HS-IIoT

HS-IIoT-MAN-002

Smart irrigation manual
Gardens and farms

How it decides when to water, how you follow and control it, alarms, installing the sensors and caring for them.

REVISION
1.0

DATE
2026-11

WEBSITE
hs-iiot.com

Document control

Rev.	Date	Description	Prepared by
1.0	2026-11	First release: the smart irrigation manual.	HS Team

Contents

01 **Welcome to smart irrigation** 4

The parts of the system 4

02 **How it decides when to water** 5

Watering windows by month 5

Two modes for each zone 6

03 **The controller on site** 7

The ALL OFF switch 7

On a power cut 7

04 **The Garden page of the dashboard** 8

The top of the page 8

Each zone’s card 8

05 **Manual runs and pausing** 9

Starting a manual run 9

Stop all, pause and resume 9

Why a command is refused 9

06 **Alarms and what to do** 10

07 **Installing the soil sensors** 11

Choosing the spot 11

Burying it 12

08 **Care and maintenance** 13

09 **Common questions** 14

01 Welcome to smart irrigation

HS-IIoT smart irrigation waters your garden or farm by the moisture of the soil at the roots, not by the clock. It measures moisture in every zone, picks the coolest hours of the day, opens and closes the valves itself, and keeps limits nobody can pass. This manual explains how it decides, how you follow and control it, and how the sensors are installed and cared for.

The parts of the system

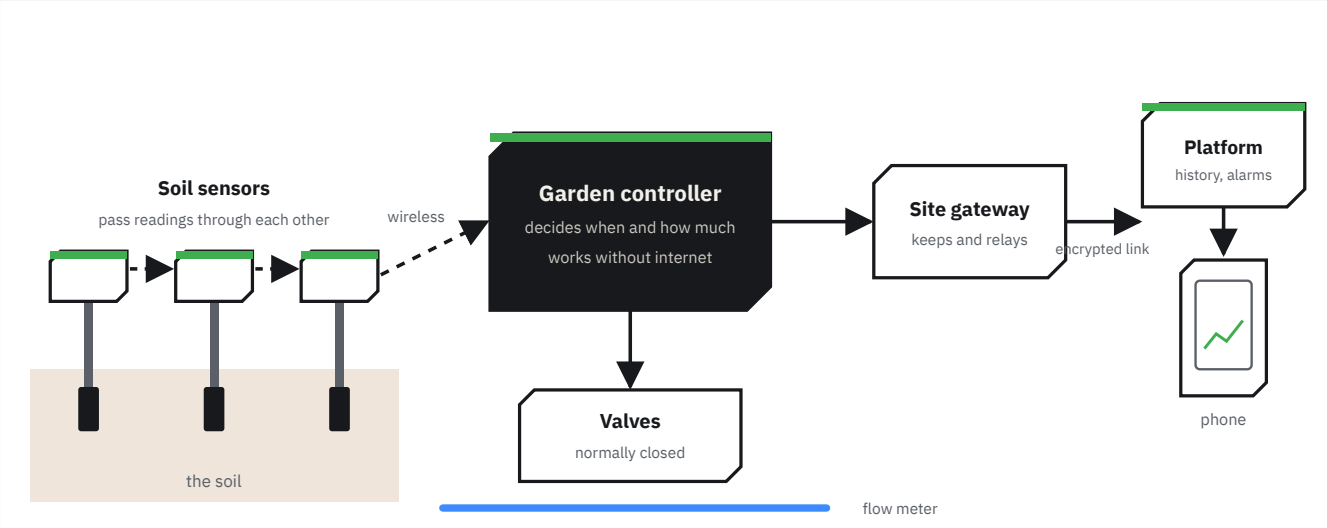


Figure 1.1: From the soil to your phone.

Part	What it does	What it never does
Soil sensor	Measures soil moisture at the roots, sends it, then sleeps. Runs on batteries.	Open a valve or give an order.
Garden controller	Decides when and how long each zone is watered, opens and closes the valves, and keeps the record of every run. It has a touch screen.	Need the internet to water.
Valves and flow meter	One valve per zone, normally closed. The meter on the main line confirms the water really runs.	Stay open on a power cut.
Site gateway and platform	Carry the state and the record to you, and deliver your manual commands, the settings and the time.	Decide when the garden is watered.

