

HEALTHCARE MANUFACTURING SOLUTIONS AT SCALE IN EUROPE

CHALLENGES – SOLUTIONS –
OPERATIONS

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Business Development Director

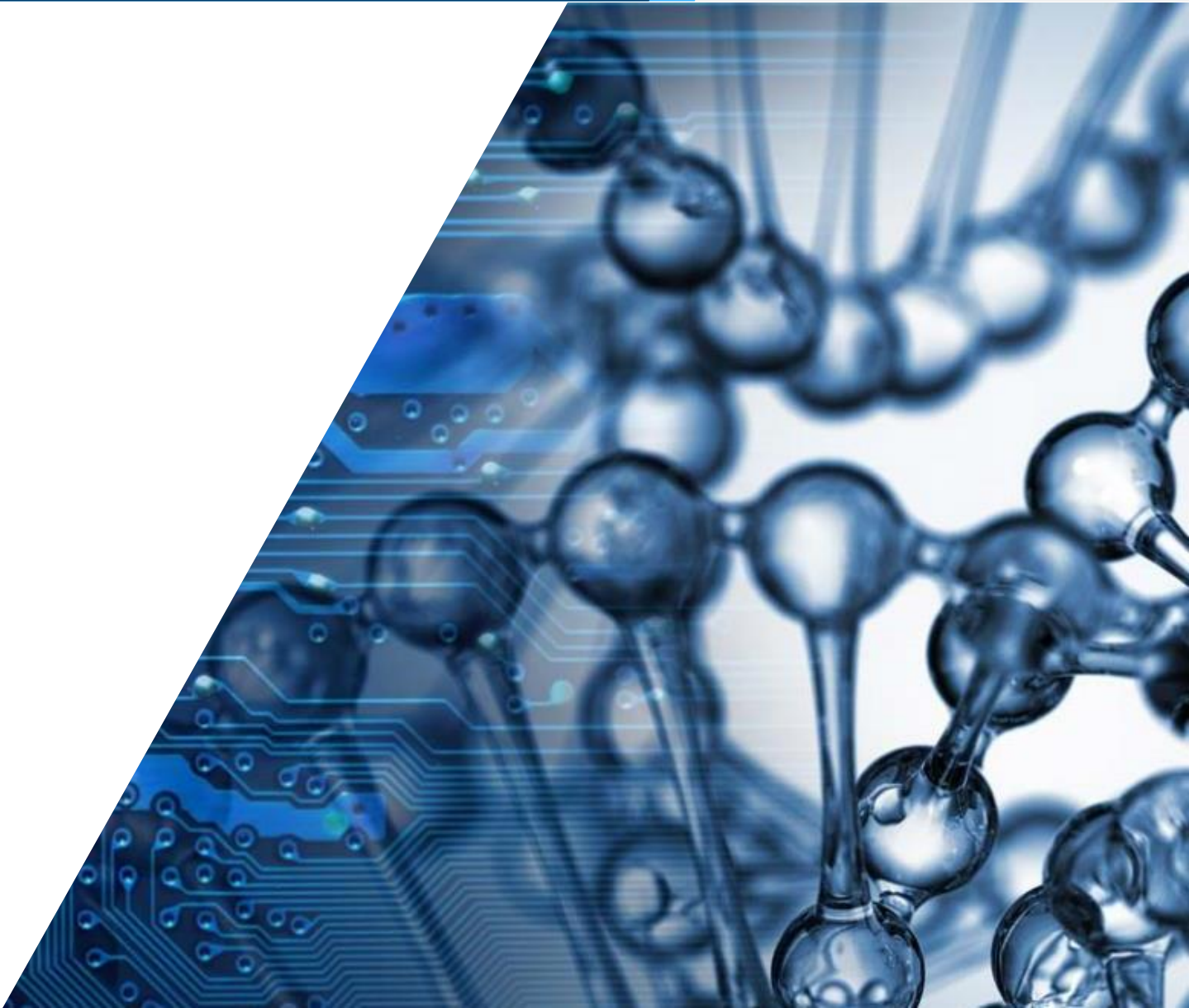
JABIL



Challenges on the Market Today

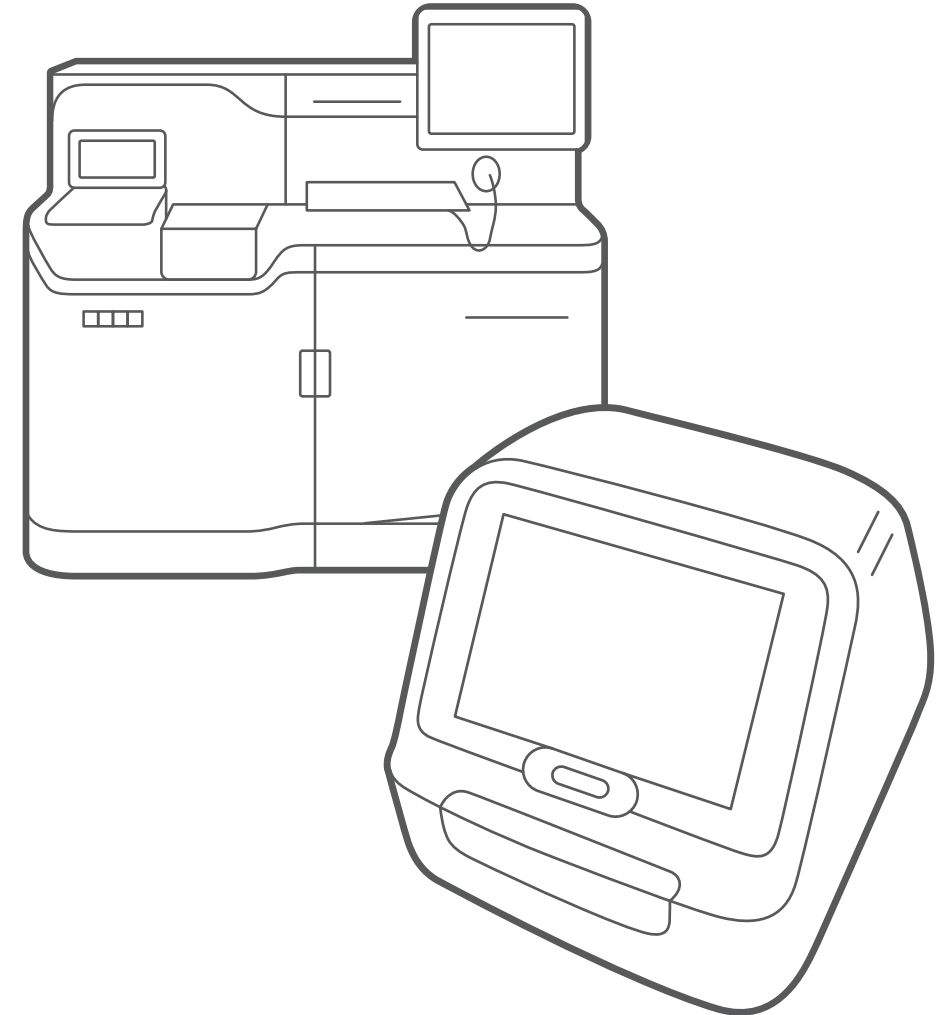
Solutions

Global / European Operations



Challenges with Devices on the Market Today

- Devices are not mobile — need smaller, Point of Need form factor
- Need more sensors integrated into device
- Need ready-to-use closed cartridges
- Manual identification of consumables is bothersome
