Kisvin Science Inc.

Sap Flow Sensor Mannual

For Scienceful and Sustainable Agriculture

Monitoring system

①Sensor Harness

②Junction Cable
  (+ Extension Cable, if you need)

④Logger Box

③Logger Harness

⑤Datalogger : KSLogger-Ez

⑥Stabilized Power Supply Circuit
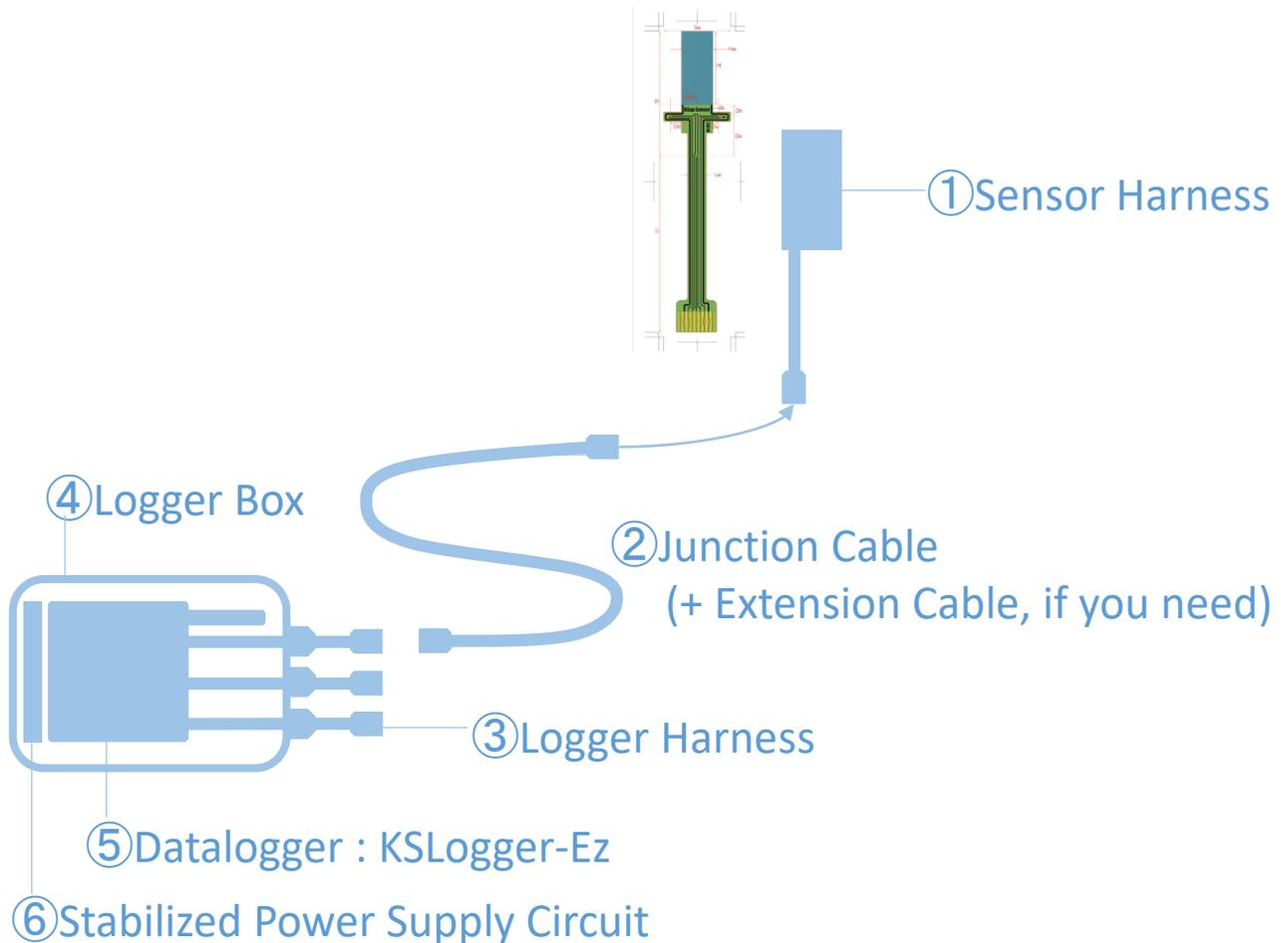
　The cable connector is waterprrof so you can safely use it outside. However, If you make your own logger box, be careful not to let rainwater or pesticide solution get into the box by using cable grant. It is strongly recommended to cut the line at the sensor installation point. The inside of the insulation form may get wet. Maintain plants every few days to avoid stress. It is also a good way to put desiccant inside the insulation form. It's a little bit of a story, but please fix the cable to the branches and trunks properly so that the branches and leaves will not be damaged by the shaking of the wind and the unnecessary load will be applied to the plants and cause stress.

