



# Instrument Business Outlook

September 2023

© Kalorama Information

# The 2023 IBO Design Awards

The annual **IBO** Design Awards recognize lab equipment and instruments that are making a contribution to the aesthetic quality and associated functionality of laboratory tools. Industrial design informs product development, engineering and manufacturing, resulting in the blending of form and function. The product not only looks good in the lab but thoroughly meets end-user needs creating an optimal experience. In doing so, the industrial design engages the end-user, enhancing product perception and appreciation.

Nominees for the **IBO** Design Awards are chosen from lab instruments and equipment that **IBO** views at trade shows, on websites and in company marketing materials. The awards are strictly based on visual appearance and how visual features improve system functionality. Performance is not considered. Criteria include originality, the use of harmonious design elements and aesthetics. To be eligible for 2023's awards, a product must have begun shipping between August 1, 2022 and September 1, 2023.

This year's awards acknowledge systems that provide a fresh take on the industrial design of well-established technologies. They do so by going beyond the boxy look of most lab instruments and by "brightening" up a lab in new ways. These instruments' designs seek to distinguish themselves visually and to invite and inform user interaction. This year's winners, which are both large and small in size as well as routine and advanced techniques, show how good design can be applied across the spectrum of lab tools.

## Gold Award: Illumina

The winner of this year's **IBO** Gold Award for Design is Illumina's NovaSeq X sequencer. The system's modern, streamlined look connotes approachability, technological advancement and sophistication. Visual features include rounded edges, colorful and modern lighting displays, and a silvery finish. User interaction features include the automatic sliding up of the touchscreen to reveal the flow cell compartment, which automatically slides out to prompt flow cell loading. Other features include a hidden optional keyboard, automated cabinet door openings and sliding drawers for consumables loading.



The NovaSeq X is designed to work with Illumina’s new XLEAP-SBS chemistry enabling greater throughput and accuracy and lower sequencing costs. Other new features include higher-density flow cells and new optics. The system can sequence as many as 20,000 genomes annually. The NovaSeq X series measures 86.4 cm (34 in) × 158.8 cm (62.5 in) × 93.3 cm (36.7 in) (w × h x d) with monitor and weighs 1,253 lb (568 kg) (dry weight).

Nick Dean, Staff Industrial Designer, Experience Design Department, at Illumina told *IBO*, “So our priority with designing this instrument was really to apply the same successful principles that helped us design the NextSeq 1000 and 2000. Those principles that we abide by are: 1) to embody precision, 2) to instill clarity, 3) to create harmony, and 4) to be pioneering.” The application of the principles is wide-ranging. “We drew on these principles as we considered the overall look and feel of the instrument and then all the way down to the consumables, both looking at the aesthetics and then the usability of those elements.” He added, “These principles, we trust and rely on them to ensure we deliver a unique, recognizable and intuitive experience that will drive loyalty to our brand, secure our position as an industry leader and further enable our company's mission.”

The NovaSeq X is the first instrument designed by an Illumina in-house design team. “At the beginning of the development process of NovaSeqX, Illumina didn't have an internal industrial design [ID] group, so we did utilize an external vendor,” explained Mr. Dean. “But recognizing the value of design, we started building out our internal team, and we hired on the two outside consultant designers who were working on NovaSeq X. This

transition became the foundation of our internal team, and the ID team is now part of our larger experience design team.”

The overall approach was focused on the users’ total experience. “What we tried to focus on was streamlining our users’ experience, so removing the elements that distract or add confusion to their workflows, and make it clear where to place elements, clear when things need to be replaced, and [to make it] easy to interact with things like waste bottles or reagent bottles,” explained Mr. Dean. “We added things like poka-yokes so you can’t put [the consumables] in backwards. You always get it in right the first time.”

---

*“One of our experience design principles is to ‘guide with light.’”*

---

Among the elements streamlining the user experience and creating a modern look is the NovaSeq’s lighting displays. “One of our experience design principles is to ‘guide with light.’ We use the lighting to help guide the user through the entire setup process, whether they’re placing a flow cell, replacing a buffer bottle, [etc.],” said Mr. Dean. “Then [we use the lighting] to also indicate from across the lab where that instrument is in the sequencing process, if there are any issues, where those issues might be located and how to troubleshoot them. Then that lighting will move between both the display and the instrument itself to really combine the physical and digital experiences.”