- Devices are difficult to use
- Need more cost-effective solutions
- Need modular versions of the device
- Need higher accuracy



Challenges on the Market Today

Solutions

Global / European Operations

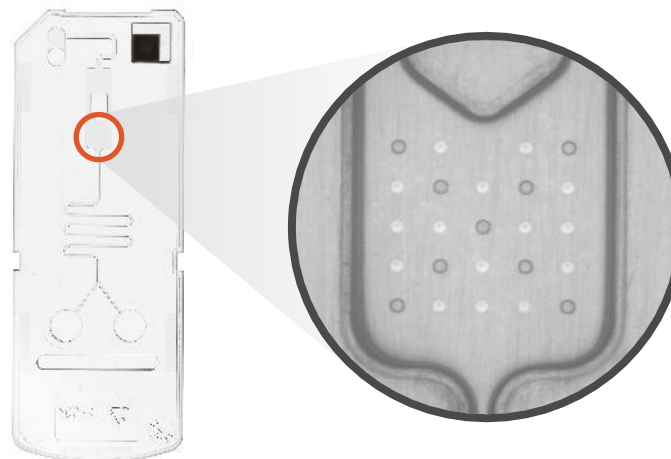


The PoNee Demonstrator

Jabil Healthcare has developed a Point of Need Demonstrator (PoNee) consisting of a Point of Need reusable device, disposable cartridges and an iOS App to showcase our capabilities in product ideation, miniaturization, human machine interface (HMI), connectivity and microfluidics.