KS Logger-Ez

⑩ Serial port

⑨ Radiation sensor 1 / 2
⑧ Humidity & Temp. sensor

① Power source

② Power switch

③ Arduino pro mini

⑥ Preheat port

⑤ Selector switch

④ Analog signal port

High side

Low side

⑦ Socket for SigFox Shield

⑪ Battery for RTC

FSF1 FSF2 FSF3

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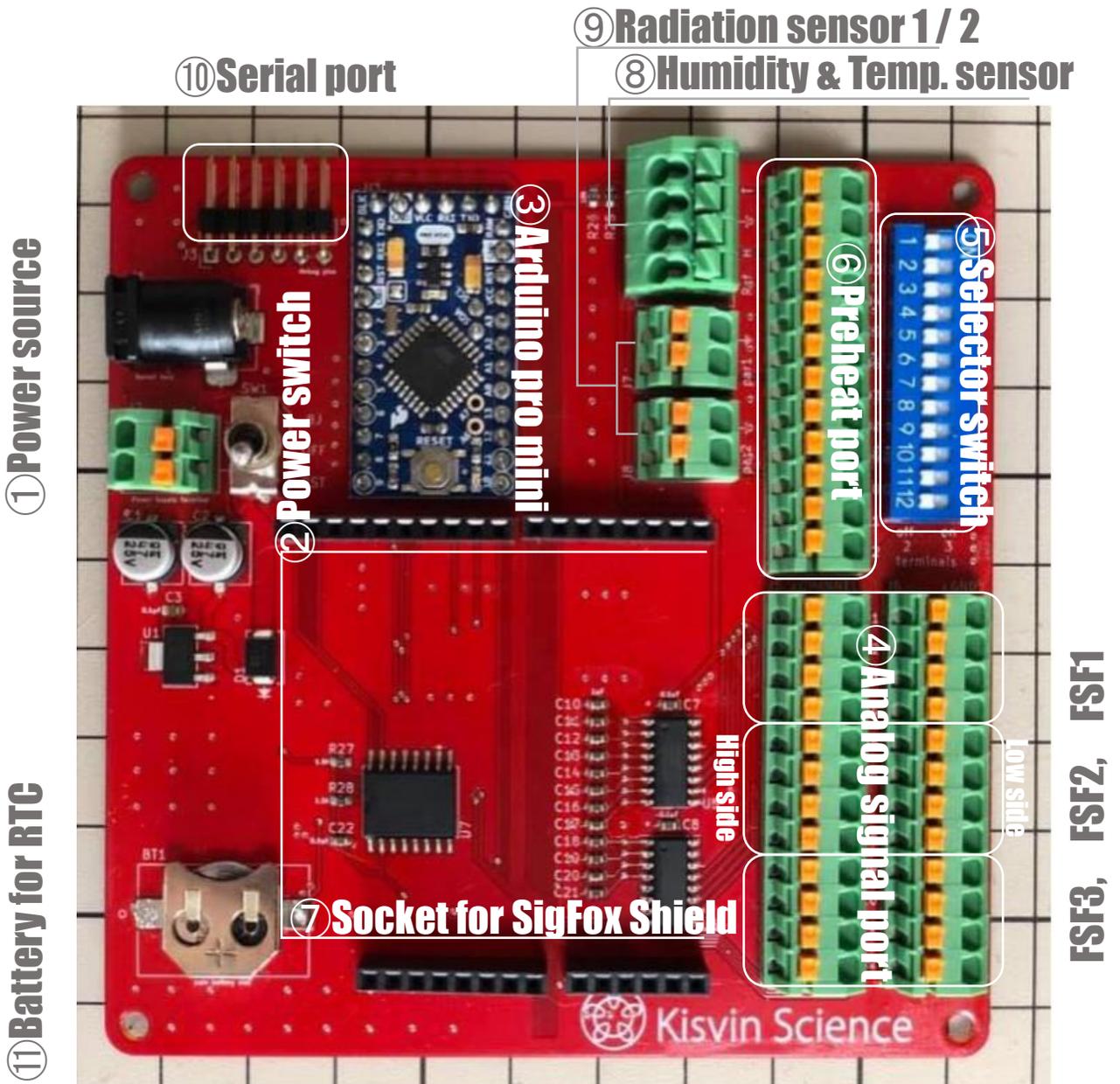
① Power source : 12V
② Power switch : Select power input port
③ Arduino Pro mini : 5Vtype
④ Analog signal port : 0 – 5V (12bit)
⑤ Selector switch : [ON] for thermistor / soil moisture
　　　　　　　　　　[OFF] for other sensing
⑥ Preheat port : When the selector switch was off,
　preheat port supply 5V for each sensor connected
　to paired port.
⑦ Socket for SigFox Shield : UnaShield for Arduino is svailable.

