# EIC TRANSITION

EIC Transition (Innovation Activities)

# Photonic Biosensor Maturation for Point-of-Care Sepsis Detection

## SEPSILUX

| Field | Value |
|---|---|
| Call Identifier | HORIZON-EIC-2026-TRANSITIONCHALLENGES-01 |
| Type of Action | EIC Transition |
| Duration | 24 months |
| TRL Range | TRL 4 to TRL 6 |
| Total Budget | EUR 2,500,000 |
| EU Contribution | EUR 2,500,000 |

## Abstract

SEPSILUX will advance an integrated silicon-photonic biosensor for multiplexed point-of-care detection of three sepsis biomarkers - interleukin-6 (IL-6), procalcitonin (PCT), and lactate - from TRL 4 to TRL 6 within 24 months, building directly on validated results from a completed EIC Pathfinder project and an ERC Proof of Concept grant. The technology combines functionalised photonic ring resonators with a disposable microfluidic cartridge to deliver laboratory-comparable quantification of all three biomarkers in under 15 minutes from a finger-prick capillary blood sample - a capability that does not currently exist in any CE-marked point-of-care device. The consortium comprising NovaPhotonics BV (Netherlands, coordinator), University of Twente (Netherlands), and Charité Berlin (Germany) will execute two parallel and integrated tracks: a technology maturation track encompassing cartridge industrialisation, ISO 15189-aligned analytical validation, and a prospective clinical validation study in 150 emergency department patients; and a business readiness track encompassing freedom-to-operate analysis, IVDR regulatory pre-submission dialogue, and preparation of an investor-ready business plan. A pre-specified sex-disaggregated analysis of diagnostic performance is embedded in the clinical study design, ensuring equitable validation across patient populations. SEPSILUX targets the EUR 1.2 billion EU point-of-care sepsis diagnostics market, with first commercial launch planned within 18 months of project completion. The project will reduce sepsis mortality, decrease inappropriate antibiotic prescribing, and strengthen EU strategic autonomy in medical diagnostics through a fully European supply chain.

Keywords: silicon photonics, point-of-care diagnostics, sepsis, biosensor, multiplexed detection, microfluidics, IVDR, in vitro diagnostics, IL-6, procalcitonin

# SECTION 1 - EXCELLENCE

## 1.1 Objectives and Ambition

SEPSILUX builds directly on validated results from two completed eligible prior projects: an EIC Pathfinder project that established the core silicon-photonics evanescent-wave sensing principle, and an ERC Proof of Concept grant that demonstrated multiplexed detection of sepsis biomarkers (IL-6, procalcitonin, and lactate) in buffer at TRL 4. The biosensor chip integrates three functionalised photonic ring-resonator channels with an on-chip reference channel, enabling simultaneous, label-free quantification of all three analytes from a single sample introduction. The disposable microfluidic cartridge developed within the prior projects demonstrated proof-of-concept fluidic integration; however, cartridge manufacturing reproducibility, surface biofunctionalisation stability, and analytical performance in clinical matrices have not yet been established. SEPSILUX addresses this maturation gap comprehensively.

The project pursues four primary objectives: (O1) advance the integrated photonic biosensor and its disposable cartridge from TRL 4 to TRL 6 through engineering optimisation and scalable manufacturing process development; (O2) validate analytical performance - including sensitivity, specificity, limits of detection, and reproducibility - against ISO 15189-compliant reference methods using clinical sepsis samples; (O3) conduct a prospective clinical validation study at Charité Berlin demonstrating non-inferiority versus central laboratory analysers in an emergency department setting; and (O4) establish freedom to operate, a robust IP protection strategy, a credible IVDR regulatory pathway, and an investor-ready business plan to enable market entry within 36 months of project completion. All objectives are defined with SMART key performance indicators and verified through measurable milestones, enabling evaluators to assess progress transparently throughout the 24-month project lifetime.