The Device



Closed Microfluidic Cartridge



App for iPhones

CAPABILITIES UTILIZED



Microfluidics



Reagent Filling



Microspotting



Thermal Management



Product Design



Human Machine Interface



Sensor Integration



Power Management



Wireless Connectivity



RFID Integration



Optical Detection



Materials Science



Miniaturization



Product Ideation



Prototyping



Wireless Charging



PCBA



Injection Molding

CAPABILITIES UTILIZED - OPTICS -



Microfluidics



Reagent Filling



Microspotting



Thermal Management



Product Design



Human Machine Interface



Sensor Integration



Power Management



Wireless Connectivity



RFID Integration



Optical Detection



Materials Science



Miniaturization



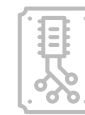
Product Ideation



Prototyping



Wireless Charging



PCBA



Injection Molding

JABIL OPTICS ENGINEERING ORGANIZATION



World Class Tailored & Application-Specific Optical Design And Systems Solutions

<p>IMAGE SENSORS (DETECTION)</p> <ul style="list-style-type: none"> • Broad-ranging image sensor selection • Selected wavelength, polarization • Fluorescence (QE) optimized • COB assembly lines in-house • Established, long-term business relationships with all leading sensor manufacturers • Photodiodes vs. CCD / CMOS 	<p>PRECISION LENSES / OPTICAL ELEMENT</p> <ul style="list-style-type: none"> • High performance lenses with strong focus on cost and manufacturability • Customized lenses beyond off-the-shelf • Highest contrast • All-glass / All-plastic / Hybrid • Free-form surfaces 	<p>COMPACT CAMERA MODULES</p> <ul style="list-style-type: none"> • Lens and camera assembly by Active Alignment • Customized integrated cameras e.g. <ul style="list-style-type: none"> • PoC, Analysis, Observation • Endoscopy • Imaging • Excitation intensity vs. defection efficiency (optimization) 	<p>ILLUMINATION / LIGHT DISTRIBUTION</p> <ul style="list-style-type: none"> • LED & Laser illumination • Customized illumination area • Precision illumination profiles • Wavelength & polarization • Wavelength combination • Refractive and diffractive light shaping • Fiber illumination, filters, diffusors 	<p>COMPLEX OPTO-MECHANICAL SYSTEMS</p> <ul style="list-style-type: none"> • System understanding of complex illumination / imaging systems • High level of miniaturization • Advanced mechanical integration • Assembly and test development and setup • Fast prototyping and verification • Cost optimization 	<p>ELECTRONICS / SOFTWARE</p> <ul style="list-style-type: none"> • Electrical design, schematics, layout • PCB & process data evaluation • PCBA / Set functional testing • Set assembly • Advanced, cross-industry software services • Software architecture & development, e.g. embedded, cloud
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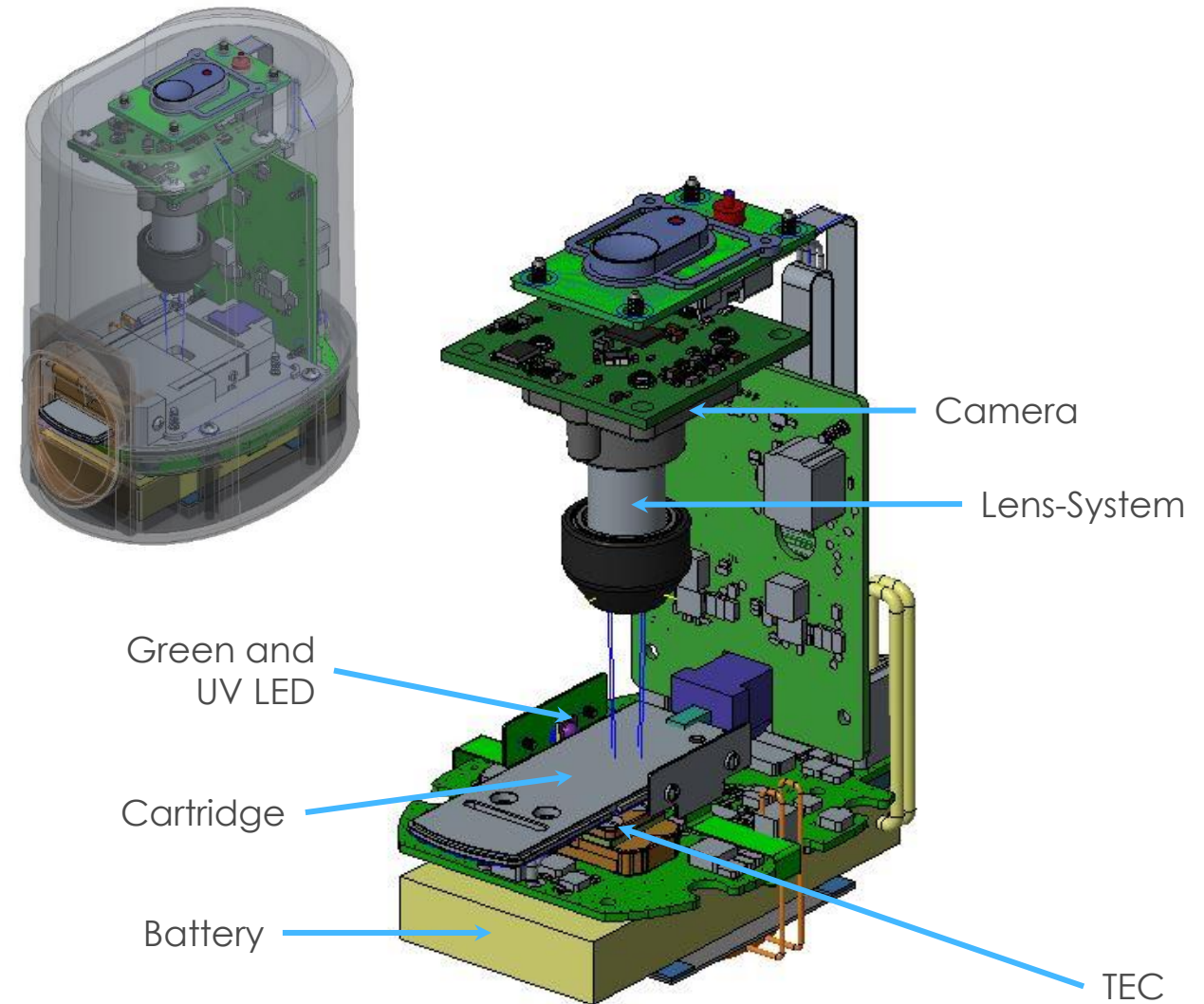


OPTICS ENGINEERING & PRODUCTION SITES

- Burlington, U.S.A.
- Huangpu, China
- Jena, Germany
- Taipei, Taiwan



- Portable, slim and handy profile
 - Dimensions: 105 x 88 x 67 mm
- Integrated sensors
 - Ambient temperature, humidity and air pressure
 - Accelerometer (drops)
 - Heating temperature (in reaction area)
 - Cartridge detection
- Optical detection
 - Close up pictures with filters
 - Illumination (green light or UV-light - can be controlled via App) to excite fluorescent light emission
- Isothermal temperature control
 - 30 – 65° Celsius (can be controlled via App)
- Wirelessly charged
 - Standard charger is used
 - Charging via USB-C also possible
- Wirelessly connected to a phone
(test results transmitted to phone and the cloud)