⑧ Temp & Humidity sensor :
　HSHCAA114A is available.
⑨ Radiation sensor : Apogee SP-100
　is available.
⑩ Serial port : TTL-232R-5V is available.
⑪ Battery for RTC : CR1220 is available.

Vineyard Sensing

PAR1

Leaf Wetness

Temp/RH

Sap Flow / Stem Diameter

PAR2
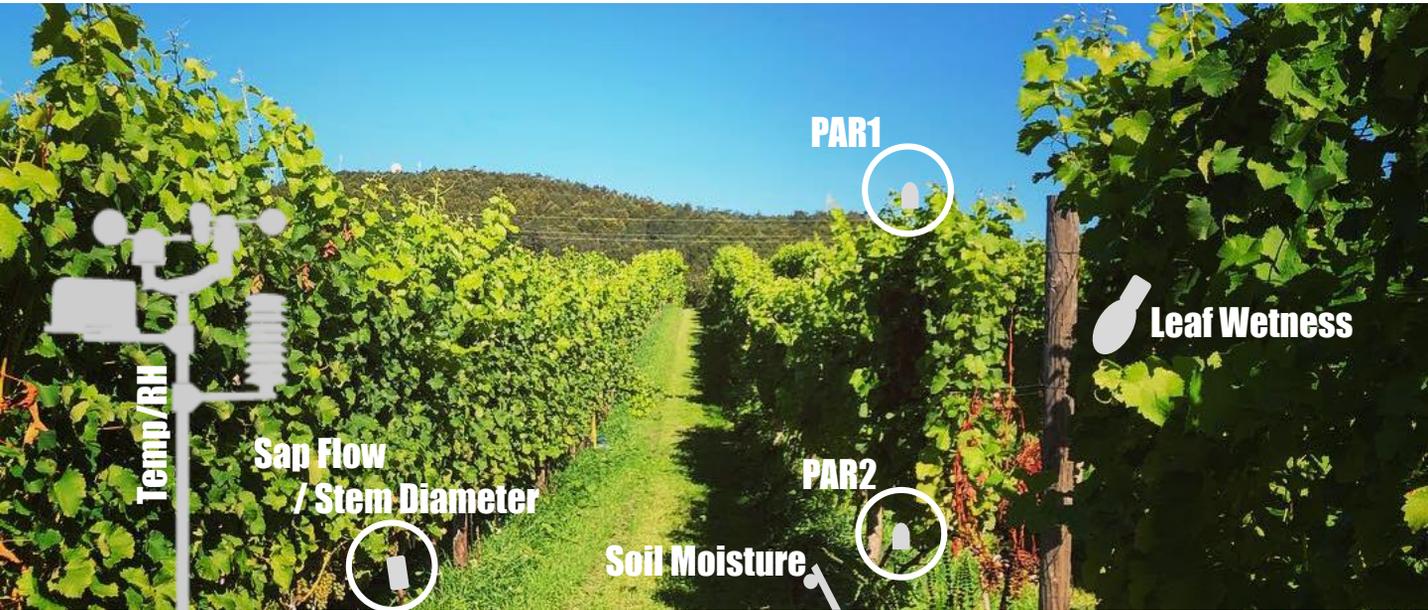
Soil Moisture

[Air Temp / RH / PAR]

HSHCAA114A

pin	signal
4pin	Temp
3pin	GND
2pin	Humidity
1pin	Preheat
	GND
	PAR1
	GND
	PAR2
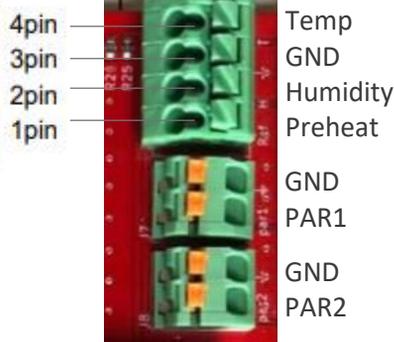
LAI estimation
is possible using two solar radiation sensors!



Apogee SP-100 Silicone Sun Sensor

## [Sap Flow / Soil Moisture / Leaf Wetness / Stem Diameter]

Analog signal port   Preheat port

