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LIFE SCIENCE

PCR SETUP

AUTOMATED

CAS-1200™
automated PCR setup

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Robotics for Everyone

Laboratory automation is still widely assumed to be an unaffordable luxury—the reserve of the lucky few with big projects and budgets to match.

The CAS-1200™ changes all that. With superb precision, versatility, ease-of-use, small size, and low cost, it brings the benefits of automation within reach of everyone.

A Practical Solution

Many also assume robotic systems are expensive to run and maintain. But here again, times have changed. The CAS-1200 was designed to be practical in any laboratory. Above all, this means it's affordable to own and to operate.

The precision and reproducibility of the CAS-1200 usually means significant savings. For example, you can reduce reagent use with smaller reaction volumes and minimize tip and tube waste. In addition, productivity will increase and there will be fewer repeat experiments just because robots don't make human errors.

Once you discover the benefits of a CAS-1200 you'll wonder how you managed without it!

Minimize Injury Risk

The rigors of manual setup can have direct health implications. Carpal Tunnel Syndrome, a painful injury of the median nerve at the wrist, is a repetitive strain injury easily triggered by hand pipetting. All the more reason to consider automation when staff are at risk.

"Mechanical micropipettes introduce a repetitive movement that can result in cumulative trauma disorders in anyone pipetting for more than 300 hours a year. This equates to a daily routine of only 1-2 hours a day of pipetting tasks."

A-Z of Quantitative PCR
(Bustin S. ed. IUL Biotechnology Series)

A Robot That Works Like You Do

Some people are naturally able to pipette with high precision. Sometimes the techniques they use are subtle or even subconscious, but they make a big difference. We studied the behavior of experienced technicians and replicated their "tricks" on the CAS-1200. Here are just a few:

The CAS-1200 tracks the meniscus in each tube so it can pipette near the liquid surface. This minimizes "tip retention", i.e. inaccuracies and waste due to reagent adhering to the tip.

The tip will normally retract while dispensing. This further reduces tip retention artifacts by minimizing tip immersion and at the same time the possibility of overfilling due to volume displacement by the tip.

An experienced technician knows to slow down when pipetting viscous liquids. The CAS-1200 slows the pipetting of any reagents flagged as viscous to a set speed.

The software is smart about tip re-use; simply indicate the maximum number of times a tip may be re-used. The CAS-1200 complies, but knows to avoid the possibility of cross-contamination by never re-using a tip that has touched a well containing a different liquid.

When re-using a tip, the CAS-1200 will first "pre-wet" it with a brief aspiration/dispense before first using it. This ensures the tip will deliver the same amount of reagent every time, including the first time!

If both 200 µL and 50 µL tips are available, the CAS-1200 will automatically select the most suitable for minimizing tip usage and maximizing precision.

There are a variety of smart mixing possibilities to choose from, such as pre-mixing a sample prior to pick-up and/or after dispensing it. The amount of mixing is also adjustable.

The system makes numerous self-checks and delivers intelligent warnings to ensure operation is safe, convenient and trouble-free. It's also adept at resuming normal operation after an interruption, such as after the hood is opened during a run.

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Quantitative PCR Setup

The setup of quantitative PCRs demands the highest pipetting precision and challenges even the most experienced technicians. Automation is of great benefit, especially when consistency of results between operators or laboratories is a primary concern.

The CAS-1200 was developed specifically for the setup of real-time quantitative PCRs. The results achieved match or exceed the best hand pipetting day-in, day-out *(see opposite)*. Setup is also fast; a 96-well plate takes about 20 minutes.

Because the software was designed to support quantitative PCR, it has all the functions you'd expect including a range of advanced options such as:

- Preparation of dilution series according to variable user-specified dilution ratios
- Calculation of reagent needs according to the number of reactions and replicates specified
- Master mix preparation
- Wizards for speedy PCR setup and optimization
- Virtual mode for remote creation and testing of new protocols at the desk or in the classroom
- Detailed pre- and post-run reports