## 1.2 Relation to the Work Programme

SEPSILUX represents a genuine technological breakthrough in point-of-care in vitro diagnostics and is directly aligned with the HORIZON-EIC-2026-TRANSITIONCHALLENGES-01 call's mandate to mature deep-tech innovations from validated laboratory proof-of-concept to prototype demonstration in relevant environments. Existing CE-marked point-of-care sepsis tests - such as lateral-flow immunoassays for procalcitonin or single-plex electrochemical sensors for lactate - suffer from three fundamental limitations: single-biomarker readout, insufficient analytical sensitivity at clinically relevant low concentrations, and susceptibility to matrix interference. SEPSILUX overcomes all three simultaneously through the integration of silicon-photonic ring resonators with a multiplexed microfluidic cartridge, achieving limits of detection for IL-6 below 5 pg/mL, for PCT below 0.1 ng/mL, and for lactate below 0.5 mmol/L - all within a single 15-minute assay from a finger-prick capillary blood sample. No currently available or publicly disclosed competitor product combines silicon-photonic transduction, three-plex sepsis biomarker detection, and a disposable cartridge format suitable for use outside a laboratory environment.

The novelty and ambition of SEPSILUX extend beyond performance metrics. The project targets a paradigm shift in sepsis triage: moving from centralised laboratory testing with turnaround times of one to four hours to a decentralised, actionable result at the patient bedside. This ambition is aligned with EU4Health programme priorities, the European Health Data Space initiative, and the EU's strategic autonomy objectives in critical medical technology. By developing a fully European supply chain - photonic chip fabrication via silicon-on-insulator foundry processing in Europe, and cartridge production via injection moulding at NovaPhotonics BV - SEPSILUX directly reduces EU dependence on non-European diagnostic platforms. The project also exceeds the typical scope of device optimisation actions by coupling technology maturation with a parallel clinical evidence generation track and a regulatory pre-submission interaction with a designated notified body, constituting an

unusually advanced level of business readiness for a TRL 4-to-6 transition action.

## 1.3 Concept and Methodology

The SEPSILUX concept rests on three interlocking technical pillars. First, the photonic sensing element: a silicon-on-insulator chip bearing an array of four ring resonators - three functionalised, one reference - interrogated by a compact swept-source laser. Specific antibody receptors for IL-6 and PCT, and an enzymatic lactate oxidase layer, are covalently immobilised on the resonator surfaces via optimised silane–PEG–NHS chemistry. Biomarker binding shifts the resonant wavelength in proportion to surface mass density; the reference channel corrects for bulk refractive index changes and temperature drift, enabling quantification in complex whole-blood matrices. Second, the disposable microfluidic cartridge: a three-layer polymer laminate integrating a blood–plasma separation membrane, passive capillary pumping, and a sealed reagent blister, allowing the clinician to apply a finger-prick sample and obtain a result with no additional sample preparation steps. Third, the reader instrument: a palm-sized, battery-powered optical interrogator that communicates results wirelessly to a tablet or hospital information system.

The maturation methodology follows a structured stage-gate approach. In WP1, the team will optimise biofunctionalisation protocols for batch-to-batch reproducibility (target CV below 10%), validate cartridge injection-moulding tolerances, and demonstrate analytical performance in spiked plasma and whole blood. Concurrent failure mode and effects analysis (FMEA) will identify critical-to-quality parameters for the manufacturing process. In WP2, a prospective observational clinical study at Charité Berlin's emergency department (target n = 150 sepsis-suspected adult patients; Ethics approval secured in T2.1) will compare SEPSILUX results against central laboratory IL-6, PCT, and lactate measurements, assessing sensitivity, specificity, and positive and negative predictive values against Sepsis-3 criteria. A pre-specified sex-disaggregated sub-analysis will be performed, reflecting published evidence that sepsis biomarker kinetics differ between male and female patients. WP3 will run in parallel, conducting a freedom-to-operate analysis, filing at least one PCT patent application covering the cartridge–chip integration, and initiating IVDR Article 70 pre-submission dialogue with a designated notified body. WP4 will develop the go-to-market strategy, business plan, and investor pitch concurrently with technical activities, ensuring that by month 24 the consortium delivers both a TRL 6 demonstrator and an investment-ready business case. This dual-track, stage-gated methodology is fully consistent with the objectives and evaluation criteria of the EIC Transition programme.

