

Design, Supply, Installation, Technical Supervision  
and Commissioning  
of 24 ha Multi-season Drip Irrigation System  
for ADANA Blueberry Plantation



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#### Seller and customer responsibilities

## General

It is our pleasure to submit this proposal for design, supply, installation, technical supervision and commissioning of 24 ha Multi-season Drip Irrigation System for ADANA Blueberry Plantation in [REDACTED]. This document details the technical description of the system, roles and responsibilities of parties.

The scope of works, included in this technical description, comprises conceptual general planning of Head Control (HC), including Filtration, Fertigation, Automation & Control system, infield valves, main and submain pipes and drip irrigation blocks.

### Terminology:

*Irrigation Block:* The smallest irrigation area comprising ~ 3-5 ha, operated by a single hydraulic field command valve, controlled by a command AC solenoid.

*Irrigation shift area:* The area, combined by few Irrigation Blocks, irrigated simultaneously. The areas will be operated based on: Head Control - 6 shifts (this project is operating one Irrigation Block per one Irrigation Shift).

*Project Area:* The whole project area comprising a net area of 22.2 ha, composed by 6 Irrigation Blocks (Irrigation shift areas).

## Water Supply

According to the information received from the client, the plantation has two drilled wells with existing pumps, which have the following characteristics:

1. North – West well:  $Q = 40 \text{ m}^3/\text{h}$ ;  $H = 25 \text{ m}$ .
2. South – East well:  $Q = 25 \text{ m}^3/\text{h}$ ;  $H = 25 \text{ m}$ .

From the wells the water will be delivered to the water accumulating pool. Construction of the water accumulating pool is not included into this offer and should be prepared by the client. (PLT Irrigation will provide an additional offer for the water pool construction on demand). The volume of the pool should be 1000  $\text{m}^3$  minimum (870  $\text{m}^3$  of daily water consumption + 20%). We recommend having a pool of 3-day reserve = 3000  $\text{m}^3$ .

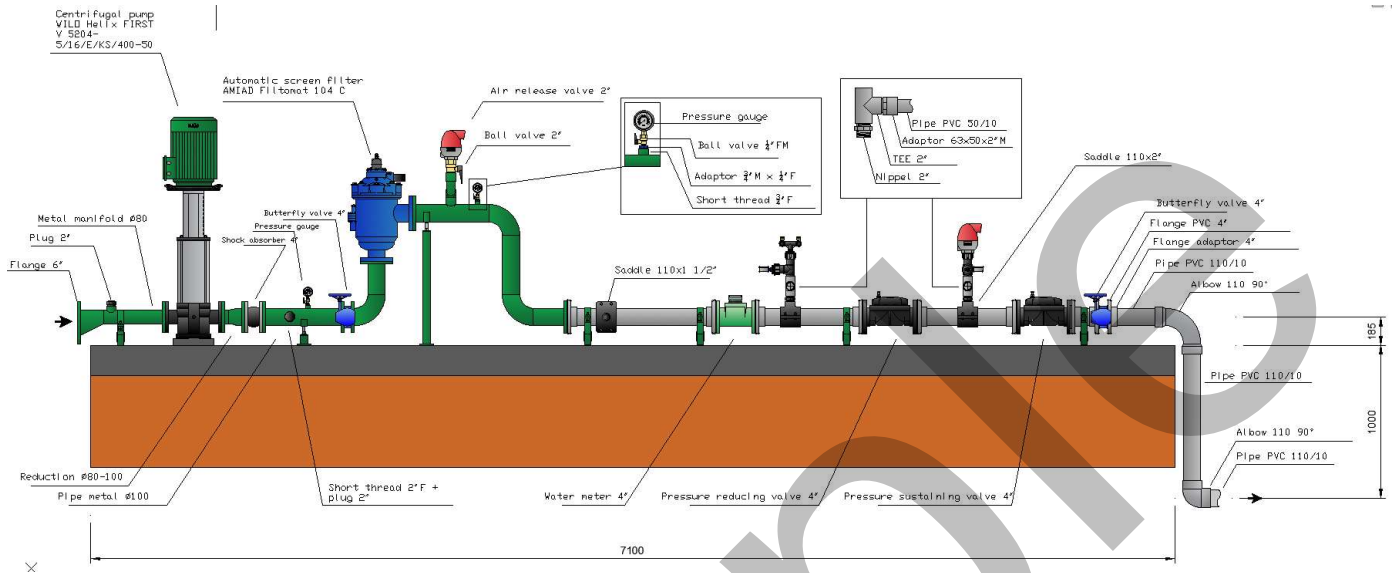
The water pool will be situated on the North West side of the plantation, near the well #1. The water from the well #2 will be delivered to the pool via PVC pipe.

The irrigation water will be taken from the pool with the help of a Pumping Station, included into the Head Control.

