PLANNING NOTES · INSTALLATION INSTRUCTIONS · INSTRUCTIONS FOR USE

System Build-up Summer Plains

Life on Roofs

System Build-up "Summer Plains"
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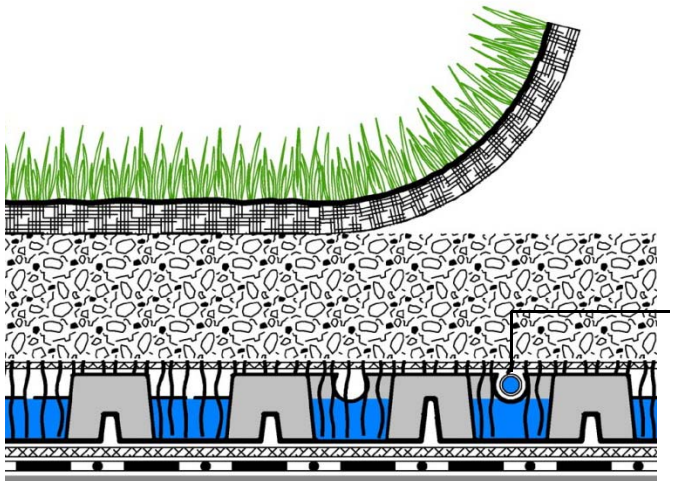
System Build-up “Summer Plains”
System Overview

1 System Overview

1.1 System Build-up

Weight kg/m²		Height in mm
dry	water saturated	
95	140	min. 100
4	25	5
99	165	



Roof construction with root resistant waterproofing

Turf “Lawn” (cultivated on sandy soil)

System Substrate “Lawn”, at least 80 mm

Dripperline 100-L1

Wicking Mat DV 40

Aquatec® AT 45

Filter Sheet PV

Note:
If waterproofing is not root resistant the Root Barrier WSF 40 is required additionally (or Root Barrier WSB 100-PO if using woody plants)

* Alternatively comparable mixtures of herbs or grasses can be seeded; in this case the depth of the system substrate “Lawn” should be increased to at least 100 mm.

Build-up height:	**from approx. 150 mm**
Weight water saturated:	**from approx. 165 kg/m²**
Water storage volume:	**from approx. 65 l/m²**

1.2 Schematic Representation of Irrigation System

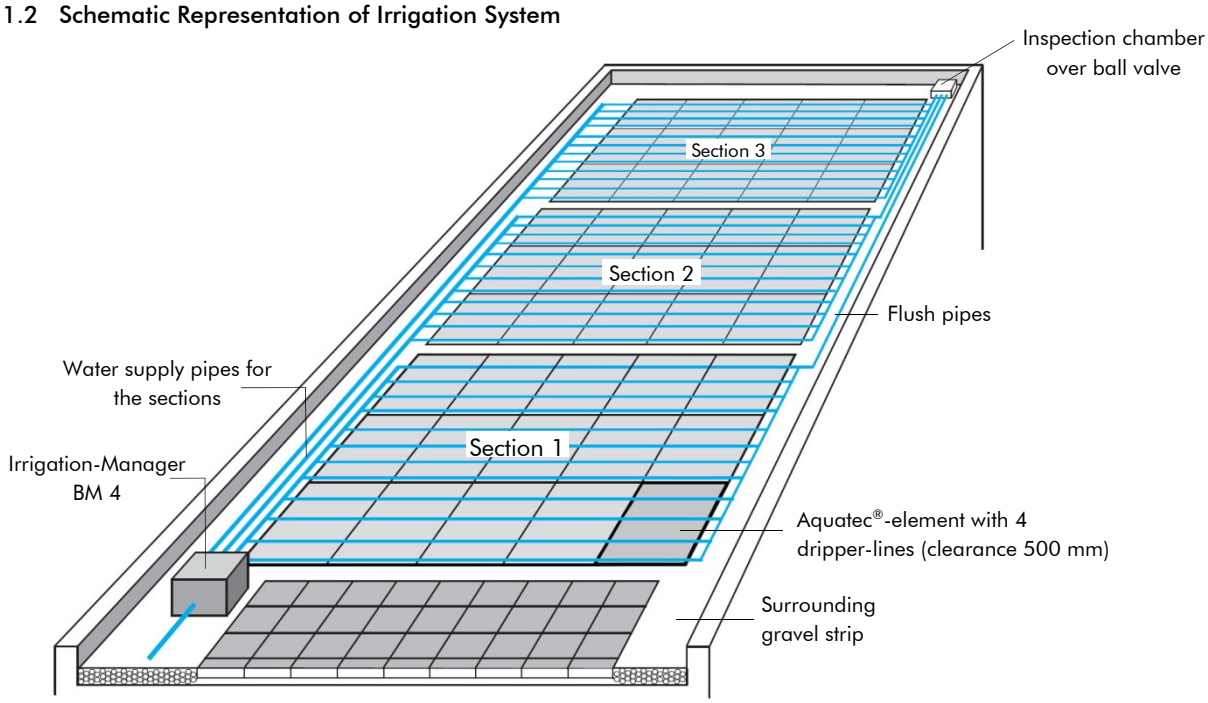


Fig. 1: Schematic representation of “Summer Plains” irrigation system
For better clarity, the sections are shown here with a gap between each one. In reality, the Aquatec®-elements are installed side by side without a gap.

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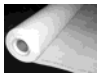
System Build-up “Summer Plains”
Material List

1.3 Material List

Order No.	ZinCo Material	Picture	Specification	Need	Unit	Package
2130	Filter Sheet PV		Thermally strengthened filter sheet made of polypropylene	Base area + 100 mm overlap + edgings + special areas	m²	roll of 100 m²
3345	Aquatec® AT 45		Water distribution, storage and drainage element of thermoformed ABS	Base area	m²	board of 2 m² netto
9310	Dripperline 100-L1		Dripperline with internal drippers; Ø ca. 16 mm	250 mm distance – 4 m/m² 500 mm distance – 2 m/m²	m	roll of 100 m
2165 2160	Wicking Mat DV 40		Polyester fleece with capillary-effective fibres on one side	Base area	m²	roll of 20 or 50 m² netto
4045	Irrigation-Manager BM 4		Pre-assembled head unit for automated irrigation	1 piece for example for 500 m²	piece	piece
4010	Inspection Chamber KS 10		Inspection chamber made of plastic-coated aluminium with a walkable cover	1 piece per roof outlet	piece	piece

→ Please note: an additional inspection chamber with appropriate height is required for each roof drain and each ball valve.

Order No.	Accessory	Picture	Specification	Need	Unit	Package
9330	Water supply pipe Ø 32 mm		Water supply pipe made of PE, designed as straight pipe 6 m long	Inflow + Supply pipe	m	pipe of 6 m
9321	Coupling Ø 32 mm		Coupling, straight, for water supply pipe Ø 32 mm		piece	10 pieces
9322	L-piece for water supply pipe		Angle connector for water supply pipe, Ø 32 mm, side length 32 mm		piece	10 pieces
9323	L-piece for supply pipe, without starting piece		Angle connector for water supply pipe Ø 32 mm x ¾ in.	1 piece / section at end of supply pipe	piece	10 pieces
9342	T-connector for supply pipe		T-connector for supply pipe 32 x 32 x 32 mm		piece	
9324	Tapping saddle		Tapping saddle for water supply pipe Ø 32 mm	1 piece / connection dripperline	piece	40 pieces
9325	Starting piece		Connector Ø 16 mm x ¾ in.	1 piece / connection dripperline	piece	40 pieces
9320	Flush pipe 16 mm		Water supply pipe made of PE, Ø 16 mm		m	roll of 100 m
9326	T-connector for flush pipe		T-piece connection for the flush pipes and the dripperline, 16 x 16 mm		piece	50 pieces
9327	L-connector for flush pipe		Angle connector for the flush pipes, 16 x 16 mm		piece	25 pieces
9328	Ball valve Ø 16 mm x ¾ in.		Ball valve for flush pipe, Ø 16 mm x ¾ in.	1 piece / section	piece	
9329	Connector Ø 16 mm		Connector for dripperline and flush pipe, 16 x 16 mm		piece	40 pieces
9331	Flexible connection pipe Ø 16 mm		Flexible connection pipe in case of non-orthogonal arrangement of dripperline and flush pipe/supply pipe, cut to length on site		m	roll of 30 m
9332	Teflon tape		Teflon tape to seal the connection between starting piece and tapping saddle	1.35 running metres / tapping saddle (≙ 16 wrappings)	piece	roll of 12 m

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2 Planning Principals

Very important:

When installing a sub-surface irrigation, certain standards for the protection of drinking water need to be observed. These standards may vary depending on the country you are working in. Please make sure to observe all relevant national and local standards.