## 1.4 Interdisciplinary Considerations

SEPSILUX requires the genuine integration of four distinct scientific and professional disciplines, making interdisciplinarity a structural feature of the project rather than an incidental attribute. Integrated photonics and silicon nanofabrication (NovaPhotonics BV) provide the core transduction platform; biochemistry and surface science (University of Twente) underpin the biofunctionalisation and assay chemistry; clinical medicine and laboratory diagnostics (Charité Berlin) provide clinical study design expertise, patient access, and regulatory know-how for IVDR conformity assessment; and business development and medical device commercialisation expertise (NovaPhotonics BV, supported by EIC Business Acceleration Services) ensures that technology maturation decisions are continuously informed by market and regulatory realities. Disciplinary boundaries are operationalised through co-leadership of key tasks - for example, T1.3 (analytical validation) is co-led by University of Twente and NovaPhotonics BV, ensuring that photonic performance metrics are directly mapped to clinical assay requirements defined by Charité Berlin.

The project explicitly incorporates a gender dimension: the clinical study protocol includes a pre-specified sex-disaggregated analysis of biomarker kinetics and diagnostic performance, responding to published evidence that IL-6 and lactate thresholds may differ between male and female sepsis patients, and ensuring that the resulting diagnostic device is validated equitably across patient

populations. Open Science principles are applied throughout: all non-commercially sensitive analytical datasets will be deposited in Zenodo under CC-BY licences, clinical validation results will be published in open-access peer-reviewed journals, and a GDPR-compliant Data Management Plan will be submitted as a formal deliverable by month 6 (D5.1). These practices align with Horizon Europe Open Science requirements and strengthen the credibility and reproducibility of the project's evidence base.

# SECTION 2 - IMPACT

## 2.1 Pathways Towards Impact

Sepsis kills approximately 150,000 people per year in the European Union and accounts for over EUR 7.6 billion in annual EU hospital expenditure. Delayed diagnosis is the primary modifiable risk factor: every hour of delay to appropriate antibiotic therapy increases mortality by approximately 7%. SEPSILUX addresses this directly by enabling a 15-minute, three-biomarker triage decision at the point of care - in emergency departments, intensive care units, ambulances, and primary care clinics - replacing a process that currently requires one to four hours and centralised laboratory infrastructure. The immediate benefit for clinical users is a faster, more confident treatment decision; the systemic benefit is a measurable reduction in ICU length of stay and in inappropriate antibiotic prescriptions, directly contributing to the EU Action Plan on Antimicrobial Resistance.

The addressable EU market for point-of-care sepsis diagnostics is estimated at EUR 1.2 billion and is growing at approximately 12% CAGR, driven by post-pandemic investment in decentralised diagnostics and the EU4Health programme's emphasis on pandemic preparedness and health system resilience. The global market exceeds EUR 4 billion. NovaPhotonics BV's commercialisation strategy targets a first commercial launch in the Benelux and German markets within 18 months of project completion, leveraging the Charité Berlin clinical reference data and an existing distribution partnership under negotiation with a pan-European IVD distributor. The revenue model combines instrument placement (reagent-rental model) with recurring disposable cartridge sales - a commercially proven structure in the IVD sector. Financial projections indicate break-even at approximately 200 installed instruments, with a target of 500 instruments deployed across five EU markets by year three post-project.

SEPSILUX generates direct socioeconomic impact beyond clinical outcomes. The project funds six FTE positions, and the post-project scale-up plan anticipates 25 additional high-quality jobs at NovaPhotonics BV within three years of first commercial sale. The technology is protected by a European IP portfolio, ensuring EU-headquartered value capture. By sourcing chip fabrication and cartridge manufacturing entirely within Europe, the project strengthens EU strategic autonomy in critical medical diagnostic technology and reduces exposure to non-EU supply chain disruption.

## 2.2 Dissemination, Exploitation and Communication

The SEPSILUX IP strategy is anchored in two existing patent families arising from the prior EIC Pathfinder and ERC Proof of Concept projects, covering the silicon-photonic ring resonator array architecture and the surface biofunctionalisation chemistry respectively. During the project, NovaPhotonics BV will file at least one new PCT patent application covering the integrated cartridge–reader system and the multiplexed assay protocol (WP3, M1–M18), extending protection to the US, Japan, and China. A freedom-to-operate analysis (WP3, M1–M9) will be conducted by an external specialist IP law firm to map the competitive landscape and identify any potentially blocking third-party rights, informing design-around decisions where necessary. All project foreground IP will be owned by the generating entity; a consortium IP agreement defines access rights for exploitation and ensures that the University of Twente and Charité Berlin retain appropriate licences for academic publication, while NovaPhotonics BV holds exclusive commercial exploitation rights.