ch12   ch1   ch12   ch1

Input

GND

Input Circuit Switching Slider
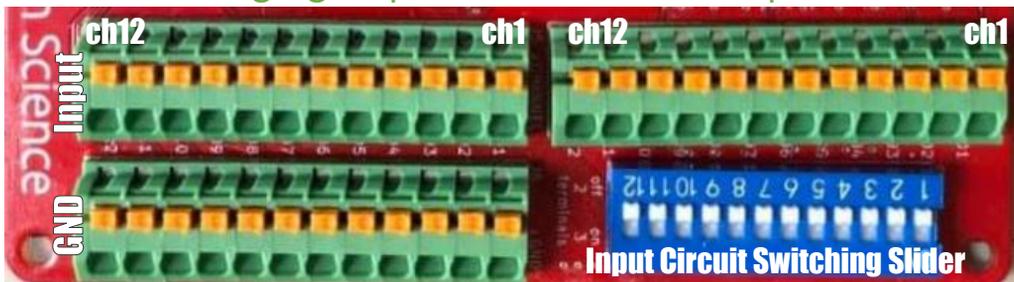
The left input channel is normally used for sap flow measurements. Here, the blue selector switch in the lower right corner must be ON. Other sensors (dendrometer, leaf wetness sensor, soil moisture sensor, etc.) can be connected using the preheat function by turning the selector switch OFF. Watermark sensors (Irrometer Inc.) can be connected with the ON mode, however a soil temperature sensor must be installed in close. If there is no difference in soil temperature, this means that a maximum of eleven Watermark sensors can be connected.

