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SiLA Rapid Integration®

4titude®

A Modular Detection System From Plug–And–Play Components Using the 4LAB™ Robot As Core Pipetting Unit

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Overview

Detection systems consist of multiple functional components like readers, PCR machines, plate sealers, plate hotels and core pipetting units. Those components are manufactured by a large number of different suppliers, each one using their own interface for communication.

This makes it difficult and costly to integrate them into an automated functional unit.

Introduction

The SiLA Consortium (Standardization in Laboratory Automation, www.sila-standard.org) develops and certifies a communica–tion standard for instruments and their control software, which allows plug-and-play combination of all instruments matching this standard. Enormous costs can this way be saved when integrating instruments. Periphery instruments can be re-used in different automation environments on a project basis, without the need to buy several for each custom combination.

Here, we present two 4titude® instruments, the 4LAB™ pipetting robot and the 4s3™ heat sealer in an automated environ–ment, plug-and-play connected to build an automated system for high throughput RNAi screening (Ribolution) using their respective SiLA drivers.
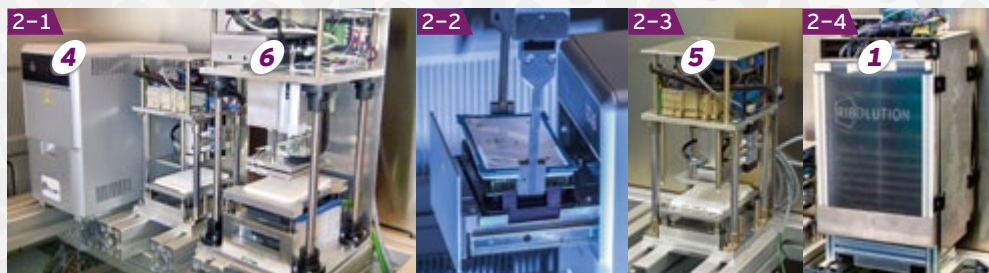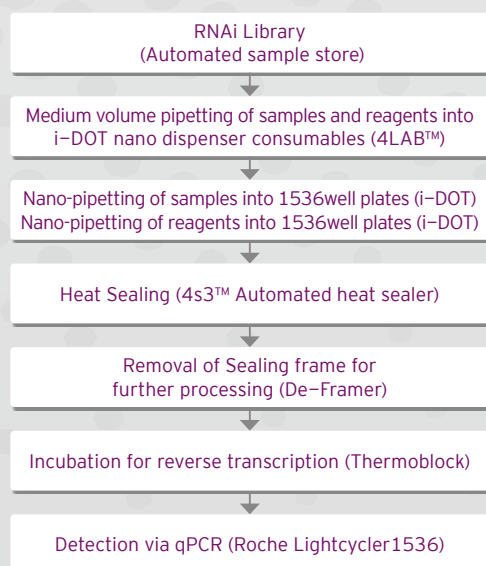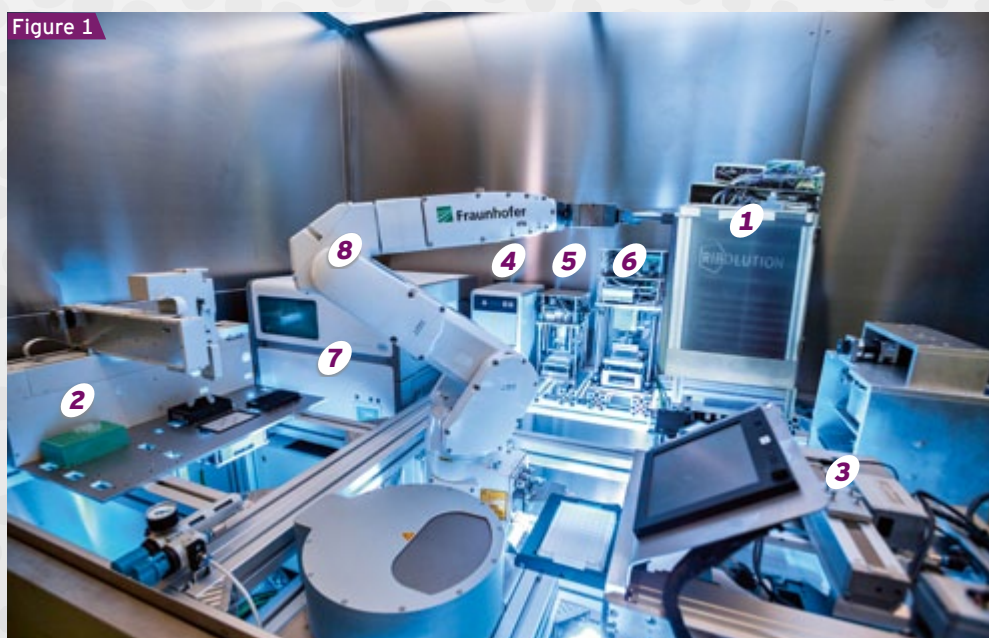
Workflow