Dissemination activities include publication of at least three open-access peer-reviewed articles covering clinical validation results, analytical performance characterisation, and photonic integration methodology. Results will be presented at two major IVD and clinical diagnostics conferences - Medica Düsseldorf and the AACC Annual Meeting. A dedicated project website will provide public updates throughout the project lifetime. Communication targeting non-specialist audiences will include a press release at project launch, a patient-facing plain-language summary of clinical findings,

and active engagement with the European Sepsis Alliance to amplify reach to patient communities and healthcare policy stakeholders.

Exploitation is led by NovaPhotonics BV and encompasses regulatory submission preparation, investor roadshows supported by the EIC Business Acceleration Services, and active engagement with the broader EIC Portfolio to identify potential corporate partners or strategic acquirers. A Technology Transfer Agreement template governing future licensing to non-EU markets will be prepared in WP4 and finalised by month 22, ensuring that post-project commercialisation can proceed without delay.

## 2.3 Summary of Impact Indicators

| Indicator | Target | Measurement |
|---|---|---|
| TRL advancement | TRL 6 achieved by month 24 | Stage-gate review report confirming validated demonstrator in relevant environment (emergency department) |
| Clinical sensitivity for sepsis triage (3-plex panel) | >=85% sensitivity, >=80% specificity vs. Sepsis-3 criteria | Prospective clinical study statistical analysis report (WP2, M20) |
| Analytical limit of detection - IL-6 | <= 5 pg/mL in whole blood | ISO 15189-aligned analytical validation report (WP1, M12) |
| Time-to-result | <= 15 minutes from sample application | Timed test runs documented in technical validation report (WP1, M14) |
| Patent applications filed | At least 1 new PCT application filed | Patent filing confirmation (WP3, M18) |
| IVDR pre-submission dialogue | Pre-submission meeting with notified body completed | Notified body meeting minutes (WP3, M20) |
| Business plan investor readiness | Full investor-ready business plan and pitch deck completed | Deliverable D4.3 approved by Advisory Board (WP4, M23) |
| Direct jobs created or sustained | 6 FTE during project; 25 additional FTE within 3 years post-project | HR records; post-project follow-up report |

# SECTION 3 - QUALITY AND EFFICIENCY OF THE IMPLEMENTATION

## 3.1 Work Plan and Work Packages

| WP | Title | Lead | PM | Duration |
|---|---|---|---|---|
| WP1 | Analytical Validation and Cartridge Industrialisation | NovaPhotonics BV | 22 | M1-M18 |
| WP2 | Clinical Validation Study | Charite Berlin | 18 | M6-M24 |
| WP3 | Regulatory Pathway and Freedom to Operate | NovaPhotonics BV | 10 | M1-M22 |
| WP4 | Business Plan, Investor Readiness and Exploitation | NovaPhotonics BV | 10 | M1-M24 |
| WP5 | Project Management and Coordination | NovaPhotonics BV | 8 | M1-M24 |

### WP1: Analytical Validation and Cartridge Industrialisation

**Lead: NovaPhotonics BV | Person-months: 22 | Duration: M1 - M18**

WP1 advances the biosensor system from TRL 4 to TRL 5 by optimising biofunctionalisation protocols, cartridge injection-moulding processes, and reader firmware, and by validating analytical performance in spiked plasma and whole blood against ISO 15189 criteria. The University of Twente leads biofunctionalisation and surface chemistry optimisation, working in close collaboration with NovaPhotonics BV on chip-to-cartridge integration and reader validation. A stage-gate review at month 14 will confirm TRL 5 attainment before the clinical study commences. Key outputs are a validated analytical performance report and a frozen cartridge manufacturing specification, both required as prerequisites for WP2.

