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ISTRUZIONE
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Ministero dell'Università e della Ricerca

Italiadomani
PIANO NAZIONALE DI RIPRESA E RESILIENZA

VITALITY

Work Package 3: Advanced drug delivery systems and in vivo theranostic tools for personalized medicine

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Ud'A

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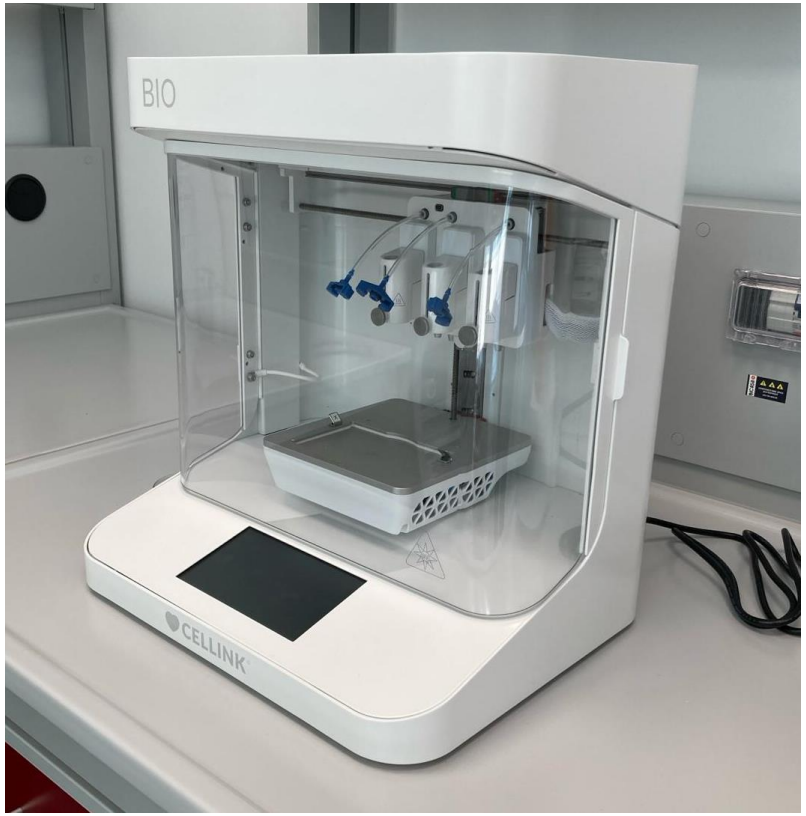
COSMOB TECHNOLOGICAL CENTER

MECCANO



The **BIO X** 3D printer is classified as a bioprinter among additive manufacturing technologies.
It allows the use of different types of materials of biological, semi-synthetic and synthetic origin with the possibility of adding cell cultures into the construct.

General applications
The fields of application are varied both in the pharmaceutical field with the production of drugs or medical devices and in the biological field with the possibility of building complex in vitro systems containing or not cells.

Technological and industrial applications
Materials
Polymers
Pharmaceutical
Biological
Tissue engineering

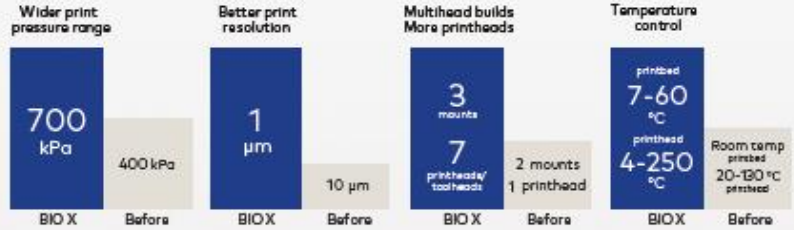
Available techniques
Temperature-controlled printing bed
Clean print chamber technology (UV HEPA filter)
Classic pneumatic syringe print head
Temperature controlled pneumatic syringe print head (4-65°C)
Pneumatic print head for extrusion of thermoplastic materials (up to 250 °C)

