for protecting the valves and the pump motor, do not remove it!

If the water outlet (6) is connected to a drain pipe that is over 1.5 m long, it is recommended to add an anti-vacuum, (Cat. No. – 700190-006733) to prevent a vacuum in the discharge line.

Operation of model 4-01 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.
Ensure that the pump is installed above the level of fertilizer in the tank, thus preventing the fertilizer from leaking through the pump to the empty water line.

1. Open the operating water valve (1) and pull the knob on the automatic switch (4). The motor starts operating quickly.
2. To start the pumping operation, press the air release valve dome (7) until all of the air is released from the system and fertilizer begins to flow out of the clear tube (air release). After releasing the air, the motor's speed significantly decreases.
3. The flow-rate of the injected fertilizer can be controlled by either throttling the manual valve on the fertilizer injection line (5) or by using the flow regulators as described in the flow regulator section later in this document.
4. The pump automatically stops when one of two conditions is met:
   4.1. The fertilizer level in the tank decreases and the float in the suction head assembly (3) descends to the bottom of the assembly.
   4.2. The operating water flow stops.
5. The pump can be turned off manually by pressing the on/off button on the automatic switch (4).

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 achieved 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 required 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 required flow-rate). To achieve this, the operating water valve must be throttled until the pump beats at a rate of 50 strokes per minute. The fertilizer flow will be 100 liters per hour.

Dosing

In a model 4-01 pump suctioning from the tank bottom, fill the fertilizer tank with the required amount or hang the suction head at an appropriate height. When the fertilizer level drops to the bottom of the suction head, the pump's water supply automatically stops.
To distribute the fertilizer dose throughout the duration of the irrigation, use an appropriate flow regulator. It is recommended to use Amiad flow regulators (see page 26). A water flow regulator 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 flow regulator should be set to 150 liters.

Relative dose

There are two main methods of maintaining a constant ratio between the water dose and the fertilizer dose:

a. If the flow-rate in the water line is constant, the relative dose is determined by the use of an appropriate fertilizer flow-rate regulator.
b. In the case of changing flow pressure and operating at changing ratios, a flow regulator can be installed on the irrigation line with a flow-rate higher than the fertilizer flow rate regulator at the appropriate ratio.

Maintenance

Ongoing maintenance of the fertilizer pump is crucial to ensuring proper and efficient operation of the system. Proper maintenance can prevent malfunctions, extend the life span 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 personal protective equipment such as goggles, gloves, overalls sealed to hazardous materials, boots, hat, 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 and the environment, 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 and the environment, while complying with all safety instructions, standards and local regulations.

Returning 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 water operation filter regularly and ensure it is 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.
- Do not add solid fertilizer to the tank when the suction head is inside the tank. Prepare the fertilizer solution before inserting the suction head into the tank. This prevents the suction of particles such as sand grains and fertilizer crystals that may scratch the inside of the cylinder body and the activation of the automatic shutoff.
- Rinse the fertilizer tank. Hard particles sometimes found in solid fertilizers may settle around the suction head. Pumping these particles into the pump will cause the erosion of the pump seal and the cylinder body.
- Lubrication - see instructions on the next page.

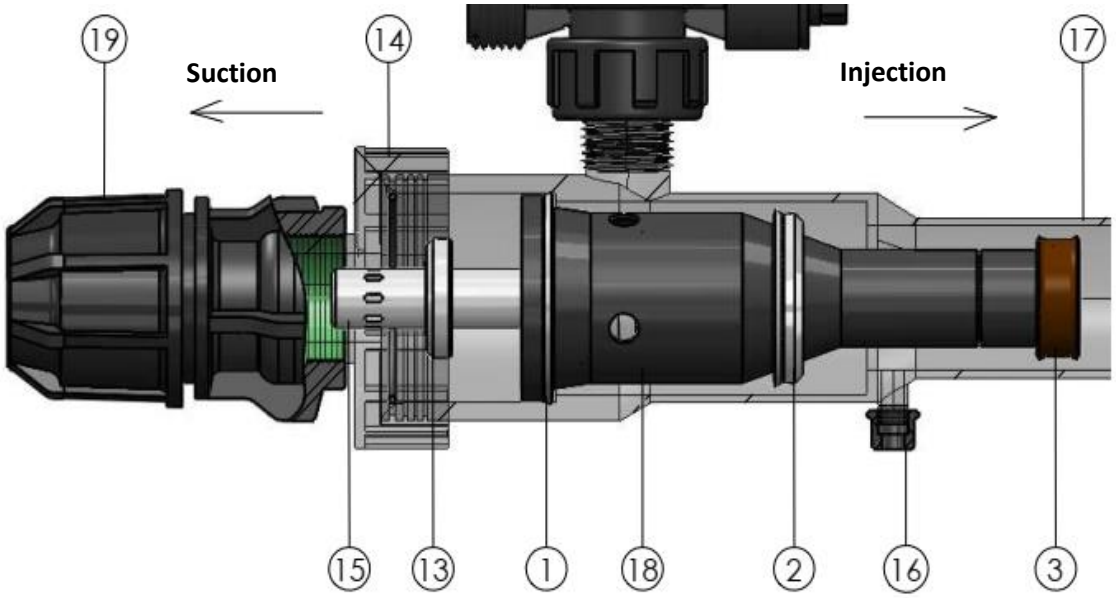
Lubricating the pump

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

Lubrication instructions (Figure 4)

1. Turn the pump off by pressing the switch or closing the operating water valve.
2. Disconnect the discharge water pipe from the fitting 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) is 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 assisted 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. Insert 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 pipe to the pump. The pump is ready for operation.