CAPABILITIES UTILIZED - MICROFLUIDICS -



Microfluidics



Reagent Filling



Microspotting



Thermal Management



Product Design



Human Machine Interface



Sensor Integration



Power Management



Wireless Connectivity



RFID Integration



Optical Detection



Materials Science



Miniaturization



Product Ideation



Prototyping



Wireless Charging

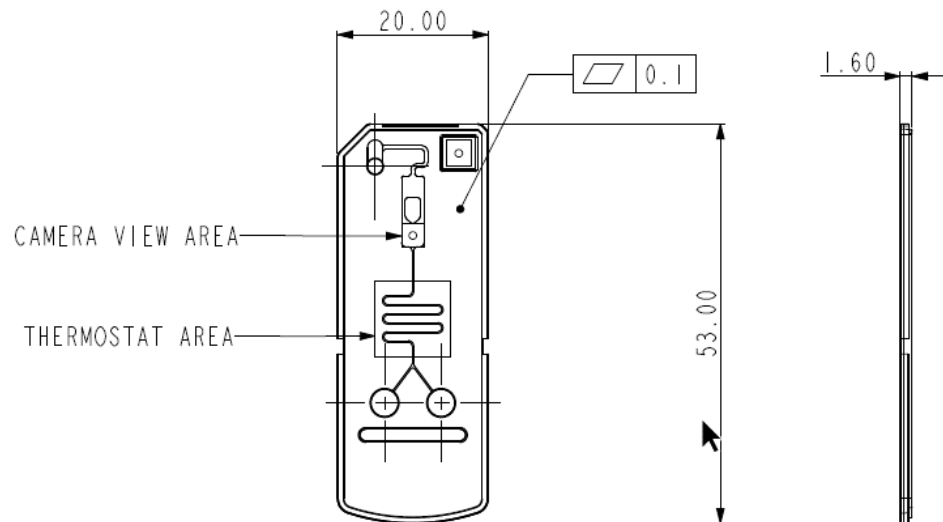


PCBA

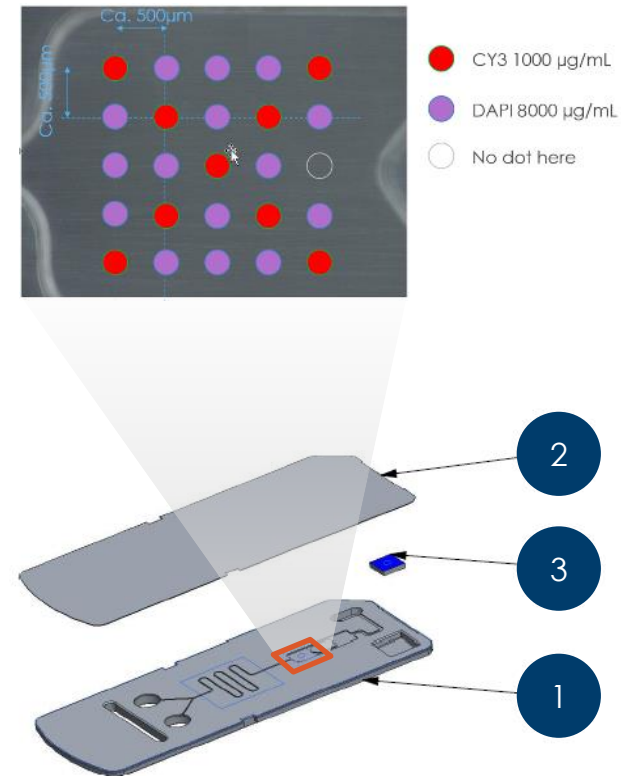


Injection Molding

- Overall Size: 53 x 20 x 1.6 (mm)
- Tooling & Moulding: CNC Tooling
- High Precision Microfluidic Cartridge
 - 1 Channel layer made from POC
 - 2 Sealing foil with pressure sensitive adhesive
 - 3 Small RFID tag in corner of the channel layer



- Pre-filled Cartridge: Fluorescent media is spotted into the reaction area (camera view area, 3 x 3 mm)
- Spot Matrix Pattern:



QUALITY TO SCALE



MECHANICAL DESIGN

- Application definition
- Define material, process, and packaging



DESIGN FOR MANUFACTURING

- Evaluate/design product for mass production (DFM report)



TOOLING

- Precision CNC milling
- Photolithography and electroforming
- Electrical discharge machining (EDM)



MOLDING

- Injection molding
- Liquid Silicone Rubber (LSR) compression molding



ASSEMBLY & PACKAGING

- Plasma, thermo-bonding, laser welding, lamination
- Assembly

END-TO-END OFFERINGS

CONCEPT

MECHANICAL DESIGN

DFM

PROTOTYPING

PILOT RUN

MASS PRODUCTION

APPLICATIONS



Biochemistry Analysis



Immunoassay



Cell Applications



Molecular Diagnostics

PRODUCT EXAMPLES



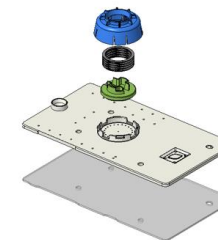
Chip size:
65mm x 88mm x 7mm



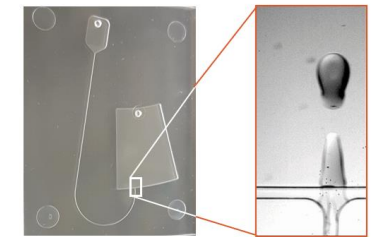
Microfluidic Chip with RFID



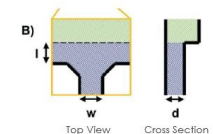
CTC Chip



NGS Disposable Device



Chip Dimension: 45mm x 35mm x 1.5mm



Droplet Generator Chip

Jabil is partner of MedPhab, Europe's first Pilot Line dedicated to manufacturing, testing, validation and up-scaling of new photonics technologies for medical diagnostics.