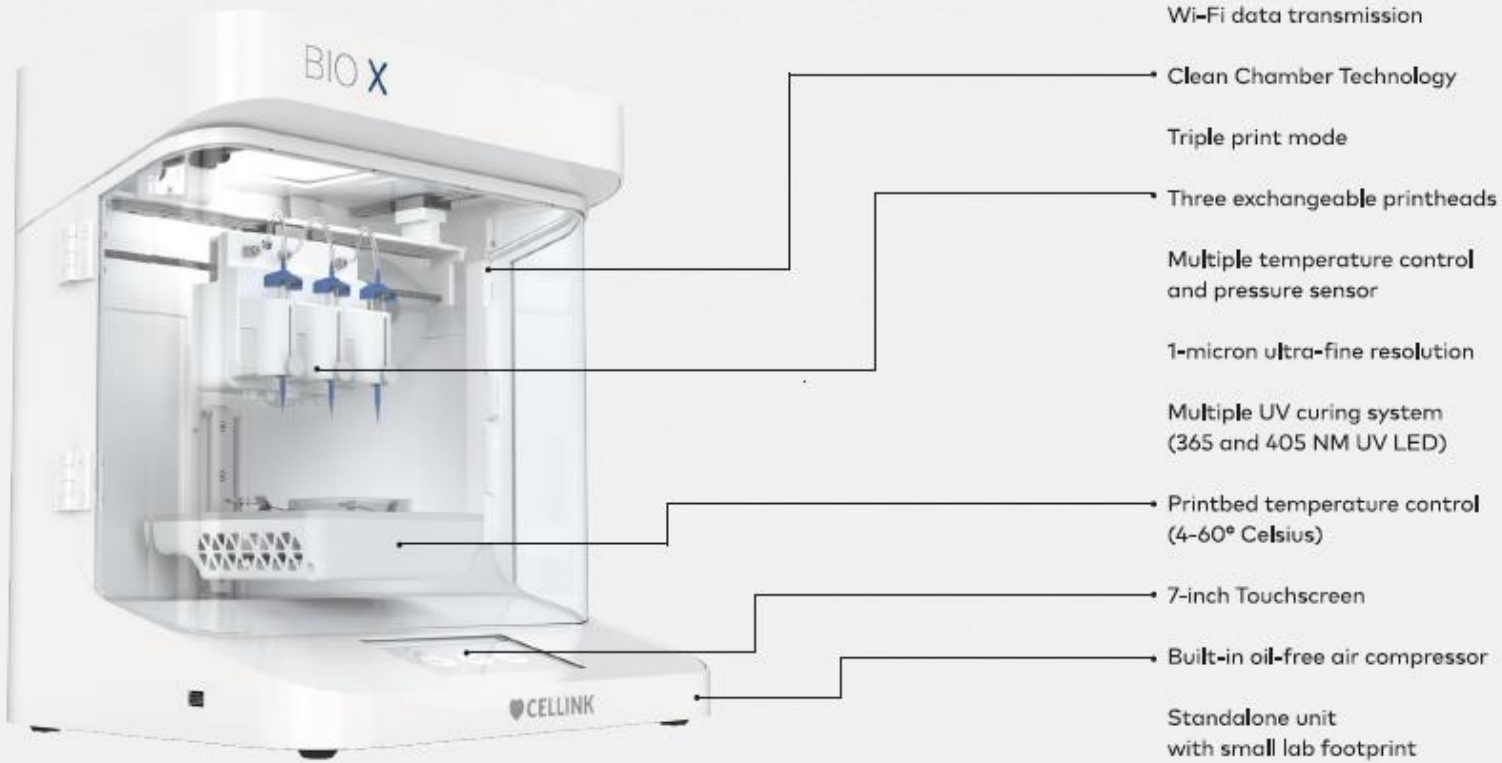
Meet the BIO X

BIO X is the most user-friendly and flexible bioprinter in the world, providing the user with an unparalleled bioprinting experience. The built-in features along with the new BIO X software managed through the large touchscreen display minimize the learning curve and ensure you will receive the results you want.

Bioprinted tissue can be used in drug discovery where researchers can test new potential treatments and evaluate efficacy in very early stages. New drugs and treatments will potentially reach clinical trials faster with a decreased number of failures and reduced need for animal testing.

BIO X is the next-generation bioprinter, bringing scientists closer to the future of medicine.





