

PMS Instruments - Pressure Chamber Models 600, 615, 1505EXP

How it works:

The pressure chamber works by applying pressure to the leaf and portion of the petiole inside of the chamber. The amount of pressure required to force water up through the cut end of the petiole (located outside of the chamber) is indicative of the tension the leaf is experiencing when trying to access water. The greater the pressure required, the harder the leaf/vine has to work to get the water it needs.

Stem Water Potential vs Leaf Water Potential:

There are 2 standard pressure chambers measurements used to monitor water status in vineyards: Stem Water Potential (SWP) and Leaf Water Potential (LWP). Both LWP and SWP are taken at mid-day, but there is an important difference between collection and interpretation of results. LWP measurements are indicative only of that particular leaf's water status, which is impacted by several factors, including: position on the vine, age of leaf, sun exposure, etc. SWP measurements require an added preparation step and a short waiting period before measurements can be taken, however the measurement is indicative of the whole vine water status. For this reason, the protocol and recommendations provided below are based on the collection of SWP. For more information on LWP vs SWP contact Kraz.

When to take readings:

Readings should be taken on a sunny day between 10:30am and 4:00pm. Excessive cloud coverage can impact values collected, so it is best to avoid these days when possible. However, in the event of a long stretch of overcast days, taking readings in these conditions may be necessary, in which case data should be interpreted with conditions in mind.

The best way to use the chamber for irrigation scheduling is to check blocks when you think the vines might be dry BEFORE the next scheduled irrigation set. Depending on SWP readings irrigation sets can be pulled forward, kept on schedule, or pushed back. Once you've determined your target irrigation interval, you can tweak the water applied up or down in quantity and/or frequency based on the forecast or actual rainfall, as well as the phenological requirements to hit production targets.

Safety and Operation:

Complete safety and operating instructions from the manufacturer are provided separately. Ensure all staff operating the pressure chamber have read and understand pressure chamber safety and proper operation before using.

Tanks and Filling:

Tanks in New Zealand can only be filled by a WorkSafe certified filler. A staff member can be trained by a WorkSafe certified Compliance Certifier. A list of such trainers can be found at <https://compliancecertifiers.worksafe.govt.nz/>.

Filling protocols for the Model 615 can be found at

<https://www.pmsinstrument.com/resources/filling-the-model-615-or-model-1515d-portable-tank/>



STEM WATER POTENTIAL:

Required Supplies:

- Safety Glasses
- Foil bags*
- Sharp knife
- Magnifying glass
- Pressure Chamber
- Data Sheet and writing utensil

Helpful Supplies:

- Block map(s)
- NDVI map(s)

Vine Selection:

Block intended use, variety and variability can play a significant role in deciding which vines to measure to best predict the irrigation requirements of the block. If you have not already consulted with our team on where to measure, or you're looking at measuring a new block for the first time, here is a good starting point:

Early Season (before flowering)

Measure healthy vines in a lower vigour area. These tend to be on soils with a lower water holding capacity, so tend to dry out the fastest.

Mid-Late Season (after flowering)

Measure in an area you deem 'average' vigour to fine tune irrigation intervals

Taking Readings:

At the vine:

1. Select leaf to measure (ideally: main shoot, mid/lower canopy, undamaged)
2. Place a foil bag over the entire leaf and seal around the petiole ensuring not to damage the leaf or petiole during this process. Folding the leaf is fine, but fold gently.
3. Wait at least 10-15 minutes (bags can be applied hours before, but 10-15 is a hard minimum time)
4. Break the petiole off of the shoot

At pressure chamber:

5. Make a clean cut of the petiole - leaving it long enough to stick through the pressure chamber cap (about 2-3 cm)
6. Insert petiole into chamber cap and screw the black compression screw (top portion of the cap) to tighten around the petiole
7. Attach chamber cap to chamber ensuring the cap is locked in place
8. Slowly turn gas control valve to CHAMBER setting.
9. Note - if you hear a slight hissing sound, the chamber cap might not be completely sealed around the petiole - quickly twist the compression screw until hissing stops
10. With magnifying glass watch the cut end of the petiole
11. At the first sign of water bubbling out of the end of the petiole, turn the gas control valve to the OFF setting
12. Record the pressure reading on the gauge to the LEFT of the chamber
13. **Turn the gas control valve to EXHAUST to depressurize the chamber *DO NOT SKIP THIS STEP***
14. Once the chamber is depressurized, remove the cap, loosen the compression screw to release the petiole, remove the foil bag from the leaf, and you're ready for your next reading.



INTERPRETING THE DATA:

These are general guidelines. Depending on the variability within the vineyard/block, vines within a given area may be experiencing a wide range of water potential. Vines monitored should be selected to be representative of the target water status range to achieve production goals - this may change over the course of the season. Indicated range for various situations is the threshold at which water should be given.

Pressure Chamber Reading (Bar)	0	-1	-2	-3	-4	-5	-6	-7	-8	-9	-10	-11	-12	-13	-14	-15
General Range Notes****	No Water Limitation, rapid shoot growth/lateral growth							Approaching water limitation, shoot growth slowing towards the top of range, photosynthesis starts to slow at -7.5			Increasing water limitation, more and more stomatal closure as the number gets more negative.					
Young Vines	Target zone to avoid limiting vegetative growth when establishing young vines. Note: Allowing vines to reach the top of range will encourage root exploration.															
High Production/ Whites						Target zone for high production goals when maintained between fruit set and onset of veraison										
Reds for Table								Target zone for trying to limit berry size when maintained between fruitset and onset of veraison					Sometimes safe for Syrah or blocks that are accustomed to water stress. Not suitable for Riparia Gloire rootstock with any scion			
Ripening vs Vegetative Growth								Post onset of veraison limits vegetative growth and can improve rate of ripening								