Opening 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 -

The **Annual Maintenance Kit** contains all the parts and materials needed to carry out comprehensive maintenance of 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 includes 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 span of the pump**:
   Extends the life span of the pump and prevents premature wear and tear of critical parts.
3. **Improved performance**:
   Improves pump performance and ensures it runs at maximum efficiency.
4. **Prevention of malfunctions**:
   It prevents unexpected malfunctions and reduces the need for urgent and expensive repairs.
5. **Saving time and money**:
   It Saves time and money in the long run by preventing malfunctions and prolonging the life span of the pump.

Installation of valves (refer to Figure 6)

1. Ensure the correct direction of the valve in suction and injection according to the markings on the body of the pump. 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.
   If you have disassembled the valves, prevent disruptions in pump operation by ensuring the valves are installed in the correct direction, as well as correct installation of the spring.

Flow regulators

Installation of flow regulator - general

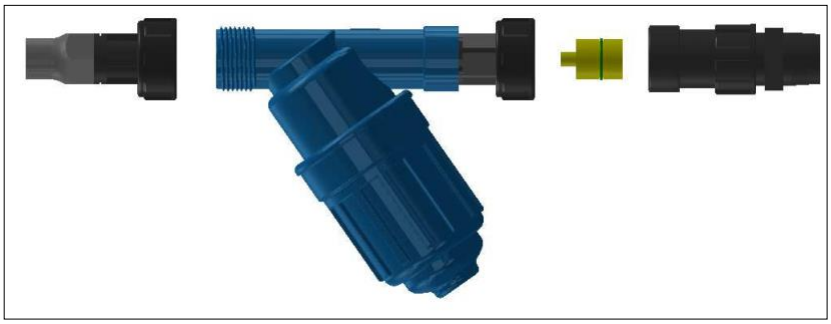
To maintain a constant fertilizer flow and to distribute it evenly throughout the duration of the irrigation, it is advisable to use a flow regulator suitable for the required fertilizer flowrate.
The flow regulator is made of materials that are resistant to most fertilizers and chemicals, and it is located at the end of the fertilizer injection pipe to the irrigation line.
It is important to use the filter supplied with the regulator, 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 joints should not be closed by force. Tightening by hand force is sufficient.

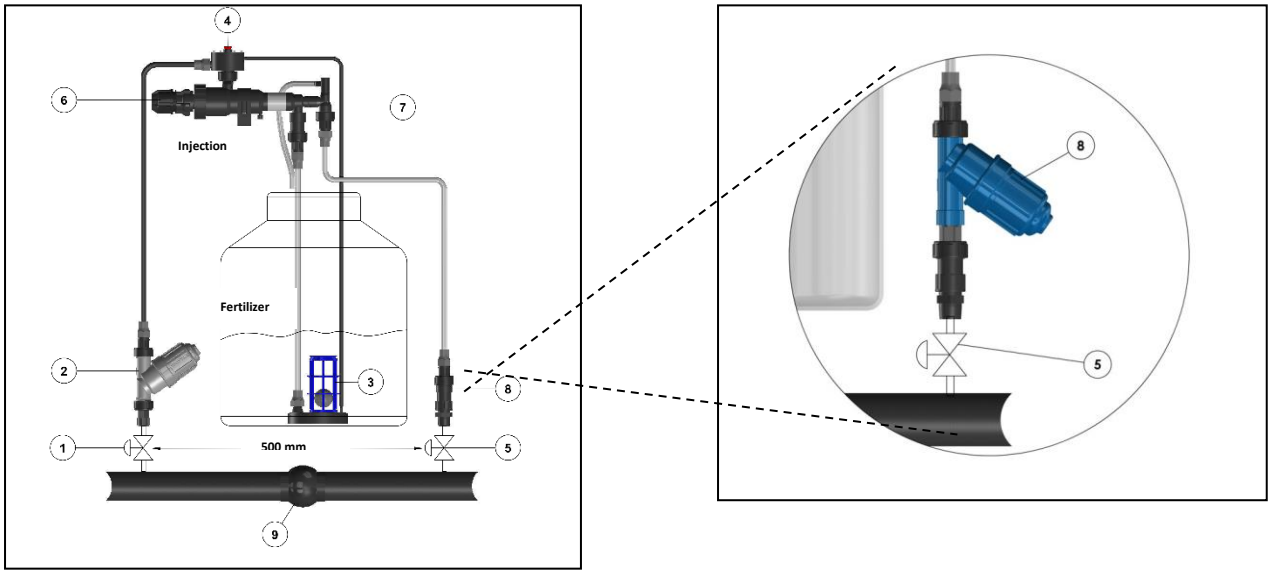
Notes:

1. To remove the regulator from its seat, do not use sharp 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 upstream of the flow regulator.