<https://medphab.eu/>

This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No 871345. The presented results reflect only the author's view. The EU is not responsible for any use that may be made of the information it contains. www.photonics21.org



PHOTONICS PUBLIC PRIVATE PARTNERSHIP

Challenges on the Market Today

Solutions

Global / European Operations

JABIL GLOBAL OPERATIONS – LOCAL, REGIONAL, GLOBAL



100+ SITES LOCATED AROUND THE WORLD

ASIA

Bandung	Gotemba	Kulim	Shanghai	Taichung
Batu Kawan	Hachioji	Neihu	Shenzhen	Tianjin
Beijing	Ho Chi Minh	Penang	Sungai Petani	Weihai
Changhua	Hsinchu	Pune	Suzhou	Wuhan
Chengdu	Huangpu	Sanchong	Singapore	Wuxi

EUROPE & MIDDLE EAST

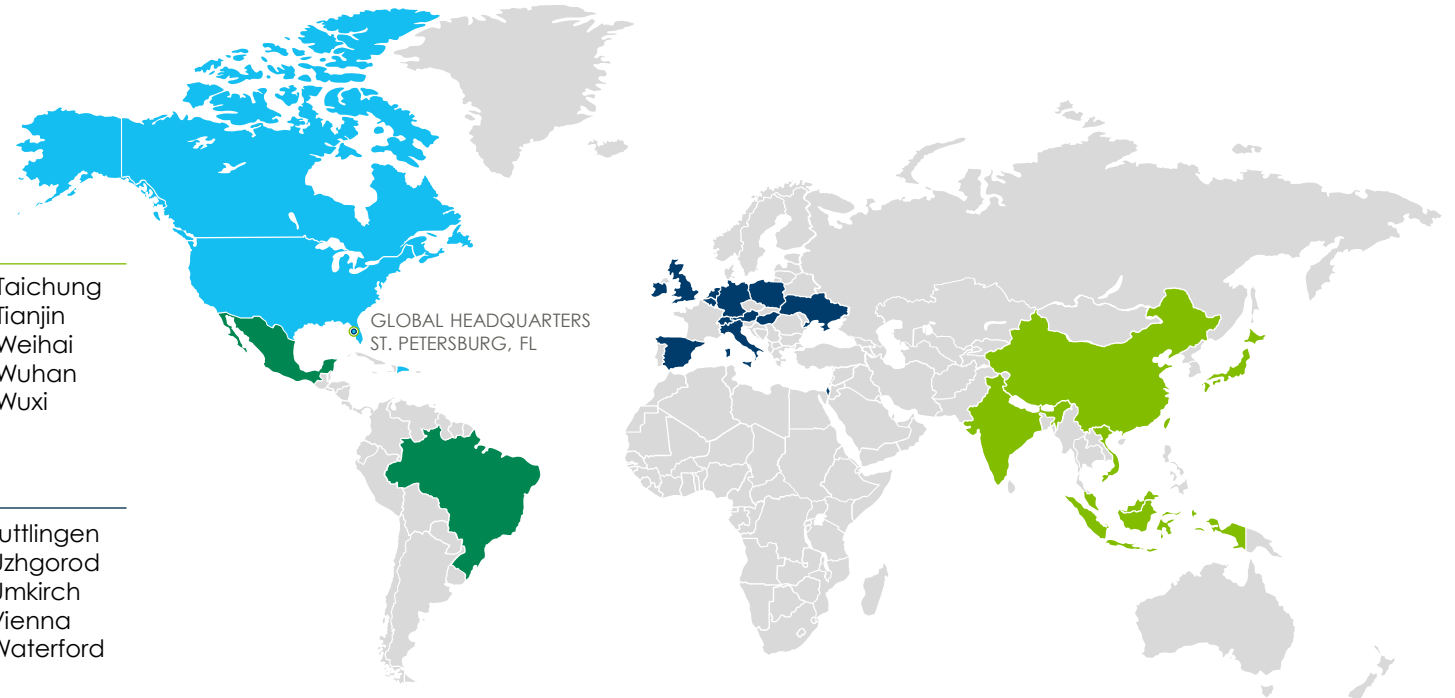
Balsthal	Hasselt	Livingston	Nagyigmand	Tuttlingen
Bettlach	Jena	Le Locle	Paris	Uzhgorod
Bray	Kharkiv	Marcianise	Raron	Umkirch
Grenchen	Knittlingen	Mezzovico	Tiszaújváros	Vienna
Hägendorf	Kwidzyn	Misgav	Tortosa	Waterford

LATIN AMERICA

Belo Horizonte	Manaus	Santo Domingo
Chihuahua	Monterrey	Tijuana
Guadalajara	Valinhos	Torres
Juarez	San Cristobal	

NORTH AMERICA

Albuquerque	Austin	Clinton	Gurnee	McLean	Ottawa	Waltham
Anaheim	Burlington	Devens	Hanover Park	Mebane	Pleasanton	Westchester
Asheville	Cayey	Florence	Lexington	Memphis	San Jose	
Atlanta	Chaska	Fremont	Livermore	Monument	Seattle	
Auburn Hills	Chicago	Grand Junction	Maple Grove	Mount Pleasant	St. Petersburg	

