

Agilent Direct Drive Robot

Data Sheet



Applications

Microplate handling for life sciences applications

1. Drug Discovery
2. High-throughput screening
3. Compound management

4. Genomic workflows and assays
5. Cell-based assays
6. Microplate-based cell maintenance
7. Secondary screening and ADMET assays
8. Enzyme assays and more...

Introduction

Automating laboratory processes with the Agilent BioCel System enables scientists to focus on science rather than repetitive manual tasks, ensuring high throughput and reliable results. Standing on a docking table or at the core of the BioCel System is the Agilent Direct Drive Robot (DDR) – fast, precise, and designed with safety in mind. State-of-the-art direct drive technology reduces number of moving parts and eliminates the need of gears, resulting in a robotic arm that has increased reliability and speed, moving smoothly with precision and accuracy with a fraction of the inertia of comparable industrial robots, producing the safest robot for the life sciences laboratory. Innovative design revolutionizes robot teaching, minimizing setup personnel and time, and makes re-configuration of a system a matter of minutes.



Agilent Technologies

Revolutionary

One-person, one-touch teaching

Anyone can quickly teach the Agilent Direct Drive Robot with the click of a button. The new design simplifies the teaching process and enables one person to quickly integrate instruments into the system. In the teach mode, the robot arm can be freely moved to any location. At the desired teach position the robot is taught by simply pressing the button on the end effector. A three-dimensional graphic display of teachpoint locations and real-time robot movements can be used to facilitate teachpoint editing, refining, and configuring (see screen shot on right). Teachpoint options permit automatic regrip between portrait and landscape orientations during protocol runs.



One Person, One Touch Teaching results in quick addition of instruments to a System

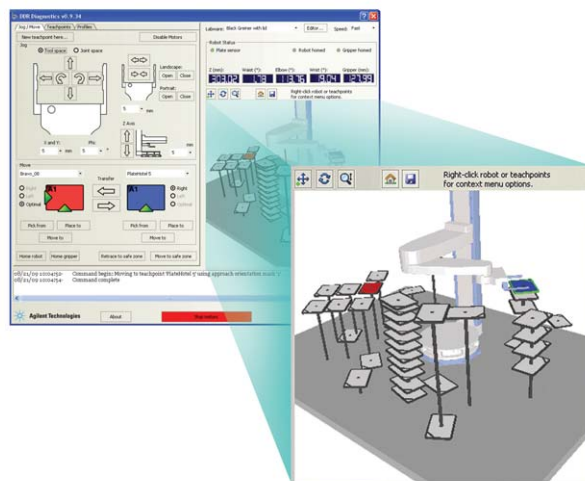
Flexible

Multiple system configurations

Portrait or landscape labware orientation: Integrated VWorks control helps the robot to determine the best path and labware gripping height from one instrument to another, whether gripping in portrait or landscape mode. Multiple gripping orientations can be defined for each teachpoint. The robot can then choose the optimum orientation for source and destination to minimize or eliminate re-gripping and take the shorter path between pick and place. Undesired approaches and orientations can be changed or excluded to avoid crashing on nearby devices.

Infinite rotation:

The Direct Drive Robot has infinite rotation on each joint, so the robot can travel the shortest distance for each move. This results in faster, more efficient processing for higher throughput.



A three dimensional graphic display of teachpoint locations and real-time robot movements can be used to facilitate teachpoint editing, refining, and configuring.

Increase your reach:

The extended z-axis travel on the Direct Drive Robot permits greater use of vertical space, therefore facilitating more instrument stacking. A self contained design frees up valuable underbench space and facilitates mounting on any solid surface. In addition, the fourth axis, or 'wrist', permits instruments to be placed in a non-radial pattern, thus increasing system density and facilitating access to off deck devices.