Wi-Fi data transmission

Clean Chamber Technology

Triple print mode

Three exchangeable printheads

Multiple temperature control and pressure sensor

1-micron ultra-fine resolution

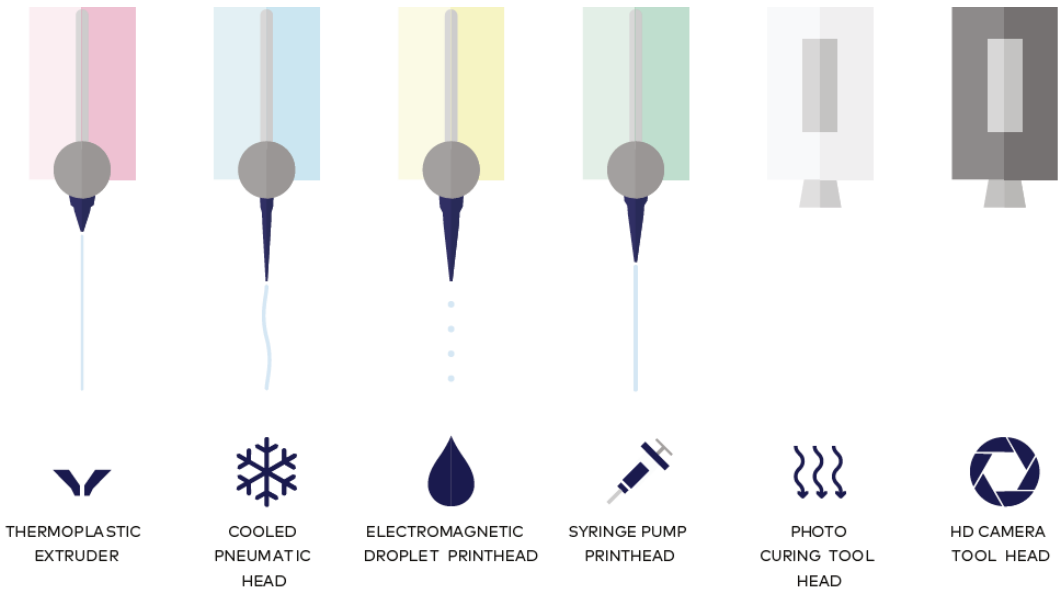
Multiple UV curing system (365 and 405 NM UV LED)

Printbed temperature control (4-60° Celsius)

7-inch Touchscreen

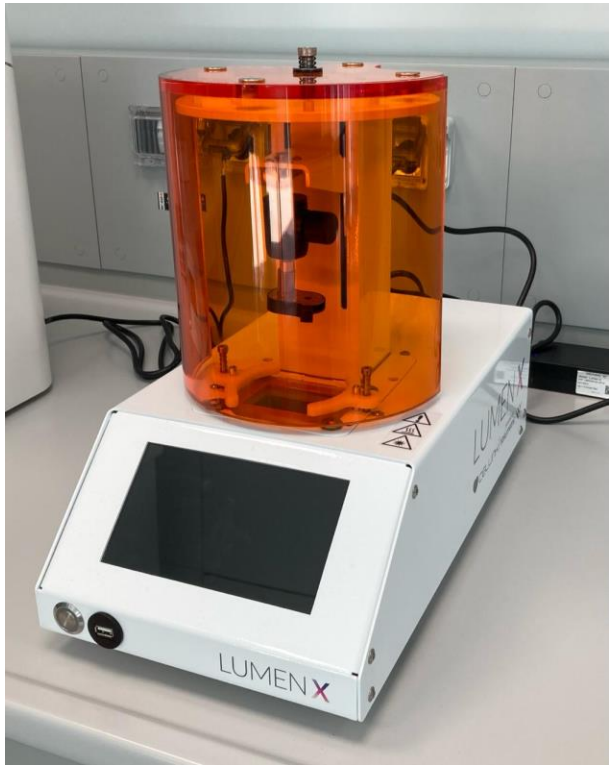
Built-in oil-free air compressor

Standalone unit with small lab footprint



LIST OF BIOINKS AND THEIR PRINTING EXTRUSION METHODS

	Pneumatic-driven Extrusion	Piston-driven Extrusion (syringe)	Inkjet	Thermoplastic Extrusion
Gelatin Methacryloyl	✓	✓	✓	
Collagen methacryloyl (Collagen solution and precipitated)	✓	✓	✓	
Hyaluronan	✓	✓	✓	
Alginate	✓	✓	✓	
Chitosan	✓	✓	✓	
Silk	✓	✓		
Nanocellulose	✓	✓	✓	
PEG/PEGDA	✓	✓	✓	
Fibrinogen/thrombin	✓	✓	✓	
Decellularized ECM	✓	✓	✓	
Pluronics F127	✓	✓	✓	
PropyleneG lycol	✓	✓	✓	
Polycaprolactone	✓ (heated)	✓ (heated)		✓
Polylacatic Acid				✓



The **Lumen X** 3D printer uses DLP (Digital Light Processing) technology among additive manufacturing technologies. It allows the use of different types of photopolymerizing materials dedicated to this process with the possibility of adding cell cultures into the construct.

