FIO FERTIGATION FAMILY

LWV FIO-WQ

Two pH, two EC, four isolated circuits

The FIO-WQ measures pH and EC in the feed line for the FIO-C controller. It reads two pH electrodes and two conductivity cells, each in its own isolated circuit with its own temperature probe, and checks its probes before it trusts them. It plugs into the controller's SENSOR BUS, so it keeps measuring through a STOP while the FIO-P4 pump modules dose by its readings.



Rev D, rendered from the design plan.

2
pH inputs, sealed BNC

2
EC inputs with temperature compensation

4
isolated measuring circuits

24 V DC
from the controller's sensor bus

FEATURES

Lab-style pH in the line

Each pH channel has an electrometer-grade buffer right behind its BNC jack and a 24-bit converter that also reads the channel's PT1000, as a lab meter does.

Calibrate at the box

Dip the probe in a buffer and hold its key for 2 s. The module recognises the buffer, waits for a steady reading and stores the point, or refuses a bad one.

Four isolated measuring circuits

pH 1, pH 2, EC 1 and EC 2 each have their own isolated supply and isolator. Probes in the same water do not disturb each other, and a fault on one stays on one.

EC in and EC out

Two EC channels measure the source water and the mix, so a recipe can target the EC it adds, and a pump that stops delivering shows as a mix EC that does not rise.

Checks its own probes

An hourly glass test finds a cracked or dry pH electrode. Each EC channel measures an on-board check resistor every 10 minutes and tracks its cell for fouling.

Keeps measuring through STOP

The controller's SENSOR BUS keeps its 24 V when STOP cuts the pumps, so pH and EC readings and their alarms carry on.

SPECIFICATIONS

pH	
Inputs	2 combination electrodes: glass on the BNC centre pin, reference on the shell
Front end	electrometer buffer, 24-bit converter, PT1000 compensation, per channel
Input span	± 414 mV at 25 °C (pH 0–14)
Accuracy	± 0.02 pH against a fresh buffer (design target)

EC	
Inputs	2 two-electrode cells with a PT1000; AC measurement at 2 kHz
Range	25 µS/cm to 200 mS/cm with a K = 1 cell, in two ranges (design values)
Accuracy	± 2 % at 1413 µS/cm (design target)
Compensation	to 25 °C, 1.90 %/°C by default (a setting)

Temperature	
Inputs	a PT1000 per channel: TEMP 1 and TEMP 2 for the pH probes, one in each EC cell
Accuracy	± 0.3 °C (design target)

Calibration and probe health	
At the box	hold the probe's key 2 s with the probe in a buffer; also from the app
Buffers recognised	pH 4.01, 7.00, 10.01; EC 1413 and 12 880 µS/cm
Refused	pH slope outside 85–105 % or offset beyond ± 60 mV; EC cell constant outside 0.5–2 × nominal; the old calibration is kept
pH probe check	glass test every hour: cracked below 3 MΩ, aged above 3 × its commissioning value
EC probe check	cell-constant drift (clean at ± 10 %, fault at ± 25 %), coating index, check resistor every 10 min, dry pipe, open cable
Reminder	calibration due after 30 days (a setting)

Isolation	
Circuits	4 (pH 1, pH 2, EC 1, EC 2), each with its own 1 W isolated supply and digital isolator
Spacing	≥ 2.5 mm between circuits
Rating	functional isolation for measurement, not a safety barrier; voltage to be confirmed

Bus and power	
Connects to	the FIO-C SENSOR BUS; BUS OUT passes the bus on
Bus	RS-485 Modbus RTU, 19 200 baud (9600 option)
Address	47; a second FIO-WQ takes 48 by key press
Termination	switched in software; on by itself at the end of the bus
Supply	24 V from the bus; on above 19.0 V
Fault containment	0.31 A electronic fuse: a fault inside never takes the other sensors down
Consumption	≈ 1.0–1.2 W at 24 V (design estimate; measured value to be confirmed)
Readings	every 1 s; the controller reads them every 2 s

Panel and processor	
Keys	4 on the top wall, one over each probe: pH 1, EC 1, EC 2, pH 2
Indicators	socket lights, light bars, key lights, 6-light scanner, 1-digit module number; no buzzer
Real-time clock	RV-3032-C7, CR1220 backup cell: calibration dates stay right offline
Processor	Seeed XIAO RP2350, socketed