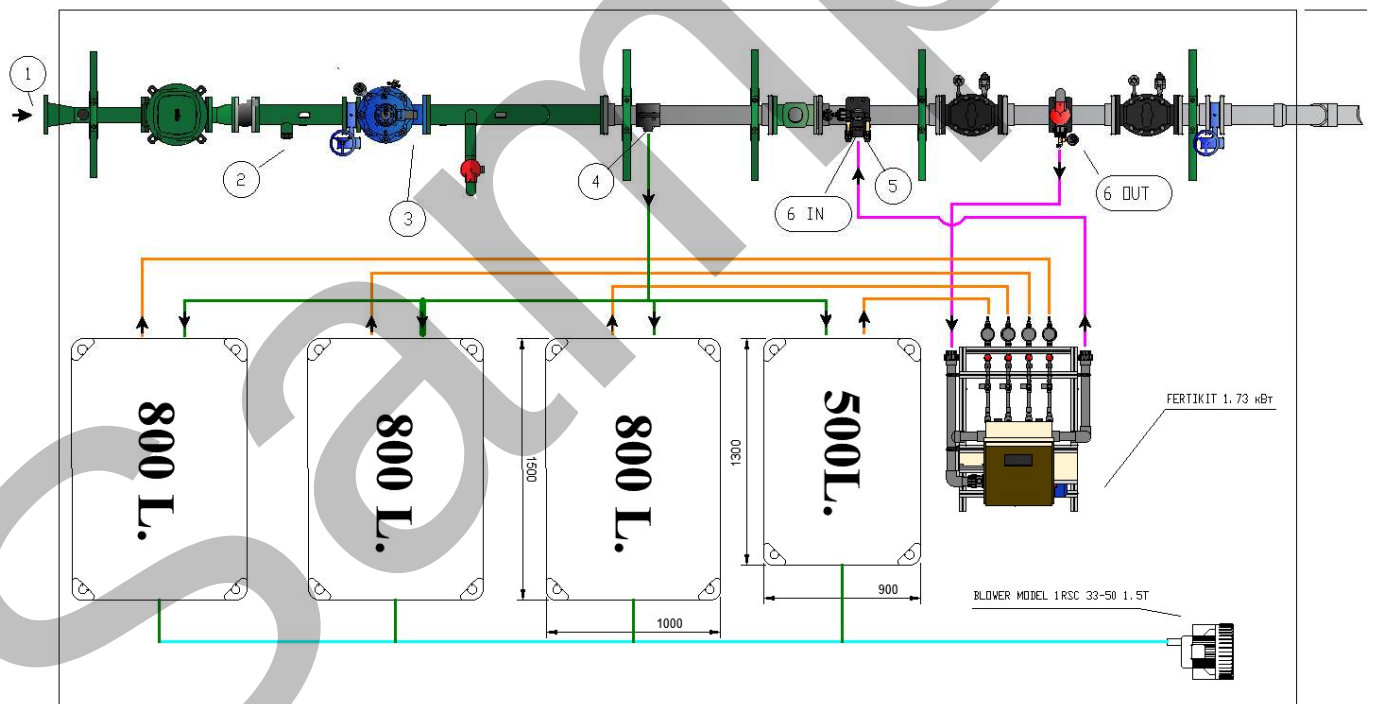
## Head Control

The Head Control (HC) of the system is devoted to water preparation, fertigation and irrigation control. In general, it consists of:

- pumping station,
- controller with remote control unit,
- automatic screen filter,
- water meter,
- pressure reducing regulating valve,
- pressure sustaining valve,
- fertigation unit with tanks, mixing and dosing systems;
- piping.



Pict. Typical Head Control layout (side view).

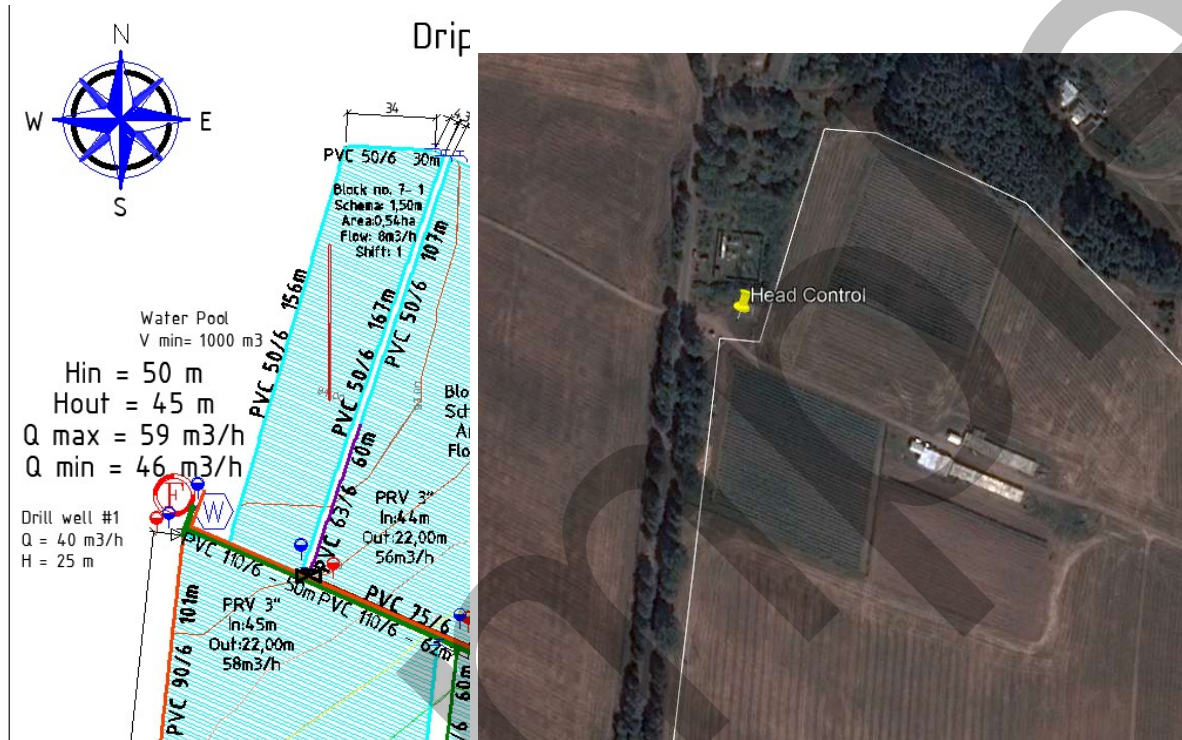


Pict. Head Control layout (top view).

You can find your detailed drawings attached to this Project Book.

## Head Control: Situation

The Head Control (HC) will be situated at the North West side of the field, close to the Well #1 and pool.



Pict. Head Control location.

You can find your detailed drawings attached to this Project Book.

Electricity must be available on the site: 3 phase, 50 Hz, 19 kW (this is only drip irrigation system's consumption, excluding drilled wells' pumps or other additional users).

For the proper HC installation, the concrete basement with roof must be prepared (preliminary size: 7 x 4 m). Also, you can take in account the option to arrange the HC inside the 40' container with tanks outside.