For EVERY Real-Time Instrument

No matter what real-time instrument you use, the CAS-1200 is compatible. The system is pre-configured to work with all PCR tube types, including standard 0.1 mL and 0.2 mL PCR tubes, strip tubes, SmartCycler™ tubes, COBAS® TaqMan® 48 Analyzer tubes, and LightCycler® capillaries. All plate formats are also supported, including all varieties of 96-well, 384-well, and Gene-Disc™ plates.
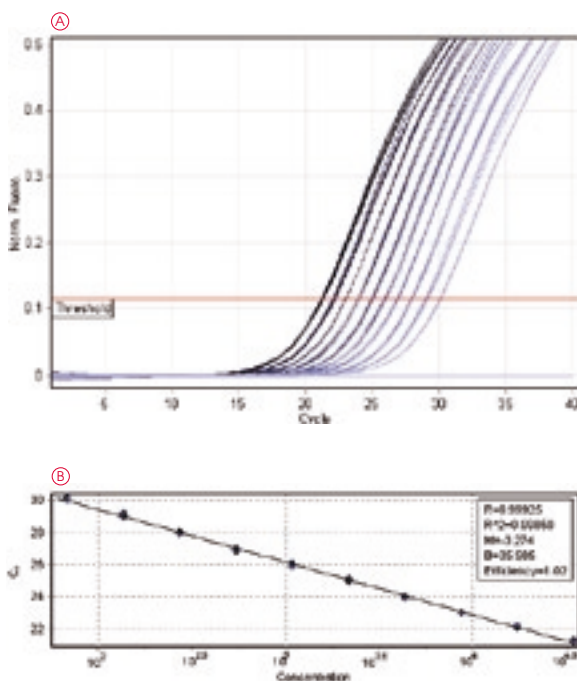
2-fold standard curve dilution series set up on a CAS-1200

A CAS-1200 PCR setup robot was used to prepare a 2-fold dilution series of human genomic DNA standards. Amplification reactions were then set up in replicates of four by the CAS-1200 using the diluted standards as template and targeting the human BCL-2 gene. A Rotor-Gene 6000 real-time rotary analyzer was used for amplification and analysis. (A) Plots show tight replicates with the expected one-cycle difference between each 2-fold dilution. (B) Standard curve for this experiment is shown with statistical data (boxed).
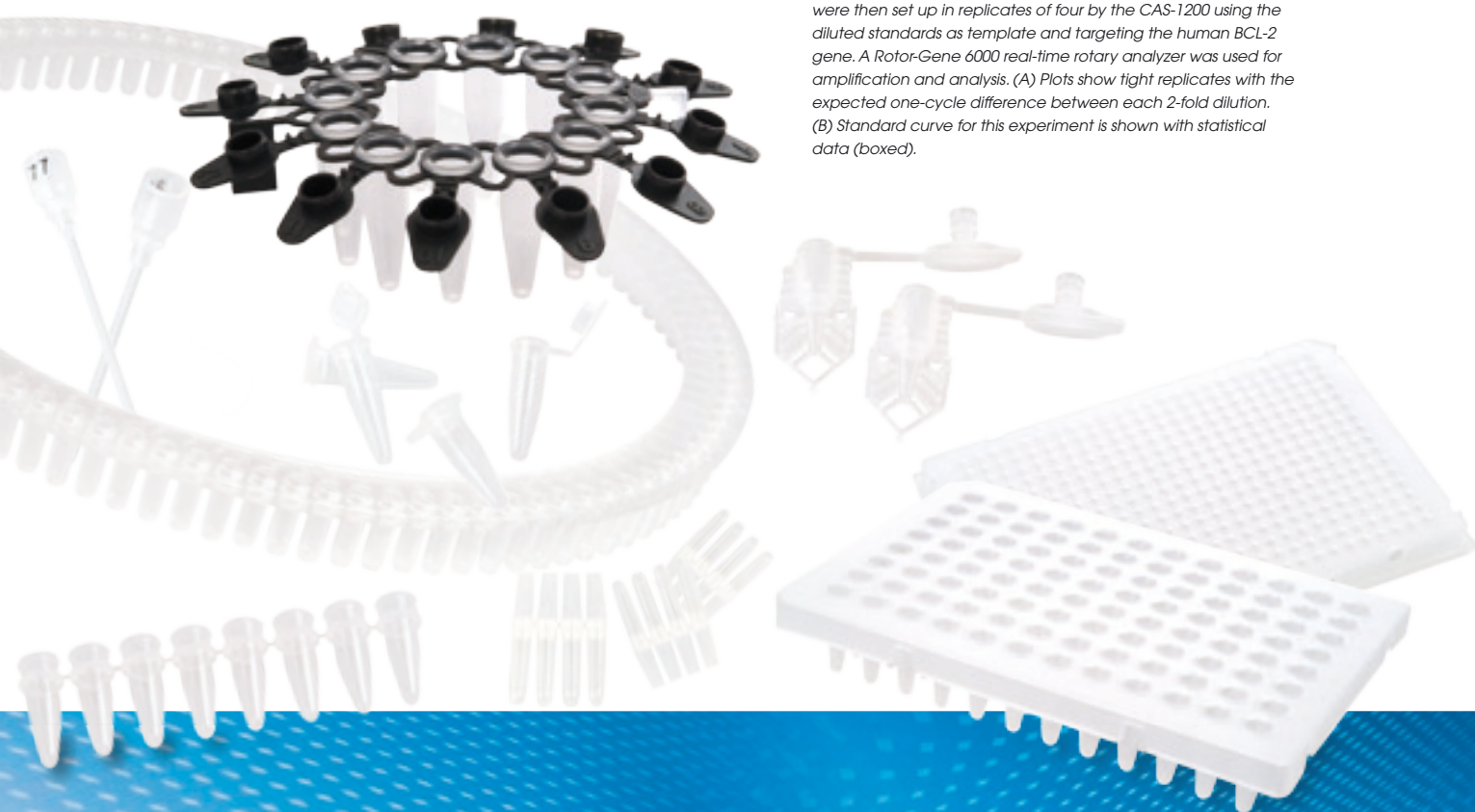
Normalize Sample Concentrations