> **Language of the screen**
> The dashboard's words are in English. In this manual every word from the screen appears in a box like `GARDEN` followed by its meaning.

02 How it decides when to water

The controller checks every zone continuously and goes through the rules below in order. The first rule that says no is enough to stop.

1. **Time.** It needs a trusted time. Without one there is no automatic watering, only manual runs.
2. **Off or paused.** A zone switched off, or automatic watering paused, is not watered.
3. **Safety.** Everything stops if the ALL OFF switch is pressed, a flow fault stands, or the tank that feeds the garden is low.
4. **Window.** It waters only inside the current month's windows (table below).
5. **Heat.** In the summer months, a shade temperature above 38 °C defers watering.
6. **Limits.** A daily budget per zone, a minimum gap between runs, and one run per window.
7. **Moisture.** Depending on the zone's mode (below), the soil's moisture decides whether to water now.
8. **Length.** The planned run, cut to the maximum run, the budget left today and the time left in the window.

Watering windows by month

These are the default windows for central Iraq, and each site can change them (Basra is hotter, Duhok colder). The morning window is preferred; the evening one is a spare.

Months	Morning	Evening	Heat limit
Dec, Jan, Feb	10:00–14:00	–	–
Mar	07:00–10:00	16:00–18:00	–
Apr	06:00–09:00	17:30–19:30	–
May	05:00–08:00	18:30–21:00	38 °C
Jun, Jul, Aug	04:30–07:00	19:30–22:00	38 °C
Sep	05:00–07:30	19:00–21:00	38 °C
Oct	06:00–09:00	17:00–19:00	–
Nov	07:30–10:30	15:00–17:00	–

Two modes for each zone

Mode	When it waters
`SCHEDULE`	Once a day (or every few days) in the first window that allows it. If the soil is already wet enough, the run is skipped.
`DEMAND`	In any window, once two readings in a row are below the low limit.

> **It fails dry, never flooded**
>
> If no trusted reading arrives from a zone for a whole day, that never means “water a lot”: it waters once a day at half the planned run until the sensor is back.

03 The controller on site

The controller sits in a panel near the valves. Its touch screen shows every zone: its moisture, its state and today’s watering minutes. Decisions are made here, so the garden keeps watering by its programme even if the internet drops or the platform stops.

The ALL OFF switch

The panel has a manual switch that cuts power to every valve at once, whatever the controller is doing. Use it for any leak or work on the pipes. While it is pressed it shows on the platform, and no run is accepted.

On a power cut

- The valves are normally closed: they close by themselves the moment power is lost.
- An independent watchdog cuts the valves’ power if the controller stops working.
- The internal clock keeps time on its battery and the record is kept on a memory card, so the programme resumes as it was when power returns.
- If the clock loses its time, automatic watering stops and `TIME INVALID` shows until the site gateway gives it the time.

04 The Garden page of the dashboard

1. Sign in to the dashboard as in the user manual, and choose your site from the `MASTER` list.
2. Press `GARDEN` in the side menu. The page shows when your site has an irrigation system.

The top of the page

Item	Meaning
`LITRES TODAY`	Water through the main line since midnight.
`FLOW`	Flow now in litres per minute. It must be zero while every valve is closed.
`NEXT WINDOW`	When the next watering window opens.
`SENSORS`	How many sensors reported, out of all of them.
`PAUSED` / `ALL OFF`	Show while automatic watering is paused, or the ALL OFF switch is pressed.

Each zone’s card

Each zone has a card with its moisture in percent (or `–` with no trusted reading), today’s watering minutes, and its state:

State	Meaning
`WATERING`	The valve is open and the zone is being watered.
`MANUAL`	A manual run someone asked for.
`IDLE`	It needs no water now.
`WAIT WINDOW`	It needs water and waits for the next window.
`WAIT HEAT`	The window is open but it is too hot, so it waits.
`BLOCKED`	A safety condition prevents watering (low tank, flow fault, ALL OFF).
`FAULT`	A fault on this zone’s valve. See the alarms.
`OFF`	The zone is switched off in the settings.