Appropriate safety devices for the protection of drinking water are not part of the ZinCo Irrigation-Manager BM 4. For reasons of frost protection, these shall be placed within the building. These safety devices are to be provided by a specialized company taking into consideration the required water flow rate and pressure.

A full protection of the potable water can be achieved by an air gap and a pump station thereafter.

Furthermore, it is very important first to examine the water quality in terms of suitability for plant irrigation, in particular via drip irrigation.

Following values need to be verified (measured in H_2O):

What?	Unit	Result
Al	mg/l	
B	mg/l	
Ca	mg/l	
Carbonate hardness	mmol/l alkaline earth ions	
Cl	mg/l	
Cu	mg/l	
EC-value	µS/cm	
Fe	mg/l	
K_2O	mg/l	
Mg	mg/l	
Mn	mg/l	
Mo	mg/l	
Na	mg/l	
NH_4-N	mg/l	
NO_3-N	mg/l	
P	mg/l P_2O_5	
pH-value	-	
S	mg/l SO_4	
Zn	mg/l	

It is important to use clean vessels with a volume of approximately 1 l for the sampling. Furthermore the water needs to run long enough to get a fresh sample from the tub. The table on the left is to be understood as a basic component for an initial analysis of drinking or well water. If gray water is to be used, depending on its origin at least the following parameters need to be clarified in addition:

What?	Unit	Result
As	mg/l	
Ba	mg/l	
Be	mg/l	
Cd	mg/l	
Co	mg/l	
F	mg/l	
Pb	mg/l	
Hg	mg/l	
Ni	mg/l	
Se	mg/l	
Suspended matter	mg/l	

We are happy to assist you in evaluating the suitability of water for your project.

2.1 Determination of Dripperlines Clearance

The clearance of the dripperlines is a consequence of the case distinction shown below. The planning is to be verified on site with regard to the structural conditions prior to installation.

2.1.1 Roof Pitch 0–1 %

It is hardly possible to define an installation direction for this roof pitch, especially given the fact that counter slopes can come about as a result of unevenness in the roof and overlapping waterproofing. In this case, the Aquatec® AT 45 boards are installed in a way that best suits the geometry of the building – trimming should be kept to a minimum.

The design of the Aquatec® AT 45 board allows for the installation of dripperlines at a clearance of 500 mm within this pitch range, at an unevenness of maximum ± 5 mm along a distance of 500 mm. If the deviations are greater (please measure!), twin installation should be chosen in order to ensure a uniform distribution of water across the entire roof area.

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2.1.2 Roof Pitch 1–3 %

In the case of large roof areas, it may be possible to define the installation direction of the Aquatec® AT 45 boards as the direction of the roof pitch. If this is the case, the dripperlines can be easily installed at a clearance of 500 mm and orthogonally to the pitch of the roof. If an installation direction cannot be defined due to differing pitches (e.g. ridges, valleys etc.), the boards should be installed in line with the geometry of the building and the twin installation option chosen.

2.1.3 Roof Pitch 3–5 %

Generally speaking, a roof pitch within this range allows for a defined installation direction and, if this can be adhered to, it is possible to reduce the number of dripperlines. With a defined installation direction and unevenness of less than ± 10 mm across a distance of 500 mm in the direction of the roof pitch, the dripperlines can be installed in this range at a clearance of 500 mm.

2.1.4 Roof Pitch 3–10°

With a defined installation direction, the dripperlines can be installed at a clearance of 1.0 m.

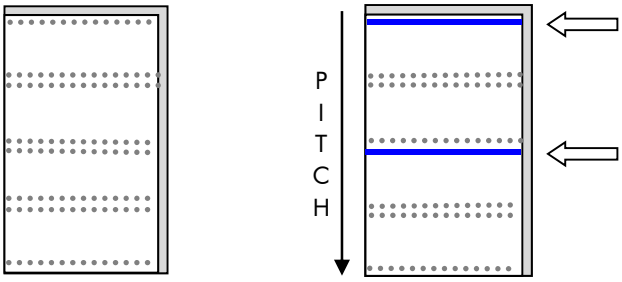

Fig. 2: Possible clip locations for dripperlines (left side) and clip locations to be used at pitched surfaces (right side; only every 1.0 m)

2.2 Determination of Section Sizes / Dripperline Lengths

To ensure a uniform irrigation, it is important to note this chapter. Subsequent on site adjustments can result in considerable additional effort.

2.2.1 Flow Pressure and Flow Rate

It is decisive to know the flow pressure and the maximum amount of water flowing on the roof. The closer these values are to the maximum values, the more efficient the irrigation system can be designed. Depending on the further supply pipe length and its course up to the planned position of the Irrigation-Manager deductions are to be made.

2.2.2 Section Size

The following table shows which maximum section sizes are possible depending on flow pressure / flow rate and on the clearance of the dripperlines. A safety factor of 0.85 was considered due to losses and pressure fluctuations in the pipeline network. Local conditions may require a different safety factor. Greater distances between the Irrigation-Manager BM 4 and the section which is to be irrigated and in particular any height differences have to be considered regarding further pressure and flow rate losses. The installation guidelines (see 3.2.2.1) describe how the flow pressure and the flow rate can be verified on site prior to installation.

Flow pressure [bar]	1.7	2	2.4	3
Max. flow rate [l/min]	19	53	91	98
	↓ maximum section size [m²] ↓			
250 mm (twin installation)	25	70	115	125
500 mm	50	135	230	250
1000 mm	100	270	465	500
2000 mm	195	540	930	1000

Table 1: Maximum section size

2.2.3 Dripperline Lengths

The last value to be determined is the maximum admissible length of each dripperline (from the tapping saddle to the flush pipe). Depending on the water flow pressure (always measured at the tapping saddle), the maximum length must not exceed:

- approx. 75 m at 2.5 bar,
- approx. 70 m at 2.0 bar,
- approx. 60 m at 1.5 bar and
- approx. 50 m at 1.0 bar.

The pressure in the Irrigation-Manager BM 4 (measured at the vent valve) should always be at least 0.5 bar higher, depending on the distance to the tapping saddle. For safety reasons, and to ensure uniform dropping the pressure is reduced automatically to a maximum of 2.8 bar within the Irrigation-Manager.

2.3 Planning and Installation Details

The following details illustrate how the dripperlines should be positioned and where the other components such as Aquatec® AT 45 and Wicking Mat DV 40 should be located. A gravel strip of about 300–500 mm of width is to be applied along the roof edges and around any roof penetrations. This allows a neat installation of main pipes and flush lines and prevents the vegetation from growing below the parapet coverings.

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System Build-up "Summer Plains" Planning Notes

2.3.1 Wall connections

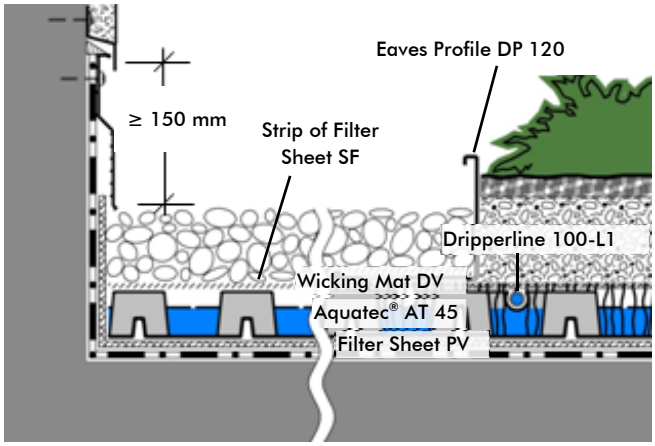

Fig. 3: Wall connection with gravel strip and Eaves Profile DP 120; Dripperlines installed parallely to the wall

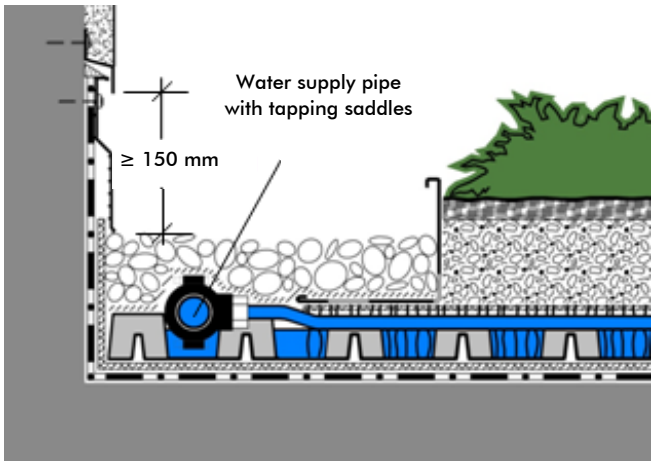

Fig. 4: Wall connection with gravel strip and Eaves Profile DP 120; Dripperlines installed orthogonally to the wall

2.3.2 Water Outlets

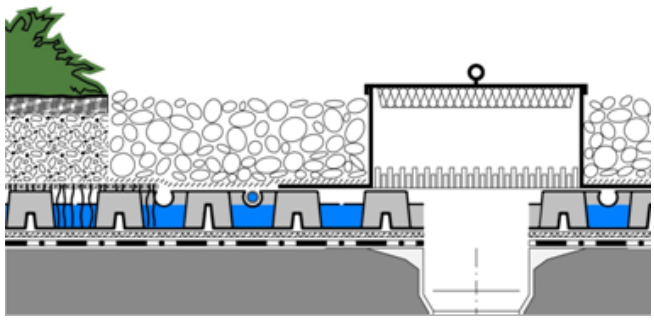

Fig. 5: Outlet with Inspection Chamber KS 10 – layout of a strip of filter sheet (not a Wicking Mat!)