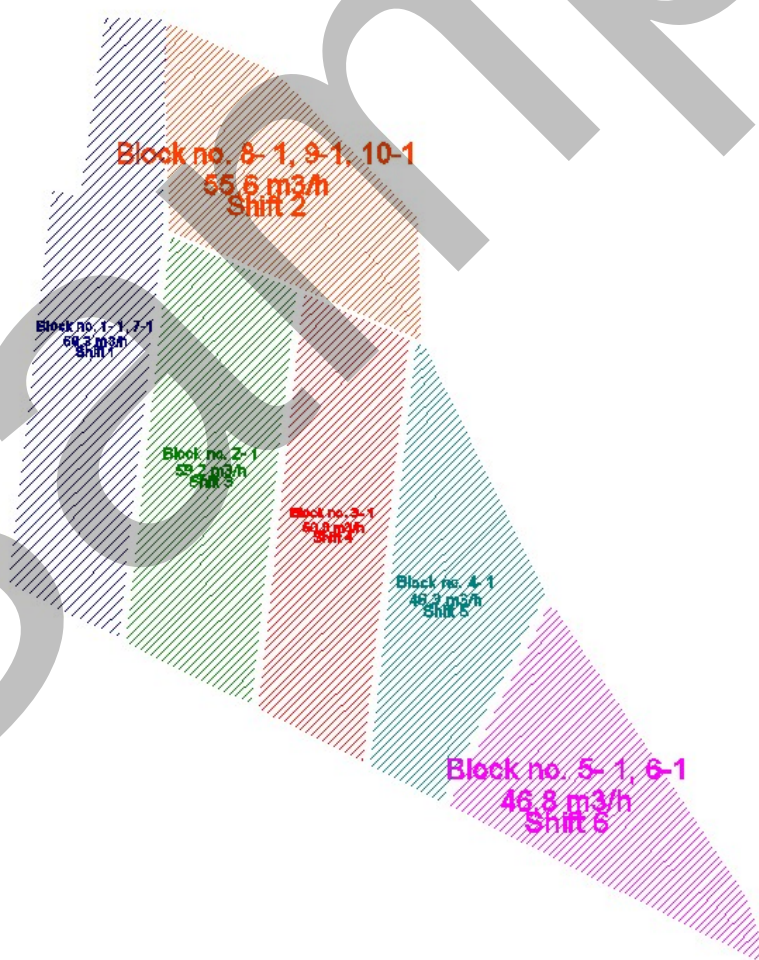
## Head Control: Irrigation Data

| Основные показатели проекта/Main irrigation data |                                                        |                         |                 |           |
|--------------------------------------------------|--------------------------------------------------------|-------------------------|-----------------|-----------|
| №                                                | Наименование/Description                               | Unit                    | Value           |           |
| 1                                                | Культура/Сгор                                          | Голубика/Blueberry      |                 |           |
| 2                                                | Площадь орошения/Irrigated area                        | ha                      | 22,2            |           |
| 3                                                | Источник воды/Water source                             | накопитель/pool & wells |                 |           |
| 4                                                | Схема полива/Distance between laterals                 | m                       | 1,5 (2 per bed) |           |
| 5                                                | Марка капельной трубки/Drip lines type                 | ASSIF                   |                 | (16 mils) |
|                                                  |                                                        | Ø16-                    | 0,85            | -         |
| 6                                                | Тип оросительной системы/Type of irrigation system     | drip                    |                 |           |
| 7                                                | Количество капельных линий на гряде/Laterals per bed   | pcs.                    | 2               |           |
| 8                                                | Расст. между грядками/Distance between beds            | m                       | 3               |           |
| 9                                                | Норма полива/max Daily consumption                     | mm                      | 4               |           |
| 10                                               | Расчетное водопотребление/Calculated daily consumption | mm                      | 3,9             |           |
| 11                                               | Скорость полива/Application rate                       | mm/h                    | 1,417           |           |
| 12                                               | Длительность операции/Duration of one operation        | hrs.                    | 2:45            |           |
| 13                                               | Количество операций/Number of operations               | pcs.                    | 6               |           |
| 14                                               | Максимальный расход/Maximum discharge                  | m3/h                    | 59              |           |
| 15                                               | Минимальный расход/Minimum discharge                   | m3/h                    | 46              |           |
| 16                                               | Общее время полива/Daily operation duration            | hrs.                    | 16:50           |           |
| 17                                               | Водопотр. за цикл/Total discharge per irrigation cycle | m3                      | 870             |           |
| 18                                               | Мин. напор на капельнице/Emitter min. pressure         | m                       | 8               |           |
| 19                                               | Давление после ГУ/Head Control Outlet pressure         | m                       | 45              |           |
| 20                                               | Давление перед ГУ/Head Control inlet pressure          | m                       | 50              |           |

## Head Control: Scheme of Operations

| Irrigation Shifts | Irrigation Blocks | Discharge, m3/h |
|-------------------|-------------------|-----------------|
| 1                 | 1-1, 7-1          | 58,3            |
| 2                 | 8-1, 9-1, 10-1    | 55,6            |
| 3                 | 2-1               | 59,2            |
| 4                 | 3-1               | 50,3            |
| 5                 | 4-1               | 46,3            |
| 6                 | 5-1, 6-1          | 46,8            |

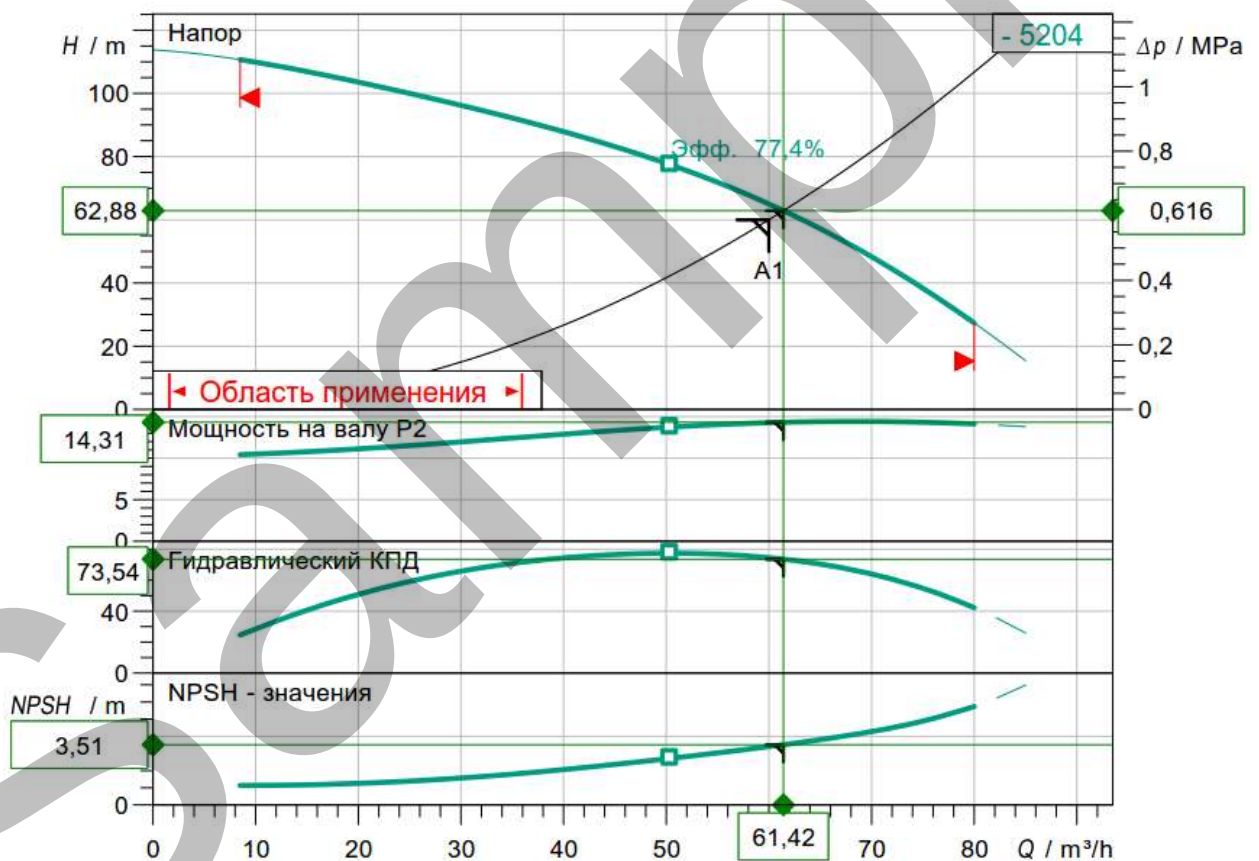
Irrigation cycle diagram



## Head Control: Pumping Station

The WILO Helix FIRST V 5204-5/16/E/KS/400-50 highly efficient centrifugal pump was selected according to the need of the system. As the calculated need for the system is:  $Q=59 \text{ m}^3/\text{h}$  and  $H=50 \text{ m}$ , we selected the pump with the following characteristics in the working points:

$Q = 61,42 \text{ m}^3/\text{h}$ ;  
 $H = 62,88 \text{ m}$ ;  
 $\text{NPSH} = 3,51 \text{ m}$ ;  
 Electric power = 15 kW.