05 Manual runs and pausing

Starting a manual run

1. On the zone's card press `RUN`.
2. Choose the length in minutes. Outside the window or in the heat, tick `OUTSIDE WINDOW` if you are sure.
3. Press `SEND`. The answer shows within seconds: the minutes granted, or why it was refused.

> **Manual runs keep the limits**
> A manual run may pass the window and the heat limit only, and only if you choose to. Nobody passes the safety checks, the maximum run or the daily budget, so you may be granted fewer minutes than you asked for.

Stop all, pause and resume

- `STOP ALL`: closes every valve now. Automatic watering returns in the next window.
- `PAUSE`: stops automatic watering for a number of hours you choose (after rain, say, or during work in the garden).
- `RESUME`: brings automatic watering back before the pause ends.

Why a command is refused

Answer	Meaning
`REFUSED: STALE`	The command arrived late (slow or broken link). Commands are never stored to run later. Try again.
`REFUSED: WINDOW`	Outside the window or in the heat, and you did not tick `OUTSIDE WINDOW`.
`REFUSED: BUDGET`	The zone has used up today's budget.
`REFUSED: TANK`	The tank that feeds the garden is low.
`REFUSED: FAULT` / `ALL OFF`	A flow or valve fault stands, or the ALL OFF switch is pressed.
`REFUSED: AUTH`	The command did not carry a valid signature. Contact the HS-IIoT team.

06 Alarms and what to do

Garden alarms show with the rest of your site’s alarms, on screen and on your phone.

Alarm	Meaning	What to do
`FLOW STUCK`	Water flows while every valve is closed: a stuck valve or a burst pipe.	Close the main stopcock and check the pipes at once.
`NO FLOW`	A valve is open and nothing flows: no water, no pressure, or a broken valve coil.	Check the water source, the pump and the stopcock.
`MAX RUN`	A valve reached its maximum run and was closed.	If it repeats, review the sensor and the settings with the team.
`TANK LOW`	The tank feeding the garden is low or its level is unknown.	Fill the tank. Watering returns by itself.
`VALVE FAULT`	A valve coil is open or shorted.	Ask for service. The zone is not watered until it is fixed.
`TIME INVALID`	The controller has no trusted time.	Clears itself once the gateway connects. If it stays, contact us.
`SENSOR SILENT`	A sensor missed two rounds.	Check the sensor, its cells and its antenna.
`SENSOR BATTERY`	A sensor’s cells are low.	Replace the cells (chapter 8).
`SENSOR SUSPECT`	A sensor behaves oddly and was set aside.	Check how it sits in the soil. It returns by itself after three good responses.
`SD FAULT`	The record’s memory card is not working.	Watering continues. Ask for the card to be replaced.

07 Installing the soil sensors

The HS-IIoT team installs the sensors at commissioning. This chapter is for whoever adds or moves one.