2.3.3 Roof Edgings

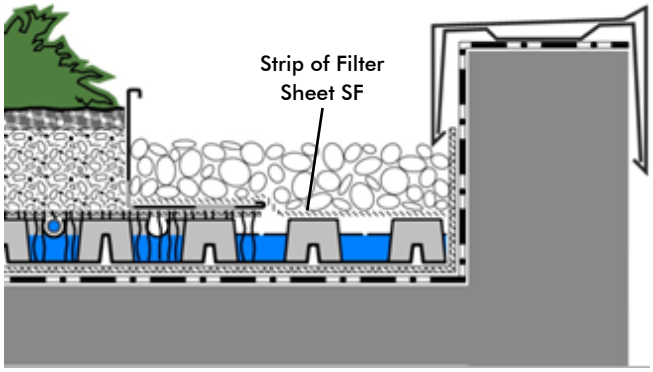

Fig. 6: Roof edge with gravel strip and Eaves Profile DP 120; Dripperlines installed paralelly to roof edge

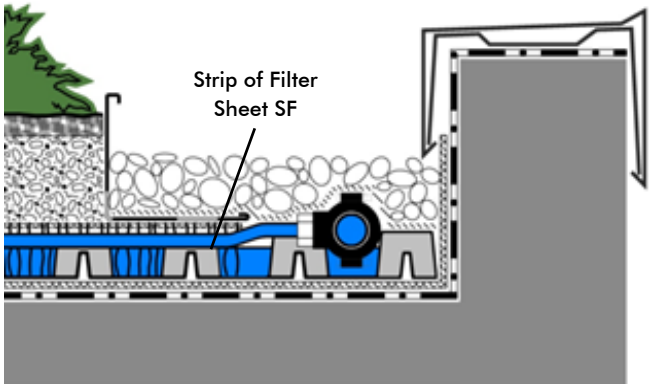

Fig. 7: Roof edge with gravel strip and Eaves Profile DP 120; Dripperlines installed orthogonally to roof edge

2.3.4 Skylight Connection

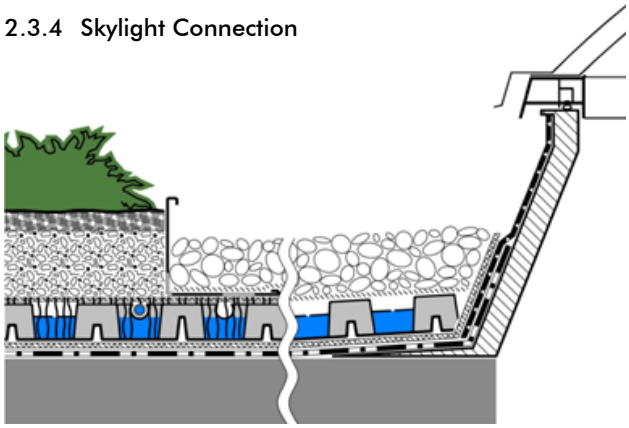

Fig. 8: Skylight connection with a strip of filter sheet (not a Wicking Mat!)

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2.3.5 Walkways and Terraces

Single slabs (e.g. maintenance paths) can be installed as usual on the substrate. A slight settlement needs to be considered.

We recommend separating the systems when installing continuous slabs or paving. This prevents the pavement surfaces from being watered unnecessarily. It is important to frame this type of pavement, e.g. with concrete brackets or using a cobble strip. If the paths or surfaces are narrow or small, the dripperlines can be extended using connectors and a flush pipe, so that they can be continued beneath the pavement surfaces without any loss of water. In the case of large surfaces, irrigation should be omitted completely. It is important to use materials with low lime content and to install the slabs and paving with generous gaps, in order to avoid efflorescence.

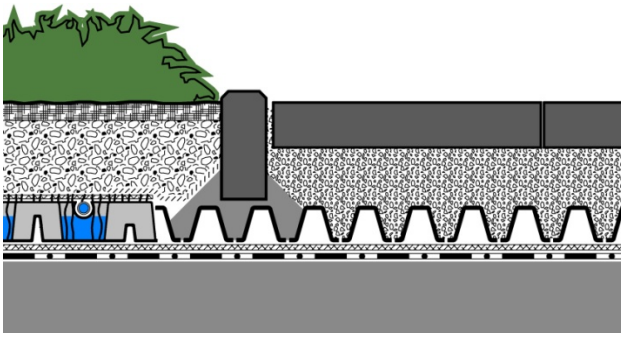

Fig. 9: Edging between green area above Aquatec® AT 45 and walkway above Floradrain® FD 40-E – at the same level

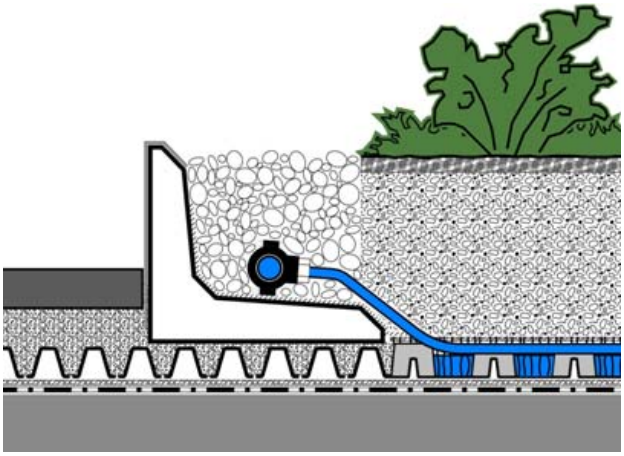

Fig. 10: Edging between green area above Aquatec® AT 45 and walkway above Floradrain® FD 40-E – vegetation at higher level

2.3.6 Foundations

In order to secure, for example, swings or lamps, the Aquatec®-element is first of all filled with coarse gravel. A Filter Sheet TG is then laid on top of this. The required foundations can now be laid on top of the filter sheet. The quality of the concrete is important in order to minimize carbonate discharge! Use at least quality C 25/30 and ensure that the surfaces are smooth and even!

Further details such as dilatation joints are available upon request.

2.4 Salinization

Salt accumulation can occur particularly in arid regions due to capillary rise in combination with salty water. If such symptoms appear, it is important to irrigate excessively at intervals, therefore causing the Aquatec®-elements to overflow and the salt to drop back to the bottom. However, this is not a long-term solution and the vegetation will appreciate a "shower" from above every now and again, which means that a possibility of sprinkling should be provided. If a sprinkler, which could be used for flushing out, hasn't already been installed for aesthetic reasons to clear dust from the leaves, the salt content must be reduced, manually if necessary, to a plant-sustainable level. Alternatively, some very salt-tolerant grasses could be used, such as those that are popular on golf courses that are located on the coast. In any case, salinization is an issue that must be taken seriously, and one which has to be taken into consideration in arid regions as early as the planning stage.

Other water-saving sub-surface irrigation systems also exhibit this problem, which must be addressed from the start of the project.