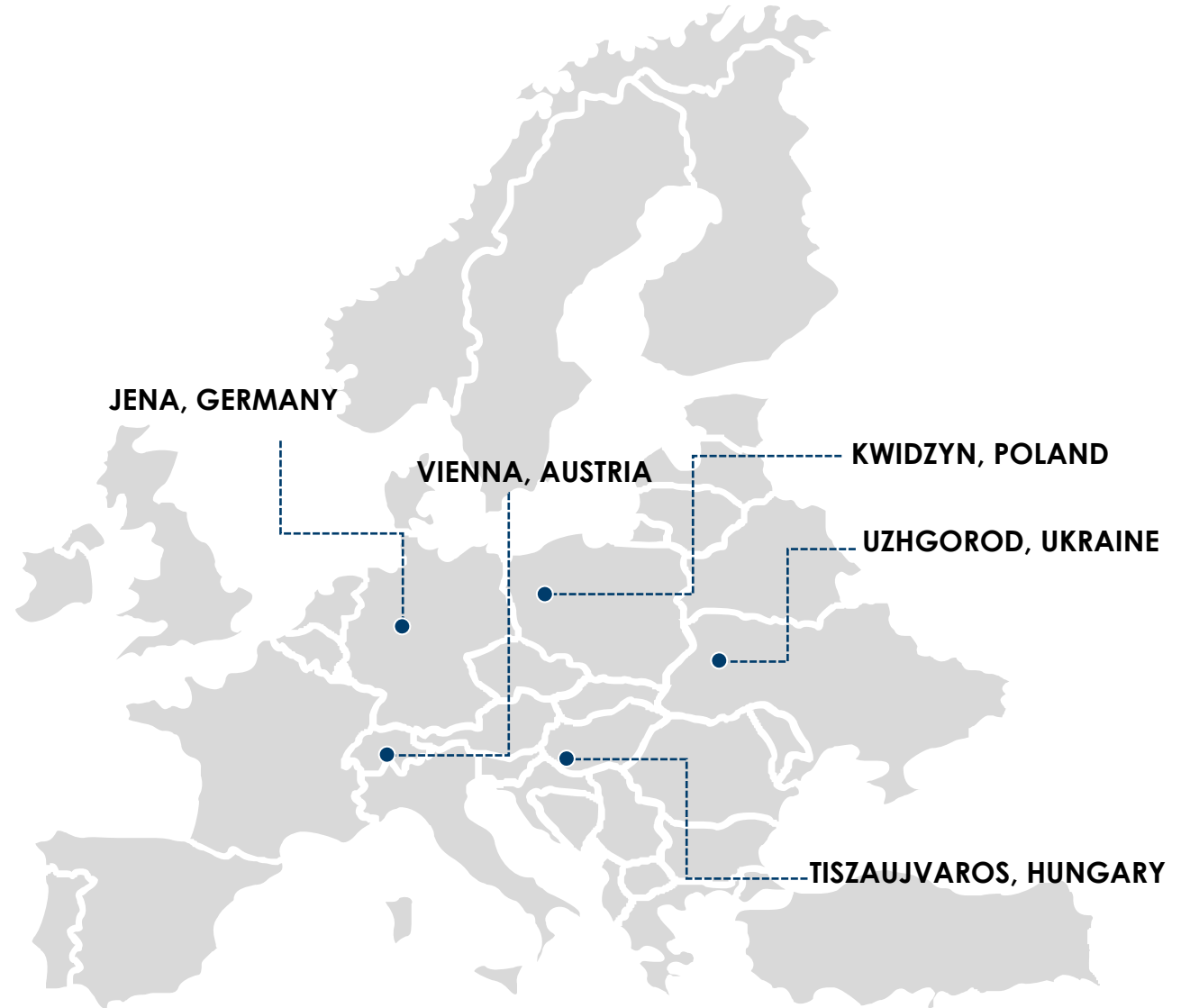


GLOBAL OPERATIONS ENABLE LOCALIZED MANUFACTURING



EUROPE & MIDDLE EAST

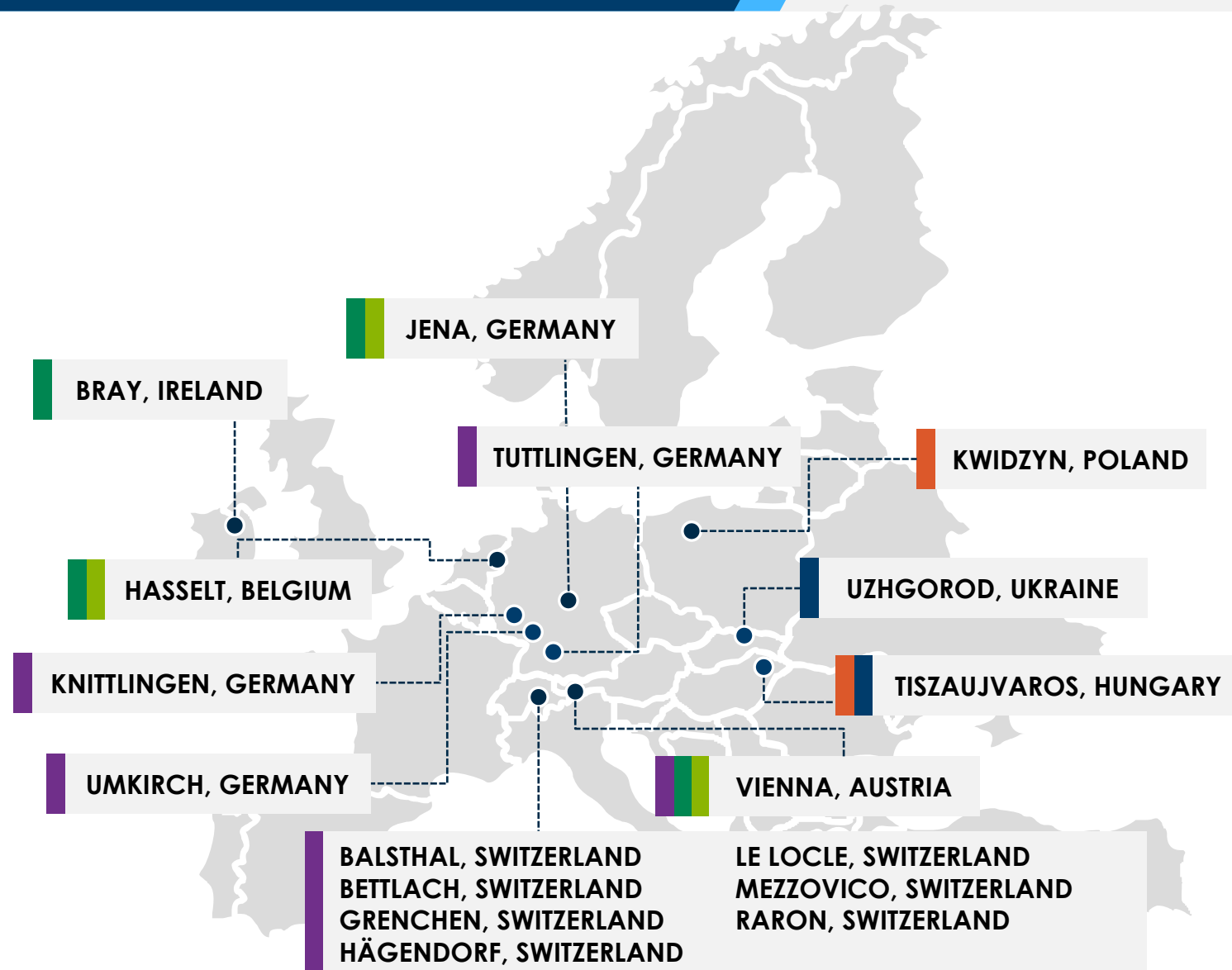
Balsthal	Nagyigmánd	Hasselt	Uzhgorod	Le Locle
Bettlach	Raron	Jena	Vienna	Marcianise
Bray	Tiszaújváros	Knittlingen	Waterford	Mezzovico
Grenchen	Tortosa	Kwidzyn	Livingston	Misgav
Hägendorf	Tuttlingen	Unkirch		