T1.1: Biofunctionalization protocol optimisation - The University of Twente, with support from NovaPhotonics BV, will optimise antibody and enzyme immobilisation chemistry on silicon-on-insulator resonators to achieve a coefficient of variation (CV) below 10% across independent manufacturing batches. The work will systematically evaluate silane–PEG–NHS linker densities, antibody loading concentrations, and blocking strategies to maximise both sensitivity and shelf-life stability. Protocols will be documented in a frozen specification transferred to NovaPhotonics BV for cartridge-level implementation.

T1.2: Cartridge injection-moulding and assembly scale-up - NovaPhotonics BV will transfer the cartridge design to a qualified contract injection moulder, define critical-to-quality (CTQ) parameters through a systematic FMEA, and produce a 500-unit validation batch for use in T1.3 and WP2. A design-for-manufacturability review at month 6 will incorporate tolerance analysis to ensure microfluidic channel dimensions meet functional specifications. Two candidate contract manufacturers will be qualified in parallel to mitigate supply risk.

T1.3: Analytical performance validation - NovaPhotonics BV and the University of Twente will jointly determine limits of detection (LoD), limits of quantification (LoQ), linearity, precision (within-run and between-run), and matrix interference for IL-6, PCT, and lactate in both spiked plasma and whole blood matrices. Validation will follow an ISO 15189-aligned protocol, and the resulting report will serve as the primary technical evidence for TRL 5 confirmation and as supporting documentation for the IVDR technical file.

T1.4: Reader instrument engineering validation - NovaPhotonics BV will finalise the optical interrogator hardware design, validate the on-board temperature compensation algorithm against a range of ambient conditions (15–35 °C), and confirm reliable wireless data transfer to hospital information system interfaces via standard HL7/FHIR protocols. An engineering validation report will document compliance with IEC 61010-1 electrical safety requirements as part of the IVDR technical file preparation.

### WP2: Clinical Validation Study

**Lead: Charite Berlin | Person-months: 18 | Duration: M6 - M24**

WP2 advances the SEPSILUX system to TRL 6 through a prospective observational clinical validation study conducted at Charité Berlin's emergency department. The study enrolls 150 sepsis-suspected adult patients, comparing SEPSILUX point-of-care results with central laboratory reference measurements and assessing diagnostic accuracy against Sepsis-3 criteria. Ethics committee approval

and clinical trial registration are addressed in the first task and are formal prerequisites for patient enrolment. A pre-specified sex-disaggregated sub-analysis is incorporated into the statistical plan, ensuring the device is validated equitably across patient populations. The clinical validation report produced in T2.3 constitutes the primary evidence for TRL 6 confirmation.

T2.1: Ethics approval and clinical study setup - Charité Berlin will obtain ethics committee approval, register the study on ClinicalTrials.gov, train all clinical and laboratory staff in study procedures, and establish sample collection, handling, and data management SOPs compliant with GDPR and GCP requirements. All documentation will be prepared to support future inclusion in the IVDR performance evaluation report.

T2.2: Patient recruitment and sample testing - Clinical staff at Charité Berlin's emergency department will enrol 150 eligible adult patients with suspected sepsis over a 10-month recruitment window. SEPSILUX testing will be performed at the point of care in strict parallel with standard-of-care central laboratory testing; time-to-result and clinical outcome data will be systematically recorded. Enrolment will be monitored monthly against a pre-defined recruitment curve, and the pre-agreed standby clinical site will be activated if enrolment falls below 50% of target at month 16.

T2.3: Statistical analysis and clinical validation report - Charité Berlin will perform the pre-specified statistical analysis, including receiver operating characteristic (ROC) curve analysis, sensitivity, specificity, positive predictive value (PPV), negative predictive value (NPV), and a sex-disaggregated sub-analysis of diagnostic performance. Results will be compared against Sepsis-3 clinical criteria as the reference standard. The resulting clinical validation report will be submitted for open-access publication and will form a core component of the IVDR performance evaluation dossier.

### WP3: Regulatory Pathway and Freedom to Operate

**Lead: NovaPhotonics BV | Person-months: 10 | Duration: M1 - M22**

WP3 establishes the regulatory and intellectual property foundations required for market entry. Activities encompass a comprehensive freedom-to-operate analysis, filing of a new PCT patent application, initiation of IVDR Article 70 pre-submission dialogue with a designated notified body, and preparation of an ISO 13485-aligned Quality Management System roadmap. Notified body engagement is initiated from month 1 to secure a pre-submission meeting slot well in advance of the month 20 target, mitigating the risk of notified body capacity backlogs. The outputs of WP3 directly feed the IVDR technical file and the investor-ready business plan developed in WP4.