Installation of flow regulator in model 4-01 fertilizer pump

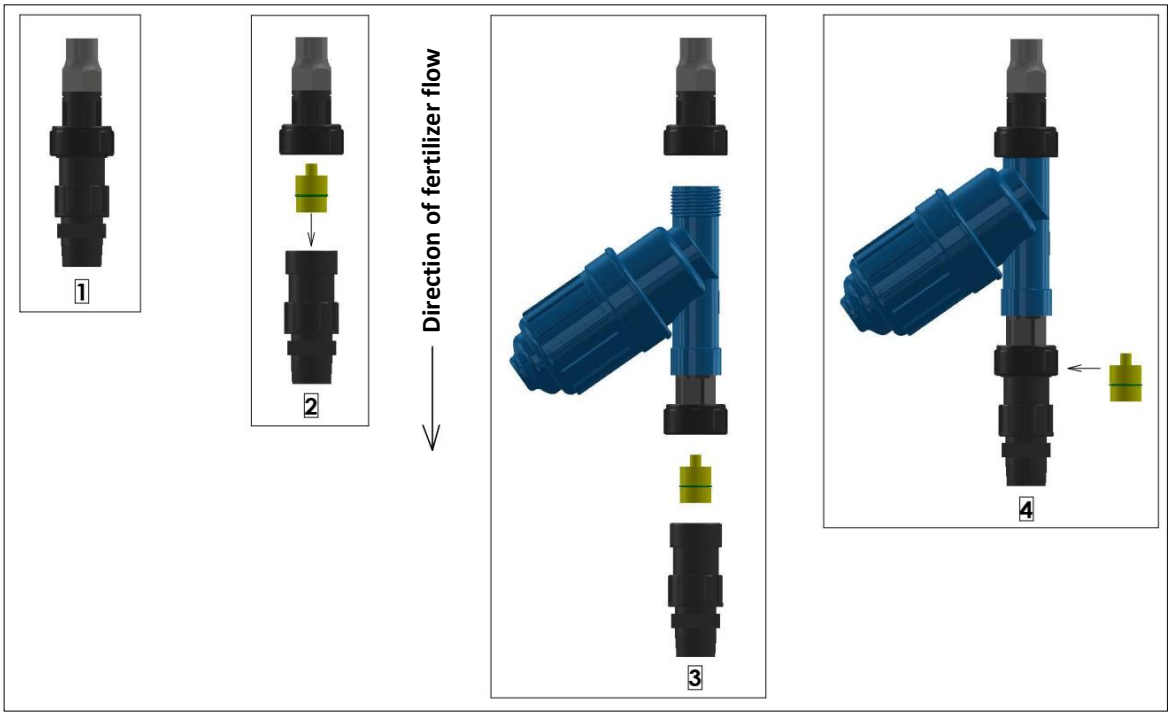
The location of the regulator assembly is at the end of the fertilizer injection pipe at the connection to the irrigation line.

Installation of the regulator - Figure 1



Installation of regulator - Figure 7

Below is a drawing of the installation of regulator + filter:

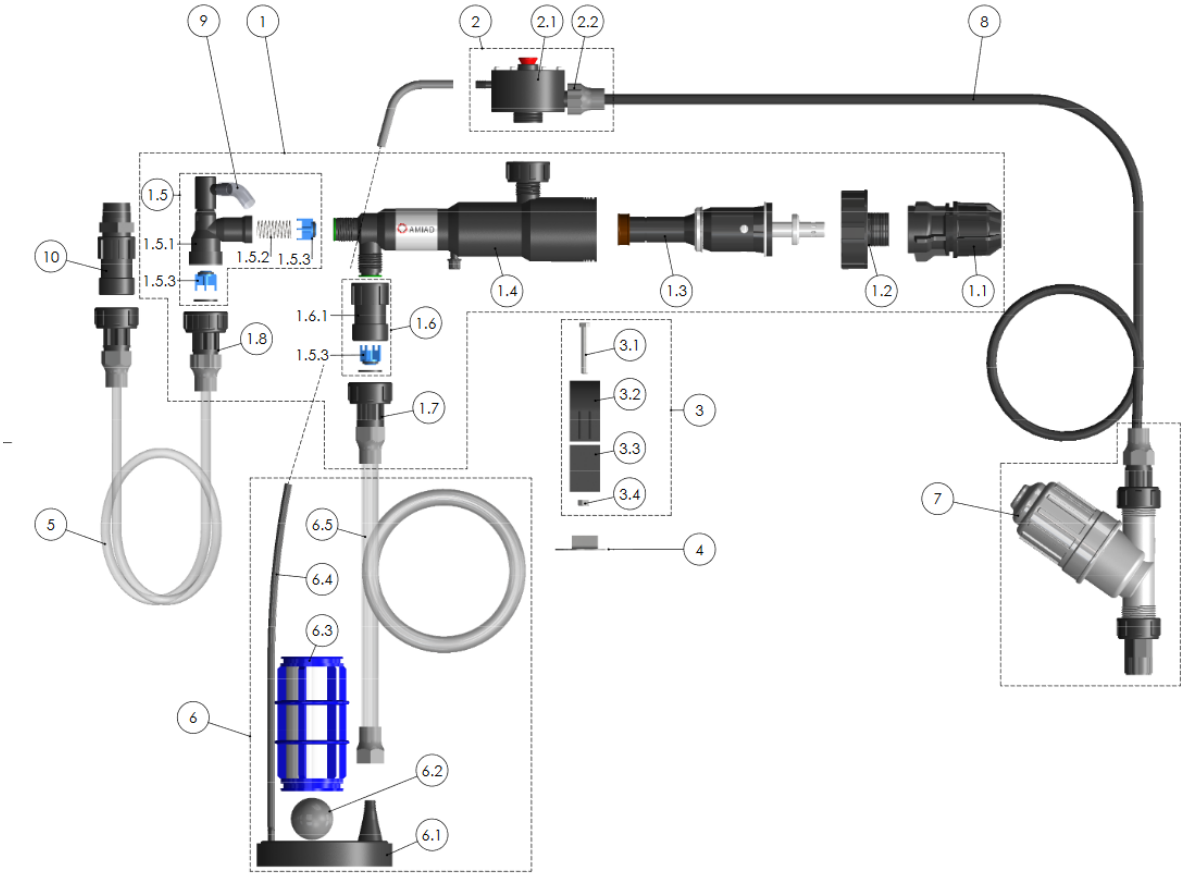


Installation of regulator and filter - Figure 8

1. Open the Raccord nut at the end of the injection pipe (2).
2. Insert the regulator into the Raccord 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 pipe by tightening the Raccord nut at the end of the injection pipe (according to the direction of the arrow on the filter) (3).
4. Connect the injection pipe with the filter to the irrigation line by screwing the Raccord nut on the filter into the Raccord fitting with the regulator which are on the line (4).

Description of pump parts

Exploded-view diagram of pump parts - Figure 9



Exploded-view diagram of pump parts - Figure9

Parts list – pump

No.	Cat. No.	Description	Quantity	Structure material
1	700190-005787	Cylinder housing assembly + motor + pump assembly	1	Miscellaneous
1.1	780104-001604	Adapter 1"F 25 mm PE Plassim	1	PP
1.2	710103-004196	Cylinder housing cover (machined)	1	PBT
1.3	700190-003249	Linear motor for fertilizer pump	1	Miscellaneous
1.4	700190-003258	Cylinder housing assembly	1	Miscellaneous
1.5	700190-005784	Injection valve assembly with spring 4 - 01	1	Miscellaneous
1.5.1	700190-003305	Injection valves housing 4-01	1	PP
1.5.2	760107-000060	Spring 0.7 for injection valve	1	L316 stainless steel
1.5.3	700190-003318	Valve with Viton seal	3	PP
1.6	700190-005782	Suction valve assembly	1	Miscellaneous
1.6.1	710101-000985	Suction valve housing	1	RPP
1.7	700190-003256	20 mm integrated coupler	1	Miscellaneous
1.8	700190-003255	16 mm integrated coupler	1	Miscellaneous
2	700190-005785	1" automatic switch assembly (for fertilizer pump)	1	Miscellaneous
2.1	700190-003250	1" automatic switch (for fertilizer pump)	1	RPP
2.2	780101-000739	16 mm Nir cap	1	PVC
3	700190-003298	Assembly of clamps without a mount	1	Miscellaneous
3.1	760101-000419	1/4" UNC stainless steel bolt	2	316 stainless steel
3.2	710101-000971	Top clamp for fertilizer pump	1	RPP
3.3	710101-000972	Bottom clamp for fertilizer pump	1	RPP
3.4	760102-000078	1/4” UNC 316 stainless steel	2	316 stainless steel
4	710103-004425	Stainless steel mount for fertilizer pump	1	316 stainless steel
5	700190-003289	3/8" injection hose assembly, 2 meters	1	Miscellaneous
6	700190-003301	Suction system	1	Miscellaneous
6.1	700190-003317	Suction head base assembly	1	Miscellaneous
6.2	770104-000268	40 mm PVC ball	1	PVC
6.3	710101-000486	1” stainless steel mesh 130 micron	1	PP Copolymer
6.4	790208-000007	9 mm black PVC tube	2.4 m	PVC
6.5	700190-003291	Suction hose assembly 4-01, 1/2"	1	Miscellaneous
7	700190-005712	Operating water filter 4-01/4-02/4-92	1	Miscellaneous
8	700190-003296	Operating water hose assembly 4-01, 3/8"	1	Miscellaneous
9	700190-003300	Hose for automatic air vent	1	PVC
10	700190-003321	End fitting	1	PP
11	700194-000135	Annual maintenance kit	1	
12	700190-006733	Anti-vacuum (option)	1	

