

HELIX PERFORMANCE MONITORING
DENMARK

- **Objective:** The performance of Helix probes to be monitored & validated by an independent company. The monitored figures from Helix probes & the Heat pump shall be checked against designed values and suggestions to be made on expected outputs from Helix probes and recommended spacing.
- **Material Supplier, Monitoring Strategy & Performance Monitoring Kit:**
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- **Installer:**
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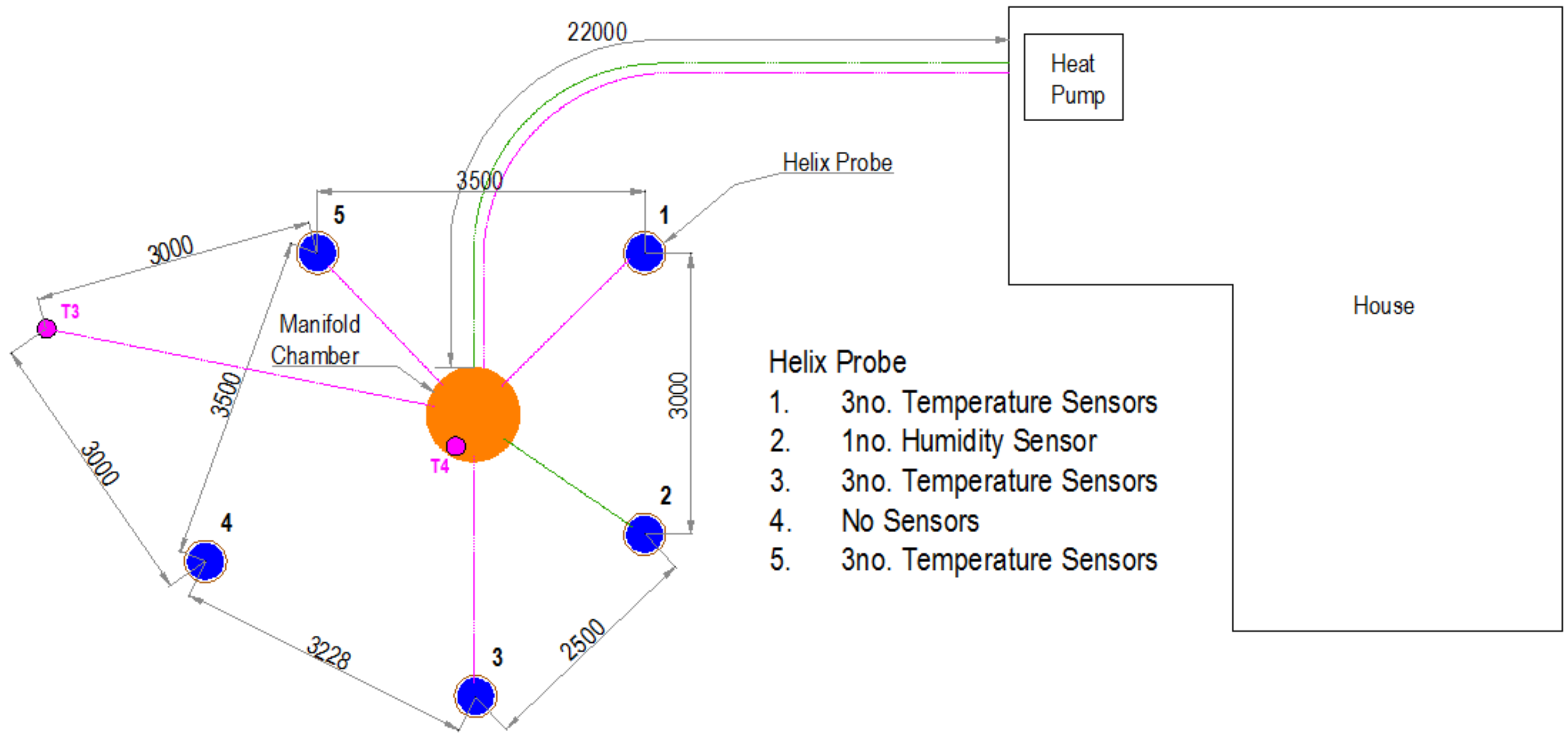
Certificering, installationsteknik, energiberegninger

