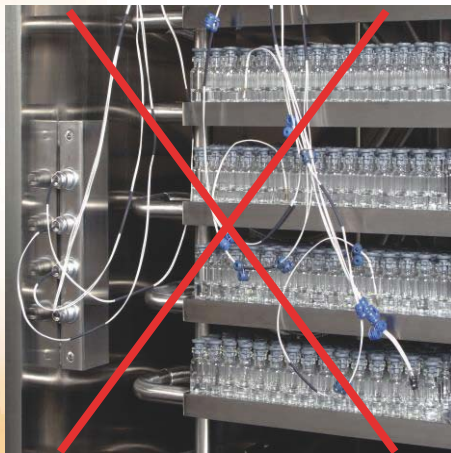


Wireless Temperature Measurement „WTM *plus*“ - the next generation

The product temperature is considered as an essential criterion for monitoring and control of the freeze drying process.

As measuring should be carried out in several – often small – vials, conventional wired sensors cause considerable handling problems (“cable spaghetti”).

WTM is dedicated mainly for production units, particularly for autoloading systems. The 2nd generation probe is significantly smaller and optimized for reduced filling volumes.



Conventional wired sensors



(„**W**ireless **P**roduct **T**emperature **M**easurement“) **W**TM *plus*

- ✓ Covers the entire process after freezing (temperature range -60°C ... $+135^{\circ}\text{C}$, sterilizable)
- ✓ Measurement directly inside the product on a spot
- ✓ Small and robust, also for bulk
- ✓ High accuracy ± 0.5 K , resolution 0.1 K
- ✓ No plugs and wires with cleaning and contact problems

Functional principle:

- **Energy supply** of the sensors by means of a **radio frequency** within in the 2.4 GHz range, i.e. no battery or other energy storing device necessary
- Intermediate storage of energy by stimulation of a quartz crystal
- High precision **temperature-dependent detuning** of quartz-oscillation frequency
- **Transmission of frequency modulation** via an antenna to the evaluation electronics for temperature determination

Wireless Temperature Measurement „WTM *plus*“ - the next generation

We are continuously working on improvements of our products. The result is a new wireless T-probe which is even smaller than the first one and which is covered by a complete stainless steel surface. The temperature-sensitive quartz is placed directly above the conical part of the probe. Therefore the measuring spot has always a few millimeter distance to the bottom of the vial. The cone end also minimizes heat conduction from the vial bottom to the the quartz crystal, which falsifies the product temperature measured with conventional probes.

Second generation
WTM-probe



Dimensions of 2nd generation probe:
D=2,6 mm x 20 mm (body)
D=0,35 mm x 33 mm (antenna)

Additional highlights:

- The product temperature is not falsified due to the "passive design" without battery as well as lowest power level
- Several sensor frequencies for monitoring at any sensor position
- **Determination** of user-defined **sensor positions** for automatic loading/unloading
- Interference proof radio transmission worldwide at 2.4 GHz
- By means of active change of frequency a **stable signal** at every position is granted even in stainless steel freeze dryers
- The WTM-technology is a **high-precision tool** and is also able to measure the water vapour temperature above the drying product