General applications

The fields of application are varied both in the pharmaceutical field with the production of drugs, medical devices and production/analysis devices and in the biological field with the possibility of building complex in vitro systems containing or not cells (e.g. Organ on chip).

Technological and industrial applications

Materials
Polymers
Pharmaceutical
Organic
Medical

Available techniques

Material containment tank at controlled temperature (up to 60°C).
Autoclavable printing plate
XYZ axis accuracy up to 50 µm

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• Leverages more than 1 million simultaneous points of light to bioprint microscopic features down to 200 microns.

• Photographically cures entire layers at once to crosslink structures 50 times faster than other printing methods.

• Complements the state-of-the-art capabilities of CELLINK's BIO X system. You can use BIO X to print living cells within a Lumen X-fabricated structure and strengthen your work in applications like organ-on-a-chip and multimaterial research.

Our Photoinks

Browse our entire category of photoinks for bioprinting with the LUMEN X series and BIONOVA X. Click on the links to learn more about the bioinks and their individual attributes.

Universal Photoinks

PEGDA Photoink

» PEGDA Soft - Photoink Kit
» PEGDA X

GelMA Photoink

» GelMA 95% DS - Photoink Kit

BIONOVA X

PEGDA Photoink

» PEGDA-INK

Alginate Photoink

» PhotoAlginate-INK

GelMA Photoink

» PhotoGel-INK 95% DOS
» PhotoGel-INK 50% DOS

HAMA Photoink

» PhotoHA-INK Stiff
» PhotoHA-INK Soft

Related biomaterials

Photoinitiators

» Xcite
» Irgacure 2959
» LAP
» Ruthenium

Photoabsorbers

» Xsorb

Technology and hardware

Projection stereolithography
>1 million simultaneous points of light
Projected image: 1280 x 800 pixels
Pixel resolution (XY): 50 µm
Z-precision (motor-driven): 5 µm
Max build volume:
64 x 40 x 50 mm (Metal platform)
40 x 25 x 50 mm (Glass platform)

Projected light

Biocompatible wavelength: 405 nm
Intensity range: 10 – 30 mW/cm²
Distortion: <1%

Additional features

Disposable, quick-change sterile vats
Heated platform: Up to 37° C

The rotational **Rheometer MCR302e** is an instrument that allows you to determine rheological parameters (viscosity, elastic modulus, plastic modulus, fluidity, smoothness, etc.) of fluid systems (melts, solutions, suspensions, emulsions, pastes, gels and colloidal systems).

General applications

The technique finds application in various sectors such as the plastics sector (for evaluating the processability of a polymeric material), the cosmetic, pharmaceutical and food sector (for quality control analysis of creams, gels, etc.) and the biological/medical sector (in particular for hemorheology analyses).

Technological and industrial applications

Materials science
Polymers
Pharmaceutical & Biopharmaceutical
Food
Medical
Cosmetic