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3 Installation Instructions

3.1 Required Tools

Preliminary Tests:

- Flow meter to determine the given flow pressure and the flow rate (see **Fig. 12**)
- Inclinometer
- Pocket rule
- Straight edge (length min. 2 m)
- 20-liter bucket if necessary
- Stopwatch if necessary
- Tube (length 1–2 m) with a geka-type connection if necessary

Installation:

- Cordless screwdriver
- Pipe cutter for PE-pipes, ⌀ 16 and 32 mm
- Chamfering tool for PE-pipes, ⌀ 32 mm
- Drill for PE-pipes (12 mm)
- Socket spanner, (11 mm)
- Bit adapter for sockets
- Marking pen (e.g. edding 750 Paint Marker, white)
- Pocket rule
- Portable circular saw with guard rail to cut the Aquatec®-elements, cutting depth 50 mm, suitable base. Alternatively a swing cut trimmer for small areas
- Kettle
- Power supply and an extension cable

3.2 Verifications Prior to Installation

Please check the building's safety devices for the protection of drinking water.

Prior to connecting the sub-surface irrigation system or any other dripping line to the drinking water system, make sure that the building is equipped with a standardized safety device. Please consider all relevant national and local standards.

We recommend asking for a written confirmation of the suitability of the safety device for the intended application.

3.2.1 Verification of the Dripperline Clearance

3.2.1.1 250 or 500 mm?

This clearance can be realised at following roof pitches.

Pitch 0–1 %

It is hardly possible to define an installation direction for this roof pitch, especially given the fact that counter slopes can come about as a result of unevenness in the roof and overlapping waterproofing. In this case, the Aquatec® AT 45 boards are installed in a way that best suits the geometry of the building – trimming should be kept to a minimum.

The design of the Aquatec® AT 45 board allows for the installation of dripperlines at a clearance of 500 mm within this pitch range, at an unevenness of maximum ± 5 mm along a distance of 500 mm. If the deviations are greater (please measure!), twin installation should be chosen in order to ensure a uniform distribution of water across the entire roof area.

Pitch 1–3 %

In the case of large roof areas, it may be possible to define the installation direction of the Aquatec® AT 45 boards as the direction of the roof pitch. If this is the case, the dripperlines can be easily installed at a clearance of 500 mm and orthogonally to the pitch of the roof. If an installation direction cannot be defined due to differing pitches (e.g. ridges, valleys etc.), the boards should be installed in line with the geometry of the building and the twin installation option chosen (Ø-clearance = 250 mm).

3.2.1.2 500 mm

This clearance of dripperlines can be safely applied at a roof pitch of 3–5 %.

Generally speaking, a roof pitch within this range allows for a defined installation direction and, if this can be adhered to, it is possible to reduce the number of dripperlines. With a defined installation direction and unevenness of less than ± 10 mm across a distance of 500 mm in the direction of the roof pitch, the dripperlines can be installed in this range at a clearance of 500 mm.

3.2.1.3 1 m

This clearance of dripperlines can be realised at a roof pitch between 3° and 10° with a defined direction of the dripperlines.

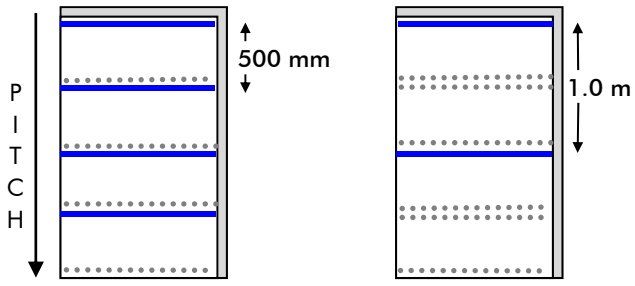

Fig. 11: Clip system used only every 500 mm (left) respectively every 1.0 m (right)

3.2.2 Verification of the Determined Section Size and the Dripperline Length

To ensure a uniform irrigation, it is important to note this point! Assumptions which have been made during the planning process need to be verified on site!

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3.2.2.1 Flow Pressure and Flow Rate

It is vital to be aware of the given flow pressure and the maximum amount of water flowing to be able to evaluate the following points. It makes sense to measure these parameters professionally some time prior to the intended installation so that the proposed irrigation layout can be adjusted if necessary. Depending on the length of the supply pipe and its course from the water tap to the planned position of the Irrigation-Manager further deductions are to be made.

Another check should be done immediately prior to establishing the single sections directly at the drain tap ⑤ of the Irrigation-Manager. This test can be performed as follows:

A flow meter is connected on top of the drain tap ⑤. A corresponding device is available on request. By regulating the flow rate the corresponding pressure can be read.

Generally a pipe diameter of at least 25 mm is required at the water meter within the building. The further connection to the roof and the Irrigation-Manager needs to be built by means of pipes (preferably plastic pipes) with a diameter of 32 mm. Only then higher flow rates for an efficient irrigation of larger surfaces can be achieved.

Fig. 12: Flow meter for the determination of the given flow pressure and the flow rate

In case of small projects and low flow rates (up to approx. 30 l/min) the maximum flow rate can be determined approximately using a stopwatch and a 20 l bucket. A 1" hose with a geka-type coupling is to be attached to the drain tap ⑤. The time required to fill the bucket is then to be measured.

Since the pressure goes down to nearly 0 at this maximum discharge, a certain safety factor needs to be considered. Otherwise the drippers would no longer work.

The maximum flow rate is then calculated as follows:

$$Max.\,flow\,rate\,\left[\frac{l}{min}\right] =$$

$$= \frac{Time\,required\,to\,fill\,the\,20\,l\,bucket\,[s] * 0.8\,[safety\,factor]}{3}$$

This way you can estimate if the single sections can be connected to the water supply as intended.

3.2.2.2 Section Size

The following table shows the maximum section sizes depending on the flow pressure / flow rate and the installation clearance of dripperlines. A safety factor of 0.85 was considered for losses and pressure fluctuations in the pipe network (regardless of the above-mentioned "bucket method").

Object specific conditions may require a different safety factor. Further losses in pressure and thus in flow rate need to be considered in case of longer distances between the Irrigation-Manager BM 4 and the section to be irrigated and in particular in case of any differences in height!

Table 2: Maximum section size

Flow pressure [bar]	1.7	2	2.4	3
Max. flow rate [l/min]	19	53	91	98
	↓ maximum section size [m²] ↓			
250 mm (twin installation)	25	70	115	125
500 mm	50	135	230	250
1000 mm	100	270	465	500
2000 mm	195	540	930	1000

Note: When programming the Irrigation-Manager BM 4 (see Chapter **4.1**) please be aware of the fact that the longer the distance between the dripperlines is, the longer it takes to fill the water storage chambers of the Aquatec®-elements. Therefore the installation clearance of the dripperlines should be noted in the BM 4, so that the programming can be done correctly at any time.

3.2.2.3 Length of a Single Dripperline

The last parameter to be determined is the length of the dripperlines (from the tapping saddle to the flush pipe). Depending on the water flow pressure (the point of reference is always the tapping saddle), the maximum length of a single dripperline can be:

- approx. 75 m at 2.5 bar,
- approx. 70 m at 2.0 bar,
- approx. 60 m at 1.5 bar and
- approx. 50 m at 1.0 bar.

The pressure at the drain tap ⑤ of the Irrigation-Manager BM 4 should always be at least 0.5 bar higher, depending on the distance to the tapping saddle. For safety reasons and to ensure a uniform drip amount the pressure in the Irrigation-Manager is automatically reduced to 2.8 bar.

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3.3 Installation of Single Components

3.3.1 Protection Layer – Filter Sheet PV

The Filter Sheet PV is installed as a protective layer directly onto the roof waterproofing. The individual sheets should be installed with an overlap of approx. 100 mm. At all roof edges, roof penetrations etc. the sheet is drawn upwards at least as far as the upper edge of the build-up.

Fig. 13: Installation of the Filter Sheet PV

3.3.2 Water Distribution, Storage and Drainage Element Aquatec® AT 45

General installation tips:

Insofar as is possible given the shape of the roof area, the Aquatec® boards should be installed in one defined direction so that the dripperlines are horizontal to the pitch of the roof. Aquatec® boards have pre-defined clip points for the dripperlines so that up to eight lines per board can be installed ("twin installation": two lines are installed side-by-side).

Prior to installation, it is important to determine the pitch of the roof that is to be greened and to check for unevenness. In particular, roofs with bituminous waterproofing layers can be somewhat uneven. The concentration of dripperlines may be reduced, depending on the pitch of the roof and possible unevenness (see Chapter 3.2.1 for different roof pitches). We offer the service of drawing up an object-related installation plan. Please contact our technical department.