EUROPEAN MANUFACTURING SITES



- Automotive **IATF16949** Certified Site
- New Product Introduction (**NPI**) Site
- Automotive **Design** Site
- Transportation Site
- Healthcare **Design** Site
- Healthcare **Manufacturing** Site



HEALTHCARE SITES BY REGION

AMERICAS

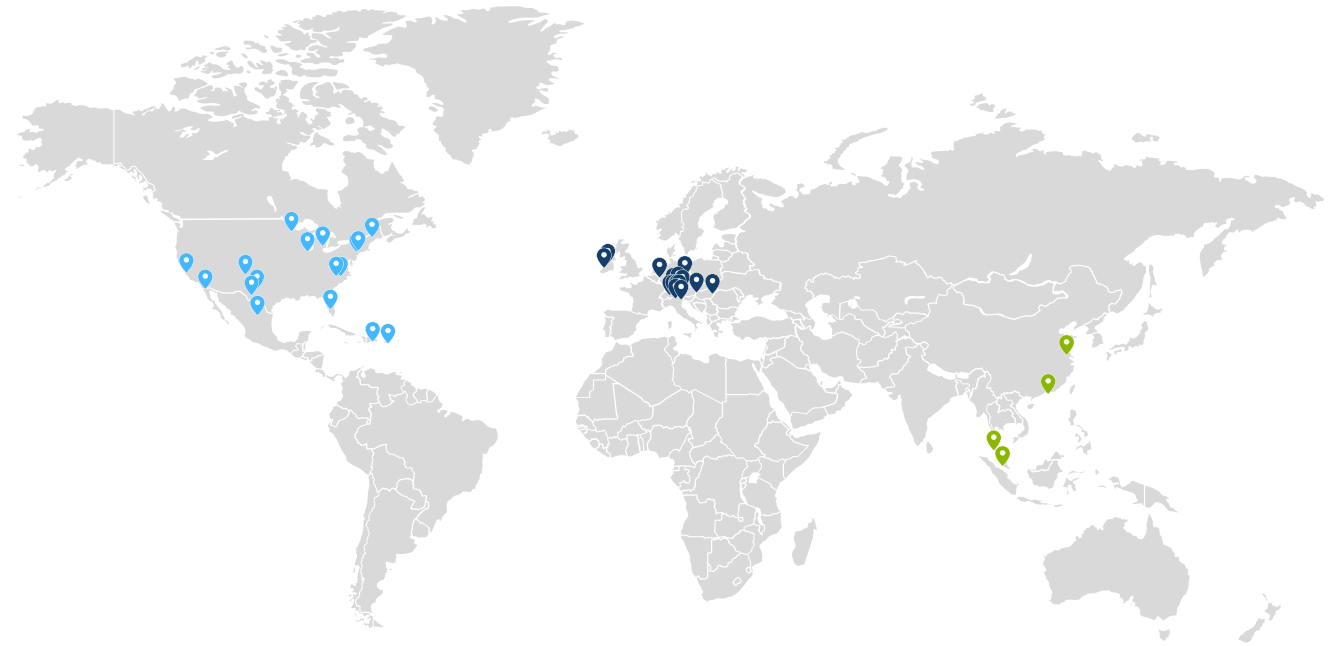
Albuquerque, NM
Asheville, NC
Auburn Hills, MI
Cayey, Puerto Rico
Gurnee, IL
Chihuahua, Mexico
Clinton, MA
Elmira, NY
Juarez, Mexico
Maple Grove, MN
Monument, CO
San Jose, CA
Santo Domingo, Dominican Republic
St. Petersburg, FL
Tijuana, Mexico
West Chester, PA (Brandywine)
West Chester, PA (Wilson Drive)