- **Project Details:**

1. Project Location:
 - a. Elleholmvej 62, Ravnebjerg, Odense SV, Denmark
 2. Project Type & Heating Requirement: Passive House
 - a. House Area: 202 m²
 - b. Heat Requirement: 16 W/m² (or) 15kWh/m².a
 - c. Total Heat Requirement: 3232 W
 3. Ground Source Heat Pump details (From Aeosmart X² Data Sheet)
 - a. Heat Pump Capacity: 3960 W
 - b. COP: 4.12
 4. Soil type: Water Logged Clay.
 5. Expected Outputs from Helix Probes:
 - a. Evaporator load for Heat Requirement of 3232W = 2447 W @ COP of 4.12
 - b. Expected Output from Helix Probes = 2447 W (@ 490 W/Helix probe)
 6. Helix Probe Installation drawing with Sensor location details (See Plan View 6(i) & Section View 6(ii))
 7. Helix Probe Installation Pictures
 8. Parameters to be monitored & Frequency
 9. Sensor & Data Logger Installation Detail
 10. Sensor Technical Details (Data Sheet)
 11. Data Logger Details (Data Sheet)
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6(i)

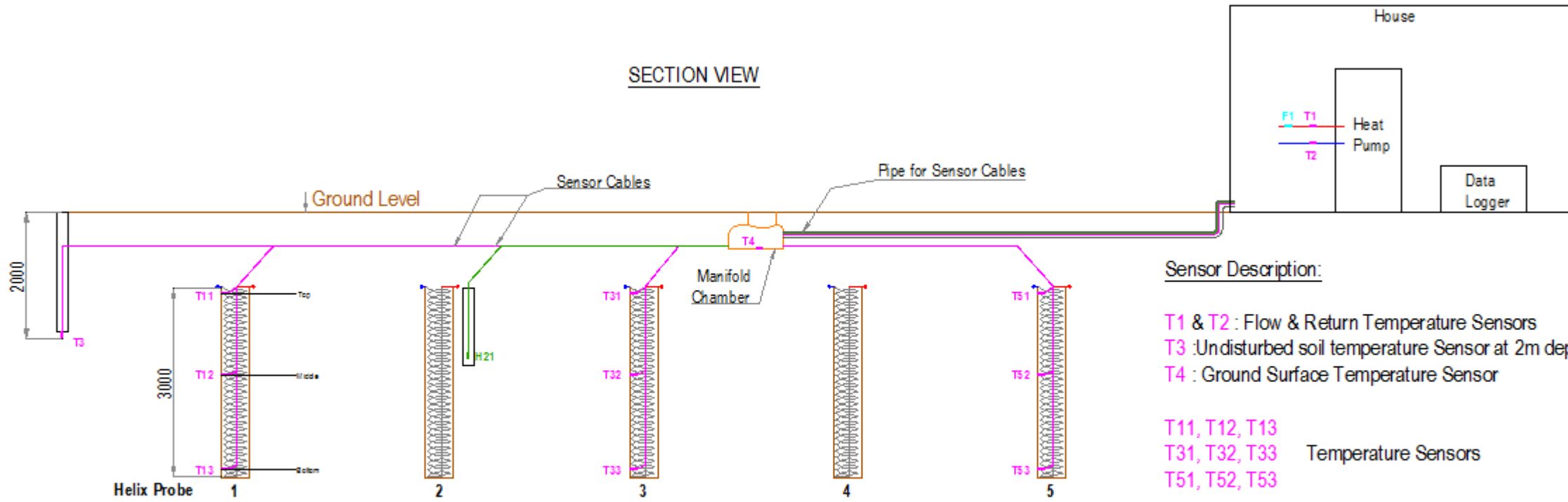
PLAN VIEW
Helix Probes & Sensors (Units in mm)



Helix Probe

1. 3no. Temperature Sensors
2. 1no. Humidity Sensor
3. 3no. Temperature Sensors
4. No Sensors
5. 3no. Temperature Sensors

6(ii)