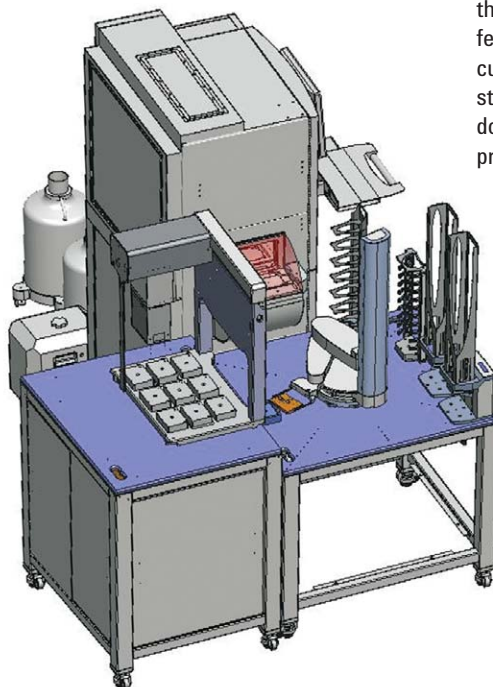
Technology

Remarkable performance with excellent positional accuracy

The Direct Drive Robot was designed from the ground up using state-of-the-art direct drive technology. By reducing the number of

moving parts and removing issues associated with mechanical gearing such as backlash, the direct drive technology combined with high resolution optical encoders at each joint help increase speed and repeatability of positioning over geared drives. This simplified construction also increases the reliability of the direct drive robot over traditional geared robots, significantly reducing the cost of ownership.

The direct drive technology combined with powerful software provides best-in-class path planning; smoothly blended movements reduce the jerk and acceleration on labware while optimizing throughput. Flexible yet simple path parameters allow users to set up move parameters to clear obstructions in the access path. Further flexibility is attained through custom pick-and-place actions. This feature allows users to select from a list of custom actions at teach points such as stirring, lidding/de-lidding, or plate push-down; alternatively, advanced users can program their own motions.



Place DDR on a rolling table and position your automation system where you need it, when you need it. Use auto docking tables for common configuration for safe docking with the click of a button or simply roll it up and quickly teach a new device.

Safety and crash recovery

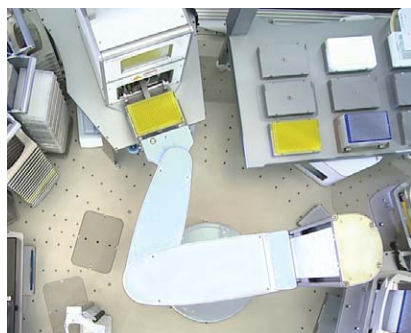
Designed specifically for life science applications unlike adapted industrial robots, the Agilent Direct Drive Robot is more forgiving in the unlikely event of a crash or interference. Direct drive technology removes gears at axis, tremendously reducing rotational momentum (2500 times lower than a common robot with a 1:50 gear ratio on its elbow). In addition, features like collision avoidance software provide emergency stops, which help prevent and mitigate crashes. Together with the unique VWorks Error Library, programmable re-tries can be set for devices with poor or tight plate holder positions.

Bringing it all together with VWorks Automation Control software

DDR is directly controlled with the proven Agilent VWorks Automation Control software providing the most advanced scheduling and path planning control available. Its outstanding event-driven controller and innovative error recovery technology is fast becoming the standard for controlling a wide range of automation systems at the world's leading pharmaceutical and biotechnology companies.

Features & Benefits

- Easy re-configuration
 - One-person, one-touch teaching
 - Integrated or on docking table
- Flexible configurations and more functionality in the same compact footprint
 - Extended vertical reach for instrument stacking
 - 360° wrist rotation for flexible instrument positioning
 - Infinite rotation on all joints for fastest plate transfers
 - Grip in landscape or portrait mode
 - 8 possible teach point orientations for fast collision-free plate transfer
- Designed with safety in mind
 - No gear design for minimal momentum on impact
 - Collision/resistance sensing and automatic emergency stop
 - Tapered robot grippers with robot's low inertia to prevent puncture or other injuries
 - Reliable and precise state-of-the-art direct drive technology
 - Fewer moving parts, higher reliability
 - More precise movements
- High resolution optical encoders for precision positioning
- Path planning with smoother more efficient robotic moves
 - Automatic re-gripping for orientation or gripper height
 - Adjustable speed/acceleration for safe liquid handling
 - Predefined and programmable custom pick and place actions



The Direct Drive Robot enables increased stacking of instruments for more functionality in a compact workspace. Here a Bravo Automated Liquid Handling Platform is stacked over an Agilent Microplate Centrifuge and an Agilent PlateLoc Thermal Microplate Sealer over a Thermo Combi dispenser.