Mr. Dean provided one example of how the large lighting display on the front of the NovaSeq X directs user interaction. “There’s lighting on that front face, that large pill lighting, that gives you broad direction. So let’s say it’s your waste bottle that needs to be emptied, the light will move down towards that edge of the instrument.” This guidance extends to inside the system. “Then when you open the doors, there’s additional lighting above the drawers that will point you to exactly where you need to go.”

Echoing the look of the lighting in the lower cabinet, the half-circle-shaped lighting display above the flow cell compartment was designed partly in response to end-users. “We call that our ballet of motion, and [it] reveals sort of the secondary surfaces of the interior of the instrument. As it opens, the light illuminates that interior space, and that was responding to customer feedback saying they wanted to be able to see the flow cells better to inspect them,” noted Mr. Dean. “But that light also indicates which side to interact with, where to place the flow cell. If you need to troubleshoot, it’s going to point you to which flow cell you need to troubleshoot.”

The ergonomics of the system are also an important function of the design. Highlighting some of the ergonomic touchpoints of the NovaSeq X, Mr. Dean discussed the reagent cartridge. “We really focused on making it easy to pick up and grab from both in the instrument or on the counter. Previous cartridges you had to scoop up. We really wanted something really nice and simple to grab from the sides.” Ergonomic considerations also extended to the other consumables. “Another is the buffer bottle and how we positioned the handle on that.”

Another notable aspect of the design is the color and finish, which ties the NovaSeq X to the design of other Illumina’s sequencers but presented design challenges. “Our NextSeq instruments are polished aluminum or textured aluminum. Due to weight considerations, we couldn't get textured aluminum on an instrument at this scale, so it is painted. But we worked really closely with our paint suppliers to get a match,” explained Mr. Dean. “We have samples that we like to put out in front of some of our partners where you literally cannot tell the difference unless you feel it. It was important for us to stay consistent, but we did have to exist within certain bounds.”

Another design consideration was the size of the NovaSeq X. “When you're designing something like a refrigerator or home appliance, you really have to think about the whole journey that something like that is going to go through, so for NovaSeq X, we had to imagine not just living in the lab but being installed in the lab,” noted Mr. Dean. “We worked very closely with our engineering partners to make sure that we could fit the power that's in the NovaSeqX instrument into a package that would allow it to be moved through doorways into our customers’ lab, and either take the place of existing instruments or live among other instruments in those labs.”

Design choices also extended to sustainability. “Additionally, we're very focused on our environmental footprint. We've worked closely with a lot of our internal partners be it engineering, operations or marketing to reduce the amount of plastic we use in those consumables,” said Mr. Dean. “In the end, we were able to reduce our plastic use by 50%.” He also noted that consumables are easy to break down, encouraging recycling, and some of them are made of bioplastics.

Mr. Dean views the NextSeq X’s industrial design as integral to the diversity of the system’s uses and applications. “We considered really every possible use of the instrument, whether that's in large or small labs, in IVD [or] RUO use cases, and what we were focused on is really creating a consistent experience across assays and across customers. We didn't

want to just appeal to one customer. We want this machine to appeal to anyone who may be able to use it in the future for new or traditional applications.” This is particularly relevant in the life sciences, according to Mr. Dean. “We’re really focused on creating a more approachable language to our instruments. The field of genetics is growing rapidly and becoming more and more accessible, and so we don’t want our instruments to alienate potential users or to appear more difficult than they need to be. It’s really important for us to help guide genetics and genetic science into a more accessible and user friendly era.”

Mr. Dean emphasized that the creation of the NovaSeq X was a team effort that found him working closely with every part of the company. Emily Rorem, Senior Director of Product Management for Illumina, told *IBO*, “The customer was forefront of [the teams’] minds in terms of the design and really being thoughtful about, ‘What are the areas that we can improve experience and workflow for the customer?’ There was a lot of customer shadowing to understand where there were pain points and opportunities for improvement.”