One of the most tedious tasks in the molecular laboratory is normalizing raw DNA or RNA samples to a specified concentration. Done manually, this process is especially demanding as the amount of sample and diluent required for each normalization must first be calculated, followed by careful re-adjustment of hand pipettor settings for each and every pipetting event in the process.

The CAS-1200 calculates all required sample and diluent volumes then pipettes them accordingly, making normalization extremely simple as shown in the example below.

Ⓐ

Well	Sample Name	Sample ID	Conc.
A1	Sample A1 @ B2	Patient 1	123
B1	Sample B1 @ B2	Patient 2	105
C1	Sample C1 @ B2	Patient 3	95
D1	Sample D1 @ B2	Patient 4	145
A2	Sample A2 @ B2	Patient 5	201
B2	Sample B2 @ B2	Patient 6	134
C2	Sample C2 @ B2	Patient 7	176
D2	Sample D2 @ B2	Patient 8	190
A3	Sample A3 @ B2	Patient 9	98
B3	Sample B3 @ B2	Patient 10	143

Ⓑ

Normalise samples?

Use normalisation? ☑

Normalise to: 50

Volume

Sample volume: (normalised total) 200 µL

Ⓒ

Well	Contents	ID
A1	118.7uL Water, 81.3uL Sample A1 @ B2	Patient 1
B1	104.76uL Water, 95.24uL Sample B1 @ B2	Patient 2
C1	94.74uL Water, 105.26uL Sample C1 @ B2	Patient 3
D1	131.03uL Water, 68.97uL Sample D1 @ B2	Patient 4
E1	150.25uL Water, 49.75uL Sample A2 @ B2	Patient 5
F1	125.37uL Water, 74.63uL Sample B2 @ B2	Patient 6
G1	143.18uL Water, 56.82uL Sample C2 @ B2	Patient 7
H1	147.37uL Water, 52.63uL Sample D2 @ B2	Patient 8
A2	97.96uL Water, 102.04uL Sample A3 @ B2	Patient 9
B2	130.07uL Water, 69.93uL Sample B3 @ B2	Patient 10

Normalization of DNA concentration
When setting up a run, simply indicate (A) the starting concentration of each sample and (B) the final concentration and volume required for normalized samples. The software then calculates and displays the amount of sample and diluent it will use to normalize each sample (C).

Versatility

The hallmark of the CAS-1200 is its versatility—there are very few tube formats or pipetting operations that are not supported and more are added all the time. The single channel pipetting head design enables transfer from any location on the deck to any other.