EUROPE

Balsthal, Switzerland
Betflach, Switzerland
Bray, Ireland
Grenchen, Switzerland
Hägendorf, Switzerland
Hasselt, Belgium
Jena, Germany
Knittlingen, Germany
Le Locle, Switzerland
Mezzovico, Switzerland
Raron, Switzerland
Tiszaújváros, Hungary
Tuttlingen, Germany
Umkirch, Germany
Vienna, Austria
Waterford, Ireland

ASIA

Hachioji, Japan
Penang, Malaysia
Shanghai, China
Shenzhen, China
Singapore



35

ISO 13485 PLANTS
IN 12 COUNTRIES

27

FDA REGISTERED PLANTS
IN 8 COUNTRIES

6.5M+

SQUARE FEET OF
MEDICAL
MANUFACTURING

HEALTHCARE SITES BY CAPACITY



ELECTRONICS

Auburn Hills, MI
Baja, Mexico
Chihuahua, Mexico
Penang, Malaysia
San Jose, CA
Singapore
Shanghai, China
Tiszaújváros, Hungary
Vienna, Austria

DESIGN

Bray, Ireland
Clinton, MA
Hasselt, Belgium
Jena, Germany
Penang, Malaysia
San Jose, CA
Shanghai, China
St. Petersburg, FL
Vienna, Austria

PLASTIC INJECTION MOLDING

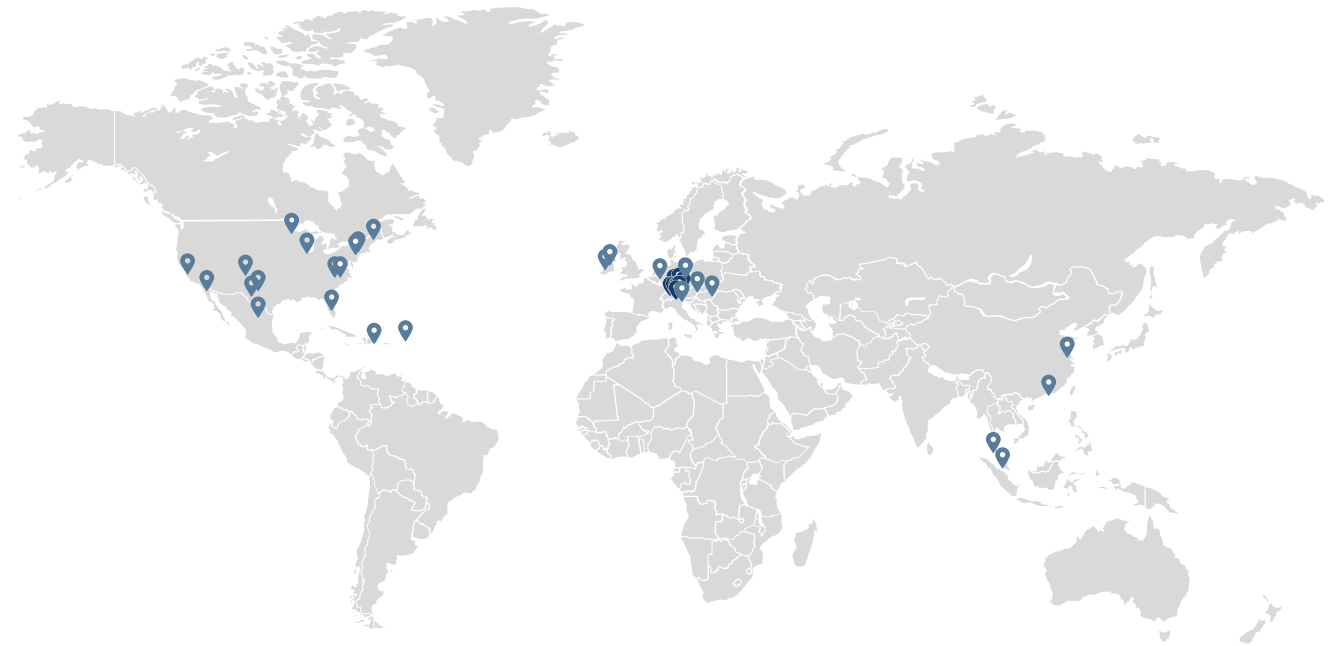
Asheville, NC
Baja, Mexico
Bray, Ireland
Cayey, Puerto Rico
Gurnee, IL
Clinton, MA
Knittlingen, Germany
Santo Domingo, Dominican Republic
Shenzhen, China
Waterford, Ireland

ORTHOPEDICS

Albuquerque, NM
Balsthal, Switzerland
Bettlach, Switzerland
Elmira, NY
Grenchen, Switzerland
Hägendorf, Switzerland
Juarez, Mexico
Le Locle, Switzerland
Mezzovico, Switzerland
Monument, CO
Raron, Switzerland
Tuttlingen, Germany
Umkirch, Germany
West Chester, PA (Brandywine)
West Chester, PA (Wilson Drive)

MEDICAL DEVICE REPROCESSING

Maple Grove, MN



35

ISO 13485 PLANTS
IN 12 COUNTRIES

27

FDA REGISTERED PLANTS
IN 8 COUNTRIES

6.5M+

SQUARE FEET OF
MEDICAL
MANUFACTURING

260K

DEDICATED
EMPLOYEES

\$33.5

BILLION REVENUE
IN FY22

100+

SITES
WORLDWIDE

50+

MILLION SQUARE FEET
OF MANUFACTURING SPACE

500M+

MEDICAL PRODUCTS
SHIPPED PER YEAR

15M

WEARABLES
MANUFACTURED PER YEAR

300K

SMART PHONES
SHIPPED PER DAY

40%

OF HOUSEHOLD APPLIANCES
HAVE JABIL COMPONENTS

THANK YOU



JABIL

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Business Enablement

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