Assemblies

4-01 pump assembly - Figure 10

Cat. No. 700190-005787

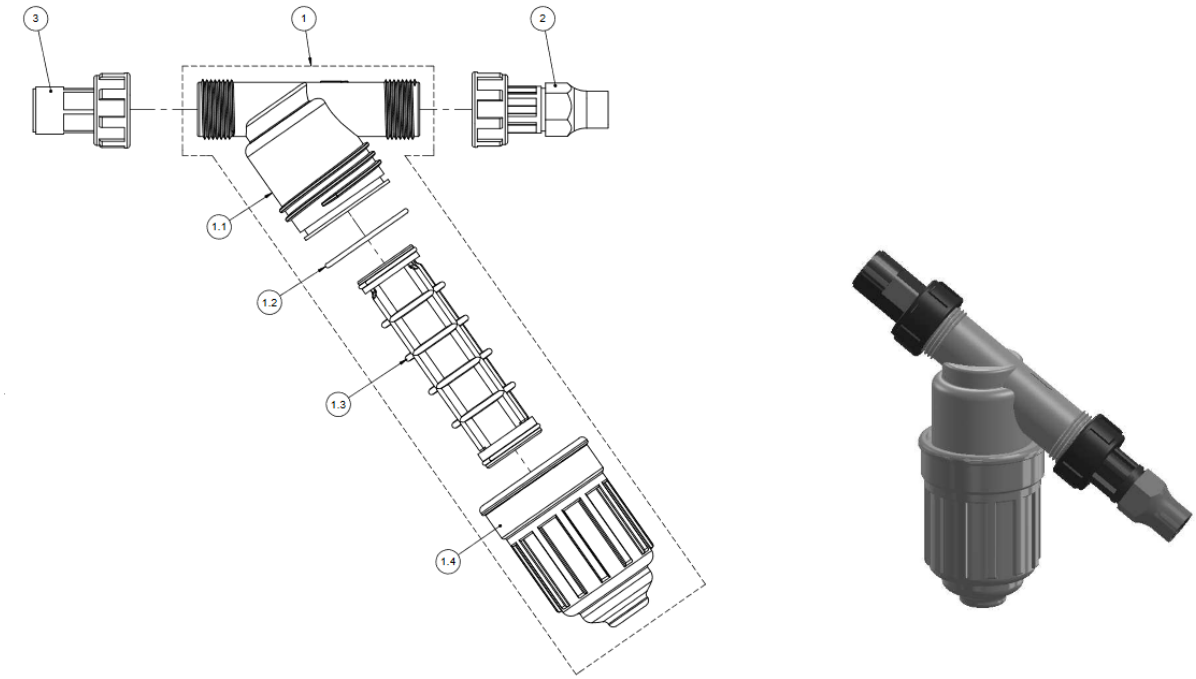
No.	Cat. No.	Description	Quantity
1	700190-003258	Cylinder housing assembly	1
2	700190-003249	Linear motor for fertilizer pump	1
3	710103-004196	Cylinder housing cover (machined)	1
4	780104-001604	Adapter 1"F 25 mm PE Plassim	1
5	700190-005784	Injection valve assembly with spring 4-01	1
6	700190-003255	16 mm integrated coupler	1
7	700190-005782	Suction valve assembly	1
8	700190-003256	20 mm integrated coupler	1

4-01 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

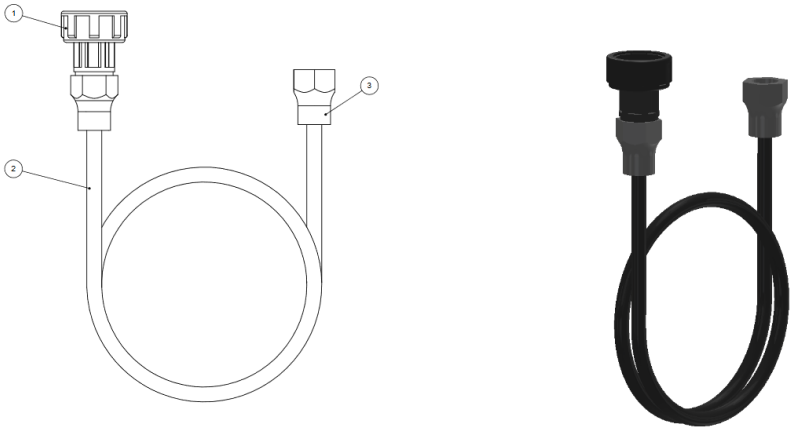


Operating water filter assembly - Figure 11

Operating water pipe assembly - Figure 12

Cat. No. - 700190-003296

No.	Cat. No.	Description	Quantity
1	700190-003256	20 mm integrated coupler	1
2	790208-000029	3/8" black pipe operating water	2m
3	780101-000739	16 mm Nir cap	1

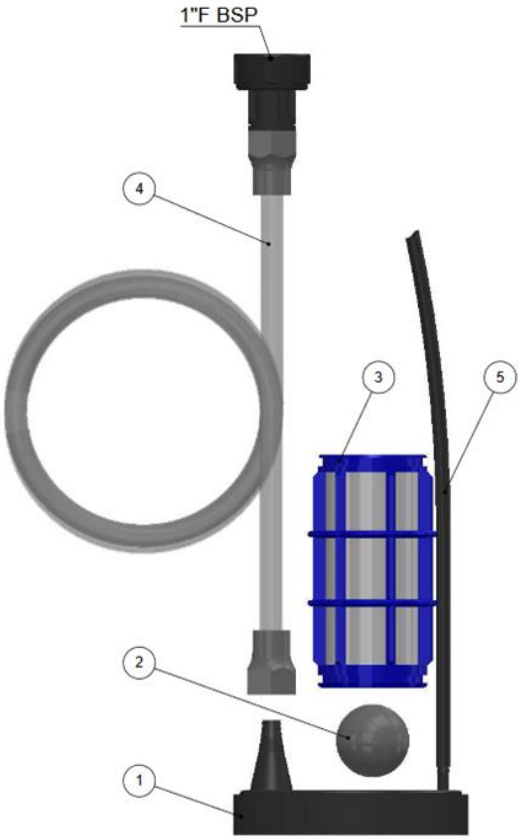


Operating water pipe assembly - Figure 12

Suction from tank assembly - Figure 13

Cat. No. - 700190-003301

No.	Cat. No.	Description	Quantity
1	700190-003317	Suction head base assembly	1
2	770104-000268	40 mm PVC ball	1
3	710101-000512	1" closed mesh 300 micron without backing, blue	1
4	700190-003291	Suction pipe assembly 4-01, 1/2" (black with white stripe)	1
5	790208-000007	9 mm black PVC hose	2.4 m