So in addition to PCR setup, the CAS-1200 can perform a wide range of other tasks. For example, transfer of liquid samples from one tube format to another, plate replication, restriction digest setup, serial dilutions, cherry picking from archived sample banks, etc. This makes the CAS-1200 useful for many tasks in the modern molecular laboratory.

Larger Projects

Some applications require a robot with a larger deck capacity than the standard CAS-1200, and a larger version is now available—the CAS-4200™.

The CAS-4200 is identical in functionality and options to a CAS-1200 but with deck locations for 15 microplates plus one combined mastermix/reagent plate.

For more information about the CAS-4200, contact your Corbett Life Science representative.

Easy to Use Software

A what-you-see-is-what-you-get interface means the software setup (below) mirrors the actual deck setup (right). Context-sensitive controls are also logically arranged. Some features of the interface are described below.

- Use pre-made master mixes or prepare several custom mixes within a run.

- The blue tube holds diluent (usually PCR-grade water).

- Hover over any well to see detailed contents, as shown here for a mastermix well.

Tips are loaded in table positions A1, A2 and B1 in this example setup. Note the left four columns of tips in position A2 are unavailable (i.e. empty of tips).

The reaction list outlines steps in the protocol. In the first step, the 32 raw samples in 1.5 mL tubes (position B2) are diluted to a normalized concentration (position C2). In the second step, 20 µL real-time reactions are set up in triplicate (at position C1). Each entry line in this reaction list can be double-clicked for more detail or to make changes.

Sample information (including barcodes) can be imported and exported using these controls.
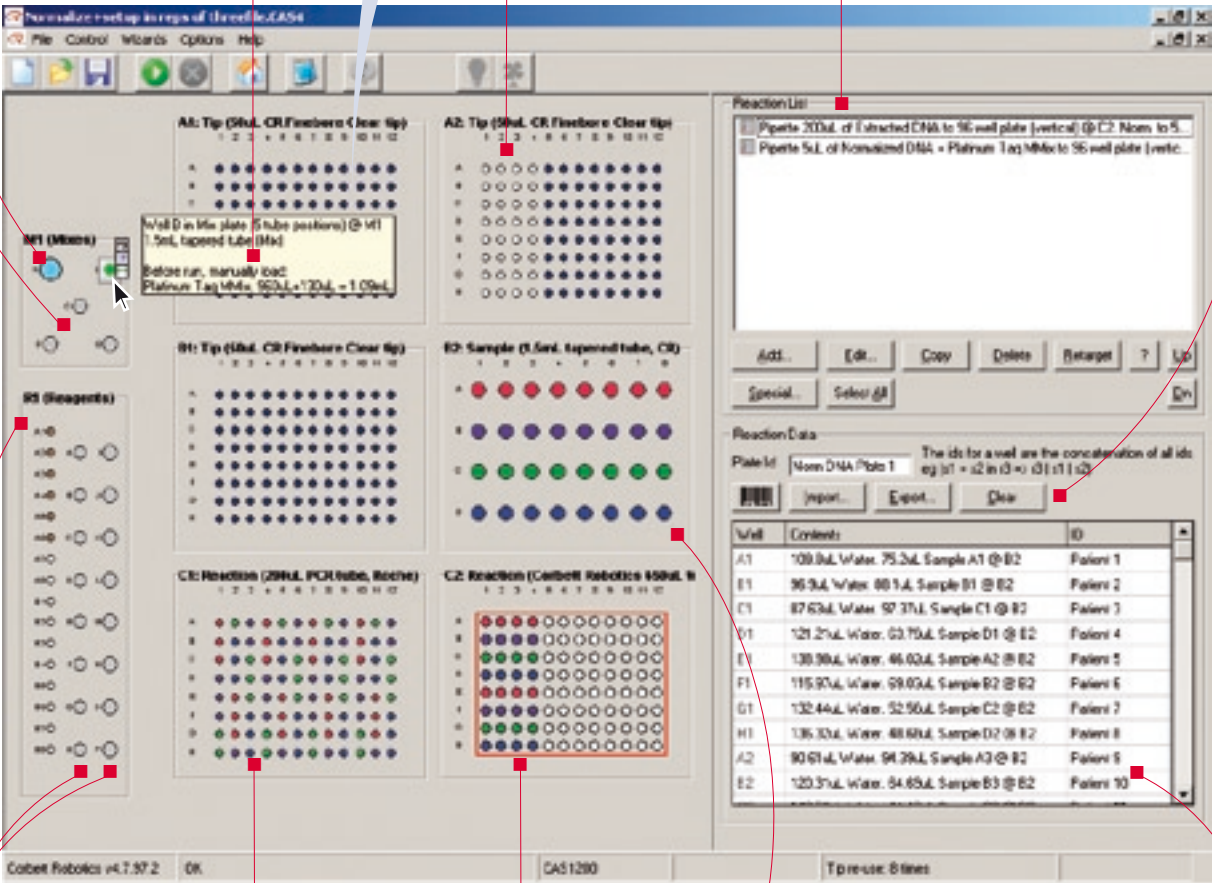
- Prepare a dilution series e.g. for a real-time PCR standard curve. Dilution series varies dynamically as needed (e.g. 1:10, 1:5, 1:2 etc)