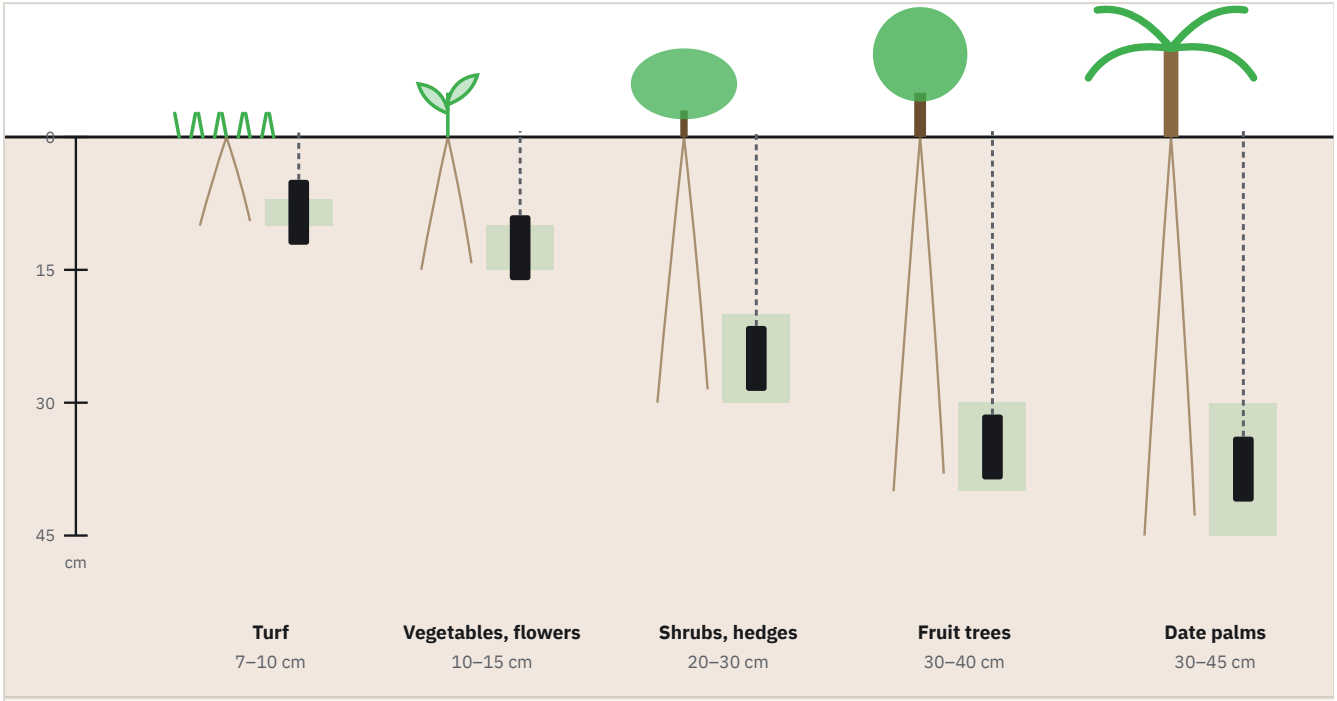


Figure 7.1: Sensor depth (the middle of the sensing part) for each planting.

Planting	Depth	Where
Turf	7–10 cm	The whole sensor below ground, its head sealed.
Vegetables, flowers	10–15 cm	In the plant row, not in the path.
Shrubs, hedges	20–30 cm	Inside the area a dripper wets.
Fruit trees	30–40 cm	At the drip line (the feeder roots), not at the trunk.
Date palms	30–45 cm	At the drip line. An optional second sensor at 60 cm shows water lost below the roots.

Choosing the spot

- 10–15 cm from a dripper, inside the area it wets, never right under it.
- A spot that represents the zone: not at the edge, not in a dip where water collects, not against a stone.
- The stake in the plant row, not the tractor path. The antenna vertical at 1.5–2 m, at least 30 cm above the grown canopy.

Burying it

1. Auger a hole to the depth you need.
2. Push the sensor vertically into undisturbed soil at the side of the hole.
3. Backfill with a slurry of the same soil so no air gap remains.
4. Trust the readings only after 24–48 hours.

> ⚠ **Deep sensors**
> When the depth is more than the sensor’s length the electronics are buried too: they must be fully sealed, the cut edge closed, and the cable run up in flexible steel conduit against rats. The team does this.

08 Care and maintenance

When	What
Every week	Look at the `GARDEN` page: every sensor reports, no alarm stands, and the litres look right.
Every month	Clean the main-line filter, and check for blocked drippers and leaks.
Once a year (April or May)	A service visit before the summer: replace every sensor’s cells and the desiccant in its housing, and check the valves.
When the planting changes	Tell the team so they adjust the depth, the limits and the windows.

> ⚠ **Do not**
>
> Do not disconnect the valves from the panel to water by hand for good, do not replace a valve with one that is not normally closed, and do not move a sensor without telling the team: the reading changes with the spot.

09 Common questions

It rained. Should I stop watering?

Usually not: the sensors see the wet soil, so it does not water. To be sure, use `PAUSE`.

Why did it not water today?

Look at the zone's state: `IDLE` the soil is wet, `WAIT WINDOW` it waits for the window, `WAIT HEAT` the heat, `BLOCKED` a safety condition.

Does it work without internet?

Yes. It waters and keeps the record on site, and sends it when the link returns. Only manual commands from the phone need a connection.

A zone shows `–` for moisture.

No trusted reading now (a silent or set-aside sensor). The zone gets the fallback run until it returns.



Thank you for choosing HS-IIoT

Our team stays with you after commissioning. Write to us with any question or remark.

hs-iiot.com
info@hs-iiot.com

© 2026 HS-IIoT. All rights reserved.