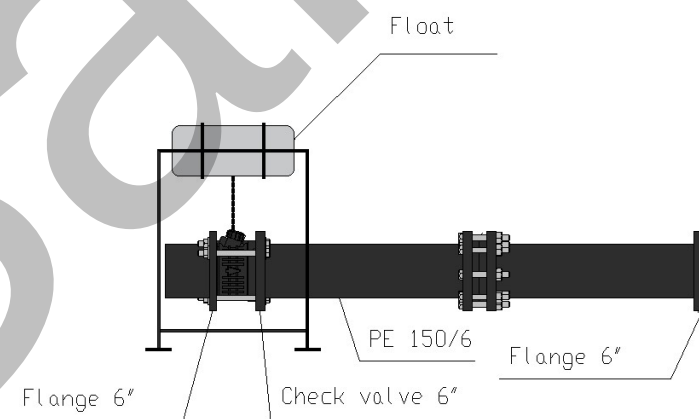
Pict. Pump's working field.



Pict. WILO Helix FIRST V 5204-5/16/E/KS/400-50 (Germany).

The pump will be equipped with the operating box and frequency regulator.

The pumping station will include all needed piping, wiring, shock absorber and water intake pipe with float, check valve and coarse filter.



Pict. Water intake pipe.

## Head Control: Filtration

We offer the automatic self-cleaning screen filter Amiad Filtomat 104c, Israel, with maximum flowrate of 80 m<sup>3</sup>/h.

### Main Features:

- Reliable operating mechanism
- Simple construction and easy maintenance
- Ideal for agricultural filtration requirements
- Automatic flushing according to pressure differential
- Short, efficient flush cycle that saves water and energy
- No interruption of downstream flow during flushing
- High reliability and durability
- Electronic control

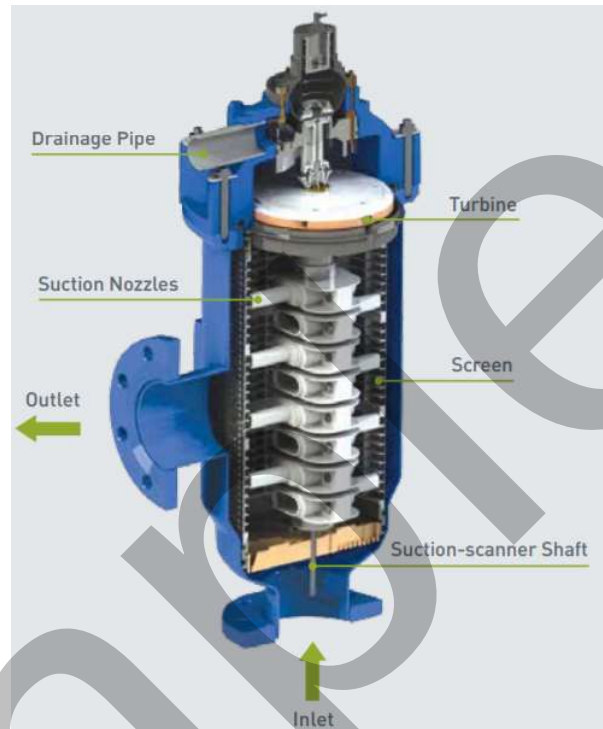
### How the Filtomat Filters Work

#### The Filtration Process

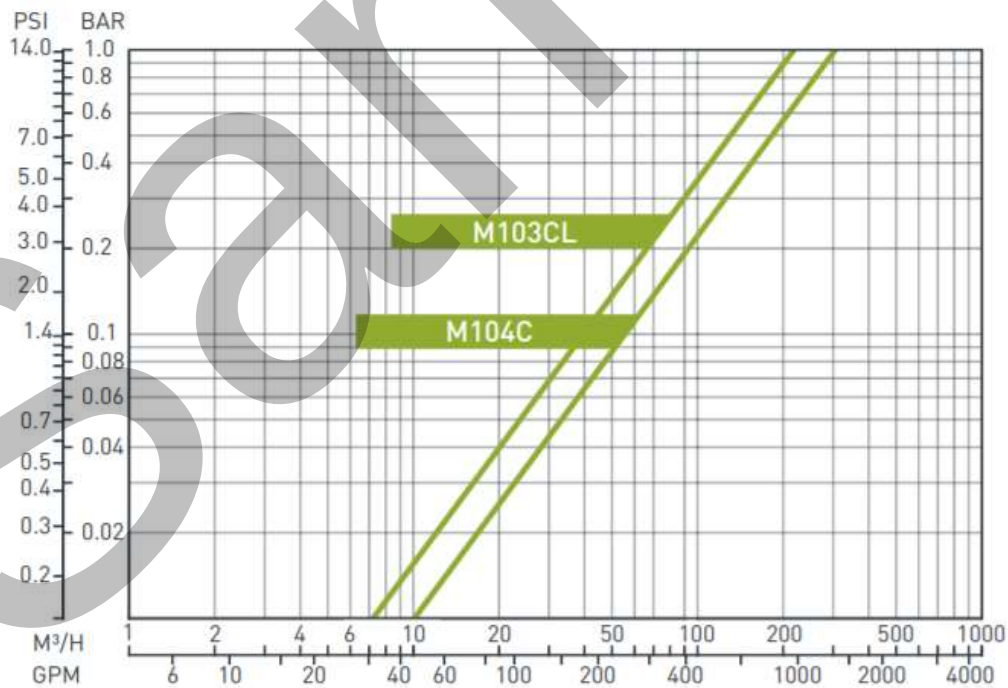
The filtration process begins, when unprepared water flows through the filter inlet into the coarse screen, which pre-filters the water to protect the cleaning mechanism from large debris. The water then passes through the inner surface of the fine screen, where dirt particles are trapped and accumulated inside the filter, while clean water flows through the filter outlet. The gradual buildup of dirt on the inner screen surface causes a so-called filter cake, which in its turn causes an increase in the differential pressure across the screen.

#### The Self-Cleaning Process

When the differential pressure across the screen reaches a pre-set level of 7 psi (0.5 bar), the M100 or MG filter starts the self-cleaning process by opening the internal flush valve. This results in the release of a back-flush stream flowing through the nozzles out of the hollow suction-scanner shaft to the turbine and to the drainage pipe.



Pict. Amiad Filtomat 104c, Israel.



Pict. Amiad Filtomat 104c hydraulic characteristics.

Filter's main technical data:

- Connection – 4-inch flange;
- Maximum working pressure – 10 bar;
- Minimum working pressure – 2 bar;
- Pressure loss on the clean screen – 0,2 bar;
- Maximum working flowrate – 80 m<sup>3</sup>/h.

### Head Control: Water Meter

Water-meter is a part of the head control components.

#### **4-inch irrigation water meter with electrical impulse for each 100 liters**

Polyester coated cast iron body. Serves for calculating the irrigation water and diagnosing the irrigation system. The water meter is installed after the filter. Its purpose is to accurately measure the total quantity (volume) of water irrigated. Manufacturer: Bermad, Israel.