- The normalized samples from position C2 are used to set up triplicate PCRs in a 96-well plate here at position C1.

- DNA samples from position B2 are normalized into cluster rack tubes for later storage here (C2).

- Position B2 holds raw DNA samples in 1.5 mL flip-cap tubes. The tube type, number of samples and their location can be changed at any deck position to suit different runs.

- Reagents such as primers, probe, MgCl$_2$, Taq and dNTPs can be kept in 1.5 mL or 2 mL tubes in these columns. Many other block and tube options are available.

The C2 deck position has been selected (red outlined). This updates the sample list here to show detailed contents of each C2 well. The amount of water and DNA used to normalize each individual sample is shown.
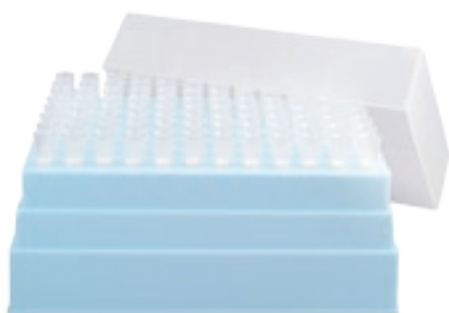
Customize Your CAS-1200

Tip type and liquid level monitoring

The CAS-1200 uses one of two methods to monitor the amount of liquid in each tube during a run; Liquid Level Tracking (LLT) or Liquid Level Sensing (LLS).

LLT is standard and uses software to track and predict liquid levels. LLT uses Capp™ style tips supplied in racks with removable covers. This format enables different users to supply and remove their own tips, a particular benefit when the robot is a shared resource.

LLS is optional and uses conductive (black, carbon-impregnated) Tecan® Genesis® style tips to electronically detect liquid levels in real-time during a run. LLS can detect as little as 10 µL in a 0.2 mL tube. Conductive tips cost a little more and are normally supplied without covers in "pallets" of 96 tips which attach to a metal support frame.

UV light sterilization

An optional UV light system automates sterilization of deck surfaces between runs. To ensure light reaches all areas, the robot arm is programmed to move during the procedure so that it casts no permanent shadow. The time of irradiation can also be adjusted.

HEPA filter

An optional High Efficiency Particulate Air (HEPA) filter provides positive clean air pressure within the closed hood. Air filtration is important for some applications (for example where fungal spores are problematic) but as with any air filter system, it cannot prevent amplicon contamination in a post-PCR liquid handling environment. The integrated system uses disposable filter cartridges that can be changed in seconds.
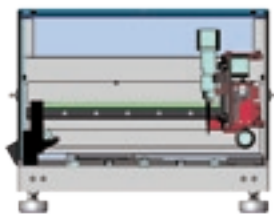

Ready-racked Capp style tips

Tecan Genesis Style conductive tips

CAS-1200 Models

Part Number	Model Description	Compatible Pipette Tips	LLS*	UV Sterilization	HEPA Filter
1201	CAS-1200 LLT	Capp™			
1201UV	CAS-1200 LLT/UV	Capp™		✔	
1201HF	CAS-1200 LLT/HEPA	Capp™			✔
1201HU	CAS-1200 LLT/UV/HEPA	Capp™		✔	✔
1200	CAS-1200 LLS	Tecan® Genesis®	✔		
1200UV	CAS-1200 LLS/UV	Tecan® Genesis®	✔	✔	
1200HF	CAS-1200 LLS/HEPA	Tecan® Genesis®	✔		✔
1200HU	CAS-1200 LLS/UV/HEPA	Tecan® Genesis®	✔	✔	✔

