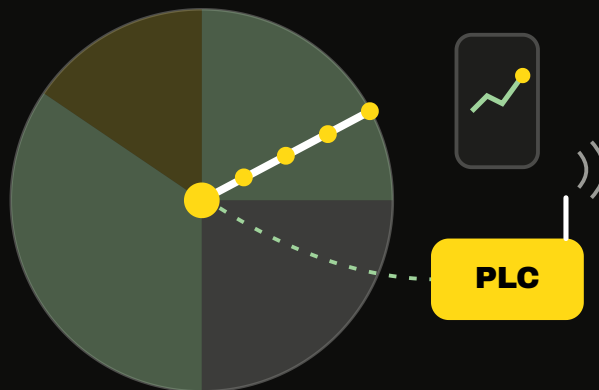


SECTOR: AGRICULTURAL IRRIGATION

Program the pivot by sector. Watch it from the phone.

One PLC in the pivot panel sets the depth, guards the water line and reports over 4G.

[Read the interactive case study online ›](#)


Schematic illustration

1

ESP32 PLC 21 FLEX in the panel at the pivot point

6

signal groups read: status, safety, position, pressure, flow, weather

3

output groups: run and direction, speed, end gun and pump

4G

board for the link to the phone and the server, over MQTT

THE CHALLENGE

The same water everywhere is not what the field needs.

A pivot turns around its center, and the speed of the last tower sets how much water each part of the circle gets. With a basic panel, speed and direction are set by hand at the pivot point, and the farmer drives to the field to change them. The builder or the integrator wants a panel that knows where the pivot is, waters by sector, stops on its own when something is wrong and can be checked from a phone.

01

Water by sector

Different crops, a dry corner or a road across the circle: each sector needs its own depth, or no water at all.

02

Know where it is

The position of the pivot drives the program: start a sector, switch the end gun, park at the right angle.

03

Stop before the damage

A burst pipe or a pump that trips shows up as low pressure. The pivot must stop before it drives dry.

04

Less driving to the field

Start, stop and check the pivot from a phone, and get a message when it stops on its own.



Rain changes the plan

When rain is forecast or the gauge already counts it, the next pass can wait. The program decides, the farmer confirms.

HOW IT WORKS

Three jobs of the pivot panel: program, protect, report.

Job 1 · Program

Each sector gets its own speed, so its own depth.

The PLC reads the angle of the pivot and looks up the sector. For each sector the program holds a depth and the water on or off. The depth sets the percent timer: the share of each minute that the last tower moves. Slower means more water.

- Sectors defined by start and end angle
- Percent timer from the target depth
- End gun only where the corners are

Job 2 · Protect

Low pressure stops the pump. The safety circuit stops the pivot.

The PLC reads the line pressure from a 4-20 mA transmitter and the flow from the meter pulses. If the pressure stays low for a set time, it stops the pivot and the pump. The alignment safety circuit belongs to the pivot: when it opens, the towers stop on their own. The PLC only reads it, stops the pump and sends the alarm.

- Low pressure with a delay, then stop
- Safety circuit read, never bypassed
- Pump stopped when the pivot stops

Job 3 · Report

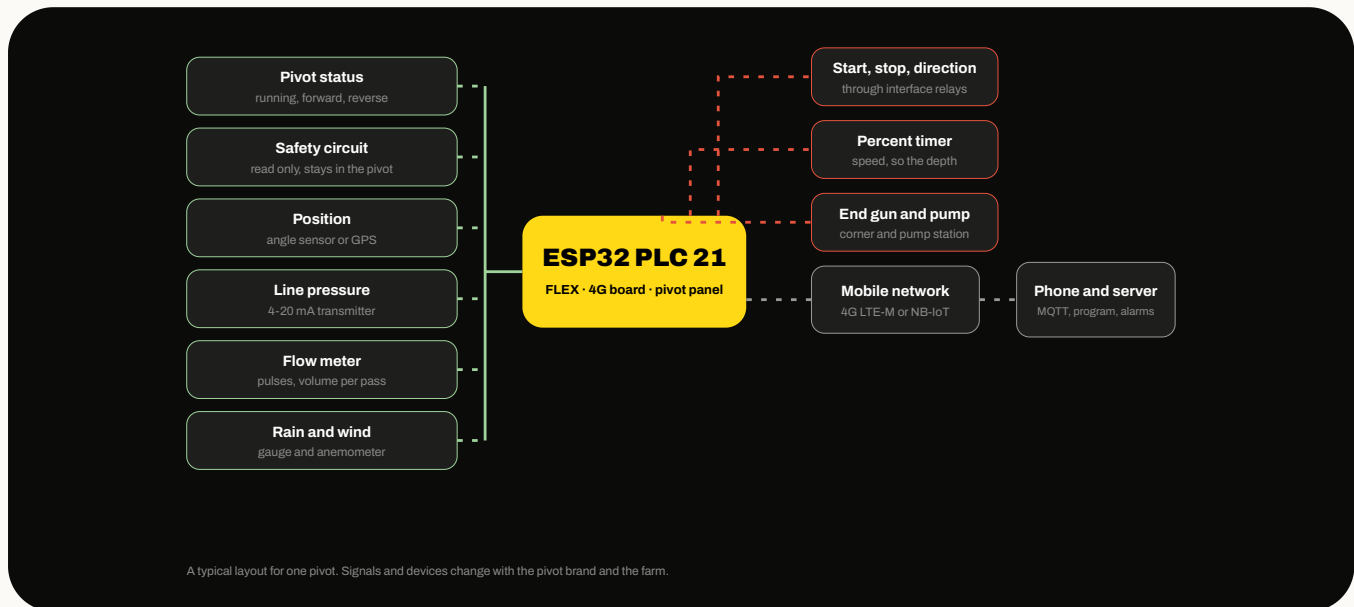
The phone starts it. The weather can hold it.

