

SIGNUX HEC25

Soil probes — RS485



DESCRIPTION

Soil probe for moisture, conductivity and temperature, with RS485 Modbus RTU output. A 2 m cable, with a stripped end or an M10 connector.

The three prongs go into the soil and measure moisture, conductivity and temperature at the same point. That is the combination a watering decision needs: how much water there is, how much salt has built up, and what temperature the soil is at.

The body is vacuum-potted in flame-retardant epoxy resin, rated IP68, and stands being buried long term without electrolysis eating the contacts. It speaks Modbus RTU over RS485, with no gateway in between.

FEATURES

- One hole, one reading: All three come from the same point and in the same Modbus frame: three consecutive registers from 0x0000. Nothing to line up between probes driven in at different depths.
- Calibrated by drying and weighing: Checked against the gravimetric reference method: the sample weighed wet, then dry. And the salt content of the soil barely affects it, so it works in any kind of ground.
- Made to stay put: Vacuum-potted in black flame-retardant epoxy, with IP68 that allows immersion and resistance to long-term electrolysis.
- The prongs go all the way in: 70 mm long and 3 mm across, and the reading needs them fully buried: if one is left in the air, the figure is worthless.

AT A GLANCE

Measures	Moisture · Conductivity · Temperature
Output	RS485
Protection	IP68
Operating	-20 to +80 °C

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1 Introduction

The HEC25 measures soil moisture, conductivity and temperature at the same point, and delivers them over RS485 in Modbus RTU.

It measures from -40 to $+80$ °C with an accuracy of ± 0.5 °C, from 0 to 100 % moisture with ± 2 % over the lower half of the scale, and from 0 to 20,000 $\mu\text{S}/\text{cm}$ of conductivity with ± 3 % up to 10,000.

The three prongs are vacuum-potted in flame-retardant epoxy resin, rated IP68. It is meant to stay buried, not for a single campaign.

2 How to order it

The unit is always the same; what is chosen when ordering is the cable length and how it ends.

TERMINATION	WHAT FOR
M10 connector	It plugs and unplugs without tools and without touching the terminal block
Bare wires	A stripped end, to go straight into a terminal block

The cable is two metres as standard. Other lengths on request.

3 Where to install it

The prongs have to go fully into the soil: if one is left in the air, the reading is worthless. Four things that change the figure more than any setting:

- A spot with no stones, so that no prong meets anything hard.
- Clear the top layer down to the depth the reading matters at, and push the probe vertically into the undisturbed soil below.
- Push it in once, without rocking it side to side: a gap around the prongs falsifies the reading.
- On a small spot, take several readings and use the average.

If the ground is hard, first drill a hole smaller in diameter than the prongs, insert the probe and compact the soil around it before measuring.

To leave it in place: dig a vertical pit more than 20 cm across, push the probe into the pit wall at the depth that matters, fill it back in firmly and let it settle. From then on it can measure and log for days or months.

Conductivity needs water to be reliable: the electrode measures the dissolved soluble ions, and below about 20 % volumetric water content the figure falls short. Over long-term monitoring, the value after watering or rain is the one closest to the true level; if a quick reading is needed, water the spot and wait for it to soak in.

4 Warnings

- The prongs have to end up completely inside the soil.
- Do not leave it in direct sun: the body is black and can go past 50 °C. The temperature read would not be the soil's.
- Do not bend the prongs, do not pull it out by the cable and do not knock it about.
- The IP68 rating allows it to be submerged.
- Do not leave it powered up in open air for long.

5 Connection

The unit comes out with four wires. Two are the supply and two are the bus:

WIRE	WHAT IT IS
Brown	Positive supply, 5 to 30 V DC
Black	Negative supply
Yellow	485-A
Blue	485-B

Mind the colour: here A is the yellow wire. If the unit answers nothing at all, the first thing to try is swapping the yellow and the blue.

With several units on the same bus, or a long cable run, bring the supply close to the unit, add an RS485 repeater and fit a 120 Ω terminating resistor at both ends.

6 Reading the unit over RS485

Modbus RTU, from the factory at 4800 8N1 and at address 1. It takes 2400, 4800 and 9600.

For reading there is function 03. Function 04 returns the same thing, so either will do.

For writing there is 06, which writes one register. Eight registers accept it: the three coefficients, the three calibrations, the address and the baud rate. The five readings are read only.

6.1 What can be read

REGISTER	PLC	WHAT IT IS	SCALE	ACCESS
0x0000	40001	Moisture	÷ 10	Read only
0x0001	40002	Temperature, signed	÷ 10	Read only
0x0002	40003	Conductivity	—	Read only
0x0003	40004	Salinity, calculated	—	Read only
0x0004	40005	TDS, calculated	—	Read only
0x0022	40035	Conductance temperature coefficient	÷ 10	Read and write
0x0023	40036	Salinity coefficient	÷ 100	Read and write
0x0024	40037	TDS coefficient	÷ 100	Read and write
0x0050	40081	Temperature calibration, signed	÷ 10	Read and write
0x0051	40082	Moisture calibration, signed	÷ 10	Read and write
0x0052	40083	Conductivity calibration, signed	—	Read and write
0x07D0	42001	Bus address, 1 to 254	—	Read and write
0x07D1	42002	Baud rate: 0 = 2400, 1 = 4800, 2 = 9600	—	Read and write

Temperature and the three calibrations come signed, in two's complement: a value above 32767 is negative. FF 9B is -101, that is -10.1 °C.

6.2 Frame examples

All the frames are for a unit at address 1 and already carry their CRC.

1 · READ THE MOISTURE, THE TEMPERATURE AND THE CONDUCTIVITY

01 03 00 00 00 03 05 CB sent

01 03 06 02 92 FF 9B 03 E8 D8 0F reply

Three registers (00 03) from 0x0000. The reply brings six bytes (06): 02 92 is 658, that is 65.8 % moisture; FF 9B is -101, that is -10.1 °C; and 03 E8 is 1000 µS/cm. Negatives come in two's complement.

2 · READ ALL FIVE READINGS IN ONE GO

01 03 00 00 00 05 85 C9 sent

The five readings sit together from 0x0000, so they are asked for at once: five registers (00 05). The reply brings ten data bytes (0A) in this order: moisture, temperature, conductivity, salinity and TDS. Measured on the bench at 4800, the unit takes 63 ms in the worst case to answer this request.

3 · READ THE THREE COEFFICIENTS

01 03 00 22 00 03 A5 C1 sent

The three sit together from 0x0022. From the factory they read 0, 55 and 50: temperature coefficient 0.0 %, salinity coefficient 0.55 and TDS coefficient 0.50. Measured that way on the bench unit.

4 · CHANGE THE ADDRESS TO 2

01 06 07 D0 00 02 08 86 sent

The address number goes in 0x07D0, from 1 to 254. We have not tried this one on the bench: the frame is put together from the register map.

5 · SET THE BAUD RATE TO 9600

01 06 07 D1 00 02 59 46 sent

The baud-rate code goes in 0x07D1: 0 is 2400, 1 is 4800 and 2 is 9600. This one has not been tried on the bench either.