T3.1: Freedom-to-operate analysis - NovaPhotonics BV will commission a specialist external IP law firm to conduct a comprehensive freedom-to-operate landscape analysis covering the silicon-photonic biosensor architecture, the multiplexed sepsis assay, and the microfluidic cartridge integration. Priority markets for assessment are the EU (Germany, Netherlands, France), the US, and Japan. Any identified potentially blocking patents will be reviewed and design-around options documented. A legal budget reserve of EUR 30,000 is allocated within WP3 for this purpose.

T3.2: New patent application filing - NovaPhotonics BV, in coordination with University of Twente regarding inventorship, will prepare and file a PCT patent application covering the integrated cartridge–reader system and the multiplexed three-plex assay protocol. The application will build on and extend the two existing patent families from the prior projects. Filing is targeted for month 18 to ensure maximum priority date protection ahead of anticipated publications from WP1 and WP2.

T3.3: IVDR regulatory strategy and pre-submission - NovaPhotonics BV and Charité Berlin will jointly classify the SEPSILUX device under IVDR Annex II List B (high-risk IVD), engage a designated notified body for a formal pre-submission meeting, and produce a comprehensive IVDR technical file roadmap and gap analysis identifying all outstanding documentation requirements for full conformity assessment. The pre-submission meeting minutes and gap analysis will serve as a key deliverable demonstrating regulatory pathway clarity to investors.

T3.4: ISO 13485 QMS roadmap - NovaPhotonics BV will develop a Quality Management System implementation roadmap identifying current gaps against ISO 13485:2016 requirements and defining a detailed post-project certification timeline and resource plan. The roadmap will be informed by outputs from T1.2 (manufacturing FMEA) and T3.3 (IVDR gap analysis) to ensure full alignment between QMS, manufacturing, and regulatory requirements.

### WP4: Business Plan, Investor Readiness and Exploitation

**Lead: NovaPhotonics BV | Person-months: 10 | Duration: M1 - M24**

WP4 develops the commercial foundations of SEPSILUX in parallel with technical and clinical activities, ensuring that the project delivers an investment-ready business case alongside its TRL 6 demonstrator at month 24. Activities include primary market research, business model validation with target customers and distribution partners, financial modelling informed by real-time manufacturing cost and clinical performance data from WP1 and WP2, and investor pitch preparation supported by the EIC Business Acceleration Services. The work package ensures that

technology maturation decisions throughout the project are continuously informed by commercial viability considerations.

T4.1: Market analysis and value proposition validation - NovaPhotonics BV will conduct structured primary market research comprising interviews with at least 20 target clinical customers (emergency physicians, intensivists, and laboratory directors) and three potential pan-European distribution partners to validate willingness-to-pay, procurement decision pathways, and the specific clinical workflow integration requirements that must be addressed in the product design. Findings will directly inform cartridge and reader design decisions in WP1 and the go-to-market strategy documented in T4.2.

T4.2: Business model development and financial projections - NovaPhotonics BV will develop and iteratively refine the reagent-rental business model, five-year financial projections, and break-even analysis. Financial modelling will be updated at months 12 and 18 to incorporate actual manufacturing cost data from T1.2 and analytical performance data from T1.3, ensuring projections are grounded in validated technical realities. Sensitivity analyses will be conducted against key assumptions including installed base growth rate, cartridge price, and reimbursement uptake.

T4.3: Investor pitch and roadshow preparation - NovaPhotonics BV, with structured support from the EIC Business Acceleration Services, will prepare a comprehensive investor pitch deck and virtual data room incorporating TRL 6 technical evidence, clinical validation data, IP portfolio status, regulatory pathway clarity, and financial projections. At least three formal investor presentations will be conducted by month 23, targeting Series A life science and medtech investors with established EU portfolios. Feedback from investor interactions will be incorporated into the final business plan (D4.3).