Over the 4G board the PLC publishes its state and receives commands over MQTT. A rain forecast or rain at the gauge can hold the next pass, and the farmer can start it anyway. If the link drops, the PLC keeps running its local program and keeps the messages until the link is back.

- Start and stop from the phone
- Hold the pass on a rain forecast or measured rain
- Local program first, link second

How does a PLC control a center pivot and its irrigation program?

An ESP32 PLC 21 FLEX sits in the panel at the pivot point. It reads the pivot status, the safety circuit, the angle, the line pressure, the flow meter, and the rain gauge and the anemometer. Through interface relays it starts and stops the pivot, sets the direction, drives the percent timer and switches the end gun and the pump. A 4G board links it to a server and to the phone of the farmer over MQTT.



— Inputs to the PLC — Outputs — Mobile network and server

Signals

Signal	Between	Type	Purpose
Running, forward, reverse	Pivot panel → ESP32 PLC 21	Digital in, through relays	Know what the pivot does
Safety circuit state	Pivot safety circuit → PLC	Digital in, read only	Stop the pump and send the alarm
Angle	Angle sensor or GPS → PLC	Analog 0-10 V or serial (typical)	Find the sector, park
Line pressure	Transmitter → PLC	4-20 mA on a 0-10 V input with a shunt	Low pressure stop
Flow	Meter → PLC	Pulses on an interrupt input	Volume per pass and per sector
Rain and wind	Gauge and anemometer → PLC	Pulses	Hold the pass, end gun off in wind
Start, stop, direction	PLC → pivot panel	Digital out, interface relays	Run the program
Percent timer	PLC → last tower control	Digital out, on and off per minute	Set the speed, so the depth
End gun, pump	PLC → end gun valve, pump starter	Digital out, interface relays	Corners and water supply
State, alarms, commands	PLC ↔ server and phone	4G, MQTT	Remote start, holds, messages

One ESP32 PLC with a 4G board in the pivot panel.



OUR OPTION FOR THIS ROLE

ESP32 PLC 21 FLEX

An industrial controller built on the dual-core ESP32, for DIN rail, programmed with the Arduino IDE. The FLEX version takes one communication board: here, 4G (M1)-NB1 IoT LTE for the link to the server and the phone.

Role	Reads the pivot, runs the sector program and the protections, talks to the phone
Processor	ESP32 dual core, up to 240 MHz
Inputs	13: 6 analog/digital (0-10 V, 11-bit), 7 digital optoisolated (5 to 24 Vdc), 2 of them with interrupt
Outputs	8: 3 analog/digital/PWM (0-10 V, 12-bit), 5 digital optoisolated (5 to 24 Vdc)
Wireless and option board	Wi-Fi and Bluetooth LE built in; one option board: 4G (M1)-NB1 IoT LTE (u-blox) here, or LoRa or CAN
Wired	Ethernet, RS-485, RS-232

The outputs are transistor outputs at 24 Vdc. Pivot panels often switch 24 Vac, 120 Vac or 230 Vac: use interface relays.

[See the ESP32 PLC 21 FLEX ›](#)

Position drives the program

Sectors, end gun and park are all angles. Once the PLC knows the angle, a new crop plan is a new table, not new wiring.

Depth from speed

The percent timer is how a pivot sets its depth. The PLC computes it from the depth you ask for each sector.

Safety stays where it belongs

The alignment circuit of the pivot keeps stopping the towers by itself. The PLC reads it and acts on the pump, and never bypasses it.

SIMILAR PROJECT?

Tell us about your pivots. An engineer will answer.

Tell us the pivot brand and length, the signals in the panel today, how you set the depth and which network reaches the field. We will tell you which controller, which signals and which link fit.

READ IT ONLINE

industrialshields.com/case-study-enter-pivot-irrigation-control-esp32-plc

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