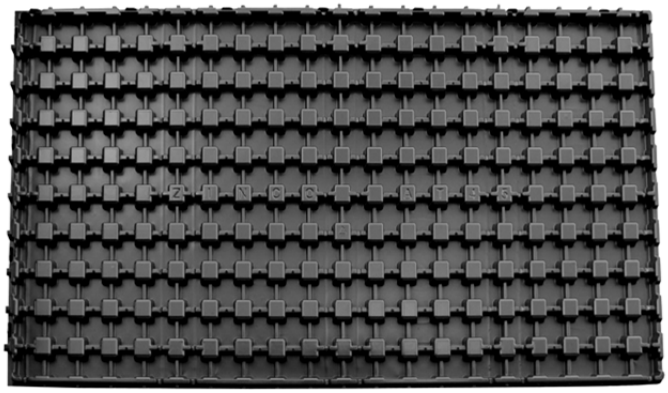

Fig. 14: Aquatec® AT 45 – a complete board

The boards have interlocking studs on two sides and an overlapping edge which together help to prevent them from slipping and the Wicking Mat from sagging. For this reason, there is one installation direction beginning, for example, at the bottom left and working up towards the top right corner (see Fig. 15 (top view)). The boards can be cut, for example, using a circular saw (fine blade, suitable for plastic).

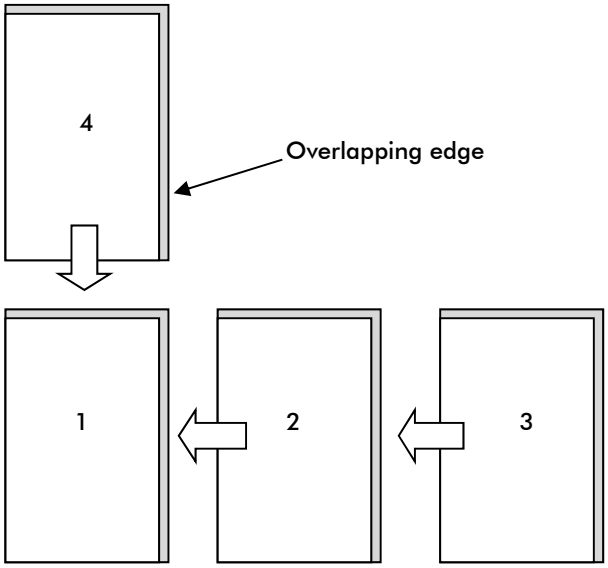

Fig. 15: Installation sequence for Aquatec®-elements

Fig. 16: Aquatec®-elements with overlapping edges and connecting studs

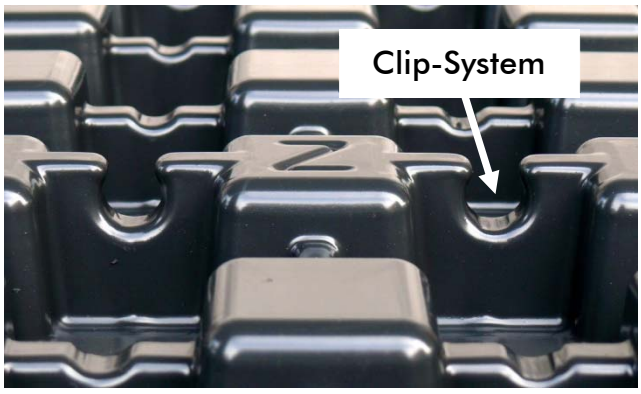

Fig. 17: Clip system for dripperlines

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The integrated clip system allows for the quick installation of the dripperlines with a defined, uniform clearance between them. The important thing when installing the system is that the Aquatec® boards are arranged in such a way that the dripperlines can be fitted in a continuous straight line from board to board. The elements can only be staggered in steps of 500 mm lengthwise.

The installation sequence of Aquatec® AT 45 at inclination and an exemplary installation clearance of the dripperlines 100-L1 are shown in the following:

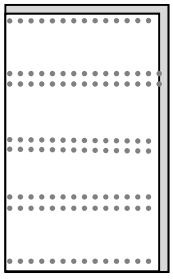

Fig. 18: Possible clip locations for dripperlines (max. 8 per board with twin installation)

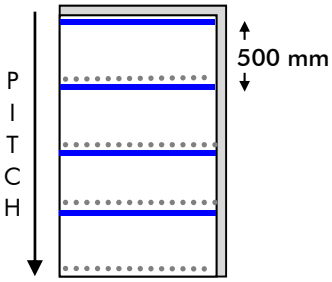

Fig. 19: Example with dripperline clearance 500 mm (resulting in 4 dripperlines per board)

3.3.3 Irrigation-Manager BM 4

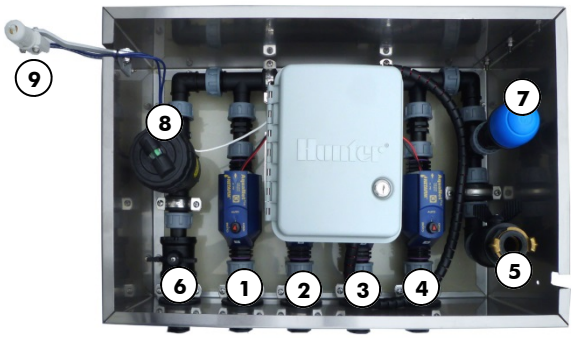

Fig. 20: Irrigation-Manager BM 4 for automated irrigation in a lockable aluminium casing for outdoor use

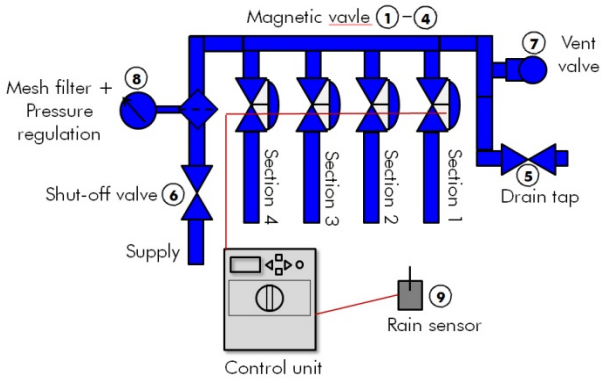

Fig. 21: Schematic representation of individual components of an Irrigation-Manager BM 4

Installation:

The Irrigation-Manager BM 4 should be installed in the vicinity of the roof or even on the roof itself for easy and safe access. It should be positioned in a way that up to four connection lines can lead out from it to the sections to be irrigated. If the BM 4 has to be installed in the interiors, the rain sensor should be removed from the casing and installed in a suitable outdoor location to be exposed to rain. An extension cable can be provided for this purpose, on request. Furthermore the sensor can be removed to the other side of the casing if more convenient, e.g. for mowing ect. On delivery, the sensor is folded into the casing.

The supply pipe for the Irrigation-Manager BM 4 must be at least a 32 mm water supply pipe and must be capable of supplying a sufficient level of water. The feeding pipes to the individual sections are created with 32 mm water supply pipes. They lead out from the Irrigation-Manager BM 4 and should run along a gravel strip. Within the section to be irrigated, they are fitted with tapping saddles at a suitable clearance so that the individual dripperlines can be supplied with water. The connection of the supply pipes to the individual sections is to be carried out at the openings ①–④ using the enclosed couplings. The water supply pipe is connected to the BM 4 at the opening ⑥ also using an enclosed coupling.

Note:

In case another irrigation unit is applied instead of the Irrigation-Manager BM 4, care must be taken to install a filter with a mesh size ≤ 0.1 mm (≥140 mesh) to prevent damage caused by dirt or foreign objects. Furthermore the pressure needs to be reduced to max. 3.0 bar.

Important:

When connecting the irrigation system to the drinking water supply, please observe relevant regulations on the protection of drinking water. There is a danger of backflow! Corresponding protection valves shall be provided within the building and are not part of the Irrigation-Manager BM 4.

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Fertigation:

If a Fertigation device is to be integrated, a suitable dosing unit (e.g. Dosatron, Mixrite) can be applied in the supply pipe to the Irrigation-Manager BM 4 within the frost-free interiors.

The Irrigation-Manager is suitable for a combined irrigation and fertilization. It must be ensured that compatible pipes are used. All relevant regulations must be observed!

3.3.4 Dripperline 100-L1

Fig. 22: Dripperline 100-L1, roll length 100 m

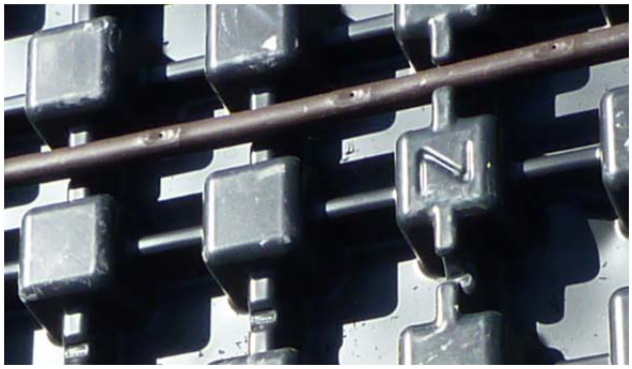

Fig. 23: Dripper openings facing upwards

It is vital that the special ZinCo Dripperline 100-L1 with a dripper clearance of 100 mm and a water flow of 1 l/h per dripper is used. In case of a dripper clearance which is not harmonized with the Aquatec®-elements not all the storage cells in the element will be filled and the irrigation system will, therefore, not function properly.