Pict. Bermad water meter, Israel.

### Head Control: Manual Isolation Valve

The isolation Valve is a manually operated butterfly valve. The valve is located in such places, which facilitate isolating Head Control sections, main pipe branches and secondary filter details.



Pict. Butterfly valve.

### Head Control: PRV (pressure reducing valve) & PSV (pressure sustaining valve)

4 – inch pressure reducing valve is automatically reducing the working pressure at the needed working level after itself.

4 – inch pressure sustaining valve is automatically keeping the working pressure at the needed working level before itself providing conditions for the stable work of fertigation system. Producer: Bermad, Israel.



Pic. Pressure reducing and sustaining regulators look the same and just have different piping set.

### **Head Control: Air valves**

The proposed design includes Air Valves Double Purpose type 2". The air valve has the features of both an air release valve and an air & vacuum valve. The air release component of the combination air valve was designed to automatically release small pockets of air to the atmosphere as they accumulate along a pipeline or piping system when it is full and operating under pressure. The air & vacuum component was designed to automatically discharge or admit large volumes of air during the filling or draining of a pipeline or piping system. This valve will open to relieve negative pressures whenever water column separation occurs.



Pic. Bermad air valve, Israel.

### **Head Control: Fertilizing unit Fertikit 3G**

The FERTIKIT 3G by Netafim, Israel is a fully configurable fertilizer/acid dosing unit - a highly cost-effective solution for precise nutrification.

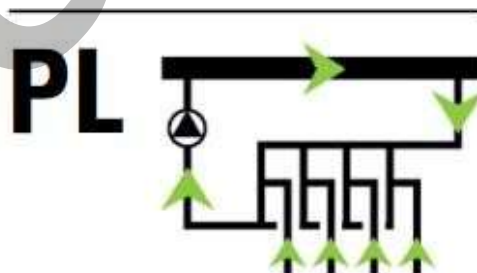
Based on a standard platform, the FERTIKIT offers 4 different operation modes, selectable according to the site conditions, in order to maximize usage of available water flow rate and pressure on the main irrigation line, ensuring the highest efficiency with minimum investment.

The FERTIKIT can accommodate a variety of dosing channels, dosing boosters, controllers, peripherals and accessories to meet a vast range of applications and infrastructure constraints.



Pic. Fertikit 3G dosing unit with NMC Pro controller general view

For the ADANA project we selected the PL mode configuration:



This mode works the best with the project's conditions: main line working pressure is between 2.5 and 6.5 bars.

Main technical characteristics:

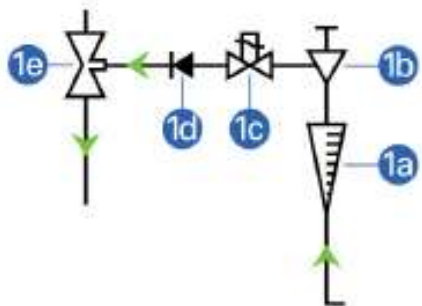
|                                                      |                              |
|------------------------------------------------------|------------------------------|
| Name                                                 | Fertikit 3G                  |
| Number of fertilizing channels                       | 3                            |
| Fertilizer channel suction capacity, liters per hour | 400                          |
| Number of acid channels                              | 1                            |
| Acid channel suction capacity, liters per hour       | 150                          |
| Pump                                                 | Grundfoss CM57EH             |
| Sensors                                              | EC/pH                        |
| Controller                                           | NMC Pro                      |
| Power supply                                         | 1,75 kW/380 V/ 3-phase/50 Hz |

The Fertikit will be supplied with fertimeters for all 3 fertilizer and 1 acid channels.

It allows fully controlled dosing of fertilizers and acids, mixing them in a homogeneous nutrient solution, EC/pH correction in nutrient solution.

Fertikit dispenses various fertilizers and acid and brings them into the main pipeline of the irrigation system. Fertilizers and acids are fed into the dosing channels on the Venturi injector principle. This requires a pressure drop, which is provided by a booster pump.