Available techniques

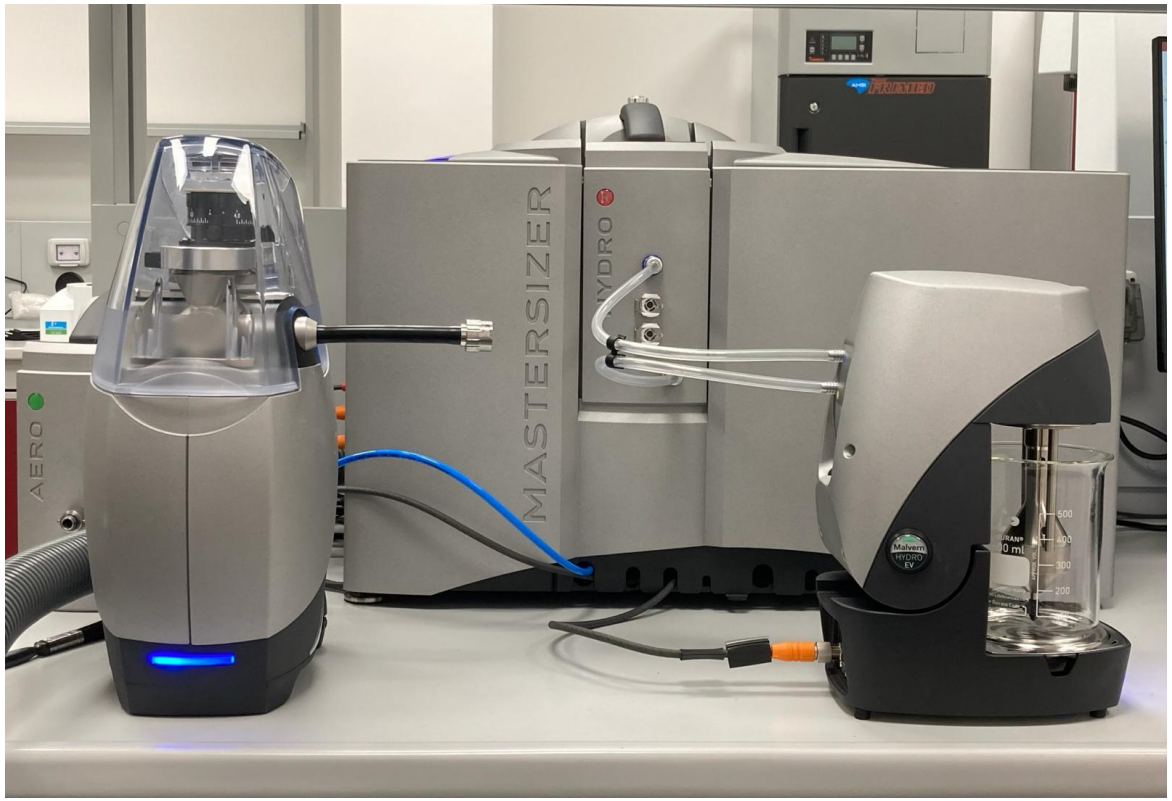
Compact modular rotor with thermostatic bath
Plate-to-plate and plate-to-cone measuring systems
Peltier for temperature analysis (from -10° to 220°C)
Oven for temperature analyzes (from -10 to 600°C)
Rheocompass software for data reprocessing

MCR 302e

IL REOMETRO UNIVERSALE AFFERMATO PIÙ VENDUTO. PUNTO DI RIFERIMENTO SUL MERCATO PER TEST QC AVANZATI E RICERCA REOLOGICA. SI ADATTA A TUTTE LE VOSTRE ESIGENZE ATTUALI E FUTURE.

- Intervallo di coppia da 0,5 nNm a 230 mNm
- Gestione termica attiva del motore e del cuscinetto per misure a lungo termine anche a coppie elevate
- Regolatori adattivi al campione (TruStrain™, TruRate™) inclusi
- Più spazio per la manipolazione dei campioni e la sostituzione degli, piena compatibilità con il CTD 1000

	Cilindro concentrico(CC)	Doppio gap (DG)	Piatto-cono (CP)	Piatto parallelo (PP)	Agitatori	Sistemi tribologici	Sistemi a polvere	Afferraggi DMA
Liquidi a bassa viscosità	✓	✓	✓	✓	✓	✓		
Liquidi viscoelastici	✓	✓	✓	✓	✓	✓		
Materiali allo stato fuso			✓	✓				
Materiali pastosi			✓	✓	✓	✓		
Materiali tipo gel			✓	✓		✓		
Solidi soffici				✓		✓		✓
Sistemi reattivi				✓				
Polvere	✓				✓		✓	
Solidi						✓		✓



MASTERSIZER 3000
The granulometer is based on the principle of laser diffraction. It offers a wide resolution range for dry and wet sample analysis.

General applications
The fields of application are varied both in the pharmaceutical, cosmetic, nutraceutical, but also food, biomedical fields and in the analysis of materials for different types of industries.

Technological and industrial applications
Materials
Polymers
Pharmaceutical
Cosmetics
Nutraceutical

Available techniques
- The Aero S (dry) sampler can handle particle sizes ranging from 100 nm up to 3.5 mm.
- The Hydro EV (liquid) sampler uses 250, 600 or 1000 ml beakers to analyze emulsions/suspensions with dimensions from 10 nm to 2 mm.

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Aero M dry powder disperser

Bulk dry powder dispersion

The Aero M is an entry-level dry powder disperser for the Mastersizer 3000E, enabling particle size distribution measurements to be made for bulk dry powder samples. Its design achieves robust particle size measurements in industrial applications and also ensures it is easy to maintain during routine use.