The dripperlines should be installed with their drippers facing upwards (to prevent dirt from settling in the openings).

The dripperlines are to be inserted into the clip system of the of Aquatec®-elements. The installation clearance is defined according to the roof pitch and is not to be changed within one irrigation section. Further information on the installation intervals can be found in Chapter 3.2.1.

Note:

It is recommended to perform an irrigation test run before laying the Wicking Mat DV 40. Once the wicks are soaked with water the mat can only be moved with difficulty.

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3.3.5 Supply pipe and Flush pipe / connection to the dripperline

The supply pipe is usually installed orthogonally to the laying direction of the dripperlines. If this is not possible, flexible connecting lines are required additionally. These are applied as extensions to the dripperlines and are fixed via straight connectors. The minimum bending radius of the flexible pipes is 200 mm.

In the following the mounting of the different couplings is shown exemplary on a straight coupling.

Fig. 24: A pipe cutter to cut the straight supply pipe

First, the dripperline resp. the supply pipe is neatly cut to length. We strongly recommend using a pipe cutter for PE pipes. Doing so the risk of injury is minimized and neat straight cuts are possible.

Now, the pipe is to be chamfered at both ends. Special chamfering tools are available for this purpose.

Fig. 25: Chamfering Tool

Fig. 26: Unscrewed connector

The connector is then to be unscrewed almost entirely on one side.

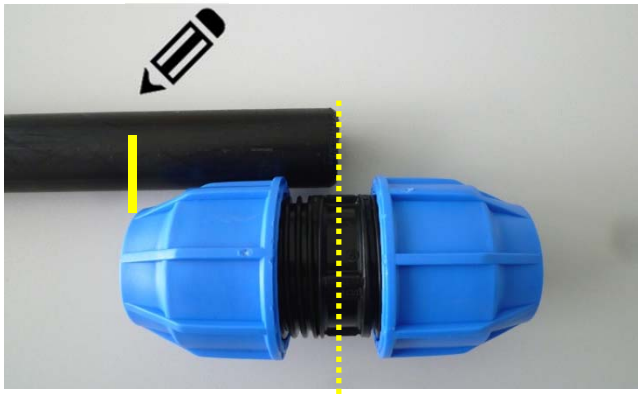

Fig. 27: Marking the insertion depth

The 32 mm supply pipe or the dripperline need to be inserted completely into the coupling. This is easiest done by marking the pipe (**Fig. 27**). Please make sure not to squeeze any of the drippers (length 20 mm).

Fig. 28: Completely inserted supply pipe

The fully inserted supply pipe is now screwed firmly by hand.

Fig. 29: Drilling the supply line

To screw the tapping saddles quickly and firmly a socket spanner (size 11) in combination with an appropriate bit adapter for cordless screwdrivers is recommended. Don't forget the sealing ring. After the tapping saddles have been positioned the supply pipe is to be drilled carefully (drill ∅ 12 mm), see **Fig. 29**.

Fig. 30: Wrapping the staring piece in teflon tape

Before inserting the starting pieces into the tapping saddles these have to be wrapped 16 times (≙ 1.35 m) firmly with teflon tape. For this purpose, the teflon tape is to be attached to the thread of the starting piece and to be wound on the thread clockwise as in shown **Fig. 30**. Alternatively a teflon thread can be used (e.g. Loctite 55 sealing thread). In this case approx. 8 windings are enough (≙ 0.7 m).

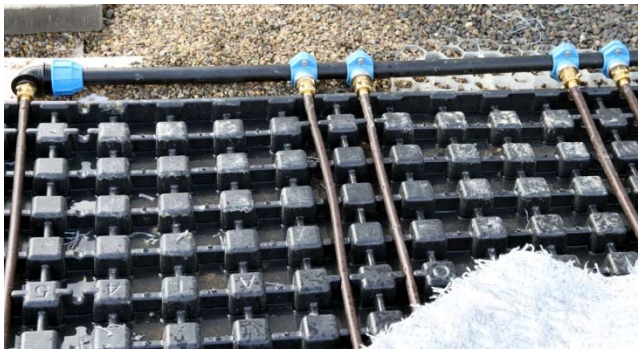

Fig. 31: Exemplary installation at the side of the supply pipe

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Fig. 32: Exemplary installation at the side of the flush pipe

In order to allow for flushing of the dripperlines it is inevitable to connect their ends with a so called flushing pipe, see **Fig. 32**. It is to be equipped with a ball valve at a suitable location, so that the plant can be flushed manually and can be blown out before winter. The ball valve is covered with an inspection chamber for its visibility. In case that no rectangular connection to the dripperlines can be realised additional flexible joints are to be used. The same applies for the supply pipe.

The connection of a dripperline and a flush pipe is shown here exemplary using a T-connector:

Fig. 33: Cutting the flush pipe to length

First, the connecting pieces of the flush pipe (**Fig. 33**) are to be cut. The lengths are determined by the distance between the dripperlines chosen before. We strongly recommend using a pipe cutter for PE pipes. So the risk of injury is minimized and neat straight cuts are possible.

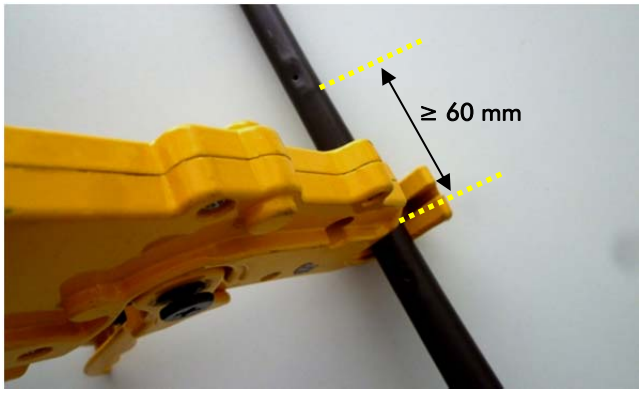

Fig. 34: Cutting the dripperline to length

The dripperlines are to be cut to length between the drippers in a distance of at least 60 mm to the last dripper.

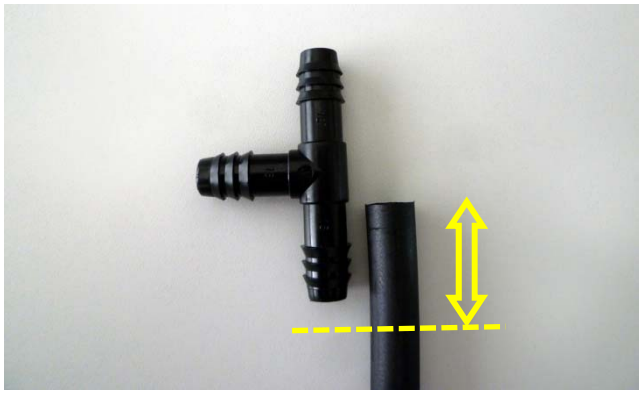

Fig. 35: Length of the pipe piece to be heated

The dripperlines and flush pipes need to be smoothened by means of hot water at their ends in a length which is to be pushed onto the connectors. This length should not be exceeded as the pipe might bend otherwise. The most rapid method is using a kettle which is to be kept at a constant temperature, best boiling.

In comparison the use of hot air is less precise and often results in bending or overheating the pipe ends.

Fig. 36: Heating the drippeline in hot water

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Fig. 37: Correctly inserted flush pipe

Plugging the dripperlines and the flush pipes requires some practise. The heated pipe end is to be pushed onto the connector by pressure and by up and down movements. It is recommended to wear appropriate gloves since the T- and L-pieces otherwise might harm your palms. To ensure tightness it is important to push the pipes up to the thickening. Please avoid rotational movements, since these inevitably lead to leakage. Only completely plugged pipes can be turned for final positioning.

Fig. 38: Correctly connected dripperline and flush pipe

That's what the connection looks like when the pipes are plugged onto the T-connector. The drippers are facing upwards. This way dust or any other particles cannot reach the dripper and can easily be removed when cleaning.