Ms. Rorem also emphasized customers’ appreciation of the NovaSeq X’s design. “We’ve had such a customer response associated with the beauty of this instrument,” she said. “I think it’s a very unique situation in an industry like the life sciences industry or even the diagnostics industry to have instrumentation be highlighted in such a way. Our customers are proud and excited about the potential it will deliver to their work. They post pictures and selfies of the instrument.” This sentiment is evident in end-users’ everyday interaction with the instrument as well. “We even had customers say that it’s such a beautiful presence in their laboratory, it makes it enjoyable to look at and desirable to use,” noted Ms. Rorem.

## Silver Award: Azenta Life Sciences

The winner of the 2023 *IBO* Design Silver Award is Azenta’s Cryo Store Pico cryogenic storage system. The system is designed for LN<sub>2</sub>-based automated storage of up to 8,800 2-mL vials at 190°C. It supports cold chain handling and real-time inventory control and features temperature stability during retrieval as well as a 10-day emergency hold time. Azenta used an industrial design firm in developing the Cryo Store Pico. The system measures 4.8 ft x 3.6 ft x 7.11 ft (144.2 cm x 108.5 cm x 241.5 cm).



The Cryo Store Pico’s unique color scheme, sweeping curves and scooped-out open corner suggest a unique system, ease of use and accessibility. The use of color and the placement of rounded corners in relation to angled edges invite user interaction. An automatic door slides open allowing users to easily submit or retrieve samples.

The design of the Cryo Store Pico marked a different approach for Azenta. “The original design idea for the Pico was a miniature version of our existing product line, the B3C, but as we considered our target applications and users we realized there was an opportunity to do something really special,” explained Erica Waller, Product Manager for Azenta Life Sciences’ Automated Cryo Systems. “We took all the familiar parts of cryo storage, the stainless steel tank, the steps people must stand on to see into the freezer, even the freezer controller itself, and we put them inside cabinetry.”

In this way, the design of the Cryo Store Pico better addresses users’ needs. “Our target users are scientists and clinicians, working to bring advanced therapies to market, with the highest degree of safety, quality and speed possible” said Ms. Waller. “We realized that these users don’t want to worry about their cryo storage protocols; they want to focus on creating the best possible outcomes for their patients. Taking those familiar visuals away helps bring the focus back to where it belongs: on the patient and on the samples they need for treatment.”

The Cryo Store Pico also marks a first for the company. “This was our first industrial design using our new corporate branding as Azenta Life Sciences, so we had a lot of fun testing out the different color options before we landed on black and purple,” noted Ms. Waller. “Our internal R&D team took it from there, to figure out how to break it into manufacturable pieces.”

Design priorities for the Cryo Store Pico included safety. “The first concern, as always, was user and sample safety. We considered the ergonomics across a variety of shapes and sizes, especially smaller heights to ensure the best possible user experience for anyone working in cryo storage and retrieval. Non-automated retrieval is a very physically demanding process of standing on steps, reaching into tanks full of LN2 and vapor, and lifting heavy racks of samples in and out,” commented Ms. Waller. “With the Pico industrial design, we were able to streamline the process to users simply opening a small door to add or remove boxes of samples. Under the cabinetry, we have our proven automation keeping watch over the samples and ensuring they stay cold and are accessed only with appropriate permission.”

---

*“We wanted users to look at the Pico and feel empowered, knowing that the samples inside are protected and available to authorized users with a few simple clicks.”*

---

A second priority was user interaction. “The Pico is designed to fit where it’s needed, especially in rooms with standard ceiling heights of eight feet, so we wanted to present a clean and streamlined appearance that would be approachable for all kinds of users,” according to Ms. Waller. “When people think about automation, they often think of sophisticated and highly technical machinery that requires special skills to operate.” The design addresses these concerns. “With the design of the Pico, the visuals of the automation and freezer are replaced by a touchscreen with our intuitive software interface. The experience becomes more approachable, focusing on the sample rather than the details of how that sample is managed,” said Ms. Waller. “We wanted users to look at the Pico and feel empowered, knowing that the samples inside are protected and available to authorized users with a few simple clicks.”