The use of dry powder dispersion for particle size measurements is advantageous when measuring bulk materials, as a large mass of powder can be measured. This ensures effective sampling is achieved. In addition, dry powder dispersion avoids the need for liquid dispersants, reducing the cost of measurement and increasing sample through-put.

Specifications

Parameter	Specification
Measurement modes	Manual measurement sequence control
Measurement size range	0.1 - 1000 µm †
Dispersion pressure range	0 - 4 bar
Pressure setting precision	+/- 0.1 bar
Pressure setting accuracy	+/- 0.03 bar
Feed rate range	0 - 58 ms-2 (expressed as 0-100%)
Feed rate precision	+/- 2% FS
Materials in contact with sample ††	316 stainless 410 hardened stainless Borosilicate glass EPDM PTFE Polyurethane Carbon filled acetal Aluminium Neoprene
Maximum particle size	1000 µm †
Minimum time between measurements	less than 60 sec*
Dimensions	260 mm x 180 mm x 380 mm (L x W x H)
Mass	10.5 kg

† Sample dependent. Relates to the use of the unit with the Mastersizer 3000E, which also has an upper size limit of 1000 µm
†† Ceramic venturi dispersers are available for use with abrasive samples

- Measures dry powder particle size distributions over a 0.1-1000 µm range
- Manual measurement control, with appropriate user prompts provided to help ensure reproducible measurements are made
- Configurable for different applications through the purchase of additional sample trays and powder hoppers
- Abrasive samples can be measured through the use of ceramic venturi dispersers.

Hydro EV

Flexible volume wet dispersion

The Hydro EV has a unique dip-in centrifugal pump and stirrer design that achieves full and rapid dispersion in standard laboratory beakers, allowing close matching of the dispersant volume to the application requirements. Following measurement, the dispersion head can be raised out of the beaker, enabling quick cleaning and sample recovery.

- Compatible with 250 mL, 600 mL and 1000mL laboratory beakers
- Patented 40 W in-line sonication probe, for rapid agglomerate dispersion
- Dip-in centrifugal pump and stirrer design
- Sample easily recovered following analysis
- Chemically compatible with a wide choice of organic and inorganic dispersants
- Full software control of pump / stirrer and sonication
- Integral sample tank light.

Specifications

Parameter	Specification
Pump speed range	0-3500 rpm †
Pump speed resolution	+/- 10 rpm
Pump speed accuracy	+/- 50 rpm
Maximum flow rate	1.7 L/min †
Sonication power & frequency	40 W max, 40 kHz (nominal) †
Volume	250 mL / 600 mL / 1000 mL (using lab beaker)
Materials in contact with sample	316 stainless Borosilicate glass Tygon® FKM (cell seal only - FFKM available) PTFE PEEK Titanium Nitride
Maximum particle size	2100 µm † †
Minimum time between measurements	less than 60 sec † †
Dimensions	220 mm x 150 mm x 300 mm (L x W x H)
Mass	4 kg

† Dispersant dependent †† Sample dependent


Manual Measurement - Sample
Measurement: 5 of 5...
Result view
Laser
Light Scattering
Size Distribution
Energy
Detector Number
Volume (%)
Particle Size (µm)
Trend view
Dv 10
Dv 50
Dv 90
Statistics over 6 records
µm
Record Number
Stirrer
2000 rpm
Ultrasound
50 %
Enable pulsed sonication
Manual
Timed
Dispersant
Automatic Fill
Empty
Drain valve
Dispersant valve
Open
Closed
Cell is fitted.
Dispersant Temperature: 23.1 °C
Stirrer Speed: 1997 rpm
Hydro MV
Cell is fitted
Dispersant Temperature: 23.1 °C
Stirrer Speed: 1997 rpm