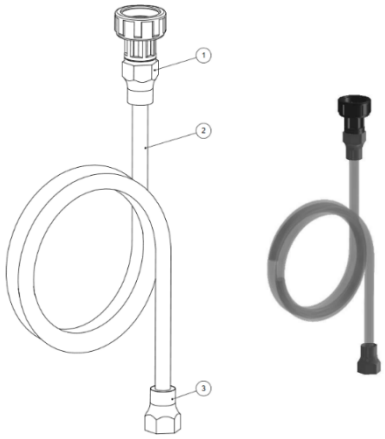


Suction from tank assembly - Figure 13

Fertilizer suction Pipe assembly - Figure 14

Cat. No. - 700190-003291

No.	Cat. No.	Description	Quantity
1	700190-003256	20 mm integrated coupler	1
2	790208-000001	1/2" transparent suction hose	2 m
3	780101-000738	20 mm Nir cap	1

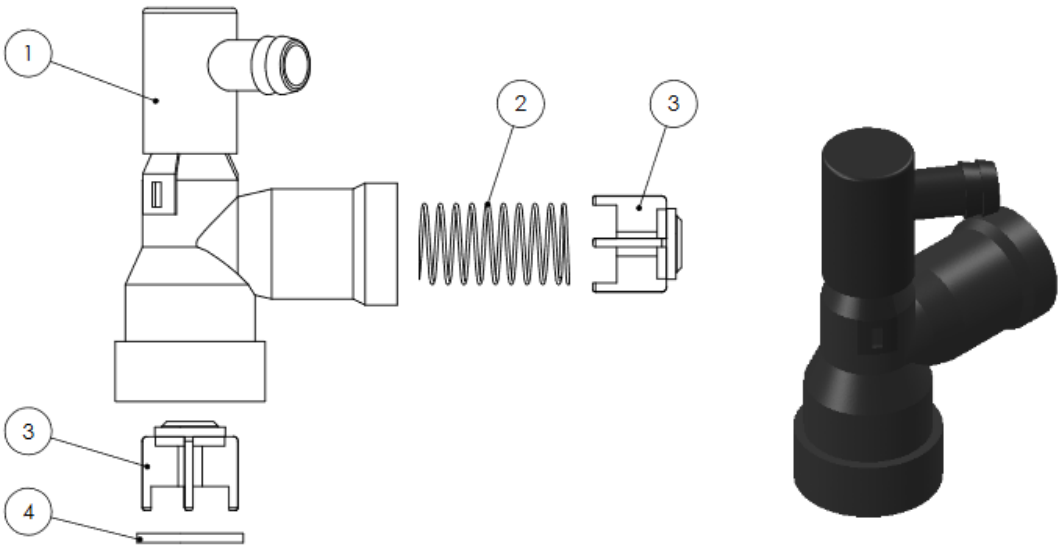


Fertilizer suction pipe assembly - Figure 14

Black air release assembly - Figure 15

Cat. No. - 700190-005784

No.	Cat. No.	Description	Quantity
1	700190-003305	Injection valves housing 4-01	1
2	760107-000060	Spring 0.7 for injection valve	1
3	700190-003318	Valve with Viton seal	2
4	710101-000987	Valve-positioning ring	1

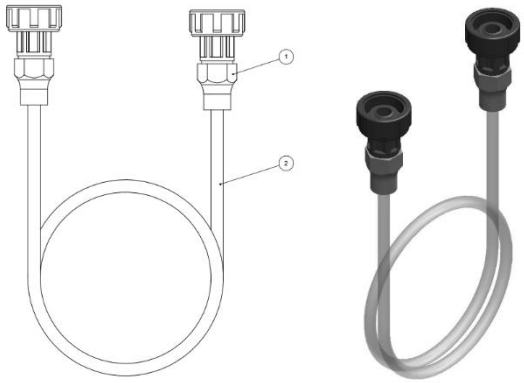


Black air release assembly - Figure 15

Fertilizer injection pipe assembly - Figure 16

Cat. No. - 700190-003289

No.	Cat. No.	Description	Quantity
1	700190-003255	16 mm integrated coupler	2
2	790208-000005	3/8" hose(black), injection	2 m

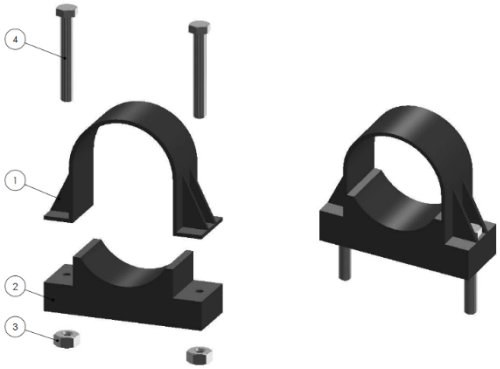


Fertilizer injection pipe assembly - Figure 16

Rod bracket assembly - Figure 17

Cat. No. - 700190-003298

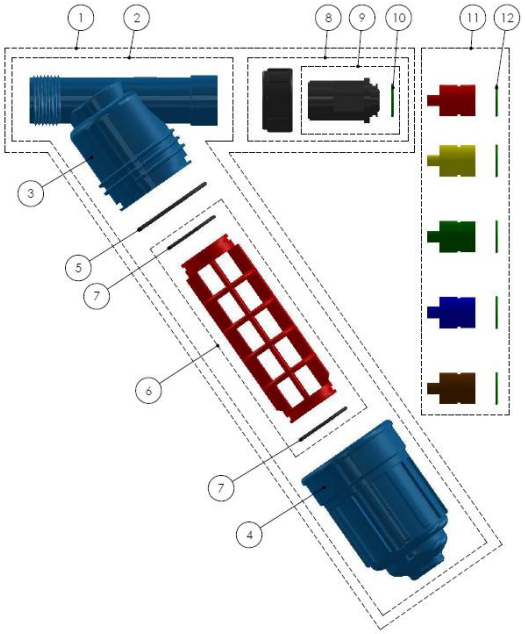
No.	Cat. No.	Description	Quantity
1	710101-000971	Top clamp for fertilizer pump	1
2	710101-000972	Bottom clamp for fertilizer pump	1
3	760102-000097	1/4” UNC 316 stainless steel	2
4	760101-000419	1/4" UNC stainless steel bolt	2