**The scheme of the dosing channel:**



1a – Rotameter

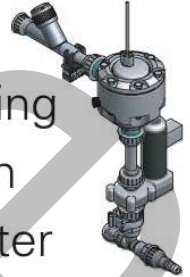
1b – Needle valve

1c – Dosing channel

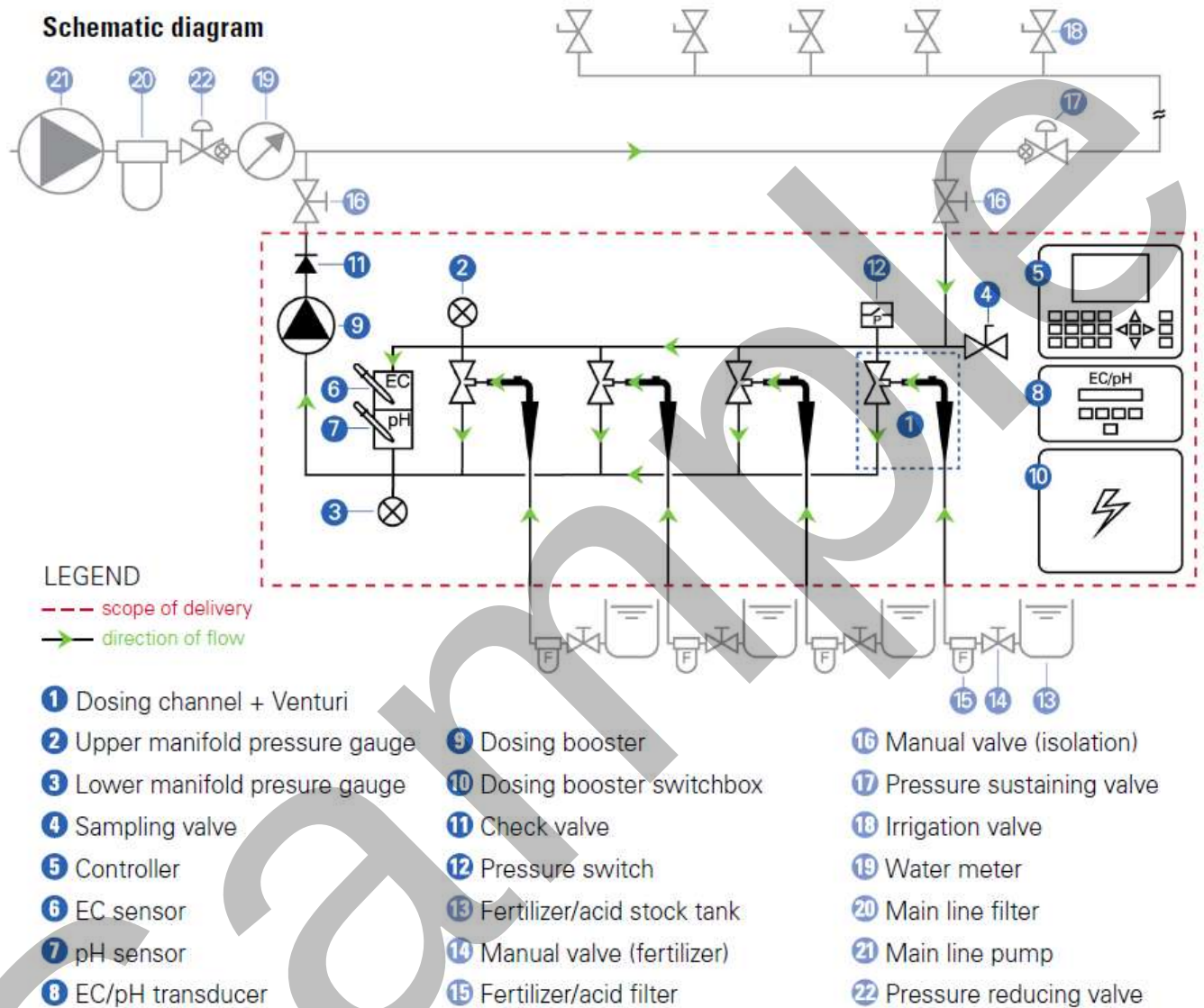
1 d – Check valve

1 e – Injector

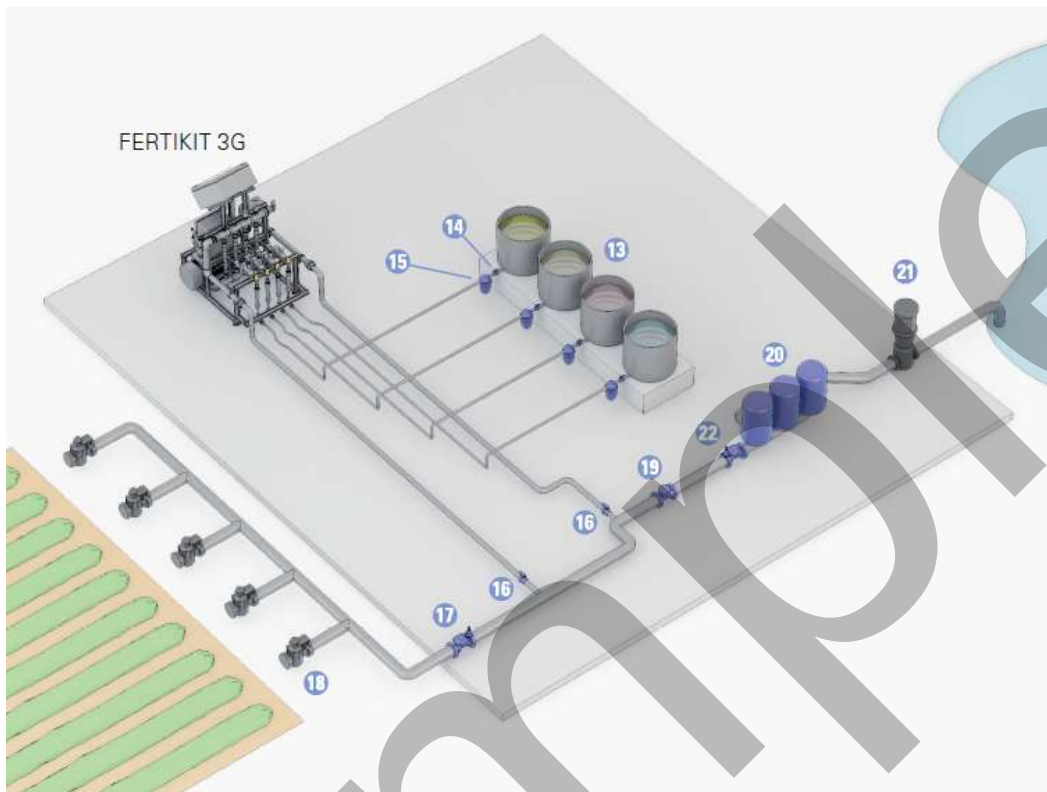
Electric dosing  
channel with  
fertilizer meter



## Scheme of work:



**The principal scheme of connections:**



- 13 – Fertilizing/acid tanks
- 14 – Ball valve
- 15 – Filter
- 16 – Ball valve
- 17 – Pressure Sustaining Valve
- 22 – Pressure Releasing Valve
- 18 – Infield valves
- 19 – Water Meter
- 20 – Filter
- 21 – Pump/Water Source

### Head Control: NMC Pro Controller

The NMC-PRO (Netafim, Israel) is an irrigation controller for mid-to-large-scale applications. A robust and user-friendly stand-alone controller, that operates under all weather conditions, NMC-PRO is suitable for open field and greenhouse solutions.

It will be configured to operate Fertikit 3G irrigation unit, all infield valves and NMC Air remote control system.

Main data:

|                |             |
|----------------|-------------|
| Analog inputs  | 11          |
| Digital inputs | 8           |
| AC outputs     | 16          |
| Power supply   | 220 V/50 Hz |

Irrigation strategy can be based on dosing program, water run time and irrigation Program. Irrigation start based on time or external conditions. Fertigation can be managed by Time, Quantity, Proportional Time or Proportional Quantity.



Pic. NMC Pro controller, Netafim, Israel.

Infield valves equipped with AC solenoids will be commutated with the controller via cuprum cable (KVVG 5x1,5) suitable for subsurface installation.



Pic. Cable KVVG 5x1,5

### **Head Control: NMC Air remote control**

NMC Air is an advanced cloud-based software, that links to Netafim's NMC controllers to enable remote monitoring and control of farms anytime, anywhere.

#### **HIGHLIGHTS & BENEFITS**

- Cloud-based software
- Real-time in-field situation picture
- Water and nutrient usage traceability
- Remote farm operations
- Easy and enjoyable user experience

#### **FEATURES**

- Farm status and active irrigation and dosing performance in a single view
- Alarms and notifications to PC and mobile devices
- Manual NMC irrigation controller operations - pause/resume irrigation, start/stop irrigation program, start/stop irrigation valve, start/stop filter flushing
- Irrigation, dosing and water run time filter, flushing/misting, and cooling program editing and creation
- Graph viewing and creation for continuous farm monitoring

- NMC history for farm data analysis, including sensor log, irrigation log, and incomplete irrigation programs



Pic. NMC Air on different devices

Requirements: LAN or GSM internet access.

