

## Outstanding Features

- 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
- The WTM-technology is a high-precision tool and is also able to measure the vapour temperature above the drying product
- 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
- Excellent value for money!



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## Taking a Step Forward



Innovative, Comfortable  
& Precise – WTMplus  
Wireless Temperature  
Measurement

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## A Fully Integrated PAT-Solution

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”).

WTMplus is dedicated for Martin Christ pilot units as well as production units, particularly together with autoloading systems.

- Fully integrated in automated systems and process documentation
- GMP-design for best cleaning results during CIP/SIP
- Small and robust, also for 2R vials and bulk
- High accuracy  $\pm 0.5$  K, resolution 0.1 K
- Covers the entire process after freezing (temperature range  $-60$  °C ...  $+ 135$  °C, sterilizable)
- No plugs and wires with cleaning and contact problems

### Functional principle

- Energy supply of the sensors by means of radio frequency within 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



Conventional wired sensors



WTMplus (Wireless Product Temperature Measurement)

## Improved Handling

We are continuously working on improvements of our products. A mounting for the sensor is now available. With a positioning tube the exact height of measurement spot can be fixed.

### This could be:

- Inside the product cake
- Above the product (vapour temperature)
- On the vial bottom

The temperature-sensitive quartz is placed directly above the conical part of the probe. The probe antenna can be deformed during stoppering without failure.



WTMplus is suitable for automatic loading and unloading