### WP5: Project Management and Coordination

**Lead: NovaPhotonics BV | Person-months: 8 | Duration: M1 - M24**

WP5 ensures efficient coordination, financial management, reporting, and risk monitoring across all consortium partners throughout the 24-month project. It establishes the consortium governance structure, manages internal and external communication, and coordinates all interactions with the EIC Programme Manager. The work package maintains a live risk register updated quarterly, ensuring that risks identified in the risk management plan are actively monitored and that corrective actions are implemented promptly. WP5 also oversees compliance with Horizon Europe Open Science requirements, including GDPR-compliant data management and open-access publication commitments.

T5.1: Governance, reporting and financial management - NovaPhotonics BV will establish the consortium governance bodies - including the Steering Committee (meeting every six months), the Scientific Advisory Board, and the Project Management Office - and will prepare all periodic technical and financial reports to the EIC. Budget monitoring will be conducted monthly, with a formal financial review at each Steering Committee meeting. The consortium agreement, including IP ownership provisions and liability allocation, will be finalised and signed before the project start date.

T5.2: Risk monitoring and quality assurance - NovaPhotonics BV will maintain a live risk register covering technical, clinical, regulatory, financial, and personnel risks, updated quarterly and reviewed at each Steering Committee meeting. Internal quality audits will be conducted at months 12 and 20 to assess deliverable quality and milestone attainment across all work packages. Corrective and preventive action (CAPA) procedures will be documented and tracked to closure, providing a quality audit trail that also supports future ISO 13485 certification.

## 3.2 Consortium Composition

| Organisation | Country | Type | Role | Description |
|---|---|---|---|---|
| NovaPhotonics BV | Netherlands | Deep-tech SME | Coordinator | Project coordinator; photonic chip and reader instrument development; cartridge industrialisation; IP management; regulatory strategy; business development and exploitation lead |
| University of Twente | Netherlands | Academic research institution | Partner | Biofunctionalization and surface chemistry |

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|---|---|---|---|---|
| | | | | optimisation; analytical validation; biosensor characterisation in clinical matrices |
| Charite - Universitatsmedizin Berlin | Germany | Academic medical centre / university hospital | Partner | Clinical validation study design and execution; ethics approval; clinical data analysis; medical device regulatory expertise |

The SEPSILUX consortium has been composed to combine capabilities that are individually necessary but collectively sufficient for the proposed TRL 4-to-6 transition with clinical validation. NovaPhotonics BV provides the photonic integration, engineering, and commercialisation engine, together with the existing IP portfolio and direct access to silicon-on-insulator chip foundry processing in Europe. The University of Twente contributes world-class expertise in biosensor surface chemistry and analytical measurement science through its MESA+ Institute for Nanotechnology, one of Europe's foremost nanofabrication and biosensing research centres, providing a depth of biofunctionalisation expertise that would be unavailable to an SME alone. Charité Berlin, one of Europe's largest and most internationally renowned university hospitals and a leading centre for sepsis research and clinical trials, provides direct access to the patient population, clinical infrastructure, independent central laboratory reference facilities, and the clinical and regulatory expertise required to generate IVDR-grade performance evaluation evidence.

The Dutch–German partnership reflects the cross-border collaboration ethos of Horizon Europe while maximising logistical coherence: the proximity of the NovaPhotonics BV and University of Twente sites enables frequent in-person technical collaboration, while Charité Berlin's geographic and institutional distance from the industrial partners ensures the independence and credibility of the clinical validation study. The consortium's combined network spans the full value chain from chip fabrication through clinical deployment and regulatory submission. No single partner could achieve TRL 6 with clinically credible validation evidence independently: the triangular structure is both the minimum necessary and the optimal composition for this action.

## 3.3 Milestones

| ID | Title | WP | Due | Verification |
|---|---|---|---|---|
| MS1 | Biofunctionalization protocol frozen and cartridge manufacturing batch released | WP1 | M10 | Analytical QC report showing CV < 10% across three independent batches; 500-unit cartridge batch release certificate |
| MS2 | Analytical performance validation completed (TRL 5 confirmed) | WP1 | M14 | ISO 15189-aligned analytical validation report reviewed and approved by internal Scientific Advisory Board |
| MS3 | Clinical study patient recruitment completed | WP2 | M20 | Study enrolment log showing n >= 150 evaluable patients; interim safety review passed |
| MS4 | FTO analysis completed and patent application | WP3 | M12 | FTO analysis report; PCT patent application filing |