RNAi Library
(Automated sample store)

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Medium volume pipetting of samples and reagents into i–DOT nano dispenser consumables (4LAB™)

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Nano-pipetting of samples into 1536well plates (i–DOT)
Nano-pipetting of reagents into 1536well plates (i–DOT)

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Heat Sealing (4s3™ Automated heat sealer)

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Removal of Sealing frame for further processing (De–Framer)

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Incubation for reverse transcription (Thermoblock)

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Detection via qPCR (Roche Lightcycler1536)

2–1 2–2 2–3 2–4

Figure 1

Multi–component system

Figure 1 The system features the following components:

1 Ribolution Automated sample store

2 4LAB™ Pipetting Unit for medium volume pipetting

3 i-DOT system for nano-pipetting

4 4s3™ Integrable heat sealer for heat sealing 1536well PCR plates

5 De-Framer for removal of sealing frames needed for automated heat sealing

6 Thermoblock for incubation of reverse transcription protocol

7 Roche Lightcycler1536 for high throughput RNAi screening

8 Central robot arm for transport of plates plates between the components

Automated sealing

Figure 2 Shown are the 4s3™ heat sealer (4), the De–Framer (5), the robotic thermoblock (6) and the Ribolution RNAi sample store (1). The covers of the De–Framer and the thermoblock have been removed.

2–1 4s3™ Heat sealer The instrument is fully integrable into an automated workflow. Sealing occurs sheetwise with the seals mounted into a frame needed for handling and positioning. We present here:

• the most cost effective automated heat sealer available

• a solution in line with demands of diagnostics for a sterile, single use consumable

• the most compact instrument for integration

2-2 Loading of 4s3™ sealer The robotic gripper forms a sandwich of plate and seal and inserts it into the sealer.

2-3 De-Framer This instrument is removing the sealing frame after the sealing process. The seals are mounted into the frame with a perforation that facilitates removal of the frame after sealing.

2-4 Ribolution Sample Store The RNAi sample store keeps the RNAi samples to be screened in a cooled environment.

Central gripper

Figure 3 The central gripper is moving the plates between the various components of the system.

3-1 Loading the i-DOT The gripper inserts the RNAi reservoir plate into the i-DOT nano-dispenser.

3-2 Loading a 1536well plate
The gripper operates a Roche Lightcycler 1536well plate.

Consumables

Figure 4 All kinds of consumables can be linked into a walk-away workflow.

4-1 Heat seal mounted into the sealing frame for moving and positioning.

4-2 i-Dot reservoir plate for nano-pipetting Holder (a) and 8strip insert (b).

4-3 Roche Lightcycler: 1536well plate.

Conclusion

As a core feature, the Ribolution system shows the ability to perform both small to medium volume (4LAB™) and nanoliter volume (i-DOT) pipetting in combination. This feature will become increasingly important when minimal amounts of precious samples or reagents together with larger amounts of diluents and reaction mixes must be handled at the same time.

Whereas both abilities could so far only be found in expensive, dedicated stand-alone systems, we present here not only an integrated, but also a cost-effective solution.

The system is also very robust as off-the-shelf components can be used.

This has been achieved by applying SiLA communication standards for the softwares of the instruments involved and integrating them in a simple plug-and-play fashion.
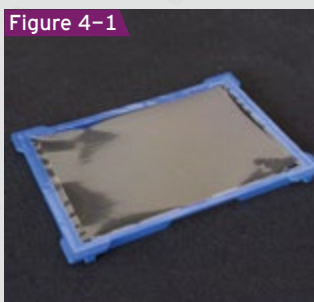

Figure 3-1
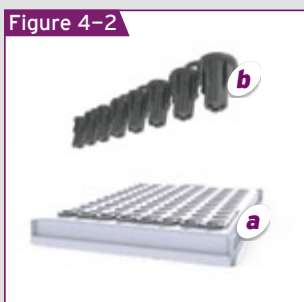

Figure 3-2

Figure 4-1

Figure 4-2

Figure 4-3