Rod bracket assembly - Figure 17

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

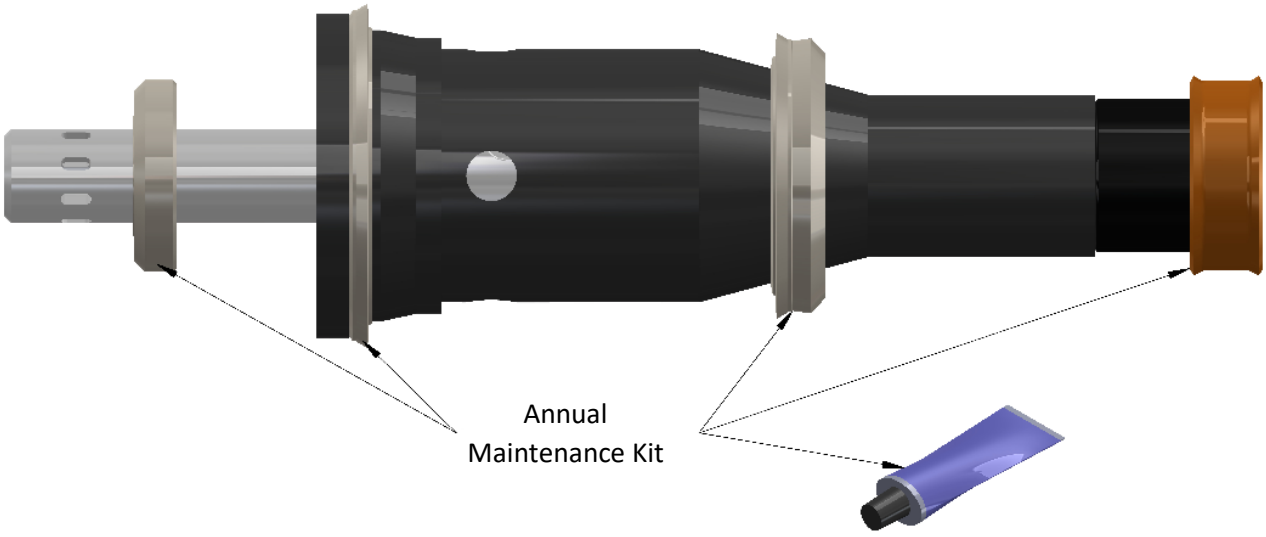
Capsule color	Red	Yellow	Green	Blue	Brown
Flow rate (liters/hour)	10	20	40	60	80
Fertilizer quantity (grams)	2.6	5.3	10.6	15.9	21.1
Cat. No. Flow regulator **capsule**	700190-003263	700190-003264	700190-003265	700190-003266	700190-003267
Cat. No. Flow regulator **assembly**	700190-003271	700190-003272	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 flow regulator (if there is one) and pump switch (Figure 3 part 4) are all in the open position 3. Make sure the filter is not clogged. (Figure 9 part 6.3) 4. Push the on/off switch to the off position (Figure 3 part 4) 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. Pull the on/off switch (Figure 3 part 4) 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 pipe (Figure 9 part 8) 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 pipe (Figure 9 part 6.5), in the flow regulator (if there is one), in the valve (Figure 3 part 5) 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 shut off valve (Figure 9, part 1.5.3) 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 the presence of grease on motor seals and pump seals. 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 cleanliness of the suction filter (Figure 9 part 6.3) in the deep suction model (4-01) and ensure the suction head ball (Figure 9 part 6.2) is not stuck on its holder and preventing fertilizer from entering 2. Ensure the free movement of the suction valve (Figure 9 part 1.5.3) by moving it up and down 3. Make sure the suction valve is mounted in the right direction with its legs facing upward
		2	Breather valve opening is blocked	Make sure the breather valve opening (fig. 4 part 16) is not blocked (blow through it when the motor is outside)
		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
5	Breather valve leak (part 16)	1	Water under pressure is discharged from the breather valve	A small motor seal is torn, or the bracket of this seal is worn and cracked. Replace seal or motor.
		2	Fertilizer is discharged from the breather valve	Pump seal (brown) 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 15 part 4) by pulling it out with a screwdriver 3. Remove the suction valve (Figure 9 part 1.5.3) 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 1.7) in the suction hose 7. Replace any faulty parts 8. Put the valve back in place. Make sure to return it in the right direction (Figure 9 part 1.5.3) 9. Return positioning ring (Figure 15 part 4)
		3	Injection valve stuck or damaged (Figure 9 part 1.5.3)	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 switch in model 4-01