Ms. Waller also described some of the other design challenges. “This was the first time we’d ever built anything like it. Our internal R&D team spent countless hours on the phone with our suppliers to work out how to create such large panels with the proper stiffness to support the weight and curvature to fit all together into a cohesive cabinet design,” she



recounted. “The installation and manufacturing teams worked closely with R&D to find the best way to install the assembly to minimize gaps between panels and time to install. At one point, there were parades of people carrying around the frame to simulate the rigors of travel in the back of a truck!” The ultimate result was a more movable instrument. “A lot of love went into this project, and I am so proud of the team who achieved the final result: a system that can be taken through doorways and standard elevators to be assembled efficiently wherever it’s needed.”

Regarding the Cryo Store Pico’s relationship to sales and marketing, she told *IBO*, “I would say the industrial design has been very important to the Pico’s marketing and sales, it certainly turns heads wherever it goes! The aesthetic of cryo storage really hasn’t changed since the 1950s, with the creation of the first high-efficiency freezers to serve the animal husbandry market.” Thus, it was time for a change. “As times have changed and the need for cryo storage in biotech has developed, the industrial design has been the last thing on manufacturer’s minds. If you walk into any large pharma biobank today, it would look indistinguishable from the storage facility of a steer breeder,” as she described it. “We think the market is ready for a change, and the Pico is here to challenge the idea that cryo storage must be an eyesore, hidden away in a basement. It can be beautiful, it can be easy to use, and it can be something to be proud of.”

## Bronze Award: Starlab

The winner of *IBO*’s 2023 Bronze Design Award is the Starlab Minicentrifuge. The standard minicentrifuge design is well known, often a bubble-top configuration. Starlab reimagined the design to combine a square base, rounded corners, sloping edges and prominent shapes. The design communicates novelty and modernity as well as ease of use. The two-color scheme highlights touchpoints. The overall design also blends with the design of the Starlab logo.



The Starlab Minicentrifuge measures 6 in x 4 in x 5 in (160 mm x 112 mm x 130 mm) and weighs less than 2.6 lb (1.2 kg). Applications include microfiltration, cell separation and quick spin downs. It offers a maximum speed of 2,500 x g (6,500 rpm) and a choice of rotors. The tube rotor can hold up to eight 1.5/2.0 mL microfuge tubes or eight conical/skirted screw cap microtubes. The PCR strip rotor can hold up to four 0.2 mL eight-strip tubes or 32 0.2 mL single PCR tubes. The noise level is 55 dBA.

The industrial design enables an important functionality: the system can be operated with only one hand. This is enabled by design features that increase usability as well as intuitiveness including the quick-start lid closure, one-touch stop, tool-free rotor exchange and magnetic lid. Starlab worked with industrial design firm TEAMS Design on the system.

---

*“We believe that an appealing, state-of-the-art product design has a positive impact on the buying decision.”*

---

The system marked a new aesthetic for the company. “Our aim was not only to design for the centrifuge, but to have a concept that can be extended to other small laboratory devices and create a recognition value,” stated Stefanie Josewski, Head of Marketing and Product Management for Starlab. “The instrument also reflects the value of industry design to sales. As she described it, “We believe that an appealing, state-of-the-art product design has a positive impact on the buying decision.” The industry design is even incorporated into the product’s tagline: We love every curve. Except the learning curve.

Influencing the Starlab Microcentrifuge's industrial design were the constraints and needs of end-users and the marketplace. For example, said Ms. Josewski, "The size limitations was a topic imposed by the market and the competition, with a specified minimum number of samples." Another factor informing the design was the spin down function, which Ms. Josewski described as, "the short centrifugation of the sample to collect liquid droplets on the wall at the bottom." Starlab also wanted the system to do this without the need for programming and with quick, safe access to the sample.

As Ms. Josewski explained to *IBO*, all of these needs were addressed through the industrial design. "The lid which, in addition to its safety function ([by providing] no access to rotating rotor), also takes over the function of the start button." Once the lid is closed, the system starts automatically, simplifying operation. Similarly and intuitively, once the stop button is pushed, the lid opens automatically.

Another application requirement described by Ms. Josewski was use with different sample tubes as well as the aim of "no need for complicated rotor solutions [and] no great effort [required] in using different tubes." The solution, she explained, was "simple 'click' rotors that can be easily unlocked and locked (simply plugged on)." She added, "This makes the system flexible and allows for quick changeover of tools."

Another key design feature is the magnetic lid lock. According to Ms. Josewski, it replaces complicated and potentially error-prone mechanical locking systems.