For additional flexibility and ease of access, the Direct Drive Robot can reach off the deck of the Agilent BioCel onto docking tables. Alternatively, the DDR itself can be placed on a docking table for outmost flexibility and mobility. Docking tables with QuickDock can be quickly moved and replaced without re-teaching the instrument position enabling instruments to be used offline when not in an automated protocol.

Specifications

Transfer Time: pick and place below
4 sec average

Repeatability: ± 0.1 mm X,Y,Z $\pm 0.02^\circ$ Phi

Radial Reach: center of rotation to center of microplate: 625 mm (0-15° from radial), 600 mm (30°), 550 mm (45°), 450 mm (90°) (3D e-drawings and integration guide are available on Agilent.com)

Vertical Reach: (bottom of grippers to tabletop) 32-520 mm

Exclusion Zone: 500 mm diameter cylinder above the base (825 mm on lower 75 mm)

Travel: waist, elbow, wrist: infinite; z: 0.5 m

Grip Force: 0-2 Kg

Standard Gripper Fingers: 6 mm thick titanium, replaceable rubber gripping pads

Min/max plate dimensions:

Min 80 mm Portrait / Max 133 mm Landscape
- Supports all SBS standard labware

Payload: SBS microplates 200 g max for full speed, 500 g max

Height: 850 mm

Weight: 31.1 kg (68.5 lb)

CE marking	Standard
EM Immunity	IEC 61326-2005 / EN 61326:2006
EM Emissions	CISPR 11:2004 / EN 55011:2007 (Class A)
Safety	IEC 61010-1:2001 / EN61010-1:2001
Low Voltage Directive	2006/95/EC
EMC Directive	2004/10/EC

EMC	Standard
Canada	ICES-001:2004
Australia/New Zealand	AS/NZS CISPR 11:2002

CSA/ Safety	Standard
Canada	CAN/CSA-C22.2 No. 61010-1-04
USA	ANSI/UL 61010-1:2004

Mounting Pattern: 8 X M6 through holes on 305 mm bolt circle, also fits on 12" grid pattern 1/4-20

Teaching: one-button teaching on end effector, or jog/teach remotely at computer terminal

Collision avoidance: real-time and predictive self-collision avoidance

Operating environment: 4-40°C, 10-90% RH non-condensing

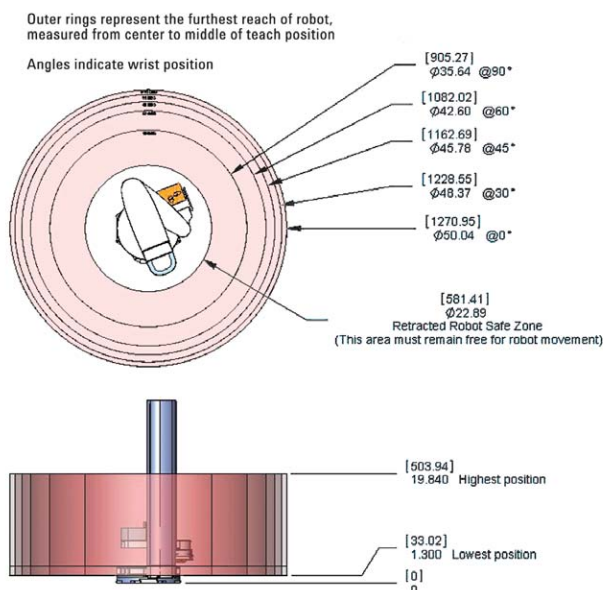
Certifications: CE, NRTL

Power requirements: (200 W typical), 10 A

Power supply: 140(h) x 444(w) x 508(d)mm

Emergency stop: collision sensing, stop pendant (2 m) and interlock

Communications: Ethernet with VWorks control (10.0.0.8.21.2009 or higher)



DDR Integration Guide. DDR Plate Reaching cylinder (to center of Labware)
[mm] / inches; angle indicates hand angle to radial direction.

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