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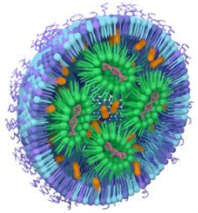
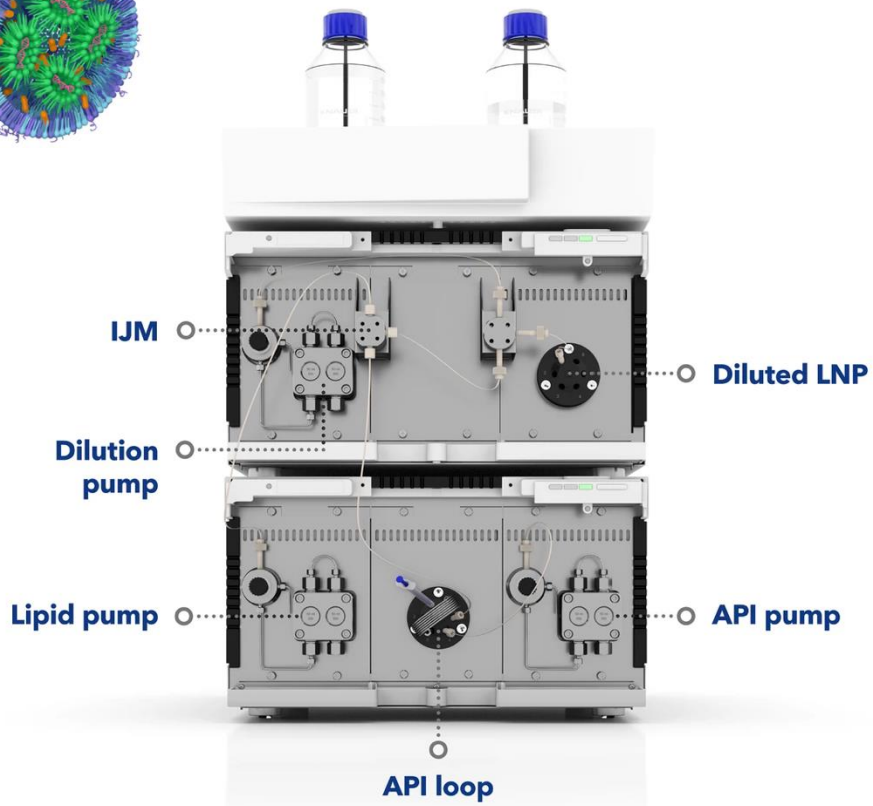
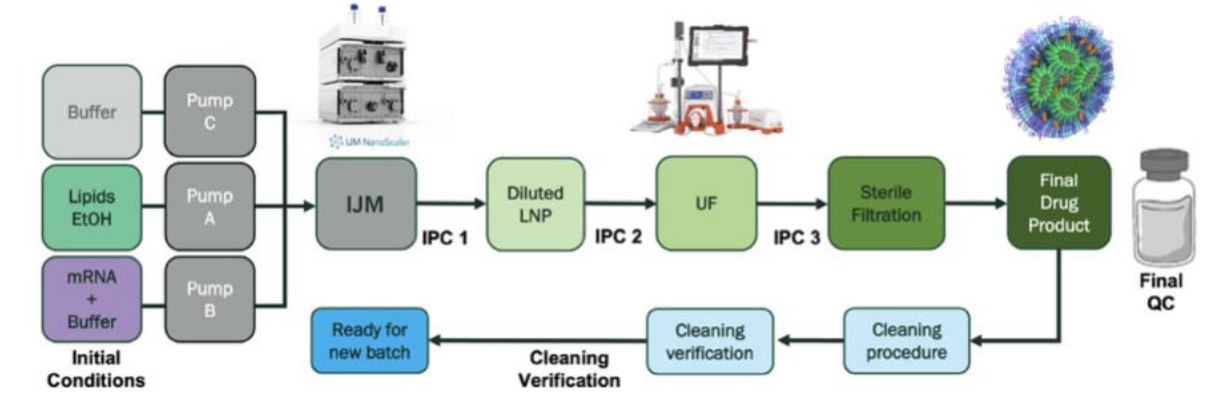




Development and optimization of LNP formulations – using the KNAUER NanoScaler



Initial Conditions	IPCs	Cleaning Verifiction	Final DP QC
Lipid identity and concentration (HPLC-CAD, MS), mRNA content (UV-Vis) and identity/integrity (CE, LC), pH, buffer content (IC)	Size and polydispersity by DLS (Stunner), mRNA encapsulation (Fluorescence assay), mRNA content (UV assay) (Stunner), mRNA integrity (gel or capilary electrophoresis), pH	Sampling and empty run Lipid concentration (HPLC-CAD), mRNA concentration (UV-Vis, LC, CE). Buffer concent (IC), TOC	Particle size, distribution & z-potential, API identity & total concentration, API % encapsulation, Total API (RNA) purity, Lipid and polymer excipient identity & concentration, Impurities, Sterility, bioburden, SVP

Fig. 1 Process workflow for LNP formulation using NanoScaler.