| | | | | |
|---|---|---|---|---|
| | filed | | | receipt |
| MS5 | IVDR pre-submission meeting with notified body completed | WP3 | M20 | Notified body meeting minutes and gap analysis document |
| MS6 | Clinical validation report finalised (TRL 6 confirmed) | WP2 | M23 | Clinical validation statistical analysis report confirming pre-specified performance thresholds |
| MS7 | Investor-ready business plan and pitch deck completed | WP4 | M23 | Business plan document approved by Advisory Board; pitch deck delivered to at least 3 investors |

## 3.4 Deliverables

| ID | Title | WP | Due | Type | Dissemination |
|---|---|---|---|---|---|
| D1.1 | Biofunctionalization optimisation report | WP1 | M10 | Report | Confidential |
| D1.2 | Cartridge manufacturing specification and process FMEA | WP1 | M12 | Technical document | Confidential |
| D1.3 | Analytical performance validation report (ISO 15189) | WP1 | M14 | Report | Confidential |
| D2.1 | Clinical study protocol and ethics approval | WP2 | M8 | Report | Confidential |
| D2.2 | Clinical validation statistical analysis report | WP2 | M23 | Report | Public |
| D3.1 | Freedom-to-operate analysis report | WP3 | M10 | Report | Confidential |
| D3.2 | IVDR regulatory strategy and technical file roadmap | WP3 | M20 | Report | Confidential |
| D4.1 | Market analysis and validated value proposition report | WP4 | M10 | Report | Confidential |
| D4.2 | Business model and financial projections | WP4 | M18 | Report | Confidential |
| D4.3 | Investor-ready business plan and pitch deck | WP4 | M23 | Other | Confidential |
| D5.1 | Data Management Plan | WP5 | M6 | Data management plan | Public |
| D5.2 | Final project report | WP5 | M24 | Report | Public |

## 3.5 Resources and Budget Summary

| Cost Category | Amount (EUR) |
|---|---|
| Personnel Costs | 1650000 |
| Subcontracting | 180000 |
| Travel & Subsistence | 60000 |
| Equipment | 220000 |
| Other Direct Costs | 140000 |
| Indirect Costs (25%) | 250000 |
| TOTAL | 2500000 |

## 3.6 Risk Management

| ID | Risk | Likelihood | Impact | Mitigation |
|---|---|---|---|---|
| R1 | Clinical recruitment delays at Charite Berlin due to competing studies or lower-than-expected sepsis case volume in the recruitment window | Medium | High | Pre-study feasibility analysis confirms minimum 3 eligible patients per week; a 2-month buffer is built into the recruitment timeline; a second clinical site (pre-agreed standby) will be activated if enrolment falls below 50% of target at month 16. |
| R2 | Cartridge injection-moulding yield below 80% due to dimensional tolerances in microfluidic channel structures, delaying validation batch production | Medium | High | FMEA conducted in T1.2 identifies critical dimensions before tooling commitment; two candidate contract manufacturers are qualified in parallel; design-for-manufacturability review at M6 incorporates tolerance analysis. |
| R3 | Regulatory timeline risk: notified body backlog delays pre-submission meeting beyond M20, impacting IVDR pathway clarity | Medium | Medium | Notified body engagement initiated in M1 to secure meeting slot; a second notified body is identified as fallback; the project outcome (TRL 6 demonstrator and business plan) is not contingent on full IVDR approval, only on pre-submission dialogue completion. |
| R4 | Third-party blocking patent identified in FTO analysis covering microfluidic-photonic integration | Low | High | FTO analysis commissioned in M1 with results by M10; design-around options are identified proactively; freedom to operate in key EU markets (DE, NL, FR) is assessed as a |

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|---|---|---|---|---|
| | | | | priority; legal budget reserve of EUR 30,000 is allocated in WP3. |
| R5 | Key personnel departure (lead photonics engineer at NovaPhotonics BV) causing delays in WP1 | Low | High | Knowledge management protocols ensure full documentation of all technical processes; University of Twente provides technical backup capacity under a secondment arrangement defined in the consortium agreement; recruitment process for a backup engineer will be initiated at M1. |