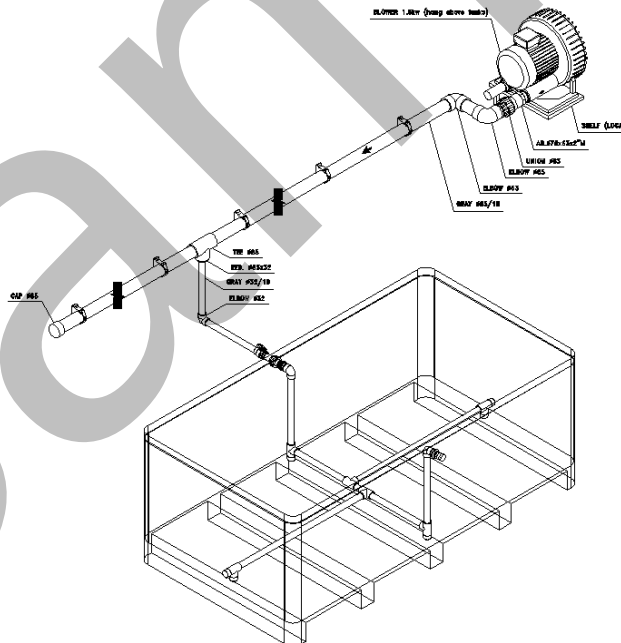
## Head Control: Tanks and Dissolving (Mixing) system

For the project we offer 3 pcs of 800 liters DOLAV PE tanks (Israel) for the fertilizer mixtures and 1 pc of 500 liters DOLAV PE tank for acid mixture. All tanks will be supplied with covers.



Pic. DOLAV PE tank, Israel: general view.

For fast and efficient dissolving of the fertilizers all fertilizing tanks will be equipped with air dissolving system. This solution allows to dissolve and mix the fertilizers quicker comparing to separate mechanical mixers.



Pic. Air mixing (dissolving) system example.

## Main and Submain pipes

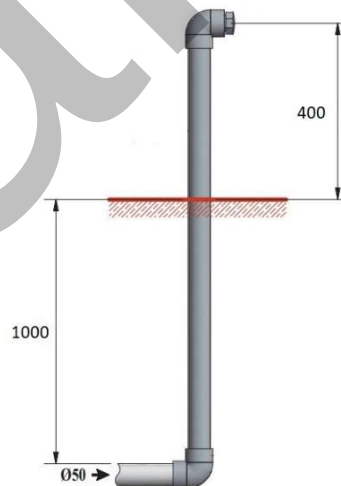
In this project for all main and submain lines we will use PVC pipes (Ukraine). The design includes diameters from 50 mm up to 110 mm. Pipes are classified to a maximum working pressure of 6.0 bars.



Pic. PVC pipes, Ukraine.

All the pipes will be buried into the trenches with the depth = 1.0 meter.

The end of each submain is serviceable and allows periodic flushing by the flushing outlet.



Pic. Submain flushing outlet

Each irrigation Shift will be closed with the flushing PVC d50 manifold divided into 4 flushing outlets with ball valves. It will create enough water speed to flush out possible debris.

## **Infield Valves**

Each block is controlled by a solenoid hydraulic (pilot) 3-inch valve produced by Bermad, Israel. It is a direct sealing diaphragm valve, operated by pipeline pressure. The reinforced rubber diaphragm seals the water passage, when line pressure reaches the valve's control chamber. Relieving the pressure from the control chamber causes the valve to open.

The valve includes no moving parts, other than its diaphragm. A spring in the upper side of the diaphragm ensures valve closure, even at extreme flow pressure conditions.

Each valve is equipped with a hydraulic pilot not to exceed a maximum downstream valve pressure level. The pressure level is set according to design parameters.

The specified valves are at maximum 10.0 bars pressure rating; connection standard is 3-inch threaded.

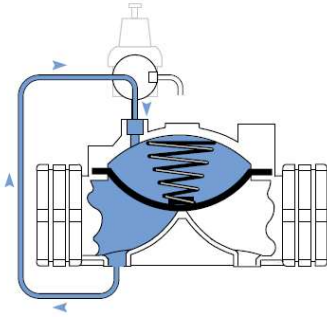
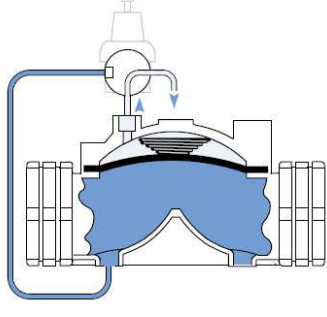
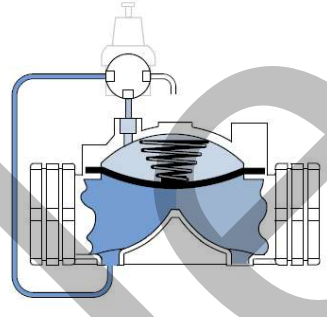
All valves will be operated remotely from the controller via wires.

The total number of the infield valves is 6 pcs.

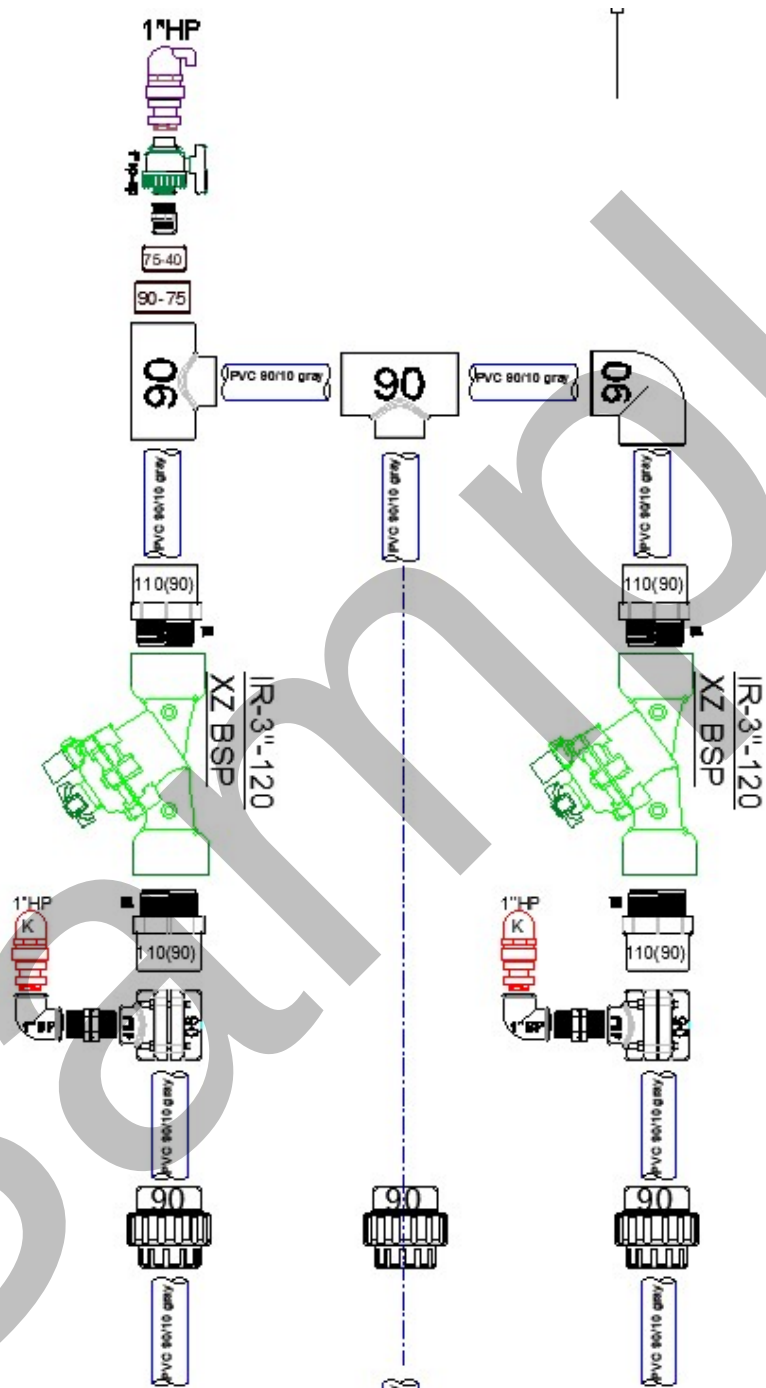


Pic. In field PRV (pressure reducing valve), Bermad, Israel.