Signs of malfunction		Possible cause		Order of inspection, detection and repair of malfunctions
7	When pressing the on/off button, spring resistance is felt, and the switch does not close	1	High pressure prevents the valve from closing	Press the air release valve while pressing the on/off button on the switch
		2	Air trapped in switch control tube (Figure 10, part 6.4)	1. Disconnect the switch control tube from opening to control tube (Figure 10 part 6.4) to release trapped air. 2. Press the on/off button (Figure 3 part 4) 3. 3. Put the tube back in place
8	Automatic idle closing of the switch (even though the tank is full of fertilizer)	1	Viscous fertilizer has difficulty passing through the filter mesh holes, causing the ball to drop on its mount and closing the switch	Dilute the fertilizer if possible Replace the filter mesh with a mesh that has larger holes Clean the mesh Ensure the fertilizer tank is clean Ensure the tank is filled with clean fertilizer
		2	The filter mesh is clogged and causes the ball to drop	
9	The switch does not automatically close after the fertilizer is finished	1	Ball damaged or not located in suction head	Ensure the ball is present (Figure 10 part 6.2) at the suction head Check the ball for tears or holes. If necessary, replace the ball Open the switch cover with a suitable screwdriver Pull up the red button along with the cover and diaphragm assembly Check diaphragm assembly for tears or fractures Replace parts if needed or call a service technician
		2	Faulty diaphragm assembly in the automatic switch	

Amiad Limited Warranty

1. This certificate applies to Amiad Water Systems Ltd. ("**Amiad**") products purchased by you (the "**Buyer**") from Amiad unless specifically agreed otherwise in writing by Amiad. This Warranty extends only to the original purchaser, and is not transferable to anyone who subsequently purchases, leases, or otherwise obtains the product from the original purchaser.
2. Amiad hereby warrants that the products are and will be free from defects in material and workmanship under normal use and service. Amiad warrants that it will correct manufacturing defects in the products, in accordance with the conditions set out in this Warranty.
3. This Warranty is enforceable for a period of 12 months after the date upon which the products were delivered (the "**Warranty Period**").
4. In the event that during the Warranty Period the Buyer discovers a defect in material and/or workmanship in any product or part (the "**Defective Product**"), it shall submit a written complaint to Amiad using Amiad's standard Buyer Complaint Form. For the receipt of the Buyer Complaint Form, the submission of the complaint or any questions please contact your service representative.
5. Upon written demand by Amiad the Buyer shall return the Defective Product - or a sample thereof - to Amiad, at Amiad's cost. If the Buyer ships any such Defective Product, Amiad suggests the Buyer package it securely and insure it for value, as Amiad assumes no liability for any loss or damage occurring during shipment. Provided however that in the event Amiad determines that this Warranty does not apply to such product, Buyer shall promptly reimburse Amiad for such cost (including freight and customs). Any returned product or part must be accompanied by the Warranty certificate and the purchase invoice. It is clarified that the Buyer may not return the Defective Product unless such return was coordinated and approved by Amiad in advance.
6. Amiad's obligation under this Warranty shall be limited to, at Amiad's option, the repair or exchange, free of charge, of the product or any part which may prove defective under normal use and service during the Warranty Period. The provision of a repair or replacement of a product during the Warranty Period will result in an extension of the Warranty Period by an additional period of 12 months, provided that the total accumulated Warranty Period shall in any event be no more than 18 months from the date upon which the products were delivered.
7. This Warranty is valid on the condition that the products are installed according to Amiad's instructions as expressed in Amiad's instruction manuals and according to the technical limitations as stipulated in Amiad's literature or as stated by a representative of Amiad.
8. This Warranty will not apply to damaged or defective products resulting from or related to:
    - (i) Fire, flood, power surges or failures or any other catastrophe and/or unforeseen occurrence, such as but not limited to those for which the Buyer is customarily insured for, or any force majeure events;
    - (ii) Fault, abuse or negligence of the Buyer;
    - (iii) Intake water not meeting the agreed standards, as set forth in a written document, approved by Amiad, or improper storage;
    - (iv) Improper or unauthorized use of the product or related parts by the Buyer, including Buyer's failure to operate the product in conformity with the recommendations and instructions of Amiad, as set forth in Amiad's manuals and other written materials, the operation of the product other than by a trained and qualified operator, or improper installation of the product by a third party not authorized by Amiad;
    - (v) Performance by the Buyer of maintenance or operation other than in conformity with the recommendations and instructions of Amiad, or other than in accordance with procedures defined in the literature supplied for products (including the timely replacement of requisite parts), and for services provided other than by a trained and qualified advanced operator; or
    - (vi) Any alteration, modification, foreign attachment to or repair of the products, other than by Amiad or its authorized technical representatives.
9. In no event shall Amiad be liable to the Buyer or any third party for any damages to property, or for any intangible or economic loss, including loss of profits, loss of customers or damage to reputation, for any damages, including indirect, special, consequential damages, or punitive damage arising out of or in connection with this Warranty, or arising out of or in connection with the product's performance or failure to perform, even if it has been advised of the possibility of such damages.
10. Amiad will be excused for failure to perform or for delay in performance hereunder if such failure or delay is due to causes beyond its reasonable control or force majeure preventing or hindering performance.
11. This Warranty set forth herein is the only contractual warranty given by Amiad and is provided in lieu of any other warranties created by any documentation, packaging or otherwise.
12. Amiad makes no warranty whatsoever in respect to accessories or parts not supplied by Amiad. In the event that Amiad is required to correct a Defective Product or product not covered by this Warranty, it will do so solely in consideration for additional fees.
13. The parties will actively endeavor to amicably settle any dispute arising between them. In the event that the parties are unable to reach an equitable settlement of such dispute, any claim or lawsuit related to the Warranty, its validity execution, its performance be brought before only the courts of Tel-Aviv, Israel. Israeli law will govern the Warranty, to the exclusion of any conflict of law rules.