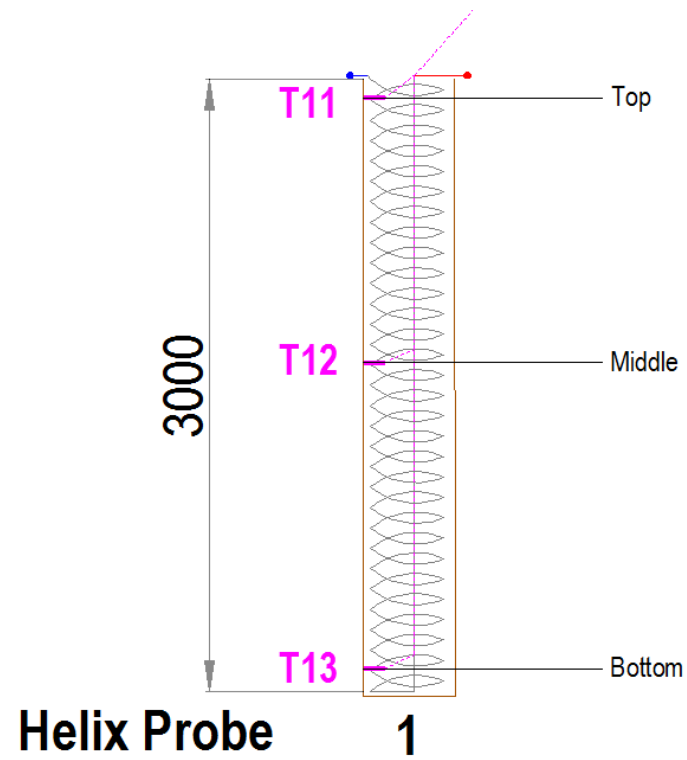
Sensor Description:

- T1 & T2 : Flow & Return Temperature Sensors
- T3 : Undisturbed soil temperature Sensor at 2m depth
- T4 : Ground Surface Temperature Sensor

- T11, T12, T13
- T31, T32, T33 Temperature Sensors
- T51, T52, T53

H21 : Humidity Sensor

F1: Flow Rate Sensor



7. Helix Probe Installation Pictures

A. Helix Probe being installed



B. Auger Drill drilling hole for Helix Probe



C. Manifold Chamber



D. Helix Probe with Sensor



E. Helix Probe with 3no wires that connect to Sensors



F. House



8. Parameter's to be monitored & Frequency

S.No	Parameter to be monitored	Purpose of monitoring	Frequency of Monitoring	Sensor Type	Total No. of Sensors	Installation Location	Extension Cable Specification	Notes for Datalogger
1	Temperature of Antifreeze in top, middle & bottom of Helix probe T11, T12, T13 T31, T32, T33 T51, T52, T53	To understand energy extraction rate at different depths of Helix probe.	?	Temperature Sensor	9	Top, Middle & Bottom of Helix probes 1, 3 & 4.	Cable shall be suitable for outside use, joined by soldering. The cross section of the litz wire should be about 0,25 mm ² . A cable with 2 leads for every temperature sensor.	It is very important to let the manufacturer of the datalogger know the length and cross section of each cable, so he can configure the datalogger properly. This means that you have to document for each cable how much you lengthened or shortened it and, if you use different cross section of litz wire on one sensor, the length of each cross section.
2	Humidity of Soil H21	To understand the effect of energy extraction on surrounding soil	?	Moisture Sensor. Type PT1000 stainless steel casing cable IP65 or IP66	1	Near Helix probe 5 in a 100mm pipe.	A Cable with 3 leads for every Moisture Sensor	
3	Flowrate of Antifreeze into Helix probes F1	To calculate energy extraction from Helix probes	?	Flow Sensor	1	In the Plant room near Heat Pump	A cable with 3 leads for every Flow Sensor	
4	Temperature of Antifreeze going into the Helix Probes & coming out of Helix probes. T1 & T2	To calculate energy extraction from Helix probes	?	Temperature Sensor	2 (1 for Flow pipe & 1 for Return pipe)	In the Plant room near Heat Pump		
5	Ground Surface temperature T4		?	Temperature Sensor	1	In the Plant room near Heat Pump		
6	Undisturbed Soil Temperature T3							

- Notes:

1. To make the installation easier you can also use one single cable for all the sensors with the equal number of leads.
2. The supplied Flow sensor has no cable on it, but it includes a connector that should be easy to install.