### **Operating principle:**

| Closed mode                                                                             | Open mode                                                                                                               | Modulating mode                                                                                                                                                              |
|-----------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|        |                                        |                                                                                           |
| When the inlet pressure is applied to the control chamber, the valve closes drip-tight. | When the operating pressure is relieved from the control chamber, the line pressure at the valve inlet opens the valve. | The position of the diaphragm is dictated by the volume of water in the control chamber, which is regulated by the pilot valve in order to maintain a preset pressure value. |

Each infield valve will be equipped with the vacuum valve. The air & vacuum component was designed to automatically discharge or admit large volumes of air during the filling or draining of a pipeline or piping system. This valve will open to relieve negative pressures whenever water column separation occurs.



Pic. Valve group construction example

## Driplines

We offer Metzer ASSIF 16 mm diameter compensated dripline.

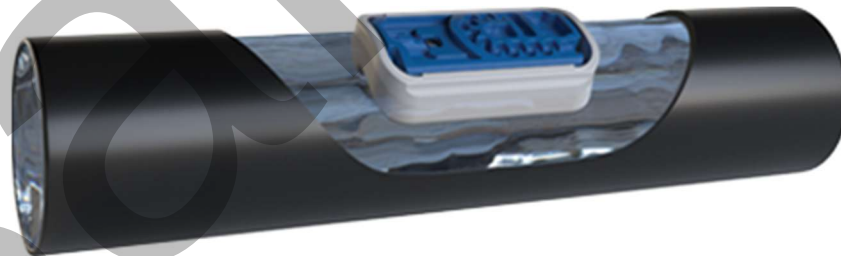
Dripper flow rate: 0,85 l/h.

Dripline wall thickness: 16 mils (0,4 mm).

Distance between emitters: 40 cm.

### Features:

- Especially designed for SDI applications
- Anti-siphon system – prevents suction of sand or soil into the dripper
- Wide range of working pressures for various topographies
- Unique and accurate regulating labyrinth mechanism
- Wide water passages along the labyrinth
- Suitable for different water sources
- Long-lasting silicon diaphragm
- Durable under harsh field conditions and chemical applications



Pic. Metzer ASSIF 16 mm compensated dripline

## SELLER & CUSTOMER RESPONSIBILITIES

|                 |                               |
|-----------------|-------------------------------|
| <b>Project</b>  | Adana                         |
| <b>Location</b> |                               |
| <b>Area, ha</b> | 24                            |
| <b>Crop</b>     | Blueberry                     |
| <b>Type</b>     | SDI (multi-seasonal, on beds) |

| Description                                                                                                                                        | Seller | Customer |
|----------------------------------------------------------------------------------------------------------------------------------------------------|--------|----------|
| <b>Planning and design</b>                                                                                                                         |        |          |
| Area for Development - mapping at a proper scaling and contours, routes and schemes of existing infrastructure for drip irrigation detailed design |        | √        |
| Soil analysis (suitability for agricultural purposes)                                                                                              |        | √        |
| Define block borders, waterways, roads                                                                                                             |        | √        |
| Confirm irrigation data and peak water consumption for design                                                                                      |        | √        |
| Detailed design of the irrigation system: Bill of Materials (BOM) & system layout maps                                                             | √      |          |
| Water analysis: suitability for drip irrigation (quality & volume)                                                                                 |        | √        |
| Plan the time schedules for irrigation system development and installation                                                                         | √      |          |
| Obtain all local permits for land development, water rights, power lines, labor employment, import equipment, and any other required local permit. |        | √        |
| <b>Procurement &amp; Shipment</b>                                                                                                                  |        |          |
| Manufacture equipment per design specifications                                                                                                    | √      |          |
| Procure complementary components and assemblies per design specifications and detailed Bill of Materials (BOM)                                     | √      |          |
| Assure products quality and compliance with project specifications                                                                                 | √      |          |
| Coordinate the transportation to the project site and cover all related expenses                                                                   | √      |          |
| Assure the labor and needed machinery to unload the containers on site                                                                             |        | √        |
| Provide the safe storage place for equipment, tools and instruments.                                                                               |        | √        |
| Assure the presence of a responsible person for the acceptance and transfer of the equipment                                                       | √      | √        |
| Guard the safety of equipment at all time after shipment                                                                                           |        | √        |
| <b>Execution</b>                                                                                                                                   |        |          |
| Land preparation for drip irrigation installation under the PLT Irrigation guidelines                                                              |        | √        |

|                                                                                                                                                                                                                                                                         |   |   |
|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---|---|
| Mark the area, blocks, roads, existing waterways or other infrastructure objects (gas or oil pipes, different kind of cables, electrical lines, etc.) in needed places by a land survey team                                                                            |   | √ |
| Provide and manage the required labor:<br>- responsible manager – 1;<br>- crew chief – 1;<br>- qualified workers – 4-6 (depending on stage of installation);<br>- unqualified workers – 2.<br>The workers should be the same during the all term of installation works. |   | √ |
| Provide and manage the required machinery:<br>- a truck to deliver the equipment and pipes from the warehouse to the place of installation – 1.                                                                                                                         |   | √ |
| Provide electricity for the pumping station and fertigation system = 20 kW/3 phase/380V                                                                                                                                                                                 |   | √ |
| Provide Router with mobile internet                                                                                                                                                                                                                                     |   | √ |
| Prepare the concrete platform for the Head Control – 7x4 meters                                                                                                                                                                                                         |   | √ |
| Provide all soil and construction works: trenches, pits, road intersections, trench cleaning and covering, anchors for pipes.                                                                                                                                           |   | √ |
| Provide a sand bedding in the trenches, where it will be needed                                                                                                                                                                                                         |   | √ |
| Coordinate the required labor and machinery (including local needed materials) for the installation works                                                                                                                                                               | √ | √ |
| Supervise the Installation of the irrigation system components (one supervisor)                                                                                                                                                                                         | √ |   |
| Maintain and run the irrigation system                                                                                                                                                                                                                                  | √ |   |
| Test and commission the system block by block with signing the Certificate of Acceptance                                                                                                                                                                                | √ | √ |
| Produce "As Made" maps (drawings)                                                                                                                                                                                                                                       | √ | √ |
| Provide a training onsite                                                                                                                                                                                                                                               | √ | √ |