Enclosure	
Size	244 × 155.4 × 42.5 mm (9.61 × 6.12 × 1.67 in)
Case	black ASA tub and bezel, heat-set M3 inserts
Window	3 mm smoked grey polycarbonate, 35 % light transmission
Seal and vent	silicone cord seal, ePTFE vent
Ingress protection	IP65 (design target)
Operating temperature	To be confirmed

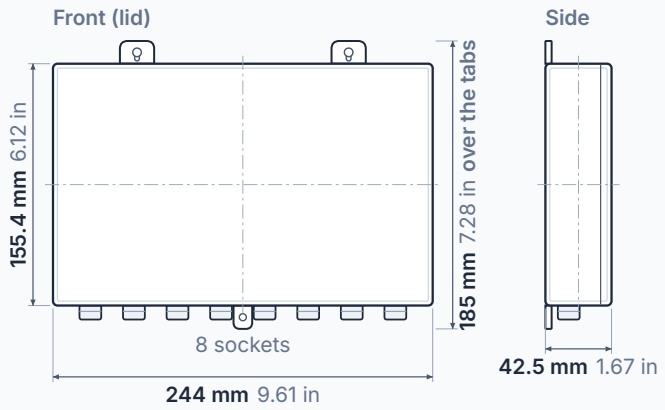
CONNECTORS

PORT	TYPE	USE
BUS IN	M12 A-coded, 4-pin, female	from the FIO-C SENSOR BUS: 1 +24 V, 2 A, 3 0 V, 4 B
TEMP 1, TEMP 2	M12 A-coded, 4-pin, female	PT1000 of the pH probe: 1 RTD +, 3 RTD −, 2 solution ground (optional), 4 shield
pH 1, pH 2	BNC, female, sealed board jack (Amphenol RF 031-70564-12G); IP67 unmated once nutted to the wall	combination pH electrode; the shell is the reference, isolated, never grounded
EC 1, EC 2	M12 A-coded, 4-pin, female	conductivity cell with its PT1000: 1 drive, 2 sense, 3 T +, 4 T −
BUS OUT	M12 A-coded, 4-pin, male	to further sensors; pins as BUS IN

STATUS LIGHTS

LIGHT	MEANING
Scanner	green sweep: all good; amber: clean, calibrate or stale reading; red: probe fault or out of band; all flashing: controller in STOP; blue: calibrating or updating
pH and EC lights	dim green: reading valid; amber: needs attention; red: probe fault or out of band; blue: calibrating; dark: channel off
TEMP lights	dim green: fine; amber: more than 1 °C from the EC cell in the same pipe; red: open or short; dark: not fitted
Bars	one spark per reading, half a run for a failed one; fill while a calibration point settles
Key lights	dim green: calibrated; amber: due; red: replace the probe; blue: settling; 3 green blinks: stored, 3 red: refused
Digit	module number, 1 out of the box; alternates with a letter on a fault (b probe, L link, E power, U unit); dash: no address

DIMENSIONS



Weight	To be confirmed
Mounting	Wall: two keyhole tabs on top, 136 mm (5.35 in) apart, for #8 or M4 pan-head screws; one screw in the bottom tab. Boxes 20 mm (0.79 in) apart, 12 mm (0.47 in) at least. The probes sit in the water line; only their cables come to the box.

WORKS WITH

- LWV FIO-C controller, on its SENSOR BUS
- LWV FIO-P4 pump module: dosing follows its readings, through the FIO-C
- Combination pH electrodes with a BNC plug
- Two-electrode conductivity cells with a PT1000; PT1000 temperature probes
- Further RS-485 Modbus sensors down the bus
- GCU Cloud, through the FIO-C: readings and probe health

ORDERING

PART	DESCRIPTION
FIO-WQ	Water-quality module, Rev D, in its wall-mount box. Ordering code to be confirmed.
Bus cordset	M12 A-coded extension, female to male, 0.5 mm² (20 AWG), from the SENSOR BUS to BUS IN.
BNC cap	Cap with chain for an unused pH socket.

1. The accuracy figures are design targets until bench tests confirm them.
2. The BNC shell is the pH reference, on its own isolated circuit: it must not touch ground or the box.
3. A mated BNC plug is not sealed by itself: in spray-down rooms fit a silicone boot over it, and cap any unused socket.
4. Connect it to the controller's SENSOR BUS, not the MODULE LINK, so readings and alarms continue through a STOP.
5. IP65 is a design target, to be confirmed by a water-jet test (IEC 60529) with every port plugged or capped. Cap unused ports.