3.3.6 Wicking Mat DV 40

Fig. 39: Wicking Mat DV 40 installed with its wicks facing downwards

General Notes

The Wicking Mat is provided with a 100 mm wide side strip without fibres to allow for a neat overlapping (when installing, this strip is always on top). In case of butt joints the Wicking Mat also needs to be overlapped approx. 100 mm.

To ensure a lossless water supply over the entire surface, sagging or overhanging of the mat over the Aquatec®-elements need to be prevented. For this reason, a gravel strip is installed along the roof edge and around roof penetrations.

Preventive Measures against Wind

In order to protect the Wicking Mat from being lifted by wind after installation, we recommend irrigating it from above. This also simplifies the subsequent initial irrigation event as basic moisture content enhances the capillary effect. It is important to moisten the mat only when it no longer has to be moved.

Cutting the Wicking Mat

The Wicking Mat can best be cut using a self-sharpening rotating knife, such as e.g. Bosch XEO.

3.3.7 Growing Medium

The Correct Choice

Preferably, the ZinCo system substrate "Lawn" is used, as it has very good capillary properties and the turf "ZinCo Summer Plains" is adapted to suit this type of substrate. However, other substrates are possible for other types of vegetation. The System substrates "Roof Garden" and "Heather with Lavender" should not be used as their content of organic matter is too high.

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Substrate Depth

A substrate depth of approximately 100 mm is sufficient to grow the vegetation type "Summer Plains" using capillary irrigation. Approximately 80 mm should consist of the system substrate whereas the remaining 20 mm are applied with the turf. In terms of capillarity a maximum substrate depth of up to 250 mm is possible.

Application

In order to avoid damaging the wicks in the Wicking Mats, we recommend using Big Bags or the Turbobag® or to have the substrate brought up through a chute. Dragging silo hoses across the Wicking Mat will rip the wicks out and this will affect irrigation. If silo hoses have to be used, this can only be done by working bit by bit on substrate that has already been applied, therefore, continuing with the silo hoses only on substrate that has already been installed.

3.3.8 ZinCo-"Summer Plains" - Turf

In general, it is particularly important that the turf complies with the quality standards required by the FLL Green Roof Guidelines (grown on sandy soil with a low to medium humus content). High water permeability needs to be given.

Delivery

On receipt of the turf, the transport packaging must be removed immediately and the goods inspected to ensure that they are undamaged. Any complaints must be notified without delay to the supplier of the turf. The goods must be unloaded and transported with care.

Interim Storage

Where possible, the turf should be installed immediately on receipt. If it has to be stored, it should be removed from the pallets and stored in a single layer in a cool place (in the shades or indoors). If they are to be stored for longer than a day, the rolls must be rolled out flat and watered.

Installation

Prior to installation, the substrate must be flattened with a roller. The rolls are then installed side by side without a gap. Overhanging edges can be cut off with a knife. After installation, the turf is flattened or pressed down, to ensure good contact with the substrate.

Irrigation

Irrigate from above immediately after installation. Lift one of the sods to check that both the turf and about 50 mm of the substrate are well soaked.

We assume no liability for installation during a frosty period. The entire area should be kept moist for a period of about 2 to 4 weeks after installation in order to ensure growth. If the weather is not too hot or dry, you can switch over completely to capillary water supply from the Aquatec®-elements.

Fertilizing

We recommend applying the long-term fertilizer, Plantfit® 4M, once a year in spring and in a quantity of 25 g/m².

3.4 Installation Details

Different installation details can be found in Chapter 2.3.

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4 Operation Instructions

4.1 Programming the Irrigation-Manager BM 4 for Different Types of Vegetation

The Irrigation-Manager BM 4 is supplied with a separate programming manual for the control unit.

In the following the programming for the vegetation types ZinCo-"Summer Plains" as well as for lawn and shrubs in moderate climate is explained more detailed.
Of course, it is possible to use the Irrigation-Manager for other types of vegetation and to program it accordingly.

When programming first the cycle start time for program A is set (= start time for the processing of all valves / sections). Then the duration for program A is set for each valve. If a valve is not to be used the value 0 is to be set. The recommended durations are given in Table 3 to Table 6. Finally the days on which the area needs to be irrigated are to be set for program A (e.g. daily irrigation for lawn or interval irrigation every 4-5 days for "Summer Plains"). The sensor needs to be set to "Active" to activate the Mini-Click switch.

If properly adjusted, the rain sensor incorporated into the mini-click switch will suppress the programmed irrigation cycles, which saves on water. The recommended setting for the mini-click is 6 mm for "Summer Plains".

In the case of "Summer Plains", the following duty cycles can be taken as a guideline for programming.

Table 3: Duty cycle depending on installation clearance – ZinCo-"Summer Plains"

Installation clearance dripperline (mm)	Duty cycle per irrigation event (min)	Corresponds to irrigation quantity at 100 % (mm)	Irrigation quantity per minute (mm)
25	30	20	0.67
50	60	20	0.33
100	120	20	0.167

The irrigation quantity of 20 mm will certainly fill the storage volume of 17 l/m² of the Aquatec®-elements, even if capillary water already rises to the top at the same time.

Table 4: Aid to programming – ZinCo-"Summer Plains" (Example for a 100 mm growing layer)

Month	Frequency	Seasonal adjustment (%)	Corresponds to irrigation quantity (mm) per irrigation event	Maximum irrigation quantity** / month (mm)
April	manually, if required*	manually	when required	when required
May	every 4–5 days	100	20	120–150
June	every 4–5 days	100	20	120–150
July	every 4–5 days	100	20	120–150
August	every 4–5 days	100	20	120–150
September	every 4–5 days	100	20	120–150
October	manually, if required*	manually	when required	when required

* Danger of frost!
** Mini-Click interrupts the program more or less often.

If you were to set your system in line with the highest values, up to about 750 l/m² of water a year would be used with the above program, without the mini-click switch. However, as the irrigation program is repeatedly deactivated by the mini-click switch, this theoretical consumption is reduced to a greater or lesser extent, depending on the region.

If the intention is to develop the "Summer Plains" into a usable lawn through frequent cutting, the irrigation level should reflect more the settings for lawn and perennials (see **Table 5** and **Table 6**).

To optimize the water consumption the frequency of irrigation events should be adapted individually depending on the mowing time and the respective year. Potentially the irrigation can be switched entirely on manual mode in mid September.

The seasonal adjustment is not considered in case of "Summer Plains" as each irrigation event completely fills the storage volume of the Aquatec®-elements. Longer irrigation duration would result in overflowing.

If the available growing layer is greater than 100 mm, the frequency of irrigation events can be reduced again as required, given that a greater part of the natural precipitation occurring can also be used.

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For other vegetation types, such as lawn, with higher water requirements daily irrigation should be preset, as a constant water level has positive effects on the growth. The Mini-Click switch is set to 3 mm. An orientation for moderate climate is given in the **Table 5** and **Table 6**. Make sure that the elements are entirely filled at the beginning of the irrigation season. This achieved by irrigation each section at least once with the duration given in **Table 3**.

Table 5: Duty cycle depending on installation clearance – "Lawn / Perennials"

Installation clearance dripperline (mm)	Duty cycle per irrigation event (min)	Corresponds to irrigation quantity at 100 % (mm)
25	8	5
50	15	5
100	30	5

Table 6: Aid to programming – "Lawn / Perennials" (Example for a 100 mm growing layer)

Month	Frequency	Seasonal adjustment (%)	Corresponds to irrigation quantity (mm) per irrigation event	Maximum irrigation quantity** / month (mm)
April	manually, if required*	manually	when required	when required
May	daily	100–120	5–6	150–180
June	daily	100–120	5–6	150–180
July	daily	120–160	6–8	180–250
August	daily	120–160	6–8	180–250
September	daily	100–120	5–6	150–180
October	Manually, if required*	manually	when required	when required

* Danger of frost!
** Mini-Click interrupts the program more or less often.

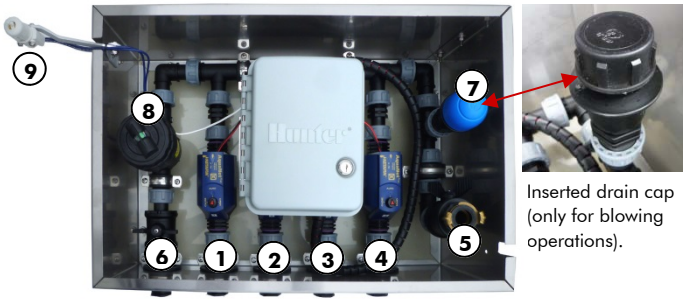
Please note: If the irrigation intensity was adapted too late during a dry period, it might be necessary to run one additional irrigation event according to **Table 3** to achieve uniform conditions.