Pin a sign of logger harness

08T-JWPF
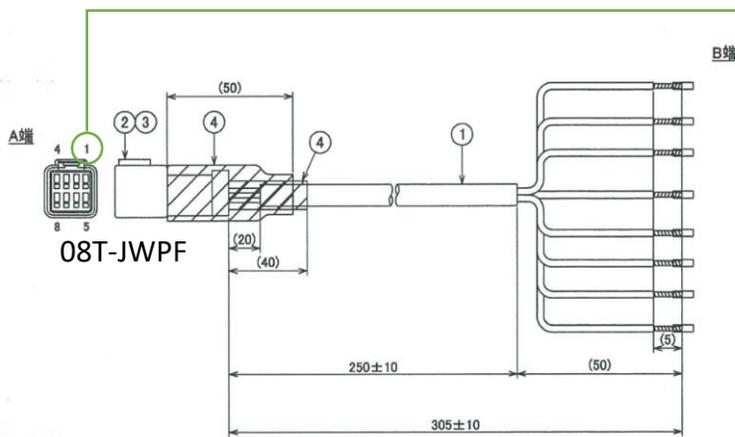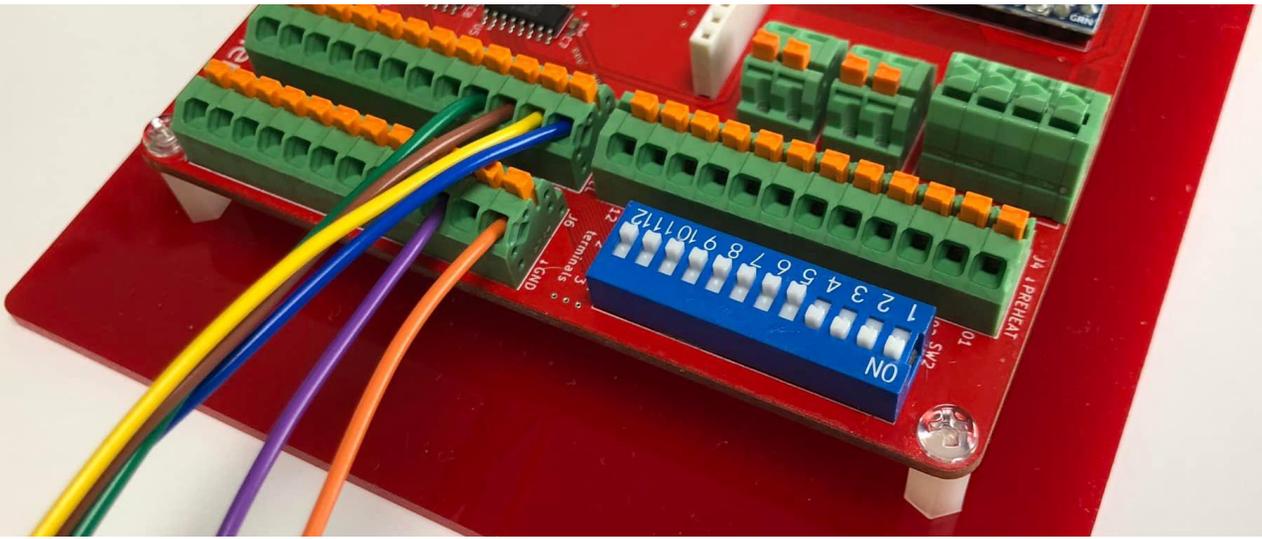
Pin No.	Color	Connect to	Note
1	Black	Heater	No polarity
2	Violet	GND	
3	Orange	GND	
4	Green	Ch4 high	
5	Red	Heater	No polarity
6	Blue	Ch1 high	
7	Yellow	Ch2 high	
8	Brown	Ch3 high	

The red and black wires should be connected to the regulated power source circuit. The image above shows the case with one sap flow sensor connected; if three sensors are to be connected, connect the logger harness to the remaining analog channel in the same manner. The purple wire must be connected to ground, but the orange wire does not necessarily need to be connected. However, if the cable is left unconnected, it is easy to cause a short circuit, so it is best to connect it to any available ground. When connecting a soil temperature sensor (thermistor), Watermark sensor or sap flow sensor to the analog channel, remember to turn the blue selector switch ON.