* Liquid Level Sensing

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SPECIFICATIONS

Pipetting Head	Single Channel, 20–150 μL/sec (software controlled)
Precision	CV<1% ≥ 5 μL (dry-well transfer), CV<5% 2–5 μL (wet-well transfer)
Tip Volume	1.0–200.0 μL
Standard Tips	96-racked Capp™ compatible 50 μL and/or 200 μL low retention tips (LLT only)
Conductive Tips *(optional)*	96-racked Tecan® Genesis® compatible 50 μL and/or 200 μL conductive tips (LLS only)
LLT-Liquid Level Tracking	Software to track liquid levels in every tube during normal operation. Standard on all models
LLS-Liquid Level Sensing *(optional)*	Liquid level sensing down to 10 μL in 0.2 mL PCR tubes. Liquid levels are detected at every pipetting event in real-time. For Tecan Genesis compatible conductive tips only. LLS is only available with initial instrument purchase.
Tip Waste Handling	All tips ejected externally; no waste accumulation within deck area. High-capacity covered waste bag or container can be fitted at user discretion.
UV sterilization *(optional)*	UV light system for deck sterilization within closed hood. Available only with initial purchase.
HEPA Filter *(optional)*	Dual-cartridge 3M Air-Mate™ HEPA (High Efficiency Particulate Air) filter system provides positive pressure clean air within the closed hood. Can be purchased separately.
Hood	Integrated strut-supported tinted acrylic hood for access on 3 sides.
Dimensions	**H** (hood closed) 390 mm (15.4"); 420 mm (16.5") UV light option fitted **H** (hood open) 770 mm (30.3") **W** 490 mm (19.3") **D** 580 mm (23"); 640 mm (25.6") including cables
Weight	30 kg (55 lbs) standard configuration
Temperature range	4°C–35°C
Electrical	100–120 VAC @ 4 Amp (50/60 Hz), 200–240 VAC @ 2 Amp (50/60 Hz)
Table Capacity	6 x Microplates (SBS standard size, holds any combination of tips/plates/tubes/capillaries etc) 1 x Mastermix blocks (hold 1.5 mL and/or 5 mL tubes, other combinations available) 1 x Reagent block (standard holds 8 x 1.5 mL tapered tubes, 8 x 1.7 mL straight-sided tubes 16 x 200 μL PCR tubes, other combinations available)
Startup Consumables *(included)*	10 racks of 96 x 50 μL tips, 10 racks of 96 x 200 μL tips, 25 x 5 mL tubes, 200 x 0.2 mL flat cap PCR tubes
Startup Accessories *(included)*	2 x Loading Blocks; 96 x 0.2 mL PCR tubes (P/N 0007) 1 x Flip-Cap Loading Block for 32 x 1.5 mL tubes (P/N 2627) 1 x Flip-Cap Loading Block Tube Lifter for 32 x 1.5 mL tubes (P/N 2628) 1 x Reagent Block (P/N 0004) 2 x Mastermix Blocks (P/N 0002, P/N 0003) 4 x Aluminum Tip Racks (P/N 0060) for Tecan Genesis tips (included with LLS option only) 1x Pipettor head maintenance kit (P/N 0644)
Communications	Serial RS-232
Minimum Computer	Pentium® IV, 2.6 GHz (desktop) Pentium® M 1.6GHz (laptop) or higher, 256 MB RAM (512 MB recommended), 40 GB HDD, USB or Serial RS-232 Port, DVD/CDROM, 1024 x 768 monitor (speakers recommended), Windows XP® OS
Software	Supplied, with unlimited user license. Free upgrades by web download.
Warranty	1 year on instrument, manufacturers warranty on computer and monitor.

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Designed and manufactured in Australia by:

corbett ROBOTICS
A Division of Corbett Life Science

Quality System
Quality Endorsed Company
ISO 9001 Lic 23731
SAI Global