4.2 Initial Commissioning and Control during the Irrigation Season

Important: We assume that every section and every supply pipe is connected in a correct way.

4.2.1 Filling the Supply Pipe to the Irrigation-Manager BM 4

Since the volume of air in the supply line can be significant, proceed with the utmost caution! Compressed air is a risk which is not to be underestimated. Set the red knobs ①–④ to "Auto". Attach a short piece of a hose above the drain tap ⑤, so that exceeding water can be led out of the aluminium casing. The shut-off valve ⑥ of course needs to be opened as well. The filter ⑧ is to be closed firmly. Now the supply pipe is filled slowly until water without air flows out of ⑤. As soon as that is the case the drain tap ⑤ can be closed. Possibly small amounts of water can still flow out of the vent valve ⑦, this remains unconsidered. It also serves for the ventilation.
Now the main water pipe within the building can be opened completely. The water supply is thus established.



Inserted drain cap (only for blowing operations).

Fig. 40: Irrigation-Manager BM 4

4.2.2 Programming the Control Unit / Energy Supply

After each winter or at the beginning of commissioning new batteries are to be inserted. The programming itself is subject to its own manual. Notes on the irrigation duration for each section can be found in Chapter **4.1** of the instruction manual "Summer Plains".

4.2.3 Flushing each Section and Checking the Control Unit

Each section can be activated easily for flushing using the rotary switch. Thus, the communication functionality between the control unit and the magnetic valves is checked at the same time. The red knobs ①–④ need to be set to "Auto". It is important to open the valves at the end of each section. As soon as clear water with no air is flushing from the valves (usually after a few minutes), the flush valves can be closed again. Then, the corresponding magnetic valve is closed by using the rotary switch. Step by step, every single section is filled with water. The seasonal adjustment should be checked and adjusted if necessary. Finally the rotary switch of the control unit is to be set to "On". Thus, the programmed watering cycles are activated again.

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4.2.4 Controls during the Irrigation Season

4.2.4.1 Seasonal Adjustment

The seasonal adjustment should be modified once a month or even more often if necessary. This way water can be saved. However, it is even more important to react in extreme dry periods and to increase the water amount.

4.2.4.2 Filter and Flushing

The filter within the Irrigation-Manager needs to be inspected regularly, in the beginning monthly. Depending on the local water quality the interval can be extended later on. For this purpose, following steps are necessary:
After closing the shut-off valve ⑥ the pressure within the drain tap ⑤ is relieved carefully. A short piece of hose with a suitable connection helps to lead moisture away from the Irrigation-Manager. Now the filter lid can be unscrewed and the sieve can be cleaned best under running water using a fine brush. Then everything is to be assembled again. The drain tap ⑤ is to be closed and the shut-off valve ⑥ to be opened again slowly. Small amounts of water can leak from the vent valve ⑦.
After the cleaning the individual sections are to be activated again (best using the rotary switch of the control unit). Then the corresponding valve at the end of each section is to be opened and the pipes are to be flushed for some minutes depending on the size of the section (see also Chapter 4.2.3).

4.2.4.3 Salinization

Salt accumulation can occur particularly in arid regions due to capillary rise in combination with salty water. If such symptoms appear, it is important to irrigate excessively at intervals, therefore causing the Aquatec®-elements to overflow and the salt to drop back to the bottom. However, this is not a long-term solution and the vegetation will appreciate a "shower" from above every now and again. If a sprinkler, which could be used for flushing out, hasn't already been installed for aesthetic reasons to clear dust from the leaves, the salt content must be reduced, manually if necessary, to a plant-sustainable level.
Basically, the suitability of the used water should be checked according to Chapter 2 at the planning stage.

4.3 Notes for Winter Maintenance

4.3.1 Flushing and Cleaning the Mesh Filter

Whenever the System Build-up "Summer Plains" is to be prepared for winters time it makes sense first to flush the plant and to clean the filter.
After closing the shut-off valve ⑥ the pressure within the drain tap ⑤ is relieved carefully. A short piece of hose with a suitable connection helps to lead moisture away from the Irrigation-Manager. Now the filter lid can be unscrewed and the sieve can be cleaned best under running water using a fine brush. Then everything is to be assembled again. The drain tap ⑤ is to be closed and the shut-off valve ⑥ to be opened again slowly. Small amounts of water can leak from the vent valve ⑦.
After this cleaning the individual sections are to be activated again (best using the rotary switch of the control unit). Then the corresponding ball valve at the end of each section is to be opened and the pipes are to be flushed for some minutes depending on the size of the section.

4.3.2 Emptying and Blowing

To prepare the irrigation system for winter the pipe network needs to be emptied and blown out. First the water connection within the building needs to be turned off. Then following steps need to be carried out:

Step 1: Emptying and Blowing the Supply Pipe

First, the supply pipe to the Irrigation-Manager needs to be emptied at the drain valve in the building. For this purpose, all magnetic valves (①–④) in the Irrigation-Manager are to be closed, only the drain tap ⑤ and the shut-off valve ⑥ remain open. Be aware of the possibility of large amounts of water (depending on the length of the supply pipe) running out of the valve. After draining the pipe should be blown out additionally. To make sure that the vent valve doesn't hinder the blowing process, it is to be closed with the provided plug (see **Fig. 40**). Please consider the general notes on blowing and connect an air compressor according to item 5. Each cycle shall not take any longer than 2 minutes. This procedure can be repeated 1-2 times till only fine mist emerges from the drain valve in the building. Air must not be led into the devices for the protection of drinking water on any account. If that happens the drain valve is probably mounted at a wrong position.
If you are not familiar with these system components, please consult a qualified specialist company which will gladly offer this kind of service.

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General Notes on Blowing:

1. Please wear safety glasses! Dirt particles might be blown out.
2. Do not remain above the valves or any other components of the irrigation system while blowing out.
3. The pressure of the compressed air should not be any higher than 3.5 bar. Please use a pressure regulating valve.
4. The compressor performance needs to be between 17-42 m^3/h depending on the size of the surface. The decisive factor for blowing correctly is the amount of air, not its pressure.
5. Connecting the air compressor to the Irrigation-Manager: an appropriate connection for compressed air is to be fitted above the drain tap (not included in the Irrigation-Manager). For larger sections and thus longer blowing times it is recommendable to apply an intermediate metal tube to conduct heat away. Air is only inserted when it can escape, so always keep one section or the stopcock open.

Step 2: Blowing the Irrigation Sections

To blow out the irrigation sections please proceed as follows:

First open the ball valves at the end of each section. Prior to the single sections the feed pipe is to be blown out (see Page 21).

The shut-off valve ⑥ located within the Irrigation-Manager is to be closed now. The air compressor (turned off) can remain connected above the drain tap ⑤. Now the single sections can be blown out one after the other for max. 2 minutes each. Begin with the section which is located farthest away from the Irrigation-Manager. The actual blowing process is initiated by opening the magnetic valve of the corresponding section. This is best done manually by turning the little red knob of the first magnetic valve to "On" (the compressor is still not running). The other magnetic valves should remain closed ("Off"). This way you don't have to stay in the danger zone and pressurized air is been inserted from a safe distance just by turning on the compressor.
Make sure that pressurised air is never being inserted as long as it cannot escape. After a maximum of 2 minutes simply switch off the compressor and wait for the pressure to be reduced. Now the magnetic valve of the blown section is to be closed ("Off") and the next one can be opened ("On"). The compressor is switched on and off again from a safe distance. To make sure that no water remains within the lines, repeat the blowing procedure with a maximum of 2 minutes per section. (Only fine mist should be emerging from the ball valves.)

At the end set all magnetic valves manually to "On" and the rotary switch of the control unit to "Off". So the programed irrigation cyclises remain unchanged while being inactive. Leave the batteries in the device.
Take the compressor off and replace the drain cap by the closing cap. After the blowing procedure the magnetic valves are not to be screwed out or taken from the Irrigation-Manager. Open all shut-off valves; they should be set to 45°. This also applies to the ball valves at the end of the sections.

Step 3: Preparing the Rain Sensor for Winter Storage

If the rain sensor ⑨ is dry it can simply be folded into the aluminium casing of the Irrigation-Manager. If necessary an open-end spanner or a ring spanner can be used. Should the rain sensor still be wet from the last rain event, its head is to be taken off and to be kept separately in the interiors. This prevents the cork pads from freezing.

Very Important: Please consider also the maintenance of the safety devices for the protection of drinking water (not part of the Irrigation-Manager).

For any further questions please contact ZinCo's Technical Department via our international hotline, Tel: +49 7022 6003-418

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