Sap Flow Sensor Installation

①Wrapping
Wrap a sensor head at the installation point.

②Fix
Make sure that four thermistors are firmly fixed to the plant. Fix the sensor head using Velcro.

③Covering
Cover the sensor head using insulation form (Aeroflex).

④Tying up
Tie up the insulation form using a few repeat ties without a gap. If necessary, wrap an aluminum deposition film around the outside of the insulation form.

Check this guidance.

Dendrometer connection
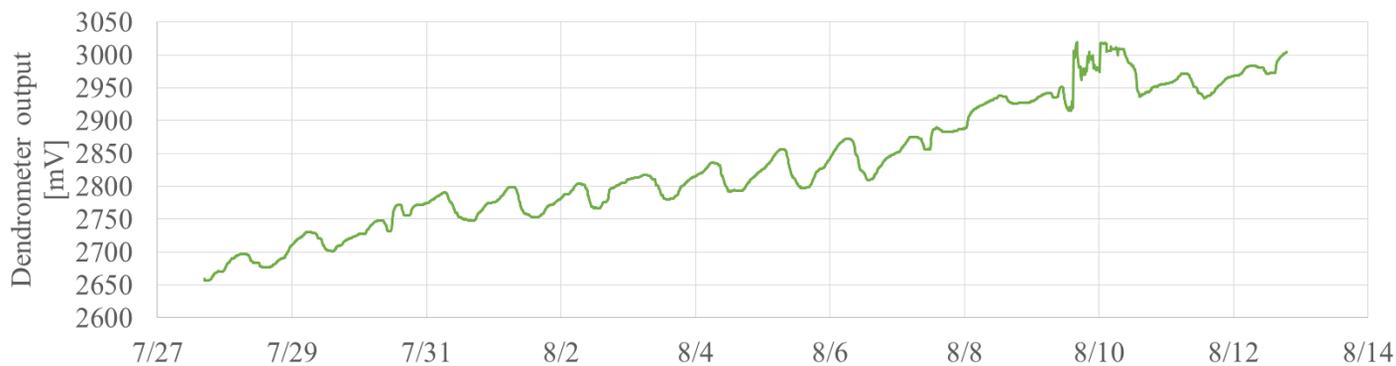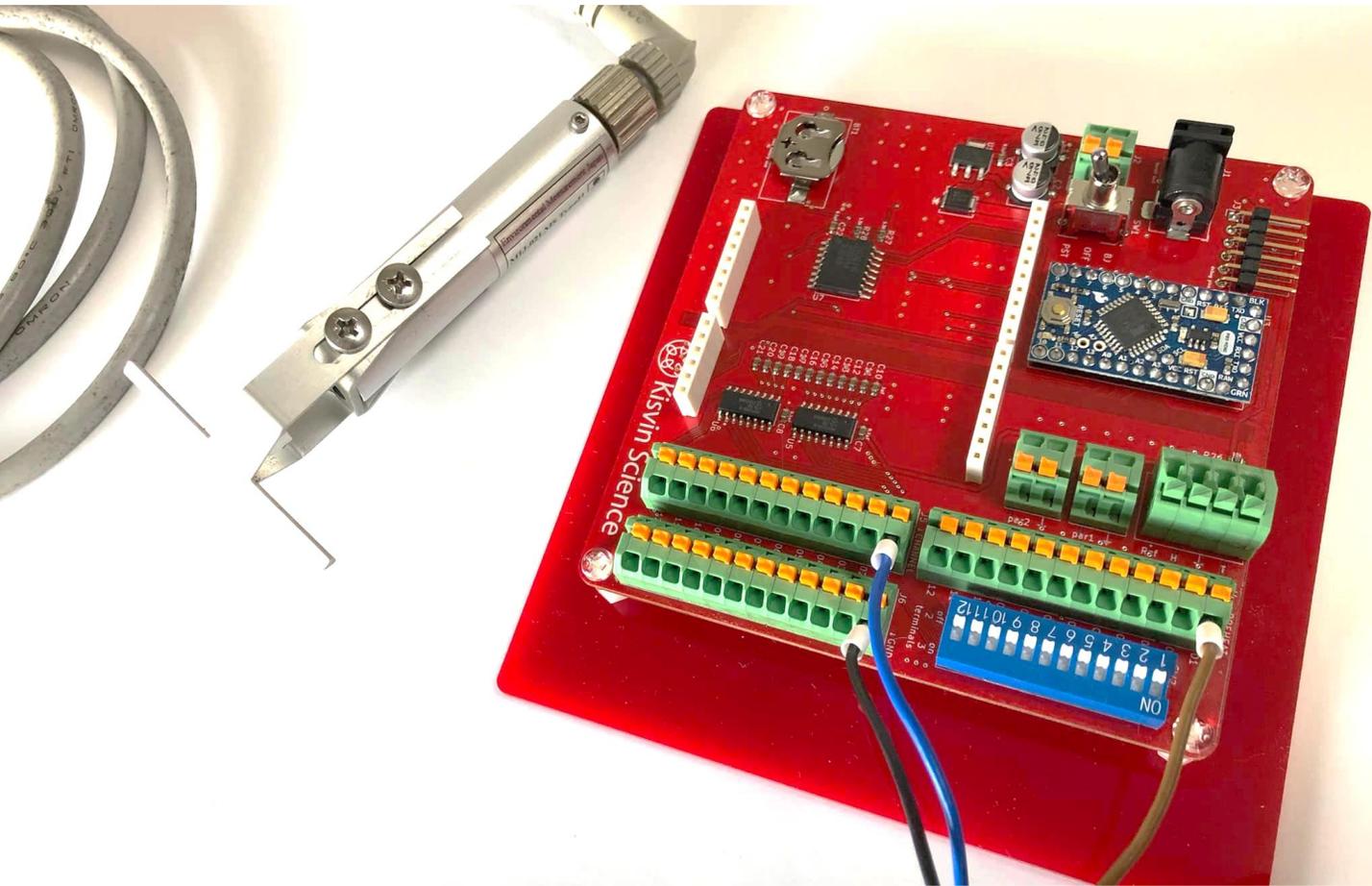
Measuring the daily variation in plant trunk and stem diameter can be said to be a measurement of physical quantities displaced as a result of shrinkage factors due to photosynthesis, transpiration, and sap flow, which change from moment to moment during the day, and water storage from the roots to the trunk at night. Measuring the long-term annual variation in stem diameter is equivalent to measuring the rate of hypertrophic growth and carbon assimilation. As a medium-term phenomenon, it is possible to obtain data that can be used to analyze situations where a history of excessive water stress is followed by weekly effects. In the short term, it is possible to measure displacements in response to parameters that are difficult to measure continuously, such as evapotranspiration rate and water potential. The greatest advantage of this system is that it can measure individual responses to daily environmental changes with high temporal resolution and high displacement resolution over a long period of time and with no maintenance. The low power consumption and absolute displacement reading design also makes it possible to perform long-term interval measurement without warm-up operation and with only a dry cell battery.

SigFox cloud + WEB application

Real-time remote monitoring of sap flow rates is possible by using Skylon application linked to the SigFox cloud. This WEB application is being developed in collaboration with Agrishot and Focus Systems.

RAW data is stored in three locations: the SD card, the SigFox server, and the Skylon server, which also stores the data after the calculation process. The SigFox and Skylon servers can only store hourly data, but the firmware can be reviced to store data at shorter intervals on the SD card.

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