

QuantStudio 7 Pro Dx Real-Time PCR System



Green benefits

- **Less waste and fewer resources**—uses 46% less material than the prior model; generates 81% less waste during calibration
- **Energy efficient**—consumes up to 26% less energy

Introduction

Thermo Fisher Scientific is committed to designing our products with the environment in mind—it’s part of how we support our mission to enable our customers to make the world healthier, cleaner, and safer. This fact sheet provides the rationale behind the environmental claim that, compared to a prior real-time PCR instrument model, the Applied Biosystems™ QuantStudio™ 7 Pro Dx Real-Time PCR System is made with fewer materials, generates less waste, and is more energy efficient.

Product description

The QuantStudio 7 Pro Dx Real-Time PCR System is the qPCR platform for the future. Combining modern hardware and software in a compact footprint, this instrument enables customers in molecular diagnostics to achieve maximum efficiency, smarter productivity, and higher accuracy from their workflow.

Green features

Less waste and fewer resources

When designing our products, we strive to minimize the amount of material they contain in order to use resources more efficiently and reduce waste. With the QuantStudio 7 Pro Dx system, our engineers focused on building the instrument’s capabilities into a smaller form factor. As a result, it uses 46% less material than the prior model, the Applied Biosystems™ QuantStudio™ Dx Real-Time PCR instrument (Table 1). The QuantStudio 7 Pro Dx system’s footprint is 52% smaller than that of the prior model, promoting more efficient use of laboratory space and supporting better freight density to help reduce emissions during transit (Figure 1).



QuantStudio 7 Pro Dx Real-Time PCR System.

Table 1. Real-time PCR instrument weights and footprints.

| Instrument | Weight (kg) | Weight reduction with QuantStudio 7 Pro Dx system | Footprint length x width (cm) | Footprint reduction with QuantStudio 7 Pro Dx system |
|----------------------|-------------|---|-------------------------------|--|
| QuantStudio 7 Pro Dx | 38 | 46% | 33.8 x 52.5 | 52% |
| QuantStudio Dx | 70 | – | 53 x 70 | – |



Figure 1. Dimension comparison of the QuantStudio Dx and QuantStudio 7 Pro Dx Real-Time PCR Systems.

The QuantStudio 7 Pro Dx system also has a smaller block and heated cover relative to the QuantStudio Dx system (Table 2). The heated cover and block in the QuantStudio 7 Pro Dx system weigh 2.8 kg, compared to 6.1 kg for the QuantStudio Dx system, allowing for easier installation. For added convenience, the block and heated cover of the QuantStudio 7 Pro Dx system can be changed while the instrument is powered up, so there is no need for tools or a power cycle.

Table 2. Real-time PCR instrument block and heated cover weights.

| Instrument | Weight (kg) | Weight reduction with QuantStudio 7 Pro Dx system |
|----------------------|-------------|---|
| QuantStudio 7 Pro Dx | 2.8 | 54% |
| QuantStudio Dx | 6.1 | – |

In addition, we reduced the amount of calibration materials needed, decreasing the waste generated through calibration (Table 3). Dye calibration for the QuantStudio 7 Pro Dx system is recommended only once each year and uses three plates to calibrate 10 dyes. The QuantStudio Dx system, by comparison, should be calibrated every 6 months and requires a calibration plate for each of the six pure dyes plus Applied Biosystems™ FAM™/ROX™ and VIC™/ROX™ normalization plates. This means that over a 1 year period, the QuantStudio 7 Pro Dx system will generate 81% less waste from calibration materials and packaging than the QuantStudio Dx system.

Our commitment to reducing waste does not end there. The QuantStudio 7 Pro Dx system is manufactured at our zero waste certified facility in Marsiling, Singapore—more than 90% of the waste generated at our manufacturing site is diverted from landfill.

Table 3. Real-time PCR calibration materials and waste reduction (includes packaging).

| Instrument | Calibration plate weight (kg) | Number of calibration plates needed | Number of plates used over 1 year | Waste production each year (kg) | Waste reduction over 1 year |
|----------------------|-------------------------------|-------------------------------------|-----------------------------------|---------------------------------|-----------------------------|
| QuantStudio 7 Pro Dx | 0.6 | 3 plates every 12 months | 3 | 1.8 | 81% |
| QuantStudio Dx | 0.6 | 8 plates every 6 months | 16 | 9.6 | – |

Energy efficient

The QuantStudio 7 Pro Dx system is more energy efficient, using 26% less energy to process one sample plate than the QuantStudio Dx system (Table 4). All measurements were taken using a model P4400.01 Kill A Watt™ meter.

We also equipped the QuantStudio 7 Pro Dx system with features to help reduce energy consumption when not in use (Table 5). Other real-time PCR systems have an idle mode that keeps the heated cover at 105°C. By contrast, the QuantStudio 7 Pro Dx system has a feature enabling either the heated cover to be turned off or the temperature reduced while in idle mode, helping reduce energy consumption by up to 25%. The QuantStudio 7 Pro Dx system also has a programmable sleep mode to transition to idle mode at a user-determined time.

Energy-efficient lab equipment helps reduce greenhouse gas emissions and save money. In a typical lab that is running a real-time PCR system for 8 hours each day during 261 working days per year, the QuantStudio 7 Pro Dx system could help save up to 640 kWh of energy over the course of one year, representing 0.454 metric tons of CO₂ equivalents [1].

A 2015 study on laboratory energy consumption by the Center for Energy Efficient Laboratories (CEEL) [2] determined that laboratories just in the state of California collectively use at least 800 GWh of energy each year—generating the equivalent of combined yearly greenhouse gas emissions from 123,299 passenger cars [1].

Designing our instruments to consume less energy, generate less waste, and use fewer resources while delivering expected performance is a win for our customers, our company, and the planet.

Table 4. Energy consumption of real-time PCR systems during use. Run conditions: 50°C for 2 minutes; 95°C for 10 minutes; 95°C for 15 seconds plus 60°C for 1 minute, for 40 cycles.

| Instrument | Average energy consumption (kWh) | Energy reduction with QuantStudio 7 Pro Dx system |
|----------------------|----------------------------------|---|
| QuantStudio 7 Pro Dx | 0.37 | 26% |
| QuantStudio Dx | 0.50 | – |

Table 5. Power and energy consumption of real-time PCR systems in idle mode.

| Instrument | Average energy consumption (kWh) | Energy reduction with QuantStudio 7 Pro Dx system |
|----------------------|----------------------------------|---|
| QuantStudio 7 Pro Dx | 0.16 | 25% |
| QuantStudio Dx | 0.22 | – |

References

1. US EPA Greenhouse Gas Equivalencies Calculator. www.epa.gov/energy/greenhouse-gas-equivalencies-calculator, accessed 18 May 2021.
2. Paradise, A (2015). "Market Assessment of Energy Efficiency Opportunities in Laboratories." www.etcc-ca.com/sites/default/files/reports/ceel_market_assessment_et14pge7591.pdf

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